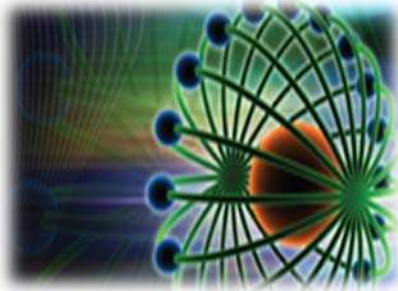




*Ministry of Education and Science
Republic of Bulgaria*

BULGARIA NATIONAL ROADMAP FOR RESEARCH INFRASTRUCTURE 2017-2023



JUNE 16, 2017

Appendix №5: PROFILE OF THE RI IN THE NATIONAL ROADMAP IN THE REPUBLIC OF BULGARIA,



National interdisciplinary research e-Infrastructure for resources and technologies for the Bulgarian language and cultural heritage, integrated within the European infrastructures CLARIN

Coordinator:

Institute of Information and Communication Technologies, Bulgarian Academy of Sciences (IICT-BAS), Sofia, Bulgaria

Infrastructure location: The infrastructure is virtual and distributed in several regions of the country

Bulgarian consortium:

Financial coordinator:

The Ministry of Education and Science

Scientific coordinator:

Institute of Information and Communication Technologies, Bulgarian Academy of Sciences (IICT-BAS);

Consortium members:

- Members of the consortium:
- Institute for Mathematics and Informatics, Bulgarian Academy of Sciences (IMI-BAS);
- Sofia University "St. Kliment Ohridski" (SU);
- New Bulgarian University (NBU);
- Konstantin Preslavsky University of Shumen;
- Bulgariana - non-profit organization for the protection of cultural heritage (Bulgariana);
- South-West University "Neofit Rilski";
- Sirma Media (SM)
- Cyril and Methodius Research Center, Bulgarian Academy of Sciences (CMRC-BAS);
- Institute for Balkan Studies with Center of Thracology,

Description of infrastructure:

The main objective of CLaDA-BG infrastructure is to create a national technological infrastructure for resources and technology for the linguistic, cultural and historical heritage. CLaDA-BG will provide public access to language learning resources and digital presentations, software tools and services for the listed areas.

The infrastructure will support solving different tasks aimed at a professional and broader audience.

This objective will be achieved through:

1. Adaptation of Bulgarian conditions to European achievements in the field of language technologies through close integration with the European infrastructure CLARIN ERIC and in the field of cultural and historical technology through integration with the European infrastructure DARIAH ERIC.
2. Complementing the existing language resources and technologies, and creating new ones as the necessary minimum for the functioning of the national infrastructure for word processing of texts in Bulgarian.
3. Further development of the existing technologies in cultural and historical heritage (mainly 3D technology and semantic technologies) and digitalization of databases for cultural and historical heritage to support the functioning of the national infrastructure in the arts and humanities.

Computer linguistics: development of software tools for creation and management of bilingual resources (bilingual online dictionaries and bilingual aligned corpora of Bulgarian language), compatible with TEI morpho-syntactical specifications for Bulgarian language (coding and annotation of Bulgarian language corpora and lexicons) and creating language resources.

Theoretical and contrastive linguistics: evaluative morphology; semantics (formal modelling of semantic phenomena); aspectology; writing systems, their history and typology.

The main scientific and practical results, achieved by collaborators of the section in the field of technologies for knowledge processing and multimedia technologies, are digital libraries, representation and processing of electronic content for cultural and historical heritage, interactive platforms for e-learning and their content development, applications in information security and the Semantic Web.

Scientific and technical team of the research infrastructure:

Over 50

- Bulgarian Academy of Sciences (IBSCT-BAS);
- Institute of Ethnology and Folklore Studies with Ethnographic Museum, Bulgarian Academy of Sciences (IEFSEM-BAS);
- Burgas Free University (BFU);
- National Library "Ivan Vazov" - Plovdiv (NLIV-Plovdiv);
- Historical Museum – Sofia
- Ontotext (in Sirma Group – leading Bulgarian software company)
-

Filed of activity:

Social and cultural innovations

Type of infrastructure:

CLaDA-BG is a Bulgarian virtual distributed research infrastructure, achieved connected related centers that use the services and resources of the infrastructure and provides a link with other centers and consumers as well. It provides access to resources and services electronically.

Draft budget for the 2016-2020 period:

Total: 7.7 million BGN.

Participation in European infrastructure:

The National infrastructure CLaDA-BG (at BAS) has been a member of CLARIN ERIC. Year of inclusion: 2012 Membership in DARIAH ERIC is envisaged in the future.

Impact / benefits:

1. Linguistic and other humanities studies that require work with a huge amount of texts or specific types of texts
2. Training in Bulgarian language and literature, in studies of texts oriented towards education
3. Systems for training in other disciplines, through semantic annotation and search for documents, and the introduction of personalized / adaptive learning
4. Studying Bulgarian language as a foreign language by developing specialized software for automation of typical processing activities of text
5. Studying foreign languages by Bulgarians using graded resources in accordance with the European Framework
6. Creation of software for automatic processing of Bulgarian language both for research purposes and in a variety of useful applications - for example, automating text processing polls and more.
7. E-Government, by analysing administrative documents and their indexation and more flexible information search, hidden facts and interactions etc.
8. Supporting the activities of cultural institutions through the creation of software for managing the collections of cultural institutions that allows cataloguing, digital storage and presentation of collections in every size and type
9. Development of “Bulgarian linked open data”, through increased participation in Wikidata, DBpedia, GeoNames and others, which will increase access to information for consumers in the Web.



