ESFRI European Strategy Forum on Research Infrastructures

DRAFT Report

of the
ESFRI Working Group on Site Issues SIG

on

How to identify, to compare and to choose the best sites for pan-European research infrastructures in proposing the relevant criteria and optimized procedures

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1. Introduction

Offering or choosing a site for the construction of a pan-European research infrastructure is an important, far-reaching and crucial science policy issue for a scientific community, a country and for Europe. It often is connected to a re-evaluation of research policies and it can have important impacts on the socio-economic developments of the region where the research infrastructure is built.

The European Strategy Forum for Research Infrastructures ESFRI supports a coherent and strategy-led approach to science policy in research infrastructures RI and facilitates multilateral initiatives leading to a better use of existing RI and the development of new RI. Therefore ESFRI intends to prepare guidelines to facilitate the decision making process regarding RI sites (siting).

To this end ESFRI set-up a specific time-limited working group (the Site Issues Group SIG) mandated to prepare a coherent view of the Forum on *how to identify, to compare and to choose the best sites for pan-European research infrastructures and to propose the relevant criteria and optimized procedures.*.

In a first step the SIG analysed past and ongoing site selection and site decision processes for different existing and planned single sited and distributed research infrastructures (ITER, ESS, ESRF, ICOS, …[1]). A number of established research infrastructures were asked to submit material on their siting process. Documents were received from JET, EWT and ESO[2]. In a second step a symposium was organised at premises of the German Helmhotz Gemeinschaft in Brussels on May 26, 2009, at which external experts and the SIG members discussed the siting experiences based on structured guidelines which has been sent to the speakers (see annexes 5 and 4). These external experts – proposed by ESFRI-Delegates - were chosen on the basis of their experience and their involvement in intergovernmental negotiations on the siting of facilities.

The report of the SIG describes the main results and conclusions of the discussions as well as the material – the experiences of some existing and new research infrastructures - on the basis of which the discussions took place. It is evident that any siting decision has to be based on a description of the scientific case and an objective report on all aspects of the site and the siting proposals (economic, financial, environmental, risk, socioeconomic impact, …). The report does not go into these details of these descriptions since there is a lot of experience and material regarding site questionnaires and evaluation reports[3].

[1] ITER: Fusion Research Facility in Cadarache; ESS: European Spallation Source in Lund; ESRF: European Synchrotron Radiation Facuility in Grenoble; ICOS: Integrated Carbon Observing System

[2] JET: Joint European Torus in Culham,; EWT: European Wind Tunnel; ESO: European Southern Observatory in Garching and Chile

[3] See e.g. ESS, ESFRI Documentation

2. Executive Summary

Each siting process is specific and has its own history, requirements and environment. However there are common issues lessons to be learnt from past experiences. The lessons learned from looking at this past experience should help to avoid too prolonged discussions on siting of research facilities. Such delays arising in a competitive and politically sensitive situation can have damaging and delaying effects on the progress in important scientific fields.

The analysis of past experiences shows that

- The Siting process has a scientific phase and a political (decision) phase. It is crucial to transfer the process at the right time from the first to the second phase and to have recognized scientists in the first phase and a high political level in the second phase.
- In the first phase strong and lasting scientific support is essential; scientists will take the risk of a new facility in case the project is crucial for the continuity of a scientific area.
- It is important to take the dynamics and debates within the scientific community into consideration. Scientists may have a strong national orientation or concentrate too much on their specific field.
- Mainly in the second phase it is important to avoid “loser-countries”. The siting process should be advanced as win-win process for all involved bidders. This is also important after the siting decision to guarantee the acceptance and well functioning of a research infrastructure. In each siting process therefore possible compensation to losing bidders should be included in a negotiation process from the beginning. National roadmaps are helpful in view of potential compensation aspects.
- Between the two steps a strong and dynamic group of proponents (with links to the governmental decision making) is required.
- The siting procedure of single sited RI is not necessarily different from the siting process of distributed infrastructures DI. Legal aspects in DI may have to reflect the interface between the partner facilities.
- A site quality assessment procedure should be defined at an early stage; it should include an analysis of all relevant technical, environmental, economic, financial, legal, social and risk aspects of all proposed sites by independent experts. Such an analysis provides a very useful basis for a decision even if it does not provide any explicit ranking.
- The final negotiation process should be carried out only between partners that will financially contribute on the facility. The early establishment of a Steering Committee including funding agencies and meeting can accelerate the siting process.
- Smaller partners of the project should develop specific strategies (such as specialized partner institutions) and forge alliances in order to serve their scientific communities efficiently.
- The procedure should be as open and transparent as possible.

Lessons learned by the SIG:

- Keep in mind that each siting process is specific
  - ➔ Beware of generalised ‘Guidelines’
  - ➔ Learn from concrete experiences
- Assure strong and lasting scientific support
- Take into consideration the dynamics and debates within the scientific community
- Avoid “loser-countries” (win-win process for all involved bidders)
- Transfer the process at the right time from the scientific phase to the political (decision) phase
- Make sure that recognized scientists in the first phase and a high political level in the second phase contribute
- Make sure that between the two steps a strong and dynamic group of proponents (with links to the governmental decision making) exists
- Define a site selection procedure at an early stage
- Carry out the final negotiation process only between partners that will financially contribute to the facility.
- Support smaller partners of the project should to develop specific strategies and forge alliances in order to serve their scientific communities efficiently.
- Assure that the procedure is as open and transparent as possible

3. Problem definition

The decisions on if and where to build a new pan-European research infrastructure (RI) or to upgrade an existing RI depend on aspects on national as well as on international levels. Clarifying these aspects is complex since the requirements of scientists and political decision makers involved can be very different. While scientists are mainly focused on an evaluation of the site which guarantees an optimal scientific performance and use of the RI and a attractive scientific surrounding (including academic international excellence and know how, technical support, academic environment, industrial or service environment, accessibility by air, train, water etc.) political decision makers who are involved in strategic negotiation processes have to emphasis questions such as the overall funding, differing communities of interests, sustainability and environment, risks and compensation aspects.

