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Science Policies and International Cooperation in the Eastern Neighbourhood of the European Union:
An Overview

Tatsiana Chulitskaya, Honorata Mazepus, Ina Ramasheuskaya and Dimiter Toshkov

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Abstract

Scientific cooperation is an important part of the European Union (EU)'s policy approach towards the countries in its neighbourhood. This has opened up many opportunities for cooperation in the areas of science, technology, research, and innovation between the EU and the Eastern Partnership (EaP) countries. This working paper reviews the institutional and policy parameters of scientific cooperation between the EU and three EaP countries – Belarus, Moldova, and Ukraine. It provides an overview of the science policies in these countries, focusing on the lasting impact of their shared communist legacies and post-Soviet transitions, as well as on their current strategies, institutions, and ambitions in the domain of science, research and development policy. The paper also reviews the place of scientific cooperation in the EU's science and external policies, focusing on relations with the neighbourhood and the EaP countries in particular. We also take stock of the existing programmes for scientific and educational cooperation and academic mobility between the EU and EaP countries. We present an inventory of relevant projects, with a discussion of the progress, level of participation of the research communities in the EaP, and other relevant parameters, such as the distribution of projects and participating institutions across broad scientific fields as well as disciplines. Altogether, we find that Belarus, Moldova, and Ukraine have registered a considerable degree of participation in the science and research programmes of the EU, but we also identify a number of barriers and structural impediments to a more successful partnership.

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1. Introduction[1]

Scientific cooperation is, and has been for some years now, an important part of the European Union (EU)'s policy approach towards the countries in its neighbourhood. The science policy of the EU is based on the general principles of openness and targeted cooperation. This has opened up many opportunities for cooperation in the areas of science, technology, research, and innovation between the EU and the countries of the Eastern neighbourhood. The countries of the neighbourhood have participated in numerous projects under the Seventh Framework Programme for Research and Innovation (FP7). Currently, four of the six countries in the Eastern Partnership (EaP) (Moldova, Ukraine, Georgia, and Armenia) are associated to the Horizon 2020 programme and the other two (Belarus and Azerbaijan) can participate as third countries. These opportunities have the potential to significantly affect the course of science policy and the quality of scientific output in the countries neighbouring the EU. But, according to the EU's strategic documents, the intention of scientific cooperation is to achieve more than purely scientific goals. It should contribute to broader societal and economic development goals, as well as serve as an instrument of 'scientific diplomacy'.

The first steps towards an evaluation of the impact of EU's scientific cooperation with the EaP countries are to provide an overview of the institutional and policy parameters of scientific cooperation between the EU and the EaP countries and to sketch the strategic context in which this process unfolds. In this working paper we address these goals. We review the science policies in three EaP countries– Belarus, Moldova, and Ukraine – paying particular attention to the lasting impact of their shared communist legacies and post-Soviet transitions, as well as to their current strategies, institutions, and ambitions in the domain of science, research and development policy. We also sketch the role of scientific cooperation in their national science policies. Furthermore, we review the place of scientific cooperation in EU's science and external policies, with a focus on the relations with the neighbourhood and the EaP countries in particular.

In this working paper, we also take stock of the existing programmes for scientific and educational cooperation and academic mobility between the EU and the countries from the EaP and provide a systematic review via document analysis and interviews of existing programmes, projects, and practices of academic mobility and scientific cooperation. We collect an inventory of relevant, completed and on-going projects, and we analyse this data to characterize the progress, level of participation of the research communities in the EaP, and other relevant parameters, such as the distribution of projects and participating institutions across broad scientific fields as well as disciplines. This dataset is constructed by pooling information from different sources, such as 'Information Exchange in Science, Technology and Innovation between the EU and Eastern Europe, South Caucasus, and Central Asia' (incrEAST), 'International Cooperation Network for Eastern Partnership Countries' (IncoNet EaP), and 'International Cooperation Network for Eastern Europe/Central Asia' (IncoNet EECA), and supporting the results with additional Internet search queries. The dataset collects information regarding the EU programme, project name, duration period, scientific area, institutions participating in each of the three countries, funding, and website.[2]

[1] The authors would like to thank Tatiana Parvan (Institute for Development and Social Initiatives (IDIS) Viitorul) and Maxim Boroda (Ukrainian Institute for Public Policy) for help with data collection and Antoaneta Dimitrova, Ildar Gazizulin, and the participants of the EU-STRAT Policy Briefing on Scientific Cooperation (Minsk, 23 November 2016), as well as the two reviewers, Maarja Beerkens and Ramūnas Vilpišauskas, for their useful comments on earlier drafts of the text.

[2] The dataset itself will be available at the EU-STRAT website (http://www.eu-strat.eu) from January 2017 onward.

Finally, in the last section of this working paper, we offer some conclusions and reflections on the opportunities and barriers to the scientific communities in the EaP countries for participating in international cooperation projects, based on interviews with policy makers and administrators of universities and other research institutions.

2. Science policy in Belarus, Moldova, and Ukraine: a brief historical review

2.1 Common Soviet legacies of science policy

As ex-Soviet republics, Belarus, Moldova, and Ukraine share the experience of science policy under the communist system in the Union of Soviet Socialist Republics (USSR). Science had a special and controversial place in the communist ideology. In the Bolshevik revolutionaries' and later Communist Party leaders' view, Marxism was a scientific theory, which was expressed later in the idea of "scientific governing of the people" and marked by the Academy of Social Science's publication with the same title issued between 1967 and 1984 (Bibkov 2014: 240). According to the Communist Party, science had an important role to play in developing the communist society. It was supposed to contribute to the economic growth, technological progress, and military power of the Soviet Union (Holloway 1999: 173f, 179; Bibkov 2014: 243-255). Communists valued 'useful science' (*poleznaya nauka*), science directly applicable to the goals of the government, which resulted in the state apparatus' favouritism towards certain scientific institutions and academics (Bibkov 2014: 243-6). Scientists, in line with state ideology, were supposed to work to achieve 'scientific-technological progress' (*nauchno-technicheskiy progress*), while being under strict control of the government, the Party and the Committee for State Security (KGB) (People's Commissariat for Internal Affairs (NKVD) in the earlier Soviet period) (Birstein 2001; Kruse-Vaucienne and Logsdon 1979: 4, 9-19).

Some fields of science were more central to the communist regime than others. Physics was one of these after the Second World War, as it was supposed to help develop nuclear weapons for the authorities. Stalin made the development of the Soviet atomic bomb a top priority and stimulated the field by offering large rewards to physicists working on the nuclear project (Pollock 2006: 73f). This approach was further strengthened during the Cold War period. Within the existing system of control, physicists were able to sustain more intellectual autonomy from the state than other fields of science. In the Academy of Science, there was the possibility of conducting more fundamental (rather than applied) work and many talented scientists such as Igor Tamm (Nobel Prize 1958), his mentor Leonid Madel'shtam, Vladimir Fock, and Pyotr Kapitsa (Nobel Prize 1978) were Academy members. Although not outside state control and pressure (Pollock 2006: 72-103), physicists involved in the atomic project could work in accordance with the principles of modern scientific research rather than dialectical materialism (Birstein 2001: 181f; Bibkov 2014: 245; Pollock 2006: 74).

Apart from the universities – which focused prevailingly on teaching – and the complex and centralized network of the Academy of Science (Kruse-Vaucienne and Logsdon 1979: 27-44), research was conducted in industrial research institutes and closed military research institutes in the large regional centres. The latter research centres were overseen by the industrial and defence ministries, and the military received 75 per cent of all research and development resources (Graham and Dezhina 2008: 2).

Especially in the period of Stalin's rule, those scientists unable to directly solve the state's problems or whose answers to questions posed by the communist elites were not in line with the ideology could be easily discredited. One of the famous instances of targeting a whole group of 'useless' scientists was the so-called 'Lysenko affair', which began in 1927 (Birstein 2001: 45-51). Trofim Lysenko, an agronomist from a peasant background, worked on increasing crop yields during the agricultural crisis following the mass collectivization and gained the support of the Communist Party. He became the favourite 'scientist' of Stalin despite the false assumptions of his research (Graham 1998: 17-28; Soyfer 1989), and he continued to be among the Communist Party's (in particular, Nikita Khruschev's) favourites until the mid-1960s. Biologists who studied genetics and questioned the scientific grounds of Lysenko's supposed findings were discredited as enemies of the state, and thousands of them were fired, imprisoned or killed (Birstein 2001). Some of these scientists were rehabilitated only in the period of Khruschev's *ottepel* (thaw).

The ideological approach to biology led to the suppression of genetics and the theory of evolution in the Soviet Union from the mid-1930s until the late 1960s (Birstein 2001: 50). In the social sciences, ideology dominated the study of political economy (which in practice was equivalent to Marxist economy; Kazakevich 1944: 316), while sociology struggled to remain a discipline independent from philosophy and history until the 1968 establishment of a separate institute in the Academy of Science (Weinberg 1974: 109). Social sciences in particular suffered from (self-)censorship and "on the whole, research which has critical implications for the existing social systems or which would tend to imply change in directions either beyond the control of or alien to the broad goals of the regime is not undertaken" (Weinberg 1974: 110).

Despite the persecution and imprisonment of many of the Soviet scientists and high social costs of research, there were several fields in which the achievements of Soviet scientists were recognized worldwide. One area of great scientific and technological progress was the rocket and space programme that originated in the Group for the Investigation of Reactive Engines and Reactive Flight under the leadership of Sergey Korolev in 1931 (Siddiqi 2000: 4). In the late 1950s and early 1960s, Soviet scientists were the pioneers in space exploration, with the first manned spaceflight of Yuri Gagarin in Vostok 1 in 1961. In the 1970s, highly regarded professors at American universities praised Soviet researchers in the field of mathematics, theoretical physics, theoretical seismology, climate research, and theoretical astrophysics (Graham and Dezhina 2008: 5). Lev Vygotsky's contribution to psychology has been recognized in the West, and his ideas about the relation between thought and language developed in line with Marxism greatly influenced education and social sciences (Graham 1993: 103-8). Another famous scholar associated with Vygotsky's school was Alexander Luria, who devoted many of his studies in neuropsychology to speech development, child development, and cultural development (Graham 1993: 107).

2.2 Rupture: the transition and its consequences for science policy

Although after the Stalinist period the persecution of scientists was not prevalent, the Soviet scientists still struggled to gain access to information about scientific developments in Western countries and suffered under bureaucratic control over their work and travel abroad (Graham 1993: 157). The troubled relationship between scientists and the political authorities did not bring the advancement in science and innovation expected by the Communist Party. The large spending on science and technology and the large body of researchers and related faculty[3] was not proportionate to the limited success of Soviet scientists. The scientific success of the early

[3] According to some estimates, there were between 10 - 30 per cent more scientists and engineers in the USSR than in the United States in 1980 (see Graham and Dezhina 2008: 1).

decades of the Soviet Union was never again reached. “Rather than being the best science in the world, science in the late Soviet Union was crying for reform. It was a system that emphasized quantity over quality, seniority over creativity, military security over domestic welfare, and orthodoxy over freedom” (Graham and Dezhina 2008: 6).

In the second half of the 1980s, Gorbachev’s *glasnost* reform allowed for voicing criticism targeted at the Academy of Science and the functioning of research in the USSR more generally. The criticism addressed, for example, the bias towards military and industrial research and the lack of a fundamental research agenda, the disregard for junior Academy members, the influence of the Party on the election of new members, the standing of scientists conducting research in provinces rather than big science centres, corruption, and the centralization of the administration of science (Graham and Dezhina 2008: 14). These critical voices on the Academy of Science came to the surface in the context of a larger socio-economic crisis in the country. The crisis was caused by the underfunding of the civilian sector of the Soviet economy, the corruption of the Party elites, inefficiency of the Soviet industrial base, unequal distribution of scientific and technological capacity across the regions of the USSR, and absence of economic forecasting that would account for global trends (Kalinov 2011: 98). The economic and political collapse resulted in the deterioration of living standards as well as a health and demographic crisis (Field 1995).

In the eyes of the regime reformers at the end of the 1980s and the beginning of the 1990s, the collapse of the Soviet Union discredited the leaders of the Academy of Science who sided with the conservative Party elites and with the August putsch that aimed to reverse Gorbachev’s reforms. Furthermore, the end of the Soviet ideology also meant the end of the dominant role that science had played in the previous regime. The collapse of the USSR brought a financial crisis and demilitarization, which meant a decrease in resources for the defence sector and, as a consequence, for scientific research. The consequences of the liberalization of the economy and privatization of property were very serious. The economic crisis following the reforms resulted in salary cuts for researchers, ‘brain drain’, and a lack of resources to fund access to journals or to fund the publishing house of the Academy of Science (Graham and Dezhina 2008: 18-25). The independence of the 14 Soviet republics also resulted in a structural change: 14 Academies within the republics were now fully independent, while the Academy of Science of the USSR was included in the new Russian Academy of Science.

