SCIENCE, TECHNOLOGY AND INNOVATION SYSTEM OF UKRAINE

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Content

1. Administration of the science and technology sector
2. Science, technology and innovation development of Ukraine
3. Review of R&D projects results
4. International cooperation in the science and technology sector
5. Challenges
27 Ukrainian Universities and research institutions and 12,000 scientists have been forced to move from the occupied territories.

- 7.8% of territory is occupied.
- Over 1.7 million persons were relocated from the occupied territories.
Ukraine in the world rankings

Global competitiveness

Research and development
50

High and middle - high-tech enterprises
45

Export IT services
23

Creation knowledge
16

Innovation effectiveness
12

Human capital
26

WEF ranking
79
I. Administration of the science and technology sector
STATE GOVERNANCE OF THE SCIENCE AND TECHNOLOGY SECTOR (as it is)

President

- Verkhovna Rada (Parliament)
  - National Academy of Science of Ukraine
    - Scientific institutions
  - Cabinet of Ministers of Ukraine (Government)
- Ministry of Education and Science of Ukraine
  - Universities
- Other central executive authorities
  - Subordinated institutions

Direct subordination
Indirect subordination
The new Law of Ukraine
"On scientific and scientific-technical activity"
was adopted on 26 November 2016
Organizational structure of the National Council of Ukraine on Science and Technology Development

Chairman
(Vice Prime Minister of Ukraine)

First Deputy Chairman
(minister of education and science)

Deputy Chairman
(Chairman of the Scientific Committee)

Scientific Committee

Secretary
(appointed by Chairman)

Other members
Members of the National Council of Ukraine on Science and Technology Development

Members of the National Council

including

Scientific Committee Members

Leading Ukrainian scientists

Administrative committee members

Representatives of central executive authorities, NASU, large scientific enterprises, universities and research institutions
Main functions of the National Council of Ukraine on Science and Technology Development

- preparing proposals for the policy frameworks development in the field of scientific and technological activities and submitting appropriate recommendations to the Cabinet of Ministers of Ukraine;
- preparing proposals for the integration of national science into the international science, taking into account national interests;
- evaluation of reports on use of funds for scientific and technical activities and obtained results submitted by the National Research Fund of Ukraine, National Academy of Sciences, central executive authorities, etc.
Organizational structure of the National Research Foundation

**Supervisory Council = Scientific Commette of National Council**

- **Scientific Council**
  - (approves projects for funding, based on calls for proposals results)

- **Chairman**
  - (appointed by the Cabinet of Ministers of Ukraine)

- **Sections**
  - (adopt provisional decision)

- **Structural units**
  - ...
  - ...
The National Academy of Sciences of Ukraine

Structure

Presidium

Presidium Administration

Sections

Sections...

Departments

Research institutes, academic institutions, organizations, enterprises, etc.
Assurances for higher education institutions and academic staff:

- Higher education institutions (universities, academies, institutes), which have passed state certification of their research activities, are covered by assurances for conducting researches, established by this Law for research institutions;

- Academic staff of such institutions are covered by assurances for research activities, established by this Law for researchers
II. Science, technology and innovation development of Ukraine
The most advanced fields of Ukrainian science

- nuclear science
- new materials
- IT-technologies
- physics and astronomy
- engineering
- Biotechnology
- agricultural technologies
- aerospace technologies
R&D Priorities of Ukraine until 2020

- Fundamental research
- Information and Communication Technologies
- Energy and Energy Efficiency
- Rational environmental management
- Life sciences, new technologies on prevention and treatment of the most common diseases
- New substances and materials
Strategic directions of innovation activity in Ukraine set for 2011-2021 (1)

**Energy sector**
- growing focus on energy transportation, use of energy-efficient and resource-saving technologies, and application of alternative energy resources

**Transportation sector**
- a hi-tech development of transport system, space rocket industry, aircraft engineering and shipbuilding, armament and military equipment

**Materials science**
- focus on materials production, machining and combination, establishment of nonmaterial's and nanotechnology industry
Agricultural sector
- technological renewal and agricultural development

Medical sector
- development of equipment for high quality medical care, treatment, pharmaceutics