In the case of distributed facilities[4] not only the site of the head quarter has to be analysed but also aspects of the sites of connected partner facilities (nodes). Nearly 60% of the ESFRI Roadmap facilities are distributed facilities[5]. Siting issues of the distributed nodes of distributed RI are usually of technical, financial or socioeconomic character and due to their limited cost rarely contested on the political level.

Being the site of a pan-European research infrastructure not only is a sign of a high reputation on the scientific (since it may attract excellent scientist from all over the world) or political level it may have also a significant socio-economic effect on the region siting the RI. Therefore several countries often compete to host such a facility. The more countries are involved in siting negotiations the greater the risk of time delays and difficult implementation processes.

Experiences in the past have shown that a detailed analysis of all aspects of the siting criteria well in advance can reduce problems and push the decision process forward. Relevant information will show different aspects put in proportion. Well prepared considerations concerning compensation between site proposers can help the committees that prepare the decisions.

Mainly smaller countries often are neither technically nor financially capable to take the responsibilities on very expensive research infrastructures. Therefore negotiations on political level are necessary which may offer compensation deals. It may be advantageous to invest in a smaller, less expensive regional or pan-European research infrastructure giving scientific and political visibility on a European or even global level instead of an active involvement in many different facilities where the country has very little influence.

For large and expensive research infrastructures (several hundred million Euro investments) such as telescopes, nuclear research installations the political siting decision may be long and difficult due to its financial and economical implications. In such cases package deals could be necessary. Such deals could be based on national priorities or

[4] *Definition of distributed research infrastructure:* Such a facility must have its own management structure, strategy and development plan even though its components have multiple sites. It will include parts of existing facilities which have common interest in doing research in a special area of a unique pan-European interest, ensuring peer reviewed open access to all interested users, thus creating a substantial added value with respect to individual facilities with a more limited scope.

[5] Beside of the e-infrastructures (100 % distributed) this applies for research infrastructures in the field of biological and medical science (90%), social science and humanities (80%) as well environmental science (70%) which are typical disciplines for distributed RI.

national roadmaps. Unfortunately not all European countries have defined their national roadmaps so far.

The siting process is also influenced by the life cycle of existing research infrastructures. If the decision on where to built a new pan-European research infrastructures or when to update of an existing one takes too long a whole scientific field may suffer.

Only some main problems are touched in this report based on the examples in the next chapters that describe where siting problems may occur and how they could be solved.

4. Single Sited Research Infrastructures

4.1. Experiences in decision making processes

4.1.1. A research infrastructure in the planning stage: *ESS neutrons*

The proposed **E**uropean **S**pallation (Neutron-) **S**ource ESS is a large research infrastructure, mainly for cutting edge research on materials. Its main features include a linear proton accelerator and a target (mercury or gold-lead alloy) in which the protons generate neutrons. The technological requirements and development needs before construction are very high. The power consumption in operation will be in the order of Megawatts. Apart form the generic siting issues for large research infrastructures the site of the ESS had therefore to satisfy important requirements regarding environment, human protection and power delivery.

The ESS was developed in European collaboration in the 1990ties under the lead of Germany with the aim - after internal competition -to build it on the site of the Forschungszentrum Jülich. A machine design and the scientific case were elaborated and published. In the context of the review of German Large Infrastructure projects the German Science Council gave an ESS in Jülich a lower priority with respect to other projects and the German Government did not pursue this project further.

Neutron scientists however remained convinced that ESS was a necessity for European Neutron Science and its competitiveness in view of new installations being built in the US and Japan. The technological aspects of ESS were thus further developed by an international expert group coordinated by FZ Jülich, with two possible options for the proton beam. In the meantime a worldwide strategic planning of the field was reviewed by the Global Science Forum of the OECD and by the European Neutron Scattering Association.

As a result ESS was considered to be ready for construction and was introduced in the ESFRI list 2006 of projects of ‘vital new European Research Infrastructures’ concentrating on the long pulse source option.

At that point three countries announced their interest for hosting the ESS (Lund in Sweden, Bilbao in Spain and Debrecen in Hungary). All three offers were supported politically at a high level and were able to make proposals for the implementation of ESS (differing in financing, host contribution, environmental aspects, …). It was now up to the European Countries intending to become partners of ESS to show their preference for a site. Most countries however were reluctant to decide on the basis of the information at hand.

In parallel to the two-year preparatory phase project of ESS starting 2008 and financed by the EU which concentrates mainly on non-technical aspects (the others having been treated extensively previously) the three sites established local teams to be able to make well defined proposals. Intense political lobbying with interested countries followed. Coalitions of countries were established, mainly between Nordic countries around the Swedish bid for Lund.

In order to facilitate and speed up the decision ESFRI subsequently offered to organize a high level group to review [6] the three sites. An ESFRI Working Group composed of national delegates (ESFRI Working group on ESS EWESS) elaborated a mandate for the review and a questionnaire for the bidding countries (see annex 1). It subsequently chose the international experts which composed the Site Review Group (SRG). All aspects were agreed by the bidding countries. The SRG experts reviewed the responses to the questionnaire and visited the sites. The final report of the experts was endorsed by ESFRI in September 2008 and sent to all European research ministers. It concluded that all three sites could host the ESS but that there were differences in detail.

Subsequent meetings of the site proposers on neutral ground (chaired by the Swiss ESFRI delegate) increased mutual understanding and laid down some principles but could not bring forward a site agreement between proposers. No common site could be agreed and replacement projects, compensations or distribution of tasks did not seem possible. In autumn and winter 2008/09 also, meetings of interested countries (without site proposers) chaired by Germany[7] were held and gave indications of preferences of interested countries but no conclusive results either. It became clear that the siting question would have to be treated on the highest political level. Germany and France and later the Czech Republic made further inquiries. A decision was considered urgent because incoming EU-Presidencies could not take over siting responsibilities being site proposers themselves and because timing considerations favored a decision without delay. Finally the Czech Presidency invited the countries committed to contribute to meet in Prague on May 29, 2009. At this meeting a clear majority expressed a preference for Lund.