The Soviet legacy continues to influence the structure and content of science policy in Belarus, Ukraine, and Moldova to significant but various degrees. It is most directly reflected in the current role of the Academies of Sciences, university education, and the agenda-setting for researchers.

Having briefly outlined the historical legacies of science policy in the Eastern European states of the former Soviet Union, we move towards a presentation of the current state of affairs regarding research and development (R&D) and science policies in Belarus, Moldova, and Ukraine, with a focus on the role of international cooperation.

3. Science policies and international scientific cooperation: views from the East

According to external evaluations, all EaP countries have a long tradition of scientific excellence, but have faced a dramatic decrease in their R&D intensity since the early 1990s. The result has been the shutting down or reorientation of many research branches as well as significant decreases in the number of active researchers (European Commission 2014b).

3.1. Belarus

3.1.1 Policy, regulations, and institutions

R&D and science policy in Belarus is characterized by a high level of dependence on the state, which can be seen in the high level of legislative regulation, funding, and institutional hierarchy. On the legislative level, science policy in Belarus is regulated by numerous laws, presidential decrees, and regulations of the government and other governmental institutions.[4] It is additionally regulated by the Programme of Socio-economic Development of Belarus for 2016-20[5] and the State Programme for Innovative Development of the Republic of Belarus for 2016-20.[6] These documents provide general, mostly formal objectives, priorities, and frameworks for science policy. A key point is the current impetus towards the further commercialization[7] of science and technology in order to make them profitable. Thus, according to experts' evaluation, "the current R&D system is excessively oriented towards the commercialization of R&D results, to the point that it possibly undermines scientific excellence" (United Nations 2011: 18).

Following the logic of commercialization in the fields of science and R&D, the main official goals for development for the next five years (2016-20) are the following (Programme of Social and Economic Development of Belarus for 2016-20: 15-16):

- to increase the role of fundamental and applied research and provide their integration with production;
- to develop the National Academy of Sciences (NAS) into an innovative corporation for the creation of a high technological sector with a special role for space, nano- and biotechnology, and robotics;

[4] For an overview of the relevant legislative acts of the Republic of Belarus in the spheres of science, technology, and innovation, see the website of the State Committee of Science and Technologies of the Republic of Belarus (in Russian), available at http://gknt.gov.by/opencms/opencms/ru/zakonadatelstvo/z2/ (accessed 20 October 2016).
[5] The text of the programme in Russian is available on the website of the President of the Republic of Belarus: 'Proekt programmy sotsial'no-ekonomicheskogo razvitiya Respubliki Belarus' na 2016-20 gody [Draft of the Programme of Socio-economic Development of Belarus for 2016-20]' (in Russian), available at http://www.president.gov.by/ru/sobranie/ (accessed 20 October 2016).
[6] At the time of the paper's submission (December 2016), only the concept of the programme was available in open sources. For the text in Russian, see the website of the State Committee of Science and Technologies of the Republic of Belarus: 'Kontseptsiya GPIR na 2016-20 gody [Concept of the State Programme for Innovative Development for 2016-20]', available at http://www.gknt.gov.by/opencms/opencms/ru/innovation/inn2/ (accessed 20 October 2016).
[7] The very term 'commercialization' here has a twofold meaning. On the one hand, it reflects a similar trend to that of the Western European countries' science and R&D policies, where science is supposed to contribute to the economy and to be 'useful'. On the other hand, it reflects the vision of Belarusian officials of a form of science that pays for itself and is profitable for the state.

- to develop a market of scientific and technical production by simplifying conditions for the commercialization of products, which are state property, as well as
- to provide a guaranteed provision of security, protection, and governance of intellectual property objects.

In general, the programme and other official documents consider innovations and an increase of investments as preconditions for the country's growth. This growth should be based on the technological modernization of key industries and production, the introduction of science-based technologies, and the development of the material resources of the national science sector.

The same pro-commercial logic of cost-benefit analyses is observed within the existing criteria of efficiency evaluations of scientific, technical, and innovative projects. The official regulations are provided by the NAS and the State Committee on Science and Technology (SCST) (Regulations No. 1/1 - 3 January 2008). Apart from the general scientific criteria of novelty, objectivity, and others, the main efficiency indicators are competitiveness, socio-economic effectiveness, commercial and budget effectiveness, and the possibility of industry using the scientific results. At the political level, the call to make science profitable and adoptable to the industrial needs has been repeatedly voiced by the Belarusian president Alexander Lukashenka[8] and by the head of the NAS.

The main governmental institutions responsible for the national scientific and R&D policy in Belarus are the President of the Republic and the government (Council of Ministers). On the lower level, there are the branch ministries that have some R&D activities (Ministry of Education, Ministry of Industry, etc.), the SCST, the NAS, and the High Certifying Commission. The latter certifies scientific personnel of higher qualification and carries out the state regulation in this field.

On the financial side, Belarusian science policy is mainly supported by the state budget with some contributions from the private sector. Among the existing private sources, official reports provide the following distribution: funds of companies and organizations (26.6 %), foreign sources (9.5 %), and sources of other organizations (19.8 %) (incrEAST, 2014a). As national statistics show, in 2014 Belarus spent 0.52 per cent of its GDP on R&D, which is less than in 2013, when spending was 0.67 per cent of GDP. The tendency towards further decreasing of the public funds available to science can be linked to the current economic crisis.

State dependence is also reflected on the institutional level as the budget for research is formed by the SCST (ranked as a Ministry for Science and Technology) in cooperation with the NAS as well as several ministries, and is then approved by the President. The same committee (SCST) controls the budget's realization (incrEAST 2014a).

On the institutional level, information about the number of R&D organizations in Belarus varies, according to different sources, from 337 (SCST and BelISA 2013) to 530 (incrEAST 2014a). The National Statistic Committee shows there were 457 R&D organizations in 2014 (according to their latest data from 2016). Information about

[8] One of the examples of such demands is the statement of Alexander Lukashenko in 2015 regarding the necessity of Belarusian science to finance itself and no longer be as dependent on the state budget. More on this issue: TV Channel 'Stolichnoe Televidenie (2015) 'Alexandr Lukashekno 13 avgysta vstretislsya s predsedatelem Preszidiuma Akademii Nauk Belarusi Vladimirom Gusakovym [On 13 August Alexandr Lukashenko Met with Vladimir Gusakov, the Chair of the Presidium of the Academy of Sciences]', available at http://www.ctv.by/aleksandr-lukashenko-13-avgusta-vstretilsya-s-predsedatelem-prezidiuma-akademii-nauk-belarusi (accessed 20 October 2016).

the amount of personnel varies from 20,571 employees (Schuch et al. 2012) to 27,208 (Belstat 2015: 35). The largest share of researchers work in the NAS and industrial companies, which are subordinate to the Ministry of Industry (30 % and 23 % respectively) (incrEAST 2014a).

R&D organizations include those positioned in government, in the sphere of business and enterprise, and in higher education.[9] The latest available national statistics indicate there are 54 higher education institutions in Belarus (including 34 universities and seven academies). According to external evaluations, amongst universities, the Belarusian State University and the National Technical University (the largest technical institution) have the leading role in R&D (Schuch et al. 2012: 116).

In line with other former Soviet republics, the involvement of universities in R&D activities is relatively low, while governmental institutions and enterprises play an important role. The leading position of governmental institutions could also be explained by the special status of the NAS, the head of which is appointed by the president. The status and activities of this institution are regulated by the special law 'On National Academy of Sciences' (5 May 1998, No. 159 - 3). The main, officially-stated function of the NAS is to carry out the organization and coordination of fundamental and applied research (NAS 2016). The Academy unites around 80 different institutions. Besides R&D centres, the list of NAS institutions includes manufacturing companies and several science and production entities, such as the State Scientific and Production Amalgamation of Powder Metallurgy (incrEAST 2014a).

With regard to assessing the quality of scientific personal, national statistics show that the share of researchers with academic degrees (Candidates and Doctors of Sciences) is 19.6 per cent. The highest number of qualified staff is in natural sciences, engineering and technology (SCST and NAS 2013), while the largest shares of highly qualified researchers are found in the humanities (54 %), medicine (40 %), and agriculture (39.5 %) (incrEAST 2014a). There is also a strong gender imbalance among researchers with an academic degree. In 2014, only 119 out of the total 671 Doctor of Sciences and 1128 of the total 2867 Candidates of Science were women (Belstat 2015, 38). When it comes to the geographical distribution, statistics show that the concentration of research institutes and researchers is highest in Minsk city, followed by the Minsk and Gomel regions (SCST and NAS 2013).

The scientific sphere in Belarus is heavily dominated by technical sciences. Official reports show that despite all government effort to change the configuration of this discipline dispersion and to promote other disciplines (e.g. life sciences, biotechnologies), the results were quite poor (SCST and NAS 2013). At the same time, humanities and social sciences are not mentioned as targets for such promotions at all.

The domination of technical science is also observed in the main thematic priorities proclaimed by the Belarusian government for the period from 2016 to 2020 (approved by the Presidential Decree No. 166, 22 April 2015). These include energy, energy saving, and nuclear energy; agricultural industry, technologies and production; industrial and construction technologies and production; medicine, medical equipment and technologies, pharmaceuticals; chemical technologies, nano- and biotechnologies; information, communication, and space technologies; rational management of natural resources and new materials; defence and national security. These priorities are supposed to be realized throughout different types of programmes, as well as via international

[9] In 2014, the National Statistic Committee also published information citing one per cent of non-commercial organizations (a total amount of three) as being involved in research, but this number is too small to claim a share of such organizations in the sector.

cooperation. These priorities are very similar to the ones proclaimed for science and technology in Belarus for the period from 2010 to 2015 (approved by the Presidential Decree No. 378, 22 July 2010).

To sum up the discussion of science and R&D policies in Belarus, we will conclude with the following observations:

- Belarusian science and R&D policy is heavily dominated by the state at the financial, legislative, and institutional levels.
- There is a strong tendency towards commercialization.
- The post-1990s reforms in the scientific sphere have had a moderate impact. The configuration of science policy and institutions still broadly fits into the framework developed during USSR period. The NAS still has a dominant position in the field, while the role of universities is relatively small. Meanwhile, the NAS itself has a double status of a research institution, on the one hand, and a public institution, on the other.
- The technical sciences are at the centre of attention in Belarusian science policy

3.1.2 International cooperation

When it comes to international cooperation in science and R&D, there is no specific programme or strategy that structures the relations of Belarus with other countries. International cooperation is seen as a means for achieving the goals of national social and economic development (incrEAST 2014a). According to the SCST, as of 2016, Belarus has 56 bilateral agreements in the sphere of scientific and R&D cooperation. Within the EU, Germany, France, and the UK are among its top partners, followed by Austria, Italy, the Netherlands, Poland, and Switzerland.[10]

There are also separate programmes of cooperation with the Russian Federation, which are supported on the national level, for example the ‘Programmes of the Union State of Belarus and Russia’ funded by a joint budget. Since 1998, this has become one of the key instruments used for supporting bilateral Science and Technology (S&T) cooperation with Russia in areas such as supercomputers, biotechnology, space, laser technologies, machinery building, and others. In general, Russia can be assessed as the main partner in this sphere: in 2010, 55 per cent of the NAS’s international projects were carried out in cooperation with Russia (followed by Germany and China with nine and eight per cent respectively) (Schuch et al. 2012: 116).

One of the most successful examples of this bilateral cooperation with Russia is the family of programmes for developing supercomputers: SKIF (2000-04), TRIADA (2005-08), and SKIF-GRID (2007-10), with its follow-up ORBISS (2012-15). These programmes dealt with developing the Belarusian-Russian infrastructure for supercomputer services (Schuch et al. 2012: 36).

Belarus also has governmental agreements on scientific cooperation with Armenia, Kazakhstan, Moldova, Tajikistan, and Ukraine. Cooperation with countries such as China, South Korea, India, the Mediterranean region, Latin America (Argentina, Venezuela), and the Arab countries is also among its stated R&D internationalization priorities.

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[10] See the full list of the agreements on the SCST website, available at http://www.scienceportal.org.by/cooperation/ (accessed 30 November 2016).

As the incrEAST country report from 2014 notes,

> "Despite the fact Belarus has no legal framework for cooperation with the EU and, therefore, there is no support to applicants on the national level, the interest towards the Framework Programmes from the side of the national scientific community is quite high. In the FP7 (2007-13), 331 Belarusian teams were partners in 282 applications that put the country on the 20th position among the third countries in terms of the applicants' number and requested EC contribution" (incrEAST 2014a).

