Ukrainian ERA Roadmap
Priority 1:
Efficiency of the national research system

Integration of Ukraine into the European Research Area (ERA) opens up additional possibilities for the development of the national research system of Ukraine due to a potential entry into new markets and obtaining new knowledge (in a variety of forms) from EU countries.

Development of a modern national research system should go in the context of an overall economy reformation. This implies that the science, research and innovation policies should comport with the industrial, educational, demographic and other policies at the top level. No «internal changes» in the science system will have proper effect unless business entities, public authorities and potential foreign partners, primarily EU partners, stimulate the demand for research and development results.

Current documents, laws and strategies

- Law of Ukraine «On scientific and research activities»
- Law of Ukraine «On scientific and technical expert examination»
- Law of Ukraine «On innovation activity»
- Law of Ukraine «On science parks»
- Law of Ukraine «On priority areas for development of science and engineering»
- Law of Ukraine «On priority lines of innovation activity in Ukraine»
- Peer Review of Ukrainian Research and Innovation System, EU Commission, 2016

Current progress and challenges

Ukraine ranks 61st in per capita GDP PPP. At the same time, according to UNO specialized agencies, in 2016 Ukraine ranked 40th in scientific potential, 41st in higher education system’s potential, 56th in innovations level.

Thus, Ukraine still retains a high scientific potential, but admittedly this potential has suffered significant losses during the years of independence. Links between science and industry have loosened significantly. Industry-oriented R&D share has been reduced most of all. The crisis in the sphere of science has been developing unevenly in time. The most significant decrease of the related indicators was observed in 1990s, but in the recent years we have seen again a rapid reduction of the scientific potential of Ukraine. Thus, according to statistical data, 2016 (the last year for which full statistical data is available as of the moment) saw a 20% decrease of the number of R&D workers, 29% decrease of the number of researchers including doctors of science (26% decrease) and PhD’s (38% decrease)1, as compared to 2015. Post-graduate course enrolment was reduced by 32%, doctoral candidacy – by 10%.

1 According to the national statistics standards, employment data specified is based on the «primary employment»
Even calculations at current prices show reduction of R&D costs: 2016 science costs funded from the state budget were 3,700,856.5 thousand UAH which is 2% less than 2015 costs, and their GDP share was 0.16%. The GDP share of the 2016 total science costs funded from all sources was only 0.48%. Starting from 2017, we observe stabilization of R&D costs and even their increase for some categories at current prices (or even at comparative prices for defence costs).

Thus, in terms of GDP share of R&D costs Ukraine falls significantly behind EU countries where this indicator averaged 2.03% in 2015. GDP share of R&D costs was above the average in Sweden – 3.26%, Austria – 3.07%, Denmark – 3.03%, Finland – 2.90%, Germany – 2.87%, Belgium – 2.45%, France – 2.23%.

Thus, the gap in science and engineering between Ukraine and developed countries is threateningly widening, Ukraine still lacks a strategy for the development of science, lacks an efficient policy in science, engineering and innovation, the pay level and social status of scientific workers remain extremely low, the prestige of scientist profession is waning, drain of scientists, specialists, skilled manpower from Ukraine is reaching a critical level.

The key challenges for the national scientific sphere in the short term are as follows:
- low level of R&D costs, even not enough for a self-reproduction of the science system;
- rapid emigration of scientists, especially younger ones;
- increase of the average age of scientific workers;
- diminishing expertise of scientific workers due to degradation of research facilities and lack of access to modern scientific equipment and information resources;
- aggravation of competition for highly skilled staff between science and other sectors (government sector, financial sector, some high-technology sectors of the economy like IT or pharmacy);
- sharp slump in demand for R&D results from other sectors of economy due to the orientation of the national economy mainly to the production of raw materials and products with a low level of processing, as well as the import of outdated foreign technologies.

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<tr>
<th>Priority 1. Increasing the efficiency of the national research system</th>
<th>Reach a higher level of integration of the national research system into ERA</th>
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</table>
| Objective 1 Instruments and activities | 1. Identify measures (taxation, organisational etc.) to stimulate and increase total R&D costs  
2. Identify and continuously update common priority lines of cooperation in science and innovation with EU countries both on a multilateral and on a bilateral basis.  
3. Ukrainian representatives taking part in EU committees on research and innovation development.  
4. Adapt national statistics-related legislation in the sphere of |
Science and innovation activity to the international standards in order to enable comparative assessments and calculations.

| Indicators | 1. GDP share of the total R&D costs  
2. GDP share of R&D costs funded from the state budget  
3. Indicators *Innovation Union Scoreboard (IUS)* as to the development of the scientific potential (indicators are altered every 2-3 years, so the most recent version should be used)  
4. Number of joint scientific publications by Ukrainian scientists and their EU counterparts (peer-reviewed in databases WoS and SCOPUS) per thousand scientists.  
5. Number of bilateral and multilateral joint scientific and innovation projects with EU representatives (separately by each project type).  
6. Number of European patents obtained by Ukrainian scientists, the number of European patent applications filed by them. Respective shares of such patents in the total number of patents obtained by Ukrainian residents. |

| Objective 2 | *Introduce a system for assessment of scientific establishments and scientific activity at higher education establishments based on the best European practices and with account taken of the national identity.* |

| Instruments and activities | Introduce advanced procedures for the assessment of scientific establishments and scientific activity at higher education establishments based on the practices existing in the EU countries. |

| Indicators | 1. Introduce an updated system of indicators for the assessment of scientific establishments and scientific activity at higher education establishments with account taken of the number of publications in international databases WoS and SCOPUS.  
2. Amounts and share of the off-budget financing for research and development at higher education establishments.  
3. Number of periodicals founded by Ukrainian scientific establishments and higher education establishments and added to the databases WoS and SCOPUS. |

| Objective 3 | *Secure necessary R&D financing, ensure that the science system fulfils its new knowledge generation function.* |

| Instruments and activities | 1. Reach a sufficient level of R&D financing, create a flexible and multichannel system for such financing which, pursuant to the recommendations of the International audit of scientific and innovation system of Ukraine carried out using «Horizon-2020» programme instruments, will in the mid-term ensure a 60:40 basic to grant (project) financing ratio for all types of budget-funded scientific establishments |
and for scientific activity at public higher education establishments.