This choice of the Lund site was then to be formalized by letters of intent of contributing countries. New ideas for collaborations and task sharing between the Lund Group and the groups in Spain and Hungary were proposed in order to make use of the expertise and resources in all three countries. These collaborations are being formalized at the time of writing of this report.

4.1.2. A research infrastructure under construction: *ITER Cadarache*

ITER is an international fusion reactor in the construction phase in Cadarache France. Studies for an international fusion reactor began in 1986 as a collaboration under the auspices of IAEA (European Union, Japan, USSR, USA). From the very beginning the partners agreed to perform common design activities on a single project and established a formal framework including a Board. The European party was Euratom represented by the European Commission.

After many technical and political steps a Final Design Report was accepted by the ITER Board in July 2001. Site requirements and Site Design Assumptions had been agreed by partners in January 2000. Successive mandates from governments allowed the delegations to negotiate on:

- Legal status of the future organization and joint implementation agreement
- Procurement allocation
- Site choice

[6] EWESS under the Chairmanship of P. Zinsli, Switzerland; SRG: Chair C. Cesarsky, members Norbert Holtkamp, Tom Mason, Scientific Secretary Peter Tindemans

[7] under the Chairmanship of Beatrix Vierkorn-Rudolph (BMBFGermany)

During the period of 2001-2002 four sites were proposed (Clarington, Cadarache, Vandellos, Rokkasho Mura). A first site evaluation (Joint Assessment of Specific Sites JASS) based on the Site Requirements and the Site Design Assumptions previously agreed by the partners was performed during the second semester of 2002 by the parties (EU, JA, RF, CAN). An ad hoc group (4 members from each party, 3 members of the ITER project) visited the proposed sites. At that time the European Union supported two candidate sites in France and Spain.
The JASS Ad-Hoc group concluded that ITER may be successfully implemented at any of the candidate sites, although some differences between the sites did exist.

While other parties progressively joined the negotiation process (China, USA, Korea and India) the EU decided to propose a single European site.
The internal EU process was managed by the European Commission, in view of obtaining a decision for a single EU candidate site to be taken by the European Council (unanimity was required). The ITER Site Analysis Group (chaired by Sir David King) was to provide a recommendation by majority vote. The report of the group was published in September 2003 and concluded that “either site would be likely to win the international site selection”. As no decision was possible on technical grounds political negotiations were accelerated towards a final agreement. The EU Competitiveness Council decided in November 2003:

- Cadarache as EU candidate site
- ITER EU domestic agency to be located in Spain.

In December 2003 Canada withdrew its candidate site and pulled out of ITER negotiations. EU, RF and CN supported Cadarache whilst JA, KO and US supported Rokkasho. Site evaluation by the parties of the two remaining sites, based on technical grounds produced no result. The four non bidding countries finally agreed that they would accept the site chosen by EU and Japan, if any.

Bilateral negotiations between EU and Japan took place in 2004-2005, bilateral high level political contacts played a very strong role in this period. An agreement was reached in June 2005 for ITER in Cadarache, including a 50% participation in the “Broader Approach to Fusion”, a joint EU Japan set of activities located in JA. The final international agreement was formally signed by all partners in November 2006.

The main peculiarities of this siting process were:

- a project that was established with a formal international organization from day zero, under IAEA,
- that the Parties established a formal method for negotiation and decision making,
- a single design, scope and objectives with a single central team,
- that each Party had to contribute at least 10%,
- that ITER requires a full nuclear license.

4.1.3. A research infrastructure in operation: *ESRF Grenoble*

The **E**uropean **S**ynchrotron **R**adiation **F**acility ESRF is a world class synchrotron radiation facility located in Grenoble France.
The first scientific studies for a European synchrotron radiation facility started in 1975 with a proposal to European Science Foundation ESF. In the following years the ESF hosted a working group on the subject and a first report was published in 1977 and approved by ESF assembly. Following that a feasibility study was finalized in 1979.

In Germany a report ranked the ESRF on 8th position in June 1980, thus making a German support for the project rather improbable. In spite of this the ESF secretary general invited the member organizations to make proposals for sites in September 1980. Although there was strong criticism on the role of ESF in the process six sites were proposed (Risø, Daresbury, Trieste, Strasbourg, Dortmund, Hamburg) during the 1980 – 1982 period, in most cases with strong local support.

In 1981 following a proposal of the Swedish research council the possibility of using the ISR tunnel at CERN a further technical study was conducted. The proposal was finally rejected by the ESF assembly. In parallel further developments of the design favored a bigger machine (6GeV 900 m circumferences).

In 1981 ESF president H. Curien proposed the creation of an intergovernmental Committee. Eight countries were represented; the so called Progress Committee was chaired by the Secretary General of Belgian FNRS. The previous site proposals were reiterated and no decision was taken. In 1982 the scientific case was updated and ILL director proposed Grenoble as a possible site.

A further site independent study was decided in 1983 and a project group was created in CERN early in 1983, a report was published in fall 1984. In response to a specific questionnaire documents were produced by Risø, Daresbury, Strasbourg, Dortmund, Trieste, Grenoble, Ispra and Jülich.

In October 1984 German and French delegations of the Progress Committee announced that their countries had decided to build the ESRF in Grenoble and to take over 68% of the construction cost, they invited other countries to join. This agreement was the result of a package deal by which the European Transonic Wind Tunnel ETW would be located in Germany and ESRF in France.

Following that a MoU was signed in 1985 by France, Germany, Italy, UK and Spain to fund a two-year preparatory phase. In September 1987 the provisional ESRF Council approved the “Foundation Phase Report”, including a chapter on schedule, staff and costs. The documents establishing the ESRF were signed in 1988 by the above countries as well as the Nordic Countries, Belgium and Switzerland

The main factors of this siting process were:

- Maintaining a wide international interest over years by working on a site independent project
- Raising the discussion from the scientific level (ESF) to the political level (Progress Committee)
- Bringing a further facility in the discussion as compensation
- A strong need for a dedicated hard X-Ray source and a mature project
- A deal between two major stakeholders

4.2. Discussion of relevant criteria and optimal procedures

The SIG discussed on the basis of the reports and presentations the questions:

- What were the decisive steps?
- What steps were relevant and positive?
- What should have been avoided?
- Who were the important organizers, decision makers?
- What steps were missing?
- What was finally decisive for reaching a decision?

