of the Commission Implementing Decision on the ENI East Regional Action Programme 2019 Part 3 (including one action on budget 2019 & 2020), to be financed from the general budget of the European Union

Action Document for EU4Digital: Connecting research and education communities (EaPConnect)

ANNUAL PROGRAMME

This document constitutes the annual work programme in the sense of Article 110(2) of the Financial Regulation and action programme/measure in the sense of Articles 2 and 3 of Regulation N° 236/2014.

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1. Title/basic act/ CRIS number	EU4Digital "Connecting research and education communities" (Eastern Partnership Connect) CRIS number: ENI/2019/41967 financed under the European Neighbourhood Instrument
2. Zone benefiting from the action/location	Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine.
3. Programming document	ENI Regional East Strategy Paper (2014-2020) and Regional East Multiannual Regional Indicative Programme 20147-2017.
4. Sustainable Development Goals (SDGs)	Main SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation Other significant SDGs: SDG 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; SDG 5: SDG 5: Achieve gender equality and empower all women and girls
5. Sector of intervention/ thematic area	Information and communication technology	DEV. Assistance: NO[1]
6. Amounts	Total estimated cost: EUR 10 526 316

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[1]   Official Development Assistance is administered with the promotion of the economic development and welfare of developing countries as its main objective.

concerned	The contribution is for an amount of EUR 10 000 000 from the general budget of the European Union for 2019.		
7. Aid modality(ies) and implementation modality(ies)	Project Modality Direct management through: Grants		
8 a) DAC code(s)	22040 - Information and communication technology (ICT) 100%		
b) Main Delivery Channel	51000 - University, college or other teaching institution, research institute or think-tank		
9. Markers (from CRIS DAC form)	**General policy objective**	**Not targeted**	**Significant objective**	**Principal objective**
	Participation development/good governance	Χ	☐	☐
	Aid to environment	Χ	☐	☐
	Gender equality and Women's and Girl's Empowerment	☐	Χ	☐
	Trade Development	Χ	☐	☐
	Reproductive, Maternal, New born and child health	Χ	☐	☐
	RIO Convention markers	**Not targeted**	**Significant objective**	**Principal objective**
	Biological diversity	Χ	☐	☐
	Combat desertification	Χ	☐	☐
	Climate change mitigation	Χ	☐	☐
	Climate change adaptation	Χ	☐	☐
10. Global Public Goods and Challenges (GPGC) thematic flagships	Human development		

SUMMARY

The "Eastern Partnership Connect" ("EaPConnect") project was first launched by the European Union (EU) in 2015 to improve EaP intra-regional connectivity and facilitate participation of local scientists, students and academics in EU and global Research and Education (R&E) collaborations.

Thanks to EaPConnect, the national R&E networks (NRENs) in the six EaP countries are now interconnected and largely integrated into the pan-European GÉANT network. Concretely this means that students and researchers in the EaP countries can now access a high-speed regional network of optical fibres and global scientific databases. Wifi coverage for students and researchers in the region has increased by 640 % (from 38 to 244 service locations). Today around one million scientists, academics and students at over 420 institutions across the region benefit from this connectivity boost. EaPConnect project has proved successful and strategic to help bring EaP and EU countries together.

The present action will build on the work done by EaPConnect and enhance the use of the newly established connectivity, broadening the user base and fostering the NREN's sustainability through enhanced public affairs activities. In addition, it will support EaP NRENs to move towards the full integration into GÉANT organisation as full rights members, following GÉANT cost sharing model. This will empower R&E institutions in the EaP countries to participate as beneficiaries in a wider range of H2020 or Horizon Europe projects.

More concretely, this will allow an increase in network coverage for students, lecturers and researchers in the EaP countries up to 70-80 % from the current values. The use of existing NREN services (eduroam, eduGAIN, cloud, cyber-security, LoLa, etc.) will be increased by 100% and new services will be implemented based on a pipeline of priorities (digitisation of cultural heritage, e-health, artificial intelligence, big data processing, IT education). This will boost the exchange of information and cooperation between the Research and Education communities in the EaP region and Europe.

1 CONTEXT ANALYSIS

1.1 Context Description

The demand for digital services to support collaboration in research and education in the region is no less than that of EU countries. All countries in the Eastern Partnership region have a large number of young and talented women and men whose future depends heavily on the speedy development of the information society, and without which their societies are likely to continue experiencing a significant brain drain. The education, cultural and scientific sectors are promising, with several centres of excellence, but these face severe limitations in the level of international collaboration with respect to their counterparts in the European Union and other world regions. Moreover it has to be noted the persistent gender inequality and lack of women in higher position in academia in the EaP region. This is a human rights concern, but also as a premise for quality higher education and innovative science.

National Research and Education Networks (NRENs), the communication layer of e-Infrastructures, are still far from being fully developed in the Eastern Partnership region.

In this context, the provision of quality education and training as well as measures to ensure that research and innovation environments are conducive should be prioritised to support the development of compatible infrastructure and of human capacities and skills and to foster the integration into the European Research Area (ERA). Given their strong potential as enablers of "knowledge-based" societies, digital technologies should be part of the integrated response to accelerate progress in the education and research sectors. This will also contribute to social and economic development, as well as to the creation of growth and jobs.

Since 2015 the EU has been helping EaP NRENs to support the needs of the research and education communities within and across EaP countries. EaPConnect project has provided the physical connection to the pan-European GÉANT network and with the services supporting the NRENs in delivering world-class network services to the research and education community. Concretely, this has enabled researchers and students in the EaP countries to work together and exchange data with their counterparts in Europe and beyond.

1.2   Policy Framework (Global, EU)

As stated in the "Digital4Development" Staff Working Document[2] outlining the European Commission's approach to mainstreaming digital technologies into EU development policy:

"Digital technologies (alias information and communication technologies - ICT) and services are proven enablers of sustainable development and inclusive growth. They can be key to improving lives even in the poorest countries, in particular by empowering women and girls, enhancing democratic governance and transparency, and boosting productivity and job creation. Nevertheless, connectivity and affordability remain a problem both across and within regions, since there are large variations between high and lower income countries and between cities and rural areas."

In 2015, the United Nations General Assembly approved the 2030 Agenda for Sustainable Development, which highlights the importance of information and communication technologies. Reference to ICT can be found explicitly as a target under Sustainable Development Goal 9 *"Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*"[3], while ICT is also referenced in the targets related to climate change, gender equality and women empowerment, private sector development, education and health. Also Goal 4.3 *"By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university"* and Goal 5.5 *Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life* will be addressed in this programme. While the 2030 Agenda sets out a comprehensive vision of what needs to be achieved to eradicate poverty and promote sustainable development, EU development policy is a critical part of the overall EU response to that Agenda.