2. Create a National Research Foundation (NRF) to be a powerful instrument of project (grant) financing for all sectors of Ukrainian science.

3. Introduce basic financing of scientific activity at higher education establishments.

4. Raise scientists’ salaries up to the level which will make activity in the area of science attractive.

5. Using various instruments (remuneration of labour, working conditions, housing etc.), sustain motivation in young people to be involved in scientific and research activity.

6. Develop Ukrainian/English dual-language research environment.

7. Develop clear and transparent criteria and procedures for selection of universities and conferring them the status of research establishment; entrust teaching-and-research staff with more «research» functions.

| Indicators | 1. Level of R&D financing from various sources (with a respective distribution).
| 2. Share of scientific workers in the total number of scientific and teaching-and-research staff of higher education establishments.
| 3. Share of young scientists aged up to 35 in the total number of scientists.
| 4. Scientists’ pay level relative to the average pay level in Ukraine and in selected «reference» economy sectors.
| 5. Number of qualified PhD. |

**Objective 4**  
**Ensure a higher level of cooperation between science and business.**

| Instruments and activities | 1. Introduce fiscal and other incentives for financing research and development by businesses.
| 2. Design a «smart specialisation» strategy for Ukraine and its regions, create conditions for access to the instruments provided by EU’s structural funds in order to ensure efficient implementation of such strategies. |

| Indicators | 1. Level of financing of the R&D area by Ukrainian and foreign businesses.
| 2. Amounts of venture financing for newly formed companies.
| 3. Amounts of income of scientific establishments and higher education establishments from patenting and licensing activity and technology transfer.
| 4. Number of joint scientific publications by workers of...
Priority 2a: Joint solving of problems resulting from global challenges

Integration of scientific and innovation area with the European Research Area stipulates, inter alia, that scientific, technical and financial capacities and efforts be consolidated for solving issues being of common interest and relating to various areas of science and functioning of social institutions.

At the EU level, such mechanism was introduced in 2013 and named «Joint Programming» which implies coordination of national (country) programmes based on negotiations between the parties concerned, identification for each country of areas of so called smart-specialisations (high-tech specialisations and priorities), and based on this, making decisions as to the Joint Programming Initiative (JPI) by the High Level Group on Joint Programming (GPC) which consists of representatives of the EU member countries and representatives of the European Commission. Normally, competitions of joint initiatives are prepared with an active involvement of large European industrial companies which are the end users of the R&D deliverables. Using the status of an associated country allows Ukraine to shape a joint vision for the involvement in such initiatives, agreement of project assessment and programme assessment procedures, deliverables joint use procedures with the assurance of intellectual property rights.

Current documents, related policies, including laws and strategies

- Law of Ukraine “On the ratification of the Statement on Ukraine membership in the International European Innovation and Research Programme «EUREKA»
- European Research Area and Innovation Committee of the European Commission (ERAC) decision of 20 April 2015 on the ERA Roadmap for 2015-2020
- Peer Review of Ukrainian Research and Innovation System, EU Commission, 2016 (recommendations 17, 18, 23).

Current progress and challenges

The instrument for implementation of international cooperation and preclusion of duplication of research and diffusion of efforts is the considerable body of bilateral and multilateral intergovernmental and departmental research programmes and
projects. Particularly, due to these instruments, Ukrainian scientists participate in some CERN collaborations, some Ukrainian scientific establishments and higher education establishments participate in the EU research programmes COST, «EUREKA», the long-term cooperation is carried out with the International Institute for Applied System Analysis (IIASA) where joint complex projects are implemented and young scientist training is supported through the Summer School programme. In 2017, a target programme was started for the scientific research by the National Academy of Sciences of Ukraine named «Aerospace observations of the environment for the sustainable development and security» as the national segment of the programme project «Horizon 2020» ERA-PLANET (ERA-PLANET/UA)», which is the first case of joint financing of such large-scale research projects for Ukraine.

At the same time, at the national level, starting from March 2014, for the purpose of saving budget funds, the development of new governmental target scientific and research programmes was suspended. This makes it impossible to benefit from the management-by-objectives approach for financing in the international cooperation. Ukraine is not a member country of the COST programme, and participation of individual organisations in joint activities within the COST can not build up a «critical mass» of researchers for future participation in consortiums of large-scale programmes, particularly «Horizon 2020». Starting from 2010, Ukraine’s participation in the international programme «EUREKA» was in fact frozen (co-financing by Ukraine of programme projects was resumed only in late 2017 and only in the nominal amount of UAH 200,000). Ukraine does not participate in any of the 10 EU-selected Joint Programming Initiatives (unlike some EU associated countries).

**Comparison with other EU associated countries assigned into separate EU cooperation groups.**

Belarus, being part of the Eastern Partnership countries, participates in 2 Joint Programming Initiatives, namely – «Healthy and productive seas and oceans» and «Cultural Heritage and Global Change»; Moldova – also in 2 Initiatives, namely – «Cultural Heritage and Global Change» and «Water Challenges for a Changing World».

One of the EU associated countries which are not part of the Eastern Partnership but can be compared to Ukraine in terms of geographic location or degree of involvement in other EU programmes is Turkey which participates in 6 Joint Programming Initiatives, another is Albania – 1 Initiative.

