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ERID-Watch

European Research Infrastructures Development Watch

Coordination Action

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1 PREFACE

*By **Ivan Wilhelm**, plenipotentiary of the Government of the Czech Republic*

There is a visible trend of to shift an accent in different human activities, which happens in the period of last years in the world. The substantial influence on this process is due to the development of the communication and information techniques and technologies. It is permanently decreasing importance of the geographic distances in organization of the activities and in structuralization of the markets. Fortunately, the importance of communication and transport is constantly growing. The changes in the political maps of regions and of the world are also significant and this circumstance represents another substantial reason in the expansion of global activities. Moreover, the global challenges faced the fields of human activity with the need of completely new studies. Within the up to now unprecedented requirements on transport, there is the claim of new resources of energy, limitations of the clean water resources, the health problems, especially with the epidemic diseases in different regions, the climate changes consequences or permanently strengthening terrorism. Each of these challenges of a global nature means a new area of solution and it means a new area of research.

It is an evident fact, that in parallel with this reality, a successful operation on the free global markets is the offer of new products and technologies earning a saving of any respect, is quite critical. The most deciding matter in this sense is the headstart in time before the competitors. Such circumstances completely change the role of research and development and strengthen its importance for commercial exploitation. It is no doubt, that research and development is one of the mean sources for the competitiveness of a modern society and this fact brings more and more attention to its progress and expansion of direct commercialization of its results. In accordance with the expectations growth the expenses embedded into research and development and this fact represents an additional argument for a search of a real way for the assessment of the impact of research in the innovative processes. The projects of new European research infrastructures belong to the financially most expansive items. Fortunately, the real capital costs to build up such equipments overlap the feasibility of individual national economies. It is another evident fact that the meaningful fullfilment of the personal capacity on the highest level of intellectual quality overlaps the human resources of individual European states too.

In the force of such circumstances the question about the research results extent on a social progress in general and in different fields in particular comes as fully reasonable requirement. How it is possible to measure such impact? How it is possible to influence the behavior of the participants using the results of such assessment? If one needs to find the most effective and fastest way to transfer the research results through applications to the innovative realizations prepared for the market competition, than the process must be comprehensively studied. It is clear, that the relation between research institution and the final user body is of substantial importance. This moment will be reflected into the methodology of assessment and will bring a marked difference with respect to the present research evaluative procedures.

The project ERID Watch, whose final report is here submitted, means one of first attempts of such analysis. Apart from the fact that it deals with relatively limited section of research arrangements it can involve important contribution to the development of the assessing methods of research results impact in future. The description of a serious access to the references about the real frame of co-operation given by the final users is a part of this report. The authors consider that the quality of innovation outputs depends primarily on the relation between research and commercial institutions being recognized as a partner's reference. With respect to the fact that the proper trend of such co-operation leads to a more intensive and closer partnership the cultivation of the methods of quality assessment will be elaborated too. The results of the ERID Watch project should serve for such process as a good starting point.

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3 Coordinator's preface

Events of the early 21st century confirm that we are living in an important period of transition. Globalization affects every sector of our daily life, and the recent financial crisis reveals the profound weakness of short-term thinking. It is time to refocus on long-term thinking and on visions emphasizing the necessity of global balance in all actions taken. Hence, Europe proposes to develop a long-term vision of a *knowledge society* as a basis for competitive, modern economies.

A key point for success is the development and use of world-class research infrastructures, where users can participate in well-coordinated research programmes, share knowledge, and develop strong cooperation with industrial partners.
The quality of these relationships is important. The EU Commission has funded the FP6 programme called ERID Watch, which aims to contribute to mutual improvements in the policy mix of the Member States, to enhance the efficiency of public investments in European Research Infrastructures, and to develop public-private partnerships.
ERID Watch has confirmed that research infrastructures are key resources for enabling scientists to remain at the forefront of science. These infrastructures stimulate technology transfer and – with an annual budget approaching 9 billion euros – are clearly an economic force in a marketplace.

The analysis presented here supports reinforcing professional knowledge and technology transfer, the heart of the innovative process. It also calls for improving employment conditions, enabling science to maintain a high level of human capital.

A main recommended action would be the creation of an Observatory of Research Infrastructures, or an Information Forum, based on a website repository containing key information on scientific roadmaps, future markets, and employment opportunities for scientists and engineers.

I hope that this work will be helpful as we prepare for the future, and that the European Research Infrastructures hosting future ESFRI projects will implement some of our recommendations. Concurrently, I hope that the long-term vision of the scientific world and wisdom-based analysis will be able to enhance faith in science among our citizens.

Thanking everyone in the ERID Watch teams who worked to accomplish this huge task, I look forward to a constructive dialogue on the findings presented.

Philippe Lavocat
ERIDWatch Coordinator

4 Summary

The EU funded ERID watch project has during 2007 and 2008 carried out the two major studies of the efficiency and impact of European Research Infrastructures market. Two final reports have been produced; one a benchmarking study among some 50 of the approx 300+ medium and large size European research infrastructures, and a market study, including government authorities and industrial suppliers to the infrastructures.

The research infrastructures in Europe form a heterogeneous group, where differences sometimes seem greater than the similarities. The basis for statistically valid conclusions is limited, but many observations may be indicative in a qualitative context. Based on these findings, the ERID Watch project team has presented a number of recommendations[1] to funders, users, suppliers and naturally also to the research infrastructures themselves.

The findings include

- Research infrastructures form a diverse community, with e.g. polar research vessels, synchrotrons, natural history museums and botanical gardens, and data collections. A division in seven different scientific fields has been used for the analysis
- Knowledge and technology transfer between the research infrastructures – where significant cutting-edge science work is being carried out – is vital to increased European competitiveness. In general, there is a potential for improvements in these functions, although many facilities are already successful.
- To some extent, this seems to be dependent on increased industrial experience and marketing knowledge
- Recruitment is difficult, due to inflexible contract terms and lack of incentives for mobility
- Research infrastructures are regarded as a premium segment of the scientific market; several companies report benefits in other markets from research infrastructures relations
- The research infrastructure market is significant and expanding, both in terms of existing facilities and planned infrastructures
- However, companies think that procurement practices, documentation and communication can be improve
- Companies welcome early involvement in the construction process of new facilities. It reduces the risk for “technology show stoppers” and forms basis for a relationship beyond the traditional “buyer-supplier” roles
- Networking may be the road to success

Research Infrastructures play a major role for Europe’s international position in the fields of research, technological development, and innovation. They have a significant effect on

[1] The ERID Watch recommendations are found in chapter 3: Background and Recommendations, and do not form part of this summary

the economic and societal growth of Europe and the interaction and network between industry and research infrastructures may reflect an important potential market as well as opportunities for further development of products, services, and new technologies. Basically, research infrastructures' market of users is divided into two parts – the scientific market and the industrial market.

The main purpose of the ERID-Watch project has been to assess and evaluate the efficiency and market impact of research infrastructures in Europe. The work in ERID Watch was divided in two major work packages; one dealing with the issues of organisation, funding, technology transfer, human resources and legal environment for Research Infrastructures; the other with market impact, investment, finance and Public Private Partnership

Related infrastructures / perimeter of the study

Following the definitions of other European projects, such as the EU surveys (2005 and 2007) and the ESFRI roadmap, a number of at least 300 medium sized and large research infrastructures in Europe were assumed. For practical reasons, about 50 research infrastructures were selected and interviewed for both the benchmarking study and the market study.

This sample consists mainly of large research infrastructures (~ with construction costs roughly exceeding 1 00M€), and these represent approximately 60-70% of the total annual budgets for operations and recurrent investments for all European research infrastructures. The interviewed sample is mainly funded by national institutional bodies (around 90%). The rest of the funding/income comes from regional funding agencies, European institutional bodies, and industry.

Four major types of organisations were identified – more than the half of the Research Infrastructures belong to a main research institution which hosts several facilities. On the other hand, on the institutional level only one in four institutions is integrated within an umbrella organisation – mainly in France or Germany – while the bulk forms standalone institutions.

Furthermore, the number of Research Infrastructure increases each decade. Several infrastructures have been built during the last ten years (one in four of the interviewed facilities) - especially in the scientific domains of Material Sciences and Biomedical and Life Sciences.

Research infrastructures in EU member states

A parallel study, carried out by the Czech Republic, confirm the indications observed by the ERID Watch team, that European research infrastructures are concentrated to a few countries (France, Germany, Italy and United Kingdom). The remaining part of the "old members" ("EU15") are hosts to the remaining ones, while no facilities at all of this size can be found in the "new member states" ("EU12").

Several issues will have to be addressed in order to develop the situation into a more balanced picture, according to the report. First, it is important to consider the research infrastructures' impact in several markets: the industrial – as users and suppliers –and the scientific community. More attention to the facilities' internationalization is necessary, as there is a strong correlation between quality of results and international relations. Furthermore, there is a need for new ways of evaluating research infrastructures; not only publications, but also other forms of output should be evaluated (patents, applications etc). Finally, the motivation for innovation may be weaker in some countries than other.

Industrial users

The results from the interviewed infrastructures indicate a wide range of industrial usage, from 0 to 90% of the capacity. Almost half of the interviewed institutions have no industrial users at all. The typical usage is less than 10%, although a small number of infrastructures have substantially larger proportions of industrial users. The four largest ones show figures between 30 and 90%. These four are found within four different scientific fields.

Technology transfer

The interviewed research infrastructures show significant differences with regard to the technology transfer approach. More than half of the institutions interviewed have a specific technology transfer organisation, in some cases organised as a separate company. At the other end of the scale, there are one third of the infrastructures interviewed without any technology transfer person or office at all.

Patents and licenses do not seem to be correlated to the industrial usage of the infrastructures or the type of R&D with the Research Infrastructures. Only very few institutions invest the time, money and personnel needed to be able to go active on the markets for a transfer of patent applications into industry or invest in business development based on their inventions. Most research infrastructures do only administer passively the occasional inventions of their employees. Better ways how to handle incentives and compensations for patents in favour of researchers will have to be found. Finally, changes in this whole field should lead to a new culture of higher business-awareness within the infrastructure community to allow for a more pro-active licensing and business development activities

Additionally, the lack of common standards for technology transfer leads to a waste of resources which could be saved with a set of commonly agreed and used standards and guidelines.

Furthermore, a central issue as regards technology transfer policy is the duality between intellectual property protection and the more traditional open science approach.

Human resources

Human Resources is a field where several research infrastructures perceive a number of problems. Fixed-term contracts with no clear future option or track, low salaries in comparison to industry and difficulties to recruit appropriate staff, especially engineers and technicians seem to be severe problems for the Research Infrastructures.

Among the interviewed infrastructures, no special program for the staff exchange with industry exists. About two thirds of the interviewed research infrastructures offer training for their own staff. Only a bit more than half of the staff is permanent staff, whilst more than a third of the employees are having fix-termed contracts. These topics may also influence other areas, such as technology transfer activities.

Financial analysis

For the market studies, 44 Research Infrastructures were selected for detailed analysis.

The construction costs of the interviewed infrastructures indicate a total construction cost of between 21,4B€ and 33,1B€ for all European research infrastructures that have been set up during the last decades and are still currently operating. This figure does not include research infrastructures under construction and not yet operational, and research infrastructures for which estimation of construction cost has not been possible (such as Collections of Museums or ESA Infrastructures). This shows the high business potential of construction phases; this is also verified by the publicly available information concerning projects of future Research Infrastructures.

The annual budgets for operations and recurrent investments in 2006 of all European Research Infrastructures are estimated to be between 7,9B€ and 9,4B€. A minor gap between information provided by national funding agencies and the infrastructures themselves is interpreted as an involvement in funding of local and regional authorities.

The total budget for interviewed research infrastructures, not including the European Space Agency (ESA), has increased with 5.5% during the last ten years (with inflation taken into account). (ESA's annual budget approximately represents as much as 40%% of the total annual budgets for operations and recurrent investments for all European research infrastructures.)

The research infrastructure market
It has been shown that research infrastructures have a market impact in several areas: as supplier of cutting-edge research, as buyer of high technology products and services, as provider of scientific advice and as a seller of state-of-the-art services to both public and academic users of the facilities.

Furthermore, the market studies show that industrial companies regard the research infrastructures as the premium segment of the scientific market. A majority of interviewed companies report increased sales in other segments, thanks to references and experience from the research infrastructures.

5 Background and recommendations

5.1 The ERID-Watch project

Research infrastructures are key resources for supporting and funding research activities, thus enabling scientists to remain at the forefront of science and technology. European research infrastructures not only provide unique opportunities for world- class research and training but also stimulate knowledge exchange and technology transfer, which in turn boosts European competitiveness through the development of new products and new markets. This boost in innovation capacity is evidenced through skills flow as a result of public-private mobility, new technologies applied in building novel products, and the creation of spinout companies.

A further element of the impact of research infrastructures on the European economy arises from the supply and demand drivers that arise from the construction and maintenance of facilities.

Finally industry may be users of research facilities – for example in new product or process development, or in problem diagnosis.

Understanding the way in which the above elements materially affect the economic impact on European industry is of prime importance in increasing the efficiency of public investment in European infrastructures and developing Public-Private Partnerships (PPP).

The present project is thus intended to evaluate the scale of the research infrastructure market and the potential for further industrial engagement.

The project was divided into three work packages : Work Package 1 was devoted to identifying and benchmarking “Good Practices” within the daily work of a research infrastructure, for example in the areas of technology transfer, Human Resources and the legal environment. Work Package 2 deals with the market for industrial suppliers and users, while Work Package 3 is focused on the dissemination of findings and recommendations.

Work Packages 1 and 2 carried out the benchmarking and market studies mainly through extensive face to face interviews. As the European research infrastructure landscape is very diverse – ranging from seagoing and polar Research Platforms to Synchrotrons to large databases in different scientific domains - not all questions were applicable to all research infrastructures; complete surveys were for practical reasons simply not feasible. Nonetheless, the reports draw thorough pictures of major parts of the European research infrastructure landscape.

The Work Packages 1 and 2 have together interviewed:

- 53 research infrastructures
- 8 ESFRI infrastructure projects (potential future research infrastructures)
- 175 companies (research infrastructures’ suppliers, R&D collaborators, or users)

- More than 30 institutional representatives (research infrastructure funders) in 17 Member States

Member States, Research Institutes, universities, research infrastructure operators and industrial companies engaged in the project, intending to exchange their experience and policies, in order to build-up recommendations and best-practice methods.

The Industrial Group of the project, consisting of more than 20 representatives of high technology companies with experience and interest in the research infrastructures market. The final meeting of the group concluded with a number of recommendations from industry to research infrastructures and governments. These recommendations – formally outside the project's surveys but within its scope – are found as part 3.3.6.

A list of project consortium partners and key persons can be found in chapter 10.

5.2 Research infrastructures' market impact

Research infrastructures create market value and impact in at least four dimensions.