The Belarus National Information Point for EU Framework Programmes was created in 2004 within the International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union (INTAS) cooperation. It was supported by the State Committee for Science and Technology and by the Belarusian Institute of System Analysis and Information Support of S&T Sphere (BelISA). After the launch of the FP7, the national contact points (NCP) system was developed with a similar structure to the one found in the EU member states (Schuch et al. 2012: 117).

According to the incrEAST report, the most successful thematic programmes are 'information and communication technologies', 'nanotechnologies and materials', 'health', and 'social science and humanities', as well as 'the horizontal research infrastructure and international cooperation' (part of 'capacities') and 'international research staff exchange scheme' (part of 'people') (incrEAST 2014a).

As the study of co-authored publications published by IncoNET EaP points out, between 2003 and 2013 Belarus had a steady flow of scientific publications with an output of roughly 20 thousand publications, 43 per cent of which were co-authored with researchers from other countries (IncoNET EaP 2016). For comparison, the authors of the paper look at some EU member countries as well as Russia and the United States, providing the following numbers: "France, UK and Germany have between 46 per cent - 49 per cent of co-authorship shares in 2012 whereas the US, Russia and Korea have between 27 per cent - 31 per cent co-authorship" (IncoNET EaP 2016). The most important co-publication partners of Belarus are Russia, Germany, Poland, the United States, and France. According to the same study, 32 per cent of the country's publications between 2003 and 2013 were in physics and astronomy. This field also accounts for 40 per cent of all co-publications with international partners.

3.1.3 Academic mobility

At the state level, the state programme 'Education and Youth Policy 2016-20' aims to develop Belarusian student and academic mobility. However, the implementation of the programme has just started, and it is not yet possible to foresee and assess its results. Despite having several multi- and bilateral agreements with different countries, the international mobility of Belarusian researchers (and, in particular, the younger generation) remains modest. An indicative example is the low participation in the Erasmus Mundus Programme, as only 62 master's degree students (2004-13), three PhD students (2010-13) and four scholars (2004-10) have participated (EACEA 2015). There are also large disproportions across scientific disciplines of the international mobility programmes' participants, where those in the information and communication technologies sphere go abroad significantly more than specialists from other fields (engineering and humanities in particular) (Schuch et al. 2012).

As UNESCO data (UNESCO UIS 2016) shows, the most popular destination for international mobility of Belarusian students remains Russia (24,880 visiting students in 2014). Neighbouring or geographically close EU states are also gaining some popularity, but even in total they attract fewer people than Russia does. Among the most popular EU destinations were Poland (3413), Lithuania (1738), Germany (1773) and the Czech Republic (626). Other EU states (Italy, France, Latvia, UK, and Austria) received less than 500 students: a number comparable with those for Ukraine (456) and the United States (291).

Reverse data on students coming to study in Belarus during the same period (2014) shows that the country is not attractive for EU students and the majority of foreign students come from Turkmenistan (8153), Russia (2128), and China (1478). Belarusian institutions are also fairly popular among foreign students coming from Nigeria, Iran, Azerbaijan, Ukraine, and Kazakhstan.

Independent evaluators point to some difficulties connected with participation in mobility programmes for Belarusian researchers and students (for example, the requirement of obtaining permission from the Minister of Education for going abroad for more than ten days, approved by the Council of Ministers, Decision No. 254, 23 March 2012). Belarusian researchers and students, like their counterparts in other EaP countries, face many issues when seeking to participate in medium or long-term exchange programmes and fellowships: a high amount of bureaucratic requirements to fulfil and uncertainty as to whether they can keep their workplace (or budget-funded university place) (Belarusian Independent Bologna Committee, 2016). With regard to the last point, researchers and students frequently face the need to quit their jobs or studies in order to go abroad and then try to get re-hired or re-admitted when they return.

In 2015, at the same time Belarus joined the Bologna process, the roadmap for higher education reform issued by the EHEA specifically stated that the country needed to "work on a plan to facilitate, develop and diversify the international mobility of staff and students to as well as from Belarusian higher education institutions. Such a plan would be expected to include changes to the current system of mobility permits, to allow longer periods of mobility within the EHEA for both staff and students, without ministerial approval" (EHEA 2015: 2).

All in all, the practical implementation of mobility programmes in Belarus remains limited, despite the positive declaratory statements.

3.1.4 Barriers

Some commonly stated barriers to wider engagement with the EU and EU member countries in scientific cooperation include the lack of bilateral agreements, the lack of awareness of existing opportunities, the language barrier, and the lack of motivation (and capacity) among research institution administrators to go through the labour-intense preparation of contracts and applications.

In conclusion, we can suggest that as the relations between Belarus and the EU start to warm up and the national public funds for science and technology continue to shrink, it can be expected that Belarusian research institutions will more actively seek scientific cooperation opportunities with the EU.

3.2. Moldova

As with all other former USSR countries, Moldova experienced a significant decline of its scientific potential and scope of activities after the early 1990s. National public funds for science decreased, which had a twofold negative effect on the scientific infrastructure and the quality of human resources. 'Brain drain' is widely perceived as a big problem for Moldovan science. International experts describe the level of human resource capacity for R&D in Moldova as "alarming" (Räim et al. 2016: 12). The national context is challenging for science development. Despite signing an Association Agreement with the EU in 2014, the governmental situation in the country remains unstable and corruption worsens.[11]

3.2.1 Policy, regulations, and institutions

Since gaining independence, Moldova has intended to reform its science and R&D sphere. From an institutional perspective, at different times the sphere has been administrated by a number of institutions – the Ministry of Economy, the Ministry of Education, a dedicated department in the government – but in 2004 the Academy of Sciences of Moldova (ASM) became the main governing structure.

The primary legislative act regulating legal issues in the field of science and innovation in Moldova is 'The Code of the Republic of Moldova on Science and Innovation' (Law of the Republic of Moldova No. 259-XV, 15 July 2004). In accordance with the Code, the Parliament approves strategic directions of scientific research as well as the allocation of funds to carry out the intended research activities. The government then concludes an agreement with the principal actor in the field of science policy implementation, the ASM.

Another important legal document regulating the sphere of science policy is the Partnership Agreement between the government and the ASM, which authorizes the ASM with government competency in the field of scientific research. An overlap between governmental and scientific institutions is also reflected in the fact that the President of the ASM is a member of the Cabinet of Ministers of the Republic of Moldova and has the position of a minister. Experts characterize the ASM as the main contributor to policy-making and implementation (Sonnenburg et al. 2012: 35).
The ASM distributes funds to scientific projects on a competitive basis. In order to ensure a high level of transparency in the decision-making and funds distribution processes, the ASM has established three new auxiliary science-supporting institutions: (1) Advisory Expertise Council, (2) Center for International Projects, and (3) Center for Fundamental and Applied Research Funding of Moldova (incrEAST 2014b). Another auxiliary institution to the ASM is the Agency on Innovation and Technology Transfer (AITT), which is authorized to implement innovation and technology transfer strategies and policies, and promotes the development of innovation infrastructure in the country.

The ASM coordinates, carries out, evaluates, and reports back to the government and the parliament the results of implementation of the science policy (incrEAST 2014c). The institution has all prerogatives concerning the preparation and implementation of research policies in the country. All this means that the ASM fulfils multiple

[11] Moldova ranks 103 (out of 160 countries) in the Corruptions Perceptions Index 2015 of Transparency International, and its score has worsened since 2012. For details see Transparency International (2015) 'Corruption Perceptions Index 2015', available at http://www.transparency.org/cpi2015/ (accessed 17 October 2016).

roles as an institution that (1) develops policies, (2) manages and implements a big share of public R&D funds, and (3) conducts research. According to some assessments, this results in a clear institutional conflict of interest for the ASM (Räim et al. 2016: 10).

In addition to the ASM, several ministries are directly involved in the management of research and innovation policy and/or funding: the Ministry of Finance, the Ministry of Economy, the Ministry of Environment, the Ministry of Education, and the Ministry of Health. However, the same ministries also manage a number of dedicated institutes that implement research and get public funding. Therefore, they are also faced with the same conflicts of interests as the ASM (Räim et al. 2016: 10, 19).

Science is not recognized as a national priority in Moldova's strategic policy documents. However, there is a dedicated National R&D Strategy until 2020, approved by the government's Decision No. 920 of 7 November 2014. According to the document, the basic goal of state policy in the field of science and R&D is to provide a stable socio-economic and human development in the Republic of Moldova. There is a request to orient science and technology towards support of the national industry (the 'real' sector of the economy) (National R&D Strategy of the Republic of Moldova 2014: 4) and to provide efficient interaction with society as well as with the business environment. Other priorities of the Strategy are the internationalization of Moldovan research and its integration into the European Research Area (ERA).

Data on the numbers of national research institutions and researchers varies in different sources. Some counts identify around 70 organizations that carry out scientific research activities and employ over 5000 researchers. The IncoNET project identifies 38 institutions in the field of research and innovation, including 21 institutions of the ASM (Sonnenburg et al. 2012: 142). The National Council for Accreditation and Attestation (CNAA) lists 58 organizations accredited in the country between 2010-14 (CNAA 2016). In 2011, international reports assessed the total number of employed persons in the scientific sector at 4764, including 3190 researchers, 1054 researchers with PhD degrees, and 310 professors (incoNET Country report: Moldova in Sonnenburg et al. 2012: 142). As of 2014, the National Statistical Bureau's figures report 5038 employees in the R&D field, of which 3315 are researchers (National Bureau of Statistics of the Republic of Moldova 2016).

In addition, there are 31 national universities, among which 19 are public and 12 are private. The country preserves a binary, segregated research and education system typical for Soviet times, whereby universities mostly concentrate on 'teaching' and institutes on 'research'.

The CNAA accredits research organizations in Moldova. Accreditation is granted for a period of up to five years. Under the Code on Science and Innovation, all research organizations accredited by the CNAA become members of the ASM. They are categorized into three different types: institutional, profile, and affiliated members of the ASM (CNAA 2016).

Due to financial difficulties and a lack of career opportunity, the number of Moldovan young and middle-aged researchers has been decreasing. For example, since the 1990s the number of habilitated doctors aged 36-45 years and 46-55 dropped 2.5 times and 1.7 times, respectively (National R&D Strategy of the Republic of Moldova 2014: 20). Simultaneously, the number of habilitated doctors and Candidates of Sciences aged over 65 increased. As the national statistics show, about one-fourth of all Moldovan researchers are of retirement age. Moldova is one of the few European countries where the number of PhD students decreased between 2004-10. The overall share of PhD students is four times lower than the EU average (Räim et al. 2016).

There is also a geographical disproportion in the distribution of scientific and R&D institutions, the overwhelming majority of which are situated in the capital. Thus, among 60 organizations accredited in the years 2005-13 to carry out R&D activities, only three were situated outside of Chisinau (Räim et al. 2016: 19).

During the first transitional period (1990-99), public funding for R&D in Moldova decreased dramatically from 0.73 per cent of GDP in 1990 to 0.22 per cent in 2004 (exacerbated by a sharp drop in the absolute value of Moldovan GDP). Then in 2008 the funding increased to 0.6 per cent of GDP, but dropped again to 0.4 per cent in 2011 due to the international economic and financial crisis (National R&D Strategy of the Republic of Moldova 2014: 10). Currently the annual expenditure on science and technology in Moldova is around 0.4 per cent of GDP, which is very low in comparison to EU standards.

Virtually the entire state budget for scientific and R&D activities is managed by the ASM through the Center for Fundamental and Applied Research Funding (CFCFA). The Center is in charge of allocating a significant share of the state budget to semi-competitive (institutional) and competitive (calls for proposals) funding addressed to the Moldovan R&D community, i.e. to universities, ASM's institutes, branch research institutes under line ministries, NGOs, and, to a minor extent, to the business sector. Research funding is commonly based on the principle of institutional membership rather than on the quality of the research project proposals (National R&D Strategy of the Republic of Moldova 2014: 34). Only 11 per cent of the competitive funding is allocated to universities. However, according to some reports, funding allocation for the ministry institutes has been shifting in 2015-16 from the ASM to the ministries. There is also an impetus towards widening connections between science and business in order to attract private investments in R&D (Sonnenburg et al. 2012: 49).

Most of the R&D activities are performed in the public sector. In 2009 the government sector accounted for 77.1 per cent of the gross expenses for R&D (72.8 % in 2005). Performance in the private sector (the business environment) in terms of R&D output according to the national statistics is insignificant. The bulk of R&D expenditure is carried out by the government (ca. 70 % in 2013), while about ten per cent is performed by the higher education sector and only 20 per cent by the business sector (UNESCO UIS 2016).

To sum up:

- Moldova claimed internationalization as one of the priorities of its scientific and R&D policies.
- The Moldovan R&D system presents several structural weaknesses, such as low financing; ageing, migration, and downsizing of the R&D personnel; insufficient possibilities for universities to conduct adequate research; an almost inexistent involvement of the private sector; and cumbersome governance structures (Räim et al. 2016: 17).