Among the Danube region countries, the most active countries in terms of participation in Joint Programming Initiatives are Poland and Romania (8 initiatives), Czech Republic (5 initiatives), Slovakia (3 Initiatives) and Hungary (2 Initiatives).
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<th>Priority 2a. Joint solving of global challenges</th>
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<td><strong>Objective 1</strong></td>
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| **Instruments and activities** | 1. Ensure proper coordination of actions of central executive bodies which are the main managers of R&D budget funds, National Academy of Sciences of Ukraine, national specialised (by branches of industry) academies of sciences in order to agree national strategies and priorities in scientific research with EU Joint Programming Initiatives and Strategies.  
2. Carry out foresight studies and identify the possibility for Ukraine to participate in certain Joint Programming Initiatives.  
3. Initiate passing of a Resolution of the Cabinet of Ministers of Ukraine as to participation in EU Joint Programming Initiatives, which would regulate the mechanism of mutual recognition of procedures for the assessment and rules of selection of projects to be supported, common terminology etc. |
| **Indicators** | 1. National GBARD (Government Budget Allocations for R&D) for bilateral or multilateral R&D programmes with the EU / EU countries.  
2. Number of Joint Programming Initiatives selected for Ukrainian participation. |
| **Objective 2** | Enhance Ukraine cooperation with EU member states and associated states and with researchers from such countries in order to diminish fragmentation of research and duplication of efforts; use joint resources in the most efficient manner for solving common problems. |
| **Instruments and activities** | 1. Ensure Ukraine accession to the research cooperation network COST.  
2. Create multilateral network platforms, particularly «European technology platforms» (ETP) and «Joint technology initiatives» (JTI) using instruments provided by COST and EUREKA.  
3. Design criteria and procedures for the assessment of joint programmes, use of R&D deliverables, protection and joint use of intellectual property items through participation in EU projects using instruments provided by CSA, Teaming, Twinning etc.  
4. Create appropriate joint investment funds, incorporate a provision as to such funds into the legislation on support and development of innovation activity. |
| Indicators | 1. Availability of new international agreements on participation in COST, ETP, JTI on intergovernmental, departmental and operational levels.  
2. Designed criteria and procedures for the assessment of joint programmes, projects, strategies, concepts.  
3. Number of R&D support funds. |

**Priority 2b:**

**Optimal utilisation of government investments into research infrastructures**

Development of world-class research infrastructures in Ukraine and ensuring access to available infrastructures or infrastructures being phased in is extremely important for the Ukrainian scientific community in the context of integration into ERA. European Commission allocates considerable funds for the development of research infrastructure facilities of exclusively Pan-European or, as a minimum, regional (Danube/Baltic/Black sea regions etc) significance. At the same time, support for or creation of new national-level research infrastructures remain, in fact, the focal point of every EU country.

**Current documents, related policies, including laws and strategies**

- Law of Ukraine «On scientific and research activities»
- Medium-term plan of Government priority activities till 2020
- Peer Review of Ukrainian Research and Innovation System, EU Commission, 2016 (recommendation 20)
- European Strategic Forum for Research Infrastructures roadmap (ESFRI Roadmap)

**Current progress and challenges**

Successful practices include financing of national property facilities, which are part of the national research infrastructure of Ukraine, from the state budget of Ukraine.

They also include the following:
- long-term participation in the European organisation for nuclear research (CERN), large-scale infrastructure project «European social survey» (ESS), consortium EuroFusion and in three research infrastructures which are under construction: DANUBIUS-RI (start of operation in 2022), EISCAT_3D (start of operation in 2021) and CTA (pre-operation launch in 2019, start of operation in 2023) as extra partners who fulfil individual tasks but are not beneficiaries of large-scale projects;
- national digital infrastructures for research and education: URAN (there is an agreement with GEANT), UarNET;
- national digital infrastructure for parallel computing: Ukrainian national Grid (agreement with the European Grid Infrastructure (EGI) at the technological level, agreement with the Nordugrid, coordinator of supercomputer network of Poland – PSNC and coordinator of the Open Science Grid USA – University of Wisconsin–Madison);
- participation in 6 projects of the programme «Horizon 2020» section «Research infrastructures», 3 of which maintain cooperation with the GEANT network, while the other 3 relate to the creation of an international centre for the research of river-sea systems DANUBIUS-RI (start of operation in 2022), international distributed infrastructure for the research of advanced materials, including biomaterials, and development of sea surveillance system SeaDataNet.

At the same time, due to a significant financial stress, outdated Ukrainian research infrastructure makes it impossible for Ukraine to become a full member and invest in the development of large-scale European-class research infrastructures. Bringing it up-to-date requires a thorough stocktaking of the available resources, significant financing and elaboration of a development strategy, and that includes identification of strong (from the perspective of international utilisation and access) topical directions, and concentration of efforts and resources exactly on them. Today, there is no systematic use of the available research infrastructure of Ukraine for the purpose of integration into the European Research Area: no analysis of condition, supply and capabilities of available research infrastructures was carried out; there is not national roadmap for research and e-infrastructures. Science policies for the development of research and e-infrastructures in ESFRI and e-IRG groups are not agreed with the EU. Yearly state budget laws of Ukraine do not provide for financial support for participation in EU research infrastructures. There is no legislation for participation in research infrastructures in the form of management of such infrastructures within international consortiums (ERIC). Possibility to use open infrastructures in the EU is limited by current regulations as to the use budget funds.

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<td><strong>Instruments and activities</strong></td>
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Priority 3:
Free job market for researchers

Open, transparent and achievement-based employment procedure to fill vacant scientific and teaching-and-research positions at scientific establishments and higher education establishments significantly influences the attractiveness of researcher’s career, efficiency of research activity at scientific establishments and universities, and ensures the influx of talents into the area of science and the area of higher education.

At the same time, academic mobility and internationalisation of research activity will allow to convert the outflow of highly skilled staff to foreign countries into an equitable exchange (staff circulation). Retention of position of a scientist who got an offing to conduct long-term research or get trained abroad, stimulation of managers of scientific establishments and higher education establishments to favour such international contacts, support for projects of cooperation with Ukrainian scientific diaspora – these are the steps which will enliven the science job market and prevent domestic and foreign outflow of staff from the area of science and the area of higher education of Ukraine.

Scientific staff will return back and rejuvenate if fair employment terms are secured based on the achievements and experience of a scientist and if first scientific employment (Postdoc equivalent) is secured for young scientists who have just defended their thesis.