Sustainable economic and social development and support to transformation process are at the heart of the EU's contribution to stabilising the neighbourhood. In addition to underpinning macroeconomic stability through sound economic policies, EaP countries need to face the challenge of driving their economic transition process forward with a view to create an attractive environment, a level playing-field for investments and business, as well as to improve their capacity to take advantage of the trade opportunities with the EU and with each other.

The modernisation of economies is another important priority. In particular, the digital economy is an area with yet untapped potential for both the EU and the EaP partner countries for social and economic development, as well as for the creation of growth and jobs.

Seen as a means to drive economic growth and create jobs, Horizon 2020 (H2020) is the biggest EU Research and Innovation programme ever, with nearly EUR 80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract.

The pan-European data network for the research and education community GÉANT is part of the H2020 framework. It interconnects national research and education networks (NRENs) across Europe, enabling collaboration on projects ranging from biological science, to earth observation, to arts and culture. GÉANT combines a high-bandwidth, high-capacity network with a growing range of services. It provides the best digital infrastructure to ensure that Europe remains in the forefront of research and has a vital role to ensure H2020 project

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[2]   https://ec.europa.eu/europeaid/sites/devco/files/swd-digital4development_part1_v3.pdf.

participants are fully able to collaborate, share and access data, discuss and learn together, and test their innovations across the network unimpeded.

Thanks to EaPConnect project, GÉANT network and services have been extended to the EaP countries, ensuring direct links to the pan-European GÉANT network and allowing their participation in regional and international research programmes such as H2020. Thanks to EaPConnect users in the EaP countries are now able to collaborate with their counterparts at more than 10 000 research and education establishments in Europe.

1.3 Public Policy Analysis of the partner country/region

EU relations with the six eastern EU Neighbours are developing within the policy frameworks of the European Neighbourhood Policy (ENP), the Eastern Partnership (EaP) and the Digital Community, the latter aiming to deliver the benefits of the Digital Single Market (DSM) to key EU Neighbours. Various bilateral agreements between the EU and the EaP partner countries (Association Agreements, DCFTAs etc.) are also delineating these relations.

Digital economy is a top priority for EU cooperation with the EaP countries, as underlined in the review of the European Neighbourhood Policy[3] (Nov. 2015): "*support for the digital economy should be stepped up, to harmonise the digital environments between the EU and its neighbours. This will create jobs, growth and innovation, particularly benefiting the young in terms of opportunities for education and employment, locally or at a distance, and for starting up low initial capital businesses*".

This objective is also in line with deliverable no.7 "Harmonisation of Digital Markets" under priority I "Economic Development and Market Opportunities" of the adopted Joint Staff Working Document "Eastern partnership – Focusing on key priorities and deliverables"[4]. This establishes an ambitious set of deliverables by 2020 on digital harmonisation, ranging from the reduction of roaming charges to cyber security with the overall aim being "*to eliminate existing obstacles and barriers to the provision of pan-European online services for citizens, public administrations and businesses. This will result in better services, at better prices and more choice; it will attract investments and boost trade and employment. Existing companies will be able to grow faster and start-ups will be created more easily. The brain drain will be reversed.*"

Various actions in the field of the digital economy and society, including actions contributing to the harmonisation of digital markets, appear also under the 2017-2020 Single Support Frameworks for Armenia, Belarus, Georgia, and Moldova and the 2018-2020 SSF for Ukraine.

1.4 Stakeholder analysis

The main stakeholders are NRENs and R&E institutions of the EaP countries. Universities and research centres being financed from public budgets, they often lack resources for arranging access to the high speed, reliable R&E network providing access to the R&E organisations in Europe and worldwide. The NRENs have been created to provide internet infrastructure and services to the research and educational communities within a country, in sufficient capacity and on affordable terms. NRENs of the EaP countries will be the primary

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[3] https://eeas.europa.eu/enp/documents/2015/151118_joint-communication_review-of-the-enp_en.pdf.
[4] https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/near-eeas_joint_swd_2016467_0.pdf.

beneficiaries of the project, as they are the representatives of the education and research institutions in the area of communication technologies.

The final beneficiaries will be the staff and students of these institutions that will be better placed to use NREN and GÉANT services and connectivity to collaborate with their peers in other world regions. This will on one hand improve education and research possibilities, and on the other hand support the emerging use of information technologies in other sectors like medicine, meteorology, earth science. Ultimately all citizens of the EaP region will benefit from a broadened use of information technologies, which has the potential to improve the quality of public services, increase the openness of the region towards global developments, prevent the brain drain and contribute to the economic growth in the region.

The NRENs participating under phase 1 of the project will continue to be involved:
1. Armenia: IIAP NAS RA – Institute for Informatics and Automation Problems of the National Academy of Sciences of the Republic of Armenia
2. Azerbaijan: IIT of ANAS – Institute of Information Technology of Azerbaijan National Academy of Sciences
3. Belarus: UIIP NASB – United Institute of Informatics Problems National Academy of Sciences of Belarus
4. Georgia: GRENA – Georgian Research and Educational Networking Association
5. Moldova: RENAM – Research and Educational Networking Association of Moldova
6. Ukraine: URAN Association – Association of Users of Ukrainian Research and Academic Network

For Ukraine, in light of phase 1 monitoring analysis, it is recommended the formal involvement of UARNet, the Ukrainian Academic and Research Network (another Ukrainian NREN related to the National Academy of Science of Ukraine and equipped to provide connectivity to the Ukrainian institutions) from the beginning of the project. Additional partnerships with other EaP NRENs may also be considered.

In order to secure complementarity with national research policies and agendas and to ensure co-funding and sustainability of the project, the involvement of Ministries of Education and Science and Academy of Sciences will also be ensured.

In addition, since its start in June 2015, the project has benefited enormously from the support provided by the associated European and Western Balkans partners, and this is one of the key factors of the success of this project. It is therefore suggested that EU and Western Balkans partners continue to be involved in the project as co-beneficiaries, including but not be limited to the ones operating under EaPConnect project.[5]

1.5   Problem analysis/priority areas for support

The main issue addressed by this action is the digital divide causing the lagging behind of the education and research sector in the EaP countries. Access to information and exchanges with

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[5]   The co-beneficiaries of EaPConnect project are: the Cypriot Kypriako Erevnitiko Kai Akadimaiko Diktyo/Cyprus Research and Academic Network (CYNET); the German Verein Zur Förderung Eines Deutschen Forschungsnetzes DFN Verein E.V. (DFN); the Dutch SURFnet BV; the Estonian Hariduse Infotehnologia Suhtasutus/ Information Technology Foundation for Education; the Italian Consortium GARR; the Polish Instytut Chemi bioorganiczej Polskiej Akademii Nauk (PSNC), the Lithuanian Kaunas University of Technology (KTU); the Romanian Agentia de Administrare a Retelei Nationale de Informatica pentru Educatie si Cercetare (AARNIEC /RoEduNet); the Serbian Informaciono-komunikaciona ustanova "Akademska mreža Republike Srbije-AMRES" (AMRES).

the outside world is one of most important attributes of a successful education system. With the fast development of ICT technologies, the access to global information sources has become a crucial element for the competitiveness of a country and its underdevelopment a major cause for some economies to lag behind.