Environmental sector
- wide application of technologies for cleaner production and environment protection

IT sector
- development of modern information, communication technologies, robotics
NUMBER OF DEVELOPED & IMPLEMENTED R&D PROJECTS BY SCIENTIFIC FIELDS

- **Fundamental research**: 6776 projects
- **ICT**: 495 projects
- **Energy and energy efficiency**: 460 projects
- **Environmental management**: 1517 projects
- **Natural science**: 1716 projects
- **New materials**: 756 projects

- **Created**
- **% Implemented**
The science sector in Ukraine is concentrated on four domains:

- Academy of Sciences
- Universities
- State R&D
- Corporate R&D

1143 organizations took part in performing research and development in 2014
DISTRIBUTION OF ORGANIZATIONS IN ACCORDANCE WITH THE SECTOR OF SCIENCE (as of 2014)

- Specialized R&D institutions: 47.3%
- Universities: 31.2%
- Industrial enterprises: 5.7%
- Academy of Sciences: 15.8%
SPECTRUM OF ORGANIZATIONS INVOLVED IN THE SCIENCE AND TECHNOLOGY SECTOR FOR THE PERIOD 2005 - 2014
QUANTITY DISTRIBUTION OF ORGANIZATIONS INVOLVED IN THE SCIENCE AND TECHNOLOGY SECTOR (by branches of science, %)

- Engineering Sciences: 40.3%
- Natural Sciences: 35.4%
- Social Sciences: 12.4%
- Multisectoral Profile: 7.5%
- Humanities: 4.4%

Core activities employees

Researchers
NUMBER OF EMPLOYEES WITH ACADEMIC DEGREE INVOLVED IN THE R&D

NUMBER OF EMPLOYEES WITH SCIENTIFIC DEGREE

- **PhD**
  - 2005: 17
  - 2010: 17
  - 2011: 16.2
  - 2012: 16
  - 2013: 15.9
  - 2014: 14.8

- **PhD women**
  - 2005: 6.1
  - 2010: 6.9
  - 2011: 6.6
  - 2012: 6.8
  - 2013: 6.9
  - 2014: 6.5

- **Doctor of Science**
  - 2005: 4.2
  - 2010: 4.5
  - 2011: 4.4
  - 2012: 4.5
  - 2013: 4.5
  - 2014: 4.3

- **Doctor of Science women**
  - 2005: 0.8
  - 2010: 0.98
  - 2011: 0.98
  - 2012: 1.1
  - 2013: 1.1
  - 2014: 1.1
AGE DISTRIBUTION OF SCIENTISTS (as of 2014)

- To 29 years: 15.0%
- 30-39 years: 21.9%
- 40-49 years: 15.1%
- 50-59 years: 21.0%
- 60-69 years: 18.5%
- 70 and more: 8.5%
- 70 and more: 8.5%
FUNDING OF THE SCIENCE AND TECHNOLOGY SECTOR FOR THE PERIOD 2005-2014

- **State Funds**
- **Funds of National Investors**
- **Funds of International Investors**
- **Private Funds**
- **Other Sources**

The chart shows the distribution of funding sources over the years 2005 to 2014.
FUNDING DISTRIBUTION OF R&D BY SOURCE AND SECTORS (as of 2014)

- State funds: 39.3
- Private funds: 18.7
- Funds of international investors: 19.8
- Other sources: 1.4
- Funds of commercial sector enterprises: 17.8
- Funds of State Organizations: 2.92
- Funds of Higher Education sector: 0.05
- Funds of national investors: 20.8
- Funds of private non-commercial enterprises: 0.03
Dynamics of technologies, purchased by industrial enterprises, 2010-2015, items

- Total amount of purchased technologies
- in Ukraine
- outside Ukraine
The structure of technologies, purchased by industrial enterprises, by forms, 2015, %

- Equipment purchasing: 38.8%
- Qualified employees recruitment: 11.4%
- Other: 1.1%
- The right to use intellectual property: 10.6%
- Know-how, technology transfer: 3.3%
- R&D: 34.7%
Dynamics of technologies, transferred by industrial enterprises, 2010-2015, items