European Social Survey for Bulgaria (ESS)

Coordinator:

University of National and World Economy

Infrastructure location: <http://www.ess-bulgaria.org/>

Bulgarian consortium:

Financial coordinator:

Description of infrastructure:

Distributed research infrastructure ESS ERIC-Bulgaria was established to ensure full and equal participation of Bulgaria in the pan-European infrastructure ESS ERIC, which with a decision of the European Commission is a transformed version of the hitherto functioning project of EC and ESF - (European Social Survey - ESS), in which Bulgaria has almost 10 years of successful participation by the Agency for Social Analyses (ASA).

Ministry of Education and Science

Scientific coordinator:

University of National and World Economy

Consortium members:

- Society and Knowledge Research Institute at the Bulgarian Academy of Sciences (BAS)
- Agency for Social Analyses (ASA)
- Union of Economists in Bulgaria

Field of activity:

Social and Cultural Innovations

Type of infrastructure:

ESS is the type of fundamental research projects and according to the specifications of the European research infrastructure ESS ERIC for **full participation for necessary government financial guarantees.**

Draft budget for the 2016-2020 period:

Total: 1,5 million BGN

Participation in European infrastructure:

By ESS ERIC-Bulgaria is provided collaboration with ESS ERIC of the European infrastructure consortium - European Research Infrastructure Consortium for the European Social Survey Research Infrastructure - ESS ERIC, established under a European Commission decision from 22 November 2013 (2013/700 / EU). Coordinator of the ESS ERIC is the City University, London, UK

Year of inclusion in the European infrastructure:

2005

The global goal of the infrastructure is for both Bulgaria and Europe to have reliable data every two years on the social climate at national, regional and European level, in order to reveal the dynamics of the attitudes, values and concerns of European citizens.

The organization of the functioning of the ESS in Bulgaria is subjected to the general idea that the results from the ESS shall bring multiple benefits not only for the academic and research community at home and abroad, but also they shall be useful for the widest possible range of individuals and institutions - politicians, governmental and non-governmental organizations, students, journalists, university professors, graduate students, young and experienced scientists, researchers – i.e. all who are interested in the fact where Bulgaria is on the social map of Europe and why it is there.

Scientific and technical team of the research infrastructure:

Over 20

Impact / benefits:

The benefits for Bulgaria to maintain the research infrastructure ESS ERIC-Bulgaria and from participation in ESS ERIC can be grouped in the following general areas:

- Thanks to its participation in the ESS, Bulgaria has reliable, up to date, and comparable geographic and prompt information with a wide range of application: it may be used for scientific, educational, political, diplomatic and other purposes.
- ESS covers an extremely broad spectrum of social, economic and political problematic topics, trends and attitudes towards them in dynamics, which provides a unique opportunity for comparability over time and between countries.
- ESS provides an opportunity for the academic community, state and business to not only have information about the dynamics of the social climate in the country and in Europe updated every two years, but also with a special innovative training program ESS EduNet, which allows synchronization of higher education in Bulgaria with the European and the world one, and to train students and young scientists of modern research methods and techniques.
- ESS provides journalists with a rich set of "news" in comparisons between Bulgarians and other Europeans, which serve not only to inform the public "Where are we?", but to provoke civil activity in search of answers and questions like "What are we? ", " Why are we like this? ", and many others.
- ESS provides rich material for organizing scientific discussions, seminars and public debates on topics and problem areas that provoke interest in people, institutions, businesses;



National Cyclotron Center

Coordinator:

Institute for Nuclear Research and Nuclear Energy – BAS

Infrastructure location:

Sofia and Varna

<http://www.inrne.bas.bg/>

Bulgarian consortium:

Financial coordinator:

Ministry of Education and Science

Scientific coordinator:

Institute for Nuclear Research and Nuclear Energy – BAS

Consortium members:

- Medical University – Sofia;
- Medical University – Varna.

Field of activity:

Natural and engineering sciences

Type of infrastructure:

National cyclotron center (NCC) is a start-up scientific and business cooperation in research and development. Essentially NCC will constitute a conglomerate between a Research Institute (INRNE) and a starting social company.

Draft budget for the 2016-2020 period:

51.9 million BGN

Note: Donation from the Department of Energy of the US and Kozloduy NPP Fund amounts to 5 million USD in 2016

Revenues:

24.8 million BGN

Participation in European infrastructure:

The cyclotron in Multidisciplinary Institute Hubert Curie in Strasbourg, France (Le cyclotron Cyrécé l'IPHC), the Cyclotron at the European Joint Research Centre in Ispra, Italy

Description of infrastructure:

The Cyclotron center, as a large-scale research infrastructure, will consist of a building in which to accommodate the cyclotron accelerator, laboratories for research in radiochemistry and radiopharmacy, a laboratory for applied research.

The basic building block of the setting is the cyclotron, as it includes the accompanying equipment (vacuum pumps, power supplies, transmission lines for the beam of accelerated particles, etc.).

The premises for synthesis and related equipment will be positioned as hot cells with modules for synthesis of radiopharmaceuticals; systems for gas, liquid and thin layer chromatography as part of the laboratory for quality control; apparatus for measuring the purity of finished pharmaceuticals; equipment for microbiological control of waste products, etc..