- Directly or indirectly commercial products and services, based on research results and other outcome of the activities carried out at the infrastructure. Indirectly commercial products and services are based on outcome from the facility, and exploited with some further value added by the industry, e.g. software.
- Purchase of leading edge technology for the infrastructure operations, such as magnets and instrumentation. These are activities in general connected with technology development and cooperation between facility and supplier.
- Services and data used for policy recommendations or as basis for public decisions, e.g. concerning environmental issues.
- Finally, the scientific community and industry as users constitute important target groups; it seems logical that the status and scientific level of external users may create significant input, not only financial, to the facility

5.3 A European Information Forum for Research Infrastructures

The European research infrastructures are key resources in the development of a European Research Area, enabling scientists and companies to work at the forefront of technology development. Furthermore, research infrastructures stimulate the transfer of knowledge and technology initiates the development of new technology in cooperation with industry and provides society with knowledge and powerful treatment of data for natural as well as social sciences and policy making.

However, in a number of fields the ERID Watch project has identified a need and a potential for improvements. To some extent these are based on the actual diversity of the research infrastructures; more comparable data and standards would be most valuable and could present a significant contribution to the effectiveness of purchase, staff mobility and the development of new tools and instruments.

Thus, the ERID Watch consortium partners propose the creation of a European Information Forum for Research Infrastructures.

Basically, the Forum can build on a web portal, a repository of key data concerning research infrastructures, and possibly also updated by professionals at the facilities.

The Information Forum could then act as a "market place" between RIs and companies

With strong links to industry, not least the small and medium-sized companies, encouraging early involvement in projects, a portal would decrease the risk of technology show stoppers, late discoveries in complex scientific projects.

It would also foster a strong networking among research infrastructures and industry.

This monitoring tool should be based on data from research infrastructures and should facilitate transfer of procurement information and technology opportunities from research infrastructures to industry, possibly in the form of a European information list to increase industry awareness.

Finally, the formation of a European Information Forum for Research Infrastructures is well in line with the intentions and ambitions as expressed in policy documents such as the ERA green paper. It would not least be the perfect meeting-place for companies, facilities as well as national and international governing boards and authorities.

5.3.1 Recommendations for the Information Forum

- Develop and apply a simple, but comprehensive long-term scheme to register key data on all relevant areas, like Users, Technology Transfer, and Human Resources.
- Develop and apply a scheme to register key data on Human Resources in all European research infrastructures. It should cover at least the categories: number of employees, national origin of staff, previous employer(s) = industrial or scientific, training.
- Develop a scheme to register the users in all European research infrastructures which should cover the categories internal user, external scientific user and external industrial user and the origin from at least the member states, European Union and other countries.
- Create and expand European networks of research infrastructures and use them for the exchange of key figures and best practice in managing research infrastructures.

5.3.2 Recommendations for the Research Infrastructures

- Develop and work with "Corporate Identity" of Research Infrastructures for internal and external purposes (Human Resources and Industrial Liaison).
- Research infrastructures should involve industry as early as possible in existing and future research infrastructure projects, in order to improve the procurement practices.

Recommendations for the research infrastructures on Know-How and Technology Transfer

- Develop and regularly revise a clear vision and strategy for Know-How and Technology Transfer.
- Develop and apply a simple, but comprehensive long-term scheme to register key data and best practice information for all relevant Know-How and Technology Transfer. processes on the research infrastructure level.
- Use a professional and sufficiently staffed Technology Transfer office with clear processes, clear responsibilities, and a dedicated focus on licensing.
- Organise your TT business with a separate budget in a profit-oriented way.
- Identify services that may be offered to industry in mutual compliance with the principles of responsible partnership and market these services in a pro-active manner.
- Use networks to exchange strategies, experiences, and standards in Know-How and Technology Transfer among research infrastructures.
- Transfer innovations and know-how to industrial partners by licensing to receive royalties at market conditions, while keeping the ownership of intellectual property rights, IPR.
- Support potential spin-off companies with consulting and financing early and use all professional means available.

5.3.3 Recommendations for the Research Infrastructures on Human Resources

- Develop exchange programs for industrial and public staff members.
- Support further efforts to modify existing payment systems towards performance oriented salaries, e.g. by offering incentives for scientists to counterbalance low salaries and fixed-term contracts.
- Create a modular and standardized social security system on national and European level to ease mobility between Research Infrastructures throughout Europe.

5.3.4 Recommendations to Funders

- ESFRI should consider a common financial reporting format for research infrastructures. The ERID standard, using classifications such as Internal, Facilities, Instrumentation, Services and Others, represents a good starting point.
- Funders should where possible contribute to less complex and diverse procurement processes, thus adding to the transparency of the market.

5.3.5 Recommendations to Industry

- Companies should consider the academic market and especially the large-scale research infrastructure opportunities as a whole rather than as individual prospects; the sum of the procurement opportunities offered by research infrastructures is substantial, especially in technology-rich instrumentation areas. The budget of the new ESFRI projects (potential future research infrastructures) announced in the ECRI conference in Versailles on 11th of December amounts around 20 b€ spread over 10years.

- Working with research infrastructures can stimulate innovation, and have a significant impact on sales into other market segments. Companies should exploit the opportunities at existing and future research infrastructures in their mid to long term business strategies.

- Companies should look for opportunities to incorporate complementary technologies in their product portfolio.

- Long-term relationships with research infrastructures from the early planning stages may help companies to anticipate the facilities' requirements.

5.3.6 Feedback and recommendations from Industry

The Industrial Group of the ERID Watch project has taken part in the development of the studies and had its final meeting in June 2008, where the following key messages were discussed and agreed upon.

- Industrial companies are in favour of developing stronger and trustful relationships with research institutions beyond the classical "customer-supplier" relationship.

- Industrial companies are prepared to participate at an early stage of conception of the research infrastructure to anticipate the development of high-tech products, as well as during the whole lifetime of the research infrastructure to foster technology transfer, including the creation of spin-off companies.

- High technology developed in research infrastructures supplier companies is a key factor for their economic development via new markets e.g. Aerospace, Health, Defence, Automotive, Energy, and Environment, however keeping in mind that these markets are not solely European but global.

- Industrial companies can also provide engineering services for the research infrastructure construction that cannot be developed in public research institutions. This is a source of money and time savings.

- It would be beneficial to have the infrastructures and funders support to help industry consider research infrastructures as a market, by developing exchange forums, thus increasing the awareness among not least the small and medium-sized companies (SMEs). Examples of exchange forums include UK-KTN, FR-C2I, G-EIFAST, GEDIIF, and SP-CDTI.

- Revise Intellectual Property rules by a better consideration of foreground knowledge. This work already under consideration by the European Commission, emphasized by the ERID Watch findings.

- Procurement rules (liability and penalties) should be revised along with simplification procedures, especially for SMEs

6 The European research infrastructure landscape

Developing research infrastructures of European interest is one of six major objectives in the European Commission's Framework Programme FP7, for the period 2007 – 2013. A budget of 1.8 b€ over the seven year period is foreseen, average 250 million Euro/year.

The term research infrastructures refers to facilities that provide essential services to the scientific community for basic or applied research have a clear European dimension or interest and may concern a range of scientific fields

The European Strategy Forum for research infrastructures was established in 2002 by the European. Since then it has been working to develop the scientific integration of Europe, with the objective to facilitate initiatives and develop the international use of the European research infrastructures.

ESFRI delegates are nominated by the research ministers of the member and associate countries. In 2006, the first ESFRI infrastructure Roadmap[2] was published, including 35 projects, several of which are now going into realization and construction phases. The Roadmap is built on the long term needs of the European scientific community, covering all scientific areas and geographic locations. The first update of the 2006 Roadmap is scheduled for late 2008.

6.1 Research infrastructures

It is estimated that there are approximately 300 research facilities in Europe that can be defined as large and medium-sized research infrastructures. In addition to that, there are several hundred facilities that are important actors and nodes in the European research landscape. These facilities or infrastructures are not included in this study, either because of size or for primarily being a regional or national facility, without European wide users.

Definitions:
Members of ERF and EIROFORUM (see below)

EIROForum: A partnership of Europe's seven largest intergovernmental research organisations, which are:
CERN - European Organization for Nuclear Research
EFDA - European Fusion Development Agreement
EMBL - European Molecular Biology Laboratory
ESA - European Space Agency
ESO - European Organisation for Astronomical Research in the Southern Hemisphere.

ESRF - European Synchrotron Radiation Facility ILL -
Institute Laue Langevin

[2] The 2006 ESFRI Roadmap can be downloaded from http://cordis.europa.eu/esfri/roadmap.htm or at the ERID Watch website, www.eridwatch.eu

ERF: European Association of National Research Facilities, of which the initiating associates are:
Societe Civile Synchrotron Soleil (FR), Gesellschaft für Schwerionenforschung GSI (DE),
Elettra – Societa Sincrotrone Trieste (IT),
Deutsches Elektronen-Synchrotron DESY (DE),
MAX-Lab Lund University (SE),
Grand Accelerateur National d'Ions Lourds GANIL (FR),
Paul Scherrer Institut PSI (CH),
FOM-Institute for Plasma Physics Rijnhuizen (NL),
Max-Born-Institut MBI (DE), Hahn-Meitner-Institut HMI (DE),
Science and Technology facilities Council STFC (UK)

For ERIDWatch, 53 of the 300+ research infrastructures from 16 countries of the European Research Area (ERA) were interviewed. However, many of the interviewed institutions operate more than one research infrastructure. Thus, in fact information and experience from about one third of the medium sized and large European research infrastructures has finally contributed to this study. Additionally, one research infrastructure from the United States was interviewed for the Synchrotron Case Study and special interviews for this study were also conducted with additional synchrotrons in Europe (see chapter 6 in this report and for more details the D3 report, available for don load at www.eridwatch.eu)

6.2 Scientific domains of infrastructures

ESFRI has categorised the scientific domains of research infrastructures in seven groups, used e.g. in the ESFRI Roadmap 2006[3]. For practical reasons, the same division has been used throughout the ERID Watch studies.

Environmental sciences
Material sciences
Energy
Biomedical and Life Sciences
Social sciences and Humanities
Astronomy, Astrophysics, Nuclear and Particle Physics
Computation and Data Treatment

This categorisation is used for the ESFRI Roadmap and was also used for the selection of infrastructures to include in the ERID Watch studies.

[3] The ESFRI 2008 Roadmap (published Nov 2008) has adjusted some of the scientific fields: Social Sciences and Humanities, Energy, and Environmental Sciences remain the same. "Biomedical and Life Sciences" has become "Biological and Medical Sciences"; "Astronomy, Astrophysics, Nuclear and Particle Physics" is called "Physical Sciences and Engineering"; "Material Sciences" has become Materials and Analytical Facilities; and finally "CDT" is now "e-infrastructures"

6.3 Number of medium size and large research infrastructures

In accordance to its objectives (funding evaluation, market estimation), the ERID Watch project has paid a particular attention to medium and large research infrastructures.

According to information provided by the research infrastructures interviewed, the number of infrastructures in each scientific domain can be calculated:

	Lower value of total number of facilities in Europe	**Upper value of total number of facilities in Europe**
Environmental Sciences (Fleet and vessels, hydrographical and test facilities, research stations, museum collections)	73	125
Energy (Fusion facility: EFDA - JET)	1	1
Biomedical and Life Sciences (Human and animal imaging facilities, biology and genetics analysis centres)	23	55
Material Sciences (Clean rooms, laser facilities, synchrotrons, neutron facilities)	70	92
Astronomy, Astrophysics, Nuclear and Particle Physics (Particle accelerators, telescopes, ESA)	26	46
Computation and Data Treatment (Computation centres, networks and data bases)	43	80
TOTAL	**246**	**409**

Table 1. Estimated number of research infrastructures in each scientific domain

This shows that the number of medium and large research infrastructures in Europe is approximately 325 (in the range of 250 and 400). In comparison to this, the estimated total number of existing medium and large research infrastructures presented in the European Commission's Survey of European research infrastructures[4] (2005) would be approximately 330 (including the 60 facilities that were planned to be in operation by 2007).

6.4 Scientific users or industrial users

Basically, research infrastructures' market of users is divided into two parts – the scientific market and the industrial market.

It cannot be said that the research infrastructures are not market oriented; rather, one could say that both markets seem to have different demands and most of the interviewed research infrastructures' core focus is on the scientific market. Their market orientation lies within the scientific community where the demands are for example the

[4] http://cordis.europa.eu/infrastructures/survey.htm

uniqueness of the research infrastructures. Up until now, both markets could not be put together and served at once with the same means. This may explain why it is relatively seldom the case that a research infrastructure has half industrial and half scientific users – it is much more likely that research infrastructures mainly serve just one of these markets.

However, the numbers of scientific and industrial users at European research infrastructures are simply not that well known. A surprisingly large proportion could not present any numbers at all, while others reported industrial users as a percentage of the total use. A few infrastructures have a large percentage of industrial users – up to 90 percent – while at other facilities, industrial visitors account for less than one percent.

7 ERIDWATCH's contribution to the analysis of the research infrastructure landscape[5]

The objective of the ERID-Watch project has been to mutually improve the Member- State policy mix impacting the Research & Innovation topics in order to increase the public investment efficiency for European research infrastructures and develop Public/Private Partnership (PPP) in this context.

The Member States, Research Institutes, Universities and research infrastructure Operators engaged in this proposal intend to exchange their experience in running selected existing infrastructures and their related policies, in order to build-up recommendations and best-practices methods.

Two ways are expected for facilitating the achievement of this objective.

The first way is to stimulate new approaches for the construction and up-grades of research infrastructures through the leverage of public procurements policies and a revisiting of research infrastructure's governing rules facilitating the settlement of sustainable PPP.

The second is to identify and stimulate Knowledge & Technology transfers of emerging crosscutting technologies linked to this market of procurements and able to boost European competitiveness through the development of new products and new markets.

Clearly, this action does not substitute itself to the European level policies and decisions which are being implemented through action with parent objectives such as ESFRI (European Strategy Forum on Research Infrastructures) road-map process or activities to be launched under the Competitiveness and Innovation Programme.

The final ambition will be to make the best practices methods sustainable in the research infrastructure management in order to develop a continuous improvement process as it is used in industry.

The recurrent annual market of research infrastructures procurements in Europe is estimated to 3-5 Billion Euros. This market, on which very different kinds of industrial companies operate, looks fragmented and poorly fluent. As a result, the leverage effect of public money which remains the main source of financing is not as efficient as one would expect. Our general objective is to better understand this mechanism of public investment in research infrastructures, to identify current practices devoted to optimise it, and to provide public authorities in charge of research infrastructure programmes with recommendations to extend good practices on a larger European scale while stimulating private-public partnership in this domain.

[5] This part is mainly extracted from the initial Description of Work and the final reports on Benchmarking and Market studies, as well as the D10 policy and recommendations report, all of which are available for download at www.eridwatch.eu

In that sense, it can be said that the principal objective of the ERID-Watch project is to improve the economic impact of research infrastructures in Europe and to improve the cost efficiency of public investment, mainly through three different strategies:

- Intergovernmental partnerships – expressed e.g. by the members of the ERID Watch Mirror Group[6]
- EU support through framework programmes – the conclusions of ERID Watch will influence future work programmes.
- Elaboration of a European roadmap for research infrastructures; future facilities will have to take ERID watch findings and recommendations into account.

