



Enhancing the bilateral S&T Partnership with Ukraine

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Author(s):	Marina Gorokhovatska
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Abstract

This task consists of an inventory of existing international accessible medium and large scale S&T infrastructures in Ukraine, some examples of their introduction in European infrastructures and comparing those ones with the similar research infrastructures in some EU Member States. The aim of this task is to create a background for key stakeholders from science organisations, industry, policy and funding institutions with an appropriate knowledge base.

Introduction

The present analysis was elaborated within BILAT-UKR project of EU FP7 as one of its essential tasks “Knowledge base on S&T infrastructure” within the WP3.

A knowledge base for newly emerging horizontal issues of sustainable cooperation primarily addressed to European and Ukrainian policy makers and decision-makers in implementing institutions includes S&T infrastructures as a significant part.

This task consists of an inventory of existing international accessible medium and large scale S&T infrastructures in Ukraine, some examples of their introduction in European infrastructures and comparing those ones with the similar research infrastructures in some EU Member States. The aim of this task is to create a background for key stakeholders from science organisations, industry, policy and funding institutions with an appropriate knowledge base. The next step has been foreseen in this task will be holding the Infrastructure Workshop and its follow up - a potential joint roadmap for an enhanced trans-national access to scientific infrastructure and upgrading existing (or establishing new) medium and large scale S&T infrastructures.

1. Methodological approach**1.1. Definitions and subject of analysis**

This survey is intended to examine the existence, state and accessibility of research facilities within large scale S&T infrastructures or research infrastructure in Ukraine in dedicated areas of science.

What are research infrastructures? According to European Strategy Forum on Research Infrastructures (ESFRI)¹ they are facilities, resources or services of a unique nature that have been identified by pan-European research communities to conduct top-level activities in all fields.

This definition of research infrastructures, including the associated human resources, covers major equipment or sets of instruments, in addition to knowledge-containing resources such as collections, archives and data banks. Research infrastructures may be “single-sited”, “distributed”, or “virtual” (the service being provided electronically). They often require structured information systems related to data management, enabling information and communication. These include ICT-based infrastructures such as Grid, computing, software and middleware.

We can find the similar definition in the Roadmap for French Research Infrastructure. A Research Infrastructure is a facility developed to conduct major targeted research and to provide successfully a service for one or more large scientific communities. Its cost of construction and operation is such that it justifies a concerted decision-making process at national level, and possibly at a European or international level, with a multi-annual programming. Its governance is centralised and the assessment of its missions and activities is performed by high-level scientific committees. Access to the facility is open to all on the basis of scientific excellence².

¹ Office for Official Publications of the European Communities, 2008, ISBN 978-92-79-10117-5

² Research infrastructures for France. Roadmap 2008

At the same time as a growing number of national research facilities are being replaced by more advanced, technologically complex international facilities in recent years, bilateral and multilateral links between the main national research organisations have been strengthened. The creation of Associated European Laboratories (laboratories ‘without walls’) which combine teams of researchers from several different countries has occurred³.

Due to the wideness of the performing of national and international Research Infrastructures, the special characteristics for identification of research infrastructures and choice of the most important ones for long-term planning and use, several funding sources, high-qualified staff, strong links and even networks were offered⁴.

Thus, all these signs have been taken in consideration to identify the medium and large scale S&T infrastructures in Ukraine and make their inventory as well as showing their accessibility for international cooperation.

The main objectives for establishing, developing and maintaining a large set of Research Infrastructure come from scientific progress and the necessity to extend the knowledge on Earth, Space, physical and chemical processes, state of matter and particles, biological and physiological phenomena. It is also very important to have a clear vision about their impact on life conditions and human development as a whole. That is why the Ukrainian scientific community, being a part of previous USSR wide-developed S&T infrastructure, makes efforts to preserve, support and upgrade the present infrastructure elements as well as establish the new ones and makes them a part of the EU S&T infrastructure.

A possibility to use infrastructure facilities of other countries is an issue of significant importance for most of the researchers, taking in account the fact that Ukraine still feels a lack of relevant devices or proper scientific equipment for carrying out top-level researches in dedicated fields. On the other hand, the possibilities for European researchers to access infrastructure facilities in Ukraine will be shown through the present inventory. The mutual interests are shown by a description of the gaps between similar Research Infrastructures and joint efforts to develop ones.

The inventory of National Programmes on S&T infrastructure support, as well as on different kinds of facilities, resources, and services was done through annual reports of State Academies, Ministries, internet search as well as through personal interviews. Additionally, the special questionnaire was disseminated among research entities and universities (*Annex I*). The questions were organized in different blocks to obtain a complete view of respondents about the state-of-the-art of Ukrainian Research Infrastructures, its capacity and possible development in the standpoint of further EU accessibility and UA-EU cooperation. The interviews were carried out by e-mail, by telephone and on-site. The questionnaire was sent to 50 persons responsible for certain infrastructure maintaining. 23 of them had been filled in and sent back.

As a whole, Internet search and annual reports of considered entities present the general overview about capacities and facilities of the given infrastructure while the questionnaire responses provide a self-estimation and positioning of the responsible persons. Such comprehensive approach allows to cut off those Research Infrastructures that have precedence as a domestic Research Infrastructure, not of medium- or large-scale accessibility. According to the Description of Work we had focused on the fields mentioned as priorities for further cooperation between Ukraine and EU. Highlighting those Ukrainian Research Infrastructures that have safe links with appropriate ones in EU and/or active cooperation with them show the strong S&T fields in Ukraine relevant to cooperation with EU. At the same time, the list will identify the gap in Ukrainian infrastructure landscape comparing with similar ones of European dimension.

1.2. Summary and Analysis of questionnaire on Research Infrastructures

³ http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=actors#top

⁴ Report regarding research infrastructures of Romania, 2007

This survey presents 29 important medium and large scale Ukrainian infrastructure. It provides a description of the work area of the Research Infrastructures included in the survey, the current cooperation activities, as well as a description of research equipment available at mentioned Research Infrastructures facilities. Information on the possibilities for Ukrainian and European researchers to exploit as partners the targeted facilities gives a clear opportunity for cooperation. Some examples demonstrating the best practices of cooperation give the vision for further development national Research Infrastructures as those ones which will have regional or even European importance.

The results of the analysis of responses are the following:

Scientific field of Research Infrastructures: Research Infrastructures in received responds covered 5 thematic priorities (in accordance with ESFRI classification), namely

- ◆ Environmental Sciences
- ◆ Energy
- ◆ Biomedical and Life Sciences
- ◆ Materials Science
- ◆ Computation and Data Treatment

Information about Respondents: age of the respondents varied from 30 to 65, position occupied: Chief scientific specialists, Heads of departments and laboratories, Heads of the institutes, Chief Managers of R&D and educational institutions.

Type of institutions – respondents, which are basis organization for Research Infrastructures: Universities and research institutes; majority of respondents are research institutions of the National Academy of Sciences of Ukraine (70% from the overall quantity), the rest of the respondents are representatives of the leading high educational institutions and research institutes of branch Academies.

Term of Institutions operation: the longest term is 139 years (Institute of Biology of Southern Seas) and 36 years (of National Technical University of Ukraine “KPI”), the shortest term – less then 5 years for one Research Infrastructures, the majority of answers was more then 20 years, 1/3 of all answers – less then 15 years.

Type of main financing sources of the Research Infrastructures (state budget, contracts, commercial activity, other support for Research Infrastructures: all respondents mentioned STATE BUDGET, 60% of respondents also mentioned CONTRACTS, only 10% mentioned GRANTS of National and International organizations.

End-users of Research Infrastructures embrace different groups: Scientists, specialists, representatives of national economic complex of Ukraine (in all of the thematic priorities), in thematic priority on agriculture where selected especially such end-users, as biology plants, livestock breeder plants, regional diagnostics laboratories, research and educational institutes, nature-protecting organisations, business-sector, government officials, medics, patients of medical institutions, pharmacy representatives.

Cooperation with other organizations and Research Infrastructures: 100% of all respondents gave positive answer, mentioning, that such cooperation is going at all levels (bilateral/ multilateral, execution of contracts/cooperation agreements/ international projects).

Accessibility of the Research Infrastructure for other partners, including foreign partners: All participants have mentioned that their Research Infrastructures are open for outside/foreign users. At the same time, only 30% mentioned, that such possibility is stipulated documental.