Scientific and technical team of the research infrastructure:

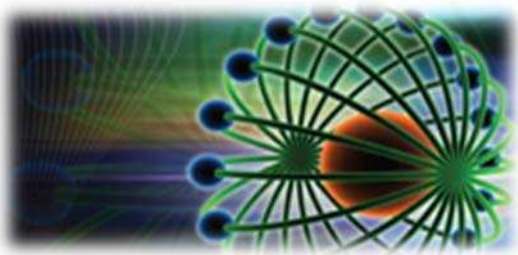
Over 20

Impact / benefits:

- Improved healthcare through timely and precise making of medical diagnosis and access provided to radiopharmaceuticals on the Bulgarian market at **affordable prices for all patients in need** of medical research
- The construction and operation of NCC and of the specialized laboratories will have direct economic and social impact, which will result in reduction of costs for end-users when purchasing highly specialized isotopes for diagnosis and treatment of various types of cancer and neurological diseases. At the moment, **the country spends 10 million euros a year** for the purchase of isotopes from other countries, without considering transportation costs.
- The production of radiopharmaceuticals for internal and external market worth **several million levs a year**
- Provided support to **socially vulnerable groups** of societies - in this case oncology and other patients
- Providing new, modern facilities for research through the creation of three laboratories - **radiochemical, microbiological and one for quality control** - and

(JRC Cyclotron, IHCP Ispra), the National Laboratory for Nuclear Research in Lenyaro, Italy , PET-Center Dresden-Rossendorf in Germany (PET Center Dresden-Rossendorf), the Bronowice Cyclotron Center in Krakow, Poland, Jülich Research Centre, Germany and others. Some of these centers have already expressed interest in cooperation and are now looking for the way to conduct these collaborations.

- purchase of equipment with an innovative character necessary to conduct research
- Training of highly qualified specialists and inspiring a new generation of scientists and engineers.



Distributed infrastructure of centers for production and study of new materials and their applications, as well as conservation, access and e-store of artefacts (archeological and folklore) – INFRAMAT

Coordinator:

Institute of Physical Chemistry, Bulgarian Academy of Sciences

Infrastructure location:

The major part of resources for Module 1 is located on the campus of the Bulgarian Academy of Sciences at the 4th km in Sofia. Infrastructure laboratories for Module 1 can be found in the two faculties of Sofia University "St. Kliment Ohridski", located on the University campus on "James Bourchier" street, Sofia (Faculty of Chemistry and Pharmacy, Faculty of Physics). Some resources are available within the UCTM, Sofia, and Central Laboratory for Applied Physics in Plovdiv. Resources for Module 2 are located in the building of NAIM, BAS in Sofia at No2 Saborna Str. Infrastructure laboratories associated with Module 2 can also be found in the Faculty of Chemistry and in the Centre for Archaeometry of Sofia University "St. Kliment Ohridski".

<http://ipc.bas.bg/page/bg/dogovori/obschoinstitutski-infrastrukturni-proekti/proekti/inframat.php>

Bulgarian consortium

Financial coordinator:

The Ministry of Education and Science

Scientific coordinator:

1. Module 1
 1. Institute of Physical Chemistry – BAS
 2. "St. Kliment Ohridski" (Faculty of Chemistry and Pharmacy and Faculty of Physics)
 3. Institute of Organic Chemistry with Centre of Phytochemistry, BAS
 4. Institute of General and Inorganic Chemistry, BAS
 5. Institute of Electrochemistry and Energy Systems, BAS
 6. Institute of Polymers, BAS
 7. Institute of Catalysis, BAS
 8. Institute of Optical Materials and Technology, BAS
 9. University of Chemical Technology and Metallurgy, Sofia

Description of infrastructure:

INFRAMAT (Module 1) offers unique opportunities for comprehensive characterization of materials with a variety of applications. Instrumental units of Module 1 cover basic methods in modern materials science and a multitude of new, modern and unique to the Republic of Bulgaria devices such as electron microscopes, X-ray diffractometers, spectrometers of various types, laboratory complex for nuclear magnetic resonance, microtomography scanner, nanoindenter and many others. INFRAMAT laboratories provide expert assistance to many Bulgarian industrial companies to control the quality of their products and to support their innovation and development. INFRAMAT (Module 2) includes basic scientific and educational institutions working in the field of archaeometry research, diagnostics and conservation of movable cultural heritage of archaeological and ethnographic nature. Module 2 laboratories carry out activities in diagnostics, restoration and conservation of artefacts for the purpose of their research and prevention from destruction and further impact on environment. The interaction between the two INFRAMAT modules gives an opportunity for fruitful implementation of additional techniques in the study of archaeological and ethnographic artefacts.

Scientific and technical team of research infrastructure:

Over 50

Impact / benefits:

1. Improving the quality and competitiveness of **research in the field of materials science and nanotechnology, green, purification and non-waste technologies, utilization of raw materials and bio-resources, and national identity** in accordance with the priorities of the National Strategy for Development of Research 2025
2. Ensuring broad access to unique in its complexity and level of technical capabilities **unified infrastructure** for all interested users of the research, public and private sector of the Republic of Bulgaria
3. Ensuring the conditions for **sustainable development** of scientific research and innovation in the Republic of Bulgaria in sectors structurally important for the industrial development of the country

10. Central Laboratory of Applied Physics, BAS, Plovdiv
2. Module 2
11. National Institute of Archaeology with Museum, BAS
12. Sofia University "St. Kliment Ohridski" (Faculty of Chemistry and Pharmacy)
13. National History Museum, Sofia
14. National Academy of Art, Sofia
15. New Bulgarian University, Sofia
16. Institute of Balkan Studies and Centre of Thracology, BAS
17. Institute of Organic Chemistry with Centre of Phytochemistry, BAS
18. Institute of Ethnology and Folklore Studies with Ethnographic Museum, BAS.

Field of activity:

Natural and engineering sciences.

Type of infrastructure:

FRAMAT is distributed infrastructure (para 6.2.) with a high concentration of resources.

Draft budget for the 2016-2020 period:

Total: 23 million BGN

Revenues

Total: 23.5 million BGN

Participation in European infrastructure:

INFRAMAT (Module 1) has made a formal request for inclusion in the European distributed research infrastructure CERIC (Central European Research Infrastructure Consortium). There is a principle agreement on participation and currently the means and scope of this inclusion are being specified. Module 2 – Since 2012 the National Archaeological Institute with Museum has been part of the European infrastructure for electronic exchange and electronic storage in the cultural EUROPEANA through the electronic network CARARE for the conservation of cultural heritage.