A fourth strategy would be to strengthen some of the existing and possible public-private partnerships. These partnerships may be of two types: normal industry suppliers of water and generic technologies, the other concerning the development of new technology, relying on expertise in the private sector. This study is mostly concerned with the latter part.

The ERID Watch goal is precisely to increase our common understanding of this economic mechanism and to find out strategies to reduce public spending for risk and to overcome possible impediments in the technical and industrial potential necessary to afford EU with world class RIs.

This means to explore and change the nature of present customer/supplier relationship into a novel public laboratory/industry Knowledge and Technology (K&T) partnership, in which technology transfer may be associated to industrial property/investment sharing or specific subcontracting

7.1 Methodology

The ERID Watch project studies were organised in two separate work packages and two working groups; one managed by DESY, Germany, and the other by the Science and Technology Facilities Council, UK.

The former was the ”Benchmark” study regarding the research infrastructures' organisation and work with knowledge and technology transfer as well as human resources (HR) management. The latter was the ”Market” study with an objective to describe and estimate the size of the research infrastructure market, primarily in the facility-industry relation, i.e. where industrial companies act as suppliers to the research infrastructures.

However, both studies' reliance on data collected through personal interviews made it relevant and desirable to merge the questionnaires and interview pilots into one, and share the interview work between the two working groups.

A sample was selected from the following criteria:

[6] The Mirror Group consists of representatives of European governments or government boards or agencies

- a construction cost of at least 20 M€ (size of the infrastructure)
- a clear European range of users (the European dimension)
- a significant share of industrial users[7]
- a reasonable distribution among European countries - type of organisation

In addition, it was decided to include all members of ERF and EIROFORUM. Finally, the Benchmarking study ended with a few more infrastructure interviews than the Market Study (53 compared to 47).

Furthermore, some 30+ representatives of European governments and research funding authorities were interviewed as well as 175 industrial companies – both primarily for the market study.

The diversity of the European research infrastructures and the sample size makes the quantitative data useful only as indications supporting a more general qualitative analysis.

The D3 Final Benchmarking Report and the D6/D7 final Market Report are based on information which was gathered mainly during face to face interviews with several representatives from different research infrastructures.

The additional part (see chapter 6, in this report) on synchrotrons is based on specific interviews with representatives from synchrotron facilities. For these interviews an Interview Guideline for Synchrotrons and a Questionnaire for Industry was used.

For the interviews during the field work, two documents, a Pre-Questionnaire and an Interview Guideline, were used. The study was conducted on a voluntary basis and also the information was given on a voluntary basis – some information was crosschecked with other reports as well as information from the web.

An attempt was also made to complement the results of the face to face interviews with two web questionnaires in the areas of Human Resources and Technology Transfer. These questionnaires were developed and sent to representatives responsible for Human Resources and Technology Transfer at research infrastructures in Europe.

Unfortunately, the response for this method was much too low to be useful for this study. But the results obtained did reaffirm the results of the first two methods.

7.2 Final samples

The final sample of research infrastructures interviewed is graphically represented in the charts below. Efforts were made to include infrastructures from as many European countries as possible, and also to include facilities from all seven scientific fields, as

[7] The shares of industrial users turned out to be one of the important findings of the ERID Watch project; the knowledge and statistics regarding users at the research infrastructures are in a significant number of cases insufficient

defined in the ESFRI Roadmap. The scientific domains are divided into the following seven major groups, according to the ESFRI Roadmap.

- Environmental sciences
- Material sciences
- Biomedical and life sciences Energy
- Social sciences
- Physics
- Computation and data treatment

The sample distribution with regard to scientific fields is presented below.

Scientific field	Market study	Benchmarkin g study
Material science	15	19
Environmental sciences	9	11
Biomedical and life sciences	8	9
Astronomy, Astrophysics, Nuclear and Particle Physics	7	8
CDT	3	4
Energy	1	1
Social sciences and Humanities	0	1
TOTAL NUMBER (n)	43	53

Table 2 Interviewed infrastructures by scientific field

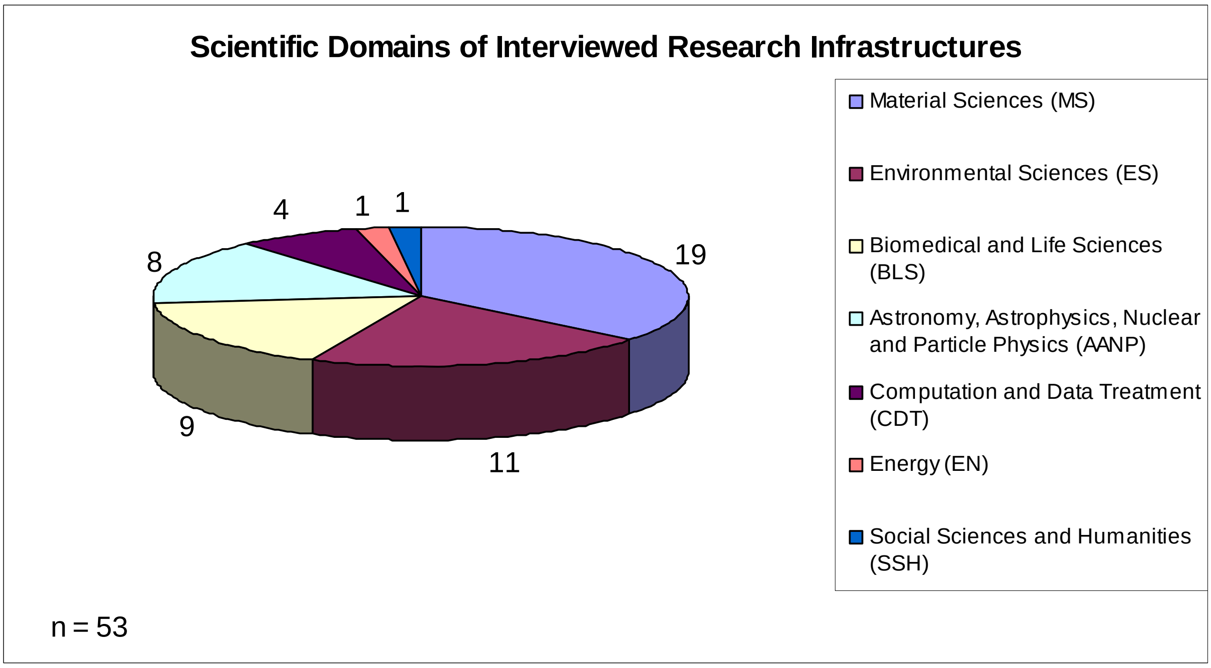

Figure 1 Scientific Domains of interviewed research infrastructures in Market

The interviewed research infrastructures should originate from all 35 states within the European Research Area (ERA) and should be represented in this study in a sense of proportion, if possible. In contrast to the EU survey, research infrastructures operated by intergovernmental organisations were not classified in this study under their host country, but rather as "EU". The graph below shows the distribution of research infrastructures interviewed for the market study.

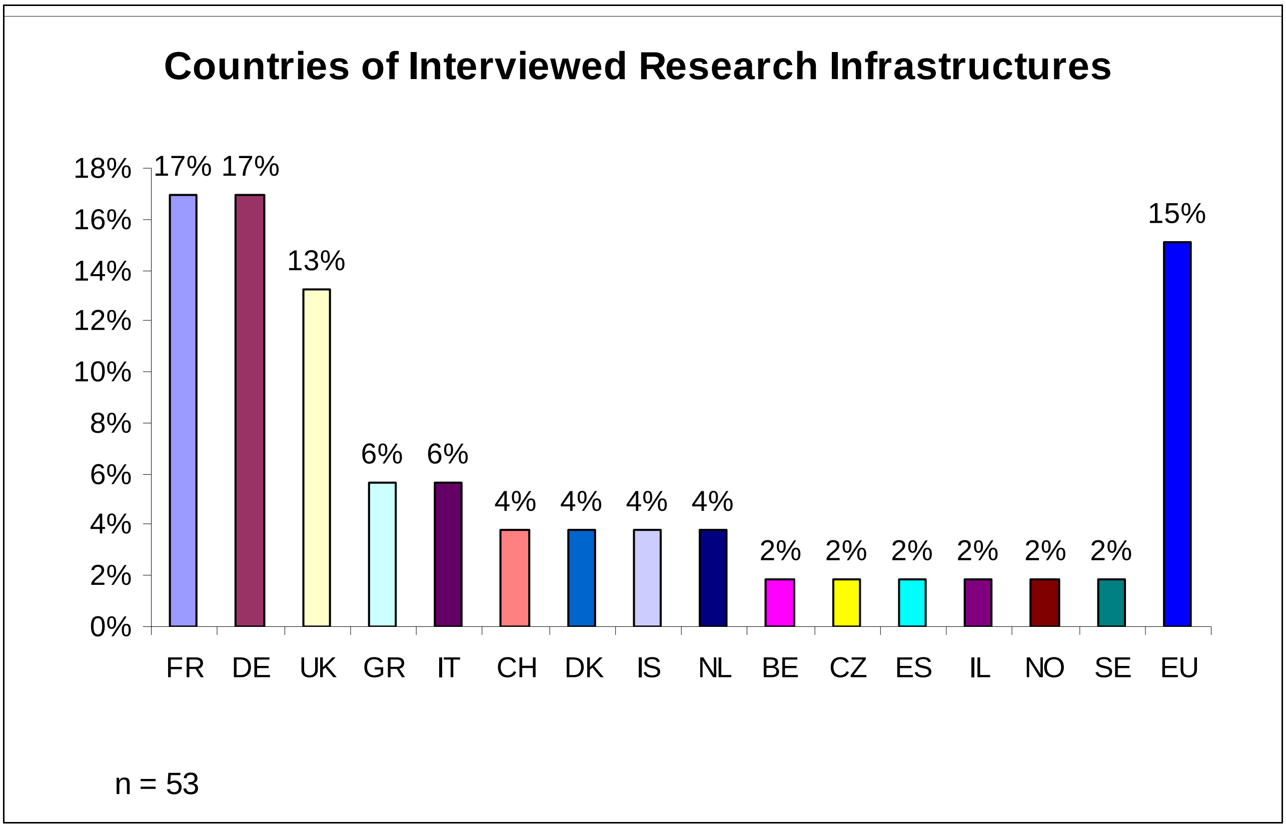

Figure2 Countries of Interviewed Research Infrastructures

This study tried to consider the different types of research infrastructures roughly proportionally to the respective percent values in the 2005 EU survey.

Interviews were conducted with research infrastructures active in all scientific domains, of all different research infrastructure types, and originating from 15 European countries, as well as with infrastructures classified as European that are operated via the participation of several EU member states. All in all, by the 24th of August 2008, 38 institutions had been interviewed and information on 53 research infrastructures hosted by these institutions had been gathered. The participation was made on a voluntary basis and even if a research infrastructure participated, it was not obliged to answer all questions. That means that several questions have not been answered by all and not all parts of the analyses could be performed with a complete set of information. The annexes to reports D3 and D6/7 provide more details about the sample of infrastructures. Reports and annexes can be downloaded from www.eridwatch .eu.

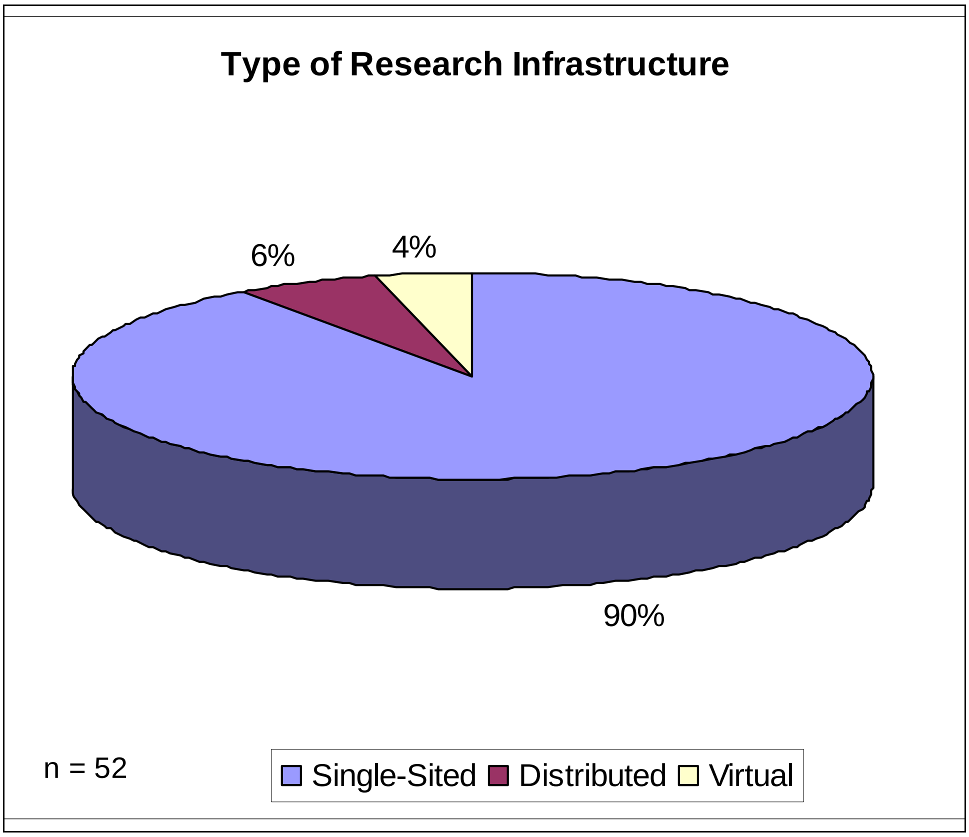

Figure 3 Type of Research Infrastructure

Figure 3 shows that the overwhelming majority of interviewed research infrastructures, namely 90%, are single-sited. According to the European Science Foundation's 2007 report, approximately two-thirds of all European research infrastructures are single-sited. While the figures in this study may be somewhat over-representative of single-sited infrastructures, they certainly are in keeping with the general trend for European research infrastructures. The remaining research infrastructures are either distributed among several sites or virtual, i.e. based on digital databases. A glance at Figure 4 shows that the under-representation of research infrastructures from the scientific domains of Computer and Data Treatment and Social Sciences and Humanities may have played a direct role in the under-representation of virtual infrastructures, whereas the over-representation of research infrastructures in the Material Sciences domain may have led to the overly large share of single-sited research infrastructures in the study.