3.2.2 International cooperation

As mentioned above, Moldova has chosen internationalization and entrance into the ERA as priorities of its national scientific and R&D policy. Article 160 of the 'Code of the Republic of Moldova on Science and Innovation' declares that the state supports the extension of cooperation with foreign partners in the field of science and innovation. According to the 'National R&D Strategy of the Republic of Moldova until 2020', the internationalization pillar is focused on the full integration of the Moldovan scientific community into the ERA. From the point of view of the ASM, this process will help the Moldovan scientific community (1) integrate into European networks, (2) participate in all EU Framework Programmes, (3) benefit from European scientific excellence, (4) attract European investment in R&D, (5) protect domestic intellectual activity results abroad, (6) facilitate scientific mobility, and (7) access European research infrastructure. Since 2012, Moldova has implemented its plan to join the ERA (Shevchenko et al. 2016).

While the country also preserves close connections with the former USSR republics (Russia in particular), it also intends to increase cooperation with the EU.[12] Thus, Moldova became associated with the EU's Horizon 2020 (H2020) programme in 2014, though it has already been associated with the EU's FP7 programme since 2011[13] (as the first associated country among the post-Soviet states). The Moldovan authorities used the H2020 Policy Support Facility peer review instrument to improve the design, implementation, and evaluation of its national R&D policies. Moldova has developed NCPs for EU programme coordination, which are supported by the public budget (Sonnenburg at al. 2012: 39). At the national level, Moldova has a number of bilateral agreements with countries inside and outside of the EU.

The ASM has, in general, supported the internationalization of Moldovan science towards the EU and other directions as well. Notably, the ASM has played a relevant role in the association of Moldova to FP7 and H2020 (Räim et al. 2016). Bilateral funding schemes have been established with Academies of Sciences in other EaP countries, such as Belarus and Ukraine. Moreover, there is strong cooperation with Russia, and a separate agreement has been concluded with China. At the same time, the ASM has also established cooperation through 41 agreements with international research and research-funding entities, the majority of which are located in the ERA. One example is the agreement with the German Federal Ministry of Education and Research (BMBF).[14]

On the institutional level, the Center for International Projects (CIP) was created in 2009. It promotes and manages bilateral and multilateral programmes in science and innovation launched within the cooperation agreements between the ASM and various international organizations and foundations. Since its inception, the CIP has managed around 250 bilateral projects under cooperation agreements. The Center provides managerial, technical, and informational assistance to the members of the Moldovan scientific community, as well as for Moldovan diaspora members, including consultation activities, seminars, training courses, and other activities as part of international and bilateral projects. The CIP is also the host institution of the network of the NCPs of the EU's H2020 programme (incrEAST 2014b). The Moldovan diaspora also plays some role in initiating, coordinating, financing, and participating in research activities in Moldova.[15]

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[12] However, the European Commission's Country Strategy Paper (CSP) for Moldova for 2007-13 did not list S&T as the priority area of EU/EC cooperation with the country.

[13] In the FP7, Moldova actively cooperated with the following EU countries: Greece, Romania, Bulgaria, France, Italy, Great Britain, Germany, and Austria.

[14] Within the framework of the German-Moldovan cooperation in science and technology, following the 'Memorandum of Intentions' signed on 14 March 2008, the German Federal Ministry of Education and Research (BMBF) and the Academy of Sciences of Moldova (ASM) jointly launched an 'Open Call' for collaborative research projects to be implemented in 2010 for a period of 12 months.

[15] For example, in 2010-13 the SCOPES Programme of the Swiss National Science Foundation (SNF), together with the Swiss Agency for Development and Cooperation (SDC), supported the research project 'Connecting the scientific diaspora of the Republic of Moldova to the scientific and socio-economic development of the home country'. The project was implemented by Lausanne Cooperation and Development Center (CODEV) in

According to some expert opinions, EU-Moldova cooperation contributes more to the development of Moldova’s research capacity and productivity than cooperation with the Commonwealth of Independent States (CIS), despite the significant number of CIS programmes for R&D and numerous implemented projects. The total financing of EU-coordinated programmes since 2008 is five times higher than the financing of CIS-coordinated projects (Duka 2016).

As shown in the IncoNET EaP study referenced above, between 2003-13 Moldova produced over 4000 scientific publications, out of which 57 per cent were co-authored (the highest percentage among the EaP countries). The most important co-publication partners for Moldova were Germany, the US, Russia, Romania, and France. In Moldova, 27 per cent of all publications were in the fields of physics and astronomy, which also account for 33 per cent of all co-publications (which is quite a low percentage for the EaP countries). The second most important field overall is chemistry (22 %, the highest among the EaP countries), which accounts for 26 per cent of all co-publications (IncoNET EaP 2016: 35).

3.2.3 Academic mobility

Data on academic mobility in Moldova is rather limited.[16] Higher education institutions from Moldova have participated actively in the Erasmus Mundus External Cooperation Window since 2007. In 2010, Moldova State University became the first Moldovan university to be selected as a full partner in an Erasmus Mundus Action 1 project, delivering a master's degree course on migration with EU partner universities. The following statistics on the participation of Moldovan students in Erasmus Mundus Programme is available: 66 master's degree students (2004-13), no doctoral students, and one scholar (2004-10) (EACEA 2015).

Institutional conditions for international mobility of researchers and students have possibly improved in the last two to three years due to the initiatives of the Ministry of Education. Prior to that, researchers wishing to go abroad for fellowships and similar purposes faced numerous obstacles, including the need for permission and finding a replacement for teaching activities, to name just a few.

3.2.4 Barriers

The further internationalization of the Moldovan science and R&D sector faces significant challenges. Science is still not an attractive field for the younger generation, which leads to the shortage of human resources in that sector. This circumstance is closely interconnected with the problems of limited employment and funding opportunities as well as poor working conditions and career perspectives for researchers, especially young and female ones. Migration, in general, and academic ‘brain drain’, in particular, worsen the situation. Budgetary limitations and minimalistic budget spending in this sector is another crucial challenge. Finally, Moldova, as well as the other EaP countries, faces a significant language barrier when cooperating with the EU.

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collaboration with the ASM. It provided empirical evidence on Moldovan skilled migrants in the destination countries and identified their factual and potential cooperation links with the national scientific community. For more information see http://cooperation.epfl.ch/page-64290-en.html (accessed 19 November 2016).

[16] Unfortunately, at the current stage there is no information available on the destinations of Moldovan students participating in mobility programmes. This issue could be studied in future research.

3.3 Ukraine

Ukraine is considered one of the scientifically most productive countries of the former USSR, although the recent crises (including worsening relations with Russia) have negatively influenced and most probably will continue to negatively influence the scientific and R&D spheres. On the political level, Ukraine has expressed the will and subsequently organized activities to foster its transformation into a knowledge-based economy. However, in order to reach this goal, the country must cope with various difficulties. These include outdated research infrastructure facilities, the highest share of over-qualification within the EHEA, and low innovation performance (Schuch et al. 2016).

3.3.1 Policy, regulations, and institutions

Ukrainian scientific and R&D national priorities are not defined in a common national strategy but rather by a number of different laws. The main legal basis is the Law of Ukraine 'On Scientific and Technical Activities' (adopted in 2001, last amended in November 2015 and in force since January 2016). Apart from this law, a large number of further laws and governmental decrees related to Ukrainian R&D are currently in force.[17]

The Law of Ukraine 'On the Priority Directions of Science and Technology' defines the following national S&T priorities for the period of 2010-20:

- 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;
- Energy and power efficiency;
- Efficient nature management;
- Life sciences, new technologies for the prevention and treatment of the most wide-spread diseases;
- New substances and materials.

Another piece of legislature – the Law of Ukraine 'On Science and Technology Priorities' (adopted on 13 December 1991, amended in 2010) – defines the legal and organizational principles guiding the complex system of forming and implementing Ukraine's science and technology priorities up to 2020 (incrEAST 2016).

For the implementation of national priorities, four State Targeted Funding Programmes are in force: (1) State Target Science and Technology Programme on realization of research in the Antarctic 2011-20, (2) State Target Scientific and Technical Space Programme, (3) State Target Programme for innovation infrastructure development, and (4) State Target Programme on marine research until 2025.

[17] The relevant laws include the Laws of Ukraine 'On Scientific Technical Information', 'On Scientific and Scientific Technical Expertise', 'On the Priority Directions of Science and Technology', 'On Scientific Parks' and the corresponding Law 'On Scientific Park "Kyiv Polytechnic"', 'On Special Regime for Innovation Activity in Technological Parks', 'On Innovation', 'On Innovation Activity Priorities in Ukraine', 'On National Security of Ukraine', and 'On Technology Transfer'. The relevant governmental decrees include: 'Concept of the national innovation system development', 'Priority R&D thematic areas for the period until 2015', 'Medium-term priorities of innovation activity of national and sectorial levels until 2016', and the 'Concept of reforming the system of funding and management of scientific and technical activities and action plan until 2017 to implement the Concept'.

The previous Ukrainian government (headed by Arseniy Yatsenyuk from 2014-16) developed a series of measures to address the following key issues in Ukrainian research policy: the establishment of research priorities which correspond to the goals of national development, a clear orientation of R&D towards respecting the best EU standards (with the intention of joining the ERA), and administrative changes to improve the governance of the R&D system. According to experts' evaluations, no essential changes in these priorities are foreseen (Schuch et al. 2016: 22).

The key players defining scientific and R&D policy in Ukraine are the President, who sets out the strategic development, the Ukrainian Parliament (Verkhovna Rada) with its special Committee for Education and Science, and the government. The Committee has capacity as the main legislative body to shape the country's R&D by adopting all legal acts, strategies, and priorities as well as international agreements in the field of R&D. The government (Council of Ministers) creates incentives for the national R&D infrastructure (Schuch et al. 2016: 23f). On the operational level, the Ministry of Education and Science of Ukraine (MESU) is in charge of the implementation of the state sectoral policy in science and higher education on behalf of the government of Ukraine.

The system of national governance of science has been periodically reformed, but the dominant position of the Academy of Sciences of Ukraine (NASU) has remained mostly unchanged. Nowadays, the NASU is an independent public institution dealing with research and innovation. It receives around 50 per cent of the yearly state budget allocated for S&T. It plays a key role in the Ukrainian system of research. The NASU brings together approximately 120 institutes, scientific centres, labs, and other organizations. The academy's main task is the coordination of the country's research and expertise in all fields of science and technology (NASU 2016).

The current MESU led by 'post-Maidan' politicians advocates a reform of science and education, while the more conservative NAS is seen as a force resisting change (Schuh et al. 2016). Under the new Law of Ukraine 'On Scientific and Technical Activities' (2015),[18] a new permanent advisory board under the Cabinet of Ministers of Ukraine, the National Council of Ukraine on the Development of Science and Technology, is to be established. The tasks of this board will include contributing to a strategic vision for research and innovation in Ukraine as well as the definition of new priorities.[19] The amendments of the law also foresee the establishment of a new independent institution, the National Research Foundation of Ukraine.

Other important stakeholders in the Science, Technology, and Innovation (STI) governance system are the Ministry of Economy and Trade, the Ministry of Finance, the Ministry of Foreign Affairs, and several other line ministries with R&D responsibilities. All these ministries have some sector budgets related to R&D activities. At the same time, their political orientations and interventions, according to international evaluations, lack coordination among as well as between them and the regional level (Schuch et al. 2016).

One big issue in the implementation of science policy (based on informal sources) seems to be the lack of objective criteria to evaluate the success of research projects and to allocate funding.

[18] Law of Ukraine 'On Scientific and Scientific Technical Activities 2015'. The text of the law is available in Ukrainian: http://zakon3.rada.gov.ua/laws/show/848-19 (accessed 17 November 2016).

[19] At the time of this working paper's submission (December 2016), the Council has been in the process of formation. Expected start of the Council is the beginning of 2017.

According to national statistics, as of 2016, 978 academic and industrial research institutions are in operation in Ukraine (excluding annexed Crimea and the conflict zones) (State Statistics Service of Ukraine (Ukrstat) 2016). The NASU has 120 institutions and 200 research establishments, totalling to around 37,000 employees. Inherited from the Soviet system, several dozen of the industrial research institutes and design bureaus, which perform business-oriented R&D, are still operating in Ukraine. Sixteen per cent of industrial enterprises were engaged in R&D activities in 2014 (Schuch et al. 2016).