The lagging behind of education and research, as well as lack of access to modern information technologies is directly affecting other sectors like healthcare and government. Limited access to modern technologies is often a cause of a brain drain of highly skilled experts into countries with better facilities and possibilities for their development.

In the countries of the EaP region, the access to R&E networks, the exchange of information between scientific groups and knowledge exchange are still limited. As a result, a major part of the population is being excluded from the realising their full potential that the access to high speed, reliable R&E networks would provide. The most affected sectors are education and research where the access to up-to-date information is a pre-condition for their quality.

However since 2015 EaPConnect project has strongly promoted the use of information technologies in the region. It has contributed to the modernisation of education systems and progress in research by facilitating the access of highly skilled scientists, researchers and students to information and increasing the exchanges with the rest of the world.

One of the main achievements of EaPConnect is the establishment of a data link to the GÉANT network in the 6 EaP countries. By the end of 2018, all six beneficiary countries were connected through the project-funded internet links.

Country/ Connectivity	2015 (prior to project start)	2016	2017	2018
Georgia	0.3Gbps	1Gbps	2.5Gbps	3Gbps
Armenia	0.3Gbps	1Gbps	1.5Gbps	1.5Gbps
Azerbaijan	0.3Gbps	1Gbps	1.5Gbps	1.5Gbps
Moldova	1Gbps	1Gbps	1Gbps	10Gbps
Belarus	1Gbps	5Gbps	10Gbps	10Gbps
Ukraine	1Gbps	1Gbps	15Gbps	15Gbps

Map 1. Overview of EaP region links to the pan-European GÉANT network, end of 2018.
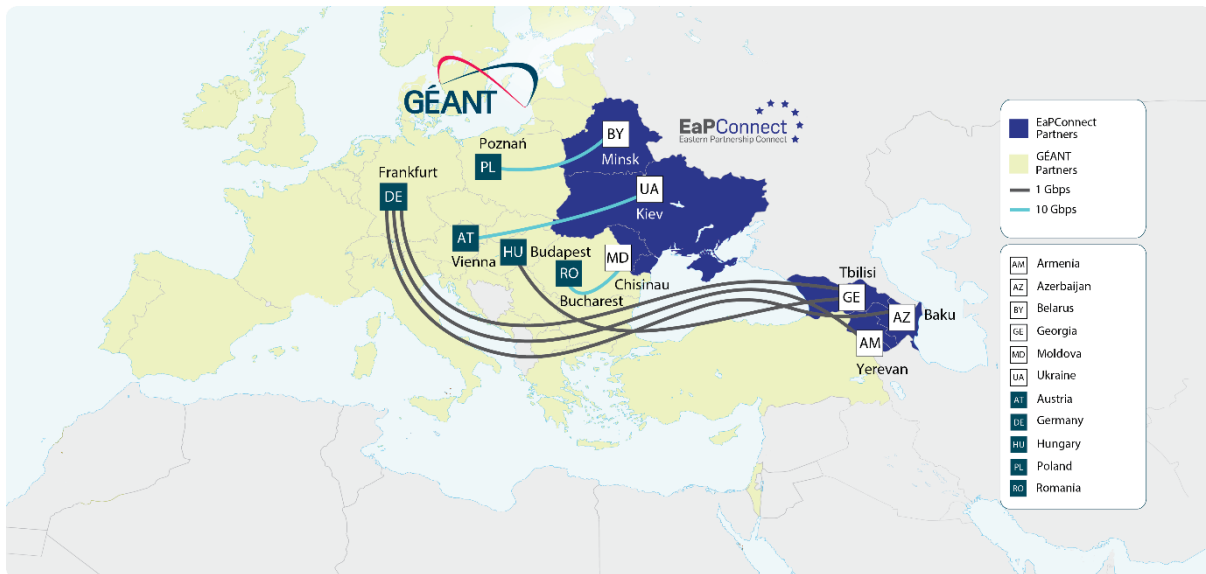
Having established the physical network connections, new services for the research and education community were developed and the usage of the existing services was increased. These services include among others Wi-Fi education roaming (eduroam), network monitoring services, and Infrastructure-as-a-Service (Clouds). To facilitate and encourage the participation of scientists, students and academics in global R&E activities, the project has set up various activities to engage EaP users (students, researchers, librarians) with their European counterparts through programmes such as Enlighten Your Research or the LOLA technology (LOw LAtency audiovisual streaming system).

The following section gives a detailed overview of the core services available to the EaPConnect partners:

1. *eduroam* – Wi-Fi education roaming, is a secure, world-wide roaming access service developed for the research and education community. The service was deployed successfully in all six beneficiary partner countries. The number of service locations increased as well as the number of national and international users of the service. In 2018 eduroam coverage increased by 136 % overall in the region (from 179 to 244 service locations).

2. *eduGAIN* – interconnects identity federations around the world, simplifying access to content, services and resources for the global research and education community. eduGAIN encompasses Identity Providers, Service Providers and Identity Federations:

   • Identity providers – universities, research institutes – that keep information about identities of their staff, members and students.

   • Service providers – organisations (universities, libraries) that own data resources that are made available to students and/or researchers.

   • Identity federation - in each country, there is one organisation (identity federation) that is responsible for keeping information about the identity providers and service providers. The eduGAIN service allows the students, researchers, staff and other members of the identity federations to have unified access to the data provided by the service providers.

Five of the six EaP countries (except Azerbaijan) have deployed this service. There are 27 federated entities (IdPs and SPs) deployed in the EaP region. The main goal for 2018 was to move from a testbed to a real infrastructure.

3. *perfSONAR* – a network monitoring service across multiple domains that provides information about the network's connectivity and any problems on the links that could impact the successful delivery of the data being exchanged. Equipment was deployed in five of the six EaP countries (except Azerbaijan). The number of deployed nodes in the region increased by 60% from 16 to 27 during 2018.

4. *IaaS* – Infrastructure as a Service (a form of cloud computing that provides virtualised computing resources over the internet) deployed independently using local computational resources by NREN organisations in Armenia, Azerbaijan, Georgia, Ukraine and Moldova enabling the service for the scientific and education community.

5. *Clouds* –all six EaP countries are designing and implementing national cloud infrastructures as well as investigating opportunities to use the GÉANT Clouds Framework Agreement.

6. *Filesender* – allows R&E users to securely and easily send arbitrarily large files to other users. In 2018 this service was used by three EaP NRENs (Ukraine, Moldova, Armenia).

7. LOLA – LOw LAtency audiovisual streaming technology. High quality video/audio connection between two different geographical locations. LOLA is adopted by two project partners – Belarus and Armenia. Azerbaijan and Moldova are also making effort to join it. Several LOLA kits are ordered for them.

8. *Digitisation of Cultural Heritage* – this service for national scientific libraries is being established in the scope of EaPConnect. Three pilot projects were selected from the Enlighten Your Research @ EaP 2017 programme to be deployed in Armenia, Belarus and Ukraine. Work on the projects continued in 2018.

9. *Cyber-security* – all countries are working on the development of cyber-security services. Georgia and Moldova have security and incident response teams CERTs that are members of the European cyber-security community Trusted Introducer TI. They are providing the following services:
   - Security incidents helpdesk,
   - Notifications and security alerts,
   - Security analysis and consulting,
   - Cyber-security education and training.
   Armenia, Azerbaijan and Belarus are providing consultation and support on cyber-security issues via network operation center staff.

Thanks to EaPConnect, today around one million scientists, academics and students at over 420 institutions cross the region benefit from this connectivity boost. EaPConnect project has proved successful and strategic to help bring EaP and EU countries together.

Moreover, there is strong evidence that research and higher education institutions reproduce social values leading to gender bias/discrimination. Women and men tend to concentrate in certain scientific fields (horizontal segregation). The stereotypical subject choices of students are a real concern and in addition top positions are more frequently occupied by men.

The comparison of the gender ratio of academic staff by position in the EaP region shows that women may be well represented in lower faculty positions, whereas there is a sharp downturn of women's number in higher positions such as full professors in department staff, chairs of

departments, deans, vice-rectors and rectors. Women are also underrepresented in the governing boards and scientific councils. For instance, the share of women at high-level positions in Georgia and Belarus are at 20% while Azerbaijan, Armenia and Moldova has 10% women at the helm of universities.[6] Moreover, research and teaching often seem to disregard the importance of having a gender dimension in their approach, content and analysis. The result is that the viewpoints, experiences and needs of half the population risk being overlooked or dismissed. This in turn leads to products, services and policies that are less than optimal because they are targeted at and serve only a proportion of society.[7]

Therefore this action will particularly emphasise the need to ensure an equal balance of women and men in all its activities and give particular attention to supporting research, which can have a positive impact on gender equality. This will contribute to further development of the region, modernisation and support democracy building. Sectors important for increasing the development of the EaP countries would be modernised, which would help to raise the economic growth and leverage the economic development in the region.

It has to be noted that the nature of NREN core user communities is highly data-intensive and technical and traditionally male-dominant. While the action will continue promoting gender balance, the baseline of NREN users is not gender equal. Out of the 37 proposals submitted under the Call for Proposals "Enlighten Your Research" in 2018, only nine came from women (24%) and out of the seven winners only one was a woman (14%). Additionally, the project supported EaP NREN participating in the GÉANT coordinated Emerging NREN activity that ran in parallel to the largest European networking conference TNC: one out of three participants from the region was a woman. The project will further promote gender equality by mainstreaming it in the work plan.

2 RISKS AND ASSUMPTIONS

Risks	Risk level (H/M/L)	Mitigating measures
High prices of broadband connectivity.	High	Allow the purchase of Indefensible Rights of Use (long-term lease). Encourage competition between internet service providers. Raise awareness of regulators and policy makers at national and regional level on the impact of monopolies.
Weak financial sustainability of EaP NRENs.	High	EaP NRENs to develop sustainable business models and to establish plans for mobilisation of resources.

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[6] Women in Power and Decision-Making in the Eastern Partnership Countries, 2015– HiQSTEP
[7] A publication by the European Institute for Gender Equality: Gender equality in academia and research, (2016)

Inadequate institutional and governance frameworks as well as human resources hampering NRENs' role as coordinating organisations.	Medium	EaP NRENs to reinforce governance rules and human resources policy (including project management). Further promote NREN capacity building as part of the activities of the project building on the work done under phase 1. Further encourage external support for NREN development, development and implementation of business plans building on the work done under phase 1.
Inability of NRENs to pay their co-funding share to the project.	Medium	Additional sensitisation of national decision makers (ministries of higher education) to secure financial means to cover NRENs' contributions to the project.
Little awareness amongst governments, ministries and other national decision makers on the benefits of the NRENs.	Medium	Continue building on awareness raising activities started in the first phase and look for new champions.
Low understanding from potential users (university, research centres) about the opportunities provided by NRENs in terms of connectivity and services.	Low	Risk addressed already under phase 1 through awareness raising activities (rectors, chancellors, etc.), use of champions, such as well-known researchers, to advocate for NRENs. Additional targeted training of NREN CEOs on business development and marketing following capacity building activities conducted under EaPConnect. Deployment of new applications and services which demonstrate the benefits of NRENs.
Low capacities (staff) in higher education/research institutions hampering the connection and use of the connection to the NREN.	Low	Further capacity building initiatives (technical trainings, marketing and communication, etc.) and train-the-trainer programmes building on the work done under phase 1.

Assumptions
• Political stability in the EaP countries allow for NRENs' activities • EaP partners remain committed to supporting digital skills development

3 LESSONS LEARNT AND COMPLEMENTARITY

3.1 Lessons learnt

This action is the second phase of a project (EaPConnect) which started in 2015 with the objective of connecting scientists and researchers from EaP countries with their peers in Europe by enabling their countries' NREN to deliver world-class services and by providing access to the GÉANT high-speed network.

For more than 400 higher education and research institutions, which are connected to those 6 NRENs, it represents increased opportunities to collaborate with peers across the world and helps them in retaining local talent.

As pointed out also by a Result Oriented Monitoring (ROM) exercise conducted in 2017, the first phase of the project has proved to be highly relevant to the needs of the beneficiaries. The efficiency of the project has proved to be good and implementation mechanisms are conducive for achieving the expected results. Cost-efficiency of the connectivity costs is the best possible given the existing constraints in the region and improved in 2017 as a result of re-procurement exercise. The effectiveness of the project is also good. The expected results have partially been achieved and are likely to be fully achieved at the end of the project. There is however an increasing demand for access to online content among the EaP Research & Education community which calls for a stronger strategic approach for connectivity deployment.

Experience gained in the field of regional research and education networks through EU funded projects (Latin America – ALICE/RedClara; South East Asia – TEIN/Asi@Connect; Pan-Africa – AfricaConnect; Central Asia – CAREN; Mediterranean – EUMEDCONNECT; Europe – GÉANT project) demonstrated the high value of the investment in stimulating regional cooperation, enabling cooperation with Europe as well as aligning to European technical standards. One of the recent success factors in the regional R&E development has been the ability to procure long-terms connectivity leases (IRU) as it was done in AfricaConnect 1& 2 and Asi@Connect. Such strategic long-term investment has contributed to sustainability of local NRENs and given them a solid basis for further development. This model has also been adopted in Europe through the 100% EU-funded GN4-3N project.

Following the ROM analysis, discussions with the project team, the beneficiaries, and the relevant EC stakeholders, and in line with the approach followed in other regions the following recommendations for a second phase of the project should be taken into account:

- **Need for a stronger strategic approach for connectivity deployment**: A need to deploy connectivity based on a long-term access to high capacity that can accommodate needs of the growing communities in the region as well as any strategic decisions to aggregate traffic in the region.

- **Need to highlight the added value of NRENs**: the mission of EaP NRENs is significantly hampered by the general lack of understanding of their role and of their difference compared to commercial internet providers. In this respect, the provision of dedicated services to the education and research communities is critical to underline NRENs' added value. In order to build and consolidate their reputation, NRENs should promote a well-selected range of services visible for the end users.

- **Capacity building activities should cover both technical and governance aspects**: capacity building activities delivered by NRENs fill a critical gap for highly specialised training that is not delivered by any other stakeholder in the region. At technical level, training is critical to ensure a smooth implementation and delivery of the services to the users. At institutional level, capacity building is needed to strengthen NRENs' capacities in leading complex procurement processes or in developing business plans and advocacy strategies in view of achieving sustainability, including financial sustainability.

- **Importance of a multi-stakeholder dialogue platform**: raising awareness on the importance of digital tools for education and research is key to secure political and

financial support but it requires NRENs to be able to transcend technical arguments to promote a clear "Digital4Development"[8] vision.

- **Need to include stronger impact indicators:** while EaPConnect mainly focused on indicators relating to infrastructure deployment, impact indicators should be included in the future programme in order to measure the impact of provision of connectivity, services and capacity building on skills retention, job employment rates, productivity levels, reduction in job inequality, innovation, etc.

- **Need to have a flexible approach to reflect local realities:** while this action pursues an approach valid for the complete region of the Eastern European Partnership, EaPConnect experienced varied basic conditions depending on the level of maturity of the NRENs, the political environment, the regulatory frameworks or the costs of internet access. The conclusion that can be drawn from such observations is the need to allow for some flexibility to adopt solutions adapted to local realities.

3.2 Complementarity, synergy and donor co-ordination

At political level, the Eastern Partnership has adopted ministerial declarations creating the framework for the **Harmonisation of Digital Markets,** the last one in February 2019 in Bucharest.

The **EU4Digital** initiative was launched to channel support to the development of the digital economy and society in the Eastern Partnership. Furthermore, the EU has provided support to develop e-government services in the context of public administration reforms and to finance business incubators.

The latest EaP digital ministerial declarations[9] and November 2017 EaP Summit declaration both set the political commitment from EaP countries and EU MS to work on six digital priorities: Telecom rules, e-Trade, Digital Trust and Cybersecurity, Digital Skills, Digital Innovation and Digital Health. Both political dialogue and EU support will focus in particular on **achieving by 2020**:

- An **easier and cheaper access to the internet**, through the roll out of national broadband strategies and the launch of the first broadband infrastructure programmes. In particular, the EU will support access for citizens in rural areas, which can lead to an increase in the access to economic opportunities. Via the EU4Digital Broadband project the EU encourages the deployment of the basic infrastructure for e-government services, increasing transparency and accountability in the process. Through EaPConnect, the EU provides this infrastructure and makes it available for the research and education communities in the EaP countries.

- **Concrete steps towards harmonised roaming pricing** and reduced roaming tariffs among the Partner countries. In addition, discussions should be well underway on harmonising the tariffs with the EU. Partner Countries' Ministers endorsed a **Roadmap towards the signature of a Regional Roaming Agreement among Eastern Partners by end 2020** at the 3rd Ministerial Meeting on digital economy (Bucharest, 28 February 2019).

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[8] https://ec.europa.eu/europeaid/sites/devco/files/swd-digital4development_part1_v3.pdf
[9] Bucharest, 2019; Tallinn, 2017; Luxembourg, 2015.

- **A stronger resilience to cyberattacks**. In line with the recently tabled EU Cybersecurity Package and due to severe cyber incidents targeting EaP countries, the EU will further increase its efforts to enhance their resilience to cyberattacks.

To deliver on all these ambitious targets, the EU has planned to commit at least **EUR 50 million** from ENI funding between 2017 and 2020. Concrete support is provided to the implementation of the **EU4Digital** initiative **(EUR 12 million**) focusing on Telecom rules (including independence of the regulator, spectrum coordination, reducing roaming tariffs and broadband development), eTrade, Digital Trust and Cybersecurity, Digital Skills, Digital Innovation and Digital Health.

Additional incentives to promote ICT research, **start-up & innovation ecosystems** and **eSkills** development in the EaP partner countries could be channelled through bilateral support, as reflected in the **Single Support Framework** programming documents for 2017-2020.

In addition, the EU wants to encourage infrastructure investments in broadband, accompany regulatory reforms and increase penetration and usage rates in Partner countries, particularly in rural areas where the conditions for private sector investment might not be fully present (e.g.: last-mile broadband access).

For this, in the context of the **External Investment Plan (EIP)**, the EU has have approved one proposal under the Digital Window of the **European Fund for Sustainable Development (EFSD)** guarantee.

The extension of **EaPConnect** project beyond 2020 would complement the efforts in terms of broadband development and help bridge the digital divide also in the research and education sectors.

Another relevant EU initiative at EaP regional level is **EU4Innovation**. This umbrella programme combines all EU activities that support the development of EaP countries innovation capacities, notably those funded under the Horizon 2020 programme and the European Neighbourhood Instrument.

A second phase of EaPConnect will complement research projects, which fosters ICT research cooperation between the EU and the EaP region. In particular it will foster collaboration among Eastern Partnership and European researchers as part of Horizon 2020 and its successor (Horizon Europe).

4 DESCRIPTION OF THE ACTION

4.1 Overall objective, specific objective(s), expected outputs and indicative activities

The **overall objective** of the action is to bring together the research and education communities in Europe and the EaP region and bridge the digital divide.

The **specific objectives (SO)**, **expected outputs** and **indicative activities** are the following:

1. **SO1: Extend network infrastructure (digital highways) to scale-up scientific exchange across borders**

   ➢ **Output 1**: Network infrastructure is further developed and better fulfils the needs of the research and education communities.

   Activities:

1.1. Develop additional network infrastructure and connect new universities and research institutes, in particular outside the capital cities.

1.2. Procuring long-term (10-15 years) lease for needed communication channels (Indefeasible Right of Use IRU) for the region or any other comparable cost-effective solutions i.e. purchase of spectrum.

