

ESFRI European Strategy Forum on Research Infrastructures

European Roadmap for Research Infrastructures

Implementation Report 2009



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ESFRI Roadmap Implementation Report 2009

Table of Contents

| | |
|--|----|
| FOREWORD..... | 5 |
| Chapter 1 - Introduction | 6 |
| 1.1 THE STORY SO FAR | 6 |
| 1.2 RATIONALE | 7 |
| Chapter 2 – Status of the Roadmap Projects and their Implementation..... | 8 |
| 2.1 PROJECTS UNDER IMPLEMENTATION | 8 |
| 2.2 PROJECTS MOVING TOWARDS IMPLEMENTATION | 9 |
| 2.3 PROJECTS IN PROGRESS | 9 |
| 2.4 PROJECTS WITH SIGNIFICANT PERCEIVED PROBLEMS THAT MAY IMPEDE IMPLEMENTATION IN THEIR PRESENT FORM | 10 |
| 2.5 PROJECTS INVOLVING A SIGNIFICANT INTERNATIONAL PARTNERSHIP AND GLOBAL PROJECTS | 10 |
| 2.6 PROJECTS FROM THE RECENT ROADMAP UPDATE (2008) | 10 |
| Chapter 3 – The role of ESFRI in the Implementation of the Roadmap | 11 |
| 3.1 LEGAL ASPECTS | 11 |
| 3.2 THE REGIONAL PERSPECTIVE | 12 |
| 3.3 HOSTING OF ESFRI RESEARCH INFRASTRUCTURES | 13 |
| 3.4 DISTRIBUTED FACILITIES | 13 |
| 3.5 MANAGEMENT OF RESEARCH INFRASTRUCTURES | 14 |
| 3.6 E-INFRASTRUCTURE ASPECTS AND DIGITAL REPOSITORIES | 14 |
| 3.7 SOCIO-ECONOMIC IMPACT OF ESFRI FACILITIES | 15 |
| 3.8 EUROPEAN CONFERENCES ON RESEARCH INFRASTRUCTURES | 16 |
| Chapter 4 – The tools supporting the Roadmap Implementation | 17 |
| 4.1 NATIONAL ROADMAPS AND RELATED FUNDING MECHANISMS | 17 |
| 4.2 FRAMEWORK PROGRAMME TOOLS IN SUPPORT OF NEW RESEARCH INFRASTRUCTURES | 17 |
| 4.3 STRUCTURAL FUNDS | 19 |
| 4.4 EUROPEAN INVESTMENT BANK: RISK-SHARING FINANCE FACILITY | 20 |
| 4.5 THE EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (ERIC) | 21 |
| Chapter 5 – Main Challenges Facing the Roadmap Projects | 23 |
| 5.1 COSTING AND FUNDING (INCLUDING POLITICAL SUPPORT) | 23 |
| 5.2 COORDINATION WITH EXISTING AND OTHER NEW RESEARCH INFRASTRUCTURES | 24 |
| 5.3 CHOOSING A SITE | 25 |
| 5.4 GOVERNANCE AND/OR ADMINISTRATION | 26 |
| 5.5 DATA MANAGEMENT AND LONG TERM ACCESS OF DATA | 27 |
| Chapter 6 – Next Steps..... | 28 |
| Annexes..... | 29 |

FOREWORD

The publication of the ESFRI Roadmap in 2006 and its update in 2008 has had a real impact on how Member States, Associated Countries, and in some cases non-European countries, see the realisation of new/upgraded research infrastructures of pan-European (and in a few cases global) relevance, as well as the development, operation and evaluation of the existing ones. Using the ESFRI Roadmap as a blueprint, Member States have started their own national roadmap exercises, in order to take stock of internal capacity, establish needs of national communities, and start the evaluation and prioritisation exercise needed to allocate funding for selected facilities.

This overall process is even more urgent given the current economic crisis, which puts pressure on national funding and research budgets. ESFRI, in fact, believes that it is now effective and urgent to invest in the construction of the new (or upgraded) research infrastructures of the ESFRI Roadmap, and involve all EU Countries, in order to sustain the high tech European economy, invest in the knowledge economy invoked by the Lisbon agenda, make sure that the next generation of European scientists remain in Europe, and build world level attractiveness of the European Research Area.

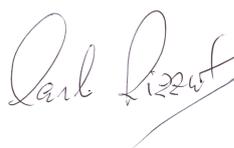
I am therefore encouraged by the progress made by the ESFRI projects towards implementation since the publication of the Roadmap: **ten projects** have effectively started, although much remains to be done to finalise all the details. At the same time, the site selection of the European Spallation Source has demonstrated that an informed decision can be taken in a way that leaves all stakeholders in a win-win situation. The approval by the Competitiveness Council of the ERIC Regulation is another important step forward. We also have high expectations that in the next couple of years many more projects now close to implementation can be considered as underway.

In spite of all these positive signals, we cannot be complacent. The majority of the Roadmap projects are in various stages of preparation, and the Member States and Associated Countries, as well as the European Commission, need to continue working with the scientific communities to solve problems of governance and funding to reach their implementation phase in order to sustain the longer term commitments that will allow their operation based on excellence. Prioritisation and coordination of national efforts with the ESFRI Roadmap should continue. Moreover, dedicated funds for their construction, operation and decommissioning need to be allocated in the framework of a common effort to pool and increase resources to build the European Research Area. Additionally, the example of the projects now being implemented shows that one country needs to play a leading role in each of these projects as a “champion”.

The e-infrastructure aspect also needs particular attention, because these facilities will create such large amounts of data that new creative solutions for their transmission, analysis and preservation are needed, irrespective of the field of science.

At the same time, the ESFRI facilities need to be solidly embedded in the fabric of existing European (and worldwide) research infrastructures. These should be helped to improve their quality and openness and therefore should be encouraged to play a major role in the European knowledge society, stimulating growth and inspiring new generations.

A lot of work still remains to be done. ESFRI is committed to continue working in the years to come to make sure that these problems are solved, and that the research infrastructures become the backbone and a reality that the European Research Area can be proud of.



Carlo Rizzuto
ESFRI Chair



Chapter 1

Introduction

1.1 THE STORY SO FAR

ESFRI supports a coherent and strategy-led approach to policy making on new and existing pan-European and global research infrastructures. In line with this mission, in November 2004 the Competitiveness Council mandated ESFRI to develop a strategic Roadmap for Europe in the field of research infrastructures, as a tool to help the development of an overall strategy for the efficient and cost effective realisation, deployment and use of research infrastructures of relevance for the European Research Area. Consequently, in 2005, ESFRI agreed on the procedure to follow, including the formation of Roadmap Working Groups and Expert Groups. During nine months starting in autumn 2005, almost 1000 high-level experts from all fields of science and technology were involved in the process of preparing the Roadmap.

At its meeting in September 2006, ESFRI agreed unanimously on a list of 35 mature proposals for new (or major upgrades of) facilities of pan-European interest covering the following fields: Social Sciences and Humanities; Environmental Sciences; Energy; Biomedical and Life Sciences; Materials Science; Astronomy, Astroparticles, Particle Physics and Nuclear Physics; Computation and Data Treatment.

As already announced during the launch of the 2006 Roadmap, and following a request by the Council, ESFRI launched in 2007 the first update process of the Roadmap.

This was necessary in order to keep up with the rapid evolution of certain fields and because of the need to address further critical areas. The update process helped to identify new research infrastructures of European relevance in the fields of Energy, Biomedical and Life Sciences as well as Environmental Sciences, addressing several of the “grand challenges”. The resulting update of the Roadmap, agreed unanimously and published in December 2008, now contains 44 projects of pan-European relevance¹, many with international participation, some of a global nature.

¹ Irrespective of the field of research, pan-European research infrastructures, new or existing, must provide:

- **scientific and technological cutting edge and managerial excellence**, recognised at European and international level (in research, education and technology);
- **clear pan-European added value**, linked with facilities which deliver **top-level services** attracting a widely diversified and international community of scientific users; host institutions awarding **free open access through international competition on the basis of excellence** (selection by peer review since demand exceeds supply) and results published in the public domain (additional access might be offered either for training or for proprietary research, the latter on a payment basis, as a marginal, non economic, activity, not interfering with the peer reviewed access).



1.2 RATIONALE

The projects on the Roadmap, together with those already existing of pan-European relevance, represent the research infrastructures needed by the European scientific community to conduct cutting-edge research in all fields of science and technology. Additionally, they should act as a set of “champions” to provide some of the essential tools for the structuring and growth, as well as for the attractiveness, of the European Research Area. Following this approach, a growing number of countries have prepared national roadmaps that establish the prioritisation of national and pan-European research infrastructures, using the ESFRI roadmap as a reference. This process helps to define national budgets for research infrastructures, facilitating political support and allowing long-term financial commitment for their construction, operation and decommissioning. This is very helpful towards better understanding the interplay between EU, national and regional funding, achieving consensus, if needed, on where to build new research infrastructures and ensuring that the whole of the European Research Area (ERA) benefits from their existence.

ESFRI, after the publication of the Roadmap update, has taken a proactive role towards the realisation of these facilities. The first concrete results of the Roadmap implementation are reported in Chapter 2, while the tools at the disposal of stakeholders and policy makers to implement the Roadmap are highlighted in Chapter 3. In Chapter 4, ESFRI's role in the implementation of the Roadmap is discussed. Chapter 5 summarises the major issues and bottlenecks still outstanding for the projects working towards implementation. Finally, Chapter 6 summarises the steps towards the implementation of the rest of the Roadmap in the next few years.





Chapter 2

Status of the Roadmap Projects and their Implementation

ESFRI has developed a list of categories that reflect the diversity in concept, structure and level of “readiness” of the projects of the Roadmap. This complements the review of the different Preparatory Phase projects made by the European Commission (see Annex 3). The integration of the new Roadmap for research infrastructures in the overall landscape of the existing facilities required in particular further analysis to define if a project is under implementation. IFMIF/EVEDA and JHR are not included in this or the following section, since they are under the remit of the EURATOM Treaty.

The definition of whether a project is currently being implemented is not always clear cut, since projects have different levels of readiness and different issues being tackled in different ways. Nevertheless the following broad groups of projects can be identified.

2.1 PROJECTS UNDER IMPLEMENTATION

These are projects where the statutes have been drafted or are in advanced status of drafting and the legal entity has been chosen, or at least formally agreed upon by the stakeholders. In some cases a MoU has been signed by the funding agencies. In the case of projects supported by an international organisation (members of EIROForum), the Council or relevant body has approved the

final design and relevant budget. In all cases the construction would effectively proceed by the end of 2009/early 2010. The following projects belong to this category:

CESSDA: facility to provide and facilitate access of researchers to high quality data for social sciences. With headquarters in Norway and Germany, and twenty Member States currently participating, it will use the ERIC regulation to establish its legal status.

ESRF UPGRADE: phase I of the upgrade of the European Synchrotron Radiation Source in Grenoble is underway, having been approved and funded, while phase II is under discussion. Twelve EU countries are members of ESRF with seven additional contributing countries.

EUROPEAN SOCIAL SURVEY: upgrade of the currently ongoing European Social Survey, the Secretariat will be hosted by the UK and the ERIC will be used to establish its legal status. Around thirty countries in Europe and outside participate to the survey rounds.

EUROPEAN SPALLATION SOURCE: new neutron source for Europe to match the US Spallation Neutron Sources in US and Japan. The final technical design will be built in Lund (Sweden) with Regional Partner Facilities to support it in Spain and Hungary. Fourteen countries so far are supporting the realisation of this project.

FAIR: the international Facility for Anti-Proton and Ion Research is currently under construction in Darmstadt (DE). An MoU has



been signed with the current participation of fifteen countries.

ILL 20/20: the upgrade of the neutron source and instrumentation at the Institute Laue-Langevin is currently underway, having been approved and funded. Ten member countries now participate in the scientific programme together with its three founding members.

PRACE: the Partnership for Advanced Computing in Europe will create a persistent pan-European high performance computing (HPC) service and infrastructure. Its organisation currently foresees six Principal Partner countries, eight General Partner countries and six Additional General partner countries to the initiative, with headquarters initially in Portugal.

SHARE: the Survey of Health, Ageing and Retirement in Europe has gathered EU-wide support. Its Secretariat will be hosted in Germany and will use the ERIC to establish its legal status.

SPIRAL2: the new particle accelerator project at GANIL (FR) has been developed by the founders of GANIL in cooperation with an international consortium of thirteen countries.

EUROPEAN XFEL: the European XFEL will be built in Hamburg by a consortium of twelve EU countries and Russia. The European XFEL GmbH has been officially registered in Hamburg on 8 October 2009, while the partners signed the convention on 30 November 2009. The construction phase has started.

2.2 PROJECTS MOVING TOWARDS IMPLEMENTATION

These are projects likely to be implemented in the next two years. For these projects the stakeholders are clearly engaged, and at present are discussing the form of the final agreement, or are awaiting decision for their implementation. These are:

| | |
|------------------|---------------|
| BBMRI | CLARIN |
| E-ELT | ELI |
| ELIXIR | ICOS |
| LIFEWATCH | SLHC |

2.3 PROJECTS IN PROGRESS

These projects are also making progress on the technical side but they still lack a clear solution in one or more of the following aspects (a) leading country, (b) clear, even partial, financial commitment, or (c) the Preparatory Phase has not yet delivered the relevant information required to proceed to the next stage. Some distributed research infrastructures may need stronger help to develop the correct coordination, being often composed of existing facilities which need to understand and fully develop the advantages and operation modes to become an integrated pan-European facility. These projects need specific attention by ESFRI:

| | |
|----------------------|-----------------|
| DARIAH | COPAL |
| IAGOS | INSTRUCT |
| EMSO | KM3NeT |
| EATRIS | ECRIN |
| INFRAFRONTIER | EUROFEL |



2.4 PROJECTS WITH SIGNIFICANT PERCEIVED PROBLEMS THAT MAY IMPEDE IMPLEMENTATION IN THEIR PRESENT FORM

These projects have specific individual problems which may suggest a reformulation in the technical or institutional approach, or need stronger technical or political leadership. At present they are:

AURORA BOREALIS PRINS

2.5 PROJECTS INVOLVING A SIGNIFICANT INTERNATIONAL PARTNERSHIP AND GLOBAL PROJECTS

These projects are in general progressing well on the technical side and supported directly by the interested countries, while discussions on legal, governance and financial issues are underway. Because of the substantial international participation, these projects need in general more effort to understand and align widely different legal structures and funding cycles. The projects concerned are:

**EURO-ARGO
ILC**

**HIPER
SKA**

2.6 PROJECTS FROM THE RECENT ROADMAP UPDATE (2008)

These projects are at present preparing their Preparatory Phase proposals, and in some cases they have already started relevant discussions on governance and financial models. They are:

| | |
|---|---------------|
| CTA | ECCSEL |
| EISCAT_3D | EMBRC |
| EMFL | EPOS |
| EU-OPENSREEN | |
| EURO-BIOIMAGING | |
| EUROPEAN HIGH SECURITY BLS4 LABORATORIES | |
| SIOS | |

ESFRI'S ROLE

ESFRI is closely following all projects. The first two categories are providing examples of best practice on how to develop effectively research infrastructures of pan-European interest. Input from ESFRI is hardly or not needed at all at this stage. Projects in the third and fourth category, however, require an active involvement by ESFRI and either Member States, Associated Countries or the European Commission. ESFRI estimates that some of them would greatly benefit from continued support beyond the current Preparatory Phase, not least to keep the critical mass of human resources currently working in the project teams.





Chapter 3

The role of ESFRI in the Implementation of the Roadmap

ESFRI has devoted considerable efforts to the identification of the new or upgraded research infrastructures that the European scientific community needs to continue being at the forefront of science and technology during the next two decades. This, however, is not sufficient. The Roadmap report shows the diversity in concept, structure, and level of their "readiness". A conservative estimate of the total cost of realising these facilities amounts to nearly 20B€, and on average 10% of this construction budget will be needed annually to run them effectively. It is therefore clear that a concerted action of all interested stakeholders (Member States, Associated Countries, Regional Governments and the European Commission) is needed to facilitate the realisation of these research infrastructures. In addition, the integration of these facilities in the overall landscape of the existing ones needs to be further developed, taking into account the present national investment in existing infrastructures of pan-European interest. This is estimated at about 100 B€, with an yearly operation and maintenance cost of about 10-15 B€, compared with a yearly investment by the EU of about 0,25 B€.

ESFRI is playing a proactive role in this respect. Since the publication of the first Roadmap report, in 2006, ESFRI is engaged in a number of activities, on one side in direct contact with Governments and on the other side through Working and Expert Groups aimed at clarifying and solving issues common to many Roadmap projects.

3.1 LEGAL ASPECTS

Already in 2006 ESFRI recognised as a major obstacle for the realisation of Research Infrastructures the absence of a suitable legal and governance framework at European level. Different types of facilities may require different legal structures. Additionally, the experience with setting up research infrastructures under existing Community law is very limited and can be used only in very special circumstances. For this reason ESFRI together with the European Commission has analysed existing legal structures with the aim of developing a generic model applicable to the ESFRI research infrastructures (following the definition outlined in Chapter one).

A series of workshops gathering experts with knowledge in this field were organised during 2006-2007 to explore which existing legal structures are most suitable. It was concluded that legal structures based purely on national law are inadequate to fulfil the needs of ESFRI research infrastructures; and that a new EC Regulation providing a common legal framework for research infrastructures of pan-European interest would be the best solution. Such Regulation would need to meet the basic needs:

- provide a legal personality recognised in all Member States
- embrace the spirit of a truly European venture
- be flexible enough to adapt to the requirements of specific infrastructures
- provide some privileges/exemptions allowed at a national level for intergovernmental organisations
- provide a faster and more cost efficient process than existing legal forms.



3.2 THE REGIONAL PERSPECTIVE

The creation of the ESFRI Roadmap has opened strong opportunities to involve all Member States and Associated Countries, exploit the potential for scientific excellence and technological growth also in the newer Member States, and in particular encourage the involvement of different European regions. ESFRI is committed to supporting the regional stakeholders in order to realise their ambitions.

To this end, ESFRI set up a Working Group devoted to regional issues. This Working Group started its activities in 2007 by evaluating the EU regional research infrastructures landscape and in particular the participation of the twelve newer Member States in research infrastructure activities at pan-European level. In its 2008 report, the Working Group recommended that ESFRI engage in actions leading to policies for the development and use of research infrastructures throughout the European Research Area. In this process, ESFRI should take into account the strengths of different Member States, Associated Countries and groups of regions in Europe and how they could offer opportunities for the common good of European citizens. Its detailed recommendations have been used as valuable input by the Czech Presidency in 2009.

Regional Partner Facilities¹ and partnership between research infrastructures in general are a new concept recently developed by ESFRI. Regional Partner Facilities would be either associated with large scale research infrastructures or with other complementary infrastructures (e.g. in a pan-European distributed research infrastructure). Thus regional capacities could be built up engaging smaller countries and regions in competitive research and innovation performance. The Regional Partner Facilities could therefore contribute to a more balanced development of the European Research Area, and to 'circulation of knowledge' throughout Europe, thus reducing the risk of 'brain drain'.

This concept is now taking shape both in the agreements following the siting decision of the European Spallation Source, whereby Regional Partner Facilities may be set up in other countries, and in the negotiations on other facilities, like the Extreme Light Infrastructure (ELI), which could be built with different "pillars" in different countries, under a common scope.

The Working Group on Regional Issues will continue its work, in particular by following up the implementation of Regional Partner Facilities.

¹ A 'Regional Partner Facility' (RPF) to a research infrastructure of pan-European interest, on the one hand, must be a facility of national or regional importance in terms of socio-economic returns, training and attracting researchers and technicians. On the other hand, the quality of the facility including its service, management and open access policy must meet the same standards required for pan-European research infrastructure. The recognition as an RPF should be under the responsibility of the pan-European research infrastructure itself (or the members of a to-be ERIC), based on regular peer-review.



3.3 HOSTING OF ESFRI RESEARCH INFRASTRUCTURES

Although ESFRI's mandate does not include siting decisions, this issue could nevertheless become critical for the implementation of some ESFRI research infrastructures, for instance if more than one country officially offers to host the same facility. This situation should be seen positively, because fair competition between potential host countries could offer a better final result for the project, provided that the selection process is carefully managed.

A first important case occurred in 2008 with the European Spallation Source, whereby three countries were actively competing to host it. In order to help reach the best results, ESFRI decided to set up, in cooperation with all the interested parties, a Working Group with the mandate of preparing a report defining criteria and a comprehensive technical assessment to facilitate the decision-making process. The outcome of this study demonstrated the high potential of the three candidate countries, and provided the technical basis for further negotiations of diverse strategic groups, which resulted on 13 June 2009 in the signing of an agreement between the Spanish Minister of Science and Innovation and the Swedish Minister for Higher Education and Research for a joint candidature for the development of this infrastructure. This agreement included the establishment of a unique project, with two additional centres: the main centre in Lund and a Regional Partner Facility in Bilbao (at

the Bizkaia Technology Park) and another one in Hungary.

Following up on the experience obtained with the case study of the European Spallation Source, a Working Group has been set up in 2009 to propose the relevant criteria and optimised procedures which could be the basis for identifying and choosing a site for both single sited and distributed research infrastructures.

3.4 DISTRIBUTED FACILITIES

The publication of the Roadmap prompted a debate on how to clearly identify distributed research infrastructures as distinct from more informal networks of existing facilities. This is of particular importance for instance for Environmental Sciences, Biomedical and Life Sciences, Socio-Economic Sciences and Humanities where the scientific fields require distributed data acquisition and analysis capabilities to be brought into a unified context. A Working Group was therefore formed during spring and summer 2008 to define more precisely this issue. A European distributed research infrastructure, as recognised by ESFRI, is a facility with one unique name and legal status, one director or board of directors, one management structure, one strategy and development plan ensuring peer reviewed open access for all interested users, and having one annual report and fiscal address although its research facilities are located in different sites and different countries.



3.5 MANAGEMENT OF RESEARCH INFRASTRUCTURES

A new generation of professional, full-time managers of research infrastructures is needed in order to ensure efficient and cost-effective exploitation of the available resources, as well as ensuring that top level science is carried out at all times. Also, policy-makers need to get a basic understanding of the role and rules by which research infrastructures can make an effective contribution to their R&D programs, as well as to the economy through innovation and education, as real “knowledge triangles”.

ESFRI is well aware of the need to find and train this new class of managers, drawn both from the scientific community and from the economic sector, especially in the newer Member States, where there have been less opportunities to run open-access pan-European research infrastructures. To prepare these future managers for the challenges ahead, a series of Symposia for Realising And Managing International Research Infrastructures (the RAMIRI Symposia) have started in 2009, with the support of Community funding. This initiative ultimately aims at providing the training needed on all aspects of bringing to realisation and running large scale international research infrastructures, including financial, governance, IPR, communication, political and legal issues.

It is essential that existing managerial expertise is made available in the most effective way and that as much hands-on experience as possible should be encouraged,

especially among policy makers and managers. A "toolbox" for the research infrastructure managers and policy makers could be ultimately developed to prepare them better for the challenges ahead. Such a toolbox will need to be accompanied by further actions and training to ensure that existing expertise is disseminated as widely as possible and that it will be continuously developed.

3.6 E-INFRASTRUCTURE ASPECTS AND DIGITAL REPOSITORIES

Research infrastructures produce and distribute huge volumes of data. The open access to the data generated, as well as the best use of the infrastructures themselves, require the development and continuous improvement of the underlying e-infrastructure, allowing data acquisition, transfer and analysis, as well as data conservation and administration, to make both data and infrastructure easily accessible to scientists.

Complementing a Commission communication “On scientific information in the digital age: access, dissemination and preservation” referred to as COM(2007) 56, ESFRI produced a position paper² highlighting the increasing importance of Digital Repositories, with general recommendations about availability, permanency, quality, right of use and interoperability.

² ftp://ftp.cordis.europa.eu/pub/esfri/docs/digital_repositories_working_group.pdf/



Together with the e-Infrastructure Reflection Group (e-IRG), ESFRI faces a major responsibility to support the definition and cost-effective integration of e-infrastructures in the fabric of research infrastructures. ESFRI therefore decided that e-infrastructure aspects should be looked at critically for all projects. As a follow-on action, ESFRI and e-IRG created a joint task force about data management (DMTF). The final report³ of the task force addresses in depth technical issues about data quality, metadata and interoperability and presents a complete set of 21 recommendations to be implemented for allowing the best use of data in a wide range of scientific disciplines.

This will be a renewed basis for a continuing cooperation between ESFRI and the e-IRG to ensure that e-infrastructure aspects of the Roadmap research infrastructures are properly developed.

3.7 SOCIO-ECONOMIC IMPACT OF ESFRI FACILITIES

The socio-economic impact of research infrastructures in their host country and in the region where they are built and operated, as well as at European level, should be qualified. This is necessary because although the impact of existing large pan-European facilities is clearly visible, it is still difficult to quantify and give advice on the potential effects of a new facility on contributing

³ e-IRG Report on Data Management, Data Management Task Force, November 2009

countries and regions, hosting and non-hosting alike.

The ERIDWatch project, funded by the European Commission, has recently presented more comparative data on some economic aspects. These results show, for example, that research infrastructures offer a qualified public procurement market worth ~8-9 B€/year to European industries, which has increased by ~5.5% per year over the last 10 years, as well as the huge potential role of research infrastructures in developing knowledge and education, and to be a test-bed for industrial development.

A workshop was organised jointly by the European Commission and ESFRI at the end of June 2009, to discuss further the issue, with a particular view towards the next call for FP7 for support measures in favour of the development of research infrastructure policies at EU level. The establishment of a Research Infrastructure Observatory, dedicated to the monitoring of the socio-economic impact of research infrastructures on the ERA, is currently under consideration.

In addition, ESFRI carried out important work to inform policy-makers on the importance of transnational access based on peer review of world-class research infrastructures to ensure their excellence, to highlight the increased socio-economic benefits, for the training of future scientists, engineers and technicians as well as for cross-fertilisation of scientific disciplines to foster innovation in Europe⁴.

⁴ See for example the outcome of the ERF seminar, held on 27 October 2009, <http://www.europeanresearchfacilities.eu/home.aspx>



3.8 EUROPEAN CONFERENCES ON RESEARCH INFRASTRUCTURES

In parallel with the reflection work on the best use of research infrastructures and the development and implementation of the European Roadmap, ESFRI has organised together with the European Commission a series of European Conferences on Research Infrastructures. Following the first conference in Strasbourg in 2000, where the concept of ESFRI itself was formulated, further conferences on research infrastructures were in Trieste in 2004, in Nottingham in 2005, in Hamburg in 2007 and in Versailles in 2008. Since then, the ECRI Conferences⁵ as they are now known, have become a major information platform for stakeholders, policy makers and researchers to discuss issues concerning the realisation and operation of research infrastructures of pan-European and global relevance. They are organised every eighteen months together with the Member State holding the Presidency of the EU and the Commission, with attendance of over 400 delegates and with regular participation of speakers and attendees from outside Europe. The next ECRI conference will take place in March 2010 in Barcelona under the Spanish Presidency of the EU.

Additionally, the conclusions of the Conference "New Worlds – New Solutions" held in Lund under the Swedish Presidency of the EU in July 2009 highlight the key role of world-class infrastructures to foster research and innovation in Europe.



⁵ <http://www.nottingham.ac.uk/ecriuk/>
<http://www.ecri2007.de/>
<http://www.ecri2008.eu/>
<http://www.ecri2010.es/>



Chapter 4

The tools supporting the Roadmap Implementation

In Chapter two the role of ESFRI in the implementation of the Roadmap has been briefly discussed. In this Chapter, closely linked to the previous ones, the tools at the disposal of stakeholders, funding agencies, ministries and the European Commission are highlighted.

4.1 NATIONAL ROADMAPS AND RELATED FUNDING MECHANISMS

In 2006 very few national roadmaps were available, and these were mainly limited to few scientific fields. The publication of the ESFRI Roadmap created the conditions for an enlarged view on all S&T fields. It further supported in a more coherent way the creation of national roadmaps, and consequently the prioritisation of existing and new research infrastructures. This process focuses Member States and Associated Countries on the current national landscape of research infrastructures, identifies strengths and weaknesses of the tools at the disposal of their communities and, helps them to integrate in the European landscape of research infrastructures. It also contributes to the construction of the European Research Area, by pooling and integrating these resources in a common effort.

This process is continuously ongoing, with new roadmaps under preparation and old ones under revision. **TABLE 1** (Annex 1) provides a snapshot updated to December 2009. As additional information, the status of national roadmaps for non-European countries involved in ESFRI projects and of the members of EIROForum is also included.

4.2 FRAMEWORK PROGRAMME TOOLS IN SUPPORT OF NEW RESEARCH INFRASTRUCTURES

During the Sixth Framework Programme, support to Design Studies for new research infrastructures of clear European dimension and interest was introduced. Such studies should address all key questions concerning the assessment of the technical, legal and financial feasibility of new facilities, leading to a 'conceptual design report' allowing policy makers and their advisors to prepare relevant strategic decisions for the development of new research infrastructures of European interest. Major upgrades of existing infrastructures are included, if the end result is intended to be equivalent to a new pan-European research infrastructure. All fields of science and technologies are considered. Design Studies have thus provided during FP6 the technical tools to address the conceptual design of new facilities in a bottom up fashion. Although facilities having benefited



from the Design Study instrument were not automatically considered for the Roadmap, it is interesting to note that nine out of nineteen research infrastructures which availed themselves of the FP6 Design Study were subsequently selected independently for the Roadmap. Many others are indirectly related to existing ESFRI Roadmap projects (see **ANNEX 2**). In all cases, however, this instrument is not sufficient nor designed to produce a fully costed production-ready detailed engineering design, and further commitment to advanced R&D is still required from the stakeholders.

Following the publication of the Roadmap in 2006, the Preparatory Phase has been introduced as an instrument specific for the support of all the legal, governance, strategic, financial and technical (with limitations) work needed to reach an agreement for the realisation of the ESFRI research infrastructures.

Its main objective is to provide catalytic and leveraging support for the phase leading to the construction of new research infrastructures or major upgrades of existing ones. The Preparatory Phase aims at bringing the project to the level of legal and financial maturity required to implement the project. Project consortia should involve all the stakeholders necessary to make the project move forward, to take decisions and to make financial commitments before construction can start (e.g. national/regional ministries/governments, research councils, funding agencies). During this Preparatory Phase the European Commission may act as a 'facilitator', in particular with respect to the financial engineering needed for the construction phase. The ultimate objective of

the Preparatory Phase is to deliver a draft Memorandum of Understanding (MoU) or equivalent agreements which can allow the stakeholders to proceed towards implementation.

By the end of 2009, 34 out of the 35 projects on the 2006 Roadmap have Preparatory Phase projects underway; of these, SHARE has virtually completed its work and is now ready to proceed to the implementation, while another seven projects will have completed their work by the middle of 2010. Only one project, EROHS, did not apply for Community funding through the Preparatory Phase, and after further evaluation was removed from the Roadmap. IFMIF/EVEDA and JHR are funded separately through the EURATOM Treaty, and therefore did not require funding from the Framework Programme. Additionally, two projects from the CERN Strategy for Particle Physics were awarded Preparatory Phase contracts, ILC-HiGrade (International Linear Collider) and s-LHC (upgrade of the Large Hadron Collider). It should be stressed that the Roadmap projects listed in 2.1 could still have ongoing Preparatory Phases needed to solve the last outstanding issues.

As seen in **TABLE 2** (Annex 3), the Preparatory Phase projects are, overall, proceeding according to expectations, with the majority making good progress, and some will exceed their expected outcome. In some cases, e.g. in PRINS, the Preparatory Phase has indicated the opportunity to reconsider the type of development best suited for efficient deployment of research services at European level in this field.



A call for proposals for the support of the Preparatory Phase of the additional ten projects of the Roadmap 2008 Update closed on 3 December 2009 and, subject to successful selection, the contracts are expected to start during 2010.

Discussions are currently taking place within the European Commission to organise the support to selected ESFRI projects, after the successful completion of the Preparatory Phase. Such support under FP7 could take place under the budgetary year 2011 or 2012 and might be related for example to the strengthening of the "eco-system" of research infrastructures in specific fields. Additionally, further strategic support to the implementation of projects with substantial international cooperation could be given.

4.3 STRUCTURAL FUNDS

In the context of the re-launch of the Lisbon process (2005) the Competitiveness Council underlined that "the Union must mobilise all appropriate national and Community resources including Cohesion policy" in pursuit of the Lisbon objectives. The goals of the Lisbon agenda formed therefore the basis for the Community Strategic Guidelines for the implementation of the Structural and Cohesion Fund programmes for the period 2007-13. The increase in the EU's capacity in the domain of research and innovation is thus reflected in the detailed operational programmes implementing cohesion policy.

For the period 2007-2013, EU cohesion policy has been allocated a budget of 347 B€, with nearly 50 B€ dedicated to the core activity of research, technological development and innovation, an amount equal to the 7th Research Framework Programme.

"R&D infrastructure and centres of competence in a specific technology" is a category of expenditure into which the operational programmes are divided. The budget allocated to this category is nearly 10 B€, of which 7.5 B€ will be spent in the Convergence Regions. Even if the bulk of these funds are likely to be spent on small-scale, general research infrastructures, significant funding could still be made available, especially in the Convergence Regions, for the pan-European research infrastructures of the ESFRI Roadmap, and their Regional Partner Facilities.

It is important to stress that many regions of the Member States are eligible for funding through the structural funds, in particular for the newer Member States. These can be combined with FP7 and national funding to contribute to the development of the research infrastructures throughout Europe. These resources are of great importance to secure the financial participation of the new Member-States, and a careful action is needed to make them effectively available for research infrastructures. The increased understanding of the socio-economic returns will help to avoid the rigidity which may result from the application of criteria normally applied in activities having more immediate and direct economic outcomes.



It is now important to coordinate and give better coherence to the available resources (FP7, structural funds, public and private sources), of regional priorities as well as the objectives of the National Authorities regarding research infrastructures: this should help also to solve the need to ensure longer term commitments for the operation. The appropriate national strategic R&D priorities for research infrastructures should be included in National Strategic Research Frameworks and subsequently in Sectoral Operational Programmes, so that structural funds are timely earmarked for research infrastructures by DG REGIO. The Regional industrial/private sector could also be encouraged to invest and to play an important role in the identification of the priorities regarding regional research infrastructures.

4.4 EUROPEAN INVESTMENT BANK: RISK-SHARING FINANCE FACILITY

Since R&D projects in general and the realisation of new research infrastructures in particular are intrinsically non-economic activities, they carry a higher level of uncertainty and risk. To allow the financing of R&D projects, a higher level of intervention in the form of risk coverage is therefore necessary, something that normal bank loans are not prepared to give. The Risk Sharing Finance Facility (RSFF) Cooperation Agreement, signed on June 2007 by Commissioner Potočník and EIB President Maystadt, provides partial cover of higher risks related to the financing of R&D projects.

Through the RSFF⁶, the EIB can provide loan finance as a complementary source of funding for these projects, combined with FP7/national grant funding, or independently, as appropriate. Between mid-2007 and May 2009, the European Commission has reviewed the eligibility of thirty seven R&D projects submitted by the EIB, some of them connected with facilities of the ESFRI Roadmap.

⁶ RSFF can be provided to support the development of new or existing research infrastructures which fulfil the following conditions:

- The research infrastructure ownership or operation involves independent legal entities in at least three Member States or Associated Countries or
- The research infrastructure services are (or will be) used or requested for use by research communities from at least three Member States or Associated Countries



Thirty three projects were considered eligible and the EIB has now approved them, with a loan volume of 2.8 B€. Loans to twenty three projects have already been signed with a volume of 1.7 B€.

Research infrastructures included in the ESFRI Roadmap are automatically eligible for RSFF finance and are regarded as priority projects. RSFF loans for research infrastructures can secure reaching the total financing of the projects, by bridging the gaps in securing complete commitments, at the earliest possible stage and thus accelerate their implementation.

The RSFF Eligibility Committee has to date approved three research infrastructure projects (two of which are on the ESFRI Roadmap) proposed for RSFF finance by the EIB as eligible for an RSFF loan with the use of the EC contribution for risk coverage: FERMI@Elettra (Sincrotrone Trieste, part of EuroFEL), E-ELT and Alphasat. Negotiations are currently in progress, to better understand amongst other issues the specific applicability of the EIB loans to research infrastructures as “non-economic” entities. It should be noted, however, that some European countries cannot at present make use of this funding instrument, due to regulatory aspects and specific interpretations in the funding of research and research institutions.

The EIB has developed – under RSFF – a dedicated facility to meet the financing needs of research infrastructures, the ESFRI RSFF Capital Facility (ERCF), offering bridge and/or project finance. The EC contribution foreseen to provide risk coverage is 70 M€, allowing for a larger total leveraged financial sum.

4.5 THE EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (ERIC)

With the support of ESFRI, the European Commission launched a proposal for a Regulation at Community level in July 2008. Following intense discussions at inter-institutional level, this EC Regulation, defining the European Research Infrastructure Consortium (ERIC), was approved by the Competitiveness Council on 25 June 2009. Since summer 2009, ESFRI has been involved in the refinement of the related guidelines for application, highlighting the need for scientific and technological excellence as well as defending the important role of research infrastructures of pan-European interest to foster mobility of researchers within and to Europe. It is now up to all the interested stakeholders to work towards its successful application to those ESFRI research infrastructures that require it.







Chapter 5

Main Challenges Facing the Roadmap Projects

In 2009, ESFRI carried out a survey on the state of implementation of all Roadmap projects, through a questionnaire sent to the project contact persons, with the aim of taking stock of their progress towards implementation, and of identifying any critical issues or problems preventing their realisation. These questionnaires were sent also to the two projects identified in the CERN Strategy Paper for Particle Physics and having Preparatory Phase projects, namely SLHC (upgrade of the Linear Hadron Collider) and ILC-HiGrade (International Linear Collider). Information was also obtained from IFMIF/EVEDA, although the project lies within the remit of EURATOM and is part of the ITER Broader Approach, thus formally outside ESFRI.

Issues can be technical, political and financial. In general the project coordinators perceive that, whichever technical problems they still have, they can be solved with the R&D currently underway. There seem to be no technical showstoppers for any of the Roadmap facilities, at least none that can be identified at present. In the following sections the main issues identified are discussed.

5.1 COSTING AND FUNDING (INCLUDING POLITICAL SUPPORT)

The majority of the projects report that while there is a good generic level of support for the conceptual and technical design development from governments, funding agencies and scientific communities, a lot of effort is still needed to secure longer term financial and political commitment.

Commitment for funding goes hand in hand with the political commitment to build the facility. This is not possible to achieve if the detailed engineering design is not yet completed, making it difficult to give a reliable estimate of the construction costs in today's money. Support to the design studies and the R&D needed to reach the construction phase might be also difficult to achieve: in this case a preliminary, less formal set of agreements between research institutions could be sufficient.

One specific issue that has become more and more clear is that there is a basic difference between securing the funding for construction and the long term commitments needed for funding of operation and upgrades. Financing of the construction costs is frequently granted outside of the current research budgets (e.g. from structural and/or other local funding). By contrast, the needed long term commitments for operation and upgrades have to be found in tight research budgets, becoming tighter still with each newly added facility.



Within the definition of costs, moreover, there is the hidden risk for the projects of trying to adjust the design and “official” cost by stripping-down instruments and other needed options, to “fit” to perceived or real financial constraints. This is in fact a deferring of costs that may lead later on to cost overruns and strong political and institutional tensions.

If not properly solved, the long term commitment to operation costs might also lead to a conflict with the principle of “open access” based only on peer review, which must be guaranteed first. It may be tempting to claim a “reserved access” only for funders, which would be problematic if the competition is correspondingly restricted.

Also for the “closed club” the principle of peer review excellence can and should be used. If the issue of operation costs is properly solved, then the use of other funding sources for construction and the involvement of local resources become easier because shorter term commitments in view of longer term returns are politically easier to obtain.

It is necessary to avoid a situation where some research infrastructures are for the exclusive use of a few countries which can afford to pay for the construction costs and for the access fees, thus leaving the other ones behind. Not to do so would decrease the attractiveness of the European Research Area for the best scientists at world level. The issue of the support to open access-based operation should be solved by all EU countries by pooling their resources: this solution will however be sustainable in the long term only if there is a substantial

increase of the EU contribution to ensure open access.

5.2 COORDINATION WITH EXISTING AND OTHER NEW RESEARCH INFRASTRUCTURES

The development of national roadmaps, connected to the ESFRI Roadmap, is helping to develop the required overall coherent policy by evaluating and prioritising national resources dedicated to existing research infrastructures (both national and pan-European) as well as by assessing the option of attracting or supporting new pan-European research infrastructures. This process may help to reach, within each country, an improvement in the overall expenditure, with decisions on upgrading, redirecting or discontinuing resources dedicated to existing facilities. In most cases assessed so far, the consequence of these decisions is that the intrinsic value as well as the scientific, educational and innovation impact of existing research infrastructures is increased. Some of them can evolve from being purely national facilities to reach pan-European relevance, e.g. connected as regional partners to distributed or larger research infrastructures. This contributes to the European Research Area by responding better to the existing scientific and global challenges.

It is important to stress, however, that the support to the overall improvement of existing and new infrastructures, and their operation in a more competitive European Research Area cannot be achieved solely by the savings achieved by discontinuing or redirecting existing resources. The operation



costs needed to ensure growth and excellence require an increased common EU budget, that takes into account the increase of the frontiers of knowledge, the additional need to ensure the correct access to the data produced and the increasing need to provide the e-infrastructure support.

5.3 CHOOSING A SITE

The analysis of the returned questionnaires shows that siting issues do not seem to be high on the list of issues of most project managers. This may be due to the fact that many projects have not yet reached the level of technical and financial development that requires addressing the choice of site, related socio-economic returns and political aspects. Several scientific communities are still unaware that a suitable site cannot be chosen, and connected long term commitments acquired, solely on the basis of a scientific and technical process, whether the facility is single sited or distributed. In the case of single sited facilities, the site choice may act as a showstopper for the implementation process, if not adequately addressed. A first test case has been that of the European Spallation Source (see paragraph 2.3). The experience gained by ESFRI with this first test case and the current work of the Siting Working Group will be useful to address similar situations.

The choice of site is of course not relevant to those research infrastructures on the Roadmap which are upgrades of existing facilities and therefore have a well defined

site, or are already connected to global negotiations.

It is interesting to note that in some cases, facilities which were initially conceived as single sited are exploring a possible "win-win" situation through distributing the original research infrastructure on two or several sites connected to a central facility. In these cases operation will make full use of their e-infrastructure capabilities. The challenge is to make sure that this choice is technically, scientifically and economically as well as politically sound.

Distributed facilities have different issues. Data infrastructures or e-infrastructure, especially in the social sciences and humanities, have a good perception of what their "site" is, because in most cases this is where the data is collected and/or coordinated, and there is a past history of networking and/or coordination. In several other cases, projects do not feel the need to discuss siting issues because often the attention of the stakeholders is rather concentrated on the upgrade of their national centres. In these cases more time may be needed to develop the concept of a central "coordination centre" to integrate the efforts and manage the legal entity capable to represent the partners forming the overall distributed facility.

Only few research infrastructures have so far developed the concept of Regional Partner Facilities, in the sense of having a clear scope of involving and outreaching different regions also in terms of socioeconomic returns. Clearly there is a need for further development of this concept taking full advantage of Structural Funds to involve the convergence Regions also upgrading existing



national facilities into regional partner pan-European research infrastructures.

Europe will also need to reflect on how to participate in research infrastructures of global relevance. Joint funding capability will be needed to allow Europe to speak with one voice and negotiate with the other Nations at an equal level, in particular with the emerging economies like India and China, but also with developed countries such as the USA, Japan or Russia.

Another benefit of this joint approach would be the capability for Europe to act as a host when technically possible and to be able to involve European industries in the construction, by in kind contributions or appropriate procurements, also in the cases of where the site is outside Europe.

5.4 GOVERNANCE AND/OR ADMINISTRATION

Most projects started at a relatively immature level in terms of indications of proposed governance. This is understandable both because a standard legal form like the ERIC was not yet available when the Preparatory Phase started and also because the primary concern of the scientific communities was devoted to develop the science case. In general, however, new research infrastructures will be more complex than existing ones. In particular this will be the case for the distributed infrastructures. This means that a considerable effort had to be devoted to these aspects in the Preparatory Phase to develop sound and reliable

governance and administration schemes, which now are being oriented in many cases towards the ERIC legal form.

This requires also close interaction with funding agencies and government departments. The basis for these developments are the well-proven models for the governance of larger existing projects, and this gives also indications on the best involvement of industries in those cases where the size of the project becomes an important source of revenue for the possible contractors and other service providers.

The operation of these new facilities is another potential challenge. As already stressed, training of specialised managers and scientists interested in the management of research infrastructures will be crucial for their efficient running.

The capability to attract scarce technical resources is another aspect which may have an impact, if several projects in the same scientific field start in the same period. This is connected to the general EU problem of attracting and keeping human resources.

Several workshops⁷, often initiated by the projects themselves, showed that in fact governance and legal aspects are still an issue where exchange of experience or assistance is needed. A lot of work clearly still needs to be done in this area, to which ESFRI can make a significant contribution.

⁷ *Preparatory Phase Workshops organised jointly with the EC on Feb. 6 and Oct. 30, 2009, or the NEERI workshop, Helsinki, Oct. 2009.*



5.5 DATA MANAGEMENT AND LONG TERM ACCESS OF DATA

One fundamental aspect of all Roadmap research infrastructures is that of e-infrastructures: by this term it is not meant only the issue of fibre-optic links, Géant/GRID type of ICT structure or High Performance Computing, but more generally the whole issue of data acquisition and management, digital repositories, access to standardised, calibrated and inter-operable data, their curation, mining of archived data, their release for broad open access, etc. This is an increasingly important aspect and is expected to add to the problem of operation costs, if open access to data is to be ensured.

Three groups of facilities can be broadly distinguished in the ESFRI Roadmap: i) those which fundamentally are e-infrastructures (e.g. in particular all the SSH research infrastructures, the bio-informatics Elixir project or the biodiversity observatory Lifewatch system) where therefore this aspect has to be solved first for them to exist; ii) distributed facilities, which need e-infrastructures to be fully implemented but for which this aspect does not seem to have been addressed as important at present (BBMRI for biobanks, ICOS for carbon monitoring or EPOS for seismic activities); iii) those facilities for whom e-infrastructures will be important at least for data acquisition, processing and distribution to users, and have therefore already engaged in developing these aspects, also, in some cases, in partnership with industry (such as the PRACE initiative for high performance computing).

ESFRI and the e-IRG are currently working together to address the relevant e-infrastructure issues, also in view of the applicability in a global scientific data infrastructure, which is strongly expected from all scientific communities. Defining this concept based on existing building blocks like communication networks, grids, HPC resources and digital repositories, there is still a lot to achieve to ensure a full integration into a global data infrastructure, including all aspects related to the production, preservation and access in a sustainable and interdisciplinary context. Beyond the policy contributions which were done already for the digital repositories and the data management, the two constituencies will continue working together towards a shared vision of the scientific data infrastructure.





Chapter 6

Next Steps

ESFRI will continue following the implementation of the 44 identified projects and developing specific support actions, together with related Member States, Associated Countries and the European Commission. Nevertheless some recommendations are formulated, in particular towards Member States:

- Each Roadmap project needs to be sponsored and actively supported by at least one "champion" country that can actively engage at all appropriate levels the other interested countries towards its implementation. The ESFRI Delegates are uniquely positioned to stimulate this role;
 - Some scientific communities lack proper channels of communication to engage governments and funding agencies. This happens in the case of scientific communities which are still fragmented and new in using shared international facilities. It is very important to help these communities to structure themselves in order to realise their potential and participate in the European Research Area. ESFRI is therefore stimulating these communities, e.g. through the involvement of the European Science Foundation, and by the work of the Thematic Working Groups. It will be very important to also involve Member States and Associated Countries to support or improve the communication channels between science communities and funding agencies.
 - The Thematic Working Groups will have an important role in monitoring the landscape of European research infrastructures within the evolving landscape of the research areas they cover. This will include increased "cross-border" cooperation between the different TWGs and an analysis of the potential interfaces to e-infrastructures. The Thematic Working Groups should help to define where it will be appropriate to set up Regional Partner Facilities to facilitate the involvement of smaller Member States and of Research Communities which are not yet skilled to use Research Infrastructures.
 - All members of the ESFRI Forum are challenged to implement the national processes for the utilization of the ERIC regulation which will include contacting the relevant national Ministries.
 - The setting up of training possibilities would be essential, especially for young scientists.
 - The next Implementation Report will be part of the update of the ESFRI Roadmap report due by November 2010.
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TABLE 1: OVERVIEW OF THE STATUS OF THE NATIONAL ROADMAPS FOR EU MEMBER STATES, AND ASSOCIATED COUNTRIES

| MEMBER STATES | National Roadmap already published | Process to formulate a (new/updated) national roadmap has started | National public funding reserved for large RIs |
|----------------------|---|--|---|
| Austria | no | Yes | Yes |
| Belgium | no | Yes | No |
| Bulgaria | no | Yes | No |
| Cyprus | no | No | No |
| Czech Republic | no | Yes | Yes |
| Denmark | Dec. 2005 | RI-Strategy paper foreseen | Yes |
| Estonia | no | foreseen 2010 | No |
| Finland | 11 Feb. 09 | | Yes |
| France | December 2008 | | Yes |
| Germany | Jan. 2003 | Yes | Yes |
| Greece | March 2007 | Yes | Yes |
| Hungary | no | YES-foreseen end 2009 | Yes |
| Ireland | Jan. 2007 | No | Yes |
| Italy | no | Started June 2007 | Yes |
| Latvia | no | no | no |
| Lithuania | no | Publication planned for 2009 | Yes |
| Luxemburg | no | Started April 2009 | no |
| Malta | Aug. 2006 | no | no |
| Poland | no | Yes | Yes |
| Portugal | no | no | no |
| Romania | Jan. 2008 | | Yes |
| Slovak Republic | no | no | no |
| Slovenia | no | First half 2008 | Yes? |
| Spain | Feb. 2007 | no | Yes |
| Sweden | Updated 2008 | | Yes |
| The Netherlands | Oct. 2008 | | Yes |
| United Kingdom | July 2008 | | Yes |

| ASSOCIATED STATES | National Roadmap already published | Process to formulate a (new/updated) national roadmap has started | National public funding reserved for large RIs |
|--------------------------|---|--|---|
| Iceland | no | February 2007 | Yes for equipment not specifically for RIs |
| Israel | no | yes | no |
| Liechtenstein | no | no | no |
| Norway | Feb. 2008 | Yes, foreseen spring 2010 | Yes |
| Switzerland | no | September 2008 | Yes |
| Turkey | no | Yes, foreseen end 2008 | Expected Yes |

ANNEX 2 – DESIGN STUDIES

FP6 DESIGN STUDIES

SOCIAL SCIENCES AND HUMANITIES

I-CUE: Improving the Capacity and Usability of EUROMOD.

ENVIRONMENTAL SCIENCES

IAGOS: Integration of routine Aircraft measurements into a Global Observing System. Linked to ESFRI Project **IAGOS**.

EISCAT_3D: European Next Generation Incoherent Scatter Radar. Linked to ESFRI Project **EISCAT**.

DESIGNACT: Designing the Aquaculture Centre of Technology - facing the unmet needs in European aquaculture.

BIOLOGICAL AND MEDICAL SCIENCES

EUROCARBDB: Design Studies related to the development of distributed, Web-based European Carbohydrate Data Bases.

Bio-DNP: Dynamic Nuclear Polarization for NMR in Structural Biology.

DGEMAP: Design study for the creation of a gene expression analysis centre for early human development.

MATERIALS SCIENCE

DeNUF: Design study of next generation pulsed magnet user facilities. Linked to ESFRI Project DeNUF

SAXIER: Small-angle X-ray scattering at high brilliance European synchrotrons for bio- and nano-technology.

PHYSICAL SCIENCES & ENGINEERING

ELT DESIGN STUDY: Towards a European Extremely Large Telescope. Linked to ESFRI Project **E-ELT**.

EUROTeV: European Design Study Towards a Global TeV Linear Collider. Linked to ESFRI Project **ILC (CERN)**.

EUROFEL: European FEL Design Study. Linked to ESFRI Project **EUROFEL**.

L-SURF: Design Study for a Large Scale Underground Research Facility on Safety and Security

EURISOL DS: EUROpean Isotope Separation On-Line Radioactive Ion Beam Facility

DIRACSECONDARY-BEAMS: Darmstadt Ion Research and Antiproton Center (DIRAC). Linked to ESFRI Project **FAIR**.

KM3NeT: Design Study for a Deep Sea Facility in the Mediterranean for Neutrino Astronomy and Associated Sciences. Linked to ESFRI Project **KM3NET**.

SKADS: Square Kilometre Array Design Study. Linked to ESFRI Project **SKA**.

E-INFRASTRUCTURES

VO-TECH: The European Virtual Observatory.

NoAH: a European Network of Affined Honey pots.

FP7 DESIGN STUDIES⁸

SOCIAL SCIENCES AND HUMANITIES

PIREDEU: Providing an infrastructure for research on electoral democracy in the EU.

GGP: Generations and Gender Programme: A European Research Infrastructure on the Causes and Consequences of Demographic Developments.

MONDILEX: Conceptual Modelling of Networking of Centres for High-Quality Research in Slavic Lexicography and Their Digital Resources.

ENVIRONMENTAL SCIENCES

ANAEE: Structuring Infrastructures for the ANALYSIS and Experimentation on Ecosystem.

MATERIALS SCIENCE

NFFA: Nanoscience Foundries and Fine analysis.

LABSYNC: Laboratory compact light sources.

PHYSICAL SCIENCES & ENGINEERING

E-FAST: Design Study of an European Facility for Advanced Seismic Testing.

ET: Einstein Gravitational-wave Telescope.

LAGUNA: Design of a pan-European Infrastructure for Large Apparatus studying Grand Unification and Neutrino Astrophysics.

EUROnu: A High Intensity Neutrino Oscillation Facility in Europe.

EST: The large aperture European Solar Telescope.

LIVING LAB: Design Study for the LIVING LAB Research Infrastructure, to research human interaction with, and stimulate the adoption of, sustainable, smart and healthy innovations around the home.

⁸ The FP7 Design studies are not sufficiently advanced yet to yield meaningful extrapolations for future editions of the Roadmap.

TABLE 2: OVERVIEW OF THE PREPARATORY PHASE PROJECTS

| Project | progress | jul-07 | janv-08 | janv-09 | jan10 | jan2011 | jan12 |
|--|----------|--------|---------|---------|-----------------------------|-----------|-------|
| Social Sciences and Humanities | | | | | | | |
| CESSDA-PPP | | | | | extension | | |
| CLARIN | | | | | | | |
| DARIAH | | | | | | extension | |
| SHARE-PREP | | | | | | | |
| ESSurvey | | | | | | | |
| Environmental Sciences | | | | | | | |
| AuroraBorealis (ERICON_AB) | | | | | | | |
| COPAL (ex-EUFAR) | | | | | | | |
| EMSO | | | | | | | |
| EURO ARGO | | | | | extension | | |
| IAGOS-ERI | | | | | | | |
| ICOS | | | | | | | |
| LIFEWATCH | | | | | | | |
| Energy | | | | | | | |
| HIPER | | | | | | | |
| IFMIF | | | | | | | |
| JHR | | | | | | | |
| | | | | | does not have a PP contract | | |
| | | | | | does not have a PP contract | | |
| Bio Medical Sciences | | | | | | | |
| BBMRI | | | | | extension | | |
| EATRIS | | | | | | | |
| ECRIN | | | | | | | |
| ELIXIR | | | | | | | |
| INFRAFRONTIER | | | | | | | |
| INSTRUCT | | | | | | | |
| Materials and Analytical Facilities | | | | | | | |
| ESRF Upgrade | | | | | | | |
| EUROFEL | | | | | | | |
| ESSNeutrons | | | | | | | |
| PRE-XFEL | | | | | | | |
| ILL 20/20 | | | | | | | |
| Physical Sciences and Engineering | | | | | | | |
| E-ELT Prep | | | | | extension | | |
| ELI-PP | | | | | | | |
| FAIR | | | | | | | |
| KM3NeT-PP | | | | | | extension | |
| PRINS | | | | | | | |
| PrepSKA | | | | | | extension | |
| SPIRAL2PP | | | | | | | |
| ILC-HiGrade | | | | | | | |
| SLHC | | | | | | | |
| e-Infrastructures | | | | | | | |
| PRACE | | | | | | | |

LEGENDA

-  Projects already under implementation
-  projects moving towards implementation in the next 2 years
-  Progressing satisfactorily - nothing to note, but nothing to worry about either
-  Project likely to be redefined