Current documents, laws and strategies

- Law of Ukraine «On scientific and research activities»
- Labour Code of Ukraine
- Association Agreement between the European Union and the European Atomic Energy Community and their member states, of the one part, and Ukraine, of the other part
- Ukrainian Cabinet of Ministers Resolution №275-r of 03 April 2017 On approval of medium-term plan of Government priority activities till 2020 (p.10) (recommendations 15, 19, 21, 29)
- Ukrainian Cabinet of Ministers Resolution №579 of 12 August 2015 On approval of the Regulation on the procedure for exercising the right to academic mobility
- Ukrainian Cabinet of Ministers Resolution №710 of 11 October 2016 On efficient utilisation of public funds
- Ukrainian Cabinet of Ministers Resolution №411 of 13 April 2011 The issue of student education and traineeship (scientific traineeship) of post-graduates, adjunct professors and doctoral candidates, scientific and teaching-and-research
staff at the leading higher education establishments and scientific establishments abroad
- Ukrainian Cabinet of Ministers Resolution №98 of 02 February 2011 On amounts and structure of business travel costs for government employees and other persons sent on business travel by companies, establishments and organisations which are fully or completely funded using budget funds
- Ukrainian Cabinet of Ministers Resolution №287 of 04 March 1996 On approval of the Regulation on terms of financial security for persons sent abroad for education and traineeship
- Peer Review of Ukrainian Research and Innovation System, EU Commission, 2016 (recommendations 15, 19, 21, 29)

Current progress and challenges

One of the key problems in the area of science of Ukraine is the lack of competitive incentives for attracting talented young people to science. The career of a scientist in Ukraine is of low attractiveness, and that is why it prompts a massive outflow of personnel both to other branches of the economy and abroad.

In order to preserve Ukraine’s status of a state with a powerful scientific potential that will have the ability to build a knowledge-based economy, it is urgent to take measures to ensure the resumption of saturation of scientific staff with young professionals and to show young scientists the prospects for developing their scientific careers through proper funding of highly professional experienced scientists in Ukraine and introduction of the principles of selection of scientific and teaching-and-research staff, based on achievements and real qualification.

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<th>Priority 3. Free job market for researchers</th>
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<tr>
<td><strong>Objective 1</strong></td>
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</table>
| Instruments and activities | 1. Elaborate a comprehensive human resource development policy in the area of scientific research and the area of higher education at the national, regional and institutional levels.  
2. Design a system of incentives for research establishments and higher education establishments in order that they develop their internal regulations on human resource strategy based on the European Charter for Researchers and the Code of Practice for the Employment of Scientific Staff.  
3. Develop the Model Regulations on the procedure for a competition for filling vacant scientific and teaching-and-research positions of public scientific establishments and |

Ukrainian National ERA Roadmap
higher education establishments based on the general principles and requirements of the European Charter for Researchers and the Code of Practice for the Employment of Scientific Staff.

4. Design and introduce new research career development instruments to help improve career prospects for scientific and teaching-and-research staff.

| Indicators | 1. Signed declaration on Ukraine accession to the Pan-European service network of mobility centres EURAXESS\(^2\).  
3. Number of scientific establishments and higher education establishments that have developed and initiated the implementation at the institutional level of the Human Resources Strategy based on the European Charter for Researchers and the Code of Practice for the Employment of Scientific Staff.  
4. Number of scientific and teaching-and-research positions, contest for which was announced through the Pan-European service network of mobility centres EURAXESS.  
5. Number of applications from higher education establishments and scientific establishments that have expressed their desire to implement the European Charter for Researchers and the Code of Practice for the Employment of Scientific Staff. |

| Objective 2 | Develop the strategy «Career for a young scientist in Ukraine» |
| Instruments and activities | 1. Create organizational and structural conditions aimed at attracting young highly skilled researchers to work in R&D.  
2. Develop the state programme «Housing for Young Scientists».  
3. Promote the formation of a positive attitude of society towards the profession of scientist/researcher.  
4. Create conditions and environment which would promote efficient work and high productivity of a scientist/researcher. |

\(^2\) DECLARATION OF COMMITMENT BY THE MEMBERS OF THE EURAXESS SERVICES NETWORK  
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<th>5.</th>
<th>Create a system of additional temporary (so-called Postdoc) positions at universities and scientific establishments for young scientists who have been awarded a Ph.D. degree in the last 12 years, including those in foreign countries.</th>
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| **Indicators** | 1. Adopt regulations on temporary (Postdoc) positions at universities and scientific establishments for young scientists who have been awarded a Ph.D. degree in the last 12 years.  
2. Adopt the state program «Housing for Young Scientists».  
3. Total number of announced and filled temporary (Postdoc) positions at universities and scientific establishments for young scientists who have been awarded a Ph.D. degree in the last 12 years.  
4. Share of temporary (Postdoc) positions filled by young scientists who have been awarded a Ph.D. degree abroad, including European countries and the USA.  
5. Share of young scientists aged up to 35 in the total number of scientists.  
6. Share of young doctors of sciences aged up to 40 in the total number of scientists. |
| **Objective 3** | Harmonise Ukrainian legislation adopted to ensure accommodation the needs and requirements of scientific activity, creation of opportunities and conditions for attracting foreign professionals and mobility of Ukrainian scientists |
| **Instruments and activities** | 1. Overcome regulatory and administrative obstacles to attracting foreign highly skilled scientists and researchers at different levels of their scientific careers.  
2. Develop a retirement benefit strategy for researchers who have used their right to academic mobility. |
| **Indicators** | 1. Amendments made to existing by-laws in order to reduce bureaucratic procedures duration and create favourable conditions for attracting and employing highly skilled foreign scientists and researchers at higher education establishments and scientific establishments of Ukraine.  
2. Amendments made to existing by-laws in order to create incentives for the leaders of scientific establishments and higher education establishments as to attracting employees to international academic mobility and to encouraging international mobility of Ukrainian scientists.  
3. Agreement made with the Pan-European pension fund for |
mobile researchers RESAVER³.

4. Share of foreign professionals working in scientific and teaching-and-research positions at higher education establishments and scientific establishments of the total number of scientists.

5. Number of short-term visits (up to 2 weeks) of foreign professionals to Ukraine within the framework of joint scientific projects.

