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**PROGRESS OF THE IMPLEMENTATION OF EURO-INTEGRATION REFORMS IN THE FIELD OF SCIENCE AND TECHNOLOGY IN UKRAINE**

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**Introduction**

The purpose of this report is to summarise the progress on the implementation of European integration reforms in the field of science and technology in Ukraine.

Though being listed as a lower middle-income country[[1]](#footnote-1), Ukraine possesses a rich scientific heritage and a relatively good standard of education. However, since its independence it is unclear if Ukraine, partly industrialised and at the same time an agrarian society, has an expressed political will and subsequent activities to transform towards a knowledge based economy. The last 25 years were characterised by a sequence of economic and political crises, the last of which started in the aftermath of the Maidan revolution, caused by the annexation of the Crimea and Sevastopol by Russian Federation and the war against neighbouring superpower at the Ukrainian Donbas region. This crisis is critical, as it has cut the country 15% of its GDP in 2015 compared to 2014 and the GDP per capita ratio is currently below the level of 2008[[2]](#footnote-2).

**Science and technology sector[[3]](#footnote-3)**

The field of science and technology was continuously shrinking since the country’s independence, especially in terms of general expenditures on R&D in % of GDP, the number of institutions and R&D personnel. The current situation is characterised by limited public budget allocations and an economic structure, whose demand for R&D is unclear. The governance of science and technology was reformed numerous times, but the dominant R&D institution of the country, the national Academy of Sciences of Ukraine (NASU), has remained stagnant. Nevertheless, the post-Euromaidan government, including the Ukrainian Ministry of Education and Science (MESU), express clear efforts for the full-scale reform of the system. It is important to note, that the association of Ukraine to HORIZON 2020 programme can be regarded as an important element of this orientation towards reforms.

Most of the state R&D budget is invested through NASU – institutional allocation is the dominant funding principle, while competitive project-based funding is severely low. Public investment is oriented towards broadly defined R&D priorities which correspond to the unclear broad R&D landscape of the country. The share of international R&D funding is relatively high but has recently dropped ~20% because of the prevailing crisis.

Due to the relatively archaic structure and practices of both administration and funding of science and technology sector, Ukrainian economy and further development of the country faces critical risks if the aforementioned institutions and practices are not reformed.

**Integration into the European Research Area**

One of the main priorities for Ukraine’s international R&D cooperation is integrating into the European Research Area (ERA)[[4]](#footnote-4). This integration is fostered by multilateral and bilateral cooperation with the EU and its member states.

Starting in 2002, the Ukraine-EU Agreement on Science & Technology (S&T) cooperation was signed. There are several EU programmes targeting the RTDI cooperation between the Union and Ukraine: FP7 – Seventh Framework Programme for Research and Innovation, HORIZON 2020 – Framework Programme for Research and Innovation, Erasmus Mundus, Tempus, Jean Monnet Programme under the Lifelong Learning Programme, INSC and INOGATE – both funded through the European Neighbourhood and Partnership Instrument (ENPI). Cross-Border-Cooperation Programmes – funded by ENPI, Central Europe Programme – as part of the European Trans-regional Cooperation Programmes.

The association of Ukraine to HORIZON 2020 on 20 March 2015 is an important step both scientifically and politically. Ukraine had a considerable participation in FP7 with funding amounting to €30.9m and a sufficient success rate of ~20%. However, participation in HORIZON 2020 did not yet improve in quantitative terms and the success rate fell to ~13%, which still corresponds to the EU average. The highest success rates are in the EURATOM[[5]](#footnote-5) section, while the lowest – in “Industrial Leadership”[[6]](#footnote-6), confirming the weak technological orientation of Ukraine’s industry.

Ukraine also has 25 intergovernmental S&T agreements with EU Member States and countries associated to Horizon 2020, while NASU has 110 additional bilateral agreements for projects jointly implemented with Poland, France, Hungary, Slovak Republic and the Czech Republic. The most important co-publication partners of Ukrainian researchers are residing in Germany, Russia and the USA, followed by Poland, France, UK, Italy, Spain and Japan.

**Research and innovation policy**

Ukrainian national priorities for science and technology are not defined in a common national strategy but by law. Currently, two laws[[7]](#footnote-7) adopted by the parliament of Ukraine define the national priorities:

* the Law of Ukraine on the Priority Directions of Science and Technology (2001) defines basic scientific research of the most important problems of scientific and technological, social and economic, political and human potential development to ensure Ukraine’s competitiveness in the world and sustainable development of its society and state, as well as energy and power efficiency, life sciences, new technologies for the prevention and treatment of the most wide-spread diseases, and new substances and materials;
* the Law of Ukraine on Priorities in Innovation Activities in Ukraine (2011) defines innovation related priorities such as adoption of new technologies regarding energy transportation, implementation of energy-efficient and resource-saving technologies, take-up of alternative sources of energy, adoption of new technologies of high technology development of the transportation system, rocket and space field, aircraft industry and shipbuilding, armament and military technologies, adoption of new technologies for materials production, their processing and interconnection; creation of nano-materials and nano-technologies industry, technological modernization and development of agro-industrial complex enterprises, introduction of new technologies and equipment for quality medical service, medical treatment and pharmaceutics, wide use of technologies for cleaner manufacturing and environment protection, and development of modern information and communication technologies and robotics.