Participation in international programs:

Affirmative answers – 90 %

Negative answers – 10 %

Type of international cooperation: 100% respondents specified bilateral cooperation, 70% mentioned multilateral cooperation and joint execution of contracts. The main foreign/international partner-organizations appeared to be: UNESCO, International Atomic Energy Agency, OBSEC, UN Environment Programme, EU Programmes, GLOBEC, EUROCEAN, TÜBITAK, Research centers of the Russian Academy of Sciences, International Institute for Applied Systems Analysis (IIASA), Euroatom, NATO, CNRS, European Space Agency (ESA), Euroscience.

Types of cooperation which are of most interest for respondents: All respondents have answered that they are interested in all types of international cooperation: international-bilateral/ multilateral, execution of contracts/cooperation agreements/ international projects. Each respondent has identified the reasons of such interest. They are listed below in order of the importance reduction:

- High prestige of participation in international R&D Projects
- Participation in a collaborative research projects
- Mutual interest in research themes
- Access to special facilities and expertise
- Opportunity to promote domestic research organization at international level

Existence of any strategies of the further development of the given Research Infrastructure: 90% of the respondents answered positively.

Existence of the strategy for the foreign users' involvement: 90% responded "NO"

Concerning the interest of the institution in receiving help from European structures on the involvement of new users for the given research infrastructure, all respondents gave positive answer. At the same time, almost all of them admitted that they don't have any strategy for foreign users' involvement.

2. Organisation of financial support of Ukrainian Research Infrastructures

All existing infrastructures in Ukraine are acting within the jurisdiction of certain ministries/academies/agencies as the Ministry of Education and Science of Ukraine (MESU)⁵, the State Agency for Science, Innovations and Informatization⁶, the National Agency Ministry of Industrial Policy of Ukraine (MIP)⁷, the Ministry of Fuel and Energy of Ukraine (MFEU)⁸, the Ministry of Agrarian Policy of Ukraine (MAPU)⁹, NASU¹⁰ and branch academies as the Academy of Medical Sciences of Ukraine (AMSU)¹¹, Ukrainian Academy of Agriculture (UAA)¹² or under the responsibility of the Government through special programmes. Particularly "The List of sites of special scientific interest, which forms the National acquirement" approved by the Cabinet of the Ministers of Ukraine in 2001, consists in science and research foundations, the collection of archaeological evidences, of historical significance, archives, the set of collections and foundations relating to the biology researches (namely: microbiology and cell banks, repository collections and expositions of plants and animals, nuclear physics installations, spectroscopic complexes, equipment for astronomical researches, bench testing unit etc.) This list is renewed annually and includes for today 117 S&T infrastructures. The annually support through the State Budget of Ukraine is foreseen for their maintaining. The appropriate programmes are:

- Financial support to research infrastructure in different fields including National acquirement

⁵ <http://www.mon.gov.ua>

⁶ <http://www.dknii.gov.ua/>

⁷ <http://industry.gov.ua>

⁸ <http://www.mpe.energy.gov.ua>

⁹ <http://www.minagro.gov.ua/>

¹⁰ <http://nas.gov.ua>

¹¹ <http://www.amnu.gov.ua/>

¹² <http://www.uaan.gov.ua/>

- State Programme “Development of Information&Telecommunication technologies in Education and Science for 2006-2010”
- National Programme for Informatization
- NASU Programme for support research infrastructure 2006-2011

Each ministry / academy responsible for support and development appropriate infrastructures foresees certain expenditure for it in the frame of overall budget costs. Beside the mentioned programs envisage the costs for support activity of numerous subordinator entities.

National Academy of Science of Ukraine hosts 67 **Centres for Shared Use (CShU)** operating in 42 recognized research institutes and centers in 8 cities and regions¹³ that are also an element of research infrastructure. Their objective is to provide top-level experiments in different scientific fields. This became possible due to governmental support in the recent years which allowed purchasing of 124 units of unique facilities and instruments. In fact all of them can be classified as single-sited, placed and acting as additional laboratories/units within research institutions or research centres. The State budget programme plans the annual costs for widening this research equipment park and each hosting institute is responsible for the maintenance of the activity of the mentioned CShUs.

3. Description of Ukrainian Research Infrastructures in chosen fields

The certain scientific fields to describe Research Infrastructures were defined from both questionnaire responses and reasons to provide objective information on the most prospective areas for cooperation between Ukrainian scientists and European scientific community.

The intention to establish, develop and maintain a large set of Research Infrastructure comes from scientific progress and necessity to extend the knowledge on Earth, Space, physical and chemical processes, state of matter and particles, biological and physiological phenomena. It is also very important to have a clear vision about their impact on life conditions and human development as a whole. That's why Ukrainian scientific community being a part of wide-developed S&T infrastructure in previous USSR makes efforts to enhance Research Infrastructures and thus to strengthen the Ukrainian capacities to become an eligible and desired partner for cooperation.

3.1. Environmental Sciences

The Earth and Environmental sciences require a lot of infrastructure elements to provide permanent observation and monitor the state of land, water areas, air etc. They need also large data files for a clear description and forecast of the processes for preserving, maintaining and develop the different parts of Earth. The additional part of given Research Infrastructures relies to the facilities and personnel capacities for gathered data treatment. This part is cross-related to Research Infrastructures in the field of Computation and Data Treatment (see below). For these means the international open standards for discovery, access and processing of geospatial information are implementing in most advances Ukrainian Research Infrastructures. The development and upgrade of the existing Infrastructures occurs currently under different programmes and under auspice of the Ministry of Education and Science of Ukraine (MESU)¹⁴, State Agency for Science, Innovations and Informatization⁶, NASU¹⁵, State Space Agency of Ukraine¹⁶. A lot of facilities as observatories, stations for monitoring operate in different regions of Ukraine and can be classified as distributed infrastructure resources. Ukraine participates actively in the creation and development GEOSS, particularly GEO-UA as Ukrainian segment of mentioned System. The main directions in applying GEO-UA system are disaster monitoring, environmental monitoring and agriculture. Additionally the ground infrastructure which includes satellite control facilities, as well as data reception, processing and distribution provides the effectiveness of the Earth Remote Sensing System. They have a strong

¹³ <http://www.sharedresources.nas.gov.ua/Pages/default.aspx>

¹⁴ <http://www.mon.gov.ua>

⁶ <http://www.dknii.gov.ua/>

¹⁵ <http://nas.gov.ua>

¹⁶ <http://www.nkau.gov.ua/nsau/nkau.nsf/indexE>

links with appropriate Research Infrastructures throughout the Europe as well as with domestic and international ones in the field of Data Treatment. (*Annex 2*)

3.2. Energy

The field of Energy is an important issue in Ukraine as our country feels lack of domestic energy resources and at the same time remains the main transit corridor for Russian gas essential for European States. Due to the high correlation between energy consumption and economic growth, it affects respectively national security and independence. Besides the development of gas-transport and oil-transport equipment and facilities, it is closely coupled with environment preservation. All mentioned challenges demand a high attention on Research Infrastructures in this field. It was shown that the full-scale employment of heat-accumulating regulator users would allow increasing the precision of frequency adjustment in the United Power System of Ukraine to meet the requirement of EU grids. The State target programme of updating Ukrainian municipal heating systems was approved recently that stipulates a 30% reducing of natural gas in heat supply. The problems of safe exploitation of the power stations especially the nuclear ones, preserving any accidents and extending of the equipment long-life stand back-to-back in this line. (*Annex 2*)

3.3. Biomedical and Life Sciences

Ukrainian entities in this field are represented as powerful research centres in the most relevant areas of modern experimental pathology, molecular biology and molecular oncology. The actual needs for investigations were supported in Ukraine during last decades in increasing costs. The special techniques for treatment of plants, tissues, cells are developing at almost all recognized universities and research centres. A special emphasis is put to applied researches and their introduction in practices. From this point of view, establishing networks that link scientists, pharmaceuticals, specialists in agriculture as well as physicians, suppliers of investigated new compounds with possible biological active properties form the complex approach to solve a set of problems dealing with biochemistry, molecular biology, and physiology. Integrating the European community became one of the priorities in this field. As an essential step, the joint programmes were launched between Ukrainian and European research, educational bodies including SMEs. (*Annex 2*)

3.4 Materials Sciences

The basic research for development of many modern processes and technologies such as thin films technologies for microelectronics, energy conservation, chemical production, nano-scale technologies, development of new materials with predetermined properties requires a set of supporting services as well as special equipment, facilities, analytical techniques, at least professional skills of personnel involved in mentioned research. The background of the main important developments and of the new high technologies are understanding of the physical and chemical properties, measurement of parameters of atomic-scale structures, simulation of models predicting the composition of new materials etc. The issues of technical diagnostics and non-destructive testing, automation of processes of welding and related technologies, technologies of surfacing, coating and treatment of surface are of great importance in the nowadays due to well-developed mechanical engineering, shipbuilding, rocketspace complex, aircraft engineering, power generation, mining industry, metallurgy and chemical production, development of pipeline transportation systems, construction industry ect.