6. Number of medium-term visits (2 weeks to 3 months) of foreign specialists to Ukraine within the framework of joint scientific projects.

7. Number of foreign professionals working in scientific and teaching-and-research positions at higher education establishments and scientific establishments (over 3 months).

8. Number of short-term (up to 3 months) travels of Ukrainian scientists abroad within their scientific activity.

9. Number of medium-term (3 months to 1 year) travels of Ukrainian scientists abroad within their scientific activity.

10. Number of long-term (1 to 2 years) travels of Ukrainian scientists abroad within their scientific activity.

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<th>Objective 4</th>
<th><strong>Eliminate legal and other barriers to open, transparent and achievements/qualifications based employment of researchers</strong></th>
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</table>
| Instruments and activities | 1. Elaborate a comprehensive policy to promote the development of an attractive, open and sustainable labour and recruitment market, based on the achievements, qualifications and professional qualities of researchers.  
2. Create a system for the assessment of the career development of scientific and teaching-and-research staff taking into account the value of all forms of mobility.  
3. Create a stable system for the development of researcher career at all career stages regardless of the type of contracts and chosen career line in the research and engineering activity. |
| Indicators | 1. Amendments made to the Cabinet of Ministers Resolution No. 710 of 11 October 2016 «On efficient utilisation of public funds» in order to eliminate the limitations on the number of scientific staff selected by competition for vacant |

³ https://euraxess.ec.europa.eu/information/content/europe/pensions-researchers
positions at higher education institutions and scientific institutions, in case higher education establishments and scientific establishments use their own funds received through grants, international projects or other proceeds to a special-purpose fund.

2. Adopted act of the Cabinet of Ministers of Ukraine on approval of the Model Regulations on the procedure for a competition for filling vacant scientific and teaching-and-research positions of public scientific establishments and higher education establishments based on the general principles and requirements of the European Charter for Researchers and the Code of Practice for the Employment of Scientific Staff.

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<th>Objective 5</th>
<th>Develop new principles for the recording of working time of teaching-and-research staff of higher education establishments, based on the time spent on research</th>
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| Instruments and activities | 1. Develop new principles for financing higher education establishments and recording of working time of teaching-and-research staff of higher education establishments taking into account the time spent on scientific research.  
2. Develop a strategy for the harmonization of accounting and statistical reporting in the area of financing scientific and teaching-and-research activities in higher education establishments with European regulatory practice in this area. |
| Indicators | 1. Amendment made to the Cabinet of Ministers of Ukraine Resolution No. 1134 «On approval of standards for the number of students» in order to take into account the scientific work carried out by teaching-and-research staff of higher education establishments.  
2. A list of legislative and statutory acts that require harmonization with the European directives and legal principles of accounting and financing of scientific and research activities are made. |
Priority 4:  
Gender equality and comprehensive gender-oriented approach in the area of science and research

Integration of gender aspects into science and research means taking into account the biological characteristics and evolution of social / cultural characteristics of women and men. It encourages researchers to include gender analysis in the research process, in the development of concepts and theories, in the formulation of a research problem, in the collection and analysis of data, the use of analytical tools that are specific to each field of science. Without regard to the gender aspect, the efficient use of the variety of intellectual human resources with the aim of ensuring the relevance and representativeness of research is currently considered impossible.

Current documents, laws and strategies

- Law of Ukraine «On ensuring equal rights and opportunities for women and men»
- Law of Ukraine «On higher education»
- Law of Ukraine «On scientific and research activities»
- The Concept of the State social programme for ensuring equal rights and opportunities for women and men for the period until 2021
- Peer Review of Ukrainian Research and Innovation System, EU Commission, 2016

Current progress and challenges

Ukraine is one of the countries with traditionally high educational level of women. Thus, it is now customary that the share of women obtaining education at higher education establishments is dominant – 51.2% - in the total number of persons who studies at higher education establishments in 2014-2015 academic years.

The percentage of women who conducted scientific research and development is slowly growing per sector of science and per scientific degree. Thus, in 2014, they were 45.8%. Among Ph.D.s, in 2014, women accounted for 51.7% (in 2009 - 44.3%, in 2012 - 49%). At the same time, the number of female doctors of science was only 28.3% in 2014, although the trend in this case is also positive (for comparison - in 2012 they accounted for 25.4%). The percentage of women in full members and corresponding members of the National Academy of Sciences of Ukraine is also slowly growing, although it remains small: as of 27 December 2017, this indicator was 5.26%. For the first time in the period of Ukraine's independence, in 2016, a woman became Minister of Education and Science.

Since 2015, a working group on gender equality and discrimination prevention in the field of education (mainly staffed by representatives of higher education establishments of Ukraine) has been operating in the Ministry of Education and Science of Ukraine.
Since the late 90’s of the twentieth century, gender resource centres and gender laboratories have been opened at universities, some of which since 2012 have united into the Pan-Ukrainian network of centres for gender education of higher education establishments. In 2015, the first gender audit was conducted on 15 of Ukrainian higher education establishments.

**Challenges**

Unbalanced representation of women and men in science at the decision-making level.

Underestimation of the importance of integrating a comprehensive gender approach into research activities in the academic community. Marginalisation of this problem as a consequence.

**Comparison with EU member countries**

The gender priority is reflected in the Roadmaps of all EU countries. Programs to increase the motivation of women to go into natural and technical specialties, «positive actions» as to the representation of women at the decision-making level, creation of conditions for a harmonious combination of professional and family life have been implemented in Europe for more than 10 years. The implementation of the equality policy at the level of research establishments, which reflects, inter alia, the principle of gender equality, is also practiced by the European research community.