Total amount of transferred technologies
- in Ukraine
- outside Ukraine
National innovation system of Ukraine: key facts and figures

- 978 scientific organizations
- 63,864 scientists
- 58,695 researchers
- 16,000 doctors of science
- 86,230 PhD
- 27,662 postgraduates

- 824 innovation active enterprises
- 12 technoparks
- 21 Science parks
- 49 centers of innovation and technology transfer
- 14 Innovative business incubators

- 116,008 patents on inventions
- 105,719 patents on useful models
- 31,798 patents on industrial designs
- 88% inventive activity of Universities and research institutions
Projects of Technology Park "Y.O. Paton Institute of Electric Welding"

The technology of welding high-robust railroad rails.
The technology of welding soft living tissue.
Stand-alone energy-saving system with using alternative energy sources.
SCANNING NUCLEAR MICROPROBE

SILICON-BASED SEMICONDUCTING SENSOR (ELECTRONIC NOSE)

PHOTOCONTROL OF ANTIMICROBIAL ACTIVITY

The colonies did not grow where GS-SwLF was activated by visible light.
Science park "Kyiv polytechnic"

Currently, the university implements 11 projects worth 10.2 mln. UAH.

Since 2012 the Science Park hosts the annual nationwide festival innovative projects «Sikorsky Challenge».

Winners of the Festival "Sikorsky Challenge -2015" signed agreements with venture capital, investment and charitable funds for investment of development worth over 573 million UAH.
IV. Review of R&D projects results
Countries ranking due to publication activity (SCImago, 2014)
Ukrainian Science Overview according to Scopus data

Number of publications and authors is growing, but the citation impact is lower than world average.
Where in the world do the articles downloaded by Ukrainian researchers via ScienceDirect come from?

In the last 5 years, researchers from Ukraine have downloaded on ScienceDirect 1,071,431 documents written in 211 countries.

ScienceDirect brings research from all over the world to Ukraine

Top 20 Downloaded Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Downloaded Percentage</th>
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<tbody>
<tr>
<td>United States</td>
<td>16.49 %</td>
</tr>
<tr>
<td>China</td>
<td>15.86 %</td>
</tr>
<tr>
<td>Japan</td>
<td>5.46 %</td>
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<tr>
<td>France</td>
<td>5.08 %</td>
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<tr>
<td>Germany</td>
<td>4.90 %</td>
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<tr>
<td>India</td>
<td>4.46 %</td>
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<tr>
<td>United Kingdom</td>
<td>4.36 %</td>
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<tr>
<td>Korea</td>
<td>3.57 %</td>
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<tr>
<td>Spain</td>
<td>3.30 %</td>
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<tr>
<td>Italy</td>
<td>3.29 %</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2.61 %</td>
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<tr>
<td>Canada</td>
<td>2.57 %</td>
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<tr>
<td>Australia</td>
<td>2.03 %</td>
</tr>
<tr>
<td>Iran</td>
<td>1.79 %</td>
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<tr>
<td>Brazil</td>
<td>1.61 %</td>
</tr>
<tr>
<td>Poland</td>
<td>1.59 %</td>
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<tr>
<td>Russia</td>
<td>1.50 %</td>
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<tr>
<td>Turkey</td>
<td>1.42 %</td>
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<tr>
<td>Ukraine</td>
<td>1.36 %</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1.28 %</td>
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</table>

Source: Elsevier Web Analytics Department, ScienceDirect Usage Data 2010–2014
In the last 5 years, articles from Ukraine affiliated authors and published on ScienceDirect, have been cited 97,651 times by authors from 169 countries.
IV. International cooperation in the science and technology sector
INTERNATIONAL AGREEMENTS IN THE SCIENCE AND TECHNOLOGY SECTOR BETWEEN UKRAINE AND OTHER COUNTRIES

TOTAL: 70 AGREEMENTS
COOPERATION WITH INTERNATIONAL ORGANIZATIONS AND FUNDS

- Ukraine-EU
- Ukraine-NATO
- International European Innovation Scientific and Technical Program “EUREKA”
- U.S. Civilian Research and Development Foundation (CRDF)
- European Organization for Nuclear Research (CERN)
- Joint Institute for Nuclear Research (JINR)
- Organization of Black Sea Economical Cooperation (BSEC)
- Science and Technology Center in Ukraine (STCU)
- International Centre for Scientific and Technical Information (ICSTI)
On 20 March 2015, Carlos Moedas, European Commissioner for Research, Science and Innovation and Serhiy Kvit, Minister of Education and Science of Ukraine, signed the Horizon 2020 Association Agreement.