Year of inclusion in the European infrastructure:

Module 2 – 2012 - EUROPEANA

4. Presence of the Republic of Bulgaria on the map of the European roadmap for research infrastructures in the fields of materials science and opportunity **for reciprocal use of European research infrastructure units.**
5. Providing capacity for conservation, restoration and study of existing **museum collections and cultural values**
6. Creating a **critical mass of young researchers and practitioners** through specializations in leading laboratories abroad to ensure sustainability of conservation, restoration and study of national cultural heritage in the next two decades at least
7. Connecting conservation and restoration work with a research subjects
8. Development of research on ancient technologies and sources of **raw materials**
9. Creating conditions for the construction of **Balkan Centre for Conservation, Restoration, Archaeometry** and its integration with education in the region and Bulgaria



Regional astronomical center for research and education (RACRE)

Coordinator:

Institute of Astronomy with the National Astronomical Observatory (IANAO)
Situated in one place – National Astronomical Observatory (NAO) – Rozhen

Infrastructure location:

Rozhen

<http://nao-rozhen.org/>

Bulgarian consortium:

Financial coordinator:

Ministry of Education and Science

Scientific coordinator:

Institute of Astronomy with the National Astronomical Observatory

Consortium member:

- Astronomical Observatory, Belogradchik,
- Department of Astronomy of the Sofia University "St. Kliment Ohridski";
- Astronomical Center of Shumen University "Konstantin Preslavski"

Area of activity:

Natural and engineering sciences.

Type of the infrastructure:

concentrated, virtual

Budget project for the period 2016-2020:

45.6 million BGN

Revenues:

0.5 million BGN

Description of the infrastructure:

RACRE is an association of research and educational institutions in the field of astronomy in Bulgaria. In the National Observatory - Rozhen concentrated are specialized resources for astronomical observations, where students and doctoral students are training. With its unique infrastructure and surveillance technique, as well as with the available basic infrastructure, the National Astronomical Observatory is the largest functioning observatory in Southeastern Europe. The main components of the specialized infrastructure are four telescopes:

- 200 cm. Ritchey-Chretien-Coude telescope
- 60 cm. Cassegrain telescope
- 50/70/172 cm. Schmidt telescope
- 15 cm. Bio coronagraph

The construction of an observatory of Shumen Plateau is currently in progress with a 40-cm telescope that will allow teachers and students to do research.

Scientific and technical team of the research infrastructure:

96

Impact / benefits:

The telescopes of NAO – Rozhen are used to obtain a unique observational material that serves to research a wide range of activities of modern astrophysics. The results of these studies are published in many prestigious international astronomical journals. NAO works closely with several universities such as Sofia University (SU) and Shumen University who have accreditation for training in astronomy. Many studies are conducted in collaboration with scientists from almost all European countries, USA, Canada, Chile and other countries with highly developed astronomy. IA's founder and an active participant in a sub-regional astronomical Committee for Southeast Europe.

Expected benefits shall be pointed:

- Retention of the status of the biggest astronomical observatory in Southeast Europe;
- Improving the quality of education and strengthening the links between education and research sector through practical training of students in astronomy in real terms;
- Applying innovative methods of observation to study the processes occurring in inaccessible for terrestrial laboratories

Participation in European infrastructure:

Participation in **ASTRONET** and **OPTICON**.

A preliminary study for participation in the **European Southern Observatory** was made.

conditions: powerful gravitational and magnetic fields, huge densities and temperatures, nearly absolute vacuum and temperatures close to absolute zero, relativistic speeds;

- Studying physical processes in celestial bodies to develop areas of practical application, such as nuclear physics, plasma physics, neutrino physics and magneto-hydrodynamics;
- Detection and tracking through astronomical observations of passing dangerously close to our planet asteroids and comets.



National Geo-Information Centre

Coordinator:

National Institute of Geophysics, Geodesy and Geography (NIGGG)

Infrastructure location:

Located all over the country

<http://www.niggg.bas.bg/>

Bulgarian consortium:

Coordinator:

- National Institute of Geophysics, Geodesy and Geography (NIGGG)

Участници в консорциума:

- National Institute of Geophysics, Geodesy and Geography (NIGGG)
- National Institute of Meteorology and Hydrology (NIMH)
- Institute of Oceanology (IO)
- Geological Institute (GI)
- Institute of Mathematics and Informatics (IMI)
- Institute of Information and Communication Technology (IICT)

Field of activity:

Environment

Type of infrastructure:

NGIC is a new research infrastructure with national coverage.

Draft budget for the 2016-2020 period:

Total: 44.5 million BGN

Revenues:

Total: 9.5 million BGN

Participation in European infrastructure:

EPOS (European Plate Observing System), DANUBIUS (Danube International Centre for Advanced Studies for River-Delta-Sea-Systems), EURO-ARGO (European 'infrastructure' for Argo international program), ICOS (Unraveling Earth's greenhouse gas balance with measurements), ACTRIS

Description of infrastructure:

National Geo-information Centre (NGIC) is a newly established research infrastructure for collaboration and integration of human resources and information products of ICT-based systems (monitoring networks and observatories), their complex (integrated) and broad analysis and creation of mathematical models.