<table>
<thead>
<tr>
<th>Priority 4. Gender equality an comprehensive gender-oriented approach in the area of science and research</th>
<th>Objective 1</th>
<th>Increase the share of women in natural and technical specialties (where women are not sufficiently represented) at all levels of the hierarchy. At the same time, ensure a 30% representation, as a minimum, of either gender in fields of science and research where representation of such gender is unbalanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruments and activities</td>
<td>1. Encourage women to get into / work / conduct research in natural and technical specialties, men - in specialties in which their representation is unbalanced, in particular through educational campaigns, through introduction of career development plans for women in scientific establishments and higher education establishments etc. 2. Create equal opportunities for the professional self-fulfilment and representation of both genders in the area of science and research through various instruments (social support, incentive system, special working conditions etc) and through the development of infrastructure which would allow to combine professional and private (family) responsibilities at scientific</td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td>Establishments and higher education establishments.</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Share of female researchers in natural and technical specialties; share of either gender in the fields of science where such gender’s representation was previously unbalanced.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Availability of career growth plans of women in scientific establishments and higher education establishments.</td>
<td></td>
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<tr>
<td>3.</td>
<td>Availability of infrastructure in scientific establishments and higher education establishments which allows to combine professional and private (family) responsibilities.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2</th>
<th>Increase the share of women at the decision-making level in science through the integration of a comprehensive gender-oriented approach into the structures and policies in the area of science</th>
</tr>
</thead>
</table>
| Instruments and activities | 1. Introduce the equality policy (principles) at the level of research institutions and annual plans of its implementation.  
2. Introduce «positive» action programmes (special temporary measures aimed at eliminating the imbalance between the opportunities of women and men to exercise equal rights granted to them by the Ukrainian Constitution and laws), in particular temporarily grant women advantages in competitions for senior management positions at the decision-making level in the area of science, when choosing between male/female candidates of the same professional level. |

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Establishments and higher education establishments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Share of women in management positions in scientific establishments and higher education establishments.</td>
</tr>
<tr>
<td>2.</td>
<td>Availability of gender policies and action plans in scientific establishments and higher education establishments.</td>
</tr>
<tr>
<td>3.</td>
<td>Indicators of gender balance in the composition of the presidiums of the National Academy of Sciences of Ukraine and national branch academies of sciences, governing bodies of public scientific organizations, academic councils of higher education establishments etc.</td>
</tr>
<tr>
<td>4.</td>
<td>Availability of procedures for «positive actions» in scientific establishments and higher education establishments.</td>
</tr>
</tbody>
</table>
Priority 5: 
Optimal exchange and transfer of scientific knowledge

Priority 5 strategically combines the objectives of enhancing access to publications, open scientific data and knowledge, introducing state support for innovation activities and new procedures for knowledge transfer, for the purpose of optimal exchange and transfer of scientific knowledge for unlocking the potential of science and promoting the creation of a competitive economy.

Priority 5a: 
Transfer of knowledge. Open Innovations

Current documents, laws, strategies

The main regulatory documents that directly regulate the technology transfer sphere in Ukraine are the following laws of Ukraine:
- «On state regulation of activities in the area of technology transfer»;
- «On innovation activity»;
- «On investment activity»
- «On scientific and research activities»
- «On priority areas of innovation activity»
- «On priority areas of development of science and engineering»
- «On special regime of innovation activities of technology parks»
- «On science parks»
- «On scientific and technical expert examination»;
- «On scientific and technical information»;
- «On industrial parks»;
- «On copyright and related rights»,
- «On protection of rights to Inventions and utility models»;
- The concept of the development of the digital economy and society of Ukraine for 2018-2020, approved by the order of the Cabinet of Ministers of Ukraine dated January 17, 2018, No. 67-p

International Recommendations. At the request of the Ministry of Education and Science of Ukraine, a European peer-review of the national system of research and innovation of Ukraine was carried out in 2016 with the help of Policy Support Facility (PSF), a Horizon 2020 instrument for the support of national policies. The final report points at a «gap» between actions of various institutions in Ukraine as to innovation development, which requires the design of a cross-governmental research and innovation strategy, the use of best European practices in support of knowledge transfer and the innovation development: innovation vouchers, mobility programmes for science and industry, joint research projects, participation in priority multilateral European initiatives etc. These findings were also confirmed in 2017 by the World Bank’s recommendations as to the development of a more priority-focused and balanced portfolio of support programmes in the area of science, innovation and
Current progress and challenges

A number of technology transfer centres and networks have been set up in Ukraine, such as the Ukrainian technology transfer network, Ukrainian integrated technology transfer system, Automated system for the formation of integrated interstate information resources (ASFIMIR). Ukraine has a significant experience in participating in EUREKA projects since 1993. In 2011, the EEN-Ukraine consortium was created. In order to promote the commercialization of the deliverables of scientific and research activities of educational establishments / scientific establishments, 22 scientific parks were set up in Ukraine. For the financial support of innovation activity of business entities of various forms of ownership, a specialized state-run non-bank innovative financial and credit institution has been set up which provides financial instruments for the implementation of innovative and investment projects.

At the same time, financial and organizational support for the operation of technology transfer and innovation activity units, recording and accounting of intellectual property at scientific establishments and higher education establishments are not sufficient. Technology transfer centres and networks are not properly integrated with each other and with other elements of the country’s innovation infrastructure.

One of the important problems hampering the transfer of research deliverables from research establishments and higher education establishments to the industry is the lack of financial, in particular - credit, tax mechanisms in Ukraine to support the transfer of research deliverables.

Amendments to specific intellectual property legislation have been developed with account taken of the provisions of the Association Agreement and the European directives and regulations in the area of intellectual property. Bodies of executive power do not enforce current legislation on the assessment and accounting of intangible assets. The fiscal service does not exercise due control over financial reporting documents which confirm the payment of royalties.

Comparison with EU countries and associated countries.

Despite Ukraine’s commitment in the Association Agreement with the EU as to the development of scientific and technical potential, there is currently a discrepancy with the European knowledge and open innovations transfer policy. The development of innovation systems in line with the European «Open Network Innovation 2.0» paradigm is due to the involvement of all interested parties - industry, government agencies, academic circles, citizens in all their roles - in the open innovation ecosystems (OIE) for the creation of new markets, new products, new services as a result of transition from linear innovations to parallel interconnected innovation processes. Thus, OIE is the subject of innovation infrastructure, a communication instrument of public-private partnership, aimed at engineering to address the problems of innovation processes, both from demand and supply standpoints.
uniting means and resources and provision of various types of services by innovative actors interacting on a contractual basis to all interested parties in order to create new knowledge, products, services, technology markets through the transition from linear innovations to parallel interconnected innovation processes.