The field of materials science in Ukraine is performed by dozens of research institutions and universities as well as included infrastructure, namely design bureaus and pilot plants. Recognizing the importance of this field in industry development the special State Targeted S&T Programme “Nanotechnologies and Nanomaterials” for 2010-2014 years had been approved in 2009 by order of Cabinet of Ministry of Ukraine¹⁷ (*Annex 2*)

¹⁷ http://www.nbu.gov.ua/science/2009_en.pdf

3.4. Computation and Data Treatment

The value of computational science and computer modeling has arisen significantly during the last decade. Development and use of cutting-edge supercomputer systems, GRID-technologies, and access to international network is a significant part of Ukraine's efforts to become a full member of the ERA. Through the implementation of the special programmes, mentioned above, computing capacities of 16 research institutions were pooled, and Ukraine became a member of the world-largest international GRID-project.

There are overall 21 computing clusters, which are located in research and educational institutions in Ukraine.

The provision of permanent access to research data, software tools, on-line library resources and keep the modern research level of establishing and renewing networks are crucial tasks of S&T infrastructure development for Ukrainian stakeholders. Particularly GRID infrastructure makes possible the integrated and operational use of multisource data for different application domains including meteorological and climate modeling, rational land use, environmental monitoring, forecasting of natural and technological disasters. The mentioned capabilities are exploited in Ukraine successfully within special programme¹⁸ (*Annex 2*)

4. Cases of Best Practices

In the field of Environmental Sciences the following examples of mutual accessibility to Research Infrastructures can be presented.

- Wide cooperation of Academic Vernadsky Station acting within **National Antarctic Scientific Center** with recognized international organisation. 16 projects from Ukraine with participation/under coordination of foreign partners were executed within the framework of III International Polar Year 2007-2008.
- **Scientific Centre for Aerospace Research of the Earth of the NASU (CASRE)** and **Scientific Institute for Economy and Forecasting of the NASU** is involved in cooperation with the CENTRAL EUROPE project HABIT-CHANGE – “Adaptive management of climate-induced changes of habitat diversity in protected areas”-, as well as with RISSAC (Research Institute for Soil Sciences and Agricultural Chemistry of the Hungarian Academy of Sciences). It is active within the joint projects ““Forestry” and “Land Use Cover” of International Institute for Applied Systems Analysis (IIASA)¹⁹ under the special Agreement IIASA and Committee for Systems Analysis at Presidium of National Academy of Sciences of Ukraine - Ukrainian NMO. IIASA's researchers investigate the critical issues of global environmental, economic, technological, and social change that we face in the twenty-first century. The space technology of forecasting and monitoring of emissions changes as well as CO₂ absorption by vegetation has been used while conducting comparative data analysis on changes of greenhouse gases from satellites ENVISAT (ESA) and Aqua (NASA).
- In the field of Astronomy, Astroparticles various programs of observations of solar system objects are carried out jointly by **The International Center for Astronomical, Medical and Ecological Research (ICAMER)**²⁰ with the Max Plank Institute fuer Aeronomie (Germany). The most prominent results obtained within those programs are the observations of the ejection of a gaseous cloud from the Hale-Bopp comet (August 1996), the detection of a water ions tail in the Wirtanen comet (March 1997), as well as the monitoring of decomposition process in the C/1999 S4 (Linear) comet in July 2000. The results of photometry and astrometry of Jupiter's satellites were used in planning the Rosetta and Cassini missions to Solar system objects. Due to international

¹⁸ <http://uaq.bitp.kiev.ua>

¹⁹ <http://www.iiasa.ac.at/>

²⁰ www.mao.kiev.ua/icamer

cooperation, significant results were obtained in the field of space research. The unique mosaic echelle-spectrometer of extra-high (up to 500,000) resolution in the coude focus of the 2-m telescope was designed and put into operation. In particular, it is used for investigation Sun-like stars and searching for carbon chains in interstellar clouds.

- In the field of Computation and Data Treatment, **the Ukrainian Branch of World Data Center** operates in the structure of ESC "IASA" NTU "KPI" on the basis of global data centers of our two East European countries (Russia and Ukraine) as regional cluster of global system data. It was an important step towards creating a unified information space for gathering, processing, exchange and use of data for research. WDC acts as a part of World Data Center System²¹ of the International Council of Science (ICSU), and acts according to the “WDC System Guide”.

Among the basic tasks of WDC-Ukraine there are the collection, handling and storage of scientific data and giving access to it for usage both in research and educational process. It includes contemporary tutoring technologies and resources of e-libraries and archives; remote access to own information resources for the wide circle of scientists from the universities and science institutions of Ukraine. Together with partners from and abroad Ukraine, the World Data Center conducts a number of projects. For example, the first stage of implementation, the automated storage of geophysical data elements with publications seismic data has been delivered, recommendations on upgrading transmission systems and storage of seismic data is being developed now, the procedure of entry to international organizations IRIS (Incorporated Research Institutions for Seismology) and ORFEUS (Observatories and Research Facilities for EUropean Seismology) has been started. Joint project with CASRE (p.6 of *Annex 2, Environmental Sciences*) is running on for elaborating the complete set of models for solving topical problems of remote sensing and their subsequent implementation on the basis of computing power WDC. WDC acts as a partner in maintaining and supporting the electronic version of the National Atlas of Ukraine (the main developer is Institute of Geography of the NASU and LTD "Intelligent Systems – GEO”) on the technical basis of WDC. Joint research and educational laboratory of spatial (geographic) database and geoinformatic systems applications is at the stage of establishment.

- **The Ukrainian Research & Academic Network (URAN)** connects about 500,000 users from approximately 100 universities and scientific research institutes in 18 regions of Ukraine. From 2008 the link to GÉANT2 occurred as part of an incentive by the Cabinet of Ministers of Ukraine called ‘Information and Communication Technologies in Education and Science’ for the development of scientific telecommunications networks.

The 100 Mbps connection procured by URAN terminate in Warsaw, where it is being carried on PSNC, the Polish NREN, following an exclusive agreement with the Ukrainian NREN, URAN. A high speed dark fibre route is provided by PSNC between the cities of Warsaw and Poznan in Poland, allowing a dedicated connection to the GÉANT2 router in Poznan to be accessed by URAN in Kiev. This link provides a big improvement in available bandwidth enabling a new quality of collaboration between Ukrainian and associated European academia. The link provides access to scientific and information resources such as electronic libraries, databases, search engines and supercomputing resources to facilitate joint research activities in areas such as climate change, life sciences, elementary particle physics, grid computing, radio astronomy and sustainable development.

- In the field of Material Sciences, an active long-term cooperation is carried out between a set of Ukrainian research institutes and Universities and **International Laboratory of High Magnetic Fields and Low Temperatures (IL)**²² that operates in Wroclaw, Poland. At present, there are four ordinary members of IL: Bulgarian, Polish, Russian and Ukrainian Academies of Science (hereafter referred to as BAS, PAS, RAS and NASU) and, as associate members, scientific institutions from England, Germany and Moldova. The scientists from other countries can also use the Laboratory facilities. The Laboratory owns various types of high magnetic field installations: the resistive

²¹ <http://www.ngdc.noaa.gov/wdc/wdcmain.html>

²² <http://alpha.ml.pan.wroc.pl>

Bittertype magnet (BM), superconducting magnets (SCM) and pulse-magnets with mid-pulse duration (MPM) and short-pulse duration (SPM) and offers the measurements of the magnetic, transport and some optical properties, and magnetostriction both in permanent magnetic fields (Bitter and superconducting coils) and in quasi-pulsed magnetic field. It is financed now by the Polish Academy of Sciences, Russian Academy of Sciences, National Academy of Sciences of Ukraine, and Bulgarian Academy of Sciences as the main contributors.

