

# RESEARCH INFRASTRUCTURE ROADMAP FOR ALBANIA



**RESEARCH  
INFRASTRUCTURE  
ROADMAP  
FOR ALBANIA**

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## EXECUTIVE SUMMARY

The Ministry of Education, Sports and Youth is responsible for preparation and implementation of the Research Infrastructure Roadmap in Albania.

Research Infrastructure Roadmap is a key strategic document for identification of research potential and should serve as a tool to direct further development of research infrastructures and integration of research community with business sector of Albania.

Albania should catch up with developed countries in the process of opening access to research infrastructure and undertaking the next steps towards integration into the European Research Area. Investing in Research Infrastructures should accelerate the integration process into ERA. Furthermore, strengthening macro-regional cooperation should contribute to enhanced research capacities and improved transfer of knowledge and technology.

In order to keep pace with other Western Balkan economies and get closer to developed countries of the European Union, the following recommendations are proposed in order to improve the current state of research infrastructures:

- 1. Creating an Action Plan for development of Research Infrastructures.** The Action Plan should be developed by the Ministry of Education, Sports and Youth and it should comprise a number of activities related to further development of research infrastructures in Albania. The adopted version of the Action Plan, among other things, should include the creation of an online database of existing research infrastructures and available equipment defined under this document. The main purpose of the Action Plan is to summarise key steps that need to be taken to implement the actions and attain the objectives of the Roadmap.
- 2. Increasing the level of investment in research infrastructure.** In order to enable further development of research infrastructures in the economy, the total investments in research laboratories need to be significantly increased. Additionally, the financing of centres of excellence in priority research areas and establishing a science and technology park should also be considered in order to create conditions for research and innovation activities and take an additional step towards better co-operation between science and business sector.
- 3. Increasing mobility and institutional cooperation among higher education institutions in the Western Balkan region and beyond.** Additional measures need to be taken to increase the mobility of researchers. One such measure is the adoption of Research Infrastructure Roadmap. However, this is not enough and it is necessary to launch additional initiatives to encourage mobility and usage of research infrastructures.
- 4. Improving the legal framework.** The term Research Infrastructures should be defined by the Law on Higher Education and Scientific Research in Higher Education Institutions in Albania.
- 5. Improving the visibility of research infrastructures through the creation of a database of research infrastructures and equipment.** Researchers in Albania do not have the right information that would allow them easier access to research equipment located in another research organisation. To overcome this, it is necessary to launch an online portal

that contains information on available equipment, type of service it provides, relevant contact person, etc.

6. **Improving the Access Policy to research infrastructures.** By developing official internal documents on Access Policy, research institutions in Albania would make the step forward towards creating conditions for greater mobility of researchers nationally and internationally. Considering that Aleksander Moisiu University and University of Medicine in Tirana have already developed internal Access Policies as a result of support programme financed by RCC in 2020, other research institutions should follow these examples and develop their own Access Policies to research infrastructures.
7. **Considering more active participation in pan-European research infrastructures.** Albania should consider options for more active participation in the work of ESFRI by looking at the opportunities to increase the participation at large research infrastructures. By accessing large research infrastructures, Albania would benefit through strengthening scientific excellence, capacity building, accessing research methods that are not possible in the economy, widening perspective for young researchers, etc.
8. **Establishing a two-way communication system with the research community.** Once adopted, the Research Infrastructure Roadmap should be subject to revision after 2 years as a result of joint work between the Ministry and the research community.

## 1. SCOPE AND PURPOSE OF THE DOCUMENT

This document represents the national Research Infrastructures Roadmap (RI Roadmap) the main aim of which is to identify research potential of Albania in order to encourage further development of research infrastructures. Development of Research Infrastructures requires significant investments leading to the enhancement of national, macro regional and international research collaborations. Having in mind that the scientific problems and challenges are not specific for one economy and that science by its nature thrives on international collaboration, by creating RI Roadmap, Albania is making important efforts in encouraging international research cooperation and research excellence.

RI Roadmap contributes to the accessibility and transparency of research infrastructure. Access to research infrastructures fosters the transfer of technology and enables researchers to continue their training and personal development. Available and transparent research infrastructure increases the attractiveness of Albania as a location for research development in the Western Balkans, macro regions and beyond. Thus, investments in research infrastructure undoubtedly represent an investment in the future of the nation.

Although research equipment and facilities are the integral part of research organisations, the information about them are not usually found in one place. Thus, a comprehensive analysis of the research landscape is needed. This analysis represents the most important input for RI Roadmap as it gives insights into the current research support structures in a given scientific domain, operational details, ways to monitor scientific impact and other features which can lead to a better understanding of collaboration and alignment possibilities for researchers, research infrastructures and institutions.

Research infrastructures included in RI Roadmap incite interest of the international research community, attract top-level researchers, produce added value in their research, and markedly raise the standard of research. Research infrastructures also support scientific impact outside the scientific community on public services, culture, economy, health and environment. A comprehensive and up-to-date mapping of the existing and planned research infrastructures provides basic background information for policy makers in the area of research and innovation. RI Roadmap leads to a better use of the existing and more considerate development of future research infrastructures helping to avoid duplications and redundancies. Comprehensive information about RI landscape enhances and optimises RIs and their access by scientists and innovation developers, which is a key ingredient for competitiveness as well as a necessary basis for tackling societal challenges.

RI roadmaps of EU MS usually include only those RIs that are of pan-European significance, meaning that they are selected as strategic in terms of size and uniqueness, and provide open access services to users from other regions/countries. Considering the low level of research infrastructure development of Albania, it should be noted that this roadmap considers this fact, and the final structure of this document is adjusted to the current situation in this area. The document focuses on identification of research equipment within research institutions, which indicates the research potential of Albania.

The primary target group of the Roadmap is domestic and international research community. It presents the national state-of-the-art research infrastructures and outlines the research

communities that are integrated into European research infrastructures. The document also records research groups that are not yet connected to any EU RI, either because they have not been given the opportunity, or their research area is not closely connected to any RIs that exist or are under construction.

The National Roadmap provides a great opportunity for policy-makers and other stakeholders to become aware of the main advantages, strengths and trends of national research infrastructures. In addition, the Roadmap may also be of interest to a wider audience and may therefore increase the visibility and acknowledgment of domestic scientific research.

## 1.1. What are Research Infrastructures?

The use of the term Research Infrastructure varies significantly even inside Europe. The term is used in different contexts internationally and can have different meanings and connotations to different communities. Nevertheless, RIs represent an essential component of every science and research system. Research infrastructures serve to advance basic research and enable complex national research issues to be addressed.

The EU uses the following definition of Research Infrastructures as defined by Article 2 (6) of the Regulation (EU) No 1291/2013 of 11 December 2013-“Establishing Horizon 2020 – the Framework Programme for Research and Innovation 2014-2020”:

Research Infrastructures are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. They include: major scientific equipment (or sets of instruments), knowledge-based resources such as collections, archives and scientific data, e-infrastructure, such as data and computing systems and communication networks and any other tools that are essential to achieve excellence in research and innovation.

In accordance with the EU definition, RIs may be ‘**single-sited**’ (a single resource at a single location), ‘**distributed**’ (a network of distributed resources), or ‘**virtual**’ (the service is provided electronically). Additionally, the EU points out that RIs offer unique research services to users from different economies, attracting young people to science, and helping shape scientific communities.

Research infrastructures are important because they: provide a basis for scientific discoveries; determine the international scientific competitiveness of an economies; reinforce human research capacities; strengthen cooperation and networking between research groups and the business sector; generate significant socio-economic effects, etc.

For the purpose of developing the RI Roadmap of Albania, research infrastructures are defined as instruments, resources or service facilities which are of at least national relevance in their field of science. The Roadmap will distinguish between the development of national RIs and the participation of Albanian researchers in international RIs. A national research infrastructure is an RI that has at least national relevance, with a strong potential for regional or international relevance.

## 1.2. The background of preparing the National Research Infrastructure Roadmap

This document has been developed in close cooperation with the Regional Cooperation Council (RCC) that provided technical assistance to the Ministry of Education, Science and Youth of Albania in this assignment. The technical assistance was provided as part of a broader action that included the provision of assistance to other Western Balkan economies with the final goal to contribute to creating the Western Balkans' Roadmap of Research Infrastructures (WBRI).

The development of RI Roadmap of Albania implied two research methods: analysis of existing strategic documents relevant for research infrastructures and field research.

The existing policy settings for research and innovation have been analysed with the particular emphasis on the following: ongoing reforms of the research sector; legal framework for research infrastructures; reviewing the existing strategies on research and innovation and the current status of the process of developing smart specialisation strategy. The potential gaps and fits between national R&I priorities and existing research infrastructures have been considered.

Mapping research infrastructures included field research that involved the use of comprehensive questionnaires through which a range of information was collected. The survey questionnaire was shared among the research community in Albania to identify potential research infrastructures. It served as an input for the identification and evaluation of research infrastructure potential.

The survey questionnaire is provided in Appendix 2 and detailed instruction for launching and conducting the survey is provided in Appendix 3. The guide comprises detailed instructions for sending out the questionnaire to the research community, gathering necessary data processing, and integrating all responses that served as the main input for selection and mapping of research infrastructures in Albania.

## 2. THE CURRENT POLICY CONTEXT

The Ministry of Education, Sports and Youth is the primary institution entitled to design and implement policies in the field of higher education and science in Albania. The Council of Higher Education and Scientific Research (KALKSH) is the main advisory body to the Ministry regarding the higher education and scientific research policies. KALKSH reviews and advises the Minister regarding the drafting of strategies and national programmes for higher education and scientific research, respective policy directions and preparation of laws and regulations; primary fields and programmes of scientific research and technological development; development of special policies and funding mechanisms, etc.

The scientific research system of Albania has been modernised in accordance with the fundamental principle of modern science systems. The reform of the scientific research system dates back to 2006, when two important systemic changes were made:

- ◆ the Academy of Sciences of Albania (Academy) was reorganised according to the model of many European countries. It now operates through a selected community of scientists organised in sections and no longer administers research institutes;
- ◆ the research institutes of the Academy were detached and integrated into the higher education system.

The institutional reform undertaken in 2006 included the system of scientific research institutes subordinated to line ministries. Nearly 30 research institutes were dissolved, closed, and restructured through the merger or transfer of their institutional affiliation. These profound changes had a significant impact on their future performance. It provided the basis for further development of the research infrastructure of Albania. The reorganisation of research ecosystem produced a single modern institutional framework that sets the premises for accelerated development of research and innovation.

The new Law on the Academy of Sciences was adopted in September 2019 regulating the functioning of the Academy of Science, the Youth Academy and aiming to increase the integrity of scientific research system. This Law defines the functioning of the Youth Academy as an advisory and collaborative body of the Academy of Sciences to encourage scientific research activity of young researchers and bridge the intergenerational gap.

According to the National Strategy for Development and Integration (2014-2020), the key challenges of the research sector in Albania include: (i) increasing and widening the quality of research in Albania based on OECD indicators; (ii) integration of the Albanian scientific research in the European Research Area (ERA) through active participation in all European research and development programmes; and (iii) improving the quality of research and steering scientific research to match market needs by strengthening the links between the existing national and international research and innovation programmes with private businesses.

With regards to research infrastructure, legal and policy framework in Albania is defined by the following policy documents: National Strategy of Scientific Research, Technology and Innovation 2017-2022, Law on Higher Education and Scientific Research in Higher Education Institutions in Albania (Law no 80/2015) and the new Law on Academy of Sciences (2019).