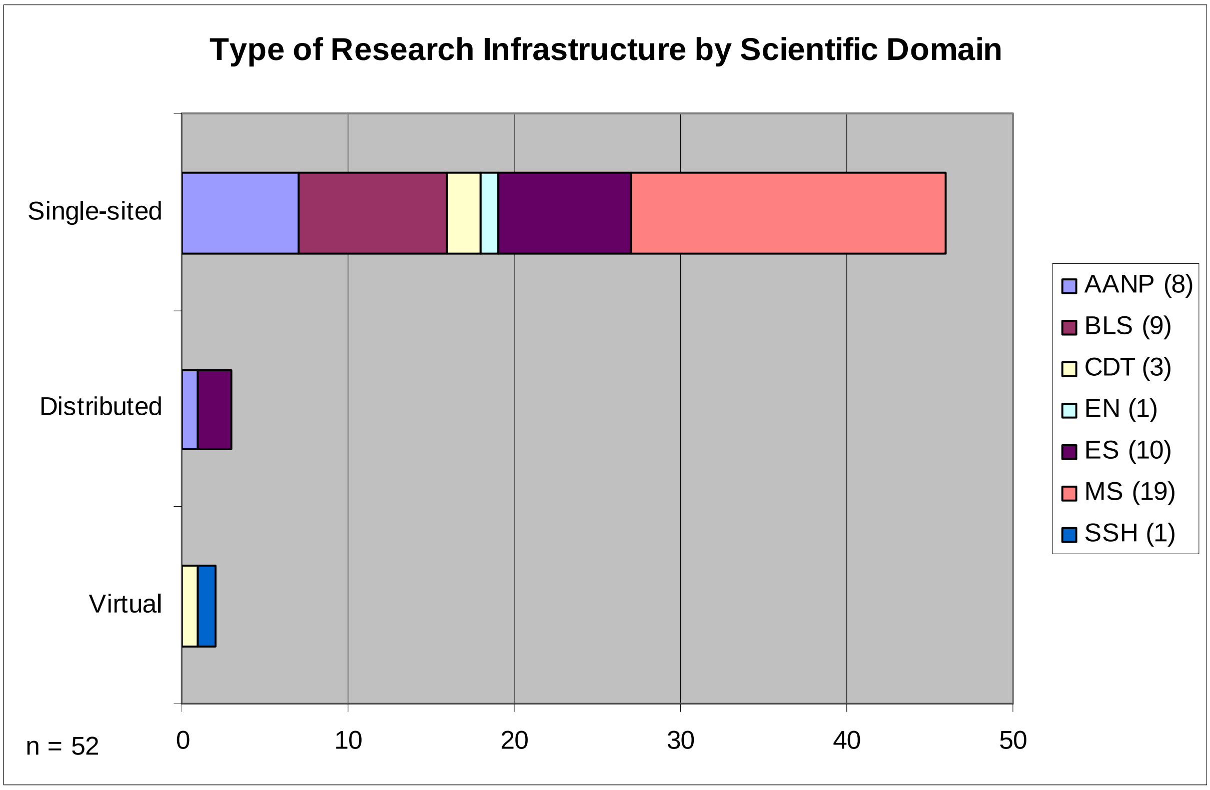

Figure 4 Type of Research Infrastructure by Scientific Domain

7.2.1 Reliability of results

The data collected during the interviews with research infrastructures, industrial companies, government bodies and others were both quantitative and qualitative. The statistical significance of data was checked and, if possible, double checked with other sources of information.

However:
- the sample covers a large percentage of the economic activities, but a smaller part of the total number of infrastructures
- participation could not be achieved proportionally across scientific domains and countries
- not all questions were answered with the same degree of detail
- not all data could be double-checked

With this in mind, it must be stated that statistics in this study mainly serve as indicators for the qualitative issues discussed.

8 Findings

When collating the data, the lack of available and comparable key figures presented a recurring challenge in all areas investigated in this study. Thus, the analyses presented here have to be read with care - they are indicative rather than conclusive.

8.1 Benchmarking Study

This first part of chapter 6 Findings is mainly a summary of the D3 Final Benchmarking Report. Further data, analyses, and information can be found in the D3 report and the D3 annexes – both of which are available for download from www.eridwatch.eu.

8.1.1 General organisation of research infrastructures

The European research infrastructures are found in several different organisational structures. Some of the differences seem to be based on different national research systems, while other may be more dependent on the scientific field of the infrastructure.

Examples of the former are many of the German research infrastructures, which often are organised within one of the major German research institutions like DESY or Alfred Wegener Institute. In France, on the other hand, it is more common that a research infrastructure is organised as a separate entity with one major piece of equipment. Soleil Synchrotron is an example.

The ERIDWatch ”WP1” project team categorised the organisational forms as follows, with number of interviewed infrastructures and proportions in parentheses.

- Main research institution hosting one research infrastructure (5/53, 9%)
- Main research institution hosting several research infrastructures (42/53, 61 %) - main research infrastructure hosting one major piece of equipment (8/53, 15%)
- Main research infrastructure hosting several major pieces of equipment (3/53, 6%) unspecified (5/53, 9%)

Furthermore, the research institutions may also be part of some kind of umbrella organisation. This is most often the case in Germany and France (AWI as part of the Helmholtz-Gemeinschaft, CNRS in France owns 72% of Soleil Synchrotron, etc).

The European research infrastructures have been established over a long period of time; the oldest actually being founded in 1750. In the 1980’s several infrastructures in the environmental sciences were established, while the 1990’s were the decade of infrastructures within biomedical and life sciences. Interviewed infrastructures that have been established since 2000 are mainly within materials sciences and biomedical and life sciences.

Only about 60% (32) of the interviewed infrastructures could provide data on the distribution of industrial and scientific usage. Of these, six reported no industrial users at all. Among the infrastructures that could provide data, 14% of the total reported usage was allocated to industrial users. This might seem a high average, but it is distributed very unevenly, as only four infrastructures have a very high share of industrial usage, namely 90%, 60% and twice 30% (one each from Material Sciences, AANP, Environmental Sciences, and Biomedical Sciences).

The number and the home countries of visiting scientists at research infrastructures are seldom collected within the infrastructures and seem to have minimal importance with regard to the connection to industry.

8.1.2 Age of the Infrastructures

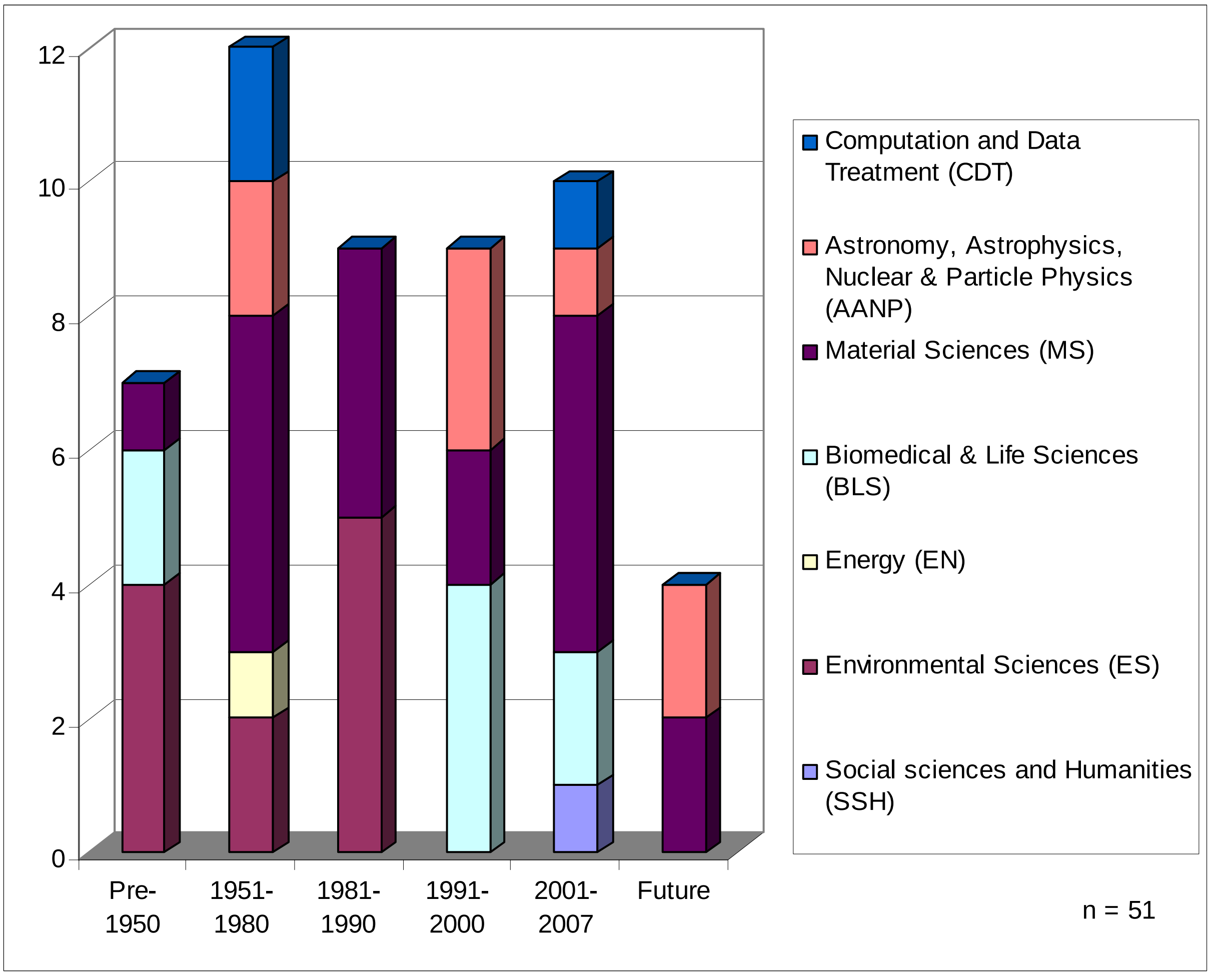

Figure 5 Founding Years of Interviewed Research Infrastructures by Scientific Domain

8.1.3 Legal Status of the interviewed institutions

Nearly half of the institutes can be categorized as research institutes, agencies or university attached department under public law.

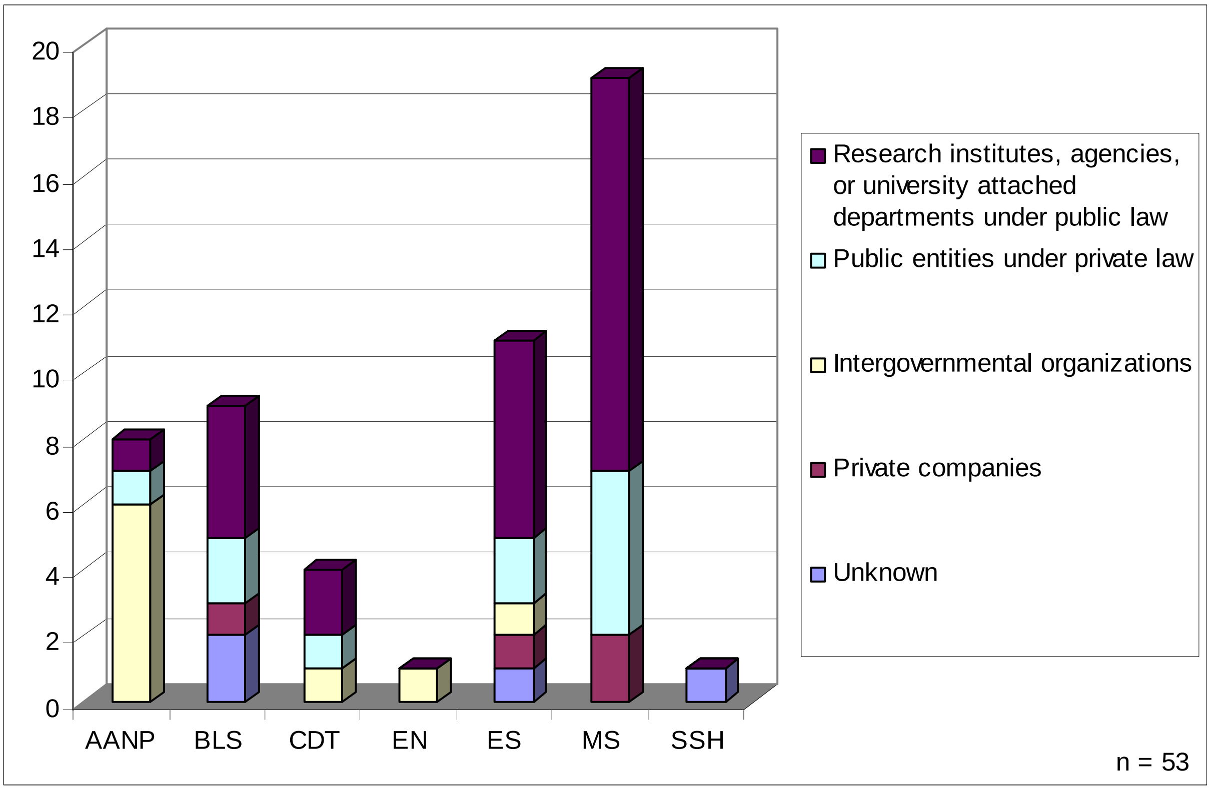

Figure 6 Legal Structure of Interviewed Research Infrastructures by Scientific Domain

8.1.4 Knowledge and Technology Transfer

Knowledge and Technology Transfer were found to be organised at an institutional level at all interviewed research infrastructures. None of the interviewed institutions handled the related issues at the level of individual facilities.

39 of 51 Research Infrastructures interviewed about technology transfer, TT, issues reported that they had the option of using a TT-office/department, a separate TT company, or that there was at least a TT-responsible person that they could turn to. A further 12 infrastructures do not have this possibility.

The main funding source of for technology transfer offices is the institutions' general budget. Almost half of the interviewed infrastructures report that the technology transfer office receive no income from activities with industrial partners. Only very few infrastructures manage to obtain 50% or more of the money spent in this field from royalties or payments for contract research. But still, four out of ten interviewed infrastructures generate income from their knowledge and technology transfer activities.

Two thirds of the interviewed infrastructures stated that, in principle, they offer services to industry, from mostly basic services like accommodation to full R&D service, as well as additional services such as special trainings. Engaging in patenting or licensing does not seem to be imperatively linked with the industrial usage of the infrastructures.

There is a large spread in the number of patent applications from individual research infrastructures. In general, facilities within the astronomy, astrophysics, nuclear and particle physics, biomedical and life sciences, and environmental sciences is somewhat above average. Research infrastructures in Germany have a higher relative possession of intellectual property rights among the interviewed infrastructures.

The number of licenses given from research infrastructures per year – among the interviewed facilities – is about one, with a range from 0 to 12.

A little less than half of the interviewed infrastructures have generated spin-off companies, and in general less than ten companies have been established as a result of the activities of the research infrastructure. Once again, facilities within astronomy, astrophysics, nuclear and particle physics and within biomedical and life sciences seem to be the most active in this field.

8.1.5 Human Resources

To many research infrastructures, the human resources constitute a field of specific concern. Problems finding appropriate, low salaries compared to industry, the high number of fixed term contracts vs. permanent contracts were frequently mentioned in the interviews.

No notable programs for the exchange of staff between research infrastructures and industrial partners/companies were found during the ERID-Watch Interviews. The difficulty of “re- recruiting” was mentioned; it is rare that scientists return to academia from industry. The focus for publishing in research organisations may be one reason; publications do not have that value in the industrial career.