5. Potential EU Research Infrastructures that would be complemented by Ukrainian Ris

In spite of mentioned cases of best practices of international cooperation of Ukrainian Research Infrastructures, the real involvement in those European Research Infrastructures appeared to be rather poor. Most of them concern bilateral cooperation. So we asked the people in charge of the institutions presented in the *Annex 2* in dedicated fields, about their possibility to complement with their unique facilities or capacities or techniques the Research Infrastructures of European dimension.

The answers we received show first of all that there is lack of information in Ukraine about a variety of EU Research Infrastructures, about ESFRI as a whole and as a room for discussion. Ukrainian researchers also have little knowledge about possibilities to be involved in the process of developing of dedicated Research Infrastructures. The positive answers showed the willingness to cooperate with some of the examined EU Research Infrastructures that were pointed out in Research infrastructures for France. The Roadmap 2008² and Report regarding research infrastructures of Romania, 2007⁴ and to submit own capacities and facilities for joint development.

Euro Argo is the European component of a world wide in situ global ocean observing system, based on autonomous profiling floats. The Argo objective is to develop a global array of floats (spaced 300 km apart, on average) throughout the ice-free areas of the deep ocean. Find more information on <http://www.euro-argo.eu/About-Euro-Argo/>.

- The Marine Hydrophysical Institute of the NASU (MHI) and Ukrainian Hydrometeorological Institute (UHMI) (p.1, 2, 3, of *Annex 2*, Environmental Sciences) would be a part of mentioned Research Infrastructure and complement its activity using their facilities and experience.

EMBRC – European Marine Biological Center as distributed pan-European infrastructure build on and expand on the synergies developed in FP6 and FP7 between the partners through networks of excellence and Infrastructure initiatives (See Marine Genomics Europe and MarBEF, EurOceans, ASSEMBLE & ESFRI Life Watch). Find more information on <http://www.embrc.eu/>.

- The Institute of Biology of Southern Seas of the NASU (IBSS) (point 2 of *Annex 2*, Environmental Sciences) would be a part of mentioned Research Infrastructure and complement its activity using their facilities such as multifunctional Oceanographic research vessel conducting the broad spectrum of works (stern trawling with pelagic and demersal trawls) and experience in marine investigations confirmed by participation in a large variety of international projects.

INSTRUCT (“Integrated Structural Biology Infrastructure for Europe” <http://www.instruct-fp7.eu/>) with its core Center G: Max Planck Institute of Biophysics, expected to stimulate the development of innovative technologies by European companies and their effective uptake by both academic and industrial researchers in Europe.

- R.E.Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology of the NAS of Ukraine (point 6 of *Annex 2*, Biomedical and Life Sciences) regards the possibility and actuality their participation in INSTRUCT Research Infrastructure as the owner of the Bank of

Cell Lines from Human and Animal Tissue, the famous in Ukraine official nonprofit resource dedicated to the collection, cryopreservation and distribution of human and animal cells cultures and transplantable tumors. The collection of this unique Bank of Cell Lines includes more than 30000 samples of standard and original cell lines established from normal and tumor tissues of human and animals of various species (rat, mouse, hamster, monkey, pig, dog, cow, sheep, bat, mink, e. c.). More than 200 cell lines and tumor strains can be found in the catalogue . Creating a sensitive cell system for testing anticancer drugs, toxic components of nanocomposites, salts of various metals and other toxic environmental agents is foreseen in the frame of developing of the Cell Bank.

BBMRI – Biobanking and Biomolecular Resources Research Infrastructure

This infrastructure already manage over 10 million samples and declare the goals to increase this number, to improve quality, to reduce fragmentation and to extend the reach of European researchers. It would realise more fully the potential of European biomedical research.

BBMRI will sustainably secure access to biological resources required for health-related research and development intended to improve the prevention, diagnosis and treatment of disease and to promote the health of the citizens of Europe. You can find more information on <http://www.bbmri.eu/>.

- R.E.Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology of the NASU (point 6 of *Annex 2*, Biomedical and Life Sciences) and Bogomoletz Institute of Physiology of the NASU (p.2 of *Annex 2*, Biomedical and Life Sciences) with International Center of Molecular Physiology affiliated with the last one with Unique Banks of Cell Lines (different in each institutes) may be considered as a partner or as element of above mentioned BBMRI in aspect of Biobank. These Ukrainian Research Infrastructures could complement the European one by deliver those resources. Also There is a possibility to create a collaborative network like BBMRI Nordic: A collaborative network between National Biobanking Infrastructures in the Nordic Countries . See <http://www.bbmri.se/en/BBMRI-Norden/>

IRAM is an international research institute for radio astronomy. Its overall objective is to explore the universe and to study its origins and evolution. More information can be found on <http://www.iram-institute.org/>.

- The Institute of Radio Astronomy (IRA) of the National Academy of Sciences of Ukraine (point 7 of *Annex 2*, Astronomy, Astroparticles) is leading research establishment exploring space with radio astronomy and radio physics means. Apart from the basic research the institute carries out the applied high-tech R&Ds and designs the oscillation circuits and radio systems of varied applications in microwave, millimeter and submillimeter wavelengths. Using its facilities and experience especially in design of unique equipment it evidently may be considered as a part of IRAM as EU Research Infrastructure.
- The complex of the unique telescopes: the Interdepartmental **CShU** radiotelescope RT-22; the G.A. Shain telescope, 2,6m-sized; the VST-1 tower solar telescope; the GT-48gamma-ray telescope; the AZT-11 automatic reflector telescope; the “Simeiz-1873” satellite ranging system forming all together the equipment of the Crimean astrophysical observatory (point 2 of *Annex 2*, Astronomy, Astroparticles); experience of 120 researchers in at least such programmes as International Solar Service programs, ASTRON mission, SPECTRUM-UV project allow to regard this Research Infrastructure as an important potential participant and permanent partner of **IRAM**.

EISCAT_3D - a new opportunity for ionospheric research. More information on http://www.cwc.oulu.fi/ursi2010/papers/P1_Turunen.pdf

The above mentioned Institute of Radio Astronomy (IRA) of the National Academy of Sciences of Ukraine (point 7 of *Annex 2*, Astronomy, Astroparticles) represents Ukraine according to appropriate Agreement from 2009 as a permanent member. Joint use of unique equipment provided by IRA allows considering it as a part of developing EISCAT_3D EU infrastructure just now.

Conclusions

The present inventory and analysis of existing Research Infrastructures in Ukraine have found out that in a whole there are no appropriate coordination between Ukrainian and EU's Research Infrastructures practically in all mentioned fields. It is worth to underline that there are few special programmes, on a majority of European states which provide development of national Research Infrastructures. As random national roadmaps have been elaborated only recently by several European countries as a response to ESFRI activities, the comparison of similar Research Infrastructures appeared non-correct due to quite different S&T structures. This fact leads to the conclusion that exchange and coordination of the scientific knowledge and expertise is not enough yet.

Additional analysis shows that the most developed Ukrainian Research Infrastructures that have a permanent and sustainable links or even present Research Infrastructures of EU-dimension belong to the fields of Environment Sciences, including Space and Astronomy, Material Sciences and Biomedical and Life Sciences. At the same time there is lack of contribution to as well as access of international customers and users to Ukrainian infrastructures in the field of Energy, Social and Humanities, Computation and Data Treatment.

Nevertheless, the inventory shows that Ukrainian capacities in Research Infrastructures exist in wider areas and scales than they are represented in Europe. Particularly only one of them is placed in the database at the European Portal on Research Infrastructures' Services²³. Better promotion of Ukrainian Research Infrastructures will encourage the certain institutions to build up engaging of the third countries and regions in competitive research and innovation performance. The Regional Partner Facilities could therefore contribute to a more balanced development of the European Research Area, and to 'circulation of knowledge' throughout Europe, thus reducing the risk of 'brain drain'. On the other hand Europe will also need to reflect on how to participate in research infrastructures of global relevance. The benefit of such joint approach would allow for Europe to act as a host where technically advanced infrastructures can develop and involve European industries in the construction, by in-kind contributions or appropriate procurements, also in the cases when this site is outside EU²⁴.