Currently the EaP NREN's that serve more than 400 higher education and research institutions, are connected to GÉANT network via a single link (as shown in map 1 under section 1.5). However the analysis of EaP region network development needs showed a clear requirement to eliminate part of digital divide and provide a more powerful and reliable infrastructure for R&E collaboration, capable of mitigating any network failures. Therefore, capacity upgrades for all EaP countries should be planned taking into account the projections of traffic growth and evaluating the total connectivity capacity covering routes used by this region. To ensure stable and reliable connectivity **redundant connections via different routings** will be established.

To explain the benefit of meshed redundant topology in the EaP region and its integration into the GÉANT topology, data generated in Moldova will be able to travel directly to Ukraine without needing to go first to Romania, Hungary and Austria before reaching Ukraine as it is seen in Map 1. The same would apply for data sharing between South Caucasian countries and the Eastern European countries whereby traffic would stay in Eastern Europe without needing to go all the way to Frankfurt. The integration will serve as a logical development of infrastructure in Central and Eastern Europe.

Map 2. Preliminary plans for the network development
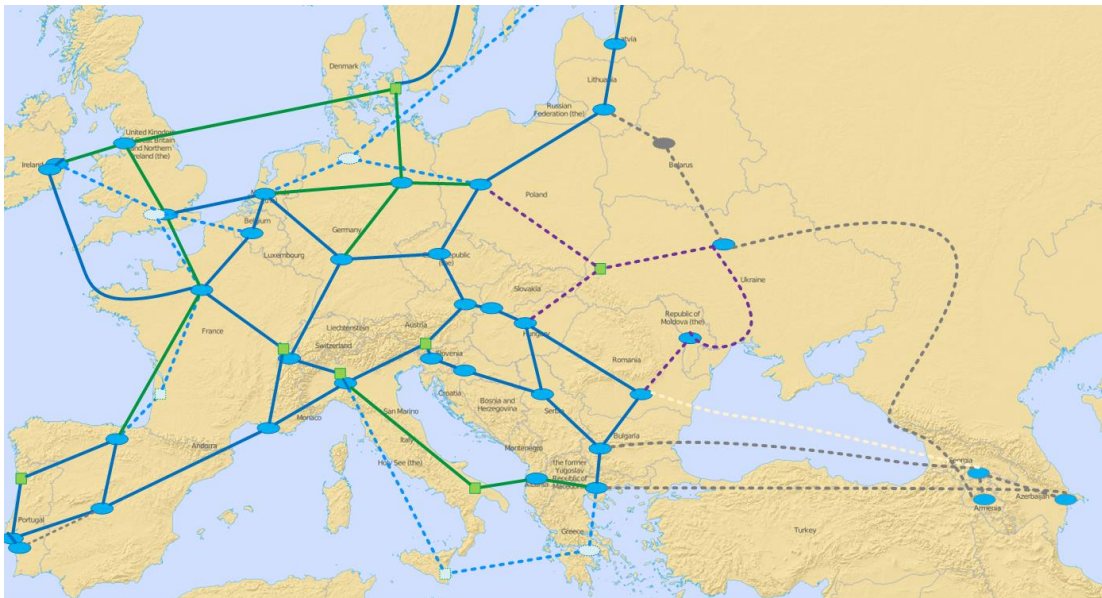
In addition, by allowing the **purchase of IRUs** (long-term lease) we would enable NRENs to have a cost-effective and long term networking solution in the region, sustainability of international connectivity and a smoother integration into the Pan-European network infrastructure.

This will be crucial for **decreasing the digital divide** within the countries between the capital and the regions and, by including stakeholders such as High Schools and Hospitals, at the same time widen the customer base of the NRENs. Diminishing the Digital Divide inside the countries will provide another way of preventing rural depopulation and migrating into cities. Furthermore, an improved infrastructure will allow to better connect remote research institutes, such as telescope facilities dispersed on the countryside, to the main network.

2. **SO2: Increase the use of services implemented under EaPConnect and offer new services to enhance international cooperation in R&E.**

   ➢ **Output 2:** Additional services are provided and existing services are further promoted.

   Activities:

   2.1. Promotional activities for the use of services implemented under EaPConnect (see section 1.5), in particular flagship services to be identified.

   2.2. Identify and enable new cutting-edge services (such as digitisation of cultural heritage, audio visual streaming systems, e-health, artificial intelligence, big data processing, IT education, etc.), based on a pipeline of priorities to be jointly agreed. These will integrate the gender dimension in line with Horizon 2020 gender mainstreaming.

   2.3. Enable the integration of the national facilities (telescopes, synchrotrons, etc.) and datasets (climate, life science, earth science, agriculture, cultural heritage, etc.) into Pan-European networks to support the cooperation with the European research community.

   2.4. Establish cooperation within the European e-infrastructure initiatives European Open Science Cloud (EOSC), European Data Infrastructure (EDI) and other EC led flagships to further enhance cooperation with EU R&E counterparts.

EaPConnect has already added value to each **NREN's service portfolio** which has attracted further user engagement. The second phase will build on these achievements and thus allow EaP NRENs to fully benefit from the global R&E networking opportunities.

Integrating the national facilities (telescopes, synchrotrons, etc.) and datasets (climate, water, life science, agriculture, cultural heritage, etc.) into pan-European networks will enable EaP researchers to become part of the World-wide research community. They will be able to use technology and services that are standard to researchers in the European countries. By becoming part of the European Open Science Cloud (EOSC), they will be able to use European Infrastructures such as PRACE (Partnership for Advanced Computing in Europe) and HPC (High Performance Computing) facilities without having to leave the country. This will contribute to **diminishing the brain drain** from EaP Countries to Europe.

The objective is to strengthen the ties of EaP researchers and scientists to Europe, to enhance EaP researchers' scientific excellence and offer support and funding for their innovative ideas leading to the creation of companies and start-ups and thus **strengthening the national economies**.

3. **SO3: Strengthen EaP NRENs' position in the national R&E ecosystems.**

   ➤ **Output 3:** Adequate technical capacity is built within education and research communities.

   Activities:
   3.1. Provide trainings for users on R&E technologies and services, ensuring gender balance.

   3.2. Provide highly specialised trainings for EaP NRENs (i.e. on network architecture, new services, new users communities - i.e. e-health, artificial intelligence, cyber-security - business development, marketing and communication, public affairs, etc.), ensuring gender balance.

   3.3. Organise conferences (including on e-infrastructure), workshops, networking events in region with the participation of European experts, always ensuring gender balance.

   ➤ **Output 4:** EaP NRENs' financial sustainability conditions are improved.

   Activities:
   4.1. Develop financial sustainability strategies for EaP NRENs (including by exploring opportunities to sell some of the services).

   4.2. Raise awareness on NRENs' role in the education and research ecosystems to leverage their impact towards gathering appropriate financial resources. This means EaP NRENs are recognised as a core of the research and education community, trusted partners for users, government and international partners and accelerators for innovation in R&E.

   4.3. Support EaP NRENs connection to GÉANT network by covering annual GÉANT membership and cost-sharing fees.

   While EaPConnect in the first place focused on establishing good connectivity to GEANT and other European R&E Networks, the second phase will concentrate on **increasing the sustainability of EaP NRENs** and if possible, a decreased dependency of the NRENs from their government.

   To reach this objective NRENs will need to acquire capacities related to budget planning, marketing and communication, as well as Public Affairs.

   In addition, as new services will be deployed and the users community will grow, specific trainings for users and NRENs will be organised.

4.2 Intervention Logic

The present action constitutes a second phase of the Eastern Partnership Connect project to continue bringing together the research and education communities in Europe and the EaP region by allowing for unrestricted scientific exchange across borders and enhancing international cooperation in education.

In addition, in order to provide a long-term sustainable cost-effective solution for communication infrastructure, it is proposed to procure long-term (10-15 years) lease for the communication channels (Indefeasible Right of Use IRU), provided IRUs are effectively proved to be the most cost-effective solution. The purchased infrastructure will be transferred to the partner countries ideally within the first year of project implementation. The IRU

approach is considered more cost-effective compare to standard scheme of leasing channels for one or few years and ensures sustainability and reliability of the established infrastructure. This is also in line with the DG CNECT 100% funded IRU project for EU countries and DG DEVCO approach for Africa and Latin America.

The project will be built along 3 main components:

1) Purchase of hard infrastructure to ensure access to digital highways (output 1);
2) Develop soft services to enhance international cooperation in education and research (output 2);
3) Human capacity building and knowledge transfer to ensure sustainability (output 3 and 4).

Communication will be mainstreamed throughout the 3 components.

4.3 Mainstreaming

Gender will be mainstreamed in this action. A specific strategy (conferences, services, mentoring, marketing campaigns, etc.) will be developed by the project to increase the share of women involved in science, technology, engineering and mathematics.

4.4 Contribution to SDGs

This intervention is relevant for the 2030 Agenda. It contributes primarily to the progressive achievement of SDG 9: Industry, Innovation, and Infrastructure while also contributing to SDGs 4: Quality education and SGD 5: Gender equality and women's empowerment.

5 IMPLEMENTATION

5.1 Financing agreement

In order to implement this action, it is not foreseen to conclude a financing agreement with the partner country/regional organisation/territory.

5.2 Indicative implementation period

The indicative operational implementation period of this action, during which the activities described in section 4 will be carried out and the corresponding contracts and agreements implemented, is 72 months from the date of adoption by the Commission of this Financing Decision.

Extensions of the implementation period may be agreed by the Commission's responsible authorising officer by amending this Decision and the relevant contracts and agreements.

5.3 Implementation modalities

The Commission will ensure that the EU appropriate rules and procedures for providing financing to third parties are respected, including review procedures, where appropriate, and compliance of the action with EU restrictive measures[10].

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[10] www.sanctionsmap.eu Please note that the sanctions map is an IT tool for identifying the sanctions regimes. The source of the sanctions stems from legal acts published in the Official Journal (OJ). In case of discrepancy between the published legal acts and the updates on the website it is the OJ version that prevails.

5.4   Grants: (direct management)

(a) Purpose of the grant(s)

The purpose of the grant is to support scientific exchange across borders and enhancing international cooperation in education among the EaP countries and with the EU, as well as provide long-term sustainable cost-effective solution for communication infrastructure (outputs 1, 2, 3, 4).

(b) Type of applicants targeted

The type of applicants targeted non-governmental organisations leading on e-infrastructure and services for research and education in Europe and worldwide.

(c) Justification of a direct grant

Under the responsibility of the Commission's authorising officer responsible, the grant may be awarded without a call for proposals to GÉANT Verenigin (GÉANT Association Netherlands).

Under the responsibility of the Commission's authorising officer responsible, the recourse to an award of a grant without a call for proposals is justified because GÉANT has exclusive competence in planning, building and operating dedicated pan-European Internet research network GÉANT for the R&E community.

GÉANT has much experience and expertise in planning, building and managing networks in many similarly challenging territories. Over the past years, GÉANT has taken on the responsibility of the regional projects in Latin America, Asia Pacific, South Asia, Central Asia, the Mediterranean, and for South-East Africa in Africa Connect. This involves bearing the financial risk for the collection of the beneficiary contribution for all these projects.

5.5   Scope of geographical eligibility for procurement and grants

The geographical eligibility in terms of place of establishment for participating in procurement and grant award procedures and in terms of origin of supplies purchased as established in the basic act and set out in the relevant contractual documents shall apply

The Commission's authorising officer responsible may extend the geographical eligibility on the basis of urgency or of unavailability of products and services in the markets of the countries concerned, or in other duly substantiated cases where the eligibility rules would make the realisation of this action impossible or exceedingly difficult.

5.6   Indicative budget

	EU contribution (amount in EUR)	Indicative third party contribution (amount in EUR)
Grant (direct management) for Outputs 1 to 4	**10 000 000**	**526 315**
Grants – total envelope		**10 526 315**

5.7 Organisational set-up and responsibilities

The project will be implemented under the responsibility of GÉANT Vereniging that will allocate one project manager to coordinate the actions, ensure progresses is made and report to the European Commission both through regular contacts and when milestones are reached or exceptions identified. The project manager will mobilise human resources as appropriate from both GÉANT (notably for the procurement and operation of the network) and experts from European NRENs and local NRENs. The European Commission will review and approves reports.

An annual steering committee will be led by the EC services for reviewing the results of the project and guide the way forward with the main stakeholders (including GÉANT, EaP and EU project partners, relevant Ministries, EU4Digital project team members, etc.). Other EC services (such as DG CNECT, RTD), the European External Action Service, and the relevant EU Delegations) will be closely associated. Furthermore, technical meetings with the EC and regular updates with the EU Delegations will be held throughout the year in between the annual steering committees (and at the inception phase, with a view to find in particular synergies and possible overlaps with bilateral projects).

5.8 Performance and Results monitoring and reporting

The day-to-day technical and financial monitoring of the implementation of this action will be a continuous process, and part of the implementing partner's responsibilities. To this aim, the implementing partner shall establish a permanent internal, technical and financial monitoring system for the action and elaborate regular progress reports (not less than annual) and final reports. Every report shall provide an accurate account of implementation of the action, difficulties encountered, changes introduced, as well as the degree of achievement of its results (outputs and direct outcomes) as measured by corresponding indicators, using as reference the Logframe matrix (for project modality) or the partner's strategy, policy or reform action plan list (for budget support).

SDGs indicators and, if applicable, any jointly agreed indicators as for instance per Joint Programming document should be taken into account.

The report shall be laid out in such a way as to allow monitoring of the means envisaged and employed and of the budget details for the action. The final report, narrative and financial, will cover the entire period of the action implementation.

The Commission may undertake additional project monitoring visits both through its own staff and through independent consultants recruited directly by the Commission for independent monitoring reviews (or recruited by the responsible agent contracted by the Commission for implementing such reviews).

5.9 Evaluation

Having regard to the importance of the action, a mid-term evaluation(s) will be carried out for this action or its components via independent consultants.

It will be carried out for problem solving and learning purposes, in particular with respect to the intention to launch a third phase of the action.

5.10 Audit

Without prejudice to the obligations applicable to contracts concluded for the implementation of this action, the Commission may, on the basis of a risk assessment, contract independent audits or expenditure verification assignments for one or several contracts or agreements.

The financing of the audit shall be covered by another measure constituting a financing Decision.

5.11 Communication and visibility

Strategic communication is an essential element supporting reforms. Activities will be carried out to ensure the transparency, visibility, and impact of the action. This will also facilitate the exchange of good practices as well as the reporting of impacts indicators and results. Monitoring of progress of data as well as aggregating and standardising data and indicators at regional level will also be carried out. Based on progress achieved under the first phase of EaPConnect, the development of these statistics and indicators will be facilitated. This also includes ensuring action presence on social networks, maintaining its web page, etc. Presence and visibility at meetings under various Platforms and Panels functioning as part of the Eastern Partnership architecture will be ensured, as well as communication with relevant EU institutions and presence during relevant international fora.

Communication and visibility of the EU is a legal obligation for all external actions funded by the EU. This action shall contain communication and visibility measures which shall be based on a specific Communication and Visibility Plan of the Action, to be elaborated at the start of implementation.

This action shall contain communication and visibility measures which shall be based on a specific Communication and Visibility Plan of the Action, to be elaborated at the start of implementation and supported with the budget indicated in section 5.5 above.

In terms of legal obligations on communication and visibility, the measures shall be implemented by the Commission, the partner country (for instance, concerning the reforms supported through budget support), contractors, grant beneficiaries and/or entrusted entities. Appropriate contractual obligations shall be included in, respectively, the financing agreement, procurement and grant contracts, and delegation agreements.

The Communication and Visibility Requirements for European Union External Action (or any succeeding document) shall be used to establish the Communication and Visibility Plan of the Action and the appropriate contractual obligations. Additional Visibility Guidelines developed by the Directorate-General for Neighbourhood and Enlargement Negotiations shall be followed where relevant.

Visibility and communication actions shall demonstrate how the intervention contributes to the agreed programme objectives. Actions shall be aimed at strengthening general public awareness and support of interventions financed and the objectives pursued. The actions shall aim at highlighting to the relevant target audiences the added value and impact of the EU's interventions. Visibility actions should also promote transparency and accountability on the use of funds.

It shall be the responsibility of the implementing partners to keep the EU Delegations fully informed of the planning and implementation of the specific visibility and communication activities.

The implementing partners shall report on visibility and communication activities in the report submitted to the ENI monitoring committee and the sectoral monitoring committees.

The action shall use the common branding regarding EU support, in particular the name "EU for [Country]" (i.e. "EU4Georgia") shall be used for all activities implemented in the Country both in English and in the local official language. The action shall also use common branding regarding all EU support to Digital in the Eastern Partnership, in particular, the name EU for Digital (EU4Digital) shall be used for all relevant activities both in English and in local official languages.

APPENDIX - Indicative Logframe matrix [11]

	Results chain: Main expected results (maximum 10)	Indicators (at least one indicator per expected result)	Baseline (2018)	Target (end of project)	Sources of data	Assumptions
Impact (Overall Objective)	To bring together the research and education communities in Europe and EaP region and bridge the digital divide	• Participations of EaP countries in Horizon 2020[12] projects (number of participations) • ICT development index (IDI) in the EaP region (average IDI value)	• 355 • 6.3 (2017 latest data available)	• 500 • 8.3	EC H2020 statistics, GÉANT and NRENs statistics, United Nations Agency for Information and Communication Technologies	*Not applicable*
Outcome(s) (Specific Objective(s))	SO1: Extend network infrastructure (digital highways) to scale-up scientific exchange across borders SO2: Increase the use of services implemented under EaPConnect and offer new services to enhance international cooperation in R&E SO3: Strengthen EaP NRENs' position in the national R&E ecosystems.	• Fraction of students, lecturers and researchers using network infrastructure • Amount of data exchanged between the R&E communities in the EaP region and Europe (in Peta Bite per year) • Number of H2020[13] projects with an EaP NREN partner enabled thanks to the connection to GÉANT network • Number of NREN events organised and attended by policy makers, politicians and other decision-making bodies (per year) • Number of EaP NRENs paying fully GÉANT Cost-sharing fee	• 55% (1.1 million) • 17 PB/y • 22 • 20 • 0	• 75% (1.5 million) • 25 PB/y • 35 • 25 • At least 4	GÉANT statistics, NRENs statistics, project reports	• Political stability in the EaP countries allow for NRENs' activities • EaP partners remain committed to supporting digital skills development
Outputs	Output 1: Network infrastructure is further developed and fulfils the	• Number of R&E institutions integrated in GÉANT network and using the established infrastructure	• 420 • 0	• 640 • At least 4	GÉANT statistics,	

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[11] Mark indicators aligned with the relevant programming document mark with '*' and indicators aligned to the EU Results Framework with '**'.

[12] And its successor Horizon Europe.

[13] Same as above.

					NRENs statistics, project reports	
	needs of the research and education communities	• Number of countries using IRUs • Number of network users (sex disaggregated)	• 1.1 million (sex-disaggregation to be decided at the start of the project)	• 2 million of which at least 40% women		

	Output 2: Additional services are provided and existing services are further promoted	• Number of (new) services provided
		• Services penetration rate (usage) broken down by:
		  - Number of authorisation of EaP eduroam users abroad
		  - Number of eduGAIN federated entities (IdPs and SPs) in EaP countries
		  - Number of EaP NRENs Cloud user organisations
			• 9
			- Indicatively 360.000/year
			- 27
			- 108
				• 15
				- 430.000/year
				- 89
				- 290		

	Output 3: Adequate technical capacity is built within education and research communities	• Number of users trained per year on services offered by EaP NRENs (sex disaggregated) • Number of trainings organised for EaP NREN staff • Number of conferences, workshops, trainings and events offered per year (including sex disaggregated data on the participants)	• 270 (of which 25% women) • 6 • 14 (for 450 participants of which 30% women)	• 270 (of which at least 40% women) • Up to 10 • 14 (for 500 participants of which at least 40% women)		
	Output 4: EaP NRENs' financial sustainability conditions are improved	• Number of NRENs financial sustainability strategies in line with similar EU strategies • Number of participants to the EaPEC annual Conference	• 0 • 180	• 6 • 200 min./year		