8.2 Market studies

This part of chapter 6 Findings is mainly a summary of the D6/D7 Final Market Study Report. Further data, analyses, and information can be found in the D6/D7 report and annexes – both of which are available for download from www.eridwatch.eu.

8.2.1 Research infrastructures – a premium segment of the research market

Basically, research infrastructures' market of users is divided into two parts – the scientific market and the industrial market. It cannot be said that the research infrastructures are not market oriented; rather, one could say that both markets seem to have different demands and most of the interviewed research infrastructures' core focus is on the scientific market. Their market orientation lies within the scientific community where the demands are for example the uniqueness of the research infrastructures. Up until now, both markets could not be put together and served at once with the same means. This may explain why it is relatively seldom the case that a research infrastructure has half industrial and half scientific users – it is much more likely that research infrastructures mainly serve just one of these markets.

On the other hand, the research infrastructures together constitute a very important market for industrial suppliers. This market can be seen as a pyramid, where the research infrastructures form the top.

There are approximately 300 medium-sized and large European research infrastructures. Viewed as a pyramid, the top would consist of extremely large, unique, facilities, such as the Large Hadron Collider, LHC, at CERN or – on a global scale – the ITER facility being built in the south of France. Next to the top are a number of synchrotrons and then there is the basis of the remaining 250 medium and large-size infrastructures from all scientific fields.

Another part of the pyramid would be the 300+ smaller facilities, that play important roles in the European research landscape, but without having either the 20 m€ investment costs or the true pan-European user group.

A third part, the real basis of the pyramid, is made out of the remaining "research sector": laboratories, university facilities, research institutes etc. Estimates made for the instrumentation market, indicates that this part of the pyramid constitutes about half of the total value. Of the total annual budgets for these, approximately 90 percent are covered by public funding trough the research budgets of member states and institutions like universities and research councils. Only a smaller part is estimated to be covered by external funding from industry, foundations, and license agreements or similar.

The European research infrastructures form a significant part of the annual budgets for the "research market", estimated at 25 percent, worth about 8-9 b€ out of a total of maybe 35 b€. Approximately 50%, or 4-4.5 b€, is spent on instrumentation. The new ESFRI roadmap was announced during the ECRI conference on 11th of December in Versailles. It represents various domains distributed over 44 projects (Social Science & Humanities, Environmental Sciences, Biomedical and Life Sciences, Energy, Physical Sciences & Engineering, Materials and Analytical Facilities, *e*-Infrastructures). The budget amounts around 20 b€ spread over 10years, thus equal to around 2b€ per year, this is an increase of around 20% on present investment.

The research infrastructures constitute a premium segment of the "research market" as the requirement of the sector is demanding and challenging, often basis for innovative solutions. **Almost two out of three companies (62%) report that they have been able to move into additional markets** (downwards in the pyramid) thanks to the more complex products developed and sold to the larger, international, infrastructures (upwards in the pyramid), where 4 out of 5 products are subject to modifications, compared to "off-the-shelf" products.

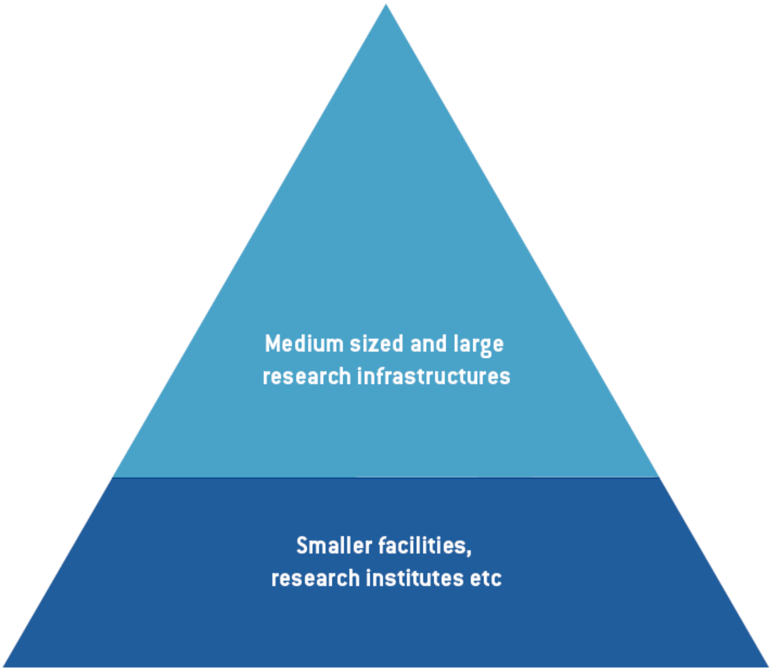

Figure 7 The market pyramid.
The top represents the 300+ medium-sized and large research infrastructures, while the darker blue segment represents the remaining 300+ smaller infrastructures identified in the European Commission survey 2005-2006.

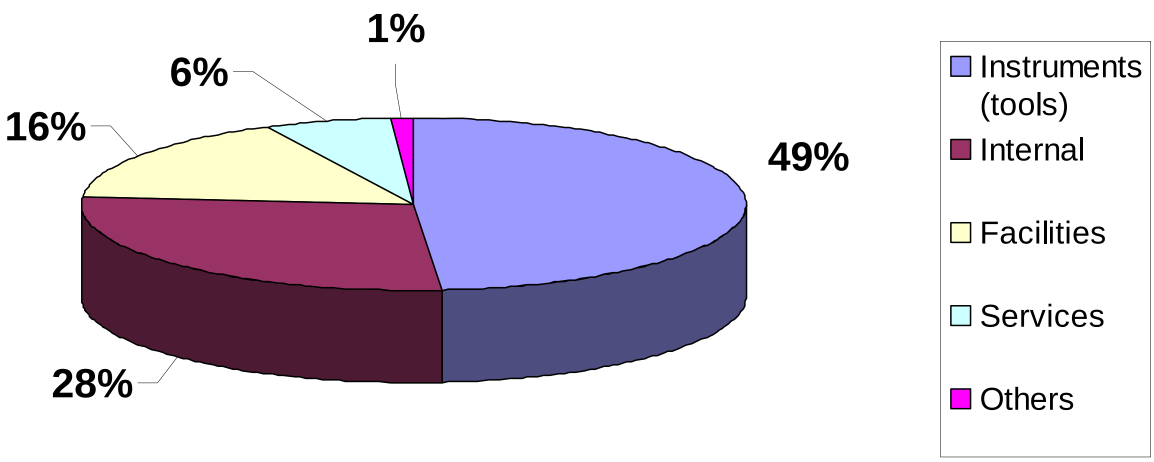

Figure 8. Breakdown of expenditure – interviewed Research Infrastructures

From an industrial point of view, the research infrastructures constitute a premium segment of the more extensive research market, which would include thousands of laboratories, university departments and research institutes. However, to most of the interviewed companies this makes a specification of the research infrastructure market share difficult.

However, many of the interviewed companies indicate that contracts in the infrastructure segment of the research market are beneficial and prestigious, which support sales efforts and results in other segments of the market. Furthermore, the demanding requirements are challenging and form basis for technology development and innovations.

The research infrastructures form a very diverse community. The group of facilities includes research vessels as well as synchrotrons, space stations and natural history museums. Furthermore, existing really large scale operations, like the European Space Agency, and planned facilities, like ITER, or infrastructures not yet in use, such as the Large Hadron Collider at CERN, influence the budgets and hence the market size significantly.

8.2.2 Financial situation of European research infrastructures

The total annual turnover of European research infrastructures amounts to several billion euros. The exact numbers are hard to get; it illustrates the issue of different accounting and delimitation procedures and policies in the European countries.

However, a reasonable estimate has been calculated from the interviews with the research infrastructures themselves and the national and international research funding organisations of this study.

The income is mainly public funding through government, research funding organisations and research institutions like universities and laboratories. Only a minor part comes from industry or as payment for delivered services.

There are two major categories of budgets and costs for the research infrastructures, the construction costs and the annual budget for operations and recurrent investment for replacement instruments etc. They have been calculated as follows:

- *Construction cost for research infrastructures*: this figure refers to the total expenditure in building the existing European infrastructures. The data has been provided as often as possible from the interviewed research infrastructures and updated to current economic conditions
- *Annual budget for* research infrastructures: this indicator includes operational and investment costs for the annual operation of research infrastructures. The data collected refers to fiscal year (2005-2006)

8.2.3 Income

By interviewing more than 30 representatives from European national institutional bodies such as ministries, agencies, science funds and research councils in 17 countries, it has been shown that almost 91% of research infrastructures funding originates from national institutional bodies. European institutional bodies fund almost 4% of the European research infrastructures budgets and, around 2% comes from industry and the same amount comes from contracts (R&D, users, and visitors). Almost 1.5% of the budget originates from local public bodies and virtually nothing comes from license agreements.

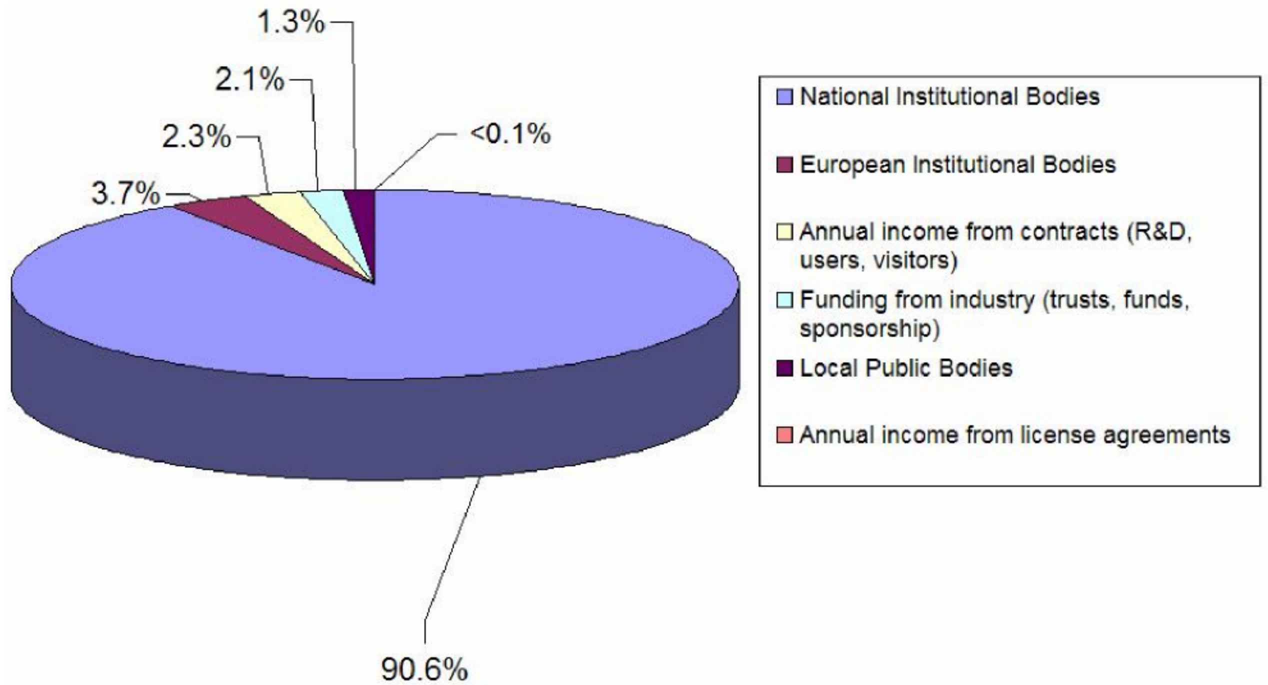

Figure 9. Contribution breakdown - research infrastructures

8.2.4 Construction costs

Scientific Domain	Subgroups of research infrastructure	Lower value Cumulated construction costs	Upper value Cumulated construction costs	Example of research infrastructures interviewed
Social Sciences and Humanities	Surveys	N/A	N/A	None
	Subtotal	**N/A**	**N/A**	
Environmental Sciences	Fleets and Vessels*	1600	2000	Polastern AWI, Pourquoi Pas Ifremer, ...
	Hydrographical and Test facilities	250	1000	Large Wave Channel, Ifremer Hyperbaric tanks, Sintef Flow Loop,
	Research	300	375	Neumayer station AWI, ...
	Museum Collection	N/A	N/A	Kew Garden Herbarium, MNHN Collections, ...
	Subtotal	**2150**	**3375**	
Energy	Plasma facilities	1000	3000	JET
	Subtotal	**1000**	**3000**	
Biomedical and Life Sciences	Human Imaging Facilities	750	1500	Cyclotron of Liege University, ...
	Animal Imaging facilities	150	450	Copenhagen Animal Research Unit, Fleming Mouse Facility, ...
	Genetics analysis centres	450	1500	Decode Genetics
	Subtotal	**1350**	**3450**	
Material Sciences	Clean rooms	660	1200	Danchip, ...
	Laser Facilities	1000	1500	FORTH IESL, FOM Laser Facility, CLF, ...
	Synchrotrons	6750	7500	Hasylab, Elettra, ESRF, Soleil, Diamond, PSI, Max Lab, ...
	Neutron facilities*	1400	1700	ILL, ...
	Subtotal	**9810**	**11900**	
Astronomy, Astrophysics, Nuclear and	Particle accelerator	7000	9000	CERN LHC, GANIL, ...
	Telescopes*	1800	3000	ESO Telescopes, ...
	ESA	N/A	N/A	*Orbital Stations and Specific Labs*
	Subtotal	**8800**	**12000**	
Computer and Data Treatment	Computation Centres	450	1500	Computation Centre of IN2P3, ECMWF HPCF...
	Networks and databases	40	70	GBIF, ...
	Subtotal	**490**	**1570**	
TOTAL		**23600**	**35295**	

Table 3. The cumulative construction cost for all European research infrastructures (not complete)

This shows a cumulative construction cost in the range of 23.6 and 35.3 billion Euros for all European research infrastructures.

Note: This analysis **excludes:**

- The research infrastructure subgroups where it has been impossible or impractical to collect information on total construction costs, for example ESA infrastructures and the collections at natural history museums
- The part of annual research infrastructure budgets which are used for continuous upgrades of existing facilities (where it has been impossible to distinguish data specifically for upgrades/constructions)

We assume that a readjustment of 15% has to be added in order to take into account the possible subgroups that have not been identified in our sample.

As conclusion, an estimate of the cumulated construction cost for all existing and operating European research infrastructures (not including ESA and the collections of history museums) is found to be in the range of 27.1 b€ and 40.6 b€.

Sometimes, the figure 100 b€ is mentioned as the accumulated value of the European research infrastructures. ERID-Watch's more moderate estimate of 40 b€ does not include – as mentioned above – ESA, upgrades, or the infrastructures under construction, such as ITER.

The new ESFRI roadmap announced during the ECRI conference in Versailles on 11th of December represents various domains distributed over 44 projects. The budget amounts around 20 b€ spread over 10years, this is an increase of around 20% on present investment.

8.2.5 Annual budget

The cumulated total annual budget of the European research infrastructures is estimated at 8-9 b€.

