European Strategy Forum
on Research Infrastructures

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2008 REP
OF
ESFRI REGIO
ISSUES WORK
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2008 REPORT
of the ESFRI Regional Issues Working Group

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2008 REPORT OF THE ESFRI REGIONAL ISSUES WORKING GROUP

Research Infrastructures in – and for – the regions; their role within ERA; cooperation between states; (recommendations for the next 5 years)

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1. Introduction

By Carlo Rizzuto and Naďa Witzanyová

The European Strategy Forum for Research Infrastructures (ESFRI), has the mission of developing policy options for all EU Member States, aiming at their involvement in a common and integrating action in building a world-standard capacity in terms of those "research Infrastructures" (RIs) needed to support High Quality Research and capable of attracting researchers from inside and also outside Europe.

Europe has a long tradition of policy making based on the principle of balancing national interests in the field of research coordination. As a result of such thinking emerged the intergovernmental research infrastructures in the middle of the last century (e.g. CERN).

We think that time time has come to have a different approach to European research infrastructures based on a common vision of the future of European Research Area (ERA) in the field of research infrastructures. The reasons are very practical; first – the European Union does not need a large research infrastructure of every science field in every member state; second – large research infrastructures of pan – European interest are too expensive to be paid for by one member state alone; third – Europe needs to use the talents of all its researchers and share particular advantages of its member states in order to be competitive.

The legal framework for an ERI (European Research Infrastructure) is a big step forward in this direction. If we want to build a common ERA of research infrastructures, then we need a common set of rules on how to run them and a common set of priorities to follow.

The development of an EU policy capable to have global visibility cannot be only based on an "average EU" approach, but must make full use of the opportunities given by the intrinsic diversity of EU Regions, and of their rich cultural and historical backgrounds. Of particular interest for ESFRI's action has been the enlargement of the EU to the Member States in Central-Eastern Europe and the perspective entry of the West Balkan Countries and Turkey, all of which have a very rich and high quality scientific and cultural background, as well as a long tradition in high quality research.

It was, therefore, natural to focus particular attention in this direction, and ESFRI set-up an ad-hoc Working Group aimed at speeding up the process of integration of the overall area covering the new members, building also on the rich network of scientific interactions which had been rapidly growing well before the political process was initiated. This approach has been confirmed in several recommendations by the Council of EU Ministers, and fits perfectly within the "Lisbon" and the "Ljubljana" processes. The present report aims at giving support for further recommendations to be formulated in particular during the Czech Presidency in 2009, bringing to maturity a process that, ideally, has started during the Slovenian Presidency.

The following document presents, in the annex, a "sample" of RIs operating in the overall Regional Area. Many of them are already operating in an "open access" mode of service to outside researchers selected only on the basis of quality, attracting them internationally with the excellent feature of the RI's and of their managerial and scientific environments. This allows the Member and Associate Countries of the area to participate with full capability in developing the projects in preparation and also to bid for being the site of several of the ESFRI's Roadmap RI's. There has been an important development of the concept of "Regional Partner Centres" connected to larger RI's built elsewhere, but "catalysts" for the capability of building future, larger and pan-European RIs in local. This overall capability is now being strengthened by the availability of ad-hoc financial instruments, such as the Structural Funds of the EU and the possible synergy with other financial instruments, namely the loans by the European Investment Bank.

The presentation makes use of the "Meta regions" concept which allows us to focus more on specific common "cultural" basis, with "cultural" having the greatest diverse meaning, stretching from common historical background to trade, to the environmental and scientific aspects. This concept allows, in the EU spirit, to better overcome the borders between States and/or Regions, underlining and strengthening the cultural continuum. The document outlines the historical-scientific background of the "Central European", the "Black Sea", and the "Baltic States" meta regions. In all of these, the tradition of "Research Infrastructures" open to scholars from elsewhere was already active in the Middle Ages, with mobility and attraction based on a continuity of cultural links. This historical perspective can now be strengthened and put into the new frame of the EU, recovering the imbalance that had been built in the second half of the last century. The fact, that most Countries in these regions have initiated, and in some cases completed, the development of "National Roadmaps" for RIs, is a strong indication of their readiness to contribute to the growth of the EU competitiveness and integration.

The document has been assembled from contributions made by members of the Working Group focusing on the various effects that a joint and integrating policy of RIs can produce. The role of RIs in "Capacity Building" is the foremost and strategic effect which underlines the whole ESFRI action. Capacity building is an all encompassing concept which goes from the attraction and motivation of young researchers and technicians, to the development of a stronger interaction between Research and Technology Transfer and increase of the Socio-Economic returns to the Regions. This document contributes to the process.

The main outcome of our work is a call for a common European policy in the field of research infrastructures. Without coordination on a European, national and regional level the resources invested in research infrastructures will not be used efficiently.

If this Report brings positive change in the development of research infrastructures throughout Europe and an improvement of good neighborhood relationships within the Meta regions of Europe as a byproduct, it will have fulfilled its aim.

2. Large Research Infrastructures: Their Role as Training Grounds and Natural Knowledge Triangles and Their Socio Economic Impacts

To be internationally attractive, Open access Research Infrastructures need to bring together the best equipment, excellent organization, good technical and administrative support, and build an environment where researchers (senior and junior) can operate at the best of their capabilities.

This has a number of outcomes such as the training of younger generations of researchers and technicians, and the continuous development of technologies and instruments to respond to advanced requirements. These, in turn, create opportunities to enhance the socio-economic returns to the hosting region also in industry-relevant aspects. Therefore, Research Infrastructures act as a real "knowledge triangle" between Research, Education and Innovation.

In terms of training, in many of the natural- and life-sciences the frontiers of knowledge are explored by PhD students and postdocs. When these young 'foot soldiers' are given the opportunity to fight their battles with the most modern equipment – for instance: advanced neutron sources, biobanks, high power lasers, clean rooms – they enter a new level of experience. Similar advantages come to young researchers in Social Sciences and Humanities, when they can operate in connection with international level infrastructures (data-banks, libraries, collections) in these fields.

In the physical space of a large facility – or in a regional partner centre of a large facility organizational structure – articulating your science case, planning activities and working in teams are common day practices. ‚Planning' implies not only meeting your deadlines but also meeting technical specifications (when auxiliary equipment has to be built) or doing your experiments when access time is made available to the research team in a fixed period. It also implies taking note of safety regulations and taking them seriously. Working in teams requires specific skills, not only to work well with technicians, regulators, and administrative staff but very often also with people from different cultures.

In short, giving young scientists and engineers the experience of working at large facilities will make them much better equipped not only for doing science in a modern way but also for jobs in industry or the service sector.

If the management of the facility, and the organization of the local-regional area, are such that the people educated through its construction and operation are brought to interact with the local environment in all aspects (Industries and local Services, Universities and Schools, Administrations), then there will be a continuous exchange of experience and a significant percentage of the trainees will have the chance to find jobs

in the local economical or service activities, bringing a strong innovative capability as well as opening the local environment and the local culture to international interaction. This will, in turn, attract new economic activities and influence the overall growth of the region, with an overall positive socio-economic impact.

In terms of socioeconomic impacts, the siting of the Research Infrastructure in a Region has also a direct local return, both during its construction and its operation. The extent of returns depends on the "technological footprint" of the infrastructure, whether it is based on the intensive use of new and advancing technologies or on more established technologies, and on the numbers of staff and visitors. The first case (e.g. synchrotrons, biomedical centers, etc) is more costly in terms of siting and construction but has the potential to induce the attraction of high-tech industries, the second case (e.g. computing and environmental centers, libraries or data banks, etc.) is more extensively contributing to the training of personnel. Both cases can be either visitor intensive or more based on virtual access.

The economic return in the long term, as estimated on the basis of previous experience, indicates that over 70% of the operation costs (personnel, supplies, utilities...) end up in the local economy. This amount, in various cases, can become an even larger inflow, due to the attraction of other investments, e.g. by providers (from restaurants to shops or maintenance workshops), spin-off companies, service industries etc. this may contribute to a continuous inflow to the local economy which may be up to three times the RI's expenditure, as measured in specific examples. If we take into account that, typically, the operation costs are about 10–15% of the construction costs, then the local economy will recoup the investment costs during the lifetime of the infrastructure, typically in about 20 years, if no amplifying factor works, or less than 10 years if the attraction of other investments functions in the right way. The construction and the operation of a facility tend to induce also the attraction of specific services and the development of other infrastructures in the area, from restaurants and hotels to providers, specialized schools, transportation, etc. To maximize the local returns it is required that the local authorities make an overall planning aiming at the best exploitation of the potential for growth.

3. Large Research Infrastructures and Their Role in the Motivation of Researchers

The word motivation derives from the latin verb moveo, to move. Therefore, motivation is the reason which drives people to behave in a specific way. Why people chose to work as researchers, stay in this career and decide to work for a specific company or research institution? These are the questions asked today within the context of the development of human resources in the European Research Area. What is the role of large research infrastructures between the factors influencing the motivation of researchers to do research?

Motivation can be divided in intrinsic and extrinsic. Intrinsic motivation is very strong, not easily influenced and depends on the personality and life experience of the person. A person intrinsically motivated to do research will run research without regard to conditions of work just because it brings him/her pleasure.

Extrinsic or external motivation is the consequence of a set of factors like remuneration, work conditions, popularity and possibilities of self achievement. Many theories were developed to describe the motivation factors of external motivation. For the purpose of this report we will concentrate only on one basic need theory: Abraham Maslow's hierarchy of needs actualized by Huczinski and Buchanan.

The following chart is an application of the Maslow's pyramid of the hierarchy of needs to the situation of research.

Maslow's theory states that people move to higher degrees of motivation only after the lower needs have been satisfied. The higher we climb to the top of the pyramid the lower the amount of motivation needed becomes; higher levels of motivation factors are more efficient. The lack of motivation factors in the category of basic and physiological needs will in many cases result in migration of researchers to other professions or to countries where the basic needs are being better met. Fortunately, the intrinsic motivation is usually strong and researchers are people who are oriented more to the higher levels of human motivation, therefore, some of the "born" researchers will still run research even in worse work conditions. Nevertheless, such a situation can hardly lead to the formation of research teams and to a situation of brain circulation replacing the situation of brain drain.

According to the Maslow's hierarchy of needs the research infrastructures are on the basis of the pyramid of needs for the researchers in order to perform research. But the nature of research infrastructures influences also the higher degrees of this pyramid. People of different workplaces meet and network within a research infrastructure, so the possibility to know about a work position in case of loss of employment is very probable, and this adds to a feeling of security. At the level of belonging and self esteem working at a prestigious research infrastructure can act as evidence of a researcher's quality. Every good leader has to learn how to work in a team and has to know the dynamics of teamwork. Research infrastructures promote teamwork and a mature leadership issuing from such a surrounding.

An extreme example of the consequences of a malfunctioning motivation system was the researchers' situation in the Czech Republic in the years 1968 to 1970. After a short period of freedom, when scientists were allowed to travel to the Western Europe and the USA came the so called normalization as a follow up of the invasion of the Soviet troops to Czechoslovakia in 1968. The Academy of Sciences (The Czechoslovak Academy of Sciences at that time) lost 11% of its scientific workers (PhD. holders) by emigration . As the main reason for emigration to the USA, Canada, Great Britain, Germany and Switzerland scientists indicate isolation, unhealthy relationships at the workplace and obsolete equipment of the workplace. Research infrastructure of both small scale and large scale was old and insufficient, remuneration low and career development linked to other criteria then scientific achievements.

The competitiveness of Europe depends on the sufficient number of skilled educated researchers in all parts of Europe, and therefore it depends also on the development of all over Europe in the terms of excellent research infrastructures. The occurrence of quality research infrastructures in a region will have a positive effect on the development of human resources and on the stabilization of the researchers'workforce in this region.

[1] Lidové noviny 16 August 2008 – Věda (Science)

4. The Ljubljana Process, RIs and Regional Issues

The Lisbon Strategy was launched in March 2000 with the aim of making the European Union the most competitive knowledge-based economy in the world together with achieving full employment by 2010. This process was re-examined five years later and, as far as research is concerned, lead to the „Green Paper on the European Research Area: New Perspectives" (April 2007). The Commission proposed there to develop a vision of the European Research Area based on six dimensions, namely: realizing a single labor market for researchers; developing world-class research infrastructures; strengthening research institutions; sharing knowledge; optimizing research programs and priorities; and opening to the world through international cooperation in S&T. The European Council of 14 December 2007 called for work to be taken forward promptly this was followed by further discussions during the Informal Meeting of Ministers for Competitiveness of 15 April 2008 under the Slovenian Presidency in Ljubljana, paving the way for a new course for the European Research Area.

As highlighted by the Council held in Ljubljana in spring 2008 „the fundamental role of ERA (is recognized) as a primary pillar for the Lisbon objectives and as an engine for driving the competitiveness of Europe. However Europe needs to develop a common vision and effective governance of the European Research Area (ERA), in order to improve the coherence and synergy among several good initiatives already launched at national and EU levels, so that a globally competitive, knowledge-based and innovative Europe can be created".

The „Ljubljana Process" of enhanced governance is based on a long-term vision on ERA developed in partnership by Member States and the Commission with broad support from stakeholders and citizens. The Council in spring 2008 highlighted that the vision should i.e. include the following features:

a) free movement of knowledge, the 'fifth freedom', with excellent training and attractive career prospects for researchers moving and interacting freely across Europe;
b) modern universities and research organizations developing globally competitive poles and networks to deliver excellent science and technology throughout Europe;
c) favorable conditions for all actors to investing in research and exploiting its results, having access to world-class research infrastructures, participating in an open and well-coordinated research programs, sharing and using knowledge across sectors and borders, and developing strong, coordinated cooperation with partners outside Europe;
d) benefits for citizens from the contribution of large-scale R&D efforts;

ESFRI, RIs and the Ljubljana process

The Council called on Member States and the Commission to establish effective governance arrangements for each of the five ERA initiatives planned in 2008. ESFRI is mentioned in particular for the domain of world-class research infrastructures.

To be consistent with the political guidelines, there is a need, in a first stage, to continue clarifying the ERA vision as far as RIs (including e-infrastructures) are concerned:

- is ERA an area (1) of strategic opportunities which are conducive to knowledge production, and (2) in which researchers, knowledge and technologies can move freely?
- Are RIs key elements to address grand challenges identified (such as those treated by the informal Competitiveness Council of July 16-17, 2008, i.e. climate change, food and agriculture, information society, and health and ageing)?
- Is ERA the needed dimension for the development of world-class research infrastructures?

This would be complemented by a review of the present situation of ERA (cf. survey recently launched by the Commission under the Research Infrastructures web site[2]).

In addition, the Ljubljana process is aimed at realizing the shared vision of ERA, for which purpose monitoring indicators and evaluation criteria (based on improved coherence and effectiveness) should be defined, adopted and jointly developed by the Commission and the Member States, without unnecessary complexity. The evaluation (ex-post and ex-ante) of the impacts of existing and future research infrastructures and e-infrastructures is an issue which is timely to be treated.

Inputs should be ready for the meeting of ministers in May 2009 which will discuss the ERA roadmap.

[2] http://ec.europa.eu/research/infrastructures/ri_portal;

5. The Regional Issues

ESFRI looked already during the last months on the regional issues. The conference on ‚Research Infrastructures and their structuring effect on the European Research Area' (ERA), held in Brdo the 5 and 6 March 2008 concluded in particular on:

- The important role of research infrastructures (including e-infrastructure) in contributing to sustainable regional development, economic growth and attraction of a new generation of scientists and engineers was confirmed. Current efforts at national and European levels towards a coordinated development of pan-European research infrastructures were stimulated to be continued.
- The need for a consistent strategy of Europe's regions and Member States by setting their own priorities and developing their own roadmaps. They should also increase their investments in existing and new research infrastructures, combining in the most efficient way (an „orchestrated" manner) the instruments and funds available.
- The possible creation of "ecosystems" for innovation considered in the context of prioritisation and decision making processes, to be developed at pan-European and **meta-region levels**, based on an efficient mix of research, cohesion and human resources policies, a right equilibrium between scientific excellence, social and economic criteria, and a balance between support to existing and new facilities.
- The role of cities and regions as important drivers leading to the development of a knowledge based society; subsequently the Council invited therefore Member States and regions to continue developing **"regional partner facilities"** as a useful way of promoting a balanced ERA.
- **Regional Partner Facility (description of a concept)** Europe needs to utilize fully its potential. In the field of RI there are two ways towards realization of this objective – (i) involve less research intensive countries in distributed facilities, and (ii) develop Regional Partner Facilities (RPF). Typically these RPF would be associated via various schemes with large facilities, and through such links could share some of the benefits. Some of the most important would include dissemination to local economy or collaboration with local industry. The specific 'partnership' role of RPF would include participation in preparation of experiments (at lower costs), training young scientists and a broad promotion of science performed at the large facility. The RPF would also have an important role of more general nature – contributing to 'brain circulation' and reducing the risk of 'brain drain' while at the same time providing much needed balance to the European RI landscape at affordable costs. In support of a region (country) undertaking a commitment to RPF, a proactive approach by the host country/community of a large facility is of utmost importance. Development of RPF should result in benefits for both parties and for ERA. Both parties should

take a European perspective into account. Full utilization of European research potential requires working together

- **Meta region** – although acknowledging the concept of regional partner facilities, the discussions at Council level in early 2008 show, however, that the „meta-region“[3] concept remains vague and undefined. The following tries therefore to show how common problems could be tackled by joining forces across borders.

[3] For the purpose of this report has been considered that “Generally, a meta region is formed by collaboration of the regions and/or states based on the same goal and the interconnecting is driven by different reasons. Such reasons, like geography, history or scientific content have preferably a high level degree of proximity.

5.1. The Central European Meta Region

History and characteristics of Science and Research Infrastructures of the meta region

The meta region of Central Europe (Austria, Czech Republic, Hungary, Poland, Slovakia, and Slovenia) is defined by its – more or less – common history. Research in this region has had a long tradition and accordingly the medieval universities of Prague (founded 1348) and Vienna (1365), the Academia Istropolitana in Slovakia (1465) or the Bibliotheca Corviniana in Hungary can be considered as first research infrastructures and knowledge bases of this region.

Besides universities, research flourished in monasteries with their libraries, herbal and botanical gardens, astronomy observatories and hospitals. One of the first schools in Europe the school in Pannonhalma, Hungary, was founded by Benedictian monks (996) and is still serving as a high-standard grammar school today. In the context of this long lasting tradition Georg Mendel must be mentioned, a monk and later Abbot of the Augustinian Order of St. Thomas in Brno, Moravia, who became "the father of modern genetics".

Even outside monasticism outstanding individuals dedicated themselves to science, e.g. 16th century's' Theophrastus Bombastus von Hohenheim, also referred to as Paracelsus, who was a medical doctor, alchemist, astrologer, mystic, theologian and philosopher, or Matej Bel who was one of the greatest scholars of the 18th century in Hungary. Bel was active in the fields of pedagogy, philosophy, philology, history, and theoretical theology; he was the founder of Hungarian geographic science and a pioneer of descriptive ethnography and economy[4].

Maecenases played an irreplaceable role in the funding of research and its infrastructures during many centuries. The Hungarian king Matthias Corvinus contributed a lot to the scientific life of his time, and emperor Rudolph II. was famous for his collections in his private Kunstcamer at the Prague castle, which served as focal point for his friends such as Tycho Brahe, Johaness Kepler or Anselmus Boetius de Boodt.

The 19th century was preparing the path for the technological advancements of the beginning of the 20th century and the region of Central Europe produced a series of inventors and famous scientists: János Irinyi invented the noiseless and non-explosive match in 1836, Ányos Jedlik invented the electromotor and the dynamo, the physician Ignác Semmelweis, discovered the background of childbed fever. The construction of the horse-drawn Railway, and the Semmering Railway made Austria a pioneer in the

[4] Interesting sidestep: Carl I who ruled in Hungary between 1307 and 1342 convened the so called „Kings' Summit in Visegrád" in 1335 with the participation of Casimir III, the Polish, and John of Luxemburg, the Czech King. This event has a long-lasting, living effect on the regional cooperation in Central Europe (see: 1. Central European Free Trade Association, CEFTA; 2. The Visegrád Group, also called the Visegrád Four or V4). A modern times alliance, the V4, of the Czech Republic, Hungary, Poland and Slovakia for cooperation and furthering their European integration, originated in 1991. All four members of the Visegrád group became part of the EU on May 1, 2004.

field of railway construction. A. Negrelli achieved international fame as an engineer and expert in railway, hydraulic and road engineering, but he became most famous for his plans for the construction of the Suez Canal, which was subsequently carried out by F. Lesseps.

An immense boom of new inventions and technologies occurred at the end of the 19th and beginning of the 20th centuries. Research still took place mostly at the universities but in addition a new type of research, namely industrial research, emerged. During this time František Křižík invented the differential arch-lamp (1881), Josef Ressl the screw propeller (1827) or Viktor Kaplan the turbine (around 1925). The Austrian pioneer of automobile construction S. Marcus designed the first test vehicle with a petrol engine. It was also in Vienna that C. Gräf constructed the first petrol engine car with a Cardan front-wheel drive in 1898 (patented in 1900), L. Lohner and the young F. Porsche constructed an electrical automobile with wheel-hub motors in the front wheels. Štefan Banič, born in Slovakia, constructed a prototype of a military parachute in 1913, and in Slovenia Janez Puh actively improved the invention of bicycles (1900 onward). Herman Potočnik – Noordung proposed his version of rocket engine (1928). In 1879 Tivadar Puskás built Europe's first telephone exchange in Paris.

Nikola Tesla from Serbia is best known for many revolutionary contributions in the field of electricity and magnetism in the late 19th and early 20th centuries. Tesla's patents and theoretical work formed the basis of modern alternating current electric power (AC) systems, including the polyphase power distribution systems and the AC motor.

Modern research infrastructures as we know them today started to be built in the middle of the 20th century. At this time not only the Czechoslovak Academy of Sciences was founded but many research institutes were built all over the region. In Slovenia, Jožef Stefan Institute was founded in order to complement nuclear engineering research in former Yugoslavia, named after Jožef Stefan who described some thermal radiation phenomena.

And even more gifted inventors and researchers contributed to the never ending history of science and research:

E.g. Jaroslav Heyrovský discovered polarography (Nobel Prize in 1959), Otto Wichterle constructed, over Christmas 1961 with the help of a children building kit MERKUR a rotational device for the casting of soft contact lenses made from HEMA (poly-hydroxyethylmethacrylate gel), László Bíró patented the ball-pen in 1938, Leó Szilárd invented, and, jointly with Enrico Fermi, realized the nuclear chain reaction for the first time in the world. Einstein and Szilárd were the messengers of the so called "Roosevelt letter", Jenő Wigner got the Nobel-Price (1963) for the development of theory of atomic nucleus, and particles. He designed the water-cooled nuclear power plant. The mathematician János Neumann is the inventor of the program controlled digital machines and the "father" of the computer science. He was a genius of set theory, quantum mechanics, nuclear energy, and computer design as well. János

Kemény was a follower of Einstein and Neumann; he created the BASIC computer language, and won the first Robinson Award of IBM for the creation of the time-sharing network.

The region of Central Europe has produced a remarkable number of excellent scientists, researchers and inventors, especially in the fields of material science, particle physics, bio- medicine and energy and therefore it should be included in all European plans and considerations regarding the implementation of the European Roadmap for Research Infrastructures and its potential spin offs.

Existing research infrastructures and membership in international research infrastructures organizations[5]

The existing infrastructure in the Central European meta region is supporting the thesis, that there are some traditional fields of research in this region. Austrian research infrastructure is supporting pharmaceutical, biomedical and material research. In this report Austria is presenting the Climate-Wind-Tunnel in Vienna, the only system for railway vehicles of its kind presently operated in the world. Here, railway vehicles can be tested under extreme climatic and aerodynamic conditions. The Czech research infrastructures support research in energy and material science – the Institute of plasma physics is housing the COMPASS-D, which can be considered a regional partner or demonstrator for ITER and a part of the Institute of physics, the PALS center is housing the PALS – Prague Asterix Laser System. PALS will bid for the site of ELITPALS (the CZ ELI version). The Czech authorities recognize the importance of e-infrastructures represented by CESNET, which is a part of GIANT. The Czech scientists are successful in particle physics and nuclear physics as can be demonstrated by the case of the Řež research institutes. Hungary is represented by the Budapest neutron center, which houses a nuclear research reactor at the Central Research Institute for Physics (KFKI); the Szeged Laser Centre which is an association of laser laboratories operated at the Departments of Physics, University of Szeged, Szeged, Hungary; the Departments of Physics, which is a part of the Faculty of Science and Informatics and the largest photonics-related institution in Hungary; and finally Hungarian Ion-beam Physics Platform (HIPP) is a consortium constituted by the Institute of Nuclear Research (ATOMKI) of HAS, Debrecen, Northern Great Plain Region and the KFKI Research Institute for Particle Nuclear Physics (RMKI) of HAS, Budapest, Central Hungary Region and carries out research and provides research services related to ion-beam physics in the field of materials science, ion-solid interactions, nuclear solid-state physics, cultural heritage research, environmental research, earth sciences, biomedicine, etc. Czech and Hungarian people care a lot for their languages and the study of language. Czech Republic is involved in many projects for the study of language through the Charles' University. The Hungarian Infrastructure for Speech and Language Technology (ISSLT) coordinates research and development in Speech and Language Technology to avoid overlaps in this area of research.

[5] Detailed information about the research infrastructures is included in the ANNEX.

Membership in European research infrastructures

Central European countries are members of excellent research infrastructures in Europe (also in the USA) in order to close the gap existing for their researchers by the lack of home based research infrastructures. Many scientists from Central Europe are educated and scientifically enriched by the cooperation happening within the frame of these research infrastructures. Such researchers gain not only scientific excellence but also experience in the management of large infrastructures. Cooperation within the frame of Central Europe already exists. CENI – Central European Neutron Initiative is a consortium which is a way these countries participate in ILL 20/20 and CENTRALSYNC fulfils the same purpose in the case of ESRF. Descriptions of the organizations are listed in the glossary.[6]

NAME OF THE INFRASTRUCTURE	AUSTRIA	CZECH REPUBLIC	HUNGARY	SLOVAKIA	SLOVENIA
CERN	×	×	×	×	
CISM	×		×		
DUBNA SUJV		×		×	
EFDA	×	×	×	×	×
ELETTRA	×	×			
EMBL	×	negotiations in course			
ESA	×	×			
ESO	×	×			
ESRF	×	×	×	×	
EUMETSAT	×				×
ILL 20/20	×	×	×	×	negotiations in course
PIERRE AUGER		×			×

[3] The participation in these RIs is most of the times a membership enabling to participate in management structures (CERN, ESRF,ILL20/20), it can also be only a participation in a project (DESY).

A view ahead

Many regions of the new member states are eligible for the structural funds. These funds should be combined with the 7.FP and national funding money to contribute to the development of the research infrastructures throughout Europe. In order to solve this problem the concept of regional partner facilities has been developed and is slowly taking shape.

In the following chart the participation in ESFRI Roadmap projects and their combination with the structural funds projects is shown for central European countries. The word link means the link and synergy with a project built from structural funds or an existing research infrastructure funded from national resources.

ESFRI ROADMAP PROJECT	AUSTRIA		CZECH REPUBLIC		HUNGARY		SLOVAKIA		SLOVENIA	
	P	Link	P	Link	P	Link	P	Link	P	Link
BBMRI	×				×					
CESSDA	×		×		×				×	
CLARIN	×		×		×	ISSLT				
DARIAH									×	
EATRIS			×							
ECRIN	×				×					
ELI			×	SITE ELITPALS	×	SITE SLC				
ELIXIR					×					
ESRF -up			×				×			
ESS source					×	SITE				
ESS survey							×		×	
FAIR	×						×			
HiPER			×	PALS						
HPC	×									
ICOS			×	Small project						
INFRAFRONTIER			×	BIOCEV						
INSTRUCT			×	CEITEC						
JHR			×	NRI Rez						
LIFEWATCH							×		×	
SHARE	×		×						×	
SPIRAL 2					×					
XFEL							×			

[7] The participation is at this time limited to a commitment by the governments of the member states to fund the preparation phase of the project;

It is clear from the above information that some participations in ESFRI projects will be carried out by combining the structural funds, national and framework funding. In the Czech Republic one node of the project INFRAFRONTIER is planned as project BIOCEV in Vestec, the same as the project CEITEC is planned to be a part of the project INSTRUCT. Two Central European countries, the Czech Republic and Hungary will enter into the bidding process for the site of ELI. It would be a shame not to use the capacity existing in both countries and the European Community should envisage some solutions to this problem, for example by building a demonstrator in the countries which did not succeed in the bidding process. In addition to this, Hungary is bidding for the site of ESS.

Framework programme and its themes dedicated to research infrastructures has also shown itself as a great opportunity for teams from Central Europe for cooperation with research infrastructures placed in the whole Europe. For example, the Czech Republic's organizations which started to participate in the previous FP projects oriented to research infrastructures are currently being involved in the FP7 projects, and what is really especially important, they are participating in the ESFRI roadmap projects. Their experience and cooperation in previous projects have made them reliable partners for future cooperation. We can talk about the **snowball effect.** As a very good example we can take both Czech research infrastructures presented at the annex to the report as examples of existing research infrastructures – Institute of Physics AS CR (part of the "Slovanka" area) and CESNET. Both of these institutions had been successfully involved in several FP6 projects (Institute of Physics – 2 projects, CESNET – 6 projects) and they have been very successful in present FP7 calls as well. The Institute of Physics is also currently involved in two ESFRI roadmap projects and CESNET is the main Czech partner for projects in the field of e-infrastructures.

National Roadmaps

The participation in ESFRI Roadmap projects combined with the regional partners' projects and research infrastructures built from national money are a common feature in the National Roadmaps of new member states in the Central European region.

The **Austrian National Roadmap** is still under development and should be ready in the first half of 2009. As regards the European Roadmap, Austria has already joined the FAIR-Project and is very much in favor of the project of European Biobanking and Bio-Molecular Resources Infrastructure and the SHARE project.

As for the **Czech National Roadmap** the choice of supported ESFRI preparation phase projects have been done; the part concerning the structural funds projects and small scale projects will be amended by stakeholders, presented to the government and agreed upon by the end of 2008. For the Czech Republic the goal is to be an integral part of virtual research infrastructures, to have on its territory a node or a measuring station being a part of the whole project in the case of distributed infrastructures and

building a regional partner facility in the case of single sited research infrastructures. There is one exception to this concept, ELI.

The **Hungarian National Roadmap** project was launched by the research minister in 2008 September. The process use the foresight method involving many researchers from the academic, university and enterprise sectors to prepare strategy for development of national research infrastructures. The inputs come from surveys, workshops, conferences and studies for the strategy. This project will conclude by the autumn of 2009. Based on this strategy, a governmental body will prepare the action plan for the implementation. Additionally to this bottom-up approach, the Hungarian Government has made a top-down commitment to build one Pan-European research infrastructure in Hungary.

5.2. The Black Sea Meta Region – Bulgaria, Greece, Turkey and Romania

History and characteristics of Science and Research Infrastructures of the Meta region

The Black Sea was a busy waterway on the crossroads of the ancient world: the Balkans to the West, the Eurasian steppes to the north, Caucasus and Central Asia to the East, Asia Minor and Mesopotamia to the south, and Greece to the south-west. The oldest processed gold in the world, arguably left by Old Europeans, was found in Varna, and the Black Sea was supposedly sailed by the Argonauts. The land at the Eastern end of the Black Sea, Colchis (now Georgia), marked by the Greeks as an edge of the known world.

The meta region is geographically defined by the proximity of the sea. The Black sea has thousands of kilometers long coastlines, which results in the need for infrastructures in the field of marine and environmental sciences. Another typical factor of the meta region is seismicity. The prediction and study of earthquakes along with related scientific issues is a common goal.

The Black Sea is a geographical entity but at the same time it defines a region that has been developed throughout centuries as a region with specific aspects in respect to culture, politics, economy and geo-strategy. Considering the fact that the Fertile Crescent happens to be in the same area where Hittite, Thracians, Lydian, Phrygian, Greek, Roman, Byzantine, Goths, Slavs, Bulgars, Seljuk and Ottoman civilizations were all founded, makes it hard to dissect one layer from another. That is why perhaps the best way to make oneself a picture is that this is rather a continuum of multiple layers of human development which has fed “positive science” concepts.

Going back in the centuries this is due to the long traditions in science and research. The Plato s Academy can be considered a first research infrastructure in Europe. The Greco-Roman period gave a great discoveries ti the ancient world in mathematics; nature observation; botany, zoology, mineralogy, etc., which shaped the development of science for centures ahead when Leonardo da Vinci and the great minds of the Renaissance uprooted many ancient dogmas.

The willingness for cooperation and building up common platforms within the meta region is proven via the various existing regional organizations and networks such as Black Sea economic cooperation; Black Sea Forum for partnership and Dialogue; Black Sea energy research center; Black Sea Biotechnology Center and many others.

The Black Sea Region has been a traditional partner region of the EU. In March 2003 the European Commission launched the European Neighborhood Policy (ENP) with the objective of avoiding the emergence of new dividing lines between the enlarged EU and the neighbors and instead strengthening the prosperity, stability and security of all concerned.

Nowadays, Science and Technology is identified as a very important area for cooperation in the BSR. The cooperation in S&T has been developed mainly based on bilateral agreements. A new momentum was given in April 2007 when a new document "Black Sea Synergy – A New Regional Cooperation Initiative" was launched. The "Black Sea Synergy" has been designed to complete the "chain" of regional cooperation frameworks, adding to the Euro-Mediterranean Partnership and the Northern Dimension.

Among several initiatives of BSEC a very important one was the adoption by the Ministers responsible for Research of the BSEC member states, in September 2005, of the "BSEC Action Plan on Cooperation in Science and Technology". The Action Plan identifies key topics for intervention that need to be addressed as a matter of priority in order to activate the scientific and technological potential of the BSEC member states and to enhance cooperation among them and with the European Union.

The Black Sea Region is ranked at present as the 3rd large geo-economic entity based on the development trend between 2002 and 2007. (Figure 1, Annex 3)

Geography, positive lessons learned from our common history, communication, scientific proximity are important elements in developing and shaping collaboration between our countries.

The benefits of this approach by developing and using research infrastructures in collaboration have a great impact in all participating countries in technology, innovation, socio-economic development of the region, education, regional policies and cost supportability.

The Black sea meta-region gave Europe outstanding scientists. Bulgarian scientist Asen Yordanov developed the first multi-purpose airplane; Petar Petrov invented the first Pulsar electronic watch and Rumen Antonov thought of the six gear automatic transmission in 2002 (now used in the models of Honda, Suzuki, Toyota, Fiat, and Opel). The Bulgarian scientist Dr Ivan Mitev defined the "sixth tone" of the heart at the beginning of the 1980s and gave a new insight into cardiology all over the world. The discovery of physicist Georgi Nadjakov made the invention of the copy machine possible. Neil Armstrong's first steps on the moon in 1969 were made possible with the help of the rocket engines of the Eagle module invented by Ivan Nachev, born in the small Bulgarian town of Karlovo. Romanian Henry Coanda academician and engineer, aviation pioneer and the inventor of the modern jet aircraft, built in his workshop the first „hermojet" powered aircraft (Coanda-1910). George Emil Palade (born 1912, in Iași, Romania) a cell biologist, shared the Nobel Prize (1974) in Physiology or Medicine with Albert Claude and Christian de Duve for his discoveries concerning the structure and function of organelles in biological cells. Fotis C. Kafatos (born in Heraklion, Crete, Greece) is the most influential Greek biologist, having had a pivotal role in the establishment of the Faculty of Biology in the University of Athens, the Faculty of Biology in the University of Crete and the Institute of Molecular Biology and Biotechnology in Heraklion. He is the president of the scientific council of the European research Council. Christos S. Zerefos, is Professor of Atmospheric Physics at the National and

Kapodistiran University of Athens, President of the Board of Directors at the National Observatory of Athens, Director, WMO Northern Hemisphere Ozone Mapping Center of UN, Director, Laboratory of Atmospheric Environment. Dimitri Nanopoulos (born 1948 in Athens) a Greek High Energy physicist has made several contributions to particle physics and cosmology. Turkish researchers made significant contributions to science in the last ten years. As example of this tendency can be mentioned Dr. Hilmi Volkan Demir (Bilkent University), the Principal Investigator of the Devices and Sensors Research Group at Bilkent University, working at Nanotechnology Research Center and Advanced Research Laboratory or Dr. Batu Erman (Sabancı University) who works on Genetic analysis of T-cell signaling and development.

Existing research infrastructures and membership in international research infrastructures organizations [8]

The existing infrastructure responds to the needs of the meta region. Both Greece (MART) and Romania (R/V Vessel Mare Nigrum) use marine vessels for research related to the study of the ocean floor, seismic activity and corresponding fields. Prevention and study of natural disasters is the theme of Bulgarian (Distributed Infrastructure for Management, Early Signalization and Prevention of Risk in Natural Disasters and Industrial Accidents) and Romanian (Complex/Integrated System of Seismic Monitoring) infrastructures. The special needs for sustainable agriculture in the region are studied in the Bulgarian Network for Providing and Analysis of Plant and Genetic Resources for Sustainable Agriculture in the Region. Expertise is strong in biomedical sciences as can be demonstrated by the research infrastructures in Bulgaria (CGMR) a partner of EATRIS and BBMRI, Greece (FUNGEN) a node for INFRAFRONTIER and Turkey (BYOMEDTEK, BIOMAT, and MOBGAM). The continuation of the work of Henry Coanda is supported by the available infrastructures at the Romanian INCAS wind tunnels, and respectively at COMOTI for turbo engines. Also, a partner facility for FAIR and GANIL/SPIRAL2 exists in Horia Holubei National Institute for Nuclear Physics (NIPNE,Tandem accelerator). E- Infrastructure is represented by the Bulgarian Center for Methods and Means for Protocol Internet Security and the Turkish National Center for High Performance Computing. The last 20 years have shown one of the most positive and dynamic evolution of the scientific landscape in Turkey. Turkish research system is dynamically responding to the latest developments in research, and the number of nanotechnology related research infrastructures is demonstrating it (UNAM, NANOTAM, and BIOMAT).

The Greek project KM3NET – Nestor Cubic Kilometer Neutrino Telescope uses the natural setting for a unique research infrastructure.

Along with the Czech Republic and Hungary, Romania will enter the bidding process for the site of ELI, and Greece will try to become a regional partner of ELI through its existing research infrastructure ULF- FORTH.

[8] For details on the projects and research infrastructures see the ANNEX

Membership in European research infrastructures organizations

The same as in the Central European meta-region, the needs of researchers are met by membership in international organizations.

NAME OF THE INFRASTRUCTURE	BULGARIA	GREECE	ROMANIA	TURKEY
CERN	×	× (founding member since 1954)	negotiations	
DUBNA -JINR			×	
EMBL	negotiations	×		
ESA		×	×	
ESRF		negotiations		
EUMETSAT	×	×	×	×

A view ahead

New research infrastructures in the Black Sea meta region will be in most cases built with the combined resources of the structural funds, national resources and FP contributions. The participation in ESFRI projects and the link to a national or regional partner facility is demonstrated in the chart below.

ESFRI ROADMAP PROJECT	BULGARIA	Link to national or SF	GREECE	Link to national or SF	ROMANIA	Link	TURKEY	Link
BOREALIS	×				×			
BBMRI	planned	CGPMR			×			
CESSDA			×		×	RODA		
CLARIN	×		×		×			
DARIAH			×					
EATRIS	planned	CGPMR						
ECRIN								
ELI	×		×	ULF-FORTH	×	SITE		
ELIXIR					×			
EMSO			×				×	
ESS survey	×							
EUFAR			×					
EURO-ARGO	×		×					
FAIR			×		×	TA -NIHAM		
HiPER			×		×			
HPC			×					
INFRAFRONTIER			×	FUNGEN				
JHR								
LIFEWATCH					×		×	
KM3NeT			×	Main coordinator-SITE	×			
SHARE			×					
SPIRAL 2	×				×	TA-NIPNE		
XFEL			×				×	

National Roadmaps

Bulgaria is currently developing a National roadmap for research infrastructures. The process started at the end of 2007 when a broad consultation process was launched for identification of national research facilities that have the potential to be further upgraded and modernized.

A targeted working group was appointed by the Minister of Education and Science to identify national research facilities that have a potential to be part of the pan-European research infrastructures or that have significant regional and/or national impact.

International quality standards in selected research facilities, which are expected to be performed until the end of 2008, will be validated in the last step.

The preparation for the creation of the Greek National Roadmap on RIs started in the middle of 2004 and the 1st version was available at the early of 2007. In total 15 RIs projects selected for the 1st version of the Roadmap for RIs, which cover three main scientific areas (Physical Sciences, Biological and Medical Sciences and Social & Humanities Sciences). National Call of proposals is expected to launch at the beginning of 2009 in order to start the implementation of the preparatory phase of the RIs of the National Roadmap. This exercise (Roadmap for RIs) "is a rolling process" and the National Roadmap will update and improve in order to include new RIs, according to the needs of the research community. Especially for Regional RIs (building of new RIs or integration of existing RIs) a bottom up approach will be applied. Moreover, Greece considers the inclusion of Regional or cross regional RIs on Environment, Energy, Telecommunications and Medicine in the future update version of the National Roadmap for RIs as high priority.

The Report Regarding Research Infrastructures of Romania was published in spring 2008 as a result of the work of the Romanian Committee for Research Infrastructures (CRIC) and includes new tools for financing research infrastructures, priorities and projects of national, meta- regional and pan- European impact with the participation of Romania. The CRIC Report promotes the development of 19 new national research centres, in scientific and technical fields which are considered national priorities and also strongly correlate with the present evolution of pan-european research infrastructures, including: energy (hydrogen and fuel cells), environment (in particular a view on the research infrastructures needed to support the ecological rehabilitation of the Danube Delta), nuclear and particle physics, genetics and molecular biology and nanotechnologies.

Turkey includes its research infrastructures' development onto its Ninth Development Plan (2007 – 2013) as part of its priorities in the fields of nanotechnology, biotechnology, nuclear technologies, and hydrogen and fuel battery technologies.

5.3. The Baltic States Meta Region

History and characteristic of the region from the point of view RIs

Baltic region is comprised of three North-East states of EU: Estonia, Latvia and Lithuania with the population of over 7 mln. Now this area is one of the most dynamic regions in EU with annual gross domestic product growth rates exceeding 7–10%. The region has long-standing traditions in higher education and research dating back to 16–17th centuries, in which the oldest universities of the region – Vilnius University (1579) and Tartu University (1632) have been established. The research potential of the region was noticeably strengthened by Riga Polytechnic Institute established in 1862, which hosted Tartu University graduate, one of the founders of the Physical Chemistry field, Nobel laureate Wilhelm Ostwald. Currently, the region has a developed network of universities and research institutes amounting of over 25 research universities (LT – 15, LV – and EE –) and 50 research institutions which primary function is research and development (LT – 35, LV – and EE –). Baltic countries have high science and technology tertiary graduate rate amounting from 9 to 20 per 1000 of population (LT – 19.5; LV – 8.9 and EE – 11.2).[9]

The research potential in Estonia is mostly concentrated in 32 research and development institutions (including six public universities) of which University of Tartu is the largest one, at two cities – Tallinn and Tartu, located in the Northern and the Southern part of the country, respectively. Concerning the country's historical background, the decade of 1990s was not favoring the investments in R&D – the total amount of government funding of research infrastructure was about 6 M€. Considerable investments were made using international sources e.g. Framework Programs, the World Bank, PHARE during the years 2004–2007. with the support of 20M€ from Structural Funds, 27M€ were invested in upgrading research facilities with the focus in biochemistry, molecular chemistry, molecular genomics – traditionally strong fields with strong know-how potential (in the 1970s and 1980s significant investments into biotechnological research were made).

The institutional infrastructure of science in Latvia consists of 11 State Research Institutes, 15 research institutes formally integrated into universities as legally independent institutions, 5 State Universities and 15 University Colleges with their research units. Most of these research institutions are located in Riga – the capital of Latvia, and few – in two other largest cities – Daugavpils and Ventspils. In view of the research potential and scope and level of scientific activities, the most significant research institutions are the Latvian Institute of Organic Synthesis (IOS), University of Latvia and its Institute of Solid State Physics (ISSP UL) and Institute of Physics (IP UL), Riga Technical University, Latvian Biomedical Research and Study Centre (BRC) and Ventspils University College with its Ventspils International Radio Astronomy Centre.

[9] 2006 Eurostat data

Research in Lithuania across all research fields, including science and technology, social sciences and humanities is carried out in 15 universities and 35 research institutes which geographically cover all regions of the country. However, most of the research infrastructures are concentrated in largest metropolitan areas of Vilnius and Kaunas with some infrastructural elements located in Siauliai and Klaipeda.

Existing research infrastructures and membership in international research infrastructures organizations

As it was written above, **Estonia** made an investment into research infrastructures during the period of 2004–2007 with the amount of 20M€ from Structural Funds, furthermore, 27M€ were invested in upgrading research facilities with the focus in biochemistry, molecular chemistry, molecular genomics – traditionally strong fields with strong know-how potential (in the 1970s and 1980s significant investments into biotechnological research were made). The National Institute of Chemical Physics and Biophysics is a research institution carrying out fundamental and applied research in material sciences, gene- and biotechnology, environmental technology, and computer science. Biomedicum of Tartu University (the research basis for pre-clinical departments of the Faculty of Medicine, est. 1999,) with its Animal House (the largest animal facility in the Baltic States), Institute of Technology of Tartu University (incorporating proteomics, transgenic technology, applied virology core facilities, est. 2001), The Estonian Biocentre (est. 1986 as a joint venture between Tartu University and NICPB to promote research and technological development of gene and cell technologies in Estonia comprising a number of laboratories equipped for various research in genomics, biochemistry and protein synthesis), the Institute of Molecular and Cell Biology of Tartu University and the Department of Gene Technology of Tallinn University of Technology form together the cutting-edge infrastructure for performing of medical biotechnology research in Estonia. The Estonian Bank of Gene Data was founded by the Government in 2001 and has been subsequently reorganized as a research institution affiliated to the University of Tartu. The aim is to create a database of health, genealogical and genome data representing 10% of Estonia's population. Tartu Observatory incorporates astronomical research facilities: the 1.5-meter and the 0.6-meter telescope with auxiliary instrumentation. Both telescopes are used mostly for the observations of non-stable variable stars. Estonian Educational and Research Network (EENET) is a governmental nonprofit organization established in 1993 is a member of GÉANT consortium since 2000. The Institute of Physics of Tartu University (incorporates surface science, laser spectroscopy, nano-research, and material analysis complexes), especially in the field of nanotechnology has had a long tradition and expertise.

During the last decades of the previous century (up to 2004), due to limited state budget allocations, scientific infrastructure in **Latvia**'s State Research Institutes and higher education establishments barely underwent any modernisation. In 2004,

the implementation of the National Programme „Support for the Modernisation of Scientific Infrastructure in State Research Institutions" was commenced by attracting co-financing of the ERDF. The objective of the National Programme was to modernise the infrastructure in the State Research Institutions, including the regional research institutions implementing research projects in priority research areas (pharmaceutical chemistry, genomics, materialsciences and wood processing) thus, forming an environment for the transfer of technologies and promoting development of human resources in the whole research area of the country. During the period of five years considerable investments at the level of 32 M€ were made for this aim with the support of ERDF co-funding. The upgrading and further development of the research infrastructure will continue in the next period of EU aid coming through the Structural Funds in 2007–2013 in accordance with the targets of the Latvian National Development Plan and the Operational Programme for Development Innovations and Entrepreneurship envisaging for this aim is 165 M €. Currently, state-of-the-art research equipment is provided to the Latvian Institute of Organic Synthesis (IOS), University of Latvia and its Institute of Solid State Physics (ISSPUL) and Latvian Biomedical Research and Study Centre (BRC) developing them as the national research infrastructure centres.

For years, the primary source for funding research infrastructures in **Lithuania** was the government funds. However, leading Lithuanian research institutions and groups were able to upgrade and maintain their infrastructures by attracting considerable funding from international sources. Such situation was typical in the traditionally strongest thematic areas such as biotechnology, laser technologies, material science and physics. In the period from 2003 until 2007 Lithuania government invested over 100 M LTL[10] (~30 M EUR) into upgrading of existing research infrastructures. The major part of investment was made using EU Structural funds. While most of the investments were directed towards the upgrade of existing instrumental base, information technology systems and library resources, this investment allowed creating mechanism and learning how to manage the large scale investment projects in the field of research infrastructures. Until now, the initiatives to join international organizations such as EIROforum were vague. However, in 2004 Lithuania has signed the collaborative agreement with CERN. The agreement is considered as a first step towards more intense participation and, possibly, membership in EIROforum.

The Department of Quantum Electronics of Vilnius University hosts VU Laser Center, which is a pan-European infrastructure in high power laser technologies. From 2004 until now VU Laser research center (VULRC) is a member of LASERLAB-EUROPE consortium of European laser infrastructures providing transnational access to their instruments for EU users. The example of the use of structural funds is the newly established Center of Proteomics (CoP) consisting of core unit at the Institute of Biochemistry, and 5 satellite units at partner institutions. The core unit will run state-of-the-art high-throughput protein separation and analysis instruments serving the needs of all biomedical research community of the country. The CoP model creates

[10] Lithuanian currency unit Litas (LTL): 1 EUR = 3.45 LTL

the traditions of the collective usage of expensive research infrastructures and serves as a model for rational investments into expensive equipment avoiding unnecessary duplication and fragmentation of investments.

A view ahead

Estonia will integrate into the work of international research organizations and infrastructure facilities. Currently, Institute of Computer Sience of Tartu University is a member of CLARIN, Estonian Bank of Gene Data (EBGD) is participating in the construction of pan-European network of biobanks (BBMRI), an establishment a SMEAR-type station in Estonia for the joint co-operation with Finland in Biosphere, Climate Change and Air Quality Interactions monitoring is initiated. Also, Estonian contribution for a new generation synchrotron radiation facility at MAX-lab is considered.

Latvia may integrate in the European Research Area with its research infrastructure, ensuring the effective realisation of research results through high-level technologies, as well as operation and development of unique research infrastructure objects, for instance, The Liquid Metal Laboratory of the Institute of Physics IPUL (including the pilot equipment for studies of the Earth's magnetic field) and The Ventspils International Radio Astronomy Centre.

Lithuania is actively participating in building the pan-European research infrastructures included into the ESFRI Roadmap. VULRC is a partner in ELI (Extreme Light Infrastructure), while the Institute of Lithuanian Language and Center of Computational linguistics of Vytautas Magnus University are members of CLARIN (Common Language Resources and Technology Infrastructure) initiative. In ESFRI update process, which is still ongoing, Lithuania initiated European Election Studies infrastructure, which is currently the only ESFRI proposal in the field of Social Science and Humanities.

ESFRI ROADMAP PROJECT	ESTONIA		LATVIA		LITHUANIA	
		Link to national or SF RI		Link to national or SF RI		Link to national or SF RI
BBMRI	×	EBGD				
CLARIN	×	Tartu un.	×	IMCS	×	Vytaukas Mag. Univ.
ELI					×	VULRC
ESS			×			

National Roadmaps

At the beginning of 2008 the Ministry of Education and Research initiated the first Estonian Research Infrastructure survey and Roadmap project. The roadmap will cover the national needs for new research infrastructures, upgrading the existing research infrastructures, joining in existing/new international research infrastructures and participating in upgrading processes of the existing international research infrastructures in different research fields for the next 10–20 years.

The R&D infrastructure will be upgraded in accordance with the Research, Development and Innovation Strategy document for 2007–2013, and the Operational Program for Development the Economic Environment, establishing more specific strategic approaches for the use of the structural funds: joint use of large-scale infrastructure will be ensured, a network of Estonian core laboratories will be created considering also the needs of the Baltic Sea region, certified laboratories will be established and their capability to provide services to industrial enterprises will be enhanced.

At the policy-making level, until recently, Lithuania had no strategy on maintaining, upgrading and establishing new research infrastructures. However, at the end of 2007 the Ministry of Science and Education initiated survey of existing and future Research infrastructures, which for the first time, allowed to systematically approaching the problem of planning investments into RI. In addition, in 2007 the Ministry asked Lithuanian Centre for Quality Assessment in Higher Education to identify competence centers in Lithuania capable of providing necessary human resources in case of massive investment in new RIs. Also, two governmental initiatives have been started in 2007: The National Complex Programs and Integrated Science, Studies and Industry Centers. Both initiatives aim at creation of modern system of RI that will serve needs of Lithuanian industry, universities and research institutions. These initiatives stem from the strategic decision of Lithuanian government to heavily invest into science and higher education system within next round of EU aid coming from the Structural Funds in 2007-2013. The investment that will support aforementioned initiatives will amount of 1,5 B LTL (~450 M EUR), of which 1 B LTL (~300 M EUR) will be used to build new and upgrade existing research centers, to purchase new instruments and equipment, to significantly upgrade other research resources, such as libraries, repositories and IT systems.

As a result five science industry clusters will be created: i) Santara in Vilnius specializing in biomedical research, ii) Sauletekis in Vilnius specializing in laser technologies and material science, iii) Santaka in Kaunas specializing in material science, chemistry and mechatronics, iv) Nemunas in Kaunas region specializing in agro-science, and v) Integrated Marine Science and Industry Center in Klaipeda. The investment in RI will be accompanied by significant organizational changes in public sector of research institutions. Highly fragmented network of research institutes will undergo consolidation, so that in the main thematic sectors there will be no independent research institution with less than 200–300 PhD researchers.

In 2008 Ministry of Science and Education established working group to prepare Lithuanian roadmap on research infrastructures. The purpose of this group is to elucidate strategic needs of Lithuanian science and industry for further investment in RI of the country that spans time period of 2007–2013. In addition, it is expected that expert groups will elucidate needs for participation in international organizations, in particular, in EIROforum organization and ESFRI projects. Finally, it is expected that the group will be in a position to reveal the potential of the regional cooperation between the Baltic and Nordic states in the field of establishing new and providing transnational access to existing RIs. The primary report of the group is due in December 2008.

5.3.1. The Nordic Meta Region and Its Collaboration with the Baltic Meta Region

Nordic co-operation, the Nordic Council of Ministers and NordForsk

The Nordic region consists of the countries Denmark, Finland, Iceland, Norway and Sweden, and the autonomous territories the Faroe Islands, Greenland and Åland. Nordic co-operation has been developing for several centuries, has assumed different forms and has reinforced the common Nordic identity. In 1971, the Nordic Council of Ministers was formed as the forum for Nordic governmental co-operation. NordForsk is the Nordic research board founded in 2005 operating under the Nordic Council of Ministers; responsible for Nordic collaboration in research and researcher training.

Cooperation between Nordic and Baltic countries

The Nordic countries had established a co-operation with the three Baltic States Estonia, Latvia and Lithuania even before they gained their independence in the summer of 1991. In the spring of 1991 the Nordic Council of Ministers opened offices in Estonia, Latvia and Lithuania. The co-operation has entered a new phase since the three countries became members of the EU in May 2004, but there is still close contact between the two regions.

As part of the Nordic Council of Ministers' overall programme for cooperation with the Baltic countries, NordForsk cooperates with the Baltic countries on research activities. Many NordForsk activities are open to the three Baltic countries under certain conditions.

Existing Nordic research facilities and membership in international research infrastructures

Each Nordic country has its own distinct scientific profile in respect of research areas, institutional setting and existing infrastructure. Specific national science-bases have emerged over the years. Examples are Norway's position in arctic research, Sweden's position in pharmaceuticals etc. Existing research infrastructure in the different Nordic countries is comprehensive and diverse, and one would like to mention a few examples: Max-lab, the Onsala space observatory and the European Incoherent Scatter (EISCAT) in Sweden, the NOTUR II supercomputer and the European Centre for Arctic Environmental Research (Svalbard) in Norway, the Magnetometers – Ionospheric Radars- Allsky Cameras Large Experiment (MIRACLE)

and The JYFL Accelerator Laboratory in Finland, the ISA Institute for Storage Ring Facilities in Denmark, furthermore research vessels and a large variety of databases, archived and registered in all Nordic countries.

There exist a variety of Nordic collaboration initiatives on research infrastructure such as the Nordic Optical Telescope (NOT), the NORDSYNC Consortium to coordinate and enhance the use of synchrotron radiation for scientific and industrial research in the Nordic countries, the Nordic DataGrid Facility (NDGF) and various databases registries. Nordic researchers also participate in several international research infrastructure projects such as the Atacama Large Millimeter Array (ALMA), CERN, the European Organization for Nuclear Research, EMBL and EMBC, the two organisations for molecular biology, the European Space Agency (ESA), the European Southern Observatory (ESO), the European Synchrotron Radiation Facility (ESRF) and the Integrated Ocean Drilling Program (IODP) (list not exhaustive).

The NordForsk initiative Joint Nordic Use of Research Infrastructure

National research policy strategies in the Nordic region focus on investments in national and international research infrastructure. National priorities form the basis of NordForsk's collaboration activities, and in 2007 NordForsk consequently launched a programme for Joint Nordic Use of Research Infrastructure. The overall aim of the NordForsk initiative Joint Nordic Use of Research Infrastructure is to promote efficient co-operation between the Nordic countries, including the Baltic countries and NW Russia, in terms of research and researcher education of the highest international quality, by:

- optimizing joint Nordic use of research infrastructures, increasing the interaction between existing infrastructures, and sharing best practices in operations by making these more available to interested parties.
- optimizing joint Nordic participation in the planning and implementation of European and international infrastructure projects.

A total of 19 infrastructure projects received NordForsk funding in 2007 with a total budget of 18.8 MNOK. 11 of the 19 infrastructure collaborations include participants from one or several Baltic States, most of them including Estonia (10 Projects), fewer including Lithuania (4) and Latvia (3). The projects cover a wide range of areas, as medicine, physics, biology, geosciences, philosophy, electro technique and linguistics. They also cover different models of collaboration, from sharing existing Nordic infrastructure (such as the MAX-laboratory in Lund or the JYFL Accelerator Laboratory in Jyväskylä), establishing new Nordic databases (for example a Nordic Canine Bio-bank), to strengthening Nordic participation in existing European or international infrastructure such as the Large Hadron Collider (LHC) or the Global Biodiversity Information Facility (GBIF), as well as Nordic positioning for participation in the ESFRI projects FAIR, Infrafrontier and PRINS and for participation in the international initiative Atacama Large Millimeter Array (ALMA).

In order to further strengthen the Joint Nordic Use of Research Infrastructure Projects, an opportunity for Researcher Training Courses was offered in May 2008, which are open for the 19 Infrastructure Projects. The objective was to provide researcher training in fields that are difficult for the national research institutions to cover on their own. 13 Projects receive funding for Researcher Training Courses in 2008.

A view ahead

The Nordic countries are in various processes of identifying their national strategies and roadmaps for infrastructures based on their national setting and the priorities of the national scientific community. The Nordic countries are also currently discussing how and in which areas Nordic collaboration on research infrastructure can be intensified. Among other things, some ESFRI initiatives were identified to be candidates for an increased Nordic collaboration: CLARIN, ESS, ICOS, LIFEWATCH and BBMRI. Many other ESFRI projects are of interest to one or several Nordic countries.

A Nordic Conference on Research Infrastructure „Global challenges – Regional opportunities: How can Research Infrastructure and eScience support Nordic competitiveness?" will be held in Stockholm in November 2008. The conference is a joint event organised by NordForsk, the Nordic Council of Ministers, the Swedish Ministry of Education and Research, and the Swedish Research Council.

A process followed by interest from all Nordic countries, is the proposal of a consortium known as ESS-Scandinavia to host the European Spallation Source (ESS) in Lund, Sweden. Nine countries have given their explicit support for ESS Scandinavia. These countries are the five Nordic countries, the three Baltic states, and Poland. Out of these nine countries, the four countries Sweden, Poland, Estonia and Denmark have now formalised their support. Sweden also proposed to make MAX VI, the next generation synchroton facility after Max lab, a Nordic synchrotron facility.

6. Project Finance and Financial Sustainability of Research Infrastructures in a Regional Perspective: Which Basis for an „Orchestrated“ Development and Use?

The development of a long-term initiative to design, build and operate a research infrastructure has to solve the hurdle of a research activity being “non economic”, in the sense that it is not able to generate an income capable to repay the investment and to sustain the operation costs. The definition of a sustainable financial framework has to, therefore, include also the indirect (non scientific) socio-economic effects and returns.

These returns are to be compared with typical (approximate) recurrent costs, which are about 10% of the initial investment for infrastructures having an operating lifetime of more than 10 years (e.g. libraries, synchrotrons), or about 20% (10% operation and 10% upgrade) for infrastructures having a shorter lifecycle (e.g. computing centres, biological facilities).

Based on cumulated experience, the following overall returns, of a research facility whose quality is on the international/world level and open to quality-selected users, can be listed as follows:

a) Direct financial returns, due to the industrial or commercial exploitation of research and technological developments. These are limited to between 0–10% of the recurrent expenditure, depending on the research area and on the intensity of technological development required by the research infrastructure (the “technological footprint”). This low return is typical of Research activities and of their “non economical” aspect

b) Returns to contributing Countries/Regions/Institutions during construction and operation, through the involvement of their industries/providers. This is a direct function of how much these contributions are “in kind” or connected with a “return policy” for the procurements (instruments, parts of specialized equipment, technical staff, etc.). This part can be sizeable during construction while it is much smaller during operation, and mainly connected to the upgrades of the infrastructure.

c) Returns to the surrounding territory, in terms both of direct expenditure and of attraction of other activities. This is particularly relevant during operation, when an estimated 60–80% of the operation costs end up in the territory (personnel, provisions, utilities, etc.), and can activate further investments, in terms of attraction of services, providers (shops, restaurants, hotels,...) and better infrastructures. In several cases this attraction gives a “multiplier” of the overall returns up to a factor 3 of the original expenditure.

d) Educational returns, in terms of training of researchers and technical/managerial people, which may move to the local environment and to the partner institutions/industries. These depend strongly from the type of facility and on the way it is managed.

e) Returns in terms of knowledge production and in being part of international networks. These are not normally demostrated in economic terms, being far in time and delocalized in space, but are the basis for the "outreach" to possible external contributors. This outreach to scientific users and institutions may be aimed at being mainly local/regional/national, instead of pan-EU/global, but, are relevant for ESFRI, infrastructures should have an international quality, and be able to attract a sizeable fraction of "external" users by offering "open quality-based access". This means that the use of the infrastructure, even when it is aimed mainly at a regional level, cannot be limited only to regional users, and the funding should cover the opening to external users, who ensure that the quality is attractive beyond local boundaries.

The analysis of the returns a) to c), which have recognizable economic impacts, helps to define and involve those relevant actors who can be attracted by the economic returns. The overall sustainability, however, cannot be reached without due account of the "non economic" returns of points d) and e) which are the main basis of long term commitments by contributors interested in knowledge production (without direct economic return). This requires the capability of "orchestrating" diverse potential users and financial instruments.

The involvement of these different actors varies between the construction and the operation phase, combining different financial instruments and contributors in the two phases.

The presence of an institutional actor assuring (as an "orchestra director" lasting for the competitive lifetime of the infrastructure) a long term involvement in the support of the non-economic part of the expenditure (related to the effective research activity) turns out to be the determining factor for bringing to convergence the involvement of other local and non local actors. For infrastructures with a sizeable attraction of international users, the present situation lacks a central and long term "EU-level orchestration capability" able to fund the "open access" part on the basis of evaluated international quality covering all scientific fields. This is particularly necessary if Regions need to be supported in the decision making to attract high quality facilities in a complementary and integrating way.

At present, therefore, this orchestration task has to be fulfilled either by a single State or a group of States, who activate and bring together the other economic and non economic actors, and ensure them by taking upon themselves the long term commitment of supporting the research expenditure and of supporting the access of researchers from other Countries. This need extends also to the case of high quality infrastructures having a more regional (or meta-regional) outreach.

The National public resources play a "key role" in the creation and/or development of RIs (including regional and cross-regional RIs). These resources are of great importance to secure the financial participation of the Member-States. To this end, a letter of commitment is usually required from Member States in order to ensure their participations. Such practice shows as being efficient.

FP & SF Funds (Funds from Framework Program and Structural funds) are an incommutable part of the building of RIs in new member states. In this context, it is important to prepare a National strategic plan (and a European strategic plan especially for cross-Regional RIs) in order to achieve a more efficient coordination scheme and optimum use of the structural funds.

It is strongly recommended to prepare a "strategic action plan" for the coordination and coherence of the:

a) Available resources (FP7, SF-structural funds, public and private sources) and
b) Regional's priorities and the objectives of the National Authorities regarding the regional RIs. It is important to ensure that appropriate national strategic R&D –RI priorities are included in NSRFs (National Strategic Research Framework) and subsequently in SOPs (Sectoral Operational Programme), thus that SF Funds are timely earmarked by DG REGIO

Moreover, within the aforementioned framework the Regional Industrial/Private sector should be encouraged to invest and to play an important role in the identification of the priorities regarding regional RIs.

7. Criteria for the Assessment and Evaluation of Regional Research Infrastructures with European Dimension

Although the case for new research infrastructures is regulated by procedures, such as ESFRI, no overall analysis of the pan-European and scientific relevance of existing facilities has been achieved so far. Therefore a major ESFRI work should help to identify the main criteria on the basis of identifying existing and future research infrastructures; single sited or distributed, could be evaluated and recognized, especially with respect to their pan-European interest.

Needless to say most of these criteria should be those used in state of the art scientific evaluation of international research infrastructures and laboratories.

How to identify the pan-European relevance of existing research infrastructures?

- The first approach has to be identified through the type and organization of the facilities.
  The term pan-European interest means the provision of unique laboratories or facilities necessary for the efficient execution of Community research, bringing significant improvement in the relevant scientific and technological fields comparing them with available national facilities and ensuring open access to all interested researchers based on the quality of the user proposals.
- Another approach has to be applied in terms of content and excellence of research.
  Evaluation of the European scientific character could be based on the quality of research services they offer.
- A third approach has to be evaluated in terms of impacts.
  Evaluation of the European character could be based on their training and educational role, their outreach activities and their relevance to the European competitiveness, i.e. to the European economy.

Which criteria to use?

Criteria linked with the Pan-European character

To recognize the pan-European character, the research Infrastructures should demonstrate how they help to strengthen the development of an efficient European Research Area by better integrating national efforts, avoiding sub-critical facilities, and placing Europe as a world leader for high-level research services.

In this context the evaluation of this character could be based on the facilities, including e-infrastructures:

- Help Europe to pool its resources for better performance and capacity of research services, which are indispensable for staying at the forefront of research over the next decades, providing researchers with the tools they need, therefore increasing European attractiveness and potential;
- Help to better tackle scientific challenges, societal needs (in particular environmental challenges such as climate change, energy production, water supplies, quality of the environment, or quality of life), innovation and economic activities through efficient research services
- Develop a governance of their facilities at European level, becoming possibly real distributed facilities and not remaining just at the level of networks.

Criteria linked with the Quality of Research

The research work performed in a given RI can be that of the users of the RI, it can also be the work of the research staff of the RI. The scientific quality of these research activities should be reflected in:

- Methods for selection of proposals (open access, international calls for tenders, etc.) and basic principles of scientific evaluation policy
- Publications in international peer-reviewed scientific journals, according to the methods of bibliometry (number of publications, impact factors, H factors, joint publications, joint international publications, etc.)
- Inviting over the RI own researchers in relevant national and international scientific meetings, membership in national and international associations, awards
- Leadership role of the RI in scientific community, as witnessed by the organization of scientific conferences, taking office in scientific organizations
- Attractiveness, as documented by number of proposals, origin of proponents, number and origin of accepted proposals, overbooking factors.

Criteria linked with the Quality of service for the users

- Availability, as witnessed by time effectively allocated to accepted proposals
- Results of satisfaction survey of users
- Criteria linked with the service to cost ratio (to be further developed)

Criteria linked with other impacts

Training and education: Research infrastructures are generally associated with institutions of higher education or other larger infrastructures. In any case, they have to play an important role in the higher education and training environment, benefitting both sides. The interaction between institutions of higher education or with larger infrastructures should be assessed in terms of:

- Formal links with institutions / Relevance of facilities and services provided for the education and research activities of universities or other facilities

- Training of Master and Ph.D. students, with theses being thought wholly or partially at the research facility
- Transfer of knowledge disposition to young scientists:
  - Teaching courses in institutions of higher education,
  - Opportunities for internships for young researchers

IPR results, patents, licenses, spinoffs: Research Infrastructures have a key role in making scientific knowledge and advances accessible to potential users. Service activities for enterprises and administrations could include, e.g. materials testing services for industry, social research centers helping governments to formulate policies and strategies. Furthermore, they could be important repositories of knowledge, e.g., a research facility on marine biology located in a coastal region could help build up valuable knowledge which could turn out to be critical for solving concrete problems in the future. Outreach activities could therefore include:

- meeting demands for scientific and technical skills by industry and governments
- building up strategic knowledge of relevance for Europe
- dissemination activities promoting the use of new scientific results and insights

Labor market: Research Infrastructures of pan-European interest should be attractive working places, also stimulating interest in young people to enter scientific studies. At the same time, they can be a reservoir of labor force available to local industry in need for specific technical skills. Relevance for the labor market can be assessed in terms of

- Relevance of the institute staff's skills for potential employers
- Coherence with long term economic development strategies (e.g. Silicon Valley initiatives, biotech region promotion campaigns, etc...)

Other factors for assessment of research infrastructures

Additionally any decision to recognize the European interest of a research facility would also be influenced by a number of „soft factors", such as

- Does the facility give „name recognition" to – or a positive image of – ERA?
- Does/would the population take pride in this facility?
- Would the new facility incite the spirit of confidence and optimism in ERA?

8. Bottlenecks

Research infrastructures in Europe are distributed unevenly, concentrated in most cases, on the large, founding member states. This chapter is dealing with the difficulties met by new member states during the process of building their research infrastructures within the ERA.

The lack of interest in research infrastructures is slowly diminishing as member states realize the importance of their existence in the frame of their research and development policies. Moreover, the development of a strategic governance and policy making is still only at its beginning. Some of the issues related to the national situations in some member states are the following:

- Lack of funding
- Lack of adequate management of existing scientific complexes, which are inefficiently work-loaded and maintained;
- Uneven distribution of scientific infrastructure, thematically and regionally, and lack of national catalogue or database of available equipment;
- Missing peripheral infrastructure, needed for their proper functioning;
- Insufficient satellite complexes for data management in certain areas
- Insufficiently qualified staff maintaining scientific equipment, existing strong fluctuation and the lack of schemes for the building and maintenance of this expert category.

Bottlenecks related to legal issues are also frequent:

- A definition of a research infrastructure is often missing or it is inadequate within the member states legislation
- Research infrastructures are not always separate legal entities, which makes their management quite difficult, especially if we would like to have an evidence based policy making approach

Regarding financial issues, the bottlenecks involve:

- Lack of coordination between research and regional development policies
- Criteria for the choice of site of an excellent research infrastructure are in conflict with criteria for the site of a research infrastructure within the cohesion policy program
- Weak involvement of regional representatives in cohesion policy making on the national level
- The member states are only now beginning to develop national financial instruments for the development, operation and upgrade of their research infrastructures.

In the case of governance:

- Member states not always have a committee for RIs, which would secure a bottom up approach and the participation universities, research institutions, industry and state administration in the decision making process

9. Recommendations to ESFRI for Actions Within the Next 5 Years

ESFRI has been established as a counseling body to the ministers responsible for research on the issues concerning research infrastructures.

During the next 5 years ESFRI should devote a considerable amount of its know-how and resources to the development of a pan – European policy for the development of research infrastructures. In addition to this, under the umbrella of implementation of the ESFRI Roadmap a special focus should be given to the involvement of less research intensive regions (countries) especially in distributed facilities and also to support development of Regional partner facilities.

Policy making

In the frame of the formation of a pan – European policy for the development of research infrastructures throughout Europe, ESFRI should:

- Take into account the individual conditions of different member states and regions of Europe, compare national roadmaps and suggest complementarity where overlap occurs, encourage MS to take geographical aspect into consideration
- Monitor the implementation of the ESFRI Roadmap under the regional and meta regional point of view
- Include Regional partner facilities into this policy
- Use the method of foresight for identifying future needs and priorities of member states, regions and meta regions
- Assist EC in developing a model of organisational structure and legal framework (the ERI legal framework) and to help implementation of this framework for large facility – RPF relationship

Governance and financial issues

We would like to recommend to ESFRI

- To encourage the formation of national coordination bodies, committees or councils, in order to ensure a strategic approach on the level of member states as well as on the European level
- To encourage the member states to develop national financial instruments especially designed for the long term financing of research infrastructures and the connection of existing research infrastructures to the pan- European ones

- To encourage the member states to consider the legal statutes of their RIs in the context of ERI
- To engage in formulating the evaluation criteria for research infrastructures interacting throughout the ERA and taking into account regional aspects

Communication issues

It is very important to cultivate a wide "RIs culture" not only across the regions but also across the EU itself. It is essential to ensure the approval of the European citizens for the building of Pan-European RIs.

The RIs and their impact should be "put" in the "spotlight of ERA". Possible actions could be explored. E.g. "Article of the month" in CORDIS Focus dedicated to the important European RIs; the ESFRI representatives or National representatives in the Programme Committee for the RIs, could provide a list of journalists (experienced on R&D sector) who could be invited by ESFRI or EC in order to participate in European Conference (ECRI), and a number of other relevant Conferences as well; the "European Day" of RIs could be established at EU level and regional level, where the public will have the opportunity to visit the RIs.

Annex 1: Members of the 2008 ESFRI Regional Issues WG

With the kind contributions of Liisa Hakamies-Blomquist NordForsk Director and Hans Chang FOM director

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Annex 2: Examples of Existing Research Infrastructures. Limit of Five per Country

Central European region

Austria

MedAustron http://www.ebgmedaustron.at/index.php?lang=english

The MedAustron project has its roots in the 1990's and is the response to a widely-held consensus of opinion that Austria should build an interdisciplinary centre of excellence that would serve the reunited Central Europe.

The final project for a cancer therapy treatment centre with clinical and non-clinical research facilities has been planned in collaboration with all of the Austrian University Clinics and Departments for Therapeutic Radiology and Oncology. The centre comprises an accelerator facility based on a synchrotron for the delivery of protons and carbon ions to irradiation stations for cancer treatment and for clinical and non-clinical research. All the appropriate biological and physical irradiation planning and diagnostic systems will be included.

Once the centre is in full operation, it will be possible to treat 1,200 patients per year.

The trial operation of the facility is planned to begin in 2013.

Climate-Wind-Tunnel www.rta.co.at

The Climate-Wind-Tunnel in Vienna is the only system for railway vehicles of its kind presently operated in the world. Here, railway vehicles can be tested under extreme climatic and aerodynamic conditions. The tests for the vehicles include checks for their thermal comfort (heating, ventilation, air conditioning) and function checks of different components (such as brakes, doors, windscreen wipers etc.) and their system behavior (e.g. cold start behavior of locomotives). These tests form the basis for the certification of the railway vehicles according to the applicable international standards.

SCHIG mbH has financed and realized this project, which was commissioned by the Federal Ministry of Transport, Innovation and Technology (BMVIT). After its completion, the new Climate-Wind-Tunnel was leased to the international operator Rail Tec Arsenal (RTA) for 35 years and handed over for operation on 30th December 2002. The investment volume for the new system was 65 million Euros.

System concept and design

The new system can also be used for other test objects than railway vehicles, for which the effects of their behavior under extreme climatic and aerodynamic conditions must be tested. For this purpose, a new concept with two wind tunnels was realised, which allows highest flexibility and fastest handling of tests. A system control coordinated with both tunnels allows carrying out tests automatically and, therefore, helps to optimise the test process. In addition, also the requirements of bus and HGV manufacturers were taken into account to ensure diversification, by adding bus test equipment to the smaller of the two wind tunnels.

Czech Republic

The „Slovanka“ area http://www.ipp.cas.cz/; http://www.pals.cas.cz/lprc/

Situated at the outskirts of Prague the Slovanka area is formed by two Institutes housing two research infrastructures dedicated to energy and material science – the Institute of plasma physics is housing the COMPASS-D and a part of the Institute of physics, the PALS center is housing the PALS – Prague Asterix Laser System.

In the Institute of plasma physics is the only tokamak reactor in the new member states – the COMPASS-D. COMPASS was originally built in the Culham laboratory, UKAEA, where it could not be operated any more due to lack of resources after the new spherical Tokamak MAST has been put in operation. COMPASS-D is compatible with ITER and can complement research done in the frame of ITER. In other words, it is a regional partner facility for ITER.

The COMPASS tokamak will further foster the existing cooperation with the Faculty of Nuclear Science and Physical Engineering of CTU and the Faculty of Mathematics and Physics of the Charles University.

Participation in the COMPASS project is open to all Euratom Associations which now represent practically all of EU fusion oriented research. COMPASS, owing to its relative flexibility (compared to large machines like JET or Tore Supra) and its siting in the “heart of Europe” is likely to attract cooperation from many European countries.

Formal agreements on collaboration in the COMPASS operation and exploitation have been signed with relevant institutions in Hungary, Portugal and Poland, letters of intent of such cooperation have been received from CEA (France), OAW (Austria), Ghent University (Belgium) and from Romania. Practical collaboration is underway already at the current preparatory phase (FOM Netherlands in the design of Thomson scattering diagnostics system, IPP Garching in numerical simulations of the COMPASS plasma, and last but not least, with UKAEA in technical questions connected with the COMPASS reinstallation).

The PALS – Prague Asterix Laser System Research Centre, member of LASERLAB-EUROPE, is the only laser laboratory in the Czech Republic as well as in all the „new" member states of EU, which operates a kJ-class terawatt high-power laser, the third largest laser in Europe. PALS Research Centre is an open civilian users infrastructure. Thus, it serves not only the whole Prague region and the Czech Republic as whole, but is utilized also by users from neighboring countries like Poland, Hungary, and many others. No users' fees or access costs have been charged to any regional users up to now.

The PALS Research Centre is tightly linked with the universities in Prague (CTU), Brno and Pilsen through their educational and research programmes. The PALS Research Centre cooperates with several high-tech SMEs in the Czech Republic (Crytur, Foton, Reflex, Vacuum Praha).

The PALS facility is offering its beam time to European users since September 2000. A complete list of the PALS users would contain over 140 names of scientists from over 40 different European and non-European research institutions. E.g. Rutherford Appleton Laboratory, Didcot; University of York, York; GB. Queens University Befast, N.I. LIXAM (LSAI), Université Paris-Sud, Orsay; Institut Curie Recherche, Université Paris-Sud; CEA Saclay; CEA, Bruyères-le-Châtel; CELIA-UMR5107, Talence; University of Provence et d'Aix-Marseille 1; LULI – Université Paris 6, Palaiseuau; LUTH, Observatoire de Paris; France. Deutsches Elektronen-Synchrotron DESY, Hamburg; F. Schiller-Universität Jena; Light Ion Technologies Bad Abbach; Technische Universität Remagen; GSI Darmstadt, Germany. Universita di Milano-Bicocca; University of Pisa; Universita di Messina, Messina; Universita di Lecce, Lecce; INFN-LNS, Catania, Italy. CFP Lisbon, Portugal. IPPLM Varsaw; MUT Varsaw; IBJ Otwock-Swierk, Poland; KFKI Budapest, Hungary and others. PALS in the frame of the project ELITPALS will enter the bidding procedure for the site of ELI from the ESFRI Roadmap.

CESNET z. s. p. o. http://www.ces.net/about/

CESNET is a private non-profit research organization, established in 1996 by all public universities of the Czech Republic and the Czech Academy of Sciences (for the list of association members see http://www.ces.net/about/members.html) for the purposes of operation and development of the Czech NREN (National Research and Education Network). This infrastructure, nowadays called CESNET2, is a virtual collaborative environment dedicated to support the needs of the research and education communities within the Czech Republic.

CESNET2 is a part of pan-European infrastructure Géant2 (www.geant2.net) connecting European NRENs and providing connectivity to similar infrastructures worldwide. This relationships allows Czech scientists to take part on globally distributed teams and collaborate with their colleagues abroad and vice versa.

Being a part of global research infrastructure, CESNET2 association participates in several networking organizations, the most important of those are: DANTE (www.dante.net), TERENA (www.terena.org), Internet2 (www.internet2.org), GLIF (www.glif.is).

Nuclear Research Institute Řež plc (NRI Rez)
http://www.nri.cz/eng/index.html

The Nuclear research Institute plc has several daughter companies and only some of them are sited in Řež in the region of Central Bohemia. These companies are for example Ústav jaderného výzkumu Řež a.s. (Nuclear Research Institute Rez plc - NRI Rez plc) and its daughter companies "Centrum výzkumu Řež s.r.o." (Research Centre Ltd.), "ŠKODA Výzkum s.r.o." (SKODA Research Ltd.) – Last two forming consortium VÝZKUMNÉ A TECHNOLOGICKÉ CENTRUM UDRŽITELNÉ ENERGETIKY (Research and technology center of sustainable energy), Ústav aplikované mechaniky Brno s.r.o. (Institute of Applied Mechanics Brno Ltd.), and others.

NRI Rez plc has leading position in EU in research support for VVER (pressurized water nuclear plants) technology, and molten salt technology, representing EURATOM in the GIF. NRI Rez plc with daughter companies play an important role on foundation of the SNE TP (Sustainable Nuclear Energy Technology Platform) and under preparation is participation in tree additional technology platforms: Hydrogen and Fuel Cells TP; Clean Coal TP; CARD TP. A new technological center developing different loops for research and development of nuclear reactors of the IV.th generation has been recently built using structural funds, supported by the Prime Minister of the Czech Republic. NRI Řež is also working on an in-kind contribution of a hot cell for the JHR (Jules Horowitz) reactor.

Research fields covered include nuclear energy, clean coal technology, power engineering, nuclear science and engineering, nuclear chemistry, radioactive waste management and disposal, material sciences and structural mechanics, mechanical engineering, civil engineering, transport engineering, radiopharmaceuticals and hydrogen technology.

NRI has a huge impact on the industry and higher education in many Czech regions; it collaborates with universities and enterprises.

Hungary

Budapest Neutron Centre

The nuclear research reactor at the Central Research Institute for Physics (KFKI), Budapest was built and first started in 1959. A full-scale reconstruction and upgrading was performed in 1986–92. The actual main parameters are as follows: average power 10 MW, flux at a core-trap: 2.3×10^{14} n/s.cm^2, at a thermal beam exit ~3×10^9 n/s.cm^2;

core: 220 fuel elements (36% ^{235}U), Be-reflector (~20 cm); operation: ~3500 hours (typically 15 times 10 days cycles) per year. For neutron beam measurements different types of horizontal channels are available: six radial thermal, two fast neutron channels and two tangential beam tubes. A 15 x 27 m^2 guide hall extending from the reactor hall, housing three neutron guides, was constructed in 1990. In 1999–2000 a cold neutron source (CNS) was built and installed. The construction of the CNS has been followed by the replacement of the obsolete neutron guides by a new supermirror guide system both for the in-pile and out-of pile part. Five experimental stations (also partly modernised) have been installed on the cold neutron beams and since early 2001 the "CNS facility" is routinely operated.

Thanks to a substantial national research grant (with Hungarian acronym NAP) won by a consortium of 4 institutes in 2005, a new research and development project was started for the period of 2005–08. It has 3 main objectives: a) improvement and development of equipment and access services at the BNC; b) establishing formal research and instrument development co-operation with Institute Laue-Langevin (ILL) at Grenoble c) performing high level research with special emphases on bio- and nanotechnology related materials, engineering systems with industrial relevance as well as for exploring objects of cultural heritage and ancient technologies.

Szeged Laser Centre (SLC)

The Szeged Laser Centre is an association of laser laboratories operated at the Departments of Physics, University of Szeged, Szeged, Hungary. Departments of Physics, part of the Faculty of Science and Informatics, is the largest photonics-related institution in Hungary, where studies on optics and lasers including also their applications started as early as 1969. SLC has the unique feature that it incorporates three independent short pulse laser systems at three base wavelengths (at 248 nm, 800 nm, and 1064 nm). The High Intensity Laser Laboratory (HILL) incorporates a short pulse KrF laser offering the best laser parameters at 248 nm (80 mJ, 600 fs or 40 mJ, 150 fs, max. focussed intensity I > 1018 W/cm2). Three target chambers together with the most important plasma diagnostic tools are also available. To the best of knowledge the TeWaTi laboratory hosts the only terawatt-class femtosecond laser in the new member states of EU, producing 35 mJ, 20 fs laser pulses at 800 nm with 10 Hz repetition rate.

International cooperations link SLC to the USA, China, Japan and Europe. Within the EU, our close partners are the Lund Laser Centre (LLC, Sweden); the Laboratoire d'Optique Appliquée (LOA, France); the Rutherford Appleton Laboratory (RAL CLF, UK); the ULF-FORTH (Greece) and the IPPLM (Poland), while from Germany the Friedrich Schiller University (FSU), the Laser Laboratorium Göttingen (LLG), the Max Born Institute (MBI) and the Max Planck Institute for Quantum Optics (MPQ). SLC is a new member of the international infrastructure initiative LaserLab, offering access

time for international users and taking part in a joint research activity aiming at development of high power high repetition rate lasers. Szeged Laser Centre of the University of Szeged takes part in the preparatory phase of ELI already in the ESFRI Roadmap. Szeged also aims to enter the bidding procedure for the site of ELI.

Hungarian Ion-beam Physics Platform (HIPP)

HIPP is an open consortium of two research institutes of the Hungarian Academy of Sciences (HAS) established for operating and developing the ion beam physics resources of the stakeholders.

Part of the experimental facilities of HIPP is located at ATOMKI. These facilities are mainly based on a homemade 5-MV Van de Graaff (VdG) electrostatic accelerator for ions lighter than O and include, besides conventional beamline for PIXE/PIGE and DIGE analysis of larger sized samples, a PIXE beamline devoted to aerosol analysis in the Mg–U range, a microbeam for PIGE, RBS, NRA, ERDA and PIXE analysis in the C–U range as well as micro-machining of minute samples with high lateral resolution. Further facilities of ATOMKI partly belonging to HIPP are a 20-MV cyclotron, a 1-MV VdG accelerator and an Electron Cyclotron Resonance ion source.

Another part of the experimental facilities of HIPP is located at RMKI. The accelerator complex consists of the homemade 5-MV single-ended VdG accelerator and a 450-kV heavy-ion cascade implanter connected to each other via a joint scattering chamber. Three beam lines (RBS/channelling, proton microprobe and PIXE the latter allowing for performing external analysis) are devoted to ion-beam analysis.

HIPP services extend to whole Hungary; furthermore they are utilized by users from neighbouring countries like Croatia, Romania and Slovenia. A complete list of international HIPP users would contain over 50 names of scientists from more than 20 different EU and non-EU research institutions located in Belarus, Belgium, Bulgaria, Germany, France, Greece, Italy, Japan, Poland, Portugal, Russia, Singapore, Spain, United Kingdom, etc.

The Hungarian Infrastructure for Speech and Language Technology (ISSLT)

The ISSLT is coordinated by the Research Institute for Linguistics of the Hungarian Academy of Sciences. Its academic partners include the Institute of Informatics, University of Szeged, the Department of Telecommunications and Media Informatics and the Media Research Center at the Department of Sociology and Communications, both of Budapest University of Technology and Economics (BUTE). Industrial partners include AITIA International, Inc., Applied Logic Laboratory plc, MorphoLogic plc, Kilgray plc., the leading centers in industry and academia engaged in speech and language technologies. The Linguistics Institute is also one of the founding partners of the CLARIN infrastructure

project, and Budapest will play a key role in the region as one of the regional centers within the CLARIN project. The Linguistics Institute played a leading role in TELRI (Trans-European Language Resources Infrastructure) and the MULTEXT-EAST project along with its partners in Slovenia, Romania, Bulgaria, Croatia, Slovakia, the Czech Republic and Poland. As a recognition of its leading position in the field, the Institute organized EACL'03, the Conference of the European Association of Computational Linguistics.

Slovakia

National NMR laboratory

National NMR laboratory is formed by four laboratories in Bratislava and Košice. It is basically a distributed infrastructure formed by a set of NMR spectrometers ranging from 200 MHz to 600 MHz. The laboratory is under construction. It will provide NMR instrumentation for a wide range of research activities covering different branches of natural sciences. Besides the structural studies (organic compound, natural products,...) strong significance will be given to the biochemical application especially to the field of metabolic studies on different levels (experimental animal, tissues, cell cultures, extracts, bio-fluids,...). Also high importance will be given to the material research (solid state NMR). The laboratory will be open to the wide international cooperation. Common projects with EU countries will be strongly supported.

International laser center

The International Laser Centre (ILC) is an interdisciplinary institution, focused on training, research and development in the areas of advanced methods and technologies of photonics. The Ministry of Education of Slovak Republic in January 1997 established the ILC as an independent (research and educational) institution. The decision to establish this institution was aiming to build up an excellent research centre with laboratories equipped with up-to-date instrumentation in field of advanced laser and optoelectronic technologies. Research program is focused on two main topics in technology and biophotonics and comprise following topics: analysis and functional testing of telecommunication fiber-optic lines and investigation of new technologies of transmission and processing of optical information, subsystem design and characterization for CDMA optical encoders and decoders, characterization of high-speed optical and optoelectronic components, application of intense laser fields as a technological tool (laser deposition, laser micromachining), reflexion, diffraction and interference as a means of non-contact optical metrology and holography, measurement and monitoring of the spectral characteristics of lasers, laser and light-emitting diodes, detectors, analysis of the spectral features of the optoelectronics devices and others.

The ILC is open for international collaboration and at present has close international co-operation with following institutions: International Laser Center of Moscow State University, Russia; Liepzig University, Germany; Hong-Kong City University, China; Physical Institute of Czech Academy of Science, Prague, Czech Republic; University of Sherbrook, Canada

BITCET - Virtual biotechnological centre of SR

Facilities belonging to the virtual biotechnological centre of Slovak Republic BITCET serve as an equipment basis for development of genomics (DNA sequencing, Real Time PCR, micro array techniques etc.), proteomics (separation of biomolecules by chromatography and electrophoresis and their determination of primary structure by mass spectrophotometry), cell engineering (cell culture engineering, measurement of interaction of biomacromolecules, analyses of metabolites etc.) and bioinformatics (software's for biotechnology, molecular and cell biology). The instruments are used by 17 institutions in the field of basic as well as applied research. The main idea is to obtain unique and expensive equipment in Slovak Republic for improvement of scientific level in biotechnology.

Black Sea Meta Region and Greece

Bulgaria

Center for Genomic, Proteomic and Metabolomics Research of Rare Genetic diseases in the Different Ethnic Groups in Central and Eastern Europe (CGPMR)

CGPMR is operated at the Molecular Medicine Center, Medical University of Sofia. It is a University center, established through a FP6-ACC-SSA-2 infrastructure grant, combining efforts of its main stakeholders the National Genetic Laboratory at the SBALAG "Mother Hospital", Center on Molecular Medicine at MU-Sofia, Center on Transplantation of Stem Cells at the National Center on Hematology and transfusiology – Sofia, Center on Metabolic Research at the Medical University – Pleven, the research community, Health Care Providers, Health Insurance and Health Policy makers, patients organizations, pharmaceutical companies and innovation and science oriented SMEs and NGOs.

Research fields covered are bio-medical and life science like genomics, molecular genetics, molecular biology, bioinformatics, translational research, proteomics, metabolomics, pharmacogenomics and pharmacogenetics.

The infrastructure is member of The Cystic Fibrosis European Network, joining the European Centers of Reference Network for CF, member of European CMT consortium, member of the International Down syndrome screening group, member of ORFANET, participating in European Consortium for Affective Disorders, joining PRACTICAL (PRostate cancer AssoCiation group To Investigate Cancer Associated aLterations in the genome), joining TREAT-NMD: a European network of excellence for neuromuscular disorders. The center is a Reference Center for population genetics and genetic disorders of genetically isolated Roma population. Recently there is a planned application for joining BBMRI (European Biobanking and Biomolecular Resources Infrastructure) and EATRIS (The European Advanced Translational Research Infrastructure in Medicine).

The center has a strategic collaboration with VIB Department of Molecular Genetics, University of Antwerp, Belgium; Life and Brain Center and Institute of Human Genetics, University of Bonn, Germany; Institute of Ophthalmology, UCL, London, UK; Washington University of Saint Louis, USA, project funded by NIDA; University of Western Australia, Project Funded by NHMRC; Institute of Human Genetics, International Center for Life, Newcastle upon Tune, UK.

Distributed Infrastructure for Management, Early Signalization and Prevention of Risk in Natural Disasters and Industrial Accidents

Coordinated from the **Geophysical Institute, Bulgarian Academy of Sciences the infrastructure is formed by the following partners**: National Institute on Meteorology and Hydrology the Agency for Sustainable Development and European Integration – Eco-regions, Center for Implementation of Satellite Images, Scientific Application and Training Center on Risk Management at the SU "St. Kliment Ohridski", Central Laboratory on Seismic Mechanics and Seismic Engineering, BAS Institute of nuclear research and nuclear energy and the Simulation Center for Crisis Situations.

The main research activity of the Institute is entirely subordinated to the national and EU priorities: Protection of the population and risk mitigation of unfavorable natural phenomena and disasters. Research fields covered are seismology, earth magnetism and gravimetry, physics of the atmosphere and physics of the ionosphere.

The infrastructure has a strong impact both on regional and meta regional levels Pan-European/International users are European Mediterranean Seismological Centre, The network for digital seismological data ORFEUS, Magnetic Network in Europe MagNetE, World Network for Geomagnetic Data Exchange INTERMAGNET, European Center for Ionosphere data, Incorporated Research Institutions in Seismology USA, World Center for Geophysical Data in Boulder

Regional Astronomical Center for Research and Training

Operated at the National Astronomical Observatory – Rojen, Institute of Astronomy, Bulgarian Academy of Sciences (ACRONYM: IA) it covers the fields of astrophysics and astronomy and is oriented towards the fundamental research. However, the National Astronomical observatories in Rojen and Belogradchik (NAO) are unique complexes allowing astronomical observations; computer simulations, digitalization and storage of images and information.

The IA and NAO employ about 50 astronomers which are working in following fields of research:

- Small bodies in the Solar system (physics and chemistry of asteroids, comets, planet satelites)
- Solar astrophysics (computer simulations of active processes, magnetohydro-dynamical modelling)
- Stellar astrophysics (symbiotic stars, peculiar stars, cataclismic variables, flare stars)
- Extragalactic research (active galactic nuclei, large scale structures in the Universe, cosmology)

Network for providing and analysis of plant and genetic resources for sustainable agriculture in the region

The infrastructure is formed by the AGROBIOINSTITUTE (ABI) and the Joint genome center (JGC). It is a joint effort of the St. Kl. Ohridski Sofia University (SU), the University of Plovdiv and the National center of Agricultural Sciences.

Research fields covered are plant biotechnology, fundamental and applied research in the field of plant biotechnology, sustainable agriculture, biodiversity, improving the methods and systems for intensifying the breeding of economically important crops by using in vitro cultivation and modern technologies for genetic engineering, genomics, biosafety, risk assessment and public perception.

ABI is working on the establishment and development of a HIGH TECH Centre for research, training and diagnostic activities in the system biology (including genomics, proteomics, metabolomics, nutrigenomics, bioinformatics etc.) **The National AgroBioCenter of Genomics** will be established with the help of **structural funds**.

Since 1995 ABI represents Bulgaria in the International Centre of Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy. In 2000 ABI became a founder member of the European Organization of Plant Science (EPSO) and a member of the European Federation on Biotechnology (EFB). In the same year ABI was selected as a Sub-regional Centre for the Central and Eastern European countries in the field of GMO control and regulations. In 2004 ABI became a member of Black Sea Biotechnology Association (BSBA) (6 countries involved).

The infrastructure serves the Bulgarian institutes and universities working in this area of research as well as the academic institutions from Croatia, Greece, Cyprus, Macedonia, Moldova, Montenegro, Romania, Serbia and Turkey. In addition to this, the infrastructure has, outside Bulgaria, industrial cooperation with enterprises in Greece and Turkey.

The infrastructure even now has cooperates with the all states in Europe interested in agricultural research.

Center for methods and means for protocol internet security

National laboratory of computer virology is the coordinating unit for this infrastructure formed by the following partners Institute of Mathematics and Informatics, BAS; Institute of Information Technologies, BAS; Center for Virtual Engineering “eXcite“, Faculty “Computer Systems and Management”, Technical University of Sofia; Faculty of Mathematics and Informatics, SU “St. Kl. Ohridski”

Research fields covered include informatics and computer sciences, information and communication technologies, information security, computer security, cyber security, computer viruses, malicious software (malware) and rapid prototyping.

The National Laboratory of Computer Virology and its data base of instruments, rules and practices is one of the main key factors in the area of the regional decision-making and financial engineering about computer, information and cyber security in the last 15 years. The main Bulgarian government, parliamentary and president institutions and representatives are its users along with the main Bulgarian universities, high and secondary schools, the main commercial and non-profit organizations. There is a strong cooperation with partners and end users from Romania, Greece, Turkey, Cyprus and other Balkan countries.

Greece

KM3NET: Nestor Cubic Kilometer Neutrino Telescope
An ESFRI ROADMAP project

Neutrino detectors have opened a new window for observations and a new field in astroparticle science, that of neutrino astronomy. The Cubic Kilometre Neutrino Telescope (KM3Net) will consist of thousands of optical sensors distributed in a volume of about one cubic kilometre in the depth of the Mediterranean Sea. The sensors detect the light which is produced in the water by charged particles originated from neutrinos and the earth.

Over the past decade the three pilot projects ANTARES, NEMO and NESTOR have been exploring the technologies, building and deploying smaller scale prototype telescopes designed to operate at depths ranging from 2500 to 4500 m. Since February 2006, these groups have been engaged in a 3-year European FP6 Design Study. The inclusion of KM3NeT in the ESFRI Roadmap now gives the consortium the opportunity to apply for three years of Preparatory Phase funding within the European FP7 program.

The Mediterranean Sea "Pylos Area" appears to be an ideal place for this future installation: it provides water of excellent optical properties at the right depth and excellent shore-based infrastructure for marine operations and on-shore data processing.

With an angular resolution for muon events of better than 0.1 degree for neutrino energies exceeding 10 TeV, an energy threshold of a few 100 GeV and a sensitivity to neutrinos of all flavours and to neutral-current reactions, the KM3NeT neutrino telescope will be unique in the world in its physics sensitivity and will provide access to scientific data that will propel research in different fields, including astronomy, dark matter searches, cosmic ray and high energy physics.

The KM3NeT facility will become part of the ESONET, the European Seafloor Observatory Network.

The main stakeholder of the facility will be the National Observatory of Athens, and the facility will be built with the help of Financial Contribution of the Region of Peloponnesus in the construction of the RI with structural funds.

ULF-FORTH: Ultraviolet Laser Facility
National Research Center

The Ultraviolet Laser Facility at FORTH (ULF-FORTH) is a multi-disciplinary scientific laboratory dedicated to research in fields benefiting from the use of lasers, supporting high quality basic and technological research. The Facility is located near the city of Heraklion, Crete, Greece and has been continuously operating as a Laser Research Infrastructure open to European researchers since 1990.

The Ultraviolet Facility at FORTH is currently a member of LASERLAB-EUROPE, a Europe-wide Consortium of 17 major Laser Infrastructures from 9 European countries forming an Integrated Infrastructure Initiative.

At ULF-FORTH a wide variety of laser sources and state-of-the-art experimental workstations as well as facilities for materials processing and diagnostics, are combined with high-level scientific expertise in a broad spectrum of activities, ranging from basic scientific research to technological applications.

The objective in pan- European cooperation is to act as a pilot project for the ALS (Attoecond Light Source) of ELI, and to provide access to users until ELI becomes operational (smaller scale), and furthermore to provide complementary beam time and training after ELI will become operational

FUNGEN: Infrastructures for functional analysis of model genomes
The Biomedical Sciences Research Center 'Alexander Fleming' in Athens and the FORTH Institute for Molecular Biology and Biotechnology in Heraklion

The mouse is the central model organism used for understanding physiology and pathobiology of diseases affecting man, for the comprehensive functional annotation of the mammalian genome and for the development of new therapies. The importance of collaboration over the three continents, Europe, America and Asia is emphasized.

The strengths of research productivity by Greek laboratories in this area is extremely sound at the European level and worldwide. The Biomedical Sciences Research Center 'Alexander Fleming' in Athens and the FORTH Institute for Molecular Biology and Biotechnology in Heraklion, both hold unique expertise and tools to serve as research infrastructures for RTD purposes at the National as well as at the International level. For example, both Institutions co-ordinate a 6th EU-FP Network of Excellence (Fleming) and an Integrated Project (IMBB) in the thematic area of functional genomics. Moreover, BSRC Fleming is uniquely (for a Greek organization), listed as potential participating organization in a similar European Research Infrastructure proposal which is included in the relevant ESFRI roadmap named 'Infrafrontier: functional genomics in the mouse as a model of human disease'.

MART: Marine Research and Technology
HCMR, Hellenic Center for Marine Research

The facility will provide the state of the art infrastructure to support on-going and future underwater research with emphasis on deep waters by building of a new state of the art oceanographic vessel with multi-discipline fully equipped facilities including a state of the art multi-beam able to provide over-side and laboratory with approximately 60 m long, 12 m wide loaded draught 4 m, with diesel propulsion modern controls. The RI will serve increased national and cooperative international research activities in the Mediterranean and Black sea with extension to other near-by seas (Red Sea, Arabian Gulf, etc). The mapping of the sea floor, the seismic activity (fault lines) the potential resources (fisheries, methane hydrates and other hydrocarbons) as well activities related to cultural heritage are just a few scientific and economic activities of the proposed lab.

Such a facility of the distributed-type and operated by HCMR is very important at a National, EU and world level and Greece is at the top of such an activity.

Romania

Marine Research Vessel Mare Nigrum

The Marine research Vessel Mare Nigrum is operated by the National Institute of Marine Geology and Geoecology (GEOECOMAR). It serves the research community as well as the industry. It covers complex marine research in the following domains: Geology (grain size, mineralogy, RX), Geophysics (magnetometry, gravimetry, seismo-acoustics), Bathymetry (single beam and multibeam), Hydrology, Biology (phyto and zooplankton, zoobenthos), Hydrochemistry and Geochemistry. Research conducted by R/V Mare Nigrum for the industrial stakeholders aim to identification and delimitation of potential marine mineral and energetic resources (gas hydrates, H2S, mineral aggregates). Dedicated bathymetry, geology (bottom sediment types and spatial distribution) geophysics (seismo-acoustic, gravimetry, magnetometry) maps elaborated based on field measurements can be used by the energetic industry (conventional and non-conventional sources), extractive industry (petrol, gases, mineral aggregates), underwater cables and pipelines as well as marine construction. The vessel serves the whole scientific community of Romania and it is used for education of university students. Between meta regional users can be included the Black Sea Commission, scientific institutions, universities and private companies from Romania, Bulgaria, Turkey, Georgia, Ukraine, Russia, Greece, Israel with main areas of interest: Black Sea, Marmara Sea, East Mediterranean area.

Research Vessel Mare Nigrum is the main component of marine research infrastructure of Romania. R/V Mare Nigrum represents the most up-to-date marine infrastructure of the Black Sea region, as it is equiped with modern and complex marine capabilities and offers 25 places on-board for scientists.

R/V Mare Nigrum is presently involved in several projects which include the following main international projects: FP 7 – **CLIMATEWATER** (Bridging the gap between adaptation strategies of climate change impacts and European water policies), FP 6 – **HERMES** (Hotspot Ecosystem Research on the Margins of European Seas), FP 6 – **SESAME** (Southern European Seas: Assessing and Modeling Ecosystem changes), FP 6 – **CONSCIENCE** (Concepts and science for coastal erosion management).

R/V Mare Nigrum is also included in trans-national access in a FP-7 proposal submitted in February, 2008 and it is a part of proposal for ESFRI-Road Map Update submitted by the Turkish delegation. Among international users are: European Commission, IFREMER (France), Hamburg University (Germany), Institute of Oceanology - Bulgarian Academy of Sciences (Bulgaria),

INCAS – Wind tunnel

Wind tunnels with their main shareholder INCAS - National Institute for Aerospace Research "Elie Carafoli" cover research in aeronautics, fluid mechanics, aeroacoustics and environement.

INCAS is the leading aerospace research institute in Romania, with more than 50 years of experience in aerospace design, experimental aerodynamics and numerical methods for applied aerodynamics and fluid mechanics. INCAS is collaborating in an integrated environment with industrial partners, involved in many aircraft projects at national and international level. All Romanian projects in aeronautics were developed in INCAS (e.g. IAR-93, IAR-99, IAR-705), and also international developments (e.g. BAC 1-11/ROMBAC, IAR-330 Puma). Currently INCAS is the leading design authority for AeroTAXI sub-commuter scale CS-23 aircraft (12 pax.) and the promoter for a new transportation system and infrastructure development at regional level.

Computing facilities include a PC farm featuring a Rocks based Beowulf cluster with 64 nodes, using Grid technology and parallel pre/post processing capabilities. Access in Grid technology is enabled for an IBM JUMP 32x64 supercomputer. INCAS uses mainly in-house codes for flow analysis as well as commercial codes

INCAS is a reliable partner for most relevant actors in aeronautics in EU. As part of EREA, INCAS is in direct contact with DLR - Germany, NLR-Netherland, CIRA-Italy, ONERA-France, FOI-Sweden, INTA-Spain, VZLU-Czech Rep., ILOT-Poland, VKI-Belgium and ARC-Austria.

As a participant in several important industrial projects (JTI-Clean Sky), INCAS is associated partner with key industrial players in aeronautics: AIRBUS, Rolls-Royce, Alenia, Safran, Thalles, Dassault, CASA, SAAB. Also, based on direct contacts, INCAS is a service provider in aeronautical research for ELBIT and IAI.

Tandem Accelarator

Electrostatic Van de Graaf FN Tandem Accelerator of the Horia Hulubei National Institute of Physics and Nuclear Engineering

Nuclear Physics, Nuclear Structure, Nuclear Astrophysics, Atomic Physics, Ion Beam Analysis, Accelerator Mass Spectrometry, Ion Sources, Electrostatic Particle Accelerators

At present, the decisions concerning the Electrostatic Van de Graaf FN Tandem Accelerator are taken by the Horia Hulubei National Institute of Physics and Nuclear Engineering, Magurele, Romania, with consideration of the necessities of other partners from the University of Bucharest, the Polytechnic University Bucharest, the University of Targoviste, the National Institute of Materials Physics, Magurele and the National Institute for Laser, Plasma and Radiation Physics, Magurele.

The development of new experimental setups and associated infrastructure at the **TANDEM** Laboratory has direct feedback on the local / regional industry. User groups from large European research projects (such as, e.g., **FAIR at GSI Darmstadt**) are expected, once the participation into several FP7 program is defined.

The FN Tandem Accelerator stimulated collaborations with different research European entities as Ecole Polytechnique, France; Institut für Kernfysik der Johann Wolfgang Goethe University, Frankfurt/Main, Germany; KVI, Groningen, Denmark; Laboratorio Nazionale del Sud, Catania, Italy; Institut für Kernphysik, Frankfurt University, Germany; Istituto di Fisica del Plasma, Milan, Italy and IN2P3, France.

Users in future from **GANIL/SPIRAL2** (France) for testing of a system for production of radioactive ions beam through fusion-evaporation

Complex/Integrated System of Seismic Monitoring

National Institute for Earth Physics (NIEP), Bucharest, Romania manage a modern distributed research infrastructure and operates a real-time seismic network.

The Institute, having an important expertise acquired in more than 100 years of existence, has been involved along the time in many European and international co-operation activities in the environmental and physics sciences, from bilateral co-operation with other research institutions, infrastructures, organizations, to multilateral co-operation, participation in European programs and projects, participation to EC – funded projects and to international programs and projects extending beyond Europe.

Moreover, Vrancea type of seismicity is nowhere else observed on earth. To solve this naturally occurring situation NIEP will extend the already developed early warning system (EWS) for life–threatening incidents from earthquakes from national to regional level.

It is important to mention that this system is already working and it has been awarded by the EC with **"The European IST Prize 2006" (www.ist-prize.org)**.

The main users are the neighboring countries: Ukraine, Republic of Moldova, Bulgaria, Serbia and Hungary; EC by using the expertise of NIEP in connection to "Seismic Early warning For Europe "**(SAFER)**.

NIEP has to face the requirements of several partners at the European and International level, being part of important European and international organizations and networks **(GEO, GEOSS, NERIES, EMSC, IDC, etc.)**. Data from all real-time national seismic network stations and from several European stations: VTS(Bulgaria), MORC ,VRAC(CzechRepublic),APE(Greece),PSZ,PKSM(Hungary),AQU(Italy),KIV(Russia) and ANTO, MALT, ISP(Turkey) are send to Romania Data Centre (RO NDC).

Turkey

National Center for High Performance Computing (NCHPC)

National Center for High Performance Computing (NCHPC) provides computation and storage resources to national innovation system, and within this context it is/will be a synergy center for HPC. Three different user groups are targeted in HPC Center:

- Scientific researchers that are based at universities and public sector's research departments,
- R&D departments of industrial companies that need computational resources for their services,
- The projects of international research and application.

The main goals of the National Center for High Performance Computing are to build awareness regarding to computational sciences and engineering in Turkey and to make ready the computational infra-structure for scientific researches and R&D services. National Center for High Performance Computing Project started in 2004 with the support of DPT [Devlet Planlama Te□kilatı(Prime Ministry State Planning Organization)].

In November 2006, the first phase of the server system is deployed in its temporary location in Istanbul Technical University Ayazaga Campus. Deployment process is finished in January 2007 and it was opened for users. The second phase of the server system, disk and tape based storage system and virtual reality laboratories will be in use after the permanent building is finished. Super computers are used for finding an approximate solution for complex scientific problems.

In order to continue the international competition European scientists and engineers (super computer team) plan to collaborate. **PRACE** (The Partnership for Advanced Computing in Europe) plan to have sustained high performances on computing and long lasting infrastructures. This infrastructure will be managed as a singly European entity. Turkey progresses its work in order to become a member of this project through NCHPC.

National Nanotechnology Research Center (UNAM)

The idea of establishing a center of excellence in nanoscience and nanotechnology in Turkey has been embraced by the State Planning Organization („Devlet Planlama Teskilatı", DPT) and as a result „The National Nanotechnology Research Center (NNRC) „ project prepared by researchers from Bilkent University has commenced. This is a multi-disciplinary effort led by faculty from the Department of Physics, the Department of Chemistry, the Department of Molecular Biology and Genetics, and the Department of Electrical Engineering. The Center will be open for the participation of all scientists within Turkey through research and development projects. Calls for proposals will be announced periodically and projects supported through these calls will utilize the resources of the Center. International participation in these projects is encouraged. The goals of the Center are not limited to research and development, but include the education and training of students in nanoscience and nanotechnology. It is expected that many of the technologies and know-how generated at this Center can find industrial applications and be commercialized through start-up companies established by some of the graduating students.

UNAM -Bilkent University, Nanotechnology Research Center (NANOTAM)

NANOTAM which was founded in 2003, is an independent research institution at Bilkent; its formation and operation are completely RTD oriented. NANOTAM actively researches the area of nanophotonics, nanoelectronics, nanodevices, nanofabrication, advanced nanomaterials synthesis, characterization and nanofabrication, atomic force microscopy, nanosensors, biosensors, and theoretical modelling-simulation of nanostructures. The photonics team of NANOTAM has been a pioneer in a number of areas related to nanophotonics. The group has demonstrated the world's best AlGaN solar-blind detectors in terms of quantum efficiency, detectivity, dark current, and high speed. The group also develops a strong research effort in the study of photon-confined structures, in particular photonic crystals (PCs). The aim is to bring the expertise in these areas to control the light-matter interaction, with such results as strong light-matter coupling and new fundamental phenomena, faster radiative recombination rates, directional emitters, high-efficiency light emitting diodes. The research center also has an extensive experience on the design, fabrication and measurement of quantum well modulators. Besides fabricating and testing nanophotonic devices, the Bilkent group has also used them to design, fabricate and test high-performance photodetectors, laser diodes, and modulators.

Hacettepe University Bioengineering Biyomedtek: Center for Biomedical Technologies

Hacettepe University is one of the leading universities in Turkey especially in Life Sciences with its both very strong Medical School and Engineering/Science Faculties, and also owns a technopark which is mainly devoted to biomedical technology/biotechnology. Bioengineering is one of the first a graduate programs in Turkey, established by Prof. Erhan Pişkin in 1988, where more than 50 students graduated (Ph.D. and M.Sc.). 4 years ago, Prof. Pişkin's group with a group of biomedical companies including OSTIM which is an industrial zone located in Ankara with more than 4000 SME members, has developed an interdisciplinary university-industry collaborative research centre on Biomedical Technologies: Biyomedtek, supported by Turkish Scientific and Technological Research Council (TÜBİTAK). At the beginning of this year, this centre was converted to a society, and founded also a technopark company. **BIYOMEDTEK** has an active research in the area of **polymer synthesis**: especially biodeg- radable polyesters (lactide, glycolide and ε-caprolactone homo and copolymers), acrylate base homo and copolymers (metacrylates, hydroethyl- methacrylate, acrylic acid, etc.) and intelligent polymers (mainly temperature, pH and light sensitive, mostly isopropylacryl- amide, and derivatives) by several techniques including suspension, emulsion, microemulsion, dispersion, reactive extrusion, etc. The research center also has an extensive experience in **polymer processing and its applications such as**: Polymeric biomaterials for soft and hard tissue repair including animal and preclinical studies; tissue engineering with polymeric scaffolds and cell (including primary cells and stem cells) hybrids; polymeric particle and membrane based bioaffinity separation platforms and diagnostic test kits for medical use; polymeric carriers for drug, antisense DNA, plasmid DNA, peptide delivery.

Middle East Technical University, Biomaterials and Tissue Engineerıng Research Center (BIOMAT)

Research at BIOMAT Center is mainly concentrated in the biomedical area, specifically on biomaterials, tissue engineering and more recently nanobiomaterials and nanobiotechnology. The activities carried out so far have helped BIOMAT to gain an excellent scientific reputation which, however, requires to be supported further in order to be at a comparable level with the leading Western European and North American laboratories so that it can collaborate effectively, transfer knowledge and be more influential in Turkey and in Europe.

METU BIOMAT Center is involved in the following areas involving biomaterials and nanobiotechnology:

1. Pure Biomaterials and Tissue Engineering research.
2. Applied research and development aimed at developing industry-university relations.
3. Training through regular graduate and undergraduate programs at METU and organizing conferences in the field.

Molecular Biology-Biotechnology & Genetics Research Center (MOBGAM)

A multidisiplinary center, Dr. Orhan Öcalgiray Molecular Biology and Genetics Research Center (MOBGAM), has been established at Istanbul Technical University (ITU).

Research areas of this center are:

1) Molecular Biomimetics in the de novo design, synthesis and genetic tailoring of inorganic/organic binding polypeptides as molecular linkers in self assembly, ordered organization, morphogenesis and fabrication of hybrid systems and materials like biosensors, bioassays, biocompatible materials and therapeutic devices.
2) Application of directed evolution principles via protein and metabolic engineering in order to improve functions both at the enzymatic and organismal levels for industrial applications through site-directed mutagenesis, DNA shuffling and inverse metabolic engineering principles, respectively
3) Utilization of recombinant DNA techniques for construction of a desired or a novel function in new microorganisms.
4) Computational approaches to predict protein folding, stability, activity and de novo design of novel biomimetic molecules by determining peptide-inorganic/organic surface interactions.
5) Neurobiology in the identifying and characterization of new motor and microtubule-associated proteins, chemical modification of microtubule and associated protein interactions, physical properties of microtubule dynamics.

TÜBİTAK's R&D Institutes

The Scientific and Technological Research Council of Turkey (TÜBİTAK) is the leading agency for management, funding and conduct of research in Turkey. It was established in 1963 with a mission to advance science and technology, conduct research and support Turkish researchers. The Council is an autonomous institution and is governed by a Scientific Board whose members are selected from prominent scholars from universities, industry and research institutions. TÜBİTAK is responsible for promoting, developing, organizing, conducting and coordinating research and development in line with national targets and priorities. TÜBİTAK reports directly to the Prime Minister and acts as an advisory agency to the Turkish Government on science and research issues, and is the secretariat of the Supreme Council for Science and Technology (SCST), the highest S&T policy making body in Turkey. TÜBİTAK's researchers work in 15 different research institutes of TÜBİTAK where contract research as well as targeted and nation-wide research is conducted.

The Baltic States Meta Region

Estonia

The National Institute of Chemical Physics and Biophysics is a research institution carrying out fundamental and applied research in material sciences, gene- and biotechnology, environmental technology, and computer science. The Institute operates and supports currently NMR Centre (the recent upgrading of the institute's included installation of a 800 MHz class magnet), terahertz range far-infrared spectroscopic, mass-spectrometric, and transgenic animal imaging facilities. In the experimental side of contemporary elementary particle physics NICPB is a member of the CMS collaboration of the forthcoming Large Hadron Collider at CERN. As a spin-off of the experimental particle physics program, a distributed computing concept Grid is under development and NICPB participates in it in both levels - Estonian and European level. The facility has established collaboration with McMaster University in Canada, Max-Planck Institute for Solid State Physics in Stuttgart, National High Magnetic Field Laboratory in Florida, Bell Laboratories, Dresden High Field Laboratory, Kyoto University etc.

Biomedicum of Tartu University (the research basis for pre-clinical departments of the Faculty of Medicine, est. 1999,) with its **Animal House** (the largest animal facility in the Baltic States), **Institute of Technology of Tartu University** (incorporating proteomics, transgenic technology, applied virology core facilities, est. 2001), **The Estonian Biocentre** (est. 1986 as a joint venture between Tartu University and NICPB to promote research and technological development of gene and cell technologies in Estonia comprising a number of laboratories equipped for various research in genomics, biochemistry and protein synthesis), the **Institute of Molecular and Cell Biology of Tartu University** and the **Department of Gene Technology of Tallinn University of Technology** form together the cutting-edge infrastructure for performing of medical biotechnology research in Estonia.

The Estonian Bank of Gene Data was founded by the Government in 2001 and has been subsequently reorganized as a research institution affiliated to the University of Tartu. The aim is to create a database of health, genealogical and genome data representing 10% of Estonia's population. The Estonian Gene Project participation in international projects: Development of Hereditary Cancer Prevention Measures in Estonia and Latvia (2005 -07, financed by Interreg III), ScanBalt Clinical Research Network (2005–06 Nordic Innovations Center), PHOEBE (2006–09, FP6), ENGAGE (2008–12, FP7-HEALTH CP Collaborative Project), BBMRI (2008–10, FP7-INFRASTRUCTURES-2007).

Tartu Observatory incorporates astronomical research facilities: the 1.5-meter and the 0.6-meter telescope with auxiliary instrumentation. Both telescopes are used mostly for the observations of non-stably variable stars. In 2007 Tartu Observatory application EstSpace was among the successful FP7 projects with the budget of 1.1 M€ per 3 years which should contribute to establishing a high level space research

centre. Tartu Observatory is partner in several international networks and research organisations (ESA, Joint Research Centre, Aeronet, Nordic Network Physense, VALERI, RAMI, EARSeL, Nordic Optical, Telescope, OPTICON)

Estonian Educational and Research Network (EENET) is a governmental nonprofit organization established in 1993. The objectives of EENet are to ensure the functioning of an academic data communication network corresponding to the specific needs of educational, research and cultural institutions and its compatibility with new innovative projects (e-training, e-research, e-health, e-information, e-state, Estonian GRID). In 1994 EENet became a member of CEENet and has a National Member status in TERENA since 1996. Since 2000 EENet is a member of GÉANT consortium.

The strength of the existing infrastructure in physical and material sciences has its roots dating back to the 1980s. However, upgrading and new investments in equipment and technical support is needed for the **Institute of Physics of Tartu University** (which incorporates surface science, laser spectroscopy, nano-research, and material analysis complexes), especially in the field of nanotechnology. The institute has a long-standing and fruitful cooperation with a number of similar large-scale facilities in Europe (MAX-LAB (Lund), HASYLAB (Hamburg), the Ångström Laboratory (Uppsala), and Latvian researchers regularly perform experiments at the institute. **Department of Materials Science of Tallinn University of Technology** has invested about 2 M€ into the infrastructure during the last five years and offers now an access to the following modernized laboratories: microscopy laboratory, laboratory of thin films, laboratory for optical measurements.

Latvia

Ventspils International Radio Astronomy Centre (VIRAC)

After the withdrawal of the Russian army from Latvia the two fully steerable mirror antennas, 32-meter (RT32) and 16-meter (RT16) ones, were taken over by the Latvian Academy of Sciences (LAS). VIRAC was established on the basis of these antennas and related infrastructure. From 2004 VIRAC is a research institute of Ventspils University College (www.venta.lv). The main aim of the VIRAC is to take part in observations of cosmic sources of natural and artificial radiation in order to accumulate observational data for fundamental and practical research programs in radio astronomy, astrophysics, cosmology, geophysics, geodynamics, geodesy, coordinate-time service and other. Currently VIRAC is a member of the European VLBI Network (EVN). VIRAC performs satellite navigation research (GPS&GALILEO); research related to acquisition and use of satellite images (GMES), cosmic telecommunications (ESA & SSC) and astro-geodetic radio interferometry (VLBI). On the basis of VIRAC a Space research academic education centre has been created, which offers master's and doctor's level education.

Institute of Mathematics and Computer Science (IMCS)

IMCS was developed in 1959 as a first computational centre in Baltic States. Now it is the leading Latvian research institute in its particular sphere of activities and it is responsible for handling the country's practical needs of R&D in mathematics, computer science and networking. Main research fields of IMCS are: theoretical computer science, methods and tools for complicated system design, graph theory and visual information processing, semantic web, computer linguistics, bioinformatics, real time systems, information technologies and computer networks, mathematical modeling for technologies and natural sciences, high performance computing. IMCS has developed good cooperation with local and international IT&T business entities and it provides transfer of R&D knowledge to business sector. IMCS is the member of several international organizations, such as International Mathematical Union, Trans European Research and Education Networking Association (TERENA), Central and Eastern European Networking Association (CEENet), Council of European National Top Level Domain Registries (CENTR), Réseaux IP Européens Network Coordination Centre (RIPE NCC), Internet Corporation for Assigned Names and Numbers (ICANN), ARTEMIS Industrial Association (ARTEMISIA), European Grid Initiative (EGI), Nordunet, Sirene, Nordic Graduate School of Language Technology (NGSLT), Common Language Resources and Technology Infrastructure (CLARIN), European Consortium Mathematics for Industry (ECMI).

In 1992 IMCS was the first to introduce internet in Latvia and developed a single Academic network (Latnet, new name – SigmaNET) in Latvia. IMCS performs functions of NREN (National Research and Education Network) and is responsible for ensuring international connection to GEANT2 (IMCS keeps PoP, international connectivity at this moment is: physically – 10Gbps, operational- 2,5 Gbps), as well as development of Baltic GRID node (EU 6.FP BalticGrid project and e-Science Grid infrastructures – Baltic GRID-II).

Currently IMCS is working on development of national R&D Data Storage Computing Center with data storage capacity of one petabyte (now operational – ½ petabyte). Such IT&T infrastructure is planned to be used not only by local researchers but also for expanding R&D possibilities virtually and internationally.

Latvian Institute of Organic Synthesis (IOS)

IOS represents an academic institution of scientific competence and commercial competitiveness in the field chemistry, molecular biology and bioorganic chemistry. Institute has an excellent potential and resources in such fields as drug design and organic synthesis, pharmacological and biological studies; analytical support for these studies; in performing clinical trials (phase 2, 3 and 4) as well as in development of advanced technologies in organic synthesis.

IOS possesses excellent resources for creation of knowledge, such as NMR spectrometers (200 MHz, 400 MHz and 600 MHz), EPR system, x-ray diffractometer, gas chromatography systems (FID, ECD, TCD and MSD), high performance liquid chromatography with variant detection systems, 12-chanel filtration system, standard equipment of cell-culture laboratory and fluorescent microscope; equipments for studies of biochemical reactions, animal physiology, pathophysiology and isolated organs, complete set of equipment for pharmacological studies of animal behavior and specialists of molecular modeling. IOS has joint projects with 11 pharmaceutical companies. Together with business partners 143 patents have been filed in the last 5 years.

Institute of Physics at the University of Latvia (IPUL)

IPUL performing research in magneto-hydro-dynamics, heat, and mass transfer Latvian and French researchers (CERN and ECA) since 2004 are working on the development of new international research centre **"Ampere Institute"** (AI). The aim of this initiative is to create technological partnerships contributing to the economic growth of the European Union. Within the framework of this cooperation the following fields of magnetohydrodynamics will be further developed: fundamental research on the dynamo effect and the hydromagnetic one, research on the molten metals and research on magnetic fluids and the nanodisposits, investigations related with the elaboration of new liquid metal technologies for nuclear reactors of new generation and for fusion reactors, development of the magneto-hydrodynamic (MHD) converter of solar energy, creation of the MHD technology for production of new types of metals alloys, magnetic liquids, application of magnetic field for guiding nano-devices, interaction of magnetic and capillary phenomena, and application of magnetically conductible nano-devices in biomedicine.

IPUL possesses unique experimental capacities, such as:

- two thermo-vacuum chambers – one small (3m) and another sufficiently large one – 12 m.
- heavy liquid metal stands – installation for production of PbLi melts with dosing of components and electromagnetic steering; loop for testing of corrosion of different materials in PbLi in presence of up to 3T magnetic field; loop for long-term PbBi component testing; set of Hg loops in a Mercury Laboratory building and Galliums stand for development of a liquid metal jet limiter.
- light liquid metal stands – three Na stands with nominal diameter of piping 40, 60 and 100 mm, the latest equipped with a magnet (1 T in 100 cm long 15 cm gap); Na stand for precise combined weight/volumetric calibration of alkali metal flow-meters; two thermo/baro chambers for experiments with Li, (volume 3 m^3 and 30 m^3) capable to dissipate thermal power (50 kW and 300 kW).
- magnetic systems (potentially able to work at liquid Pb temperatures) – electro-magnet with 1.8 T field in a 300 x 50 x 20 cm gap; superconducting magnet with 5.6 T field in a D = 30 cm, L = 800 cm bore.

- a stand where different time-dependent, as a rule badly explored outer influences were "simulated, replaced, etc." by exposure of the object to a shorter (order of a few weeks) attack of liquid Li at high, up to 1000°C temperatures. The volume of the corresponding water-cooled thermo/vacuum chamber reaches 12 m^2 (D = 1,8 m; L = 4 m), with high-quality illuminators for inside observations. Total dissipated power of stand reaches 300 kW. A 99% niobium made lithium loop, placed in the chamber.

Lithuania

Department of Quantum Electronics of Vilnius University – VU Laser research center (VULRC), member of LASERLAB-EUROPE

Institute of Lithuanian Language and Center of Computational linguistics of Vytautas Magnus University

Center of Proteomics (CoP) consisting of core unit at the Institute of Biochemistry, and 5 satellite units at partner institutions. The core unit will run state-of-the-art high-throughput protein separation and analysis instruments serving the needs of all biomedical research community of the country. The CoP model creates the traditions of the collective usage of expensive research infrastructures and serves as a model to rationally invest into expensive equipment avoiding unnecessary duplication and fragmentation of investments.

Annex 3: Glossary

Existing infrastructures

CISM – International Centre For Mechanical Sciences, located in the Palazzo del Torso in the center of Udine is a non-profit organization, founded in 1968 to favor the exchange and application of the most advanced knowledge in the mechanical sciences, in interdisciplinary fields like robotics, biomechanics, environmental engineering and in other fields (mathematics, information and system theory, operations research, computer science, artificial intelligence).

DESY Deutsches Electronen – Synchrotron in Hamburg is one of the world's leading centers for the investigation of the structure of matter. DESY develops runs and uses accelerators and detectors for photon science and particle physics. DESY carries out fundamental research in a range of scientific fields and focuses on three principal areas: accelerators, photon science and particle physics

The European Fusion Development Agreement (EFDA) is an agreement between European fusion research ins EFDA European Fusion Development Agreement is an agreement between European fusion research institutions and the European Commission to strengthen their coordination and collaboration, and to participate in collective activities. In 1999, EFDA was created to provide a framework for national fusion research parties to participate in collective activities, such as the Joint European Torus (JET), the world's largest fusion experiment. EFDA is an agreement among all the Euratom Fusion Associations to strengthen their coordination and collaboration.

ELETTRA Trieste is a multidisciplinary Synchrotron Light Laboratory in AREA Science Park, open to researchers in diverse basic and applied fields. The laboratory is equipped with ultra-bright light sources in the spectral range from UV to X-rays and offers a stimulating and competitive environment to researchers from all over the world.

EMBL the European Molecular Biology Laboratory is a non-profit organisation and a basic research institute funded by public research monies from 20 member states and one associate member. Research at EMBL is supported by approximately 80 independent groups covering the spectrum of molecular biology. The Laboratory has five units: the main Laboratory in Heidelberg, and Outstations in Hinxton [the European Bioinformatics Institute], Grenoble, Hamburg, and Monterotondo near Rome.

ESRF the European Synchrotron Radiation Facility located in Grenoble – France, is a joint facility supported and shared by 18 European countries. The ESRF operates the most powerful synchrotron radiation source in Europe. At the ESRF, physicists

work side by side with chemists and materials scientists. Biologists, medical doctors, meteorologists, geophysicists and archaeologists have become regular users. Industrial applications are also growing, notably in the fields of pharmaceuticals, cosmetics, petrochemicals and microelectronics.

EUMETSAT the European Organization for the Exploitation of Meteorological Satellites is to deliver weather and climate-related satellite data, images and products – 24 hours a day, 365 days a year. This information is supplied to the National Meteorological Services of the organizations. Headquarters are in Darmstadt, Germany.

FERMILAB – Fermi National Accelerator Laboratory in Batavia, IL, USA advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines.

ILL 20/20 – The Institut Laue-Langevin in Grenoble is an international research centre at the leading edge of neutron science and technology. The Institute operates the most intense neutron source in the world, feeding intense beams of neutrons to a suite of 40 high-performance instruments which are constantly upgraded.

Pierre Auger – cosmic ray observatory in Colorado and Argentina is studying ultra-high energy cosmic rays, the most energetical and rarest particles in the universe

ESFRI Roadmap Projects – currently in the preparation phase

BOREALIS full name AURORA BOREALIS is a project for a European Polar Research Icebreaker

BMBRI full name European Bio-banking and Biomolecular Resources is project for a network of existing and new biobanks (samples and data from patients and healthy persons) and molecular resources

CESSDA is a project for a distributed research infrastructure to provide and facilitate access of researchers to high quality data for social sciences

CLARIN is a project for a distributed research infrastructure to make language resources and technology available and useful to scholars of all disciplines

DARIAH is a project for an e-infrastructure to study the sources in cultural heritage institutions

EATRIS is a project for a Network of new research centers for translational medicine

ECRIN is an Infrastructure for Clinical Trials and Biotherapy Facilities; a project for a network of clinical research centers, clinical trials and biotherapy facilities for therapeutic innovations

ELI is a project for an Extreme Light intensity short pulse Laser

ELIXIR is a project for an infrastructure for biological information in Europe to support life science research

EMSO is a project for a distributed infrastructure of multidisciplinary seafloor observatories (5 sites)

ESRF – upgrade – is a project for the upgrade of the existing research infrastructure

ESRF (see above)

ESS is a project for the European Spallation Source for neutron spectroscopy

ESS survey is a project for an upgrade of the European Social Survey (set up in 2001 to monitor long term changes in social values)

EUFAR is a project for a long range tropospheric aircraft (options: C130 or Airbus 400 M)

EURO – ARGO is a project for an Ocean Observing buoy system (deployment over 12 years)

FAIR is a project for a facility for antiproton and ion research

HiPER is a project for a high power long pulse laser for "fast-ignition" fusion

HPC is a project for an integrated European high power computing service (2–4 high-end centers)

ICOS is a project for a distributed infrastructure – an Integrated Carbon Observation System (deployment/operation over 20 years)

ILL 20/20 'upgrade' is a project for the upgrade of an existing facility (see above)

INFRAFRONTIER is a project for a distributed infrastructure for the archiving and phenotyping of mice as models for studying human diseases

INSTRUCT Integrated Structural Biology Infrastructure is a project for a network of centers for integrated structural biology (protein production, NMR, crystallography, microscopy)

JHR – Reactor Jules Horowitz is a project for a high flux reactor for fission reactors materials testing

LIFEWATCH is a project for an infrastructure for research on the protection, management and sustainable use of biodiversity

KM3Net is a project for an underwater neutrino observatory

SHARE is a project for distributed data infrastructure for empiric economic and social science analysis of the on-going changes due to population ageing

SPIRAL 2 is a project of a facility for the production and study of rare isotope radioactive beams (toward the future facility EURISOL)

XFEL is a project for a hard X-ray free electron laser in Hamburg

Annex 4: Figure 1.

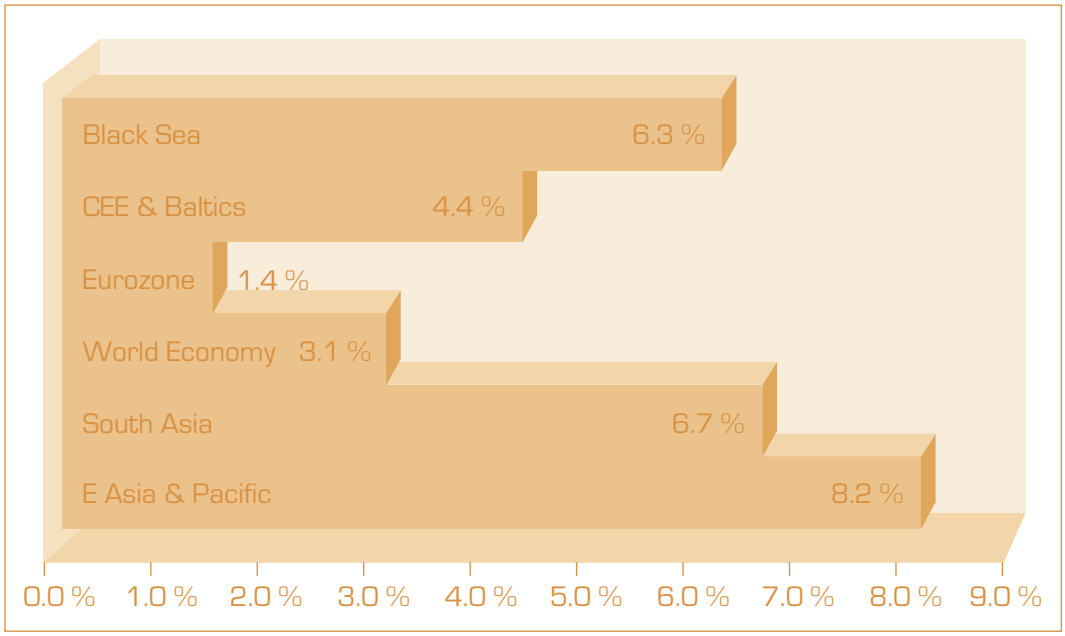

Figure1. The development trend of the Black Sea Region[12]

[12] P. Gavras, Growth and Gradualism- Economic Developments, Business Activity, and Patterns of Investment and Trade in the Black Sea Region, BSTD, Black Sea Synergy, Odessa, 2007