²³ <http://www.riportal.eu/public/index>

²⁴ European Roadmap for Research Infrastructures, Implementation Report, Luxembourg Office for Official Publications of the European Communities, 2009



Enhancing the bilateral S&T Partnership with Ukraine

Deliverable Title	D3.2 – Inventory of existing and upcoming international accessible medium and large scale S&T infrastructure in the Ukraine <u>c) Annex 1 : Questionnaire</u>
Deliverable Lead:	NASU
Related Work- package:	WP3 – Knowledge base for emerging horizontal issues of sustainable cooperation
Related Task:	Task 3.2 – Knowledge base on S&T infrastructure
Author(s):	Marina Gorokhovatska
Dissemination level:	Public
Due submission date:	31/08/2009
Actual submission:	22/03/2011
Project Number	FP7-222712
Instrument:	Support Action
Start date of Project:	01/09/2008
Duration:	36 months

Project funded by the European Commission under the International Cooperation activity of the Capacities Programme of the 7th European Framework Programme for RTD (FP7).

Annex 1

**Questionnaire for the overview
of the Research Infrastructure of Ukraine**

Information on the contact person of the Institution	First name, Last Name, Surname,	
	Position	
	Address of the Institution	
	Phone	
	E-mail	
Information on the elements of Research infrastructure (RI) (select necessary answer)	Branch(es) of science, that can be served by this RI	
	• Type of the RI (Local, Geographically allocated, virtual)	
	• Term of its operation. For how many years has it been already working (less then 5 years, less then 15 years, less then 20 years)?	
General information on the given RI	What are the main aims of the RI functioning?	
	Who is the end-user of the information\ services\material values of the given RI (scientists, students, entrepreneurial, others (determine))?	
	Directions of researches of the given RI, in accordance with European classification: -physics and technical sciences; -materials science; -environmental sciences; -energy sciences; -biology and medicine; - social and humanitarian sciences	
	Is there any cooperation with other organizations or similar RIs?	
	What are the main financing sources of the RI (state budget, contracts, commercial activity, other (determine))?	

	Do you receive support (or feel interest) from institutions beyond subordination structure (yes, no)?	
	Is there any strategy of the further development of the given RI? If yes, then, please, note briefly its essence.	
Accessibility of the RI for the foreign partners	Is this RI open for outside/foreign user?	
	Is such a possibility stipulated documentary?	
	Who are the main foreign partners?	
	What are the conditions for receiving access to this RI for the outside users?	
	Is there any web-site explaining the possibilities of infrastructure use and access to it? Please provide its address.	
	How far is this RI open for international cooperation (bilateral/ multilateral, execution of contracts/cooperation agreements/ international projects) ?	
	Name countries\ groups of countries, whose scientists are using this RI most of all	
	Give examples of successful application of the given RI in the international cooperation.	
	Is there any strategy for the foreign users involvement?	

	Is your institution interested in receiving help from European structures on the involvement of new users for the given RI?	
	In what type of cooperation are you interested in (intradepartmental, interdepartmental, international-bilateral/ multilateral, execution of contracts/cooperation agreements/ international projects?) ?	



Enhancing the bilateral S&T Partnership with Ukraine

Deliverable Title	D3.2 – Inventory of existing and upcoming international accessible medium and large scale S&T infrastructure in the Ukraine <u>b) Annex 2 - Inventory of Ukrainian medium-scale Research Infrastructures</u>
Deliverable Lead:	NASU
Related Work-package:	WP3 – Knowledge base for emerging horizontal issues of sustainable cooperation
Related Task:	Task 3.2 – Knowledge base on S&T infrastructure
Author(s):	Marina Gorokhovatska
Dissemination level:	Public
Due submission date:	31/08/2009
Actual submission:	22/03/2011
Project Number	FP7-222712
Instrument:	Support Action
Start date of Project:	01/09/2008
Duration:	36 months

Project funded by the European Commission under the International Cooperation activity of the Capacities Programme of the 7th European Framework Programme for RTD (FP7).

Abstract

This task consists of an inventory of existing international accessible medium and large scale S&T infrastructures in Ukraine, some examples of their introduction in European infrastructures and comparing those ones with the similar research infrastructures in some EU Member States. The aim of this task is to create a background for key stakeholders from science organisations, industry, policy and funding institutions with an appropriate knowledge base.

ENVIRONMENTAL SCIENCES

	Name, Main institution, URL	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
1	Department of Marine Environmental Information Technologies http://www.mhi.iuf.net/depts/mistdpt.htm under Marine Hydrophysical Institute of the NASU http://www.ocean.nodc.org.ua/	10 specialists	Oceanic and marine data center included in Research Infrastructures Database on the European Portal	State budget, International projects funded by EC, UNESCO, NATO ect.	Free by request	Cooperation agreements and partnerships with 1. Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER/SISMER), Brest, France 2. Marine Information Service(MARIS), Leidschendam, Netherlands
2	Institute of Biology of Southern Seas of the NASU (IBSS) http://ibss.org.ua/Default.aspx?tabid=169	13 scientific departments; 4 research departments at Odessa branch; research staff of 168 specialists (18 Doctors of Science, 109 PhD, 3 Full Members and 3 Corresponding Members of the NASU)	<ul style="list-style-type: none"> • Institutional Repository or the long-term preservation of digital resources; • The IODE e-Repository Service: Research literature from Marine Science and Oceanographic Research Centres; • R/V PROFESSOR VODYANITSKIY • Aquarium-Museum, • Scientific library, • Collection of hydrobionts 	Project Ocean-Ukraine, bilateral Flanders-Bulgaria Project SIBEMA , FP 6, FP 7 EC projects	Free access by request/ joint projects	CNRS(France), MPIL (Germany), EAWAG (Switzerland), JRC (European Union), Bergen University (Norway) etc.
3	Ukrainian Hydrometeorological Institute (UHMI) http://www.uhmi.org.ua/en/index.php	10 research departments; 2 site-separated units; 2 field hydrometeorological bases;	"George Gotovchiz" motor ship; speed-boat, means and devices for agroecological soil parameters measuring	State budget, services, International projects, contracts on design of new advanced devices	Free by requests and agreements	EUMETCast Network, polar orbital satellites NOAA and METOP

	Name, Main institution, URL	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
4	National Antarctic Scientific Center http://www.uac.gov.ua/en/main	11 departments including Academic Vernadsky Station, a Base Station № 89063 in the WMO network for climate monitoring	Set of equipment for geomagnetic measurements, ionosonde modified for the digital registration of ionograms, Dobson 123 spectrophotometer, Tide gauge, Actinometrical equipment	State budget, International projects	N/A	World Meteorological Organization (WMO), International Service of Geomagnetic Indices (ISGI), Council of Managers of National Antarctic Programs (COMNAP), Scientific Committee on Antarctic Research (SCAR), Ocean Biogeographic Information System (OBIS)
5	Institute of Geophysics of the NASU http://www.igph.kiev.ua/about1.html	Staff of 479 employees, among them 1 full Member and 1 Corr.Member of the NASU, 23 DSc and 55 PhD	<ul style="list-style-type: none"> • Department of Explosion Geodynamics; • Poltava gravimetric Observatory; • Carpathian Division; • Scientific Library; • 4 testing-methodical parties; • Geophysical Expedition; • digital seismologic station “Kiev” • CShU Magnetometric devices: spin-magnetometer JR-6 with supply MFK1-B, AGICO 	State budget, International projects funded by EC, UNESCO, NATO ect	Open access through joint projects and cooperation agreements	IRIS consortium (Incorporated Research Institutions for Seismology), projects EUROPROBE, GEORIFT, EUROBRIDGE, PANCAPDI, DOBRE, INTAS, NARS-DEEP, IRIS, SCAR (Antarctic studies) et al.
6	Center of Aerospace Research the Earth (CASRE) http://casre.info/ operates under Institute of Geological Sciences of the NASU	Staff is above 100 employees, including 1 Full Members and 1 Correspondent	CShU: Set of equipment for spectroradiometric measuring	State budget, International projects funded by EC, UNESCO, NATO ect	Open access through joint projects and cooperation agreements	European Space Agency (ESA); space agencies of Germany (DLR); France (CNES); International Institute for Applied Systems Analysis (IIASA); Hungarian Geological Survey, Geological Institute of Hungary