This number derives in part from the annual budgets at institutes, due to the difficulty in collecting information at research infrastructure level.
The following analysis identifies the part of this figure that is really dedicated to research infrastructures and enlarging it to the whole European research infrastructure perimeter.

Scientifc Domain	Subgroups of research infrastructure s	Lower value Total annual budget 2006 (m€)	Upper value Total annual budget 2006 (m€)	Examples of research infrastructures interviewed
SocialSciences and Humanities	Surveys	N/A	N/A	None
	Subtotal	**N/A**	**N/A**	
Environmental Sciences	Fleets and	600	750	Polastern AWI, Pourquoi Pas Ifremer,
	Hydrographical and Test facilities	10	40	Large Wave Channel, Ifremer Hyperbaric tanks, Sintef Flow Loop, ...
	Research	100	125	Neumayer station AWI, ...
	Museum Collection	15	50	Kew Garden Herbarium, MNHN Collections, ...
	Subtotal	**725**	**965**	
Energy	Plasma facilities	60	180	JET
	Subtotal	**60**	**180**	
Biomedical and Life Sciences	Human Imaging Facilities	90	180	Cyclotron of Liege University, ...
	Animal Imaging facilities	10	30	Copenhagen Animal Research Unit, Fleming Mouse Facility, ...
	Genetics analysis centres	90	300	Decode Genetics
	Subtotal	**190**	**510**	
Material Sciences	Clean rooms	220	400	Danchip, ...
	Laser Facilities	100	150	FORTH IESL, FOM Laser Facility, CLF, ...
	Synchrotrons	1350	1500	Hasylab, Elettra, ESRF, Soleil, Diamond, PSI, Max Lab, ...
	Neutron facilities*	420	510	ILL, ...
	Subtotal	**2090**	**2560**	
Astronomy, Astrophysics, Nuclear and Particle Physics	Particles accelerator	200	400	CERN LHC, GANIL, ...
	Telescopes*	150	250	ESO Telescopes, ...
	ESA	3450	3450	*Orbital Stations and Specific Labs*
	Subtotal	**3800**	**4100**	Subtotal
Computer and Data Treatment	Computatio n Centres	21	70	Computation Centre of IN2P3, ECMWF HPCF, ...
	Networks and databases	20	35	GBIF, ...
	Subtotal	**41**	**105**	
TOTAL		**6906**	**8420**	

Table 2. The total annual budget for all European research infrastructures (not complete)

This shows a total annual budget (for 2006) for all European research infrastructures to be in the range of 6.9 and 8.4 billion Euros. This figure includes ESA's budget of €.3.45b

Following the same assumption as for the total construction cost we add 15% to take account of sub-groups we might not have identified.
In conclusion, the cumulated total annual budgets for all European research infrastructures (including ESA) is to be found in the range of 7.9b€ and 9.4b€ (the average being €8.65b).

	Lower value of total RI Instrumentation procurement in Europe (€bn)	Upper value of total RI Instrumentation procurement in Europe (€bn)
Estimation from full sample	6.9	8.4
Adjusted estimation based on assumption (subgroups not identified)	7.9	9.4

Table 3. Total annual budget for all European Research Infrastructures (complete)

8.2.6 Average growth rates

The average growth rates (CAGR, 1996-2006 and 2001-2006) of the total annual budgets at interviewed European research infrastructures have been as follows:

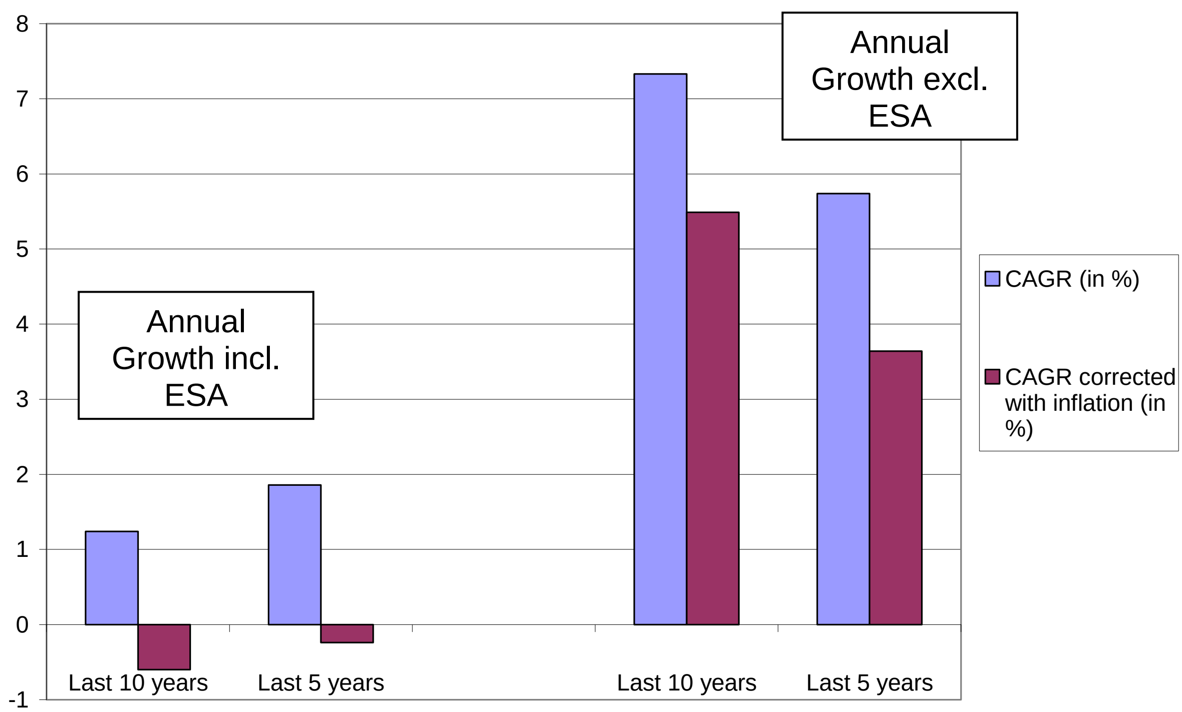

Figure 10. Budget analysis - research infrastructures - Historic Data

Official European inflation data (Eurostat) has been used: 2.1% / year over the five years period (2001-2006)
1.84% / year over the ten years period (1996-2006)

These figures were analysed both with and without the data for ESA. The ESA budget is large (approximately 40% of the total European research infrastructure annual budget), and tends to dominate the trends shown for other research infrastructures.

8.2.7 Member States funding, investment by country

The annual cumulative funding according to the interviewed institutional bodies is 5.1b€. The following assumptions are then taken into account:

Due to the different perceptions of the definition of research infrastructures in each Member State (despite the fact that ERID Watch has clearly given our definition), a margin of ±10% has to be added to the €5.1b

these lower and upper bounds now have to be increased by 15%, as data is missing from certain Member States (in particular from Italy but also from 9 medium and small sized countries)

An estimation of the annual contribution from national European ministries, agencies, and councils to research infrastructures is in the range of €5.3b and €6.4b

	Lower value of total funding (€bn)	Upper value of total funding (€bn)
Estimation from full sample	5.1	5.1
Adjusted estimation based on first assumption (different understanding of RI definition)	4.6	5.6
Adjusted estimation based on second assumption (missing countries)	5.3	6.4

Table 4. Member States funding into RIs

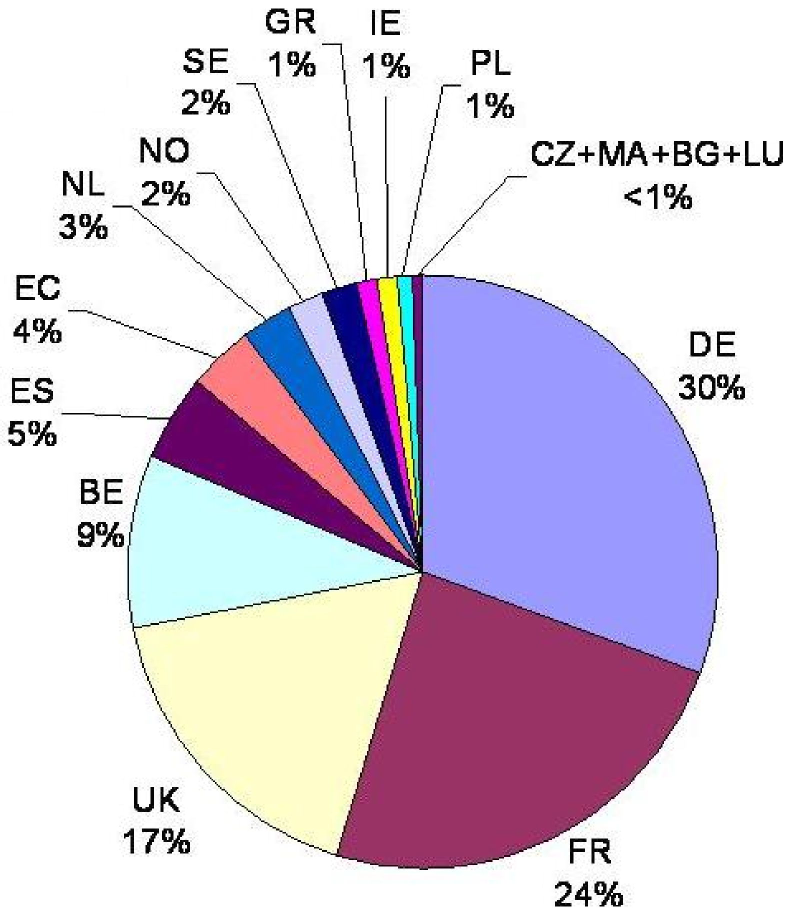

Figure 11. Member States funding into RIs - by country

Remark: Some countries have not been able to determine their financial involvement into the research infrastructure domain (Italy as a major country is for instance missing).

8.2.8 Income from industry contracts

Only about 60% (32) of the interviewed infrastructures could provide data on the distribution of industrial and scientific usage. Of these, six reported no industrial users at all. Among the infrastructures that could provide data, 14% of the total reported usage was allocated to industrial users. This might seem a high average, but it is distributed very unevenly, as only four infrastructures have a very high share of industrial usage, namely 90%, 60% and twice 30% (one each from Material Sciences, AANP, Environmental Sciences, and Biomedical Sciences).

The number and the home countries of visiting scientists at research infrastructures are seldom collected within the infrastructures and seem to have minimal importance with regard to the connection to industry.

As shown above, the incomes generated by contracts (R&D, users, visitors) or license agreements with industry only represent 2.35% of the total contribution to European research infrastructures' annual operational budgets.

These figures do not include possible university or other research institute contracts with research infrastructures that may be generated as parts of industrial projects.

By categorising the interviewed research infrastructures by the different legal statuses which exist in Europe, it has furthermore been shown that being a "private entity" or a "public entity under private law" seems only to a limited extent to improve the ability for research infrastructures to generate income from industry. Some very good management practices, especially in regards to generating revenues from industry, have however also been identified at public organisations.

By categorising the interviewed research infrastructures by scientific domain, we could however show that there is a significant difference in levels of external incomes between the domains. research infrastructures in Computation and Data Treatment (small sample of research infrastructures interviewed), Biomedical and Life Sciences, and in Environmental Sciences all generate in average more than 20% of their total income from industry. On the other hand research infrastructures in Astronomy, Astrophysics, Nuclear and Particle Physics, Material Sciences, and Energy (small sample of research infrastructures interviewed) all generate in average less than 10% of income from industry.

8.2.9 Funding of future research infrastructures

The information concerning the research infrastructure projects listed in the 1st ESFRI Roadmap gives the following figures:

- 35 future research infrastructures
- Total construction costs for ESFRI research infrastructures: €13.6b

The estimation for existing research infrastructures is based on the following:
325 medium and large scale research infrastructures (the average of 250 and 400) Total cumulative construction cost: €33.85b (the average of €27.1 b and €40.6b)

It is however necessary to keep in mind that the research infrastructures mentioned in the ESFRI Roadmap may not be comparable to the landscape of existing facilities, neither in size nor in scientific field.

The European Commission emphasizes that the ESFRI list reflects:"... vital new European Research Infrastructures of different size and scope, including medium sized infrastructures and those in the fields of humanities and bio-informatics, such as electronic archiving systems for scientific publications and databases[8]

In addition to large scale ESFRI infrastructure projects, a significant number of other initiatives have been mentioned by companies interviewed. These mostly relate to national funded research infrastructures that can be considered as medium scale research infrastructures.
The opportunities, described as being of major interest by companies, refer to the following sectors:

[8] ESFRI Roadmap

Alternative Energy (excluding fusion): Technical platforms will certainly offer supply opportunities and spill over effects (technology transfer to industry)
Medical Imaging: Centres which are to be set up at a national level are looked upon with significant interest by industrial suppliers

In this section, the information relies on interviews with 8 ESFRI projects. These projects have been selected to be interviewed based upon the following aspects:

- Emphasis has been put as much as possible on advanced projects, with the nearest expected date of operation.
- All scientific sectors have been covered (except Energy)

As a result of these criteria, most of the projects refer to distributed research infrastructures. These facilities have in particular mentioned issues such as:

- Governance: the demand for a specific legal status is high
- Financial involvement: local public bodies' funding is very small or even missing (only up to 5%) as the economic impact of such projects at local level is expected to be negligible. A strong investment from a European level is requested (in the range of 20% to 30%) as the benefit of distributed research infrastructures would be important for the whole European community.