On 27 June 2016 Ukraine joined the Euratom Research and Training Programme. The agreement was signed in Brussels by Carlos Moedas, European Commissioner for Research, Science and Innovation, and Pavlo Klimkin, Minister of Foreign Affairs of Ukraine. The signing was in the presence of Petro Poroshenko, President of Ukraine.
**Action Plan of Ukraine on participation in Horizon 2020**

1. Establishment of a joint commission on the program implementation coordination with the participation of responsible central executive authorities, NASU, etc.
2. Establishment of a structural unit responsible for Horizon 2020 implementation
3. Functioning of Program Committees Delegates; selection of the delegates
4. NCP activities’ support
6. Raising awareness of society on Horizon 2020 programs and activities (Promotion, Information Campaign on the permanent basis)
7. Peer review of National science and innovation system
8. Adjustments of the national legal framework to European standards, improvement of R&D legislation (taxes, obligatory currency exchange, etc.)
9. Development of Science & Business partnerships
10. Involving Ukrainian scientific diaspora in Ukrainian R&D activities
Horizon 2020 First Calls Results 2014-2015-2016

459 submitted project proposals with 600 teams from Ukraine:

**Higher Education Institutions** – 214 teams (7.94%)

**Private Institutions** – 182 teams (9.89%)

**Research Institutions** – 149 teams (12.08%)

44 projects supported for funding with 60 teams from Ukraine and 7 601 574 Euro Budget allocated to Ukrainian participants

**Success rate 9.59%**
Challenges

1. Russian occupation of Crimea, Donetsk and Luhansk (>5 mln population)
2. 1,7 mln refugees
3. 27 universities and scientific institutions, over 12000 researchers and university teachers relocated from Donetsk and Luhansk to other regions (thousands of researchers and university teachers)
4. Budget crisis caused by war (decrease of GPD – 20%)
5. Inertness of main stakeholders (NAS, National branch academies)
Answers to challenges

- Implementation the Law of Ukraine "On scientific and scientific-technical activity"
- The new Law of Ukraine "On innovation activity" is to be adopted
- Ukraine should use all instruments and possibilities of Horizon-2020
Priority topics of the Peer Review of Ukrainian research and innovation system

I. Optimization of available policy instruments to support the national research system

- Which research are most promising in Ukraine in terms of potential and trends of world science development?
- How effective is the established practice to support the national research system and new tools introduced by Law “On scientific and technical activity”?
- What are the recommendations for improving these tools (in particular, the evaluation system of scientific results and scientific institutions, system of institutional and project financing, research coordination system at national level? etc.)?
- What regulatory and institutional factors and practices hinder the researches mobility (cross-sectoral, internal and external mobility)?
- How scientists and researchers mobility should be improved?
II. Internationalization of research and integration of Ukraine into the European Research Area

- What factors hinder the complete integration of Ukraine into ERA and what can be advised for neutralizing these factors?
- What are the priorities/priority steps for integration into the ERA, taking into account existing structure of scientific system?
- What research areas in Ukraine (in term of available capacity and program structure) are of high priority in term of participation in “Horizon 2020” projects and which tools should be used to improve the Ukrainian participation in the program?
- What mechanism can be used to enhance the interest of Ukrainian SMEs to participate in the program?
- Which EU support programs (Commission’s Structural Reform Support Service) can be effectively used in Ukraine?
III. Role of science in Ukrainian innovations development

- Which sectors of Ukrainian economy are the highest priorities in terms of innovations implementation and which can mostly influence the further development of economy and society as a whole?
- What factors nowadays hinder the development of innovation system in Ukraine, efficient communication between the national research system and business?
- What are the recommendations for overcoming these factors, what support instrument should be established to ensure effective growth strategies?
Thank you for your attention!