Scientific and technical team of the research infrastructure:

Over 50

Impact / benefits:

- Responding to natural and anthropogenic disasters and emergencies and **establishing prevention plans**, including hazardous weather conditions (hot waves, cold, hurricanes, etc.) and related health issues;
- Overall, **98% of Bulgaria's territory can be subjected to seismic impact** of 7th and higher degree intensity, of which with a magnitude of 7th degree - 51%, 8th degree - 28%, 9th and a greater degree - 19%.
- For **sustainable urban development**; land use; designing and implementation of large infrastructure projects (pipelines, highways, water supply, etc.);
- **Improving water resource management** through better understanding of the water cycle, improving the management and conservation of terrestrial, coastal and marine ecosystems;
- IGIP will contribute for clarification of the environmental factors affecting human health and welfare, as well as assessment, **forecasting, mitigation and adaptation to climate change**;
- NGIC will **raise public awareness** on natural disasters and industrial accidents through new interactive products;
- The new IGIP of NGIC will serve not only state institutions but also the private sector, which will lead to **commercialization of research results** and interaction with various business entities;

(Aerosols, Clouds, and Trace gases Research Infrastructure Network).

Year of inclusion in the European infrastructure:

2012 DANUBIUS

- The activity of NGIC will **encourage and facilitate** the transfer of research results into operational technology by fostering the cooperation and collaboration between research communities;
- NGIC information products will support research and development in key areas of Earth Sciences, **contributing to progress in science and technology.**



Infrastructure for sustainable development in the field of marine research, bound and with the participation of Bulgaria in the European infrastructure (Euro-Argo)

Coordinator:

Institute of Oceanology

Location of the infrastructure:

Varna

<http://www.io-bas.bg/>

Bulgarian consortium:

Financial coordinator:

Ministry of Education and Science

Scientific coordinator:

Institute of Oceanology – Bulgarian Academy of Sciences

Consortium members:

- Sofia University “St. Kliment Ohridski”;
- National Institute of Meteorology and Hydrology, BAS
- Center for hydro- and aerodynamics, Varna, to the Institute of Metal science, equipment and technologies, BAS
- Institute for fishery resources, Agricultural Academy
- Higher Naval School “N. Y. Vaptsarov”, Varna
- Technical University – Varna;
- Medical University - Varna;

Area of activity:

Environment.

Type of the infrastructure:

Distributed – organized as a network of resources. The research infrastructure combines the efforts of all participants of the project, who have their units, as well as both along the entire Black Sea coast of Republic of Bulgaria and research centers in its interior (NIMH, IMST). Through the implementation of project activities an opportunity will be created, which will enable the pooling of these resources, their optimization and subsequent activity as an organized network of resources.

Draft budget for the period 2016-2020:

Description of the infrastructure:

It consists of four thematically unified scientific modules:

1. Research fleet;
2. National Operational Marine observational system;
3. High Performance Computing;
4. Research laboratory complex.

Each module represents a differentiated part of functional basis of the research infrastructure and consists of separate elements, physically distributed in various scientific organizations in Varna. The modules include: scientific equipment, facilities, databases, specialized scientific laboratories and centers connected on a computer network and needed to the scientific community to conduct modern, high quality and competitive research, transfer, exchange and protection of scientific knowledge.

The main areas of research are summarized in the following groups:

- Hydrodynamics of coastal zone (wind waves in deep and shallow water, wind-wave climate, modeling of wind waves), litho- and morphodynamics of the coastal zone (sediment transport, recent changes in the profile of the underwater coastal slope, dynamics of beaches and cadaster) and management of the coastal zone;
- Marine Physics (marine hydrology, water circulation, currents, modeling the processes of half-closed and closed basins - Black Sea, Caspian Sea, Aegean Sea);
- Marine Biology and Ecology (phytoplankton and zooplankton, microphytobenthos and zoo benthos, assess the state of fishery resources, biodiversity);
- Marine Chemistry (monitoring and analysis of hydro-chemical components of marine, river and lake environment, indicators of environmental status of the marine environment: nutrients, oxygen, heavy metals in water and sediments);
- Marine geology and archeology (geological, geophysical and geochemical surveys, geological mapping, geomorphological and tectonic processes, ancient seashores);
- Ocean Technology (development, maintenance and servicing of ocean instrumentation, specialized and precise devices and systems)

Total: 66 million BGN

Revenues:

33.2 million BGN

Participation in European infrastructure:

MASRI is developed in line with major European initiatives and infrastructures:

- Euro-Argo Infrastructure,
- WATERBORNE – The European Technology Platform,
- ECMAR - European Council for Maritime Applied R&D,
- ITTC – International Towing Tank Conference,
- EUROFLEETS network,
- SEADATANET network,
- ESONET - European Seas Observatory Network,
- GeoSeas,
- BLACK SEA SCIENTIFIC NETWORK,
- Mediterranean and Black Sea Technology Platform for Maritime and Marine Research Innovation and Training,
- JERICO,
- DANUBIUS-RI,
- Fix03,
- EMSO,
- Copernicus/MyOcean

Year of inclusion in the European infrastructure:

- Oceanographic Data Centre (collection, quality control, processing, storage, archiving and dissemination of oceanographic data and information).

Scientific and technical team of the research infrastructure:

Over 50

Impact / benefits:

The oceans and seas are the key to climate change and weather, influenced by the currents and temperature changes in large basins.

The ARGO system is a unique development, through which it is possible to measure the changes in salinity and temperature and their storage, the changes in currents and the possibility of oceans and seas to absorb excess carbon dioxide from the atmosphere.

ARGO is an essential component of the Global Monitoring for Environment and Security (GMES) and in particular, the section on marine research. GMES is an initiative for Earth observation, led by the European Community and carried out in partnership with the Member States. Earth observation allows the collection of information on physical, chemical and biological systems of the planet or the so called Monitoring of the environment.