In the **ESS** case the continuous pressure of the scientific community was essential to revive a project which had been prepared for al long time and rejected several times. The competition between 3 sites helped to interest the political circles in this RI. The careful preparation of the basic documents and the evaluation on the sites by specialists provided a reliable basis for the decision. The fact that highest political actors were involved at an early stage complicated the issues somewhat because prestige questions became important. The issue of a win-win solution was considered late, probably too late to influence the decision naming process. In the end the broad support and commitments of Nordic countries and the clear position of Germany for the site of Lund proved politically decisive.

In the **ESRF** case it was decisive to have a clear scientific need for the facility and sustained international interest over years. In time a transition from the scientific level to a (high) political level was necessary. A compensation agreement resulting in a package deal between Germany and France (siting of ESRF in France and the European Windtunnel in Germany) solved remaining international siting problems. Nationally the political proponents of Grenoble played an important role. Relevant and positive steps to foster the process were the continuous work of the *Progress Committee* as well as continuous funds provided for the scientific and technical development of the project. An assessment catalogue with site criteria was not necessary or relevant for the siting process.

In the **ITER** siting process four candidates sites (Claringdon, Cadarache, Vandellos, Rokkasho) were in competition. Informally, Claringdon was considered by some as the best proposal, but Canada was not willing to contribute as was asked for by the partners. On the other hand Rokkasho in Japan was informally discussed as a much less attractive site for researchers. Nevertheless Japan held insisted on its bid up to the final decision. It is remarkable, that an expert evaluation stated that all four sites are (equally) well suited to host ITER. The political decision had therefore to be taken without the help from evaluation and expert groups. ITER is an example of a top down and not a bottom-up process, the social criteria were of very high importance. The EU was strongly involved in the process and expressed its willingness to go alone if necessary.
In parallel to a global decision making process a decision in Europe was necessary. In the European competition between Cadarache and Vandellos, a ‘Site Analyses Group’ (King-Group) was formed but was not able to present a proposal for the site.

The case of ITER showed that institutes felt threatened by the construction of ITER, but they saw the relevance of ITER for the further development of fusion-research worldwide and their own survival. The local laboratory in Cadarache for example lost money and people because of ITER.

4.3. Conclusions

The main conclusions to be drawn from these experiences are:

General aspects

- All infrastructures studied showed that to be successful a very high political level is crucial for the siting decision making. A competing country with strong and reliable motivations and with sufficient financial capabilities is crucial. Convincing personalities and leaders in the research field proposed have to strongly advocate the facility. A convincing host institution with great motivation as well as high ranking policy makers with acknowledged authority help very much. Policy makers with only lukewarm support can mean an end to a proposal.
- An international, well selected, core group at an early stage of the project is of very high relevance in making one site option more appealing then others if the competition is full between different sites. The first level of competition is to set up the key positions of the international team that will lead the development of the infrastructure.
- Large well established institutions have certainly the strength of their solidity, but may have harder time in demonstrating the likelihood to reach the full international dimension that is expected in pan-European research infrastructure. A well recognized truly international standing team for the project is a very important ingredient.
- Counter - productive for the decision making process are dispersed science communities which could do their research in a foreseeable future without the new facility and scientific communities with no experience in large international co-operation.
- Patience and long term commitment are necessary in any case (ITER negotiations took place on a very high political level but the whole siting process took 15 years).
- Whereas the presence of a host lab can be an important advantage it also can have negative effects on these national labs or result in difficulties (contraction of the Culham Laboratory close to JET, very different salaries in international and national research labs on the same subject (CERN and universities in host states) .
- It can be detrimental that conditions for participation are raised by potential partners (like: I will join the international facility in your country if you join the local facility in my country).
- Problems arise if a small country has high ambitions but limited funds, if a site is not attractive either regarding the scientific surrounding or the local conditions or is not easy to be reached. There is no bonus in itself for a small country. A way out is a European Roadmap which lists large as well as smaller research facilities (for a few million Euro) which allow also smaller countries to participate in the roadmap implementation. In this context partner institutions can be important. It should be studied how small countries can be compensated with the level of their cumulated contributions for big projects resulting in an important overall contribution.
- Important issues are connected with the use of Structural Funds. The availability of substantial structural funds in specific areas of the UE is a resource for the realization of the full roadmap of infrastructures that will benefit all Europe and associates. In the discussion of ELI, an initially intended single-site RI, it is being considered to split the project in three sites, with financial and political aspects prevailing on the strictly technical aspects. Problems arise in connection with the timing for the use of

structural funds and to the long term sustainability of the infrastructures in countries that may have, after the use of structural funds, difficulties in assuring the correct standard of runing and continuous development cost. This raises issues to be addressed in FP8: a) relax of the time limits for use of structural funds if these are used for research infrastructures, b) international management of the running costs of the research infrastructures.

- Financially the EIB played no role in these RI up to now.

- **The relevant actors and their role**
    - Scientists have to present a convincing case, not only to political authorities but also to their fellow researchers. Highly regarded researchers available to commit themselves in an early steering committee of the proposal (with budget) are crucial.
    - Society: Social, risk and environmental questions gain in importance. The society should be convinced that the scientific output of a RI compensates any risk by far
    - Policy makers should be involved in an early planning stage to prepare for early and continued attention to the project
    - National Governments should be informed from stage one of a project and be involved at a high level at the right time
    - Regional actors play an important role to interact with the national governments and show by their analysis of benefits for the territory and their direct contributions to the development of the project the real interest in hosting a RI
    - Support by the economy is very important, but it should not be included too early.

- **The relevant criteria and the best procedures for the assessment of sites**

Criteria and procedures are different in each specific case however the following points are important:

- There is a need to inform on the hard facts of the planned RI with the help of reports/evaluations. An evaluation of all siting aspects (see for example the evaluation of the ESS Sites[8], the most difficult part being an evaluation of the outcomes and impacts on specific sites) is necessary but not enough. The site evaluation should be convincing for the scientific community that may agree on different opportunities and synergies offered by the different sites. This should be the main outcome of the site reviews lead by ESFRI or similar bodies.
- Based on agreed facts political decision making can start. One has to bear in mind that these reports on facts are needed, but they may not include clear ranking, but stress the peculiarities of each site. The competition rests largely iin the local or central governments of the bidding sites who express their strong interest by detailed investment plans directly in the RI and in complementary initiatives.
- The ESFRI siting assessment document must be a good instrument for the scientists to help their action with respect to the national/local governments in raising the quality and financial level of the bid. A good competition with a

[8] Report of the ESS Evaluation Panel, September 2008

common technical understanding of all options does eventually improve the quality of the final project and construction.

- The ESFRI siting assessment document can be a good instrument also for the Competitivity Council of Ministers, to strengthen understanding of the technical options and of their implications.
- The support for participation by the non-bidding countries rely on such high-quality report since it may help orienting the diplomacy and international finance schemes.
- Scientific reasoning asks for a reproducible and open decision process; political decision making about a site may not be open to the public.
- It is important to make the transition from the scientific to the political level at the right time. The political level involved should be of as high a level as possible to bring decisions forward. When considering the best moment to include highest political levels one has to bear in mind that at this level emotions play a key role and therefore one has to avoid the ‘losers’ which is difficult. Losers never forget. Once you have a ‘loser’ a compensation process is getting very difficult. (In the case of ITER, Japan (Rokkasho) didn’t consider themselves as losers since they got a high compensation which is a burden for the ITER-Project in Cadarache).
- Bottlenecks (to be avoided) arise if there is only half-hearted support from the persons involved at the different stages and levels.
- Competing scientists and facilities have to be persuaded.

  Example: ESS competed against existing facilities in neutron research. Parts of the scientific community had reservations against its construction as scientists raised the question whether the construction of a large infrastructure for a – in their perspective - small scientific outcome is efficient.
- One has to be prepared to fight for a new large infrastructure over a long time. The organization of the support team has to have a corresponding structure. Short term expectations often are disappointed.

5. Distributed Research Infrastructures

Distributed infrastructures are networks of research facilities (nodes) which are steered and governed by a central facility and legal structure. In the European Research Landscape large Distributed Infrastructures (DIs) are less established than Single-Sited Infrastructures. There is not very much experience – except in projects supported by the Global Science Forum GSF of the OECD (see 5.1.).[9] No project of the ESFRI-Roadmap list is implemented yet and no one has experienced bottlenecks in the siting process till now. The recent developments of the preparatory phase of ELI, evaluating a three-site option against the original single-site option are an example of possible evolution of the RI sustainability.

5.1. Experience in decision making processes

5.1.1. The OECD-GSF cases

The GSF uses a standardized procedure of the OECD in support of the setting up of distributed research infrastructures including the siting question. GSF was successful in the foundation of several DI such as the Global Biodiversity Information Facility GBIF Copenhagen (2001), the International Neuroinformatics Coordinating Facility INCF Stockholm (2005) and the Global Earthquake Model GEM Pavia (2009).[10]

GBIF Copenhagen 2001 (Global Biodiversity Information Facility; http://www.gbif.org/),

GBIF includes 30 member countries, 20 associate countries, 40 other associate participants and is located in Copenhagen. Based on a Memorandum of Understanding, GBIF is organized as a Inter-Governmental Organization (legal status).
"The Global Biodiversity Information Facility (GBIF) is an international organisation that is working to make the world's biodiversity data accessible anywhere in the world. GBIF's members include countries and international organizations who have signed a Memorandum of Understanding that they will share biodiversity data and contribute to the development of increasingly effective mechanisms for making those data available via the Internet."(self-description homepage)

INCF Stockholm 2005 (International Neuroinformatics Coordinating Facility; http://www.incf.org/)

INCF is part of the Karolinska Institutet (legal Status).
"The International Neuroinformatics Coordinating Facility (INCF) fosters international activities in neuroinformatics and related fields. The organization was established in 2005 through the Organisation for Economic Co-operation and Development (OECD) Global Science Forum, and now includes 14 member countries. The Secretariat offices are located in Stockholm, at Karolinska Institute and the Royal Institute of Technology." (self-description homepage)

[9] The following arguments are based on the SIG-Conference in Brussels, 26 May 2009

[10] The Global Science Forum brings together science policy officials from OECD countries. The delegates, who meet twice a year, seek to identify and maximize opportunities for international co-operation in basic scientific research. The following arguments are based on the SIG-Conference in Brussels, 26 May 2009

GEM Pavia 2009 (Global Earthquake Model; http://www.globalquakemodel.org/)

GEM is located in Pavia as a non-profit private foundation under Italian law (legal status).[11] *"GEM is a public/private partnership initiated and approved by the Global Science Forum of the Organization for Economic Co-operation and Development (OECD-GSF). GEM aims to be the uniform, independent standard to calculate and communicate earthquake risk worldwide. With committed backing from academia, governments, and industry, GEM will contribute to achieving profound, lasting reductions in earthquake risk worldwide." (self-description homepage)*

The standardized GSF procedure

The standardized GSF procedure for a new institution starts with the formation of a group of interested member states (institutions, agencies, etc.). Based on this, a call for interest in hosting a new institution is formulated and a detailed document is sent out by the GSF-executive secretary (5-6 pages). Key factor for this call is a detailed negotiated consensus list of criteria enumerated in a Request for Proposals (RFP) document. Required contents of a bid can be:

- Location, description of facilities and services agreed to in an arrangement between host and institution
- Eligibility: A bid may be submitted on behalf of a government or its representative institution of a country that intends to be a member of the new institution.
- Legal Status of the new institution, of the Host and employment status of the staff.
- Funds: process for receiving, holding, managing and accounting for funds from contributing countries, private company sponsors, and other entities.
- Disbursing of funds: Specification of how goods and services will be purchased at the request of the new institution.
- Procedures for using the funds of the institution.
- Voluntary Contributions of the Bidding Country.
- Guidelines and Procedure for Submission, Review and Selection.

After receiving the proposals the GSF secretariat sets up of a small committee of independent, neutral experts for evaluation of the responses to the RFP by the bidders. The committee formulates its recommendations for the site on the base of the following evaluation criteria:

1. Completeness of responses to the RFP
2. Bidder's organizational & institutional ability to provide the services listed in the RFP
3. Bidder's technical approach & project organization, as given in response to the RFP
4. The extent to which the Bidder can host the new institution as an independent legal/administrative entity with purchasing and contracting autonomy
5. Additional amenities offered by the Bidder
6. Financial support and incentives, including but not limited to tax-exempt status and cost of host-provided services, offered by the Bidder.
7. Experience of the Bidder in hosting other international programs

[11] GEM Private Sponsors: Munich Reinsurance Company, Zurich Financial Services, AIR Worldwide Corporation, Willis, EUCENTRE. Governmental Members of GEM Governing Board: Belgium, Germany, Italy, Singapore, Switzerland, Turkey. Institutional Members and Observers on GEM: IASPEI, IAEE, OECD. GEM Participating Institutions: USGS, ETH-Zurich, NORSAR, GFZ, EUCENTRE. Funding: Private Funding 11.6 Mio Euro; In-kind Contributions: 4.6 Mio Euro; Regional Funding: 5.4 Mio Euro, Public Funding: 3.4 Mio Euro (to be approved).

Based on the recommendations of the committee, interested member states make the final siting decision usually by majority vote. Global Science Forum GSF supports the establishment of a new institution e.g. as intermediate treasurer.

5.1.2. An ESFRI case: Integrated Carbon Observing System ICOS

Distributed Infrastructures listed in the ESFRI Roadmap are in many cases in a (preliminary) planning state today.[12] As an example SIG studied the Integrated Carbon Observing System ICOS.

Integrated Carbon Observing System ICOS (http://www.icos-infrastructure.eu/)

"ICOS is a new European Research Infrastructure for quantifying and understanding the greenhouse balance of the European continent and of adjacent regions. The ICOS infrastructure will integrate terrestrial and atmospheric observations at various sites into a single, coherent, highly precise dataset. These data will allow a unique regional top-down assessment of fluxes from atmospheric data, and a bottom-up assessment from ecosystem measurements and fossil fuel inventories.."(self-description homepage)

ICOS data taking will be based on a network of sites with 40 back-bone ecosystem flux sites, 40 atmospheric concentration sites and 10 ocean ship-lines.[13] The ICOS Organization shows a slightly differently approach to the organizations discussed above. Instead of one Central Node and several Distributed Nodes, ICOS will be organized around 4 central facilities and coordinated by a fifth Coordination Office. So ICOS needs to choose 5 'central facilities' and to find a key for the contributions of countries hosting a central facility (e.g. in-kind, equipment). Instead of Distributes Nodes, ICOS talks about countries hosting a network and is searching a key for their contributions (e.g. cash for services).

The reason for this structure is that competencies are distributed and that therefore there is a need to create four central facilities and a coordination office. As of 26 May 2009, potential country-candidates were Finland for the Coordination Office, Germany for the Analytical Laboratory, Italy for the Ecosystem Thematic Centre, France for the Atmospheric Thematic Centre and UK/Norway for the Ocean Thematic Centre.

Notwithstanding that there is already an idea for potential country-candidates probably based on corresponding competencies, the project-coordinator formulate some Site Issues for ICOS.

ICOS defined a procedure on how to select and site the central facilities. It stresses the following points:

- ***A transparent and fair selection procedure covering*** Governance (a specific organization for countries hosting a site), Implementation of the project (a project team in each country hosting a center) and final legal form (to be decided later)
- ***Steps of the site selection procedure***
  - Description of each site available (concept papers)
  - The ICOS Scientific Council appoints a dedicated committee for site selections
  - The site selection committee organizes meetings with government bodies to explain site requirements and to possibly reach consensus on site location

[12] One of the exemptions is SHARE Survey which stands just before its implementation. !

[13] The following arguments are based on the SIG-Conference in Brussels, 26 May 2009 (presentation by Philipp Cias, ICOS Coordinator)

    - The site selection committee may organize an application call with the objective to collect applications for each centre or - if only one application - help improve this application

- ***Eligibility of sites:***
    - Country must be represented by at least one institution, with legal entity and partner of the ICOS preparatory phase.

- ***Requirements for applicants***
    - Identification of the type of Centre to be hosted (Ecosystem, Atmospheric, Central analytical laboratory)
    - Identification of stations to be built in the country
    - Identification of all national institutions entitled to belong to the steering committee
    - Contribution from each institution (in-kind, staff with adequate skills for the needs of the Centre, cash) – contribution from other sources – with letters of commitments
    - Availability of the site
    - Academic international excellence and know-how
    - Technical support and encumbrance
    - Scientific support
    - Academic environment
    - Industrial or service environment
    - Accessibility (air, train, metro) from main European destinations
    - Buildings:
        - Option 1: The building exists and is ready to be dedicated to ICOS, with no overlap with the host laboratory – provide description and blueprint – letter of commitment of the owner.
        - Option 2: A new building is envisaged. Identification of owner of the land with letter of commitment.

- ***Implementation of the call and site selection***
    - Meetings with stakeholders organized before Nov 2009
    - Tentative schedule for applications: January 2010

5.2. Discussion of relevant criteria and optimal procedures

The experience of the **OECD/Global Science Forum** identifies the following necessary conditions for decision making on research infrastructures:

- A strong science case
- An international science community strongly behind the need for the new international and jointly funded and operated facility
- Proved that the new RI is a “must” and that otherwise long-term high-class science would be jeopardised.
- Understanding that DI implies a unique management and name so that the participating distributed sites cannot have/maintain their entire institutional/national independency.