**Higher education system**

The structural socio-economic and ideological transformation of the higher education system after the independence of Ukraine was accompanied with an orientation towards the Bologna process during the last 10 years. In May 2005, Ukraine signed the Bergen Declaration, thus officially joining the European Higher Education Area. In 2006-2007 ECTS was introduced in every institution of higher education. In 2008 a new type of entry system to the universities was introduced, according to which every student intending to study in a higher education institution must take an advanced level exam in Ukrainian in an independent centre providing maturity exams and entrance exams. This decision, however, affected negatively the main national minorities[[8]](#footnote-8).

One of the most important problems is the imperfect monitoring of the reform objectives, as the value of the introduced formal changes and of the high-sounding modernisation strategies, which have been proclaimed throughout the pre-Maidan revolution years, remains uncertain if the supervision of the implementation of the reform elements is not solved.

Ukraine is not yet fully integrated into the EHEA and the Bologna system. This can be observed from the level of study recognition: while recognition of credits became a common practice in the majority of EHEA countries, only 27% of Ukrainian students (second lowest after Armenia with 26%), who have been enrolled abroad have seen their credits gained abroad recognised nationally, while, for example, 75% of students in France, the Netherlands and Denmark has received recognition.

And though it is understandable that Ukraine primarily focuses on solving most prominent current issues, there is an urgent need to introduce more innovative solutions in the fields of education and skills development, as Ukraine, as well as the EU[[9]](#footnote-9), needs a genuine paradigm shift in the goals and functioning of the education sector and an understanding of its place and role in society.

Taking into account the current and future opportunities and challenges of digitalisation and automation[[10]](#footnote-10), it is crucial to ensure that appropriate skills are available, so that Ukraine remains competitive and is able to create new businesses and new jobs and that people can remain integrated into the labour market throughout their entire working lives. These future skills should match societal needs and the demands of the labour market.

**Doctoral training and recruitment of researchers**

The number of doctors of science and of candidates of sciences in Ukraine is constantly growing. The number of candidates grew from 59,000 in 2000 to 85,000 in 2011, and the number of doctors of sciences from 10,300 to 14,900 during the same period. However, only 20.6% of this growing number of doctors and candidates of science were involved in R&D as their primary job task in 2011[[11]](#footnote-11).

However, new positions for the recruitment of researchers are few and the number of employed researchers is constantly declining in Ukraine since the 1990s, which has led to an internal and external brain drain. The labour market for researchers in general is not very dynamic since it is difficult to terminate an existing contract with an individual researcher without serious reasons. There is also hardly any influx from foreign researchers. Although foreigners could compete for positions in Ukrainian research institutes and universities, language is often a barrier, because all higher education activities, as a rule, have to be in official state languages. The second reason relates to the general tax regulations for employment of foreigners, which give a clear advantage for the citizens of Ukraine. The third and maybe most important reason is the relatively low salary paid in the research sector in Ukraine[[12]](#footnote-12).

To attract young scientists, special state stipends and state awards for advancement in science were increased two to four-fold in the last couple years, which support the most talented and which should stimulate their work within the country. Young scientists have access to four main types of special support stipends, which in total fall behind 1,500 per year: special stipends for young doctors of science, stipends of the President of Ukraine, stipends for young scientists from the presidium of the National Academy of Sciences and regional stipends for young scientists – all of which range between €30 and €200 per month. Although the number of stipends and their financial levels have changed in the last couple of years, their basic structure and principles of provision remained almost the same.

**Employment and working conditions of researchers**

Although researchers in Ukraine usually have permanent contracts, R&D seems neither to be an attractive field of work for the young generation in Ukraine nor for foreigners. The average salary in Ukrainian research institutes and universities was around €600 per month before the most recent crisis, but dropped in real terms due to the collapse of the national currency in 2014 and 2015. Next to the low salary, the poor state of research infrastructure makes the working conditions for researchers most unattractive.

To counterbalance the low salaries, the government has also special stipends for experienced scientists, however, not more than 150 of such stipends were provided in recent years. At the same time, approximately 1,000 academicians and members of the state academies of sciences receive a monthly stipend of €2250 - €4450 until the end of their life. These stipends are much higher than the level of average monthly wages in Ukraine and are added on top to the salaries or pensions. Such exclusive treatment of the few creates a substantial hole in the R&D budget, thus preventing the improvement of working conditions of other researchers and general progress in the sector.