The benefits for Bulgaria's participation in EURO-ARGO can be grouped in the following areas:

- o Construction of a center for studying of various factors affecting the marine environment and its preservation;
- o Databases and monitoring of industrially significant fish species in order to determine their stocks and in view of their rational exploitation as well as the conservation of biodiversity;
- o Developing the competencies and the infrastructure in the field of marine technology and in particular the use in maritime and coastal engineering, aerodynamics and water transport;
- o Improving existing technologies to prevent pollution from shipping and oil spills;
- o Development of equipment and technologies for collecting oil spills, petroleum and other pollutants from incidents above and below the water;
- o Participation in various European networks and technology platforms for data exchange and joint research programs;
- o Improving the methods of scientific training and qualification of young people in the field of marine science and technology;
- o Construction of modern laboratories and centers for competitive presence in European networks and programs in marine research and technology;
- o Development of preoperational and weather numerical models of physicochemical and environmental parameters in the coastal and open-sea areas;



Energy storage and hydrogen energy (ESHE)

Coordinator:

Institute of Electrochemistry and Energy Systems – BAS

Infrastructure location:

distributed Infrastructure: Sofia (BAS, UMG, UCTM), Blagoevgrad, Plovdiv
<http://iees.bas.bg/bg>

Bulgarian consortium:

Financial coordinator:

Ministry of Education and Science

Scientific coordinator:

Institute of Electrochemistry and Energy Systems – BAS

Consortium members:

- Joint Innovation Centre, BAS
- Institute of Polymers, BAS
- University of Mining and Geology “St. Ivan Rilski” (UMG)
- Plovdiv University “Paisii Hilendarski” - Laboratory for bio-electrochemistry (PU)
- University of Chemical Technology and Metallurgy - Center for Hydrogen Technology (UCTM)
- Central Laboratory of Solar Energy and New Energy Sources (CLSENES - BAS)
- South-West University "Neofit Rilski" - Innovative Centre for Eco-Energy Technologies (ICEET-SWU)

Field of activity:

New energy and energy efficient technologies.

Type of infrastructure:

„Energy storage and hydrogen energetics” is distributed national research infrastructure (NI ESHE), which unites 9 structural units - 5 research institutes and the Center for Innovation in Bulgarian Academy of Sciences and 3 universities (in Sofia, Plovdiv and Blagoevgrad). It has an emphasized interdisciplinary character of scientific and applied competence in several scientific fields - electrochemistry, physical chemistry, physics, materials science, organic chemistry, corrosion science, bio-electrochemistry, and engineering sciences.

Description of infrastructure:

The Infrastructure fully covers the priorities of the 2020 Strategy and provides conditions for the integration of Bulgaria in the implementation of the European strategic plan for low-carbon energy technologies (SET-Plan). It brings together the active Bulgarian research centers working in the defined area with their existing base (scientific equipment, expertise, research and innovation potential, international cooperation), for joint scientific and applied activity in a highly relevant for both the European and the Bulgarian economy area - production, storage and use of renewable energy sources and rapid penetration of hydrogen technologies in various areas of economy. Coordinated targeted modernization will be provided, consistent with the principles of smart specialization and specificity of the different geographical areas of the country, which will include:

- o gradual modernization and expansion of 4 distributed thematic laboratories (constructed on the basis of the existing 15 laboratories), thereby establishing an electronic infrastructure to digitize the experimental processes (VRIMS);
- o establishing a laboratory for the certification of batteries for filling a vacant niche at national and regional level;
- o establishing a common laboratory for testing of batteries and fuel cells (components and systems) for electric vehicles and energy storage, thereby their inclusion in the network or renewable energy sources.

The thematic orientation of the infrastructure will ensure an environment for public-private partnership, for closer cooperation with the stable national battery industry, and expert support for the introduction and effective implementation of the new hydrogen technologies. It will create a new generation of experts in this field and will contribute to the promotion of innovative technologies.

Scientific and technical team of the research infrastructure:

Over 20

Impact / benefits:

Draft budget for the 2016-2020 period:

Total: 33.1 million BGN

Revenues:

20 million BGN

Participation in European infrastructure:

- Network communications in the area Central and East European Polymer Network - CEEPEN
- European Internet Centre for Impedance Spectroscopy - EICIS
- EERA Joint Programs "Fuel cells and hydrogen technologies" and "Energy storage". Active participation in this structure aims to stimulate support from the European Commission for fundamental research as well as creating a common European science policy at national level, i.e. assisting in developing a national strategy consistent with both European priorities and the national interests.
- NI ESHE is in synergy with other European programs and infrastructures: Intelligent Cities and Communities, Smart, Green and Intelligent Transport, TEN-T, ECCSEL, EU-SOLARIS.

Year of inclusion in the European infrastructure:

2008

- Methods, equipment and technology for replacing non-renewable raw materials and fossil fuels with renewable ones based on waste biomass
- Hybrid Lithium-ion and Sodium-ion batteries with cheaper electrode materials
- New bioelectrochemical systems and transfer of know-how to potential users
- Algorithm and preparation of digital database for management and coordination of the experiments conducted in a distributed research infrastructure
- Creation and improvement of processes, equipment and technologies for increasing raw material and energy efficiency of existing and newly created enterprises
- Hybrid system (battery/fuel cell) for non-road transport (electric, water)
- Databases for storage and transport of data, images and other information products (Web Library)
- Platform for e-learning
- A device for additional energy independent power supply for transport vehicles
- Technology for integrated waste management (municipal, industrial, hazardous), combined with their use as renewable raw materials and energy source
- Technology for lead batteries to power bicycles and scooters (in Iskra factory - Pazardzhik)
- Technology for hydrogen production through electrolysis or reforming to hydrogen fuel station (Adenchar, Samel)



Eco and energy-efficient technologies

Coordinator:

Technical University – Gabrovo

Location of the infrastructure:

Gabrovo

Bulgarian consortium:

Potential participants in a future consortium are scientific partner organizations such as the Technical University – Sofia, Technical University - Varna, Bulgarian Academy of Sciences, Ruse University “Angel Kanchev”

Field of activity:

Energy

Type of the infrastructure:

Concentrated – focused at one place

Budget project for the period 2016-2020:

Total: 11.9 million BGN

Revenues

0.5 million BGN

Participation in European infrastructure:

Technical University - Gabrovo is a member of the European University Association / EUA. It is a candidate member of the University Energy Cluster, founded in 2015, in order to make Europe-wide mapping of university teaching and research activities in the field of energy.