In the case of **ICOS** the selection procedures for the sites decided seem to be successful for assignment of the 4 central sites.

5.3. Conclusions

General aspects

Siting issues of political character seem to arise only in 'real' Distributed Infrastructures (DIs with a central steering mechanism) and are absent for those DIs, which remain at the level of networks. One can formulate criteria for 'real DIs':

- A clear name and legal status
- A management structure (director or board of directors)
- A strategy and development plan (including association agreements)
- Well defined access points for users (including a single web site) and a single/unified peer review of users' proposals)
- An annual report
- Standards and metrology offered to users at all sites, under unified rules of access

When discussing the meaning of 'siting' for DIs one has to distinguish governance/legal siting and siting of the nodes. There is, in principle, no difference for the selection of Central Nodes CN and Distributed Nodes DNs, regarding the quality and suitability of the sites and scientific objectives. However the siting of the nodes is a national decision and the siting of the central facility is an international decision.

The expert suggested a priority list of aspects to solve siting problems of DIs:

- Technical excellence, scientific performance of the DI
- European added value
- Regional added value
- Financial aspects
- Political aspects
- Socioeconomic aspects

- Siting problems of DI are less severe than in single site RI and can be solved usually by the participating organization themselves. Political question come up mostly regarding the central node.

- Siting of the central nodes rely more on the scientific expertise of the hosting institution than in the single site infrastructures since these central nodes rarely are constructed in a green field. Often a DI arises from an existing network.

- Siting issues of DNs of DIs have technical, financial or socioeconomic aspects interesting for regional development. Regional DIs are of particular importance for meta regions (regions of medium and small countries, e.g., the Central European Meta Region). National interests often override the rationality of creating a Regional DI.

- Siting problems of regional DIs may be avoided by the national infrastructures joining an already existing DI as new DN) e.g. an already existing or new single-sited infrastructure could join as a Regional Partner Facility).

NB: The issue of Distributed Infrastructures, and in particular the siting of their seats, will be reviewed in 2010 under a specific ESFRI working group

Annex 1

February 6, 2008

ESFRI Working Group on ESS Siting
(EWESS)

Questionnaire

Questions to the competing ESS sites relevant for an open, fair and transparent decision basis from non-host countries of ESFRI

When replying to the questionnaire the respondents are kindly asked to keep in mind the following points:

- *Please answer the questions **as far as you are in the position to do so reliably today***
- *Please follow the order of the questions and the numbering of the questions*
- *Use a maximum of 50 pages to answer the questions*
- *Use tables to inform on financial questions*
- *Give references to available documents and studies which are directly relevant to the site proposal*
- *Please return the answers to Paul Zinsli (**Paul.Zinsli@sbf.admin.ch**) by April 25, 2008.*

A) General aspect

A1 Who is acting as project proposer (ministry / organization / agency / other)?

B) Basis on which the site proposals are presented:

B1 What is the technical basis (the published technical design) of the ESS on which the site proposal is based?

The original technical basis of the ESS proposal was presented to the public in Bonn in 2002. Six years have passed. What is the same? What has changed? Are there plans for upgrades, further developments of source, accelerator, target) [14]

(Please send a summary of the technical design including a table of the main parameters; not more than 4 pages, include reference to the technical design documents)

B2 In particular, what is the scientific impact of the choice of the long pulse option?

C) Costing points

C1 What is the cost projection and its calculation model?
- For the construction and commissioning
- For the operation
- For the decommissioning

C2 To which year does the cost estimate refer?

C3 What do these projections contain and what is the cost of the different components?

[14] *What is the improvement of the concept? Has there been any R&D work to further develop aspects e.g. the target? Is the already gained experience of the projects in USA and Japan included in the project proposals? Is there further R&D necessary to have the optimum technical solution at the time construction starts?*

- Construction: machine, site development, guest houses, experimental stations, salaries, other
- Operation: salaries, investments, electricity, water, emission and waste, cooling, insurance, other
- Decommissioning: waste disposal, remediation / rehabilitation

(Site-dependent cost should be distinguished from site-independent cost)

C4 Do you have an estimation of a contingency? Is it included?

D) Financing points

D 1 What is the financing model, what are the financial contributions foreseen and/or guaranteed for construction / commissioning / operation / decommissioning?

- Contribution of the host
- Expected contributions of members
- Expected contributions of 'associate scientific members'
- Industry, private investments
- Other bodies (non-profit foundations, trusts, charities)
- Structural funds
- Loans, EIB
- Risk money
- Other financial projections not included in cost projection

D2 Are in-kind contributions foreseen? At what level?

D3 What are the financial commitments of the central and/or regional governments of the host state not included in C4?

- Commitment of local government
- VAT (exemption, reimbursement)
- Taxes, exemptions, refunds

D4 Are there already commitments of other countries? Which ones? At what levels? Connected with preferential treatment?

D5 Are satellite infrastructure centres planed?

E) Legal, organizational and security points

E1 What is the national legal and political framework?

- For building and operating nuclear installations
- Would under such legislation ESS be a nuclear installation?
- Decommissioning legislation
- Related to environmental restrictions, safety regulations
- Related to building legislations / regulations, expropriation legislation

E2 What are the proposed legal and management plans?

- Legal ESS framework (construction / commissioning / operation / decommissioning)
- Organizational model / structure (construction / commissioning / operation / decommissioning)
- IPR policy

E3 What are the important risk and insurance issues?

- What risks does the host state foresee
- Mandatory requirements for insurance
- Additional insurances (non-mandatory)

F) Environment and socio-economic points

F1 What is specific for the site? (Maximum of 3 pages)

- Size, topology, geology, site stability (record), ownership of site
- Access for people and heavy equipment (roads, train, airport, port, public transport between site and residential areas)
- Services on site (electricity, water)

F2 What are the local environment / infrastructure?

- Specific features and measures that make this infrastructure sustainable
- Existing and foreseen e-Infrastructure (communication networks, broadband connectivity)
- Local service providers (catering, cleaning, office servicing, general purpose local industries, etc)
- Local 'Industry / Technology Parks' relevant to neutron scattering
- International schools close to the site for children from kindergarten to high school
- Attractiveness for a highly-educated workforce, opportunities for accompanying partners to find adequate and attractive jobs
- Housing situation (availability, standard, cost), recreation / culture

F3 What are the scientific environment / infrastructure

- Research centres
- Universities
- Scientific environment in neutron scattering and fields that use neutron scattering (biology, materials sciences, engineering, etc)
- Experience in neutron science and neutron scattering techniques

F4 What are the specific risks at the site (during construction / operation / decommissioning phases)?

- Environmental and security (seismic activity, flooding, droughts, storms, fire, land slides, etc)
- Security and stability of the supply of utilities
- Emissions (noise, radioactivity, gas, waste water, air pollution, etc)
- Hazardous activities (industrial or other) that might create obstacles to the operation of the facility

F5 What is the socio-economic impact?

- Existing or foreseen studies on economic and social impact on region
- Work force reservoir, local skills

G) Additional Features (describe any additional features of the site offer you deem important for non – host countries of ESFRI)

Annex 2

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Annex 3

Mandate of the SIG

Terms of Reference for a specific ESFRI Working Group on "How to identify and compare the best sites for pan-European Research Infrastructures"

Site Issues Group (SIG)

Rationale for the WG

1. The European Strategy Forum on Research Infrastructures has the following scope: (1) to support a coherent and strategy-led approach to policy making on research infrastructures in Europe; (2) to facilitate multilateral initiatives leading to a better use and development of research infrastructures.
2. In the context of these objectives, ESFRI has decided to set-up a specific time-limited Working Group aimed at preparing a coherent view of the Forum on how to identify and compare the best sites for pan-European Research Infrastructures.

Creation of the WG

3. The WG is set-up by ESFRI and chaired by an ESFRI member. The nomination of its chair is made according to the ESFRI rules of procedure.
4. The duration and composition of the WG, its field of activity, and its specific terms of reference are indicated by ESFRI.

Mission

5. The group should propose the relevant criteria and optimized procedures for identifying and choosing the site of any Research Infrastructures of pan-European interest.

Expected deliverable and timing

6. The group should draw conclusions and make recommendations to ESFRI, and, if indicated by ESFRI, to the relevant actors of future infrastructures.
7. The final Report of the Group should be made available to ESFRI in 2009 considering in particular the experience of the EWESS and ESS Site Review Group in 2008.

Working method

8. The group should analyze decision making processes in relevant cases (such as e.g. ITER, ESS, SKA, EMBL outstations);
9. Based on this analysis the Group should identify:
   - the check list of the relevant actors (scientific communities, research organisations, negotiators, national and local political authorities, European fora, etc …),

- the role of actors, also in reference to the different phases of the life-cycle of an RI (concept, construction, operation, decommissioning),
- the criteria for the assessment of specific sites, and their relevance for the site selection and for financial sustainability during the RI's life-cycle,
- the best procedures for the assessment of specific sites,
- the characterisation of different decision making processes look like, with the possible bottlenecks (knowing of course that within Member States the process could be quite different and that MS are not always obliged to follow the scientific recommendations),
- any other relevant factors;

10. If appropriate, the group should also extend the analysis to the cases presented in the ESFRI Roadmap, including distributed facilities;

11. If and when dealing with specific cases the members of the group should work in conditions of confidentiality.

Group Members

12. The members of the group should be ESFRI delegates; the group may also use the advice of experts and of actors of decision making processes;

13. The list of members is given in annex.

Annex 4

Guidelines for speakers at the Symposium

SIG Symposium on Site Issues for Large Research Infrastructures26 May 2009

Formalities

- Your presentations should not exceed 20 minutes, followed by 5 minutes of Q/A; the discussion will follow at the end of a presentation block
- Laptop and beamer will be available
- If you would like to make the title of your presentation more precise please let us know as soon as possible. Could you please send a copy of your presentation **before May 15** to Beate Warneck (beate.warneck@dlr.de)?

Content of the presentation

- Please concentrate on siting issues
- Give us details of successful processes as well as of problems and failures
- Please give us the political context und the process at the interface between the science case and the political process
- Include the following points that we plan to touch in the report to ESFRI:
    - What were the decisive steps when deciding on a site?
    - What was finally decisive for reaching a political decision?
    - What steps were relevant and positive?
    - What steps were missing?
    - What should have been avoided?
    - Who were the important organizers, decision makers?
    - Which were the relevant actors and their role
    - What are the relevant criteria and the best procedures for the assessment of sites
    - Were there bottlenecks that could have been avoided
    - Was/is there a role of European Investment Bank EIB
    - Was/is there a checklist for siting issues?

April 15, 2009/PZ

ESFRI European Strategy Forum on Research Infrastructures

SIG Symposium
On site issues for European research infrastructures

26 May 2009,

at the German Helmholtz-Gemeinschaft, HGF

Rue du Trône 98, 1050 Brussels

Draft Agenda

9.00h	Task and objectives of the symposium	*P. Zinsli*
	A) Problems and solutions in single sited research infrastructures	
9.20h	Siting lessons of ESRF	*K. Witte*
9.50h	Siting lessons of ITER	*J. Sanchez*
10.20h	Discussion	all
10.50h	**Coffee break**	
11.00h	Siting lessons from the GSF/OECD	*H. – F. Wagner*
11.30h	Discussion	all
12.00h	**Lunch**	
	B) Problems and solutions in distributed research infrastructures	
13.00h	A future research infrastructure: ICOS	*P. Ciais.*
13.25h	Siting decisions on GBIF and INCF within OECD	*S. Michalowski*
13.40h	The European science policy context; socioeconomic, political and regional aspects	*D. Lajos Nagy*
14.00h	Discussion	all
14.30h	**Coffee break**	
	C) Lessons learned, conclusions	
15.00h	Discussion of report and conclusions	
16.00h	**End of Symposium**	

Impressions of the Symposium

SIG Symposium at the at premises of the Geman Helmhotz Gemeinschaft in Brussels, on 26 May 2009