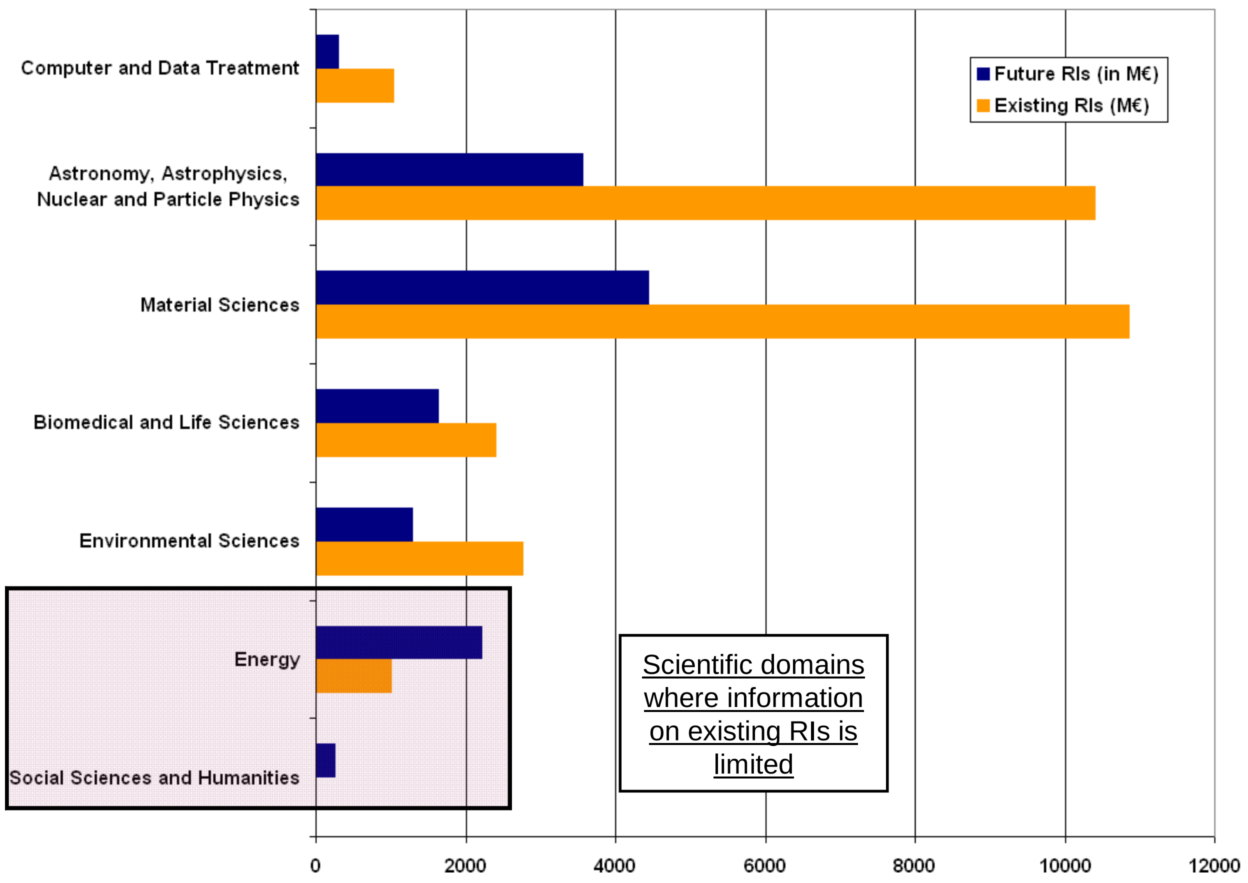

Figure 12. Total level of investment into future ESFRI Research Infrastructures – by scientific domain[9]

[9] This refers to the ESFRI Roadmap published in 2006. For updated information, see also ESFRI Roadmap published Nov 2008 at http://cordis.europa.eu/esfri/

If all research infrastructures found within the ESFRI Roadmap are implemented, the construction of these will represent 30% to 70% (depending on the scientific domain) of the total construction cost for the existing research infrastructures.

8.2.10 Technology Show Stoppers

Technology Show Stoppers are defined as technologies which are needed by future research infrastructures to achieve their scientific objectives and for which industrial involvement into their development often is necessary.

According to information provided by 8 ESFRI projects, these Technology Show stoppers have rarely been identified, mainly because:

- Several research infrastructure projects have not yet decided its technical platform they will choose (still under preparatory phase)
- Some research infrastructure projects are at an advanced phase and have already discussed issues with industry which also means they already know that their requirements will be fulfilled

For a further discussion on technology show stoppers, please see report D6/D7 (can be downloaded from www.eridwatch .eu)

8.2.11 Future research infrastructures – in addition to the ESFRI Research infrastructures

In addition to large scale ESFRI projects, a significant number of other initiatives have been mentioned by companies interviewed. These mostly relate to national funded research infrastructures that can be considered as medium scale research infrastructures.
The opportunities, described as being of major interest by companies, refer to the following sectors:
Alternative Energy (excluding fusion): Technical platforms will certainly offer supply opportunities and spill over effects (technology transfer to industry)
Medical Imaging: Centres which are to be set up at a national level are looked upon with significant interest by industrial suppliers

9 Industrial Usage of Synchrotron Radiation

Across the synchrotrons interviewed all wanted to increase industrial usage and are in the process of addressing this issue in varying ways. A summary on the topics Price System, Annual Turnover, Industrial Usage, Customer Fields, Industry Service and Marketing is found below. Please see the D3 Final Benchmarking Report for the complete material. The report can be downloaded from www.eridwatch.eu.

9.1 Price System and Annual Turnover

All Synchrotrons make a distinction between published and proprietary research. Published research is generally free.
The price for 1 hour beam time ranges from 100€ to 930€. The average sales price is 313€[10]. Five interviewed synchrotrons named the price for one hour of service - it ranges from € 100 to € 175. The U.S.-based NSLS charges $100/hour (ca. € 70). Three institutes charge additional or higher fees for Mail-In Service in the field of Protein Crystallography. The average annual turnover from industrial use ranges from € 50,000 to € 2.5 million. The total turnover was 4.6 m€ - half of which was generated by one facility.

9.2 Industrial Usage and Customer Fields

Beam time hours given to industry among interviewed synchrotrons ranged from 219 to 3700, which equals a percentage of 0.2% to 12% of total working hours.

The number of users ranges from 4 to 50 per year; often those users visit more than once. The NSLS lies at the upper end of this scale with ca. 47 companies with at total of. 154 visits per year. All but one synchrotron reported that the majority of their customers come form the pharmaceutical area. The other synchrotron reported “Chemistry and Energy” as the field from which most of its customers come.

9.3 Industry Service

All European synchrotrons offer rapid access for industrial customers.
This is also regarded as very important in the few assessments we received from industrial users, but obviously there are other factors for success.

Being able to offer service to users is generally regarded as most important, especially if one wants to draw in more (local) SMEs, which was stated as a goal in several cases. Services offered can include general assistance by a beam line scientist, experimental setup, and analysis of the measurement results. Dedicated beam lines for industry are

[10] (Additional information on the calculation of the average: two institutes gave a lowest and highest price, for those we averaged a price out of the lowest and the highest without knowledge of how many hours were in fact sold for the more “expensive” price, because that information was not given. The others stated an average price themselves).

not very widespread and the opinions on their usefulness vary. Most institutes do not have a beam line established exclusively for industry, though in some cases certain beam lines are only used by industry. There is one model where a beam line is financed by industry and a research institute. This model also exists at the NSLS in the form of the Participating Research Teams (PRTs).

One European institute reported negative experiences with a beam line designed for industry, since the industrial needs changed faster than construction of the beam line could be completed.

Two thirds of the institutes have special service groups for industry that liaise between scientists and industry. In one case, an external company was founded to better service the long-term, large customers. Half of the service groups have a link to a technology transfer group of their mother institutes.

9.4 Marketing

Obviously, at the moment there is a rather indirect approach towards promoting industrial services. This can be concluded from the fact that a lot of institutes stated that networking and going to scientific conferences was an important marketing instrument. This approach appears to reflect the view that a potential customer will be impressed by the scientific achievements of an institute and immediately convinced of the quality of the product. These potential customers then have easy points of access by being able to talk directly to the right people within the framework of the conference. This reflects the belief that institutes offer an excellent research programme which industrial users can tap into.

However, a lot of institutes also seem to have reached a point where they set out to try a more direct method of marketing synchrotron radiation:
Excellent scientific publications by the researchers using the synchrotron are seen as an important indirect marketing effect. General visibility and reputation are assumed to help industrial usage.

The most important marketing instruments are using a website for visibility and marketing and going to workshops and conferences to meet and network with industry members. These conferences are considered to offer possibilities for effective contact between scientists and industry. Networking is in general regarded as the most important marketing instrument.

9.5 Growing market vs. competition for customers?

All but two institutes expect an increase of industrial usage of their synchrotron in the future, but hardly anyone expects industrial usage to rise above 10% of the total user time. All agree that, seen globally, the industrial usage of synchrotrons will experience an increase. But the number of synchrotrons throughout Europe is growing as well.
Consequently, the question arises whether synchrotrons should perceive each other as rivals for attracting industrial customers. There are voices stating that the overall market for industrial use of synchrotron radiation will not grow adequately: "*Now the market is*

getting more competitive: more actors, but the cake is not getting bigger. It cannot be our goal [among the synchrotrons] to destroy the prices, the only winners then are industry!"
A regular exchange of information on these topics or attempting to combine efforts to find solutions to common problems might be beneficial to all.
Ultimately, the aim should be the expansion of the overall market, with each synchrotron finding its own position via its unique profile.

10 Interviewed Institutions

Scientific Domain	Research Institute	B	M	Research Infrastructure	Country
Astronomy, Astrophysics, Nuclear and Particle Physics	CERN	x	x	LHC	EU
	ENO	x		Instituto Astrofísica de Canarias	ES
	ESA	x	x	International Space Station (ISS)	EU
	ESA	x	x	Microgravity Laboratory / Life and Physical Sciences Instrumentation Laboratory	EU
	ESO	x	x	Telescope 1	EU
	ESO	x	x	Telescope 2	EU
	GANIL	x	x	GANIL	FR
	IEAP CTU	x	x	IEAP CTU	CZ
Biomedical and Life Sciences	Copenhagen Animal Research Unit	x	x	CARU	DK
	Decode Genetics	x	x	Decode Genetics	IS
	Fleming Institute	x	x	The mouse facility	GR
	Fleming Institute	x		Laboratory of Protein Chemistry	GR
	Fleming Institute		X	Array facility	GR
	HZI	x	x	Mouse House	DE
	HZI	x	x	Array facility	DE
	INSTRUCT	x	x	Weizmann	ISR
	INSTRUCT	x		Oxford	ISR
	University of Liege	x	x	Cyclotron and Imaging Platform	BE
Computation and Data Treatment	CERN	x	x	Grid	EU
	CINECA	x		Computation Center of 50 Teraflops	IT
	CINECA		X	Cineca	
	CNRS/IN2P3	x	x	Computation Center	FR
	ECMWF		X	High Performance Computing Facility	EU
	GBIF	x		French Nodal Point	FR
Energy	EFDA-JET	x	x	EFDA-JET	EU
Environmental Sciences	AWI	x	x	Polarstern	DE
	AWI	x	x	Neumayer Station in Antarctica	DE
	European Centre for Medium-Range Weather Forecasts	x		High Performance Computing Facility	UK
	Ifremer	x	x	Genavir	FR
	Ifremer	x	x	Test Facilities	FR
	Kew Gardens	x	x	The Herbarium	UK

	Kew Gardens	x	x	Jodrell laboratory	UK
	Large Wave Channel	x	x	Large Wave Channel	DE
	MNHN, Paris	x	x	Department of Collections	FR
	NHM	x		NHM	UK
	SINTEF Petroleum Research	x	x	The Large Scale Flow Loop	NO
Material Sciences	BESSY	x		BESSY	DE
	DESY	x	x	Hasylab	DE
	DESY	x	x	FLASH	DE
	Elettra	x	x	Elettra	IT
	Elettra	x	x	FERMI@Elettra	IT
	ESRF	x	x	ESRF	FR
	ETW	x		European Transonic Wind tunnel	DE
	FOM Rijnhuizen	x	x	FELIX Laser Facility	NL
	FOM Rijnhuizen	x		Magnum PSI	NL
	FORTH IESL	x	x	Ultraviolet Laser Facility	GR
	ILL	x	x	ILL	FR
	Max-Lab	x	x	Max-Lab	SE
	PSI	x	x	SLS	CH
	PSI	x	x	SINQ	CH
	Soleil	x	x	Soleil Synchrotron	FR
	STFC	x	x	CLF	UK
	STFC	x	x	Diamond	UK
	STFC	x		SRS-Daresbury	UK
	Technical University of Denmark	x	x	Danchip Clean room Facility	DK
Social Sciences and Humanities	ESS	x		ESS	EU
TOTAL		53	43		

11 Website and publications

The complete ERID Watch project, including all reports, can be found at www.eridwatch.eu. Furthermore, a handbook "Findings and Recommendations" was published in two editions, prior to the ERID Watch final conference in Prague, October 2008, and prior to the ECRI2008 conference in Versailles in December 2008. A PDF version can be downloaded from the website; a printed version can be obtained from the project coordination office at CEA; please write to Christine.porcheray@cea.fr.

12 Consortium partners

12.1 CEA, Commissariat à l'Energie Atomique, France (coordinator)

The CEA is a major player in research, development and innovation in Europe, developing R&D programmes in 3 main fields: **Energy**, **Information and Health Technologies** and **Defence**, all supported by a substratum of high level basic research, based on collaborations with Universities and CNRS. Research at CEA is 2/3 Technological and 1/3 Fundamental. 30 % of the budget comes from contracts, mainly on the basis of PPP. Employing more than 15000 researchers, engineers and professionals ([11]), it takes benefit from a crossed engineers/researchers culture, synergies between fundamental research and technological innovation, exceptional installations (super-computer, research reactors, large physics instruments, high power lasers, etc) and, finally, a real involvement in the industrial and economic activities.

CEA belongs a long and broad expertise in the RI domain: **developer and operator** of several facilities in Fundamental Physics, Engineering, Life sciences, Environment, Security and Defence; **user** of facilities run by other operators especially Intergovernmental Service RIs as well as Marine, Polar or satellite facilities; **administrator of large intergovernmental** (CERN, ILL, ESRF, ...) **and National RIs** (GANIL, Soleil, Orphée-LLB) on behalf of the French Government.

DSM is the Physical Sciences division of the CEA fundamental research branch which has developed high level skills in collaborative project management (finance, reporting, quality & risk assessment and monitoring) which lead it as being the French leader in physics infrastructures & related technologies. The total staff is 2700 (1700 CEA and 1000 CNRS, post-docs, PhD). DSM has a large experience in FP6 activities, participating in (or leading) more than 80 contracts and is largely involved in **Physics Infrastructures activities** (Integrated Initiatives or Design Studies as CARE, ILIAS, ItsLeif, NMI3, Laserlab, R3IB, EURISOL, EUROFEL, EUROTEV, Km3Net, etc).

Philippe Lavocat is Associate Director of the CEA-Direction des Sciences de la Matière, in charge. He was the project coordinator from 2007 to 2008. Odile Bourdoiseau is his assistant

Jean-Pierre Caminade is the Coordinator for European Affairs at CEA-Direction des Sciences de la Matière and Responsible Officer in charge of the supervision of all European Contracts. He was the project coordinator from 2006 to 2007

Christine Porcheray is in charge of technological & industrial strategy in physics instrumentation, fusion technology and space activities at CEA –Direction des Sciences de la Matière. She was the operating project manager

12.2 DESY, Deutsche Elektronen-Synchrotron, Germany

DESY is a national research centre with long-standing experience in accelerator design and operating RIs for high energy physics (HERA) and synchrotron radiation research (DORIS, PETRA, FLASH) with presently approximately 1000 and 1900 users per year, respectively, from all over the world. DESY has been one of the leaders in the development of the two future international RIs, Ray Free Electron Laser (XFEL) and the International Linear Collider (ILC).