TU – Gabrovo is a member of IEEE – Bulgaria (a professor at the Technical University of Gabrovo is the first IEEE Senior member from Bulgaria).

The research infrastructure "Eco and energy-saving technologies" will allow integration in research networks and in European technology platforms such as: the European Network for Cooperation in Science and Technology (COST); the scientific networks of the European Science Foundation; ENTREE - European Network for Training and Research in the field of electrical engineering and others.

Year of inclusion in European infrastructure:

2015

Description of the infrastructure:

The research infrastructure focuses on (?) Eco and energy efficient technologies, Mechanical and Instrument Engineering, CAD / CAM / CAE, laser technologies, recognition of materials and environments systems, electronics and automation, electric vehicles, photovoltaic systems, energy efficient lighting systems, solar-thermal, wind and hybrid systems, accredited measurements and tests in the fields of activity.

The research infrastructure will create an innovative environment that will enable the application of “know-how” of TU-Gabrovo and the partner organizations in the creation of eco and energy-saving technologies, machinery and equipment, specialized parts and assemblies, recognition environments and materials systems, laser systems, accredited measurements, testing and expertises.

Scientific and technical team of the research infrastructure:

Over 100

Impact / benefits:

The research and applied research results of the research infrastructure’s work will find application in the industrial enterprises of manufacturing industry sectors covering the thematic area of ISIS “Mechatronics and clean technologies” such as:

engineering, electronics, automation and robotics, precision engineering, electrical engineering, electric, energy and renewable energy sources.

The geographic location of Gabrovo allows for quick access of industrial enterprises from the region and across the country to the research results, including consultations at place, overview of models and prototypes, measurements, testing and expertise. The research infrastructure will enable the production of unique and precision components, parts, assemblies, systems, including replacement parts, and it will be able to perform precise measurements and tests. This will enable companies to not invest in the precision engineering that cannot load technologically. In many cases, the rapid problem solving in production makes companies more competitive.



National infrastructure for research and innovation in agriculture and food

RINA

Coordinator:

Agricultural Academy

Location of the infrastructure:

1080 Sofia

“Schosse Bankya” 7 Str.

Bulgarian consortium:

Consortium members:

1. Agricultural Academy – Coordinator
2. Sofia University
3. Faculty of Biology
4. Genomic Center
5. Bulgarian Agency for Food Safety
6. National Agricultural Scientific Information Complex (NASICo)
7. Central Agricultural Library – CCA
8. Agricultural University Plovdiv
9. Trakia University – Stara Zagora
10. University of Forestry – Sofia

Area of activity:

Health and food.

Type of the infrastructure:

Union of five scientific complexes, which has the necessary modern material-technical base – laboratories, experimental stations, demonstration farms, information systems and databases, etc., as well as the necessary financial resources for conducting numerous trials and tests, the results of which will be deployed in the economy.

Description of the infrastructure:

The National Infrastructure for Research and Innovation in Agriculture and Food – (RINA, Research, Innovation, Agriculture) is a consortium of research institutes, which will upgrade the currently existing scientific and servicing units and will put them together in 5 research complexes in the main thematic areas of agricultural science.

1. Scientific Complex for sustainable soil resources management, water efficiency and defining the environmental risks and threats.
2. Scientific complex for genetic research and plant selection
3. Scientific research complex for food and beverage
4. Scientific research complex for livestock breeding, fisheries and aquacultures
5. Scientific Complex for agricultural information, agricultural management and Rural Development.

RINA aims to create a modern national research infrastructure for achieving significant scientific and applicable results, transfer of knowledge and technology in the fields of agriculture, food and conserving the natural resources. NI will work for integrating modern fundamental and applicable research and educational activities to achieve an economically viable and stable industry in terms of adaptation to climate changes, ensuring the quality of life of the population. The unification of resources of scientific complexes - laboratories and laboratory equipment, genetic resources, existing and newly created information systems and databases, demonstration farms and research capacity in various thematic areas in order to create complex scientific solutions which will in result lead to – from technologies for sustainable production of important economic crops and animals through appropriate high-yielding and quality varieties and certified seeds for them to technologies for processing into a final product with high nutritional and health qualities. Providing an open access to the scientific results, to big data bases and genetic resources by creating e-platforms will reflect on the results of the infrastructure activity. The purpose of the NI RINA is conversion of research infrastructure into a preferred partner for international research and the creation of clusters between science, agriculture and processing business.

Scientific and technical team of the research infrastructure:

Over 500

Impact / benefits:

1. Innovative approaches for obtaining **ecologically clean, functional foods and beverages** of plant and animal origin

Budget project for the period 2016-2020:

Total: 52.5 million BGN

Revenues

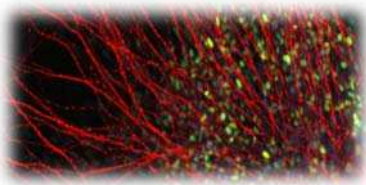
21.8 million BGN

Participation in European infrastructure:

In the Strategic Report on Research Infrastructures – a Roadmap of the European Commission from 2010 as an omission and weakness is given the lack of specialized European research infrastructure for Researches in agriculture that should bring together the key thematic areas. Working group "Research in Agriculture" at SCAR suggests the creation of new research facilities, consisting of integrated infrastructures for research and development, to be designed as a limited number of interdependent infrastructures with modern technological equipment.