The national statistics further identified 63,864 research institutions personnel, of whom (in 2015) 16,090 had Doctor of Sciences and 8623 had Candidate of Sciences degrees (Ukrstat 2016). Among the personnel in the R&D sector, 53 per cent are researchers (as of 2015), with female researchers making up 45.8 per cent (incrEAST 2016). As for the disciplinary distribution, the share of female researchers in natural sciences is 44.5 per cent, in engineering sciences 37.2 per cent, in medical sciences 65 per cent, in agricultural sciences 55 per cent, in social sciences 61.4 per cent, and in humanities 67.8 per cent (Yegorov 2013). However, new research positions are scarce, and the number of researchers is constantly declining.

Concerning the higher education sector, the new Higher Education Law, which is currently being implemented, introduces far-reaching autonomy for the universities. Although the higher education sector amounts to 70 per cent of the scientifically-educated personnel, only half of the universities perform any kind of R&D (Schuch et al. 2016: 6). University employees mostly perform teaching functions.

As of 2016, there were 659 universities[20] in Ukraine with different types of accreditation (Ukrstat 2016). Universities are usually subordinated to the MESU, but if they have an evident industry affiliation, they are supervised by the corresponding ministry.

Previously, Ukraine’s annual expenditure on science and technology was around one per cent of its GDP, the highest among the EaP countries. However, because of internal and external crises, there has been a decline of general R&D expenditure (GERD) from three per cent to 0.66 per cent between 1990 and 2014 (Schuch et al. 2016: 28). The tendency of decreasing expenditures is likely to continue.

The most important R&D funding sources in Ukraine are the national budget, local budgets, extra-budgetary funds, own funds of research institutions and final users’ funds (contracts). Private R&D funding is increasing slowly albeit from a very low level. The government directly funded 39.3 per cent of the expenditure for R&D in 2014. The rest was funded by other national sources or investors (20.9 %), foreign investments in R&D (19.8 %) and private funds (18.7 %). International experts claim that most of the state R&D budget is invested in the NASU. The dominant funding principle is that of institutional allocation, while competitive project-based funding remains very low (Schuch et al. 2016: 29).

The most important research fields for Ukraine include physics and astronomy, enabling and strategic technologies, engineering, ICT, chemistry, chemical medicine, mathematics and statistics, and biomedical

[20] The top five universities, according to the 2014 national ranking conducted by the Project ‘Top-200 Ukraine’ include: Taras Shevchenko National University of Kyiv; National Technical University of Ukraine ‘Kyiv Polytechnic Institute’; Bogomolets National Medical University; National University of Kyiv-Mohyla Academy; and V. N. Karazin Kharkiv National University.

research (Schuch et al. 2016: 41). Over the last ten years, specialization in mathematics, earth and planetary sciences, energy and economics, econometrics and finance has increased. International reports show that the highest number of Ukrainian researchers (more than 48.9 %) work in the field of engineering, which reflects the traditional direction of Ukrainian science; natural sciences represent 37.1 per cent of researchers (incrEAST 2016). However, in the educational sphere student enrolment shifted from natural and technical sciences towards humanities, social sciences, business, and law (Schuch et al. 2016: 6).

3.3.2 International cooperation

In science and R&D policy, Ukraine is following a path towards integration with the EU. In 2002, Ukraine became the third country within the EaP to sign a separate Science and Technology Cooperation Agreement with the EU (entering force in 2003 and renewed on 15 July 2015, following the adoption of the Law of Ukraine No. 602-VIII for an additional period of five years with effect from 8 November 2014) (Mission of Ukraine to the European Union 2016). Under the terms of this agreement, the Joint Science & Technology Cooperation Committee (JSTCC) was established. In the framework of the Joint Committee meetings, both sides provide up-to-date information on current developments in research and innovation policy and related programmes in the EU and Ukraine respectively.

Another big step was the association with the H2020 programme on 20 March 2015. Ukraine had good performance in FP7 (with funding amounting to €30.9 million) with a sufficient success rate (~20 %) (Schuch et al. 2016: 53). Within the FP7, a separate programme facilitating bilateral cooperation with Ukraine (BILAT-UKR*AINA) ran for three years and was completed in 2015.[21]

Due to the association with the H2020 programme in 2015, the MESU is leading consultations with wider R&D stakeholders to prepare and adopt a National Strategy on cooperation of the Ukrainian R&D organizations with partners in the ERA. This strategy should be finished by the end of 2016. The MESU, as responsible for the implementation of the H2020 programme in Ukraine, has established not only NCPs, but also Regional H2020 Contact Points in all regions.

Integration in the ERA is fostered by multilateral and bilateral cooperation with the EU and its member states. There are several EU programmes targeting the Research and Technical Development Infrastructure (RTDI) cooperation between the EU and Ukraine: FP7; H2020; Erasmus Mundus; Tempus; Jean Monnet Programme under the Lifelong Learning Programme; NSC and INOGATE; Cross-Border Cooperation Programmes funded by the European Neighbourhood and Partnership Instrument (ENPI); Central Europe Programme (as part of the European Trans-regional Cooperation Programmes). In the summer of 2016, the EU and Ukraine signed an agreement on the association of Ukraine to the Euratom Research and Training Programme, which has been a Ukrainian ambition since the end of its association with the previous Euratom in 2013 (H2020 Projects 2016).

All in all, Ukraine has S&T cooperation agreements with more than 50 countries, including EU member states and associated countries. In particular, there are intergovernmental S&T cooperation agreements with the following 17 EU countries: Austria, Bulgaria, Germany, Estonia, Finland, France, Greece, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia, and Spain (incrEAST 2016). Among all EaP countries, Ukraine has

[21] For more information, see the BILAT-UKR*AINA project website, available at http://www.bilat-ukraina.eu/ (accessed 20 October 2016).

the strongest involvement in scientific cooperation with the EU, institutionalized on both the legislative and project design levels.

The NASU has 110 bilateral agreements with most projects jointly implemented with Poland, France, Hungary, Slovakia, and the Czech Republic. The most important co-publication partners of Ukrainian researchers are residing in Germany, Russia, and the USA, followed with some distance by Poland, France, the UK, Italy, Spain, and Japan (Schuch et al. 2016: 9, 60). According to international reports, Ukraine's activities in R&D cooperation with single European member states are in line with the fostered collaboration with the EU in general. According to data from 2014, 25 intergovernmental agreements on S&T cooperation between Ukraine and the EU member states and countries associated to H2020 are in effect.[22]

Some experts believe that integration into the ERA will help Ukraine revive its research potential and build required competencies among its research community (Shevchenko et al. 2016). One big concern is the lack of research infrastructure, which is a problem that the EU framework programmes such as H2020 could help address. Another concern is the fragmentation of the implementation of scientific cooperation policy and the lack of a clear strategic plan to eventually acquire ERA membership. Experts encourage the creation of a single governmental executive body to coordinate science and innovation and to liaise with independent research communities in order to overcome the stand-off between the MESU and the NAS. Despite worsening relations with Russia, educational relations (also of scientific personnel) with Russia are still strong and sustainable.

The most scientifically productive of the EaP countries, Ukraine has the lowest share of co-publications with researchers from other countries (34 %) (IncoNET EaP 2016). According to the bibliometric study by incrEAST EaP, its most important co-publication partners are Germany, Russia, the US, Poland, and France.

Similar to Belarus and Moldova, its most important and also most internationalized field of study is physics and astronomy (with 28 % of all publications and 42 % of all co-authored publications correspondingly).

3.3.3 Academic mobility

Ukraine participates in the Bologna Process and has been member of the EHEA since 2005. Since 2011, the MESU has run a state mobility programme promoting the education and training of students and post-graduate students as well as internships for scientific and pedagogical staff (Koval et al. 2012). Ukraine has a comparatively high share of awarded Marie Sklodowska-Curie (MCA) projects both in FP7 and H2020 programme (Schuch et al. 2016: 55). The largest share of funding was allocated to researchers in the fields of nanoscience and high-tech.

Despite budgetary shortages that discourage research institutions from spending resources on trips to international conferences and seminars, the number of Ukrainian scholars and students travelling abroad has been gradually increasing since 2012. This is likely due to the possibility of obtaining EU financing for these activities. Ukraine claimed to be an active partner in EU-supported mobility exchange programmes (Erasmus

[22] The EU member states are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, The Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, and Spain. Associated Countries to H2020 are: FYROM, Moldova, and Turkey. For an extensive analysis of bilateral cooperation between Ukraine and the EU states, see Chapter 8.2. Bilateral R&D cooperation between Ukraine and the EU member states is analysed in Schuch et al. (2016).

Mundus, Erasmus Plus, and Tempus). For example, Ukrainian participation in Erasmus Mundus demonstrates the following indicators: 329 master's degree students (2004-13), 14 PhD students (2010-13), and 30 scholars (2004-10) (EACEA 2015).

However, Russia is still the most common destination for Ukrainian students. According to UNESCO data, in 2014, 12,043 students chose Russia as their study destination. However, if totalling the EU country figures, the number of students that went to Poland (9485), Germany (5444), the Czech Republic (2098), and Italy (1093) would add up to 18,120 students, thus exceeding the number of students that went to Russia. The USA is also an attractive country for Ukrainian students (1392). Other EU countries (Hungary, France, and the UK) received more than a thousand students (UNESCO UIS 2016).

When examining the number of students coming to Ukraine, the country does not appear to be a particularly popular destination for EU students. The only EU country that has a considerable number of students in Ukraine is Poland (the 14th most popular, with just 871 students). The overwhelming majority of arriving students are from Turkmenistan (14,053), followed by Azerbaijan (7599), India (3587), Nigeria (3578), and then the Russian Federation (2930). Interestingly, students from the EaP countries demonstrate moderate interest in studying in Ukraine: Moldova – 1703 students, Georgia – 1517, Armenia – 604, and Belarus – 461 (UNESCO UIS 2016).

3.3.4 Barriers

The barriers that are most frequently mentioned in connection with Ukrainian–EU cooperation are the lack of knowledge on opportunities, lack of foreign language skills among researchers, and the difficulties in leaving their workplaces for medium and long-term international fellowships, exchanges, etc.

It is unclear how the worsening of relations with Russia has affected Ukrainian-Russian scientific cooperation at the policy level, but according to expert opinions, in practice, cooperation has been discouraged. For example, Ukraine has been considering suspending the activities of four representative offices of Russian centres for international cultural and scientific cooperation (established by an agreement between the two countries in 1998) in the Russian embassy and three general consulates (Doroshenko 2016).

Weaknesses are mainly found on the side of finances and politics, as the budgetary situation in Ukraine for national R&D as well as international R&D cooperation is unstable and as Ukraine faces serious reorganization of its public administration.

3.4 Scientific cooperation between Belarus, Moldova, and Ukraine

The institutional base for scientific cooperation between Belarus, Moldova, and Ukraine is well developed and dates back to the early 1990s, when bilateral agreements between the countries of the former USSR were established. The purpose of these intergovernmental agreements was to help mend the broken connections between the scientific institutions in these countries and thus enable them to continue working on joint projects. The transition was not seamless, as suggested in the discussion of science developments presented above.

Still, among the countries studied, scientific cooperation between Belarus and Ukraine is the most institutionalized. The bilateral intergovernmental agreement was concluded in 1992, and for its implementation

Belarus and Ukraine created a bilateral commission. The commission meets every three years to overview the implementation of executive programmes of cooperation and to adopt the new programme. According to the Belarus Science and Technology portal, the priority sectors for Belarusian-Ukrainian scientific cooperation are: (1) information and space technologies, (2) new materials, (3) medicine and pharmacology, (4) laser, bio- and nanotechnologies, and (5) environment protection (Belarus National Science Portal 2016).

Cooperation between Moldova and Ukraine is based on the intergovernmental agreement signed in 1999 and institutionalized through the Commission on Science and Technology Cooperation (MFA Ukraine 2016). Experts emphasize the importance of Moldovan-Ukrainian cooperation within the framework of various EU-inspired and funded programmes.

Scientific cooperation between Belarus and Moldova is based on the intergovernmental agreement of 1999, implemented through the cooperation between the National Academies of Science as well as between individual research organizations. The cooperation focuses primarily on agriculture research (MFA of the Republic of Belarus 2016). Since 2007, the NAS of Moldova has an agreement with the Belarusian National Fund of Fundamental Research. This agreement enabled the implementation of 68 bilateral research projects between 2008 and 2013 (incrEAST 2014d).

Since 1994, the National Academies of Science of Belarus, Moldova. and Ukraine have been awarding a joint prize for scientific work that involves scientists of all three countries. Two such prizes are annually awarded in the field of natural and engineering sciences, and one prize in the field of the humanities and social sciences (NAS of Belarus 2016).

To get an initial idea of the intensity and productiveness of scientific cooperation among the three countries and its significance for their international cooperation activities in general, we consider the data collected within the project IncoNet EaP on scientific publications produced in EaP countries, including co-publications with other EaP and EU/AC. Selected data from this study is presented in Table 1 below.

Table 1. Scientific co-publications of Belarus, Moldova and Ukraine with select countries and country groups

Total number of co-authored scientific publications	**Belarus**	**Moldova**	**Ukraine**	**EU/AC[23]**	**Russia**	**US**
Belarus (8927)	X	34 (0.3 %)	774 (9 %)	5523 (62 %)	3324 (37 %)	1470 (16 %)
Moldova (2421)	34 (1.4 %)	X	165 (7 %)	1788 (74 %)	407 (17 %)	481 (20 %)
Ukraine (32,796)	774 (2.3 %)	165 (0.5 %)	X	22,100 (60 %)	6717 (20 %)	6679 (20 %)

Source: Data from IncoNET EaP 2016

As Table 1 shows, the number of co-publications is highest between Ukraine and Belarus (774 over the ten year period). This makes up nine per cent of all co-publications in Belarus and 2.3 per cent of all co-publications in Ukraine. As discussed previously, Ukraine is the eleventh most important scientific cooperation partner for Belarus among individual countries. Still, for Belarus this scientific output is only one fourth of all co-authored papers with Russia and slightly over half of all co-authored papers with the US.

[23] Associated countries (AC) include Switzerland, Israel, Norway, Iceland, Liechtenstein, Turkey, Croatia, Former Yugoslav Republic of Macedonia, Republic of Serbia, Albania, Montenegro, Bosnia-Herzegovina, Faroe Islands, and Republic of Moldova.

Scientific collaboration between Ukraine and Moldova ranks second among the three pairs, constituting almost seven per cent of all co-publications in Moldova but only 0.5 per cent in Ukraine. Thus, Ukraine makes the ninth most important partner for Moldova in terms of scientific output. However, the number of publications with Russia and the US is almost 2.5 and three times higher, respectively.

Finally, according to the IncoNet EaP study, ten years of scientific cooperation between Belarus and Moldova resulted in 34 co-authored papers. Obviously, neither country made it to the top 15 most important scientific partners in the other country. As mentioned previously, the most important partners when it comes to producing joint papers for Belarus are Russia and Germany, for Ukraine – Germany and Russia, and for Moldova – Germany and the US.

Further analysis was conducted utilising the dataset compiled by EU-STRAT's Work Package 7 on EU-funded projects, which can be found on the EU-STRAT website (http://eu-strat.eu/). Using the dataset listing all EU-funded projects in which one of the three EaP countries has been involved, as well as projects between two or three of the countries, we analysed cooperation between Belarus, Moldova, and Ukraine on EU-funded projects. Our analysis shows that out of the 263 projects with at least one of these countries participating, 81 projects involved cooperation between two or three of them. Out of these 81 projects, two countries cooperated on 41 projects and all three countries on 40 projects. Ukraine has been participating in most collaborative projects involving Belarus and/or Moldova: in total 78 (of 81) projects. Belarus has been participating in collaborative projects with Ukraine and/or Moldova in 69 (of 81) projects. Finally, Moldova has been involved in collaboration with Ukraine and/or Belarus on 55 (of 81) projects.

3.5 Summary

As is clear from the countries' science infrastructure and policy profiles, the development of science in Belarus, Moldova, and Ukraine is still deeply impacted by their common Soviet legacy. The system of a clear division between tertiary education as the province of universities and research and science as the domain of the National Science Academies still prevails. Each country is finding a way to reconcile this institutionalized division with the realities and challenges of international scientific cooperation and development. In the countries that attempt to modernize the system for management of scientific activities (Moldova and Ukraine), the National Science Academies prove to be quite resistant to change. In Belarus, where the system is largely preserved, the NAS is challenged to integrate more deeply with industry, with varying results.

What all three countries have in common is the prevalence of interest in the 'hard' sciences such as physics, their overall research activities, and international scientific cooperation.

Ukraine and Moldova have wider institutional and legal bases to engage with the EU in the scientific cooperation and academic mobility opportunities that the EU is offering. Indeed, recent national policies and strategies on science development in these countries are orientated towards closer engagement with the EU and its member countries (as well as with the US).

Belarus stands somehow apart from this trend since it has not attempted to implement any systematic reform of science management, and its strategy for international scientific cooperation is what may be called opportunistic.

However, despite having less of an institutional and legal base for cooperation with the EU in science and academic mobility, Belarus is becoming an enthusiastic partner in these programmes, and is expected to become more so as the public funds supporting research and innovation in Belarus shrink.

Having outlined the current state of science policy Belarus, Moldova, and Ukraine, the strategies of these countries and the role of scientific cooperation in these strategies, the next section will discuss the role of science policy and international scientific cooperation in the EU.

4. EU science policy and international cooperation

The EU has a strong, comprehensive, long-standing[24], and well-developed science, research, and innovation policies. International cooperation is a major element of these policies. It is declared to be a strategic priority (European Commission 2012b).

The main goals of international cooperation in research and innovation are broader than achieving scientific excellence and address economic and external policy issues as well. While the first goal is (1) 'getting access to the latest knowledge and the best talent worldwide', the additional goals include (2) 'tackling global societal challenges more effectively', (3) 'creating business opportunities in new and emerging markets', and (4) 'using science diplomacy[25] as an influential instrument of external policy' (European Commission 2012b). This last goal in particular is especially relevant for EU-STRAT as it explicitly suggests links between scientific cooperation and the external policies of the EU. The broad set of goals for EU's international scientific cooperation also suggest that the policy should be evaluated against a similarly broad range of indicators that track more than purely scientific outputs and outcomes.

In a policy briefing from July 2015, the European Parliament also considers that "Scientific cooperation with third countries aims to strengthen the European Union's attractiveness and competitiveness […] and support EU external policies" and that "science diplomacy is also an increasingly important tool to ease cooperation with third countries" (Reillon 2015: 1).

The major players in the EU science and innovation policy are (1) the European Commission's Directorate for International Cooperation within the Directorate-General for Research and Innovation (DG RTD) and (2) the Council of Minister's Strategic Forum for International Science and Technology Cooperation (SFIC), as a configuration of the European Research Area and Innovation Committee.

[24] The major historical milestones of policy development include the establishment of the European Organisation for Nuclear Research (CERN) in 1954, the European Commission's Joint Research Centre in 1957, the COST programme in 1971, Eureka in 1985, and the framework programmes after 1984 (Reillon 2015).

[25] On science diplomacy, see the speech of Carlos Moedas, Commissioner for Research, Science and Innovation (2015).

4.1 Strategies, programmes, and institutions for scientific cooperation with the EU

4.1.1 General

In 2012, the Commission proposed a strategy for EU international cooperation in research and innovation. The strategy identified two main principles: openness and targeted international cooperation activities. The strategy also suggested developing multi-annual roadmaps for cooperation with key partner countries, among which were the "EU enlargement countries and countries covered by the European Neighbourhood policy". The document further emphasized the links between scientific cooperation and other "instruments of the enlargement and neighbourhood policies" (European Commission 2012b: 6).

The international dimension is also part of the ERA (European Commission 2012a), although not as one of the original five main priorities, as it is considered a cross-cutting issue (ICF International 2015) (it was included in the ERA strategy at the insistence of the Council). EU member states are encouraged "to foster openness for international cooperation to maximize EU research potential" (ICF International 2015: i) and to coordinate their existing national strategies for international scientific cooperation. A relevant initiative in this regard is the Strategic Forum for International Cooperation in Science and Technology (SFIC). In concrete terms, the member states are expected to "increase the R&D budget going to third countries and work with member states to develop collaborative programmes with third countries" (ICF International 2015: 9). Such initiatives should result in a higher number of collaborative research projects with third countries and higher international mobility.

The implementation of the strategy for international cooperation in research and innovation in the first two years focused on developing the international dimension of H2020 and the Euratom programmes (European Commission 2014a). The principles of openness and targeted international cooperation activities on which the strategy was built were reflected in the design of the H2020 programme.

The EU instruments for supporting scientific cooperation include international agreements, EU science counsellors and officers, participation in the framework programme for research as associated or third countries, and others.

4.1.2 EaP specific

The countries from the ENP are treated differently than other potential international partners of the EU, and scientific cooperation is based on an enhanced institutional framework. The objectives of the EU–EaP cooperation are bolder and include "fostering integration into the European Research Area" and "developing a 'Common Knowledge and Innovation Space', including improving the research and innovation competences of these countries" (European Commission 2012b: 6). More precisely, with the European Free Trade Association (EFTA) countries and the Enlargement countries, the objective is integration in the ERA, while with the ENP countries, the objective is development of a Common Knowledge and Innovation Space (CKIS) (Reillon 2015).

These objectives obviously go further than supporting a narrowly-defined interest of the EU in strengthening its own science policy, and reach into (1) preparing the ENP countries for eventual full-fledged participation in the EU's institutions and policies for research and innovation and (2) supporting their domestic capacities in these areas.

4.2. The ENP, the EaP, and scientific cooperation

The ENP, launched in 2004, is the EU's policy towards the countries in its neighbourhood. It aims to support an area of prosperity and good neighbourliness and is based on democracy, rule of law, and respect for human rights.

The EaP[26] is a joint initiative of the EU, its member states, and six post-Soviet countries from Eastern Europe: Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova, and Ukraine. It was established at the Prague Summit on 7 May 2009 with the "aim to bring Eastern European countries closer to the EU" (European Union External Action Service 2016). The EaP is the Eastern dimension of the ENP.

4.2.1 Multilateral

The EaP is based on bilateral and multilateral tracks. As part of the multilateral track, four policy platforms have been established: (1) democracy, good governance, and stability, (2) economic integration and convergence with the EU policies, (3) energy security, and (4) contacts between people. Cooperation in the field of science, research, and innovation falls under the fourth platform and is implemented mainly through the Marie Skłodowska-Curie and H2020 programmes. Platform 4 also covers education and youth (Erasmus+, which supports education, training, youth and sports activities; e-Twinning; European Training Foundation) as well as culture and the media (supported by the Creative Europe programme and the Study facility).

Attached to the platform is a Panel of Research and Innovation, launched in 2013, that addresses challenges of bi-regional cooperation in these fields (European Commission 2016a). The Panel's creation is in line with the development of the CKIS, set as a key political objective of the ENP review in May 2011. The CKIS is meant to cover policy dialogue, national and regional capacity building, cooperation in research and innovation, and increased mobility opportunities for students, researchers, and academics (European Commission 2013). The Panel has agreed on collaborative research activities in three areas addressing broad societal challenges: (1) health, demographic change, and well-being, (2) climate action and environment, and (3) secure, clean, and efficient energy. Additional regional cooperation projects on e-infrastructure in research and education networking (E@P.Connect) are in a preparatory phase.

This is in agreement with the priorities the EU has set. When it comes to international cooperation with the ENP countries, the EU suggests an approach that prioritizes (1) common societal challenges (such as health, demographic change and well-being, climate action, and secure, clean and efficient energy) and (2) cross-cutting issues aimed to improve the cooperation framework conditions (addressed through measures such as sharing best practices, providing technical assistance and training, promoting researchers mobility, shared use of research infrastructures, and others)(European Commission 2014a).

In a communication from 2011 (European Commission 2011), the European Commission noted that enhanced cooperation could take place regarding research and technological development with EaP countries. It proposed "to work towards the development of a Common Knowledge and Innovation Space" that would "pull together

[26] Interestingly, there is nothing on scientific cooperation in the overview of the Eastern Partnership on the website of the EU External Action Service: https://eeas.europa.eu/topics/eastern-partnership/419/eastern-partnership_en (accessed 20 October 2016).

several existing strands of cooperation: policy dialogue, national and regional capacity building, co-operation in research and innovation, and increased mobility opportunities for students, researchers and academics" (European Commission 2011: 9). It highlighted the priority of supporting mobility, especially among students and researchers. It confirmed the EU's commitment to "knowledge sharing, research and information society: full integration of the research and education communities in the region within the e-infrastructure (e.g. the GÉANT pan-European data network for networking, and the European Grid Infrastructure for grids and distributed computing)" (European Commission 2011: 15). In the section on the expected results, the Commission mentioned "build[ing] a stronger partnership with the people by expanding contacts between students, researchers and young people" (European Commission 2011: 24), "increased student and academic staff mobility within university partnerships (Erasmus Mundus) and structured cooperation for university modernisation (Tempus)" (European Commission 2011: 10). In the section on the results and impact, the Commission named the following indicators (European Commission 2011: 25):

- The number of university students and researchers participating in Erasmus Mundus;
- The number of structured university co-operation projects;
- The number of successful applications of ENP partners in EU programmes.

In the 2012-13 work programme for Platform 4 of the EaP (European Union External Action Service 2011), the emphasis was put on raising awareness on the opportunities available, promoting the FP7, encouraging an increase in the number of researchers from the EaP countries registered as FP7 evaluators, supporting all legal and financial Contact Points from the EaP countries to attend the regular information meetings organized for member state and FP7 associated country legal and financial NCPs, and organizing a regional event on evaluation at programme and project level as well as evaluation of current national policies and foresight activities for new policies for research and innovation.

The 2014-17 work programme for Platform 4 (European Union External Action Service 2014) aims to "increase the participation of EaP countries in EU research projects and programmes" and proposes as the main means of meeting this objective the work of the Panel on Research and Innovation and awareness-raising events on the H2020 programme, in particular Marie Skłodowska-Curie Actions (MSCA) (through information days, seminars and workshops, etc.)

In the 'Roadmap for scientific cooperation with the EaP countries' (European Commission 2014b) from 2014, the priorities discussed above were reinstated.

Moldova joined the H2020 programme as an associated country in January 2014, followed by Ukraine in August 2015, Georgia in April 2016, and Armenia in May 2016. This allows the countries access to all opportunities under the programme. Belarus and Azerbaijan can still participate but only as third countries.

4.2.2 Country-specific

In addition to the multilateral programmes and strategies, Ukraine has a bilateral Science and Technology Cooperation Agreement with the EU (signed in 2002), unlike the other EaP countries. The Agreement is supported by a Joint Committee, which first met in 2011. In June 2016, Ukraine joined the Euratom Research and Training Programme that is specifically aimed at improving the levels of nuclear safety and radiation protection.

These are some of the major projects under the past and current EU programmes with options for research and technological cooperation with Ukraine (European Commission 2016b): FP7, Erasmus Mundus, Tempus, Jean Monnet Programme under the Lifelong Learning Programme, Instrument for Nuclear Safety Cooperation (INSC) (from 2007 onward, since it replaces the Tacis Nuclear Safety Programme). Other major programmes are funded partially or fully by the ENPI: The ENPI Cross-Border-Cooperation (CBC) Poland-Belarus-Ukraine Programme, Hungary-Slovakia-Romania-Ukraine ENPI CBC Programme 2007-13, Joint Operational Programme Romania-Ukraine-Republic of Moldova 2007-13, Black Sea Basin Joint Operational Programme 2007-13, NOGATE Interstate Oil and Gas Transport to Europe, South East Europe Programme, and Central Europe Programme. Major horizontal projects[27] with Ukraine include Black Sea Horizon (2015-18) and IncoNet EaP[28] (2013-16), the successor of IncoNet EECA (2008-12) which supported the incrEAST information portal. The promotion of bilateral cooperation with Ukraine was supported through a BILAT project (BILAT-Ukr*aina) (2012-15).

4.3 Summary

To conclude the sections that deal with science policies in the EaP countries and the EU, it is instructive to compare their goals, priorities, and major underlying values. To some extent, these are similar and shared, but important differences remain. While both EU and EaP policies emphasize the importance of applied research and science that can help solve social problems and contribute to economic development, the emphasis is much stronger in Moldova and Ukraine, and especially Belarus, than in the EU strategic documents and programme priorities. The EU's attention to valorization of research results does not go nearly as far as the want for directly-applicable research results in the industry and economy that is present in the EaP states.

The prioritization of the hard sciences and ICT and the relative neglect of the social sciences and humanities are also stronger in the EaP countries.

The EU's science policy is also more formalized, institutionalized, and interconnected with other policy domains. Of the EaP countries, only Ukraine can be said to have a clear, well-specified policy strategy for science.

Both the EU and the EaP countries value internationalization and are open to cooperation with each other and other countries. This general openness creates a strong platform for the further development of cooperation. Of course, the extent to which the EU depends on science cooperation with the EaP region is incomparably smaller to the extent the EaP countries depend on cooperation with the EU for scientific development.

The most important difference, however, is that the stated goals of science policy in the EU are much broader and reach into the spheres of external relations. Science as an instrument of diplomacy is not a common theme in the EaP countries, where the goals of scientific cooperation are considered in a much narrower sense in strategic documents and programmes.

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[27] Under FP7, there are two schemes for targeted cooperation: IncoNET for cooperation with regions and BILAT for bilateral contacts.

[28] The IncoNet EaP project aims to support the advancement of the bi-regional STI (Science, Technology, and Innovation) policy dialogue between the EU member states and the EaP countries, with an explicit focus on the Societal Challenges that have been identified to be of mutual interest for the two regions, namely Climate Change, Energy and Health. See IncoNET EaP website, available at http://www.inco-eap.net/en/408.php (accessed 20 October 2016).

5. Programmes for international cooperation in the Eastern Partnership countries

A major goal of this working paper is to review the institutional framework and the programmes for bilateral and multilateral scientific and educational cooperation between the EU and the countries from the EaP, and between the EaP countries themselves. The working paper should include an inventory of relevant, completed, and on-going projects, as well as the progress and level of participation of the research communities in the EaP. As has already been mentioned, the paper focuses on the three EaP countries (Ukraine, Belarus, and Moldova). The period of data collection starts in 2009, the year in which the EaP began, and ends in 2016.

5.1 Method

In order to identify the institutional framework for scientific cooperation and academic exchanges between the EU (its member states, associated countries) and the EaP countries, in the first part of the analysis we have mapped the programmes, projects, and institutions that are involved in scientific and educational cooperation with the EU in the three countries. We attempted to compile an exhaustive dataset with information on formal parameters and characteristics of the programmes, projects, and institutions, including their name, type (multi- or bilateral), duration, budget and source of funding, objectives, the scientific areas, and basic information about the formal evaluation of the projects. An additional categorization was to include any developmental (non-scientific, societal) objectives, if they were mentioned in the descriptions.

For identification of the programmes, projects, and institutions, the local teams completed desk-research. They completed searches using the Google search engine and specialized EU-supported platforms, e.g.: INCREAST, IncoNet EaP, and IncoNet EECA. Presenting the results of this exercise, we created tables with the lists of the programmes, projects, and institutions in the period of the study. These tables will be available at the EU-STRAT website (http://eu-strat.eu/) in January 2017. In the following sections, we will briefly analyse the results of the data collection exercise.

Initially, three country datasets (for Belarus, Moldova, and Ukraine) were constructed. To ensure reliability, the scientific focus for each project was coded independently by two coders.[29] On the basis of these two assigned codes, the scientific discipline was determined by the second coder. Also, the projects were coded as belonging to a technical field (e.g. projects in hard sciences or the development of technologies), to social sciences and humanities (e.g. projects in political science or culture), or to education capacity building and other interdisciplinary cooperation. The dataset includes information about the institutions participating in the project and the types of institutions (academic/non-academic, state/non-state, etc.).

5.2 Projects realized under the programmes for international cooperation in the EaP countries

Table 2 shows that the FP7 constitutes the largest percentage of projects realized with Belarus, Moldova, and Ukraine (49 %, 40 %, and 53 % respectively) out of all EU projects. In Ukraine, the mobility projects within the Tempus framework constitute the second largest share of projects (27 %), whereas in Belarus and Moldova Erasmus Mundus and Erasmus Plus programmes have the second largest share of the EU projects (22 % and 23 % respectively).

[29] One coder from a local team and one coder from the Leiden University team.

In Moldova there seems to be an upward trend in acquiring EU funding, as 15 cooperation projects (21 % of projects) have already been started within the H2020 programme, whereas 30 projects were realized within the FP7 for its entire duration. By comparison, in Belarus and Ukraine the share of H2020 projects was a bit lower by the time of data collection (13 % and 7 % respectively). Ukraine is the only country participating in the projects within the Euratom Research and Training Programme.

The share of the EU programmes in international cooperation in each country cannot be estimated accurately at this stage. So far, only the Belarusian team was able to access some limited data on scientific cooperation that is not financed by one of the major programmes of the EU. Only four projects were identified so far as those involving Belarus and one or more member states of the EU. This number is certainly lower than the actual one, and additional data needs to be collected to assess the scope of this cooperation. As this data is not easily accessible, the next step in finding it is to establish contact with the policy-makers in the field of education and university employees responsible for international cooperation.

Table 2. Number of projects identified within the European science cooperation programmes

	Number of projects		
Programme	**Belarus**	**Moldova**	**Ukraine**
FP7 (including Marie Skłodowska-Curie Actions)	47 (49 %)	30 (40 %)	110 (53 %)
Horizon 2020	12 (13 %)	16 (21 %)	15 (7 %)
The European Neighbourhood and Partnership Instrument (ENPI) & Eastern Partnership Connect (EaPConnect)	3 (3 %)	1 (1 %)	1 (0.5 %)
Erasmus Mundus/Erasmus +	21 (22 %)	17 (23 %)	24 (12 %)
Tempus IV	12 (13 %)	11 (15 %)	55 (27 %)
Euratom Research and Training Programme	-	-	1 (0.5 %)
Total*	95 (100 %)*	75 (100 %)	206 (100 %)

* Note. Four programmes included in the database for Belarus are not within the major EU frameworks. Therefore, they are not included in the calculations here.
Source: EU-STRAT data collection (Work Package 7)

The distribution of projects across different fields of research is similar in the three countries (Table 3). Cooperation in the fields of hard sciences and technologies has by far the largest share in scientific cooperation projects. Technical cooperation encompasses projects focusing on hard sciences, technology development, and building network for scientists mostly from the field of hard sciences.

Cooperation in the fields of hard sciences and technologies constitutes more than 60 per cent of projects in all three countries (Belarus 64 %, Moldova 62 %, and Ukraine 75 %). Education capacity building (e.g. developing bachelor's and master's degree programmes, and building innovation labs and alumni networks) constitutes between seven and nine per cent of projects. Multi- and interdisciplinary projects (including projects without specified discipline) are the second largest category of projects in Belarus and Moldova (Belarus 17 %, Moldova 20 %). A relatively small share of projects focuses specifically on social issues linked to the disciplines within social sciences and humanities (Belarus 12 %, Moldova 9 %, and Ukraine 8 %).

Table 3. Number of identified projects per field per country

	Number of projects		
Field	**Belarus**	**Moldova**	**Ukraine**
Hard sciences and technologies	61 (64 %)	47 (63 %)	155 (75 %)
Social sciences and humanities	11 (12 %)	7 (9 %)	17 (8 %)
Education and research capacity building	7 (7 %)	6 (8 %)	19 (9 %)
Mixed and not specified	16 (17 %)	15 (20 %)	15 (7 %)
Total*	95 (100 %)	75 (100 %)	206 (100 %)

Source: EU-STRAT data collection (Work Package 7)

When we break down these larger fields of cooperation into groups of disciplines, we can see in greater detail what the focus of cooperation between the EU countries and the EaP countries is. Table 4 shows that education and mobility of students and academic staff is the largest share of the scientific cooperation in all three analysed EaP countries (Belarus 29 %, Moldova 31 %, and Ukraine 30 %). The second most frequent cooperation in Belarus and Moldova takes place in the disciplines focusing on ICT, IT, information networks, and navigation systems (18 % and 19 % respectively). In Ukraine, physics/chemistry/engineering have the second largest share of projects (13 %), and biology/forestry/ecology the third largest share (12 %).

The science support grouping includes projects that aim to build capacity for university partnerships, build networks between universities, industries, and governments, set up innovation labs and alumni networks, as well as establish networks between universities. Moldova has the largest share of projects devoted to science support (16 %) compared to Belarus (7 %) and Ukraine (10 %).

Interestingly, social sciences (economics/sociology/political science/culture) are the focus of a larger share of projects in Belarus (8 %) than in Moldova (5 %) and Ukraine (3 %). Ukraine is the only country that participates in scientific cooperation on aero-space, space, and airplane technology (6% of projects).

Table 4. Number of identified projects per group of disciplines per country

	Number of projects		
Discipline	**Belarus**	**Moldova**	**Ukraine**
(Aero) Space/airplane technology	-	-	13 (6 %)
Agriculture/trade in agriculture	2 (2 %)	1(1 %)	5 (2 %)
Biology/forestry/ecology	5 (5 %)	4 (5 %)	**24 (12 %)**
Economics/sociology/political science/culture	8 (8 %)	4 (5 %)	6 (3 %)
Education and mobility	**28 (29 %)**	**23 (31 %)**	**61 (30 %)**
Energy & energy efficiency and security	4 (4 %)	4 (5 %)	14 (7 %)
Health & medicine	5 (6 %)	7 (9 %)	14 (7 %)
ICT/IT/information networks/navigation systems	**17 (18 %)**	**14 (19 %)**	19 (9 %)
Physics/chemistry/engineering	**17 (17 %)**	4 (5 %)	**26 (13 %)**
Research mobility (MSC)	1 (1 %)	2 (3 %)	1 (0.5 %)
Science support (general)	7 (7 %)	**12 (16 %)**	20 (10 %)
Security	1 (1 %)	-	3 (1 %)
Total*	95 (100 %)	75 (100 %)	206 (100 %)

* Note. The percentages are rounded, so they do not add up to 100 %.
Source: EU-STRAT data collection (Work Package 7)

Some projects were difficult to classify as they were on the border between two (or more) categories. Especially projects researching sustainable technologies and environment protection could have been categorized as projects belonging to the category of 'Energy & energy efficiency and security'', 'Biology/ forestry/ ecology', or 'Physics/ chemistry/ engineering'. Naturally, there are some overlaps between these disciplines. Moreover, many projects including these groups of disciplines are interdisciplinary as they investigate interactions between ecosystems, human use of resources, and clean technologies. The decision to classify a project into one group or another was based on what seemed to be the prevailing element of the research project.

'Research mobility' differs from 'Education and mobility' in that the main focus of the former is the exchange of researchers and completion of research projects, whereas the latter focuses on the exchange of students, their education, and development of education programmes in consultation with international partners. The only identified programme with a clear research mobility focus is the MSCA.

5.3 Institutions involved in international cooperation projects in the EaP countries

The distribution of different types of institutions participating in the cooperation projects with the EU is similar in all three countries (Table 5). Most institutions belong to the public sector and are either public (state) universities or other public institutes (Belarus 75 %, Moldova 60 %, and Ukraine 72 %). In Belarus only four institutions from the non-profit/NGO sector (7 %) participated in the scientific cooperation projects, compared to eight non-profit/NGOs in Moldova (18 % of institutions) and 29 in Ukraine (11 % of institutions).

Table 5. Types of institutions participating in the FP7, H2020, and mobility projects

Institution type	Belarus	Moldova	Ukraine
Public/state universities and institutes	43 (75 %)	27 (60 %)	191 (72 %)
Private/commercial	8 (14 %)	7 (16 %)	30 (11 %)
Non-profit/NGO	4 (7 %)	8 (18 %)	29 (11 %)
Ministries/governmental	1 (2 %)	2 (4 %)	4 (2 %)
Institutions with foreign support	1 (2 %)	-	-
No information	-	1 (2 %)	11 (4 %)
Total	57 (100 %)	45 (100 %)	265* (100 %)

*This number includes the NAS of Ukraine and its 36 institutes and regional branches.
Source: EU-STRAT data collection (Work Package 7)

The concentration of projects within big institutions is more visible in Belarus and Moldova than in Ukraine (Table 6). In Belarus, five big state-run universities and institutes and the Ministry of Education of the Republic of Belarus participate in 44 per cent of involvements in the EU projects. Belarusian State University participates in 21 out of 95 projects (22 % of projects). In Moldova, five institutions participate in 43 per cent of the involvements, with the Center of International Projects and the ASM participating in 23 per cent and 13 per cent of 75 projects, respectively. In Ukraine, the dispersion of projects between institutions is much higher, and the top five institutions participating in science cooperation took part in 23 per cent of involvements in the EU projects. These institutions are also located in different regions of Ukraine (Kiev, Donetsk, and Lviv), whereas the top participating institution – the NAS – has its branches spread across the country (including Odessa and Kharkiv). In Belarus, the four top institutions are in Minsk, with one in Brest, while in Moldova four are in Chișinău and one is in Bălți (additionally, Comrat State University in Gagauzia participated in seven per cent of the projects).

The Ministries of Education (and Science) in Belarus and Ukraine are involved directly in a relatively large share of projects (15 and 16 % respectively), whereas the Ministry of Education does not play such a prominent role in Moldova.

Table 6. Top five institutions participating in most EU projects

Country	**Institution**	**Number of projects** (Percentage of all projects)
Belarus	Belarusian State University	21 (22 %)
	Belarusian Institute of System Analysis and Information Support of Scientific and Technical Sphere	15 (16 %)
	Ministry of Education of the Republic of Belarus	14 (15 %)
	Belarusian National Technical University	13 (14 %)
	Brest State Technical University	10 (11 %)
	Total number of projects	95
	Proportion of all involvements in projects	73 of 167* (44 %)
Moldova	Centrul Proiecte Internationale/Center of International Projects	17 (23 %)
	Academia de Stiinte a Modovei/Academy of Sciences	10 (13 %)
	Alecu Russo Bălţi State University	11 (15 %)
	Universitatea Tehnica a Moldovei	8 (11 %)
	Academy of Economic Studies**	5 (7 %)
	Total number of projects	75
	Proportion of all involvements in projects	51 of 118 (43 %)
Ukraine	National Academy of Sciences (including institutes and regional branches)	46 (22 %)
	Ministry of Education & Science	33 (16 %)
	National Technical University of Ukraine	15 (7 %)
	Donetsk National Technical University	14 (7 %)
	Lviv National Polytechnical University	13 (6 %)
	Total number of projects	206
	Proportion of all involvements in projects	121 of 535*** (23 %)

* Note. Belarusian institutions participated in four projects (not included in the total number of projects here) within the COST programme. The information about which specific institutions were involved was not found in the documentation and therefore the count in this table does not account for them.
**Note. Moldova State University, Research and Educational Networking Association of Moldova, and Comrat State University (in Gagauzia) were also involved in five projects each.
***Note. Ukrainian institutions participated in 25 projects (not included in the total number of projects here) within the COST programme. The information about which specific institutions were involved was not found in the documentation and therefore the counts in this table does not account for them.
Source: EU-STRAT data collection (Work Package 7)

6. Conclusions

In this working paper, we set out to review the institutional framework and the programmes for bilateral and multilateral scientific and educational cooperation between the EU and the countries from the EaP and to identify relevant, completed, and on-going projects, as well as the progress and level of participation of the research communities in the EaP.

Our presentation of the current state of science policy in Belarus, Moldova, and Ukraine – three post-Soviet countries from Eastern Europe who are now part of the EU's EaP initiative – showed that underfunding and administrative fragmentation continue to hamper development in the field. Important national differences can be observed, however, with Ukraine being most active in the field of science policy (and international cooperation in particular), and further interesting national policy trajectories can be noted (for example, the emphasis on commercialization of research in Belarus). In all three countries international cooperation is mentioned in the development strategies for the R&D sector, and in reality plays an important role when it comes to funding and access to technologies (especially in the case of Moldova).

We noted the continuation in the traditionally strong role of the National Academies of Sciences in setting and implementing research policies in the EaP countries. The strong role of the academies and the relatively weaker role of universities in research and as our overview suggests, in international science cooperation, would be unusual in most EU member states. This is an important feature of the EaP countries, as the Academies of Sciences are typically closer to the state than the universities are, both in terms of institutional links and organizational missions.

While the EU is not the only actor these countries cooperate with in the fields of science and R&D, it is a major partner. There are indications that scientific cooperation with Russia remains strong in Belarus, is in practice being deferred in Ukraine, and is of decreasing importance in Moldova. It is, however, impossible to make a more precise evaluation and quantify the role of the EU vis-à-vis other countries and regions as partners in scientific cooperation in the three countries we study.

From the EU's perspective, there is no doubt that scientific cooperation based on the principles of openness and targeted cooperation is a major element of science policy. Moreover, the EU considers scientific cooperation as an instrument of scientific diplomacy and as a tool to achieve broader economic and societal objectives than purely scientific ones. It also has an important role to play in the context of the EaP initiative, and it is a major component of one of its platforms, contact between people.

The openness of EU science policy and programmes has resulted in a high number of projects involving institutions from Belarus, Ukraine, and Moldova. Their involvement has already been considerable under the FP7, but there are indications that participation in the H2020 programme will be even higher (especially as Ukraine and Moldova have only been fully associated to the programme since 2015 and 2016 respectively).

The data analysis allows for a preliminary assessment of the type of cooperation and the type of institutions from Belarus, Moldova, and Ukraine participating in projects with EU member states. Most cooperation between the EU and Belarus and Ukraine took place under the umbrella of the FP7. Cooperation with Moldova took place mainly within Erasmus projects. However, the number of projects in which Moldova has been participating in the first years of the H2020 programme indicates that the share of this type of research collaboration might be increasing. Of the three countries analysed, Ukraine is the only one that has been participating in the Tempus programme and in the Euratom Research and Training Programme.

In all three countries, hard sciences and technologies are the key area for cooperation projects. Looking at the more specific fields and disciplines, education and mobility projects are the most frequent ones in all three countries, while projects focusing on the ICT, IT, information networks, and navigation systems are the second most frequent areas in Belarus and Moldova. In Ukraine, physics/ chemistry/ engineering have the second largest share of projects (13 %) and biology/ forestry/ ecology the third largest share (12 %). Interestingly, Ukraine has participated in a smaller share of projects focusing specifically on social sciences and humanities than Moldova and Belarus. Moreover, Ukraine is the only country that participates in scientific cooperation on aero-space, space, and airplane technology, while Moldova has a larger share (16 %) of projects for science support (building science capacity).

In all countries, most institutions participating in scientific cooperation projects are public (state) universities and institutes. Private institutions have the second largest share of projects in all three countries. Non-profit and non-governmental organizations have the largest share of projects in Moldova (15 %). In Belarus, non-profit/NGOs have the smallest share of projects of all three countries (7 %). The top five institutions that participate in the most projects in Belarus and Moldova are cooperating with EU member states on more than 50 per cent of projects. In Ukraine, the top five institutions participate in less than 25 per cent of projects. Also, the top four institutions that participate in the projects in Belarus are all located in Minsk and one is located in Brest. The geographical distribution of institutions is similar in Moldova, where only one of the top five participating institutions is located outside of the capital Chișinău (in Bălți). In Ukraine, the projects seem to be more geographically dispersed, with the top five participating institutions located in different cities across the country (Kiev, Donetsk, Lviv, and various locations of the branches of Academy of Sciences, including Odessa and Kharkiv).

We also identify some areas where targeted action can improve the opportunities and reduce the barriers to the scientific communities in the EaP countries for participating in international cooperation projects with the EU. These include wider outreach of dissemination activities, facilitating mobility among faculty and students through removing administrative barriers, and building capacities of research institutions in the EaP countries outside the capital cities. Clearly, these issues must be addressed both by the EU institutions and the national authorities, which emphasizes our general conclusion that the success of scientific cooperation depends on the good will and activities of all actors involved.

To conclude this paper, we offer some recommendations that address some of the important barriers to the participation of scientific communities in the EaP countries in international cooperation projects, which we identified through the research conducted for this working paper and during pilot interviews with academics, administrators and researchers in Belarus, Moldova, and Ukraine. The following activities could more actively engage research institutions in these countries in scientific cooperation and academic exchange with the EU and its member countries:

(1) Wider outreach of dissemination activities on running programmes and projects and information campaigns about existing opportunities to cooperate with the EU. Currently most institutions engaged in scientific cooperation with the EU are located in the countries' capitals, meaning that institutions located outside of capital cities often do not have sufficient information about existing opportunities.
(2) Targeted activities to identify a wider range of research institutions in the EaP countries that can be engaged in scientific cooperation.
(3) Facilitation of scientific cooperation projects' registration with the authorities (especially important for Belarus), and a preferential taxation regime for grant funding.
(4) Facilitation of mobility among faculty and students: removing administrative barriers, making it possible for them to leave for medium- and long-term exchange programmes and fellowships.
(5) Building capacities of research institutions in the EaP countries (especially outside the capital cities) to handle the paperwork required for applying to scientific cooperation or exchange programmes.
(6) The EaP governments should develop ways to encourage domestic research institutions to actively participate in international scientific cooperation (make it one of the criteria for funding, establish annual awards for accomplishments in international cooperation, etc.)

In addition to this, some of the most frequently mentioned barriers to scientific cooperation with the EU include: language barriers, insufficient administrative capacity to prepare applications and process reporting demands by international projects, as well as the lack of bilateral agreements with the EU in the sphere of science and technology (Belarus).

Future research should examine what measures and programmes can help alleviate some of these barriers to cooperation, how the broader societal, political, and institutional context constrains and enables the success of scientific cooperation, and what the broader effects of scientific cooperation on societies and their transformations are.

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The EU and Eastern Partnership Countries
An Inside-Out Analysis and Strategic Assessment

Against the background of the war in Ukraine and the rising tensions with Russia, a reassessment of the European Neighborhood Policy has become both more urgent and more challenging. Adopting an inside-out perspective on the challenges of transformation the Eastern Partnership (EaP) countries and the European Union face, the research project EU-STRAT seeks to understand varieties of social orders in EaP countries and to explain the propensity of domestic actors to engage in change. EU-STRAT also investigates how bilateral, regional and global interdependencies shape domestic actors' preferences and scope of action. Featuring an eleven-partner consortium of academic, policy, and management excellence, EU-STRAT creates new and strengthens existing links within and between the academic and the policy world on matters relating to current and future relations with EaP countries.