Support for technology and knowledge transfer at the EU level is provided through a range of organizational and financial instruments not used in Ukraine. In the Government medium-term action plan until 2020, the problems of the area of science and technology of Ukraine include the lack of an effective mechanism for commercialization of research and incentives for this. It is necessary to provide a system of incentives for the development of innovation activity, including start-ups, spin-off companies and other innovation activity entities at the initial stage of their project implementation.

<table>
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<tr>
<th>Priority 5a. Transfer of knowledge. Open Innovations</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>To introduce the European knowledge, transfer policy at the national level, disseminate and use scientific results as much as possible for a competitive economy, innovation and sustainable development. Protection of intellectual property and efficient use of intangible assets.</td>
</tr>
<tr>
<td><strong>Instruments and activities</strong></td>
</tr>
<tr>
<td>1. Update national priorities for the development of science, engineering and innovation activity taking into account EU trends, identify priority areas for the development of open science and open innovations. Set up an office for international transfer of knowledge to coordinate participation in international open ecosystems, as well as for consultations at the state level and the level of individual stakeholders (international competences centre).</td>
</tr>
<tr>
<td>2. Create open innovation ecosystems in each of the priority areas, participate in relevant advanced European innovation ecosystems. At the first stage, it is planned to create OIE digital innovations for start-ups and industry. Conduct annual All-Ukrainian Innovation Festival with a competition of start-up projects among higher education establishments and national universities of national academies of sciences.</td>
</tr>
<tr>
<td>3. Develop and implement the Innovation development strategy including proper sections on technology transfer, open innovations and efficient use of intangible assets. Provide regulatory basis for the implementation of the Strategy, coordinate it with strategies of smart specialization. Create and launch the Innovations Development Foundation.</td>
</tr>
<tr>
<td>4. Strengthen the role of TT centres by providing them with financial resources and professional staff.</td>
</tr>
</tbody>
</table>
5. Create regional offices for knowledge transfer and open innovations and provide them with necessary resources. Exchanging the best practices, joint trainings, cooperation with international associations and networks (AUTM, European TT Offices Circle), methodologies and recommendations as to agreements, royalty rates etc. Organizational and coordination support and regulatory basis will be provided by the national office for knowledge transfer and open innovations which will be set up under the Ministry of Education and Science of Ukraine.

6. Update the government’s strategy for protecting and using intellectual property based on European open access and open innovation practices. Introduce annual monitoring of commercialization of intellectual property items that were put on the books. Use open access licenses in Ukraine.

7. Develop criteria for assessing and monitoring the transfer of knowledge for research establishments and industry. Improve the system of indicators and their use in the statistical authorities.

8. Use of financial instruments to promote the introduction of applied research, knowledge transfer and knowledge dissemination with the financial support of the NRF in coordination with international technical assistance programmes.4

<table>
<thead>
<tr>
<th>Indicators</th>
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<tbody>
<tr>
<td>1. Share of companies cooperating with scientific and educational establishments.</td>
</tr>
<tr>
<td>2. Share of innovatively active (including industrial) companies.</td>
</tr>
<tr>
<td>3. Increased share of innovative products in the total volume of industrial products sold (and the number of new innovative companies).</td>
</tr>
<tr>
<td>4. Number of institutions in registered TT networks involved in providing support to innovation activities, in particular technology transfer centres and OIE: national and European, whose services are accessible in Ukraine (including where state support is provided).</td>
</tr>
<tr>
<td>5. Number of technology proposals / requests placed online in technology transfer networks.</td>
</tr>
<tr>
<td>6. Number of innovation projects jointly implemented with the EU and the amount of their financing, including EU</td>
</tr>
</tbody>
</table>

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4 Reference is made to the Law on scientific and research activities, article 51 p. 2 reading as follows: «one of the areas of grant support for the National Research Foundation of Ukraine is: 6) knowledge transfer and knowledge dissemination».  

Ukrainian National ERA Roadmap
| technical assistance projects. |
| 7. Global innovation index indicators. |
| 8. Number of projects within the EUREKA programme. |
| 9. European innovation scoreboard indicators. |
| 10. The ratio of the fractions of budget and extra budgetary financing of research works. |

**Priority 5b:**  
**Open science and digital innovations**

**Current documents, laws and strategies**

- Law of Ukraine «On basic principles of the development of the information society in Ukraine for 2007-2015»  
- Solution of the Cabinet of Ministers of Ukraine «On the establishment of the National repository of academic texts»  
- Strategy for the development of the library science for the period until 2025.

**Current progress and challenges**

The strategy for the development of the library science for the period until 2025 provides for a comprehensive promotion of the «creation of open access to scientific information through the development of open electronic archives». National library named after V. Vernadskyi possesses significant network resources. Over 100 Ukrainian educational and scientific establishments are connected to international scientific databases Scopus and Web of Science at the expense of the state budget.

The state scientific establishment «Ukrainian institute of scientific and technical expert examination and information» (DNU UkrINTEI) has formed a single automated fund and database of R&D and dissertations. DNU UkrINTEI is also the National information centre of Ukraine in international organizations, in particular: in the International information system of the UN Environment Program and the International system AGRIS/CARIS-FAO. In 2017, UkrINTEI was designated as the Administrator of the National repository of academic texts which is currently being created in accordance with decisions taken by the Government and the Ministry of Education and Science. From the commissioning of the National Repository, it is expected to provide free access to academic texts and the introduction of mechanisms aimed at adhering to the principles of academic integrity, which will directly affect the quality of academic texts. The current state of the scientific and technical information system is characterized by incompleteness of the organizational infrastructure and the lack of a single information space that would provide effective access to the national information resources of scientific and technical information, informational and analytical provision of research and innovation activities, and interaction with the global information space. There is uncoordinated development of
the library sector, specialized information centres (patents, standards and other regulatory technical information), branch and regional centres of scientific and technical information. The Government’s mid-term action plan until 2020 contains a reference the fact that there is no proper exchange of data and knowledge between science, economy (business) and society for solving social and economic problems.

**Comparison with EU countries and associated countries.**

In Ukraine, as of the beginning of September 2017, there are 65 repositories in higher education establishments and scientific establishments. However, the lack of access to world scientific digital infrastructures (to the global knowledge base, computing services) adversely affects the Ukrainian science. One of the key tasks placed on the digital agenda of Ukraine until 2020 is «harmonization of national scientific initiatives with European and global initiatives». In particular, it is suggested to connect Ukrainian scientific digital infrastructures to European ones and use the potential of the Ukrainian science for new developments that will have a significant effect on the economy, domestic market and the formation of the country’s innovation infrastructure.

<table>
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<tr>
<th>Priority 5b: Open science and digital innovations</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>Instruments and activities</td>
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</table>
4. In the NRF activities, include measures to promote participation in the implementation of the European cloud initiative in coordination with international technical assistance programmes.

| Indicators | 1. Share of publications in open access.  
| 2. Open Science Monitor indicators.  
| 3. Number of joint activities with EU Member States as to the implementation of the Open Science and Open Innovation Agenda.  
| 2. Number of institutions in the open access network. |

**Priority 6: International cooperation**

Priority 6 emphasizes the importance of effective international cooperation in the area of science with the aim of tackling urgent public problems, promoting access to new growing markets and enhancing the attractiveness of the European Research Area for ideas and investors around the world.

**Current documents**

Integration into the European Research Area (ERA) is one of the main priorities of Ukraine’s international cooperation in the field of scientific research, development and innovation. This is facilitated by multilateral and bilateral cooperation with the EU and EU member states under international agreements, the most important of which are as follows:

- Association Agreement between Ukraine and the EU (Chapter 9 «Cooperation in the area of science and technology», Article 375), 2014;
- Agreement between Ukraine and the EU on scientific and technological cooperation, 2002;
- Agreement between Ukraine and the EU on Ukraine’s participation in the EU programme Horizons 2020 - Framework Programme for Research and Innovation, 2015;
- Agreement between Ukraine and the European Organization for Nuclear Research, 2013;
- Agreement between the Government of Ukraine and the European Atomic Energy Community on the scientific and technological cooperation and the

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5 The monitor was commissioned by the European Commission Directorate-General for Research and Innovation. It was developed by several partners, led by RAND Europe with the support of Digital Science, Altmetric, figshare and Deloitte. http://ec.europa.eu/research/openscience/index.cfm?pg=home&section=monitor

Ukrainian National ERA Roadmap
- Agreement on the establishment of a Science and Technology Center in Ukraine, 1993;

**Current progress and challenges**

Membership in international organizations and programmes is one of the most effective and efficient means of integration into the European and global economic and technological space.

Ukraine and the EU cooperate within several programmes to support cooperation in research, technology and innovation, including the following:
- Programme Horizon 2020 - Framework programme for scientific research and technological development;
- Euratom;
- European Organization for Nuclear Research (CERN);
- International European innovation research program "EUREKA";
- Science and Technology Center in Ukraine (STCU);
- Science for Peace and Security NATO Program (SPS).

Accession to the programme Horizon 2020 in 2015 was the first example of Ukraine’s associated participation in EU programmes. This membership provided the Ukrainian participants with a status equal with their European partners’ status, and also opened up opportunity to influence the content of the programme. The most successful area of the programme for Ukrainian researchers are:
- Future and cutting-edge technologies. The acts of Maria Sklodowska-Curie – 28 supported projects;
- Research infrastructures – 8 projects;
- Space – 5 projects;
- Food safety, sustainable development of agriculture and forestry, marine, coastal and inland water resources and bio-economics – 5 projects
- Safe, clean and efficient energy – 8 projects
- Smart, eco-friendly and integrated transport – 5 projects
- Climate, environment, efficient use of resources and raw materials – 7 projects
- Europe in a changing world - inclusive, innovative and conscious societies – 6 projects.

According to the results of 446 competitions (2014-2017), for 117 Ukrainian organizations participating in the Horizon 2020 programme, 90 projects will be financed in the amount of 17.232 million Euros, 9 of which are coordinated by Ukrainian organizations. During this time, 1190 Ukrainian establishments and
organizations participated in the preparation of 915 project proposals. Total cost of projects involving 117 Ukrainian organizations is € 465,851,011.

Within the bilateral scientific cooperation between Ukraine and the EU countries, the number of projects in 2017 increased by almost 1.5 times compared to the previous year, from 37 projects in 2016 to 51 projects in 2017. The amount of financing of projects in 2017 grew almost 3.5 times in comparison with the previous year, accordingly from 1,675.0 thousand UAH in 2016 to 5,636.4 thousand UAH in 2017.

### Priority 6. International cooperation

<table>
<thead>
<tr>
<th>Objective</th>
<th>Internationalisation of scientific researches, developments and innovations of Ukraine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruments</td>
<td>1. In-depth implementation of bilateral agreements in the area of science and technology with EU countries and other countries of the world.</td>
</tr>
<tr>
<td></td>
<td>2. The Ministry of Education and Science conducts bilateral contests with the EU countries and other countries of the world within the limits of available funds and taking into account national priorities and interest by international partners.</td>
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<td></td>
<td>3. Participation in meetings and membership in the Strategic forum on international cooperation in the area of science and technology (SFIC).</td>
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<tr>
<td></td>
<td>4. Develop mechanisms for domestic co-financing of international European programmes in the area of science (ERA-NET, EUREKA, COSME, COST, other joint EU programmes, STCU, SPS).</td>
</tr>
<tr>
<td>Indicators</td>
<td>1. Number of financed projects in the EU framework programmes in the area of science and technology with the participation of Ukrainian researchers.</td>
</tr>
<tr>
<td></td>
<td>2. Number of international scientific publications issued jointly with scientists from the EU countries per thousand scientists (according to WoS and SCOPUS data).</td>
</tr>
<tr>
<td></td>
<td>3. Number of bilateral and multilateral joint projects.</td>
</tr>
</tbody>
</table>