	Name, Main institution, URL	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
		Member of the NASU, 7 D.Sc. and 23 PhD				(MAFI); University of Warsaw, Faculty of Geography and Regional Studies (WGiSR)
7	Main astronomical Observatory of the NASU http://www.mao.kiev.ua/	8 Research Departments include 17 DSc and 54 PhD among the 1 Full Member and 2 Correspondent Members of the NASU	<ul style="list-style-type: none"> • Ozonometer TE 49i • Weather Transmitter WXT510 (Vaisala) http://www.mao.kiev.ua/meteo/ • Secondary Cosmic Rays Monitors http://www.mao.kiev.ua/lao/spacerays/ • Sun Photometer SIMEL http://aeronet.gsfc.nasa.gov/new_web/photo_db/Kyiv.html • DOBSON Spectrometer • photometer #040 • IR Fourier spectrometer 	State budget, International projects funded by CRDF, STCU, EC	Free by request/ joint projects	Cooperation agreements and partnerships with 1. Universit� des Sciences et Technologies de Lille Laboratoire d'Optique Atmospherique, France 2. WMO, GAW 3. WOUDC, Canada 4. KNMI, Netherlands
8	International Center for Astronomical, Medical and Ecological Research http://www.terskol.com/	Departments in Ukraine and Russia; total 40 researchers in the field of astronomy, Changed Project Teams	Astronomical facilities at the high-altitude observatory Terskol in the North Caucasus: -2-m RCC telescope (with high-resolution echelle spectrometer and multi-mode cassegrain spectrometer) -large horizontal solar telescope, -60-cm and 80-cm telescopes, -small telescopes Celestron and Meade; -several specified photometers	State budgets of Ukraine and Russia, international projects	Free by request/ joint projects	Whole Earth Telescope (WET) http://www.physics.udel.edu/~darc/wet/ ASTRONET Network www.astronet-eu.org 1 IAU Minor Planet Center http://www.minorplanetcenter.org/iau/mpc.html

	Name, Main institution, URL	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
9	<u>National University of Life and Environmental Sciences of Ukraine (NUBiP)</u> http://nubip.edu.ua/en	11 Education and Research Institutes within basic institution and 11 separated subdivisions; 26 Dr., 532 postgraduates, more than 50 workers of research and scientific stations and education-research farms perform the researches	Information and educational portal http://moodle.nauu.kiev.ua/ Institutional Repository http://elibrary.nubip.edu.ua/ Thematic Digital Library http://elibrary.nubip.edu.ua Harmonised (supplemented by experts' commentary of NUBiP of Ukraine and links to internal and external resources) standards http://agrowiki.nubip.edu.ua	Scientific researches by the budget, contractual and initiative	Open access through joint projects and cooperation agreements	Global Consortium of Higher Education and Research for Agriculture (GCHERA), GEO JECM , JRC EC

ENERGY

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
1	A.N. Podgorny Institute for Mechanical Engineering Problems of the National Academy of Sciences of Ukraine http://www.ipmach.kharkov.ua/English/inen.htm	Staff of 344 specialists (133 researchers, including one Member and three Corresponding Members of the NAS of Ukraine; 27 DSci persons and 74 PhD)	<ul style="list-style-type: none"> • A special Design-and-Engineering Bureau; • pilot production facility; • Academic Scientific-and-Educational Complex (ASEC) for open-end training of researchers 	State budget, contracts from industry partners, international projects	Open for researchers, students, industrial entities by request, International edition "Journal of Mechanical Engineering".	Westinghouse Electric Company, LLC Skoda (Plsen), Czech Republic Alstom Power Systems, Poland Gas de France Gfe Metalle und Materialien GMBH, Germany Gfe Gesellschaft fur Elektrometallurgie MBH, Germany Technical University of Hamburg, Germany Technical University of Berlin, Germany University of Hannover, Germany
2	Institute of High-Energy Physic and Nuclear Physics under National Science Center Kharkov Institute of Physics and Technology http://www.kipt.kharkov.ua/en/ihepnp.html	Staff of high – qualified specialists including 1 Member of the NAS of Ukraine	Procedures and equipment for the analysis of structure and composition of substances The large electron linear accelerator (LUE-2000); a pilot batch of accelerating installations "Sokol" designed for nuclear microanalysis is introduced into industry.	State budget, contracts from industry partners, international projects	Half-open access, Journal - "Problems of Atomic Science and Technology"	CERN (ALICE, CMS, LHC-b, JLAB(CEBAF)
3	Institute of Nuclear Physics	Research staff of more than 400	Accelerators: Isochronous Cyclotron U-	State budget, contracts	Open access to "Scientific Papers of	US DOE National Laboratories, relevant IAEA divisions, the

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
	http://www.kinr.kiev.ua/index_en.html	employers including 47 D.Sc., 147 PhD, 1 Member of the NAS of Ukraine	240, 10 MV Electrostatic Tandem Accelerator; Cyclotron U-120, Research Reactor WWR-M, Physical Protection, Accounting and Control Training Centre, Ukrainian Nuclear Data Center (UKRNDC)	from industry partners, international projects	the Institute for Nuclear Research (<i>journal Nuclear Physics and Atomic Energy</i>), Access to the Training courses, workshops and seminars for specialists in nuclear safety and nuclear material physical protection, control and accounting from Central European countries, the NIS, and the Baltic states	Swedish Radiation Safety Authority, International Nuclear Information System (INIS); CSISRS (EXFOR) Nuclear Reaction Data Centers, DESY, CERN, GSI

BIOMEDICAL AND LIFE SCIENCES

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar International Research Infrastructures
1	Institute of Molecular Biology and Genetics of the NASU http://www.imbg.org.ua/main/index_e.htm	Staff of 433 specialists (278 researchers, including 30 Dr.Sc and 138 PhD, 2 Members of NASU and 8 Corresponding Members of NASU). Annually 35 PhD students work at the Institute.	<ul style="list-style-type: none"> • Device for RNA/DNA oligonucleotides synthesis: AKTA oligopilot 10, Amersham Biosciences, Sorvall WX 80 Ultra, • Thermo Electron, Germany: Analysis of proteins, complexes • Ukrainian Bioinformatics Portal (BioUA) http://www.bioua.org.ua/index.php 	State budget, contracts from industry partners, international projects funded by STCU, EC, INTAS, NATO, UNESCO, CRDF	Free access for users from NASU and in frame of joint projects. Access for outer users according to direct agreements/ inter-academy agreements. Journals: "Biopolymers and cell" "Ukrainica Bioorganica Acta" "Bulletin of Ukrainian Society of Geneticists and Selectionists"	<ul style="list-style-type: none"> • RECOOP HST, • EAST-NMR network • European consortium CORNEAGENE in the study of corneal dystrophies • European consortium CHERISH FP7 EC.
2	Bogomoletz Institute of Physiology of the NASU http://wiki.biph.kiev.ua/en/Main_Page	Staff of 239 researchers (including 40 Dr.Sc. and 119 PhD, 4 Full members and 1 Correspondent member of the NASU); Chair of Moscow Physical-Technological Institute (Kiev Branch) - Postgraduate Study (annually about 40 PhD students)	<ul style="list-style-type: none"> • Unique Bank of Cell Lines; • CShU Equipment for cell biophysics and physiology: Confocal microscope FV1000-BX61WI Olympus, Japan, FluoView FV1000 scan head with SIMS, Lasers, 7500 Fast Real-Time PCR Systems • International Center of Molecular Physiology http://www.biph.kiev.ua/center/ ; 	State budget, international projects funded by STCU, INTAS, NATO, CRDF	Free access for users from NASU and in frame of joint projects <ul style="list-style-type: none"> • Journals "Fiziologichnyj journal"(Physiological Journal), "Neurophysiology", • Biomedical Ethics Committee 	European Brain and Behavior Society (EBBS), Federation of European Neuroscience Societies (FENS); International Union of Physiological Sciences (IUPS)

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar International Research Infrastructures
			<ul style="list-style-type: none"> Chair of UNESCO 			
3	A.Palladin Institute of Biochemistry of the NASU http://www.biochemistry.org.ua/index.php?lang=en	Staff of 367 persons, including 137 researchers, 4 full members and 3 corresponding members of the NASU, 23 Dr. Sci. and 82 Ph.D.	CShU: Devices Flow Cytofluorometer COULTER® EPICSTM XLTM; Mass-Spectrometer Voyager-DE TM PRO Biospectrometry TM Workstation	State budget, international projects funded by FP7, STCU, INTAS, NATO, CRDF	Free access for users from NASU and in frame of joint projects Ukrainian biochemical journal; Journal of Biotechnology Ukrainian biochemical society	Ukrainian biochemical society (UBS) is a member of Federation of European Biochemical societies (FEBS) and associated member of International Union of Biochemistry and Molecular Biology (IUBMB)
4	Institute of Food Biotechnology and Genomics of the NASU http://ifbg.org.ua	Research staff consists of 3 Dr. Sc. and 38 PhD	CShU Hentest equipped by 3400 DNA Synthesizer, Fast Real-Time PCR System iCycler iQ, (BIO-RAD), Confocal scanning microscope LSM 510 META, Genetic analyzer ABI RRISM 3130, Collection of microorganisms strains and plant lines for agricultural biotechnologies	State budget, international projects funded by STCU, INTAS, NATO	Open access within agreements and joint projects Journal "Cytology and genetics" (Ukrainian&English version)	Black Sea Biotechnology Association (BSBA) EPSO
6	R.E.Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology of the NAS of Ukraine www.onconet.kiev.ua	Research staff accounts 181 employees, including 1 Member of the NAS of Ukraine, 23 DSc and 72 PhD	<ul style="list-style-type: none"> Expertise centre for investigation of carcinogenic factors and molecular factors of tumor growth. Bank of cell lines - unique and the biggest in Ukraine collection of more 	State budget, international projects funded by STCU, INTAS, NATO, EC,	Open access within agreement, joint projects, training; international journals "Experimental Oncology" "Oncology Ukraine",	European Institute of Ecology and Cancer EINEC; VISBY programme (Sweden); Organization of European Cancer

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar International Research Infrastructures
			<p>than 30000 samples of biological material: cell lines, tumors, hybridomas and others, essential for different practical and fundamental research projects.</p> <ul style="list-style-type: none"> • Research and experimental facility (vivarium) - which possess more than 6500 laboratory animals (mice C57Bl, Balb/c, C3H, CBA, DBA-2, Wistar rats, chinchilla rabbits) • CShU Molecular oncology and biotechnology: 15 types of equipment • Ukrainian-German Research and Education Center (REC) of nanobiotechnology 	UICC (Switzerland), Royal Netherlands Embassy in Ukraine		Institutes (OEI-EEIG) as associated member
7	The Institute for Problems of Cryobiology & Cryomedicine http://www.cryo.org.ua	Staff consists of 337 people, among them 20 Dr.Sc., 138 PhD, including 1 Full Member of the NASU; UNESCO Chair in Cryobiology, Interdepartmental Scientific Center for Cryobiology and	<ul style="list-style-type: none"> • Special Designing and Technical Bureau with Experimental Unit, • Flow cytofluorimeter FACSCalibur, BD, USA • Confocal microscope LSM META 510 (Carl Zeiss, Germany) 	State budget, Self-funding activity of Interdepartmental Scientific Center for Cryobiology and Cryomedicine	Cooperative programs, scientific, R&D agreements, joint projects, training, “Problems at Cryobiology journal”	Close contacts with the scientists of the Ukraine, CIS, and foreign cryobiological centers in the USA, UK, Germany, India, Czech Republic, Slovakia, Bulgaria, Belgium, Netherlands, Israel.

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar International Research Infrastructures
		Cryomedicine,				
8	Institute of Cell Biology http://www.cellbiol.lviv.ua/index.html	Research staff consists of 100 employees including 9 Dr.Sc. and 23 PhD. 2 coresponding members of NASU	Large collection of yeast mutants and cancer cell lines.	State budget, international and domestic competitive grants (CRDF, FIRCA, NATO, INTAS, VISBY). Company grants	Free access Headquarter of the Ukrainian Society for Cell Biology	Universities of Rzeszow (Poland), Debrecen (Hungary), Libre Universite Bruxelles, University of California at San Diego (USA), Keck Graduate Institute (USA)

MATERIALS SCIENCE

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
1	V. Lashkaryov Institute of Semiconductor Physics of the NAS of Ukraine http://web.isp.kiev.ua/index.php	Research staff of 87 Dr. Sc. (47 full Professors) and 203 PhD, among them 6 full members of the NASU. Technology park "Semiconductor technologies and materials, optoelectronics and sensor technique"	CShUs; "Diagnostics of semiconductor materials, structures and applied systems"; "Scanning Probe Microscopy": NanoScope IIIa Dimension 3000TM, Digital Instruments (Veeco Corp.), optic microscope NU-2E (Carl Zeiss); IR microscope, Russia; Scanning probe microscope, SELMI; X-ray-fluorescent spectrometer SPRUT, Ukraine; Testing laboratory for holographic safety elements (certified by International Standard ISO 9001); Central testing laboratory for semiconductor materials science	State budget; international projects funded by STCU, INTAS, NATO, EC; Self-funding Special Design-and-Technology Bureau with a Pilot Production Line (SDTB&PPL)	Open access by requests and cooperative programs/projects; International scientific journal "Semiconductor Physics, Quantum Electronics & Optoelectronics" is published and disseminated in English	The International Society for Optical Engineering; European Physical Society (EPS)
2	G. Kurdyumov Institute of Metal Physics of the NASU http://www.imp.kiev.ua/	Research staff of 289 researchers (including 56 Dr. Sc., among them 2 Full members and 8 Correspondent members of	CShUs: VSM centre: magnetometr 7404 VSM, „Lake Shore Cryotronics, Inc.,” USA; "Study of Mechanic	State budget; international projects funded by STCU, INTAS, NATO,	Open access by requests and cooperative programs/projects	International Association "Titan"

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
		the NASU, and 140 PhD) Joint Chair with Taras Shevchenko Kyiv National University; Joint chair with Moscow Physico-Technical University	Properties”: INSTRON 8802; “NMR spectroscopy of condensed matter”, Bruker, Germany, AVANCE 400	EC; contracts from industry partners		
3	E.O.Paton Electric welding Institute of the NASU http://paton.kiev.ua/	High-qualified research staff, including 70 Dr.of Techn. Sci., 250 PhD, among them 5 Full members and 4 Correspondent members of the NASU	CShUs for fracture mechanics Test unit MTS 318.25, USA; "GLEEBLE - 3800" DSI, USA – device for simulation of welding and heat treatment, research and measuring-analytical equipment. <ul style="list-style-type: none"> • Design-Technological Bureau, • Engineering Centers of high technologies, • pilot Department on explosion welding treatment, • three pilot plants manufacturing welding equipment, consumables and using new technologies, which are capable to design, manufacture and deliver the pilot 	State budget; international projects funded by STCU, INTAS, NATO, EC; contracts from industry partners; realizing export-import operations (via INPAT company at PWI).	Access within training and attestation of scientific and engineering staff workers; scientific-technical and analog expertise of projects, structures and technologies; scientific-technical consultations	The E.O.Paton Electric Welding Institute is a corporative member of the International Institute of Welding (IIW) and European Welding Federation (EWF).

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
			samples and batches of specialized equipment, welding and filler materials, welded structures and weldments.			
4	Frantsevich Institute for Problems of Materials Science of the NASU www.materials.kiev.ua	Staff is about 1700 people, including 70 doctors and more than 345 Ph.D., among them 3 Members and 5 Correspondent members of the NASU; Affiliated Chernivtsi department	CSHU TEM-SCAN Field emission transmission electron microscope JEM-2100F, JEM-100CX II, Superprobe 733, JAMP-10S, T-20; <ul style="list-style-type: none"> • Special Design Bureau with Pilot Plants, • Computer Centre • Laboratory for Basalt Materials Production • service centres operating on the base of the detonation coating technology in Japan, China, Yugoslavia, Iran 	State budget; international projects funded by STCU, INTAS, NATO, EC; contracts from industry partners; realizing export-import operations	Open access by requests and cooperative programs/projects	The Federation of European Materials Societies (FEMS)
5	Yuriy Fedkovych Chernivtsi National University http://www.chnu.cv.ua	The staff of more than 1000 researchers , among whom 105 Professors, and nearly 500 Associate Professors	<ul style="list-style-type: none"> • Scientific library library.chnu.edu.ua • Special design office; • Student design office “Alef” at the Departments of Physics and Computer Science. 	State budget, services connected with the training of foreign citizens,	Access through cooperation agreements, international /bilateral exchange programs	Membership in European University Association; International Universities Organization "Phi Beta Delta" (USA); International society of the optical engineers (SPIE)

ASTRONOMY, ASTROPARTICLES

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
1	Main Astronomical Observatory http://www.mao.kiev.ua/	8 Research Departments include 17 DSc and 54 PhD among the 1 Full Member and 2 Correspondent Members of the NASU	Astronomic spectropolarimeter, Wanschaff vertical circle, Tepfer double long-focus astrograph, small solar telescope with a spectrograph, chromospheric telescope, reflector AZT-2 (D=70 cm), horizontal solar telescope ATsU-5 (D=44.5 cm, F=17 m), Zeiss double wide-angle astrograph (D=40 cm, F=2 m), the meridian axial circle is used for highly precision positional observations of celestial objects	State budget, International projects	Free access by request/ joint projects	COSPAR, International Astronomy Union (IAU)
2	International Center for Astronomical, Medical and Ecological Research http://www.terskol.com/sitemap.htm	Departments in Ukraine and Russia; total 40 researchers in the field of astronomy	Telescopes& Instrumentation 2m RCC Telescope (with high-resolution echelle spectrometer and multi-mode cassegrain spectrometer) produced by Carl Zeiss Jena GmbH (Germany) <ul style="list-style-type: none"> • Large Horizontal Solar Telescope • Zeiss-600 Telescope • 80-cm Telescope • Small Solar Telescope SEF • MAESTRO - Matrix Echelle SpecTROgraph • MMCS - Multi Mode Cassegrain Spectrometer • TUVES - Terskol Ultra Violet Echelle Spectrometer 	State budgets of Ukraine and Russia, international projects	Free access by request/ joint projects	Whole Earth Telescope (WET) http://www.physics.udel.edu/~darc/wet/ ASTRONET Network www.astronet-eu.org IAU Minor Planet Center http://www.minorplanetcenter.org/iau/mpc.html

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
			<ul style="list-style-type: none"> • High-Speed Two-Channel Stellar Photometer • small telescopes Celestron and Meade; • several specified photometers, 			
3	Crimean astrophysical observatory http://www.crao.crimea.ua/	150 scientists (16 - DSc, and 35 PhDs among the 1 Full Member of the NASU)	The complex of the unique telescopes: <ul style="list-style-type: none"> • the 2,6m G.A. Shain reflector telescope ZTSh; • the 22-m radiotelescope RT-22; • the solar tower telescope TST-1; • the solar tower telescope TST-2; • the large coronagraph KG-1; • the large coronagraph KG-2; • the gamma-ray telescope GT-48; • the automatic reflector telescope AZT-11; • the two-mirror telescope AZT-8; • the solar radio telescopes RT2; • the solar radio telescopes RT-3; • the solar radio telescopes RT-M; • the cassegrain telescope K-380; 	State budget, special programmes, international projects with non-budgetary provisions	Open access for researchers and students	International VLBI Service, International SLR Service, International GPS Service, European Consortium for Very Long Baseline Interferometry, International Solar Service, SPECTRUM-UV project, SPECTRUM-R project, SPECTRUM-M project.

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
			<ul style="list-style-type: none"> the richter-slevogt 640 mm camera □□□□□ the 40 cm double astrograph. The “Simeiz-1873” satellite ranging system. <ul style="list-style-type: none"> The “CrAO-GPS” GPS system. 			
4	The National Aerospace University “Kharkiv Aviation Institute” http://www.khai.edu/efc/	2,5 ths employers work here. Among theme there are 120 Professors and PhD	<ul style="list-style-type: none"> The complex of the research plants; equipment for physical simulation of the airplane flight conditions of the Intersectoral Research Institute for problems of the physical simulation of the airplane flight conditions; the supersonic wind tunnel T-6 – based aerodynamic system 	State budget, services connected with the training of foreign citizens, realization of international projects with non-budgetary provisions	Open access	International Association of Universities IAU/UNESCO, “Alfa” international space station, National Council for Science and Technology CONASYT, University of Applied Sciences of Zittau/Gerlitz (Germany), Technological University of Tampere (Finland)
5	National Space Facilities and Control Center of the NSAU www.spacecenter.gov.ua	15 employers	<ul style="list-style-type: none"> Ground Spacecraft Control Complex; Ground Data Complex; Equipment for testing; ERS Data Archive http://dzz.gov.ua 	State budget, international projects with non-budgetary provisions	Half-open access; ERS information on request	EU’s Space Agency’s Mars Express program, GMES
6	Virtual Roentgen and Gamma Observatory (VIRGO) http://virgo.org.ua/?lang=en&mf c=well joint project of Bogolyubov	Staff of 16 permanent researchers including 4 coordinators	The system of high-energy data access, access to the mirror of the Data Archive of the INTEGRAL satellite, VIRGO Educational Center, Scientific and Educational	State budget, special programmes; international projects,	Open access to researchers and students	INTEGRAL Science Data Centre.

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar international Research Infrastructures
	Institute for Theoretic Physics, Main Astronomical Observatory of the NASU, Astronomical Observatory and Physics Department of Kyiv Shevchenko National University		Center	Swiss National Science Foundation,		
7	The Institute of Radio Astronomy (IRA) of the National Academy of Sciences of Ukraine http://www.ira.kharkov.ua/eng_main.htm	Research staff of more than 100 employees including 18 D.Sc., 56 PhD, 3 Full Members and 2 Correspondent Members of the NASU	Radio Astronomy observatory by Academician S.Y. Braude (Grakovo, Kharkov region), URAN-4 (Odessa)	State budget, special programmes; international projects: FP7-SOLSPANET, PICS programme ect.	Journal “Radio Physics and Radio Astronomy” Access under agreements	URSI, EISCAT, EKA-ESTEC, JIVE, Harvard-Smithsonian Center for Astrophysics (USA)

COMPUTATION AND DATA TREATMENT

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
1	Academic Network for Data Exchange (ANDE) http://www.amod.nas.gov.ua/Pages/about.aspx	State Enterprise Research and Telecommunication centre – the Ukrainian Academic Research Network (UARNet) http://www.uar.net/en	Set of the technical centres in the majority of the regional centres of Ukraine	State budget	Access to non-Ukrainian internet resources is provided via upstream providers (American Level3, Russian PETH and Comstar) as well via European internet traffic exchange (DE-CIX) and parity channels with the East European trunk providers (Poland, Slovakia)	Polish network PIONIER
2	Ukrainian Research & Academic Network (URAN network) http://www.uran.net.ua/~eng/frames.htm	N/A	Service providing; physically unites more than 80 R&D and educational institutions (180 points of presence) and operates own optical networks in 15 Ukrainian cities 200 km long and 80 km cross-border fiber optic line Lviv - Poland	Basically from the State budget or by international grants; NGOs' contribution	Access according to the Acceptable Use Policy (AUP)	NATO SPS Program, GEANT 2
3	Information and Computer Center of the National Taras Shevchenko University of Kyiv http://cluster.univ.kiev.ua/eng/grid	Staff of 4 researchers	BEOWULF-type heterogeneous clusters	State budget or international grants	Free access for University employees. Other institutions can use the cluster resources under an agreement with University	CERN, videlicet international computing system AliEn GFID
4	Bogolyubov Institute for Theoretic Physics of the NASU	The research staff includes 38	Ukrainian Journal of	State budget; international	Free access	CERN, videlicet ALICE collaboration

	Name, Main institution	Capacities (Human potential)	Facilities	Funding	Accessibility	Links with similar EU Research Infrastructures
	http://www.bitp.kiev.ua/index.php?lang=en	DSc and 60 Ph.D, among them 3 Full Members and 2 Correspondent-Members of the NASU	Physics Scientific and Educational Center Virtual Roentgen and Gamma Observatory	grants		
5	Institute for Applied System Analysis under National Technical University "KPI" http://ipsa.edu.ua/	The research staff includes 72 employees including 17 DSc and 48 Ph.D,	Ugrid Ukrainian subsidiary of the World Data Centre (WDC UV)	State budget; international grants	E-Journals "System Sciences and Cybernetics", http://journal.iasa.com.ua/ System Research & information technologies http://journal.iasa.com.ua/	World Data Center System CODATA within the International Council of Science (ICSU) IIASA UNESCO-CEPES World network of knowledge on education and scientific exchanges (EDNES)
6	Space Research Institute of the NASU-NSAU http://www.ikd.kiev.ua	The research staff includes 91 employees including 14 DSc and 26 Ph.D,	UN-SPIDER Regional Support Office; Grid cluster;	State budget; international grants	Access in the frame of Agreements and joint projects as EGEE, GEOSS/GMES	Committee on Earth Observation Satellites (CEOS)- WGISS; GEOSS; International organization of Automatic Control (IFAC)