At this stage, the proposed research infrastructure is still not involved in such European infrastructure.

2. Forecasts and strategies for **sustainable and rational use of soil resources** of the country
3. Improving the sustainability of the sector by **introducing new Bulgarian varieties and breeds** that are better adapted to the specific soil and climatic conditions.
4. Increasing the variety of **foods for special target groups with chronic diseases** – diabetes, overweight, obesity, cardiovascular diseases
5. Direct importance in **the production of materials, substrates, pure cultures for pharmaceutical industry**
6. Direct significance for development of a competitive niche for the production of a **child and student clinically tested new generation of foods**
7. Distribution of new technologies in the food business and **increasing** its competitiveness in the production of foods and beverages
8. Breeding programs, technologies, forecasts and **strategies for sustainable and rational use of national resources** for the development of livestock
9. **Technology transfer to SMEs of new special foods** with high added value, suitable for realization of expensive food markets
10. Increasing the scientific and creative potential and the experience of staff of the Centre, which will provide continuity of knowledge and experience for the sake of future prosperity. **Transfer of knowledge and increased awareness of farms and agribusiness** on innovation and potential to improve competitiveness
11. Improving the **policy for supporting young scientists**; introducing demonstration and practical modules
12. **Improving the quality and efficiency of services** in support of agribusiness and rural areas
13. The deployment of capacity for research and innovation will provide an opportunity for **new partnerships with businesses and establishing new enterprises** in the agricultural sector
14. **Easier use of agricultural information** and ordering analyzes and developments from state institutions, NGOs and businesses
15. Increasing the accessibility of research results and acceleration of their **practical application**



National university complex for biomedical and applied research

Coordinator:

Medical University – Sofia by the Center for Molecular Medicine (CMM)

Location of the infrastructure:

Medical University – Sofia and Medical University – Plovdiv
<http://mmcbg.org/bg/index.php>

Financial coordinator:

Ministry of Education and Science

Scientific coordinator:

Medical University – Sofia

Consortium members:

- Center for Molecular Medicine;
- Medical Faculty
- Faculty of Pharmacy
- National Genetic Laboratory, Specialized Hospital for Active Treatment in Obstetrics and Gynecology (SHATOG) “Maichin Dom”;
- University Hospital for Active Treatment „Alexandrovska“;
- University Hospital for Active Treatment and Emergency Medicine „Pirogov“;
- University Specialized Hospital for Active Treatment of Endocrinology

Медицински университет – Пловдив:

- Medical Faculty
- Research Center of Immunology
- Center for medical molecular biology research

Medical University - Varna:
Center of Nutrigenomics

Potential partners:

Description of the infrastructure:

The national university complex for biomedical and applied research is a distributed infrastructure, organized as a network of resources (biobank, scientific equipment and research units) of two of the largest medical universities in Bulgaria – Medical University – Sofia and Medical University – Plovdiv.

Scientific and technical team of the research infrastructure:

Over 20

Impact / benefits:

The role of the Consortium is to link the existing resources, achieving critical mass of expertise and technological capability to boost the research in molecular medicine, genetics and epidemiology areas in Bulgaria in the post-genomic era. The aim is to accelerate the transition between fundamental research and the clinical practice in order to improve prevention, diagnosis and treatment of the most significant for the society diseases.

1. Development of the biobanking in Bulgaria and the inclusion of the national infrastructure into the European initiative BBMRI-ERIC
2. Improving the level of biomedical sciences and education by creating, expanding and maintaining **a modern infrastructure for genomics, proteomics, metabolomics and translational researches**
3. Stimulation of applied researches in the field of genomic medicine to create approaches for personalized therapy in order to **improve the diagnosis, prevention and treatment of socially significant diseases** such as cancer, cardiovascular, neuropsychiatric, metabolic and rare genetic diseases
4. **Development of biomedical research**, promotion of the applied knowledge transfer and innovation – This will encourage the establishment of public-private partnership based on providing services in the field of biomedical research and applying of “omics” technologies, will launch and boost the development of spin-off companies based on innovation with undoubted social and economic impact, and will attract partners and customers from research and health organizations from the Balkan region and the EU countries.
5. Enable important issues in science, education and health areas – technological development of the national infrastructure will give the necessary boost to the work of researchers in these biomedicine fields, ensuring the easy access to modern equipment, opportunities for further staff training and the basis

MU-Varna, MU-Pleven, Trakya University and more than 10 institutions

Area of activity

Health and food

Type of the infrastructure:

Distributed

Budget project for the period 2016-2020:

Total: **39.6 million BGN**

Revenues:

1 million BGN

Participation in European infrastructure

Scientific and technical team of the research infrastructure

Year of inclusion in the European infrastructure:

BBMRI – 2011 (memorandum signed)

EATRIS – 2013 an invitation to join

BioImaging – plan to join; no action taken to join

for **building collaborations for knowledge sharing and transfer of scientific results and achievements in practice**

6. **Rare Diseases** – significant social and economic impact, a fact that gave reason for recommendations from the European Commission and the Council of Europe and reflected in the National Program for Rare Diseases of the Republic of Bulgaria and the **National Health Strategy**

This information is available online:

Ministry of Education and Science Republic of Bulgaria

Bulgaria national roadmap for research infrastructure 2017-2023.

Appendix №5: Profile of the RI in the national roadmap in the republic of Bulgaria, pp. 44-64.

Last access: 29 November 2017:

https://ec.europa.eu/research/infrastructures/pdf/roadmaps/bulgaria_national_roadmap_2017_en.pdf