## 2.1. The National Strategy of Science, Technology and Innovation

The National Strategy of Science, Technology and Innovation (STI) defines the policies, vision, goals and strategic objectives of STI in the period 2017-2022. It is considered as horizontal policy since its implementation directly affects the development of social, economic and cultural sectors of the economy. The Strategy's fields of actions cover the following policies: improving the legal, institutional and financial framework in the service of STI; supporting scientific research to promote innovation and technology development in cooperation with the business sector; raising awareness of civil society, media and the public about the role of STI in the overall development of the society; and empowerment and cooperation at regional, European and global level. The key expected results of the Strategy include the following:

1. Reform of scientific research institutional system;
2. Increasing STI investments up to 1% of GDP by 2022;
3. Addressing the retention and brain circulation issues and inclusion of Albanian scientific diaspora;
4. Increasing cooperation between research community and business sector, and monitoring the quality of scientific research.

With regards to the development of research infrastructures, the Strategy aims to increase investments in research infrastructures and the effectiveness of their use. The evaluation and improvement of the national research infrastructures in the following areas has been envisaged by the Strategy's Action Plan:

- ◆ food safety,
- ◆ public health,
- ◆ environment,
- ◆ energy,
- ◆ materials sciences,
- ◆ ICT,
- ◆ Albanology.

The key outputs of the Strategy related to research infrastructures include:

- ◆ creation of the national RI Roadmap in accordance with ESFRI;
- ◆ drafting of the National Investment Plan for research infrastructure;
- ◆ financing accreditation of 10 scientific research laboratories in research institutes;
- ◆ improving the network of libraries and scientific archives at the level of HEIs and research institutions outside HEIs, and
- ◆ Completion of procedures for the establishment and operation of the Centre for Biomarine Studies Vlora, in cooperation with the European Union.

The first monitoring report of the Strategy was prepared in 2019. Despite a significant increase of national resources dedicated to research and innovation, this is still well below the set target. Albania needs a considerable increase of investments in scientific research and other measures to strengthen research and innovation capacity at the national level.

## 2.2. Law on Higher Education and Scientific Research in Higher Education Institutions in Albania

Legal framework for research activities in Albania is defined by the Law on Higher Education and Scientific Research in Higher Education Institutions in Albania.

The main purpose of this Law is to:

- a. determine the role of Government in the higher education;
- b. determine the mission and main objectives of the higher education and scientific research, and the rules for establishment, organisation, governance, administration, financing and closing of higher education institutions;
- c. create a unified system of higher education, of scientific research in the higher education institutions and of contemporary and competitive innovation in the European Higher Education Area;
- d. establish sustainable quality assurance mechanisms in the higher education institutions, in line with the European standards;
- e. place the higher education on sound financial basis, by creating the possibility of exploiting lawful sources of funding;
- f. guarantee equal opportunities on the basis of merit to all individuals who wish to pursue higher education studies;
- g. build a system of higher education based on the principle of free competition among higher education institutions, academic staff and students.

Although this Law is important in encouraging research activities in Albania, the term “research infrastructure” is not defined within it and RI Roadmap is not recognised as important policy document.

## 2.3. The current state of development of Smart Specialisation Strategy

Development of the National Smart Specialisation Strategy (S3) in Albania started in 2017 led by the Ministry of Education, Sports and Youth. Albania's S3 is currently being prepared with assistance from DG NEAR and the Joint Research Centre (JRC) following JRC's methodological framework for smart specialisation in the EU enlargement and neighbourhood economies.

A quantitative mapping of the economy's scientific, innovative and economic potential was completed in December 2019. The mapping process was confronted with challenges in obtaining quantitative data needed because fine-tuned statistical data was not always available.

However, after the consultation process and given the impact of Covid-19 crises, mapping report is currently under revision. A new and innovative ways of measuring and assessing the economic, scientific and innovative potential of regions and sectors will have to be developed and applied. Further steps on the S3 in 2021 involve revision and finalisation of the mapping report, qualitative analysis phase and the launch of entrepreneurial discovery process.

RI Roadmap is an important document for the selection of priority areas of the national S3. The process of mapping research infrastructures provides the basis for the analysis of research potential and selection of research areas in which Albania has the strongest potential. By providing insight into the current state of research infrastructures and scientific thematic areas with the greatest scientific excellence, RI Roadmap should be used as an input to the S3. Therefore, the final selection of S3 priority domains should take into account the research infrastructure potential identified in the RI Roadmap, as an important indicator for deciding on final priorities.

## 2.4. Financial framework

According to the Law on Higher Education and Scientific Research in Higher Education Institutions in Albania, there are two important public bodies responsible for funding research in Albania:

1. National Agency for Scientific Research and Innovation (NASRI)
2. National Agency for Higher Education Financing (NAHEF)

The current legal framework entrusts the National Agency for Scientific Research and Innovation (NASRI) to fund research activities in the economy. The NASRI is a public, legal institution under the competences of the Ministry of Education, Sports and Youth. It aims to build a modern system of science, strengthen research and technology, as well as their integration within the higher education system.

The funding is implemented through national research and development projects and bilateral and multilateral scientific cooperation projects. The NASRI provides financial support to programmes and projects in the area of STI, in accordance with the priorities defined by the Council of Ministers, based on the assessment made by the relevant committees. The Agency develops application procedures for the preliminary evaluation, monitoring, and final assessment of the programmes and projects. The NASRI is in charge of monitoring and evaluating activities of STI at the national level. It offers technical assistance to all of institutions in regard to investments in the field of STI. The NASRI also organises information days for researchers and businesses, promoting the financial programmes of EU such as H2020, SME Instrument, COSME, etc.

With regards to recent calls for funding research infrastructure in the economy, NASRI launched the call for financing research infrastructure projects in 2019. In the framework of this initiative, it has financed 15 National Research Infrastructure Projects with a total of 164,000,000 ALL or 1.4 mil Euro grant from the public budget.

National Agency for Higher Education Financing (NAHEF) is a public institution under the authority of Ministry of Education, Sports and Youth responsible for allocating public funds to: support the activities of public higher education institutions; provide scholarship support for excellent students who achieved high grades in the secondary and tertiary higher education system; support students enrolled in study programmes designated as priority areas and students

from disadvantaged social groups. The NAHEF sets allocation criteria for public funds. Ministry of Education, Sport and Youth approves the criteria and distribution formula for such funds and defines annual priorities for each main area of study.

### 3. COOPERATION WITHIN EUROPEAN RESEARCH AREA

As regards EU Framework Programmes, Albania participates in Horizon 2020 as an 'associated country'. Albania's participation in the EU Framework Programmes started with the Seventh Framework Programme-FP7 (2007-2013), which was financed from the public budget with total of around 200,000 euro. In total, Albanian entities participated in 39 actions of FP7, receiving 2.27 million euros of direct EU contribution. The success rate of proposals with Albanian participation was 14.4%, compared to the overall success rate of 21.6%.

Participation of Albanian researchers in Horizon 2020 programme was significantly higher than in the FP7. The number of institutions participating in Horizon 2020 has more than doubled, with 49 approved projects, receiving 5.27 million euros of direct EU contribution. Participation in Horizon 2020 has shown a good trend over the last two years, nonetheless general performance is low. Private sector participation in the programme continues to remain particularly low.

As shown in Table 1, the most represented priority area is "Research infrastructure" within which Albanian institutions have participated in a total of 9 project actions. On the other hand, "Health" is a priority area with the largest EC contribution in which Albanian institutions participate.

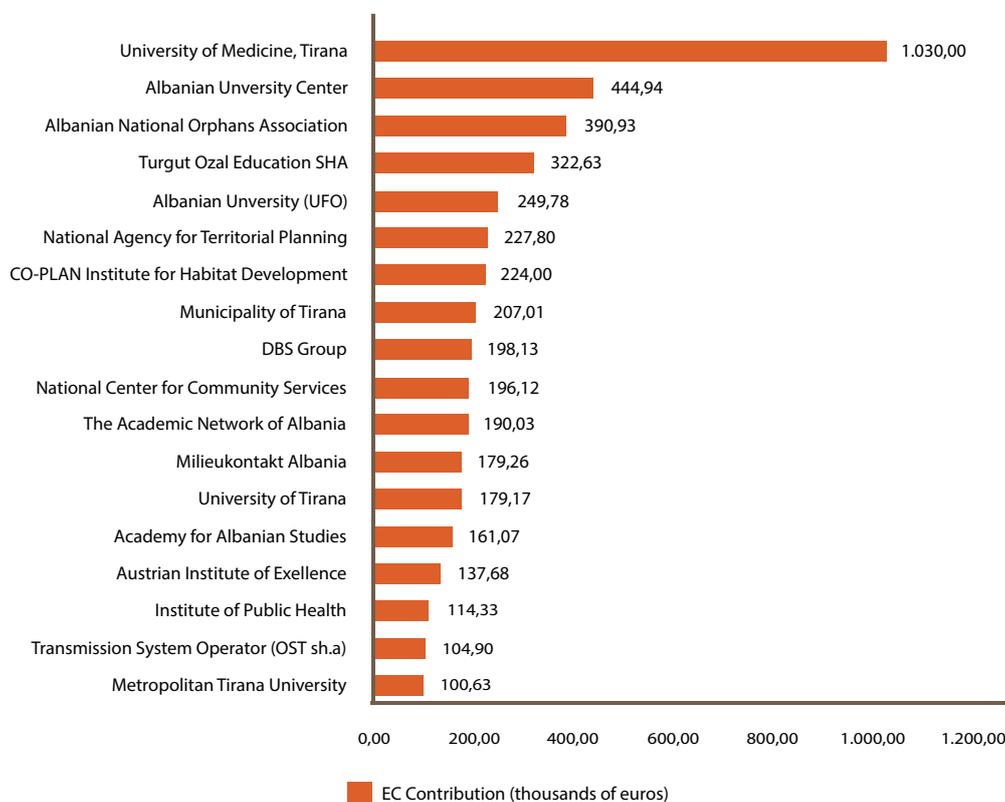
Table 1: Albania in H2020: Participation and net EU contribution per priority area

	Participation	EC contribution (EUR)
Research infrastructures	9	314.100,00
Health, demographic change and wellbeing	5	1.330.000,00
Climate action, environment, resource efficiency and raw materials	4	319.660,00
Food security, sustainable and forestry, marine and maritime and inland water research	4	229.640,00
Marie Skłodowska-Curie actions	4	214.100,00
Secure societies-Protecting freedom and security of Europe and its citizens	4	150.210,00
Secure, clean and efficient energy	4	394.200,00
Europe in a changing world-inclusive, innovative and reflective Societies	3	580.950,00
Advanced materials	2	767.500,00
Integrate society in science and innovation	2	248.880,00
Information and Communication Technologies	3	268.720,00
Make scientific and technological careers attractive for young people	2	48.230,00
Advanced manufacturing and processing	1	198.130,00
Promote gender equality in research and innovation	1	179.170,00
Smart, green and integrated transport	1	29.420,00

Source: Own calculations based on: <http://cordis.europa.eu>

With regards to the total number of projects, the Academic Network of Albania is the leading organisation participating in 6 projects but receiving only 190.000 euro of EC contribution. The University of Medicine, Tirana has received the highest level of EC contribution (1.03 mi. EUR) (Figure 1).

Figure 1: Albanian organisations participating in H2020 projects



Source: Own calculations based on: <http://cordis.europa.eu>

Regarding the relative position of Albania in relation to other economies of the Western Balkans, Albania has achieved a higher EC contribution in H2020 (5.27 mil. eur) than Montenegro (4.12 mil) and Kosovo\* (2.56 mil. eur), while Serbia is the leading economy with an EC contribution of 128.6 mil eur.

\* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

## 4. OVERVIEW OF THE EXISTING RESEARCH INFRASTRUCTURE IN ALBANIA

### 4.1. Analysis of the existing research infrastructures in Albania

Currently, there are 38 higher education institutions (HEIs) in Albania, of which 24 public and 14 private. Also, there are about 20 institutes, centres and other institutions that perform research activities beyond the competence of line ministries.

The questionnaire for providing data on research infrastructures was sent by the Ministry of Education, Sports and Youth to all relevant research institutions in Albania. Total response rate was rather low resulting in only 12 questionnaires completed. The low response rate indicates the need to introduce a legal obligation for all scientific research organisations to provide the information necessary to update RI Roadmap. In addition, the quality of answers obtained is not satisfactory, which indicates low awareness on this topic and insufficient knowledge of the importance and purpose of large research infrastructures. Table 2 shows the final list of institutions that sent completed questionnaires.

Table 2: Results of field research

	Completed questionnaire by:	Host Institution	Owns research equipment (over 50,000 euros)
1	Faculty of Economy	University of Tirana	No
2	Faculty of Social Sciences	University of Tirana	No
3	Faculty of Foreign Languages	University of Tirana	No
4	Faculty of Natural Sciences	University of Tirana	Yes
5	Institute of Applied Nuclear Physics	University of Tirana	Yes
6	Agricultural University of Tirana	Agricultural University of Tirana	Yes
7	University of Medicine, Tirana	University of Medicine, Tirana	No
8	Institute of Public Health	Institute of Public Health	Yes
9	Faculty of Information Technology, Laboratory of Multimedia and Digital TV (DIMTV)	"Aleksandër Moisiu" University Durrës	No
10	Faculty of Information Technology, ICT Laboratory	"Aleksandër Moisiu" University Durrës	No
11	Faculty of Education, Life Long Learning Centre	"Aleksandër Moisiu" University Durrës	No
12	Polytechnic University Tirana	Polytechnic University Tirana	Yes

Source: ToE–Team of Experts, analysis of collected questionnaires

According to the survey results, University of Tirana, Agricultural University of Tirana, Polytechnic University Tirana and Institute of Public Health have capital research equipment worth over 50,000 euros. The full list of capital equipment is presented in Appendix 1.

Despite the relatively small number of institutions, this section will present information on the institutions that completed the questionnaire with a focus on research infrastructures relevant for the development of RI Roadmap.

## 1. University of Tirana

University of Tirana is the largest public university in the economy. It consists of six faculties and two institutes. The main focus of the University is on education while research activities are largely neglected. Research activities conducted at the Faculty of Economy, Faculty of Natural Sciences and the Institute of Applied Nuclear Physics are presented below.

### Faculty of Economy, University of Tirana

Although the main focus of the Faculty of Economy is on providing educational courses in the field of economics, the Faculty is also engaged in international research projects. Tourism I&E centre was established at the Faculty of Economy in the framework of Erasmus+ project: "BLUEWBC: Sustainable development of BLUE economies through higher education and innovation in Western Balkan Countries". The main aim of this project is to support research, education and training processes specifically in blue economy with knowledge in innovation and entrepreneurship useful for development of blue economy sectors. The Centre has been equipped with new equipment used for: adequate education and training of students and professionals in specific blue economy (off-shore, cruise ship and yachting, marine engineering and maritime and coastal tourism); and advanced research in the field of tourism related to innovation and technology.

### Faculty of Natural Sciences, University of Tirana

The Faculty of Natural Sciences of the University of Tirana is the main higher education institution in Albania in the areas of informatics, mathematics, physics, chemistry, industrial chemistry, biology and biotechnology. Research activities are conducted by several research laboratories and departments operating within the Faculty.

The research activities are conducted in the following areas:

- ◆ In vitro Plant Biotechnology applications;
- ◆ Mass production of plant species through tissue culture technology, as a precondition for multiplication on industrial scale;
- ◆ Production of virus-free plantlets, a necessity of the market nowadays;
- ◆ Improving the production of secondary metabolites through in vitro methodologies by producing soma clonal variants in aromatic and medicinal species;

- ◆ Use of innovative methods such as SETIS and ElectIS bioreactors, essential in industrial production and commercialisation of in vitro plantlets;
- ◆ In vitro conservation of endangered species of economic and biodiversity importance via slow growth techniques and cryopreservation;
- ◆ Repopulation of natural habitats with endemic and/or endangered species produced in vitro and acclimatised ex vitro, an important process for biodiversity adding to the socio-economic values;
- ◆ Genotyping based on molecular markers (RAPDs, SSRs, AFLPs, SNPs) of local populations of aromatic and medicinal plants, endemic, rare and endangered plants of Albanian flora;
- ◆ Genotyping based on molecular markers (RAPDs, SSRs) of local cultivars of olives, grapevines, and pomegranates of economic importance;
- ◆ Early detection of viral/viroidal pathologies at fruit-trees of genus Prunus and Malus, and exploration of resistance genes in local populations of low use;
- ◆ GMO detection in crops, meat and fish products;
- ◆ Molecular evaluation of the resistance of local wheat cultivars toward extreme environmental conditions (drought, HT, salinity, herbicides);
- ◆ Evaluation of the quality of waters, trophic state and impact of different pollutants on the microbial structure in marine and freshwater systems;
- ◆ Plant biotechnology and breeding, biodiversity, Industrial and food biotechnology, environmental biotechnology.

Flora and Fauna Research Centre performs research, teaching and education activities in close cooperation with the Department of Biology and the Department of Biotechnology. They are engaged in providing and disseminating scientific information on flora and fauna, conducting teaching and educational activities and contributing to the preservation of biodiversity in Albania. The main research objective of the Centre is development of biodiversity monitoring and conservation projects.

The Department of Chemistry is the largest department of the Faculty of Natural Sciences, with a long experience in research work in chemical sciences. It is composed of four research groups: Organic Chemistry; Analytical Chemistry; General and Inorganic Chemistry; and Physical and Colloidal Chemistry. The Department of Chemistry is the only department at the Faculty of Natural Sciences that owns research capital equipment worth over 50,000 euros (Appendix 1).

Main research topics of the Department of Chemistry include the following: identification of chemical substances; environmental pollution analysis with chromatography; metal corrosion; green inhibitors; heterogeneous catalysis; extraction of essential oils; food safety; chemical technology; surface phenomena; electrochemistry; electrochemical sensors and biosensors; analysis and specification of trace elements with AAS and SFUV / Vis; assessment of water quality through the determination of nutrients; etc.

**Access Policy:** All staff members of each research group of the Chemistry Department have access to research equipment. Research equipment can be also used by PhD and MSc students under the surveillance of Department staff.

### Institute of Applied Nuclear Physics, University of Tirana

The Institute of Applied Nuclear Physics consists of 3 departments: Department of Radiometry and Radiochemistry, Department of Radiation Protection and Monitoring Network, and Department of Instrumental Analytical Methods.

The main research activities of the Department of Radiometry and Radiochemistry include:

- ◆ Monitoring of environmental radioactivity using alpha, beta and gamma spectrometry
- ◆ Quality control and quality assurance in medical equipment

The main research activities of the Department of Radiation Protection and Monitoring Network include:

- ◆ TLD Personnel Monitoring Service using Thermo Luminescent Dosimetry (TLD) system
- ◆ Emergencies Warning System (early warning system)
- ◆ Second Standard Dosimetry Laboratory (SSLD)
- ◆ Radioactive waste management and transportation of radioactive sources
- ◆ Gamma total analysis in environmental samples

The main research activities of the Department of Instrumental Analytical Methods include:

- ◆ X ray Fluorescence Spectroscopy – XRF
- ◆ Fourier Transforms Infrared Spectroscopy – FTIR
- ◆ Carbon Dating-Benzene synthesis line
- ◆ Environmental Stable Isotopes: Liquid Water Isotope Analyser – LWTA
- ◆ NDT X-ray radiology and ultrasound

List of services provided to research infrastructure users include:

- ◆ Analysis of environmental samples for determination of activity concentration using alpha, beta and gamma techniques,
- ◆ Quality control test according to Albanian regulation for the x ray medical devices:
  - Dental radiography
  - Radiography
  - Fluoroscopy
  - CT scanner
- ◆ Shielding calculation in order to determine the nature and thickness of the material needed to achieve a given attenuation factor or percentage and dose calculation,
- ◆ Training on ionization radiation for persons that work with radiation sources,

- ◆ Measuring of external individual doses from X, beta and gamma radiation of occupational exposure,
- ◆ Air radiation monitoring for radiological emergency purposes in the economy,
- ◆ Calibration of X and gamma ray equipment,
- ◆ Transportation and storage of radioactive sources,
- ◆ Analysis of environmental samples using gamma total technique,
- ◆ Training of the Front-Line Officers.

**Access Policy:** The Institute of Applied Nuclear Physics is licensed by Radiation Protection Commission for the provision of the above-mentioned services (related to ionizing radiation) to third parties. Each laboratory has relevant procedures for each service.

## 2. Agricultural University of Tirana

Agricultural University of Tirana (AUT) has been carrying out research activities in the field of agricultural and food research. The following faculties operate within the Agricultural University of Tirana: Faculty of Agriculture and Environment, Faculty of Economics and Agribusiness, Faculty of Biotechnology and Food, Faculty of Forest Sciences and Faculty of Veterinary Medicine. Research activities are focused on conducting applied research, innovation and technology transfer.

The Agricultural University of Tirana has been involved as a partner or coordinator in a considerable number of national programmes/projects. For years now various faculties of AUT have been part of international projects funded by the EU programmes, such as: Bilateral Cooperation Programmes, Cost, Tempus, Erasmus, IPA Crossing Border, FP7, Horizon 2020, etc. Main cooperation partners are Germany, Italy, France, Greece, Kosovo\*, North Macedonia, Croatia, Montenegro, Serbia and Bosnia and Herzegovina. Bilateral agreements are signed with Italy, Germany and France, and it is planned to enhance cooperation with the region and with EU MS in the period to come. There is no clearly defined strategic approach or policy to attract researchers from EU member states or other economies.

A large number of scientific laboratories have been set up in different departments of AUT. Many of them are considered as fully equipped laboratories able to carry out the entire relevant research activity. The establishment of these laboratories was made possible through different funding programmes such as TEMPUS, WB, GTZ, CBA, NPRD, and direct government funding.

Research services provided to users and researchers: Research activities conducted in the laboratories include the following: scientific research by doctoral students, experimental teaching practices for students of fisheries management, experiments and doctoral programmes in the field of aquaculture, certification and authorisation of trade of plants and seeds in the market; monitoring the environmental indicators; scientific research activity in the field of forestry and wood technology; microbiological, mainly bacteriological (culture, subculture, culture staining) analysis; serological (agglutinating tests and ELISA's system, i.e. direct, indirect immunological diagnosis) analysis; molecular (conventional PCR) analysis; etc.

**Access Policy:** Its research infrastructure is open to external users, facilitated through bilateral agreements and participation in EU programmes. There are no differences in access policy for different groups (e.g. researchers from EU Member states, researchers from other Western Balkan economies, researchers from industrialised countries such as US, Canada, Japan and researchers from other countries). Also, there are no specific requirements or limitations for researchers from WB6 and third countries when scientific collaboration (short- and long-term) is concerned.

### 3. University of Medicine, Tirana (UMT)

The University of Medicine, Tirana (UMT) is one of the most important universities in Albania. UMT comprises three Faculties: Faculty of Medicine, Faculty of Technical Medical Sciences and Faculty of Dental Medicine. The UMT is composed of over 300 academic staff, 78 professors and around 7,500 students enrolled at the three levels of study: Bachelor, Master and Doctoral degrees. The University of Medicine Tirana's campus is located in the urban area, near the Mother Teresa University Hospital Centre.

Currently, the University of Medicine does not have a research infrastructure, however it plans to establish a Centre of Biosimulation. The total envisaged value of this project is approximately 2.6 million euros. The detailed idea of this project is explained below.

#### Centre of Biosimulation

This project envisages creation of a simulation and clinical ability training service centre: Albanian Medical Visualisation and Simulation Centre. The project aims to increase training possibilities and skills assessment for medical students and professionals of the University of Medicine resulting in advancing patient care and simultaneously providing high-quality medical education through the establishment of a clinical skills training and simulation centre. It aims to achieve the objectives mentioned above through the implementation of three work packages:

- ◆ Establishment of a simulation centre for clinical training
- ◆ E-testing centre for student admission and exam skills
- ◆ Provision of a modern e-learning environment and enhancement of e-literacy.

The centre will be established in accordance with the latest standards of top universities, leaders and innovation drivers in the field of medical simulation technology and teaching. A well-rounded implementation concept will be developed, as well as a professional training concept for the personnel of the new centre. All project assets will be tailored to the requirements and needs of the UMT. The overall project duration is estimated to be two years.

Services that will be provided to research infrastructure users include:

- ◆ Standard human body simulation for education purposes focused on 3D anatomy simulation
- ◆ High level of clinical case simulation focused on mannequins / moulage simulation
- ◆ Laparoscopic practical training and simulation

- ◆ Clinical training, pathological and procedural training
- ◆ Distance learning facilities and technology

#### 4. Institute of Public Health

The main focus of the Institute of Public Health (IPH), as a National Centre in the field of public health, is on development and application of prevention and control of diseases, injuries, disabilities, environmental health detrimental factors, and development and application of health promotion, in close cooperation with national and international organisations. Key activities of IPH include: monitoring the health condition of the population in order to timely identify and scientifically solve the health problems encountered; identifying and monitoring health risk determinants; undertaking and increasing the level of information of the population, its education and awareness on health problems; stimulating, coordinating and supporting the initiatives of institutions and communities in terms of activities undertaken to identify and solve health problems; stimulating and supporting draft laws and regulations aimed at protecting the health of population and its health insurance; continuous training and education of public health workers and professional support to them; evaluating the effectiveness, accessibility and quality of both population-based and patient-based health services and providing innovative solutions to health problems; and establishing effective strategies on disease control and prevention.

Research services provided to users and researchers: IPH has carried out numerous survey projects including nation-wide representative surveys: Albania Demographic and Health Survey (ADHS), General Population Survey (GPS), Reproductive and Health Survey (RHS), European Project School Survey on Alcohol and Other Drugs (ESPAD), Health Behaviour in School-aged Children (HBSC), Childhood Obesity Surveillance Initiative (COSI), Global Youth Tobacco Survey (GYTS), Youth Risky Behaviour (YRS), and many others, as well as many smaller scale surveys targeting different population groups. All these projects have created archives of data or databases, which can be consulted and are available to research.

##### Access Policy:

- ◆ External users need to submit an official request following which the access to the required data is generally granted within a week, if no other issues are present
- ◆ Cooperation agreements are signed with various national institutions thus enabling experts of participating institutions to access data by submitting a specific request.
- ◆ There are also online networks feeding data in the IPH. There are various access procedures for the users of these networks, based on the type of network they operate.

The Institute of Public Health makes use of numerous devices in its daily activities. It has laboratory and other equipment which could be used for research purposes, despite their primary purpose is for the fulfilment of the IPH mission. IPH does not possess single equipment at purchase price higher than EUR 50,000.

## 5. Polytechnic University Tirana

Research Infrastructure of the Polytechnic University Tirana (UPT) comprises of the following elements:

- ◆ Research laboratories located near the main units (faculties and the Institute of Geosciences, Energy, Water and Environment) and basic units (departments). Scientific problems of doctoral projects are addressed in these laboratories by linking the industrial development engineering issues with the scientific research of scientific groups or special members of the academic staff. Research laboratories are essential for linking teaching with scientific research.
- ◆ Technical books and scientific periodicals from various engineering fields can be found in UPT scientific libraries. The libraries also include doctoral dissertations, first and second cycle diploma theses, monographs and other scientific papers of academic staff and students.
- ◆ Bulletin of Technical Sciences is a UPT body included in the list of scientific periodicals. It publishes original articles of specialists and scientific and teaching staff in the fields in which the UPT operates. This journal offers a wide range of studies and scientific data, accessible to all interested parties. All bulletin materials are deposited in the UPT scientific library.
- ◆ Key objectives in the field of research are:
  - ◆ Increasing the capacity and quality of scientific research
  - ◆ Quantitative and qualitative increase of the level of research cooperation at national and international level
  - ◆ Increasing the percentage of investments for scientific research in the annual budget of UPT

**Access Policy:** Research Infrastructure services are provided in an institutionalised way to all interested parties, internal and external researchers or third parties, based on the application selection process.

## 6. Aleksandër Moisiu University Durrës

### Faculty of Information Technology, Laboratory of Multimedia and Digital TV (DIMTV)

The Laboratory of Multimedia and Digital TV (DIMTV lab) was built in the framework of Erasmus+ CBHE project: Development and implementation of Multimedia and Digital Television curricula, with the general objective of innovation and implementation of Multimedia and Digital Television (MDTV) studies in Albania, and the following specific objectives:

- ◆ Restructuring the existing curricula of the first cycle Multimedia and Digital Television (MDTV) study programme
- ◆ Developing a new Professional Master curriculum in MDTV with specialised study programmes in Production and Post-Production, 3D Animation and Image Processing
- ◆ Building a new high-quality equipped laboratory

**Access Policy:** Services of DIMTV laboratory are envisaged to be provided to internal and external users. Internal users will be the academic staff and UAMD students. External users will be the academic staff and students from partner HEIs, external organisations, businesses, external researchers, companies, local or national level public institutions. The facility will be provided to third parties (external users) applying a usage fee after Erasmus+ CBHE project ends. The users which will be entitled to use DIMTV laboratory can apply to have access to the facility by sending their request via email to IT Faculty Vice-Dean. The Dean approves the request and prepares an agreement with terms and conditions for access to the Research Infrastructure.

By developing and adopting a Policy for Open Access to Research Infrastructure, the University aims to support research work and achieve the following associated outcomes: disseminate knowledge and learning by making publications more widely available to interested parties; provide research services to external audience; promote collaboration with industry; diversify funding streams and make research activity more sustainable; encourage long-term collaborations and sharing of equipment; attract funds from ministries, generate financial benefits and stronger scientific results; strengthen linkages to the local community; generate long-term benefits primarily to the research institution but also to the targeted users.

### Faculty of Information Technology, ICT Laboratory

The ICT lab was built in the framework of the project: Establishment of a multifunctional laboratory at the Faculty of Information Technology for the provision of products and services in the field of informatics and information technology, funded by National Agency for Scientific Research and Innovation with general objective to:

1. provide products and services in the field of informatics and information technology;
2. support scientific research and teaching research activities organised by the IT Faculty academic staff and support research activity of its students.

The Lab is currently used for academic purposes at the national level. Cooperation agreements with foreign higher education institutions on the access to research infrastructure are still to be explored and detailed.

The infrastructure assists the academic staff of the Faculty of Information Technology in their research and teaching activities for the improvement of teaching materials, testing of results, and Faculty students in implementation of teaching projects and application of various teaching practices for these students. Support to the improvement of scientific and research activities contributes to increasing the quality of teaching. This multifunctional laboratory avails of five dedicated spaces with specific functions. Each of these spaces has the relevant equipment adapted to and in function of the services it offers.

**Access Policy:** Services of ICT Laboratory are provided to internal and external users. Internal users are academic staff and UAMD students. External users are academic staff and students from partner HEIs, external organisations, businesses, external researchers, companies, local or national level public institutions. The users wishing to use or be entitled to use ICT Laboratory can apply by sending their request via email to IT Faculty Vice-Dean. The Vice-Dean passes this information to IT Faculty Dean. The Dean approves the request and prepares an agreement on access to the Research Infrastructure.

## Faculty of Education, Lifelong Learning Centre

The Lifelong Learning Centre has been providing "Continuous Education" Master of Science programme for about 2 years, and training for teachers of the pre-university education system, based on the modules developed by the academic staff of the Faculty of Education.

The Lifelong Learning Centre was established in the framework of Erasmus+ CBHE project: Developing teacher competences for a comprehensive VET system in Albania-TEAVET, with general objective of developing academic expertise through the establishment of specialised centres and delivery of high quality standard training programmes in the field of lifelong learning of teachers in Albania.

Specific objectives include the following: creating a new strategy of teacher training for a high quality of teacher's lifelong learning process; establishing new expertise and standard of teacher training in Albanian universities through organising seminars and training visits; establishing specialised centres of teacher training; developing training course programmes for different levels of education in scientific methodologies, pedagogical issues, ethics and ICT use in learning; applying for credits in 16 training courses with 2 credits each and discovering the equipment to support the training process; developing digital structures in Albanian universities that support training process for teacher qualification and developing a national management system and database of teacher training.

**Access policy:** Research Infrastructure services are provided to external users as a priority in case demand exceeds the quota of research infrastructure resources and related services. Priority is given to small and medium-sized enterprises that have long-term cooperation agreements and newly established (during the last 12 months before the date of application submission) small and medium-sized enterprises performing R&D activities. To encourage newly established (during the last 12 months before the date of application submission) small and medium-sized enterprises performing R&D activities to use the services provided by LLL, the Centre can apply preferential treatment.

Services provided: Teachers Scientific Symposium; Scientific Bulletin of LLL Centre; thesis presentation; career counselling with students of the Faculty of Education; web page of the LLL Centre; information access through internet; trainings of teachers; database of the trained teachers; and information meetings.

## 4.2. Access Policy

According to the European Commission, access refers to the legitimate and authorised physical, remote and virtual admission to, interactions with and use of research infrastructures and to services offered by research infrastructures to users. Such access can be granted, amongst others, to machine time, computing resources, software, data, data-communication services, trust and authentication services, sample preparation, archives, collections, the set-up, execution and dismantling of experiments, education and training, expert support and analytical services<sup>1</sup>. Access to research infrastructure is an important factor in creating greater synergies between

1 [https://ec.europa.eu/research/infrastructures/pdf/2016\\_charterforaccessto-ris.pdf](https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf)

researchers in a particular field of science and connecting business and research sectors in order to promote the development of research and innovation.

Research infrastructure in Albania is mostly used for in-house research and educational purposes. The research equipment is available to the users with the prior approval of the top management. The access policy is not clearly defined and it is mostly based on the working procedures. Access to research equipment is granted as part of regular teaching, student's research projects and research papers. In most cases it is used for national and international research projects as well as for doctoral theses.

The access to research infrastructure is usually provided for scientific research projects, bilateral cooperation projects and exchange programmes. If there is a cooperation agreement in place as part of the project or staff exchange programmes, users are permitted to use the infrastructure for the duration of the project or exchange programme.

In response to the lack of official institutional policies that regulate access to research infrastructure and having in mind that the development of Open Access policies is an essential part of the well-functioning research infrastructures, RCC Secretariat implemented Open Access Research Infrastructure in the Western Balkans Support Programme (May 2020-December 2020) to assist development of research infrastructures in the region. The Programme had two specific purposes: to guide the preparation of the Open Access policies for selected Research Infrastructures in the Western Balkans, specifically, Albania, Bosnia and Herzegovina, Kosovo\*, and North Macedonia and to train management, administrative and research staff to introduce principles of Open Access to selected Research Infrastructures in the Western Balkans.

The programme contributed to the development of the Open Science practices in the higher education and public research organisations in the region, and laid the foundation for the establishment of the **Network of Open Research Infrastructures in the Western Balkans**. The Programme resulted in 21 policies developed by the end of November 2020.

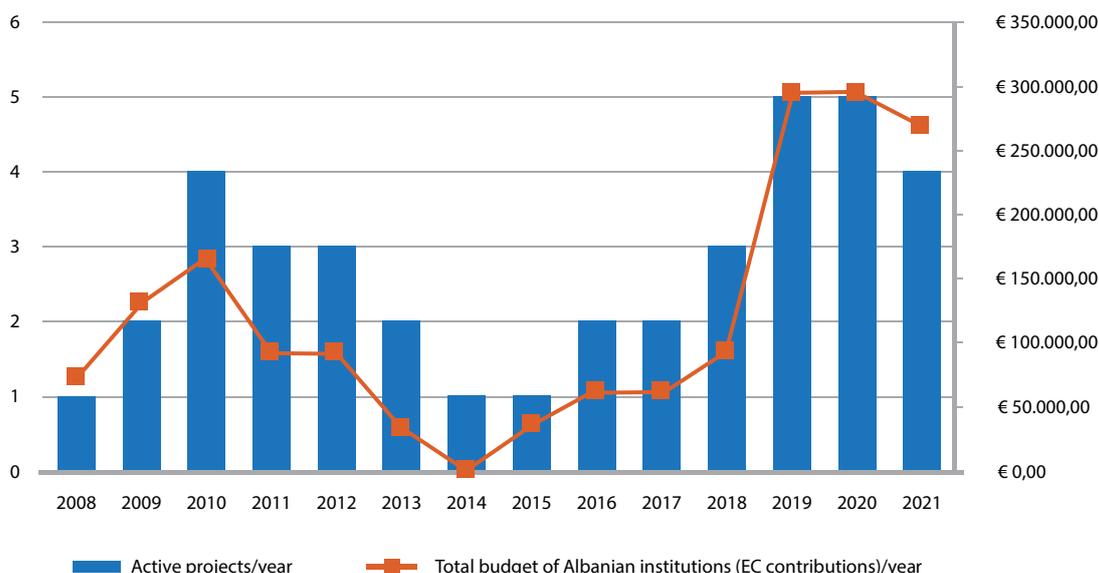
Institutions from Albania that participated in the programme were: Aleksander Moisiu University (DIMTV Lab, ICT Lab, LLL Centre) and University of Medicine in Tirana. As a result of this programme, these two universities have developed Access Policies to research infrastructures.

### 4.3. Participation of Albanian institutions in international projects related to research infrastructure development

Albanian institutions participated in 10 international projects related to the development of national research infrastructures in the period from 2008 to 2020. Six projects have been implemented and 4 are ongoing. Figure 2 shows the number of active projects and total budget of Albanian institutions per year. The main beneficiaries of the projects related to the development of research infrastructures are:

- ◆ Academic Network of Albania
- ◆ Albanian University (UFO)
- ◆ Polytechnic University of Tirana
- ◆ Mother Teresa University Medical Centre of Tirana
- ◆ Ministry of Education, Sports and Youth

Figure 2: Implemented and ongoing projects related to the development of national research infrastructure



Source: Own calculations based on: <http://cordis.europa.eu>

The total budget of Albanian institutions for the implementation of these projects is about 390.000 EUR (EC contribution). 8 out of 10 projects are related to the development of e-infrastructures. The next section presents the key information on RI projects.

#### 4.3.1. National Initiatives for Open Science in Europe (NI4OS-Europe)

- ◆ **Funding Programmes:** H2020
- ◆ **Project partners from Albania:** Albanian Academic Network-Interinstitutional ICT Research Centre RASH
- ◆ **Total number of partner organisations:** 24
- ◆ **Project implementation period:** 1/09/2019 – 28/02/2023
- ◆ **Scientific domain:** Research infrastructures

The European Open Science Cloud (EOSC) is a trustworthy digital platform that provides scientists with continuous access to the entire research data cycle at the European level. **The EU-funded NI4OS-Europe project intends to support the development of national Open Science Cloud schemes in 15 EU Member States and associated economies. It will design, analyse and categorise the national Open Science environment in these economies to create national OSC structures to support general EOSC governance.**

Lines of action:

- ◆ Support the development and inclusion of the national Open Science Cloud initiatives in 15 Member States and Associated Countries in the EOSC governance.
- ◆ Instil within the community the EOSC philosophy and FAIR principles for data Findability, Accessibility, Interoperability and Reusability.
- ◆ Provide technical and policy support for on-boarding of service providers into EOSC, including generic services (compute, data storage, data management), thematic services, repositories and data sets.

#### **4.3.2. Religious Studies Infrastructure: tools, Experts, conNections and Centres (RESILIENCE)**

- ◆ **Funding Programmes:** H2020
- ◆ **Project partners from Albania:** UFO-Albanian University
- ◆ **Total number of partner organisations:** 12
- ◆ **Project implementation period:** 1/09/2019 – 21/12/2021
- ◆ **Scientific domain:** Research infrastructures

The EU-funded RESILIENCE project will create the European Research Infrastructure on Religious Studies. It will be based on an excellent partnership and offer innovative tools to attract and serve academic and non-academic communities. It aims to bring together religious resources and offer competences to strengthen the positive perception of religious plurality in Europe and preserve the leading European position in the field of religious studies.

RESILIENCE addresses the need of a larger infrastructure and involvement of excellent scholars, producing fertile competencies, new knowledge, fresh approach and visible impact in terms of innovation within the scientific domain of religious studies. Such an involvement has been marked by several steps, e.g. a) RelReS, an emerging community funded by the programme INFRAIA-02-2017-Integrating Activities for Starting Communities; b) the H2020 call Religious diversity in Europe-past, present and future; c) the vast platform of the European Academy of Religion; and d) a first proposal submitted to the ESFRI Forum for a research infrastructure in religious studies, RESILIENCE/0. All these activities created a critical and gravitational mass capable to give effectiveness to the scientific community of religious studies: such an effort was acknowledged in the Esfri Roadmap 2018 with the definition of religious studies as a high potential strategic area. However, RESILIENCE/0 was accompanied by some remarks concerning its actual weaknesses and potential ambiguities concerning the way the consortium presented itself and some of its partners. The present renewed, improved, enhanced RESILIENCE proposal wants to respond to those remarks and better demonstrate the excellence of a partnership which can prove to be effective; it describes how to achieve an implementation which is feasible and stable; and it aims to express the capacity of the infrastructure to attract resources and competences. It will enrich the open science cloud with a series of challenges and opportunities which will preserve and improve the European leadership in the area of religious studies. RESILIENCE creates, selects and tests digital and physical infrastructures capable of generating, preserving and transmitting

knowledge between academics, members of religious communities, and the many groups on whom religious studies have a consequential impact.

### **4.3.3. Horizon 2020: H2020-SGA-INFRA-GEANT-2018 (Topic [a] Research and Education Networking)**

- ◆ **Funding Programmes:** H2020
- ◆ **Project partners from Albania:** Albanian Academic Network-Interinstitutional ICT Research Centre RASH
- ◆ **Total number of partner organisations:** 39
- ◆ **Project implementation period:** 1/01/2019 – 31/12/2022
- ◆ **Scientific domain:** Research infrastructures

The EU-funded GN4-3 is the third specific grant agreement under a framework partnership agreement between the GÉANT Consortium and the European Commission. It aims to help take European research to the next level, promoting scientific excellence, access and re-use of research data. The GN4-3 is the proposed project for the third Specific Grant Agreement under the 68-month Framework Partnership Agreement (FPA) established between the GÉANT Consortium and the European Commission in April 2015. This third phase of implementing the FPA is proposed to last 48 months and is a natural continuation of the work in GN4-2, building on the results and maintaining the overall objective of helping to raise European research to the next level, promoting scientific excellence, access and re-use of research data.

GÉANT's world-class, high-speed backbone provides seamless and secure connectivity with 42 National Research and Education Networks (NRENs), reaching over 50 million users in 10,000 institutions across Europe, and more than 100 economies worldwide through links with other regions. The core backbone is capable of multiple 100 Gbps transmission over each fibre link, and Terabit connectivity can be achieved by a single node. The safe and rapid connection of users to each other, to the increasing amounts of data generated by research, and to the high-performance computing capacity required by collaborative research form the foundation of the GÉANT partnership.

### **4.3.4. VRE for regional Interdisciplinary communities in Southeast Europe and the Eastern Mediterranean**

- ◆ **Funding Programmes:** H2020
- ◆ **Project partner from Albania:** Polytechnic University of Tirana
- ◆ **Total number of partner organisations:** 17
- ◆ **Project implementation period:** 01/10/2015-30/09/2018
- ◆ **Scientific domain:** e-Infrastructures

The main idea of this project was to bring together e-Infrastructures, build capacity and better utilise synergies for an improved service provision within a unified Virtual Research Environment (VRE) for the inter-disciplinary scientific user communities in the combined South East Europe (SEE) and Eastern Mediterranean (EM) regions (SEEM). The overall objective was to provide user-friendly integrated e-Infrastructure platform for regional cross-border/boundary Scientific Communities in Climatology, Life Sciences, and Cultural Heritage for the SEEM region by linking compute, data, and visualisation resources, as well as services, models, software and tools. This VRE provided the scientists and researchers with the support in full lifecycle of collaborative research: accessing and sharing relevant research data, using it with provided codes and tools to carry out new experiments and simulations on large-scale e-Infrastructures, and producing new knowledge and data-which can be stored and shared in the same VRE.

The driving ambition of the project was to maintain leadership in enabling e-Infrastructure based research and innovation in the region for the 3 strategic regional user communities: supporting multidisciplinary solutions, advancing their research, and bridging the development gap with the rest of Europe. The VI-SEEM consortium brings together e-Infrastructure operators and Scientific Communities in a common endeavour.

#### 4.3.5. Infradev-European Paediatric Translational Research Infrastructure

- ◆ **Funding Programmes:** H2020
- ◆ **Project partners from Albania:** Mother Teresa University Medical Centre of Tirana
- ◆ **Total number of partner organisations:** 29
- ◆ **Project implementation period:** 1/01/2018 – 30/04/2020
- ◆ **Scientific domain:** Developing new world-class research infrastructures

The general objective of this project was to design the framework for the European Paediatric Translational Research Infrastructure (EPTRI), a new Research Infrastructure (RI) aimed to enhance technology-driven paediatric research in discovery and early development phases to be translated into clinical research and paediatric use of medicines.

The starting point of the project was the serious lack of medicines for children in EU and worldwide as well as the lack of a developmental model for paediatric medicines that integrates technology-driven aspects with the methodological, ethical and regulatory framework. The design for this new RI is based on the following main pillars:

- ◆ to harness efficiency and delivery of paediatric research activities and services strengthening collaboration within the scientific paediatric community;
- ◆ to be a complementary RI in the context of the existing RIs covering the current gaps, while avoiding any duplication;
- ◆ to develop a one-stop-shop for advice in paediatric drug development.

#### 4.3.6. GN4-2 Research and Education Networking-GÉANT

- ◆ **Funding Programmes:** H2020
- ◆ **Project partners from Albania:** Albanian Academic Network-Interinstitutional ICT Research Centre RASH
- ◆ **Total number of partner organisations:** 40
- ◆ **Project implementation period:** 1/05/2016 – 31/01/2020
- ◆ **Scientific domain:** Research Infrastructures

GN4-2 is the proposed project for the second Specific Grant Agreement under the 68-month Framework Partnership Agreement (FPA) established between the GÉANT Consortium and the European Commission in April 2015. This second phase of implementing the FPA raises European research to the next level by promoting scientific excellence, access and re-use of research data. It also drives European-wide cost efficiencies in scientific infrastructure by promoting interoperability with other e-infrastructures on an unprecedented scale.

The FPA objective for the GÉANT Partnership is to contribute to effective European research by making Europe the best-connected region in the world. GÉANT must offer European researchers the network, communications facilities and application access that ensure the digital continuum necessary to conduct world-class research in collaboration with their peers, regardless of geographical location.

GN4-2 developments are also guided by the vision of a future where a set of coherent and integrated European e-infrastructure services will offer convenient, seamless access for end-users through a common service catalogue, and facilitating the adoption of services offered by new e-infrastructure developments, such as the European Open Science Cloud.

#### 4.3.7. European Grid Initiative: Integrated Sustainable Pan-European Infrastructure for Researchers in Europe

- ◆ **Funding Programmes:** FP7
- ◆ **Project partner from Albania:** Polytechnic University of Tirana
- ◆ **Total number of partner organisations:** 48
- ◆ **Project implementation period:** 30/04/2010-30/04/2014
- ◆ **Scientific domain:** e-Infrastructures

The 48-month EGI-InSPIRE project continued the transition to a sustainable pan-European e-Infrastructure started in EGEE-III. It sustained support for Grids of high-performance and high-throughput computing resources, while seeking to integrate new Distributed Computing Infrastructures (DCIs), i.e. Clouds, Supercomputing, Desktop Grids, etc., as they are required by the European user community. It established a central coordinating organisation, EGI.eu, and supported the staff throughout Europe necessary to integrate and interoperate individual national grid infrastructures. EGI.eu provided a coordinating hub for European DCIs, working

to bring existing technologies into a single integrated persistent production infrastructure for researchers within the European Research Area. EGI-InSPIRE collected requirements and provided user-support for the current and new (e.g. ESFRI) users. Support also was given for the heavy users as they move their critical services and tools from a central support model to ones driven by their own individual communities. The project defined, verified and integrated within the Unified Middleware Distribution the middleware from external providers needed to access the e-Infrastructure. The operational tools were extended by the project to support a national operational deployment model, include new DCI technologies in the production infrastructure and the associated accounting information to help define EGI's future revenue model.

#### 4.3.8. High-Performance Computing Infrastructure for South East Europe's Research Communities

- ◆ **Funding Programmes:** FP7
- ◆ **Project partner from Albania:** Polytechnic University of Tirana
- ◆ **Total number of partner organisations:** 16
- ◆ **Project implementation period:** 31/08/2010-31/05/2013
- ◆ **Scientific domain:** e-Infrastructures

Taking into account that High-Performance Computing (HPC) involvement of the South East Europe (SEE) region was very limited, HP-SEE Project has focused on a number of strategic actions. First, it linked the existing and upcoming HPC facilities in the region in a common infrastructure, and provided operational solutions for it. As a complementary action, the project established and maintained the GÉANT link for Caucasus. Second, it opened this HPC infrastructure to a wide range of new user communities, including those of less-resourced economies, fostering collaboration and providing advanced capabilities to researchers, with an emphasis on strategic groups in computational physics, chemistry and life sciences. Finally, it ensured establishment of national HPC initiatives, and acted as a SEE bridge for PRACE. In this context, HP-SEE aimed to attract the local political and financial support for long-term sustainable e-Infrastructure. HP-SEE aspired to contribute to the stabilisation and development of South East Europe by overcoming fragmentation in Europe and stimulating e-Infrastructure development and adoption by new virtual research communities, thus enabling collaborative high-quality research across a spectrum of scientific fields.

#### 4.3.9. SEE-GRID e-Infrastructure for Regional e-Science

- ◆ **Funding Programmes:** FP7
- ◆ **Project partner from Albania:** Polytechnic University of Tirana
- ◆ **Total number of partner organisations:** 15
- ◆ **Project implementation period:** 30/04/2008-30/04/2010
- ◆ **Scientific domain:** e-Infrastructures

SEE-GRID-SCI leveraged the SEE e-Infrastructure to enable new scientific collaborations among SEE user communities. SEE-GRID-SCI has stimulated widespread integrated e-Infrastructure uptake by new cross-border/boundary user groups extending over the region, fostering collaboration and providing advanced capabilities to more researchers, with an emphasis on strategic groups in seismology, meteorology and environmental protection. The initiative thus aimed to have a catalytic and structuring effect on a variety of user communities that did not directly benefit from the available e-Infrastructures. In parallel, it enlarged the regional e-Infrastructure to cater for demands of the communities: a number of new Grid clusters and economies were added, engaging a wider range of players and expanding the provider pool. Finally, SEE-GRID-SCI helped mature and stabilised the National Grid Initiatives in the region, allowing them to join the new era of longer-term sustainable Grid infrastructure in Europe. In this context, SEE-GRID-SCI aimed to attract political and financial support for materialising the e-Infrastructure vision. In longer term, SEE-GRID-SCI aspired to contribute to the stabilisation and development of South East Europe by easing the digital divide and stimulating e-Infrastructure development and adoption by new user communities, thus enabling collaborative high-quality research across a spectrum of scientific fields.

#### 4.3.10. South East European Research Area for e-Infrastructures

- ◆ **Funding Programmes:** FP7
- ◆ **Project partners from Albania:** Polytechnic University of Tirana; Ministry of Education and Science
- ◆ **Total number of partner organisations:** 20
- ◆ **Project implementation period:** 01/04/2009-31/03/2012
- ◆ **Scientific domain:** e-Infrastructures

SEERA-EI linked national-level programme managers and provided an open forum for information exchange in order to enable coordination of national programmes in e-Infrastructures, and set the framework for a common regional agenda. The project gathered and exchanged information regarding programmes and carried out a state-of-the-art analysis; produced set of best practices and guidelines for national e-Infrastructure programmes; and identified areas for joint regional activities, ranging from short-term soft actions, mid-term policy-level actions, to preparatory activities for long-term actions. SEERA-EI reduced fragmentation of national programmes, created a harmonised approach to national-level initiatives in e-Infrastructures, ensured local commitment, and paved the way towards common regional vision, strategy and sustainable cooperation, enabling collaborative high-quality research across a spectrum of scientific fields.

#### 4.4. Research e-Infrastructures

Scientific research is no longer conducted within national boundaries and is becoming increasingly dependent on the large-scale analysis of data, generated from instruments or computer simulations housed in transnational facilities, by using **e-Infrastructure (distributed computing and storage resources linked by high-performance networks)**.

E-Infrastructures provide digital-based services and tools for data- and computing-intensive research in virtual and collaborative environments. E-Infrastructures are key in future development of research infrastructures, as activities go increasingly online and produce vast amounts of data. Furthermore, e-Infrastructures enable and support the circulation of knowledge online and therefore constitute an essential building block for the European Research Area (ERA).

Core European e-Infrastructure for large-scale e-Science research consists of the backbone GÉANT network; distributed storage and computing infrastructure-European Grid Initiative (EGI); and the PRACE initiative providing tier-0 High Performance Computing (HPC) infrastructure. South East European e-Infrastructure initiatives aim for equal participation of the less-resourced economies of the region in the European trends. The South East European e-Infrastructure initiatives aim to ensure equal participation of the region in European networking and Grid computing trends. Close collaboration of National Research and Education Networks and National Grid Initiatives in the region was crucial in materialising this vision. The above initiatives have also raised awareness of national ministries on the necessity of local programmes and financial support for e-Infrastructures: a number of ministries have contributed to local network funding and regional interconnections, as well as national Grid programmes.

E-Infrastructures are crucial to foster Open Science, support the circulation of knowledge and encourage collaboration across different disciplines and technology domains. It is then of tremendous importance to involve Albania in this area to foster the development of digital skills and improve broadband connectivity to the research and education community.

So far, coordinating and funding the development and maintenance of e-Infrastructure layers was conducted by the Academic Network of Albania. The role of Polytechnic University of Tirana has to be noted since this institution has made a significant contribution to the data infrastructure. Polytechnic University of Tirana and the Academic Network of Albania have been involved in 8 EU-funded projects under H2020 and FP7 in the area of e-Infrastructures and as such benefited of € 390.000.

#### 4.4.1. The Academic Network of Albania (ANA)

The Academic Network of Albania-ANA (RASH-Rrjeti akademik shqiptar) is the National Research and Education Network (NREN). It was established in 2009 in the framework of intergovernmental Agreement of Albanian Parliament and Italy. The ANA was reorganised in 2018 as autonomous Inter-institutional Centre that offers centralised IT services for the University and Research Management and manages the national Research and Education Network which connects all public Universities, Research Institutions, Academy of Science and R&D agencies.

ANA is part of GÉANT infrastructure, the high bandwidth pan-European research and education backbone that interconnects Europe's National Research and Education Networks (NRENs), delivering network for scientific excellence, research, education and innovation through interconnections with its 38 NREN partners. ANA Infrastructure includes a modern Data centre for providing various services through network equipment and fibre optic interconnection.

Over years, ANA has developed software applications for Ministry of Education, Sports and Youth, universities and research institutes:

- ◆ U-Albania (national student admission portal),
- ◆ digital libraries (U-Library),
- ◆ Teachers for Albania portal (MpSH),
- ◆ Trainings portal (T4All),
- ◆ e-Research (statistic of Research),
- ◆ Virtual University,
- ◆ Pitagora-Student secretary management system,
- ◆ University Financial Management,
- ◆ University Research Catalogue (UCRIS), etc.

ANA builds and manages the Academic Network Backbone and Campus Networks for universities and research institutions. ANA has implemented several GÉANT services in Albania supporting all scientific disciplines:

- ◆ Eduroam,
- ◆ EduGain,
- ◆ EduVPN,
- ◆ TCS,
- ◆ FoD & DDos Alert,
- ◆ IAAS, etc.

Now that Albanian's National Research and Education Network is connected to the pan-European GÉANT network for scientific excellence, research, education and innovation, national efforts should be made in the fields of open access and open data.

#### 4.4.2. E-CRIS.AL-Current Research Information System in Albania

E-CRIS.AL (CRIS-Current Research Information Systems) is an information system on research activities in Albania with interconnected databases of researchers, research organisations and research projects in accordance with the recommendations of CERIF (Common European Research Information Format). In Europe, information systems with the generic name CRIS have been built for decades. In the past, the integration and expansion of CRIS were often made difficult by uncoordinated methodologies. For this reason, in recent times there has been a strong tendency to move towards standardisation. CERIF, maintained and developed by euroCRIS, is one of the universally accepted recommendations for the structure of research data.

In compliance with the CERIF recommendations, the web application E-CRIS was developed at the Institute of Information Science in Maribor (IZUM), which offered it to all users of COBISS applications within the COBISS.Net network free of charge in order to establish as comprehensive as possible register of research and development providers in individual economies. The register is essential for research monitoring and evaluation. National CRIS systems are linked to national COBISS library information systems, thus allowing direct access to the bibliographies of researchers

and institutions. National E-CRIS systems include interconnected databases comprising data on research organisations, researchers and research projects. Most of the data is in English.

The COBISS.AL database is currently being managed by the Academy of Sciences of Albania and IZUM-UNESCO Regional Centre for Library Information Systems and Current Research Information Systems. The National E-CRIS Centre is responsible for organising and coordinating the collection of data within the E-CRIS.AL system, checking registration criteria and supervising the quality of data sent by research organisations and researchers.

Since 6 December 2012, the E-CRIS.AL system has been linked to the COBISS.AL system (bibliographic system for the evaluation of research results in Albania), thus allowing access to the bibliographies of researchers in the COBIB.AL database. It is desirable that the E-CRIS.AL system includes all research and development providers in Albania and thus contributes to their promotion and collaboration on national and international level. However, only 701 researchers and 9 research organisations are currently presented in E-CRIS.AL.

Data on research and/or development providers in Albania can be entered into the E-CRIS.AL information system provided that they meet the following conditions:

- ◆ Research organisation is either a university or its organisational unit (faculty, institute, etc.), or any other legal entity of a public or private sector with registered research or development activities and at least one researcher employed;
- ◆ Researcher is a natural person holding at least a university degree, who carries out research or development.

## 4.5. Integration into Pan-European Research Infrastructures

Pan-European Research Infrastructures provide an important contribution to taking Europe to the forefront of Science and Research. ESFRI research infrastructures aim to attract world-class scientists and to provide a high level of support for their users.

The importance of full integration of Albanian scientific community into European Research Area has become particularly important in the light of EU approximation process. Since the research infrastructures in Albania are at a very early phase of development, the actual needs in terms of using the Pan-European RI should be identified at a more advanced phases – when the infrastructure and equipment are fully operational. Mobility schemes should enable Albanian researchers to get better knowledge on the functioning of EU research infrastructures to be able to provide some concrete research results.

With regards to Pan-European Infrastructures, Albania participates in European Social Survey (ESS).

### 4.5.1. European Social Survey (ESS)

The European Social Survey (ESS) is an academically driven cross-national survey that has been conducted across Europe since its establishment in 2001. Every two years, face-to-face interviews are conducted with newly selected, cross-sectional samples.

The survey measures the attitudes, beliefs and behaviour patterns of diverse populations in more than thirty nations. The main aims of the ESS are:

- ◆ to chart stability and change in social structure, conditions and attitudes in Europe and to interpret how Europe's social, political and moral fabric is changing;
- ◆ to achieve and spread higher standards of rigour in cross-national research in the social sciences, including for example, questionnaire design and pre-testing, sampling, data collection, reduction of bias and reliability of questions;
- ◆ to introduce soundly-based indicators of national progress, based on citizens' perceptions and judgements of key aspects of their societies;
- ◆ to undertake and facilitate the training of European social researchers in comparative quantitative measurement and analysis;
- ◆ to improve the visibility and outreach of data on social change among academics, policy makers and the wider public.

The ESS was awarded European Research Infrastructure Consortium (ERIC) status on 30th November 2013.

ESS project in Albania is implemented by European University of Tirana (UET). Albania has participated in two rounds of ESS, in 2012 and 2018.

Participation in the ESS is important both for academic reasons and for developing quality public policies. In academia, it will lead to transfer of relevant theoretical and methodological knowledge and practice in the field of social science research to the local scientific community and increase their visibility in international circles. At the policy level, it will help decision-makers make informed decisions based on data and will contribute to evidence-based policy making.

#### 4.6. Regional research infrastructure initiative

Albania is one of the initiators of the establishment of International Institute for Sustainable Technologies in South East Europe (SEEIIST). The initiative was formalised as a regional project through the Declaration of Intent on 25 October 2017 signed at the Ministerial Conference held at CERN, Geneva, by eight signatories from the SEE region.

The initiative project was initially proposed in late 2016 by Prof Herwig Schopper, a former Director General of CERN. After the signing of the Declaration of Intent in October 2017 at CERN, the Initiative was transformed into a regional project gathering the following Parties: Albania, Bosnia and Herzegovina, Bulgaria, Kosovo\*, North Macedonia, Montenegro, Serbia and Slovenia.

After analysing common regional social and economic challenges and needs for high technologies, Steering Committee members decided to support the Hadron Cancer Therapy and Biomedical Research with Protons and Heavy Ions as the main research area for the Institute.

The main missions of the SEEIIST Project include the following: Science for Peace; Scientific Excellence; International Collaboration; sustainable development of society; education; Technology Transfer; development of powerful digital network; and high-performance computing and Big Data handling.

Project members:

- ◆ **Albania, Ministry of Education Sport and Youth**
- ◆ **Bosnia and Herzegovina, Ministry of Civil Affairs**
- ◆ **Bulgaria, Ministry of Education and Science, Sofia University St. Kliment Ohridski**
- ◆ **Kosovo\*, Ministry of Education and Science**
- ◆ **North Macedonia Ministry of Education and Science, Ss. Cyril and Methodius University Skopje, Faculty of Natural Sciences and Mathematics, Institute of Physics**
- ◆ **Montenegro, Clinic for Oncology and Radiotherapy, Clinical Centre of Montenegro, Ministry of Science**
- ◆ **Serbia, Ministry of Education, Science and Technological Development**
- ◆ **Slovenia, Ministry of Education, Science and Sport**

Observers:

- ◆ **Croatia, Ministry of Science and Education**
- ◆ **Hellenic Republic, Division of International and Transnational Organisations, Directorate of International Science and Technology Cooperation, General Secretariat for Research and Technology, Ministry of Education, Research and Religious Affairs**

The SEEIIST project is currently entering the next phase of implementation-the Design Study Development Phase. The final implementation of the project is not certain, however if it is implemented, it will offer numerous opportunities for technological transfer to the economies of South East Europe.

## 5. CONCLUDING REMARKS AND POLICY RECOMMENDATIONS

Research Infrastructure Roadmap is a key strategic document for the identification of research potential and should serve as a tool to direct further development of research infrastructures and integration of research community with business sector of Albania.

Albania should catch up with developed countries in the process of opening access to research infrastructure and making the next steps toward integration into the European Research Area. Investing in Research infrastructures should accelerate the integration process into ERA. Furthermore, strengthening macro-regional cooperation should contribute to enhanced research capacities and improved transfer of knowledge and technology.

In order to keep pace with other Western Balkan economies and to get closer to developed member states of the European Union, the following recommendations are proposed in order to improve the current state of the research infrastructures:

### 1. Create an Action Plan for the development of Research infrastructures.

Based on the overview of the current development of research infrastructures in Albania presented in this document, it is recommended to take the next step in this regard by creating an Action Plan. The Action Plan should be developed by the Ministry of Education, Sports and Youth and it should comprise a number of activities related to the further development of research infrastructures in Albania. The adopted version of the Action Plan, among other things, should include the creation of an online database of existing research infrastructures and available equipment defined under this document. The main purpose of the Action Plan is to summarise key steps that need to be taken to implement the actions and attain the objectives of the Roadmap.

### 2. Increasing the level of investment in research infrastructure.

In order to enable further development of research infrastructures in the economy, the total investments in research laboratories need to be significantly increased. Taking into account the limited budget, Albania should consider taking loans from international financial institutions such as European Investment Bank (EIB) in order to provide financial support to research institutions. This initiative would be aimed at projects for procurement of capital research equipment by universities and research institutes and laboratories in order to improve the current state of affairs in this area.

Additionally, the financing of centres of excellence in priority research areas and establishing a science and technology park should also be considered in order to create conditions for research and innovation activities and take an additional step towards better cooperation between science and business sectors.

### 3. Increasing mobility and institutional cooperation among higher education institutions in the Western Balkan region and beyond.

According to the current situation, there is a weak connection and staff exchange with universities in the region and beyond. There are only a few academic or institutional initiatives to lead or be part of bigger research projects within the region or at a European level. Moreover, research does not go forward in the desired dynamics because researchers

are not organised. Therefore, additional measures need to be taken to increase the mobility of researchers. One such measure is the adoption of Research Infrastructure Roadmap. However, this is not enough, it is necessary to launch additional initiatives to encourage mobility and usage of research infrastructures.

#### 4. Improving the legal framework.

The term Research infrastructure should be defined by the Law on Higher Education and Scientific Research in Higher Education Institutions in Albania. In Albania, there is still no common definition of research infrastructure. As mentioned in the introduction, the use of term Research Infrastructure varies greatly; it is used in different contexts internationally and can have different meanings and connotations to different communities. This document provides the first definition of research infrastructures within the national strategic policy documents. However, confusion can be avoided by introducing a definition of research infrastructure in the Law.

#### 5. Improving the visibility of research infrastructures through the creation of a database of research infrastructures and equipment.

At present, researchers in Albania do not have the right information that would allow them easier access to research equipment located in another research organisation. To overcome this, it is necessary to launch an online portal that contains information on available equipment, type of service it provides, relevant contact person, etc.

#### 6. Improving the Access Policy to research infrastructures.

By developing official internal documents on Access Policy, research institutions in Albania would make the step towards creating conditions for greater mobility of researchers nationally and internationally. Considering that Aleksander Moisiu University and University of Medicine in Tirana have already developed internal Access Policies as a result of support programme financed by RCC in 2020, other research institutions should follow these examples and create their own Access Policies to research infrastructures.

#### 7. Consider more active participation in pan-European research infrastructures.

Albania should consider options for more active participation in the work of ESFRI by looking at the opportunities to increase the participation at large research infrastructures. By accessing large research infrastructures, Albania would benefit through strengthening scientific excellence, capacity building, accessing research methods that are not possible in the economy, widening perspective for young researchers, etc.

#### 8. Establishing a two-way communication system with the research community.

Once adopted, the Research Infrastructure Roadmap should be subject to revision after 2 years as a result of communication between the Ministry and the research community. The revision process is usually conducted in the form of a call for proposals or an expression of interest to the scientific research community to select potential research infrastructures. It should be ensured that the final list of research infrastructures is based on a transparent selection process.

## APPENDIX 1: LIST OF CAPITAL EQUIPMENT AT PURCHASE PRICE HIGHER THAN 50.000 EUR

Institution	No.	Name of research equipment.	Purchase Price (EUR)	Year of Purchase	The source of funds for the purchase of equipment	Estimated Duration of Equipment (yrs.)	Estimated Number of Users
<b>Department of Chemistry, Faculty of Natural Sciences, University of Tirana</b>	1	GC-MS (with defect)	€ 67.000,00	2009	International donations		
<b>Institute of Applied Nuclear Physics, University of Tirana</b>	2	GAMMA SPECTROMENTRY SYSTEM, Canberra, Model 747E with accessories	€ 60.000,00	2014	ALB/2/011 Upgrading of laboratory capabilities for Environmental Monitoring, IAEA		2
	3	ALPHA SPECTROMENTRY SYSTEM, Canberra, Model 7400 A with accessories	€ 50.000,00	2014	ALB/2/011 Upgrading of laboratory capabilities for Environmental Monitoring, IAEA		3
	4	MIRA Radiation detectors (8 PCS) and Accessories	€ 92.000,00	2019	ALB 9009 Enhancing National Capacity for Radiation Monitoring and Emergencies Warning, IAEA		1
	5	Harshaw4500 TldReader and Accessories	€ 50.000,00	2012	IAEA		1
	6	X-Ray Fluorescence Micro-Spectrometers (XRF)	€ 129.000,00	2012	IAEA		1
	7	X-Ray Machine (Calibration System)	€ 93.000,00		IAEA		2
<b>Agriculture University Tirana</b>	8	Atomic Absorption Spectrophotometer novAA® 400 P	52 000€	2015	Contract with Devoll Hydropower Sh.A	5	2
	9	Flow Cytometry	75 000 €	2020	Ministry of Education, Sports and Youth	15	
	10	Gas Chromatograph	41 700 €	2012	Quality and Parity in High Education	10	5
	11	HPLC with detectors	42 200 €	2012	Quality and Parity in High Education	10	5
<b>Agriculture University Tirana</b>	12	Gas Chromatograph with UV-visible spectrophotometer	36 000 €	2010	Financed by World Bank, Albania	20	1

Institution	No.	Name of research equipment.	Purchase Price (EUR)	Year of Purchase	The source of funds for the purchase of equipment	Estimated Duration of Equipment (yrs.)	Estimated Number of Users
	13	Solar panel testing centre equipment for hot water and accessories	50,835.25	2018	PNUD Albania	2	1
	14	Laboratory equipment for measuring the strength of materials and accessories	51,071.22	2019	Own Funds	1	1
	15	Set with equipment for measuring soil shrinkage and accessories	155,154.41	2019	Own Funds	1	1
	16	Set of devices for determining speed and accessories	55,551.49	2019	Own Funds	1	1
	17	Offshore station installation	86,281.00	2019	Own Funds	1	3
	18	Specific seismic equipment	62,043.00	2020	Own Funds	1	4
	19	Specific seismic equipment	84,000.00	2020	Own Funds	1	4
	20	Specific seismic equipment	82,927.00	2020	Own Funds	1	4
	21	TA Instruments System per skanimin Differential Colorimetric+LumexInfraLUM FT mid-IR spectrometer	65,323.00	2019	AKKSHI	1	18
	22	Laboratory equipment for conductivity of building materials and laboratory equipment for traction and compression	63,650.96	2019	Own Funds	2	1
	23	Portable electromagnetic field measuring equipment	83,606.56	2019	Own Funds		1
	24	Pulsed field electrophoresis system, Model 802BR 2088	68.880	2009			
	25	Total Organic Carbon Analyser (TOC), Model	50.867	2014			

Institution	No.	Name of research equipment.	Purchase Price (EUR)	Year of Purchase	The source of funds for the purchase of equipment	Estimated Duration of Equipment (yrs.)	Estimated Number of Users
	26	Flame Atomic Absorption Spectrometer, Model AAS7000 Shimadzu	82.357	2015			
	27	Liquid chromatograph under the influence of HPLC pressure, Model nexera x2	81.388	2015			
	28	Gas chromatograph GC-2010-MS	67.501	2007			
	29	Oracle (license)	225.631	2012			
	30	Air metering station + accessory (x2)	166.508	2010			

## APPENDIX 2: SURVEY QUESTIONNAIRE

This survey questionnaire contains several sets of questions that serve as an input for the identification and evaluation of research infrastructures potential in Bosnia and Herzegovina. The aim of the questionnaire is to map the research infrastructure as the first and indispensable step in the process of designing the Research Infrastructure (RI) Roadmap.

According to the definition of European Commission, Research Infrastructures (RI) are facilities that provide resources and services for research communities to conduct research and foster innovation. They include:

- ◆ major scientific equipment or sets of instruments;
- ◆ collections, archives or scientific data;
- ◆ computing systems and communication networks;
- ◆ any other research and innovation infrastructure of a unique nature which is open to external users.

Research infrastructures can be centralised, that is, based in a single location. They can also be distributed or virtual, and can form mutually complementary wholes and networks.

Please note that the questionnaire is designed for research centres, laboratories and departments operating within public and private organisations (universities and faculties, public and private research institutes) accredited for research and innovation.

### 1. General information

#### 1.1. Data about respondent

Full name

Name of your institution

Institution's address

Your position in the institution

Your email address

Institution's website address

## 1.2. General information about research infrastructure or important research equipment and facilities

1. Name of research infrastructure
2. Host institution
3. Research Infrastructure's address
4. Research infrastructure's website
5. Thematic categorisation of RI by field of science\*
6. Type of RI\*\*
7. Main scientific domain
8. Other scientific and technological domains served by RI
9. Total number of RI users
10. Name and position of a person responsible on behalf of research infrastructure:
11. Year of establishment of RI:
12. Founder Institution(s) Ownership Share (%)

\*Thematic categorisation of RI types by field of science.

The ESFRI sets the following 6 thematic areas:

1. energy;
2. environment;
3. health and food sciences;
4. physical sciences and engineering
5. social and cultural innovation;
6. e-infrastructures

E-Infrastructure for scientific research—provides computing services for the scientific community.

\*\*Four types of RI are commonly distinguished:

1. single-site facilities;
2. distributed facilities;
3. mobile facilities;
4. virtual facilities

## 1.3. Description of Research Infrastructure. Please provide basic information and objectives of the research infrastructure

## 1.4. Please list the services provided to research infrastructure users

## 2. Data on research equipment

### 2.1. Estimated value of research equipment

Total estimated value of research capital equipment (in EUR):

purchase value: EUR

current value (amortisation): EUR

### 2.2. List of capital equipment at purchase price higher than EUR 50.000

	Name of research equipment	Purchase Price (EUR)	Year of Purchase	The source of funds for the purchase of equipment	Estimated Duration of Equipment (yrs.)	Estimated Number of Users
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
...						
n						

Please enter only the equipment the purchase value of which is above EUR 50,000.

In the column "The source of funds for the purchase of equipment" please enter the funding source. If there are two or more sources, please indicate each one with the participation share:

- a. Own funds
- b. Resources of the Federal Ministry of Education and Science
- c. Resources of other ministries
- d. Public funds
- e. Donations
- f. Funds from international projects
- g. Funds / international donations
- h. Other sources - specify which!

### 3. Information on access, collaboration and impact

#### 3.1. Information on access

Please provide short description of access policy and procedures for users of this research infrastructure.

##### 3.1.1. Information on external users

Users of RI

Please specify the name of Institution, department

Research groups from your economy

Research groups from Western Balkan economies

Research groups from EU and other countries

##### 3.2. Information on cooperation

Please list the international co-operation agreements and partnerships in which this RI has been involved.

##### 3.2.1. Integration into larger RIs

Is RI connected or integrated into larger RIs (international) or is it a member of any European RI?

Yes

No

If yes, please specify the details:

The name of larger RI:

Membership conditions:

Membership fee, who finances it:

Active

Joined

Additional information:

##### 3.3. Engagement in projects related to research infrastructure development

Have you been engaged in a project aiming at the development of research infrastructure?

Yes

No

If yes, please specify the details:

Title of the project:

Time duration:

Link to web address:

Please add new rows if necessary.

### **3.4. Plan for the Future**

Please describe in detail the plan for the next period, at least for 2-5 years:

Future investments in research equipment:

Is integration into larger research  
infrastructures considered:

Other relevant information:

## APPENDIX 3: DETAILED INSTRUCTIONS FOR COMPLETING THE SURVEY

The entire process of launching and conducting survey needs to be carried out in broad cooperation with the scientific and research community. The process of surveying need to be complemented with the integration of infrastructure data from other sources i.e. memberships in international research infrastructure organisations, research infrastructures on national level developed from domestic and EU funds etc.

The text below provides detailed instructions for completing survey questionnaire.

The survey questionnaire consists of 3 sections:

1. General information
2. Data on infrastructure and equipment
3. Information on Access, Collaboration and Networks

The questionnaire should be filled in for one research infrastructure and all data and descriptions should be given for the specific infrastructure that is subject of the questionnaire. Detailed instructions for completing the questionnaire are provided in the text below.

### Instructions for completing Part 1: General information: Tables 1.1., 1.2., 1.3., 1.4.

Table 1.1. should include the main information about respondent. The second Table 1.2 refers to the general information about research infrastructure which is the main focus of the questionnaire.

In the field "Thematic categorisation of RI types by field of science", research infrastructure should be grouped thematically. The ESFRI Roadmap 2016 sets the following 6 thematic areas:

1. energy;
2. environment;
3. health and food sciences;
4. physical sciences and engineering
5. social and cultural innovation;
6. e-infrastructures.

Research infrastructures should be linked to one of these defined categories.

In the next field "Type of RI", there are four types of RI that are commonly distinguished:

1. Single-site facilities;
2. distributed facilities;
3. mobile facilities;
4. virtual facilities.

Each research infrastructure should belong to one of these 4 types.

Table 1.3. should provide a detailed description of research infrastructure (general information on research infrastructure) and it's main purpose and objectives.

Table 1.4. should specify and explain specific research services provided to users and external researchers. It is necessary to list the services available to researchers that the research infrastructure offers.

### Instructions for completing Table 2.1:

Total value of research equipment used within the research infrastructure should be entered in Table 2.1. It is important to enter two types of values: the purchase value and the current value which takes into account the depreciation of equipment.

### Instructions for completing Table 2.2:

Table 2.2 should list only capital research equipment at purchase price higher than EUR 50,000.

Funding sources should be entered in the column "The source of funds for the purchase of equipment" funding source should be entered. If there are two or more funding sources, each one should be indicated with the participation share. One of the following funding sources should be inserted:

- ◆ Own funds
- ◆ Resources of Federal Ministry of Education and Science
- ◆ Resources of other ministries
- ◆ Public funds from Bosnia and Herzegovina
- ◆ Donations
- ◆ Funds from international projects
- ◆ Funds / international donations
- ◆ Other sources - specify which!

### Instructions for section 3: Information on Access, Collaboration and Impact

Section 3 consists of 4 open questions and sub-questions and it requires information on access, collaboration and impact of research infrastructure.

#### Instructions for completing section 3.1.

Short description of access policy and procedures for users of research infrastructure should be provided in section 3.1. If there is no official access policy, please describe internal procedures that are being used. In addition, the estimated number of users of research infrastructure should

be also inserted since that it is very important information for determining the importance of the selected research infrastructure for the research community at the national and international level. All external organisations and institutions that used research equipment provided by research infrastructure so far should be listed in section 3.1.1.

### **Instructions for completing section 3.2.**

Recognition of research infrastructure and scientific impact on the international level should be emphasised in the sections 3.2 and 3.3 of this questionnaire. This information is of particular interest for determining the relevance of research infrastructure on an international level.

Information on cooperation with other research institutions is important for determining the relevance of research infrastructure as well as the level of interaction with other actors in the research community. In section 3.2, all international research projects, partnerships or agreements that the research infrastructure has been involved in the last 10 years should be listed. Please note that only research projects that included the use of research equipment should be inserted. Information on the potential integration into international or pan-European research infrastructures should be provided, if there is any, in 3.2.1.

### **Instructions for completing section 3.3.**

The section 3.3 refers to the engagement in research projects (H2020, FP7, other programmes) which aimed at establishing research infrastructures on national or international level.

### **Instructions for completing section 3.4.**

The last section (3.4.) refers to future plan of RI management. The respondent needs to briefly specify the future investment, integration into wider RI and other relevant information as considered important.

good.  
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regional.



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