In 2013, only 511 researchers per one million inhabitants were employed by the business enterprise sector in Ukraine. This is a relatively low ratio, below that of Turkey (6609) and of Belarus (11,183)[[13]](#footnote-13). The development of this ratio is negative since 2004 in Ukraine, which indicates a severe demand-sided absorption problem of the business enterprise sector.

**Gender equality in R&D**

Women are widely represented in R&D. Like in Georgia, Moldova and most other Eastern Partnership countries, in Ukraine the majority of PhD graduates are also women (57%). They make up half of PhD graduates in natural sciences, 35% in engineering sciences (which is a very high level compared to the EU average) and 59% in health and welfare related studies[[14]](#footnote-14). Despite the rate in PhD graduation, women constitute only 45.5% of the total number of researchers in Ukraine[[15]](#footnote-15), which indicates a first glass-ceiling level at the scientific jobs’ entry phase.

There are no acts or regulations in Ukraine in place which promote a higher representation of women in R&D, however, women have in reality more problems in building their research careers than men, because they are supposed to combine childcare and related career leaves with uninterrupted professional activities. As a result, very few women have reached highest positions in the Ukrainian scientific hierarchy. For example, in the national Academy of Sciences of Ukraine (NASU) the average age of the members of the Presidium, which are highest management positions, is over 70 years of age and the percentage of female members is lower than 25%.

**Conclusions and recommendations**

The Ukrainian government should set clear priorities and tangible goals in the field of science and technology. The EESC believes, that science and technology will help the country to become a knowledge economy, therefore close inclusion of social partners and civil society into this process must be ensured, as it is imperative to establish agreeable priorities and foreseeable vision for the whole nation.

The National Academy of Sciences of Ukraine (NASU) should be immediately restructured and reformed both in terms of its composition and functions, by ensuring gender balance and that more young researchers are in the Presidium. NASU should become the leader in setting the trends of research and innovation, as well as to set example on cooperation with the industry and civil society, which is currently not the case. The modernisation of this key institution should be done by following the best practices of similar institutions within the EU member states.

The Committee also recommends rapidly shifting the R&D funding principle from institutional allocation towards competitive project-based funding, as well as to encourage and support business and industrial research and cooperation between the country’s companies and scientific institutions.

The autonomy of higher education and scientific institutions should be increased, especially in terms of self-governance and decision making. The financial surplus of such institutions should remain within them for investment and further development.

The EESC calls for more focused effort from the government of Ukraine, as well as from higher education institutions, academic and student organisations, in implementing the Bologna process and for closer integration into the European Higher Education Area.

The Committee believes, that the progress of science and technology sector cannot be ensured if the working conditions for researchers and other personnel are poor. Thus, it is highly recommended to look for viable solutions in cooperation with related actors to increase the salaries and financial contributions in the sector. At the same time, systematic discrepancies, when a minority of elderly academics receive the majority of funds, should be eliminated and maximum effort should be targeted at attracting young researchers into the governance of scientific entities.

Closer cooperation with the Commission, as well as with the member states in the field of science and technology could provide more funding and investment opportunities which in turn could provide a significant boost in terms of modern scientific inventory and equipment, as well as for the whole R&D system and the economy.

The Ukrainian government, in cooperation with the related social partners and civil society organisations, should develop and adopt the legislation to empower women in science, which should include affordable childcare, paid leave, encouragement for scientist-fathers to take a bigger part in child care, etc[[16]](#footnote-16).

1. The World Bank, 2017 [↑](#footnote-ref-1)
2. Ibid. [↑](#footnote-ref-2)
3. Background Report, Peer Review of the Ukrainian Research and Innovation System, Horizon 2020 Policy Support Facility, 2016 [↑](#footnote-ref-3)
4. <http://ec.europa.eu/research/era/index_en.htm> [↑](#footnote-ref-4)
5. <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/euratom> [↑](#footnote-ref-5)
6. <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/industrial-leadership> [↑](#footnote-ref-6)
7. ERAWATCH Country Reports 2012: Ukraine. [↑](#footnote-ref-7)
8. Klára Kovács, “The Bologna Process in Ukraine”. [↑](#footnote-ref-8)
9. EESC opinion on New skills agenda (SOC/546) [↑](#footnote-ref-9)
10. EESC opinion on Provision and development of skills, including digital skills, in the context of new forms of work: new policies and changing roles and responsibilities (SOC/562) [↑](#footnote-ref-10)
11. ERAWATCH Country Reports 2012: Ukraine. [↑](#footnote-ref-11)
12. Background Report, Peer Review of the Ukrainian Research and Innovation System, Horizon 2020 Policy Support Facility, 2016 [↑](#footnote-ref-12)
13. UNESCO Science Report 2015. [↑](#footnote-ref-13)
14. Ibid. [↑](#footnote-ref-14)
15. ERAWATCH Country Reports 2012: Ukraine. [↑](#footnote-ref-15)
16. EESC opinion on Women in science, SOC/502-EESC-2014-0625, OJ C 12, 15.1.2015 [↑](#footnote-ref-16)