The design and construction of accelerators and beam lines at DESY lead to close collaboration with the European industry and long-standing experience in knowledge and technology transfer between public laboratory and industry. Recently DESY has been a driving force towards the foundation of EIFast, the "European Industry Forum for Accelerators with SCRF Technology" in October 2005, which is supported by more than 30 companies, many of which are SMEs, and research institutions from 9 European countries. DESY is currently participating in Physics Infrastructures activities with I3 (IA-SFS, CARE, HADRON PHYSICS, EGEE, EUDET) and is coordinating the two Design Studies EUROFEL and EUROTEV. Since the Framework Programme 3 (1990) DESY receives EC funding for the Transnational Access to the synchrotrons of HASYLAB.X-

Dr. Karsten Wurr is in charge of DESY's Technology Transfer Office. He has large experience in the various relations between scientific institutions and industrial companies He was helped by Katharina Henjes-Kunst and Katja Kroschewski

12.3 STFC, Science and Technology Facilities Council, UK

The Science and Technology Facilities Council is an independent, non-departmental public body of the Department for Innovation, Universities and Skills (DIUS).

It was formed as a new Research Council on 1 April 2007 through a merger of the Council for the Central Laboratory of the Research Councils (CCLRC) and the Particle Physics and Astronomy Research Council (PPARC) and the transfer of responsibility for nuclear physics from the Engineering and Physical Sciences Research Council (EPSRC). We are one of seven national research councils in the UK.

STFC is a science-driven organisation. It makes it possible for a broad range of scientists to do the highest quality research tackling some of the most fundamental scientific questions.

Dr Peter Fletcher is the Head of Corporate Knowledge Exchange for STFC
He has overall responsibility for STFC's programme of research student training and outreach to build knowledge of science in the community. He is a UK delegate to the EU FP7 Research Infrastructure Programme Committee and the OECD Global Science Forum. He was helped by Penny Woodman and Victoria Wright

12.4 VR, Vetenskapsrådet, Swedish Research Council, Sweden

Vetenskapsrådet, VR, is a government agency that provides funding of basic research of the highest scientific quality in all fields of science. We have a national responsibility to support basic research and promote research innovation and communication. The goal is that Sweden shall be a leading nation in scientific research.

VR represents Sweden in many international organisations such as CERN, ESO, EMBL, ESRF, EUI, and IARC. Research projects are conducted by university based research groups which receive grants from VR.

VR's Committee for Research Infrastructures produces long-term strategies and allocates resources for expensive scientific equipment, large research facilities, and extensive databases. The Committee also deals with Swedish interests in, and funding of, various national and international RIs. The Committee's main goal is to ensure high-quality infrastructure for Swedish researchers.

Dr Finn Karlsson is Senior Research Officer at Swedish Research Council and Head of the office of VR's Committee for Research Infrastructures

Jan Riise acted as project manager for the Work Package 3 – dissemination.

12.5 Institute of Experimental and Applied Physics, Czech Technical University, Czech Republic

The Institute of Experimental and Applied Physics (IEAP) of the Czech Technical University (CTU) was established as an educational and research institute devoted to physics of microworld and its applications. It was founded in 2002 as an experimental base for the research in particle and subatomic physics (particle physics, neutrino physics, astrophysics, investigation of the structure of atomic nuclei, development of novel types of semiconductor detectors and detector structures, application of detection and spectrometric methods of subatomic physics in practice) which is mostly being performed in international experiments. The research program of IEAP is determined by the long-term collaboration projects with CERN, JINR Dubna, and further institutes abroad.

IEAP will be in charge of the organisation of the ERID European Conference to be hold in Prague as a main outcome of the project.

Dr. Ivan Stekl, associate professor, is deputy director of IEAP CTU in Prague. He is involved in several international experiments as NEMO (French institutes, double beta decay) and TGV (JINR Dubna, double beta decay), ATLAS (CERN, neutron shielding) as well as Picasso (SNO lab, detection of neutralino). He is member of the Governing Council of the FP6 project ILIAS. He was helped by Carlos Granja

12.6 Nenner Conseil, France

Nenner Conseil (NC) is a consultant company funded in dec.2005 by Dr. Irène Nenner who was previously Deputy-Director of the CEA Physical Science Division (DSM). The objective of the company is the development of research management

skills by coaching and training of managers. All level are concerned: ground level (labs, institutes), research installations (infrastructures), and European policy actors. Thus, the company acts as a facilitator for setting up European oriented collaborations. She will ensure the **Executive Secretariat of the Coordination Action** and of the Industrial Group as well as **the management of the WP2 (Market Studies).** She will ensure a day-to-day coordination of the project activities.

Dr Irène Nenner is currently Manager of the consultant company. She has been Vice-Director of the Synchrotron LURE at Orsay for several years. She has strong management capability and she is well-aware of European and international RIs. She is member of the French « Conseil Supérieur de la Recherche et de la Technologie » in charge of advising the French Minister of Research and Technology.

13 Glossary

- **EIROForum:** A partnership of Europe's seven largest intergovernmental research organisations, which are:
  - *CERN - European Organization for Nuclear Research*
  - *EFDA - European Fusion Development Agreement*
  - *EMBL - European Molecular Biology Laboratory*
  - *ESA - European Space Agency*
  - *ESO - European Organisation for Astronomical Research in the Southern Hemisphere - ESRF - European Synchrotron Radiation Facility*
  - *ILL - Institute Laue Langevin*

- **ERA:** European Research Area - In 2000, the EU decided to create the ERA. This means creating a unified area all across Europe, in which one should:
  - *Enable researchers to move and interact seamlessly, benefit from world-class infrastructures, and work with excellent networks of research institutions;*
  - *Share, teach, value, and use knowledge effectively for social, business and policy purposes;*
  - *Optimise and open European, national and regional research programmes in order to support the best research throughout Europe and coordinate these programmes to address major challenges together;*
  - *Develop strong links with partners around the world so that Europe benefits from the worldwide progress of knowledge, contributes to global development and takes a leading role in international initiatives to solve global issues.*
  - *Inspire the best talents to enter research careers in Europe, incite industry to invest more in European research – contributing to the EU objective to devote 3% of GDP for research, and strongly contribute to the creation of sustainable growth and jobs.*

- **ERF:** European Association of National Research Facilities, of which the initiating associates are :
  - *Societe Civile Synchrotron Soleil (FR),*
  - *Gesellschaft für Schwerionenforschung GSI (DE),*
  - *Elettra – Societa Sincrotrone Trieste (IT),*
  - *Deutsches Elektronen-Synchrotron DESY (DE), - MAX-Lab Lund University (SE),*
  - *Grand Accelerateur National d'Ions Lourds GANIL (FR),*
  - *Paul Scherrer Institut PSI (CH),*
  - *FOM-Institute for Plasma Physics Rijnhuizen (NL),*
  - *Max-Born-Institut MBI (DE),*
  - *Hahn-Meitner-Institut HMI (DE),*
  - *Science and Technology facilities Council STFC (UK)*

- **EU 15:** Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

- **EU 12:** Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia.

- **FTE:** Full Time Equivalent

- **IP:** Intellectual Property

- **K&TT:** Knowledge and Technology Transfer
- **PG:** Pilot Group
- **RI:** Research Infrastructure
- **WP:** Work Package

Abbreviations of Scientific Domains

- **AANP**: Astronomy, Astrophysics, Nuclear & Particle Physics
- **BLS**: Biomedical & Life Sciences
- **CDT**: Computation and Data Treatment
- **EN**: Energy
- **ES**: Environmental Sciences
- **MS**: Material Sciences
- **SSH** : Social sciences and Humanities

ANNEX I: Terms of Reference of the ERID-Watch management bodies

Executive Board

INTRODUCTION

The Executive Board is chaired by the Coordinator; it is composed of the 6 legal partners of the project especially the ***Work Leaders*** of the ***4 Working Packages*** (WP0->3) under the lead of the Coordinator supported by the Executive Secretary.

SCOPE OF WORK

- The EB establish the original budget of the Coordination Action (content and financial envelop) and decide finally on all budget matters
- The EB be reimbursed from all expenses linked :
  - o to the management: reimbursing travel & accommodation costs for Executive Board meetings, website (if done by ourselves)
  - o to sub-contracting and procurement expenses: market studies, website (?)...
- The EB reimburse travel & accommodation costs for all partners (legal & expert) and all other independent experts solicited for participating into the working groups linked to work packages (1 each) and the 3 bodies described below : Mirror Group, Advisory Committee, Industrial Group;
- The EB decide the admission of a new legal partner (see below);
- The EB admit any new expert-partner as far as the standard letter of intend has been signed and well received by the Executive Board,
- The EB responsible for the project deliverables delay and quality level,
- The EB responsible for the preparation of conferences (opening, mid-term and final) and the project deliverables,
- The EB provide the EC with the mid-term activity report and the final report for the contract,
- The EB provide the EC with audit certificates by the end of the contract,
- The EB accept to keep in confidence all invalidated working documents.

Mirror Group

INTRODUCTION

The Mirror Group is one of the core governing bodies of ERID-Watch. Mirror Group members are representative from the Member-State; they are designated by the highest level Member- State authorities in charge of Research policy. They are responsible for validating the specifications report and the final set of recommendations to be considered as the policy-mix aiming to increase the involvement of private companies in the construction and the management of major European Research Infrastructures (existing and to be built).

ADMISSION

It's free to the MG members to include any new M-S participants into the project by majority decision. Nevertheless, this is encouraged by the Executive Board*.*

They will share the above mentioned initial members privileged access to:

- The working documents and working meetings schedules and minutes,
- The preparation and review of report and recommendations.

SCOPE OF WORK

- The MG members validate activities of the EB which semi-annually reports to it and approves working programmes for the different periods of the project. MG is fully involved in GOW and Reviews preparations as well as the final European Conference; any candidature for joining the Coordination Action must be unanimously approved by the MG,
- They may participate to the General Opening Workshop, Mid-Term Review, and the final Conference.

PROCESS DESCRIPTION

- The chairman will be elected by the participants
- They will be invited at the specific MG meeting (at least one meeting each year)
- The MG is responsible for validating the specifications report and the final set of recommendations to be considered as the policy-mix aiming to increase the involvement of private companies in the construction and the management of major European Research Infrastructures
- They will have access to working documents, and accept to keep in confidence all un-

validated working documents.

Advisory Committee

INTRODUCTION

The Advisory committee (AC) is one of the core advisory bodies of ERID-Watch.

It's composed of **twelve high level representatives** chosen from three sectors (3x4) interested in RIs: **4 RI Operators**, **4 RI Policy-advisory bodies,** and **4 Industrialists** (including banks such as BEI).

The AC members are designated by the Executive Board (after consultation of the Mirror group and the European Commission (Research Infrastructures Unit)). The list of AC members is included in the D0 deliverable.

AC provides the Executive Board (EB) and Mirror Group (MG) with advices on its own or on the basis of formal demands, especially regarding the Good Practices selection process and the Recommendations to be validated by the MG

ADMISSION

They are designed by the Executive Board after consultation of the Mirror group and the European Commission (Research Infrastructures Unit). Advisory Committee members are nominated for the whole duration of the contract. They will share the above mentioned initial members privileged access to:

- The working documents and working meetings schedules and minutes,
- The preparation and review of report and recommendations.

SCOPE OF WORK

- The AC members will act as a panel review for the Mid-Term Meeting and the Final Conference.
- They discuss and give advices on intermediate and final reports of both good practices benchmarking and market studies.
- They may be interviewed by the WP1 and WP2 investigators (experience with RIs and cross-cutting technologies identification).
- They may participate to the General Opening Workshop, Mid-Term Review, and the final Conference.

PROCESS DESCRIPTION

- The chairman will be elected by the participants
- NC legal partner will ensure the secretary task.
- They will be invited at the specific AC meeting (ECRI-June and Mid-Term meetings in Hamburg) and the Final European Conference in Prague in October 2008.
- The AC provides the EB and MG with advices on the basis of formal demands, especially regarding the Good Practices selection process and the Recommendations to be validated by the Mirror Group. This process will be lead by the AC chairman and be assisted by the secretary.
- The AC will comment on documents by this way:
  - The secretary sends documents to be discussed and commented
  - The secretary collects all the returns
  - Without answer after 2 weeks, the document is considered as validated and "communicable" to the MG
- They will have access to working documents, and accept to keep in confidence all un-validated working documents.

Industrial Group

INTRODUCTION

The Industrial Group is one of the core advisory bodies of ERID-Watch. It must provide independent views on the project's topics. It's the reason why it must have an autonomous operating way of functioning.

It's composed of companies' representatives coming from a large range of private RI stakeholders mixing major companies and SME level ones: industrial suppliers, industrial users, technology transfer facilitators, finance.

The IG members are suggested by all partners (legal & experts). The provisional list of IG members is included in the D0 deliverable. Further members up to anticipated number around 15 members might be admitted by the below mentioned procedure. Additionally, industrial representatives to the Advisory Committee are permanently invited to the IG meetings.

ADMISSION

The candidature of a new Partner of Industrial group must be submitted to the Executive Board by a legal partner through a signed letter of intend. After admission by the Executive Board they will share the above mentioned initial members privileged access to:

- The working documents and working meetings schedules and minutes,
- The preparation and review of report and recommendations.

SCOPE OF WORK

- The IG members will act as a panel review
- They discuss and give advices on intermediate and final reports of both good practices benchmarking and market studies.
- Members of IG may be concretely involved in WP1, WP2, and WP3 as well as in the AC advices. They may be interviewed by the WP1 and WP2 investigators (experience with RIs and cross-cutting technologies identification).
- They may participate to the General Opening Workshop, Mid-Term Review, and the final Conference.

PROCESS DESCRIPTION

- The chairman will be elected by the participants
- NC legal partner will ensure the secretary task.
- They will be invited at the specific IG meeting (June in Hamburg, spring meeting 2008) and the Final European Conference in Prague.
- The IG will discuss and give advices concerning all issues of the ERID-Watch project during specific Industry Group meetings. This process will be lead by the IG chairman and be assisted by the secretary. The results of these discussions should be considered by the other project bodies.
- The IG will comment on documents by this way:
  - o The secretary sends documents to be discussed and commented
  - o The secretary collects all the returns
  - o Without answer after 2 weeks, the document is considered as validated and “communicable” to the AC and the MG
- IG members may be interviewed by WP1 and WP2 investigators about:
  - o the cross-cutting technology to be considered
  - o the improvement of general conditions for having business with RIs, e.g. a) Investing in RI, b) co-governing a RI, c) providing components and services to RIs, d) incentives for funding and/or using RIs, e) innovative regulations for improving staff training (continuous learning, etc), f) co-operative R&D with RIs, g) transferring & licensing RI technologies.
  - o How do they see the market evolution in cross-cutting technology linked to RIs?
- They will have access to working documents, and accept to keep in confidence all un-validated working documents.

Dependence between activities and bodies

The Executive Board is responsible for quality level and delay of the project deliverables. In order to match the specific objectives of the project, the work plan of ERID-Watch has been structured into 3 Work packages. The Executive Board ensures the day-to-day coordination and the coherent advancement of the different WPs.

The three Work-Packages provide deliverable drafts and carry out works under control of EB.

- **AC provides the EB and MG with advices** on the basis of formal demands, especially regarding the deliverables to be validated by the Mirror Group.
- **MG validates activities of the EB** which semi-annually reports to it and approves working programmes for the different periods of the project.
- **The IG** exchanges with the EB about project results

After this process, the deliverables can be delivered to the European Commission.

The flowchart of this process could be schematized by: