

International Distributed Research Infrastructures: Issues and Options



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FOREWORD

Since the creation of the OECD Megascience Forum in 1992, which was renamed Global Science Forum (GSF) in 1999 after the broadening of its mandate, research infrastructures have been a major topic for analysis and discussion at the Organisation for Economic Co-operation and Development.

Following a publication on “[Large Research Infrastructures](#)”, which dealt primarily with large single-site facilities, this new report addresses the challenges associated with a growing type of international infrastructures that are distributed geographically. Beside those traditional infrastructures commonly used in physics or astronomy for instance, distributed research infrastructures contribute to the development of many disciplines, such as biological, environmental or social sciences, which until recently did not require large or complex equipment or resources. This report presents findings, analyses and conclusions regarding formal status, governance, establishment, funding, access and other issues related to these new decentralised research infrastructures.

The GSF’s objective was not to carry out an exhaustive analysis but rather to provide useful information and advice to scientists and policymakers who are faced with very specific, practical challenges related to the establishment and operation of these new types of research infrastructures, which are organised along a broad diversity of models. This OECD report is therefore essentially a compendium of issues that should be considered, and of solutions that have been found to be applicable in certain cases. We sincerely hope that it will be informative and useful. Naturally, we would be interested in receiving comments from readers. The GSF staff can be reached at gsforum@oecd.org.

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INTERNATIONAL DISTRIBUTED RESEARCH INFRASTRUCTURES: ISSUES AND OPTIONS

1. Introduction and rationale

The OECD Global Science Forum (GSF) activity on international distributed research infrastructures (IDRIS) was authorised at the end of 2010. It builds on the previous activity and report on “Establishing Large International Research Infrastructures: Issues and Options”, which dealt primarily with big single-site facilities.

The objective of the follow-on activity was to explore the special challenges associated with international infrastructures that are distributed geographically, that are often decentralised administratively and financially, and that are usually (but not always) operated on a smaller scale than large single-site research facilities. This report presents findings, analyses and conclusions regarding formal status, governance, establishment, funding, access and other issues.

The principal objective of the GSF activity and report is to be a useful reference for scientists and administrators who are contemplating the establishment of a new international research infrastructure that allows several partners to pursue a common scientific goal in multiple locations. It is hoped that reading this report will save these individuals time and effort, that it will acquaint them with some of the challenges, options and solutions that are available, and will alert them to pitfalls that can be avoided. The final intended result is to promote the establishment of more and better international collaborations.

The OECD report is the result of an empirical activity, i.e., a survey of existing infrastructures, followed by discussions among infrastructure practitioners: researchers, facility administrators, officials of ministries and funding agencies. There is an intentional elasticity in the definitions, taxonomies and categories; in fact, the issues, analyses and options presented here are, to an extent, “definition-independent”. That is, they may be pertinent to many types of research infrastructures (including even single-sited facilities) and they should be relevant regardless of any definition of a “distributed infrastructure” that is used. Similarly, any conclusions are not meant to be prescriptive. As in the case of single-site facilities, there is not (nor should there be) any one-size-fits-all formula for initiating, establishing, or operating a distributed research infrastructure.

2. Methodology

The activity was supervised by an Experts Group whose members were nominated by national OECD GSF delegations of Australia, Belgium, the European Commission, Italy, Japan, Norway, Poland, South Africa and the United Kingdom.¹ The Group agreed on the Terms of Reference of the work, on the definitions and taxonomies, on the methodology, and on the rules for selecting infrastructures for detailed study.

Seven members of the Experts Group, as well as three members of the OECD GSF Secretariat, met in Paris on 6 March 2012, to refine the terms of reference of the project, with special emphasis on developing a pragmatic definition of international distributed research infrastructures. The outcomes were a text, and a taxonomy, that served as bases for the survey described below, and for subsequent discussions that led to refining and annotating the definition (as presented in Section 3).

A set of representative IDRIS for the various categories was identified for data-gathering and analysis. Available documentation (either publicly available or provided by the IDRIS) was reviewed and supplemented by confidential interviews with key individuals (typically, the Director or equivalent). The main objective was to examine the issues that relate to the establishment and operation of particular categories of IDRIS.

The interviews were structured around a set of 6 operational categories that are generic and applicable to most research infrastructures:

1. Formal status (membership, legal form, foundation documents, sustainability/duration, link to the host).
2. Governance (administrative and operating structures, decision-making processes, role of funding agencies, secretariat structure and personnel issues, role of the host).
3. Establishment (process and duration, host selection).
4. Funding (contributions and resources, financial rules and regulations).
5. Access policy (to resources and to data, for members and for non-members).
6. Equipment and intellectual property rights.

Interviewees were asked to identify critical steps in the establishment process, obstacles that they had encountered, and also to convey any information and advice that could be of use for scientists, administrators and policymakers who may be interested in setting up an IDRIS. The confidential interviews were conducted mainly via telephone (with some face-to-face meetings as well) by the OECD GSF Secretariat staff, and a consultant (Ms Christine Kubiak) during the period August 2012 to March 2013. Each interview lasted from one to two hours. A total of 23 persons were interviewed and the list of individuals is presented in Appendix 2.

The findings from the interviews were summarised by Ms Kubiak in a discussion paper that served as a basis for a workshop in Brussels on 17 July 2013.² There were thirty-eight participants, including five members of the Experts Group, persons nominated by GSF delegations, invited leaders of selected IDRIS, and members of the GSF Secretariat (the list of participants is provided as Appendix C). Following the Brussels workshop, the discussion paper was transformed by the GSF Secretariat into this report.

3. Definition and taxonomy

A variety of definitions of research infrastructures, and distributed research infrastructures, are available and have been adopted by institutions and organisations such as the European Commission,³ ESFRI⁴ and the ERIC Council Regulation.⁵ For the purposes of preparing this GSF study and report, a meeting of the Experts Group was held in Paris on 6 March 2012, resulting in the adoption of the following new definition:

An International Distributed Research Infrastructure (IDRIS) is a multi-national association of geographically-separated distinct entities that jointly perform, facilitate or sponsor basic or applied scientific research.

An IDRIS should have **all** of the following:

- An identity and a name.
- A set of international partners who are, typically, funding agencies, research institutes, academic institutions, foundations, or other research-oriented organisations from the public or private sectors. Often, only parts of these entities (as opposed to entire entities) may collectively make up the infrastructure.

- A formal agreement by the partners to contribute resources, expertise, equipment, services or personnel towards achieving a common scientific purpose. The agreement does not necessarily need to define a new legal entity, or be legally binding.
- A strategic plan, or work programme, that conveys the rationale for establishing the IDRIS and its added value over-and-above separate activities of the partners.
- A governance scheme (for decision-making, at a minimum) and a set of officers (not necessarily salaried staff) with well-defined responsibilities.
- A focus on the provision of services to its members and users.

In addition, an IDRIS **may** have the following:

- An independent legal status (or an equivalent legal identity under the terms of an existing intergovernmental agreement).
- A common fund and rules for acquisition/spending of funds.
- A secretariat.
- A host institution.
- A central entry point for users.
- Explicit policies for access by users to research resources and to data, and for managing any generated intellectual property.

The above definition covers a wide range of organisations with very different objectives/missions (for example, those in the table that follows). A few noteworthy points emerged during the interviews, analyses and discussions:

- The term “network” has often been applied to distributed infrastructures, but it is not used here because it is somewhat imprecise, and because it is sometimes associated with specific planning and funding schemes that treat networks as distinct entities which are different from IDRIS.
- An IDRIS is composed of distinct **organisational** entities. Thus, for example, an interferometrically linked array of radio telescopes, distributed over hundreds of kilometres in several countries but sharing a common (albeit multi-national) managerial, operational and financial structure, does not constitute an IDRIS under the terms of the present definition. But a group of separately funded national observatories that devotes a co-ordinated fraction of total observing time to interferometry, can usefully create an IDRIS to facilitate joint operations.
- The partners who have the authority to conclude the formal agreement (e.g. funding agencies) may not be identical to the subsidiary entities who actually participate in the research (e.g., academic departments).
- The **added value** of an IDRIS is a vital feature, since the potential partners (especially funding agencies) need to be persuaded that the investment that they are asked to make to establish and operate the infrastructure will result in benefits that would not be achieved separately by the participating entities, even collaborating via a loose or informal association. There are various possible types of added value, notably scientific (e.g., developing new equipment, setting common standards and formats), but also operational (e.g., speeding up the research, avoiding duplication of effort), educational, economic (in the form of technology transfer to the public or private sectors) or political (e.g., strengthening regional integration, providing the scientific underpinning to an international treaty).

- In most cases, it is likely that the act of joining an IDRIS will entail (for existing entities) the loss of a degree of autonomy (that is, of independence for defining scientific goals, for allocating resources or for scheduling various tasks). The benefits and risks of these constraints must be weighed carefully before any commitment to joint work is made.
- The timescale associated with the action plan can be very specific (for example, the completion of a concrete task that is distributed among the members) but, more often, incorporates the potential for an extended pursuit of a broad programmatic goal.

A notional taxonomy is presented in the table below, identifying some shared features that are relevant for the establishment and operations of distributed infrastructures (not necessarily international ones). The symbol * designates the IDRIS that were the subject of an interview.

Category	Sub-Category	Example
A. Scientific measurements using multiple facilities	A1. Combining/synchronising signals from a set of independent instruments	* EVN: European very Large Baseline Interferometry Network * LIGO/VIRGO: Collaboration of gravitational radiation laser interferometers
	A2. Subdividing a large observational or experimental programme among multiple laboratories/institutions	Any number of genome sequencing projects * AGRP: Arabidopsis Genome Research Project * ICGC: International Cancer Genome Consortium
B. Co-ordination, facilitation or integration of research based on a common scientific theme	B1. Design, implementation and co-ordination of a set of large infrastructures	* ELI: European Light Infrastructure * GEOSS: Global Earth Observation system of systems
	B2. Co-ordination/integration of diverse (sometimes multidisciplinary) projects/programmes	* SIOS: Svalbard integrated Arctic Earth Observing system * GEM: Global Earthquake Model
	B3. Provision of resources/services (often involving research: instrumentation, software, etc.)	* EMMA: European Mutant Mouse Archive * CLARIN: Common Language resources and Technology infrastructure * CESSDA: Council of European Social Science Data Archives
C. Data infrastructures and e-infrastructures	C1. Data-oriented infrastructures for federation, management, storage, and curation of large data sets (including development of standards and data-oriented products)	* GBIF: Global Biodiversity Information Facility * INCF: International NeuroInformatics Co-ordination Facility * Lifewatch: E-sciences and technology infrastructure for biodiversity data and observatories * ELIXIR: European Life-science infrastructure for biological information
	C2. High performance computing, networking, data storage, provision of services	* GEANT: a pan-European network for research and education * PRACE: partnership for advanced computing in Europe

There is a variety of models of structure/distribution:

- One distributed node per country or partner.
- Several distributed nodes per country or partner. In that case, the distributed nodes in one country or partner can be completely independent entities, can be organised as a loose network or can be organised as national infrastructures with common activities, central co-ordination or even a legal form and legal personality.
- No distributed node/entity per country or partner. The partner contributes to the IDRIS by providing scientific input and/or funding.

Node/ distributed facility

RI central facility

Country X

Country Y

Country Z

Country

Different distributed nodes with a co-ordinating mechanism supported by one node

The diagram shows a network of four countries: Country X, Country Y, Country Z, and Country. Each country is represented by a light blue oval. Within these ovals, there are nodes and facilities. A legend on the left explains the symbols:

- Node/ distributed facility (some with their own specificity): represented by a black circle.
- RI central facility (can be within a national node or independant): represented by a red cylinder.

The network structure is as follows:

- Country X contains a black circle node.
- Country Y contains a grey square node.
- Country Z contains a black circle node and a red cylinder facility.
- Country contains a black circle node and a red cylinder facility.

Connections (edges) are shown between the nodes and facilities:

- Country X node is connected to Country Y node, Country Z node, and Country node node.
- Country Y node is connected to Country X node, Country Z node, and Country node node.
- Country Z node is connected to Country X node, Country Y node, and Country node node.
- Country node node is connected to Country X node, Country Y node, and Country Z node.
- Country Z red cylinder facility is connected to Country node red cylinder facility.

Different distributed nodes and operational nodes (with the same or specific activity) and a co-ordinating mechanism supported by one or several facilities or by an independent organisation

Node/ distributed facility (some with their own specificity)

distributed node

RI central facility (can be within a national node or independent)

Multiple operational hubs, themselves being organised as network at the national level with a co-ordinating mechanism that can be supported by one (or several) nodes(s) or by an independent organisation. Countries can participate without operational node.

4. Formal structure

Although IDRIS are usually smaller than large research facilities, and may have a “lighter” administrative structure, their establishment process can still be lengthy, complex and difficult. Naturally, this process begins with the definition of the scientific objectives, but the next steps should involve analysis and decision-making on at least four key issues: the legal status of the new infrastructure, its governance (i.e., what will be its operational structures and procedures, and how decisions will be made), its financial sustainability, and the rules that will govern access to its resources (notably, data that is generated). The objective of Sections 4 – 7 of this report is to present these matters (and some others) in detail, and to identify the issues and options based on the information that was gathered in the course of the OECD study and on the collective experiences of the attendees of meetings and workshops. A caveat is in order, however: some of the IDRIS that were examined have only recently entered into an operational phase, so there is some uncertainty about the appropriateness and sustainability of their chosen solutions.

4.1 Legal form

A central question that must be addressed by proponents of any future infrastructure is: will it need a legal form at all? Typically, proponents will seek a minimum solution – one that permits achieving the scientific goals with the smallest possible legal, administrative and financial complications. However, experience shows that scientists sometimes underestimate the need for an adequate legal foundation: for example, funding agencies may have formal requirements regarding the legal standing of entities that submit proposals or are the recipients of grants. From a strictly scientific viewpoint, these requirements may seem to be unnecessary. Still, in some cases, no legal status may be needed, especially if there is no intention of holding central funds, hiring staff, renting office space, or entering into contracts (e.g., insurance or equipment maintenance, consultants). When these functions will only be carried out in a very limited way, an agreement can be made that one of the partner institutions will use its legal standing on behalf of the entire collaboration. However, in general, the absence of legal form may be perceived as a weakness, implying a lack of commitment, and diluting the international character of the project.⁶

Because the legal form has implications for the operation and management of an IDRIS, for dealing with financial issues, human resources and access policies, potential partners are well advised to establish a dedicated process for reviewing the pros and cons of various potential solutions. The following are factors that they may wish to take into consideration:

- For **European** infrastructures, an interesting analysis was done by the ESFRI Working Group on Legal and Financial Issues for European Research Infrastructures.⁷ A variety of legal forms were compared, and the Working Group’s report describes their main characteristics as regards the nature of the partnership, management, finances, liability, human resources, access policy, overall advantages and disadvantages. The outcome of the study was a conclusion that the existing legal forms in Europe were not ideally suited for the creation and operation of research infrastructures.⁸

For the infrastructures of the ESFRI Roadmap that receive funding from the Framework Programme for their preparatory phase, the analysis and selection of the legal form is the subject of a specific “work-package”, performed by a dedicated group, the outcome being a deliverable of the preparatory phase. The group is in charge of the evaluation of the different legal forms among the different options, and of selecting the most appropriate one according to the objectives and mission of the IDRIS. The group can be advised by external experts or consultants. In Europe, the options are: legal form under national law (such as a limited liability company, national association, private limited company, *société civile* according to French Law or Spanish Law), European Economic Interest Grouping (EEIG-GEIE), European Grouping of Territorial

Co-operation (EGTC-GECT), foundation, association / legal European form (European Union Treaty)/ international form such as an International Organisation or an open-ended international co-ordinating body.

- The European Commission, responding to requests from EU countries and the scientific community, proposed a community legal framework - a **European Research Infrastructure Consortium (ERIC)** - adapted to the needs of new research facilities and of distributed infrastructures as well. An ERIC⁹ is an entity with a legal status that is recognised in all European member states. It meets the needs for recognition of the European identity on a non-economic basis, a flexible internal structure to accommodate diverse types of infrastructures, providing some privileges and exemptions (most notably, from value added tax [VAT]). The applicable laws are: community law, the law of the state of the statutory seat, or of the state of operation. Under certain conditions, an ERIC can include non-European partners.

Since approximately 2011, ERIC has become an increasingly popular option for establishing European infrastructures, big and small. For the larger, costlier undertakings, a distinct perceived advantage is that, at the national level, ministerial support is sufficient, without the necessity of engaging in potentially lengthy and complex parliamentary processes required in the case of an intergovernmental organisation. The science policy community will continue to closely follow the evolution of ERICs.

At this time (2013), there is no global equivalent of ERIC, reflecting the relative scarcity (compared with Europe) of world-wide mechanisms for planning, organising or funding collaborative research. Interestingly, two countries have created legal mechanisms that could accommodate global-scale projects that they participate in: Belgium's AISBL (*Association Internationale sans But Lucratif*) and Uruguay's "Not for Profit International Organisation". These, however, do not provide the VAT exemption that is such a key feature of ERIC.

- Countries participating in an IDRIS have the option of signing a non-binding Memorandum of Understanding (MoU) as a framework for co-operation governed by statutes established for this purpose. The non-binding consortium will not be a legal entity, and can therefore not enter into contracts with third parties, e.g., enter into employment contracts or undertake procurement. A legal vehicle for these purposes can then be established, for example a limited liability company, foundation or other appropriate legal body according to the host country legislation. The statutes can, for all practical purposes, be the same as for an ERIC, although the IDRIS will not be a legal body, and will not be governed by EU law with certain tasks assigned to the European Commission. The statutes will, however, have a form that makes it possible to transform the IDRIS to an ERIC at a later stage if the co-operating countries wish to do so. This way of establishing an IDRIS does not entail any legal responsibility or liability for the parties that sign the MoU, and there will be no additional cost for the parties compared to the establishment of an ERIC. The host country can ensure – if it wishes – that the IDRIS, being a not-for-profit organisation, will not have to pay VAT. It would still be liable for payroll tax for employees. Procurement would follow the same general principles as an ERIC would.¹⁰
- In some cases, the legal status of an IDRIS (especially a large one that takes many years to implement) can usefully change as it moves from the design phase to detailed planning, R&D, implementation and operations. Thus, the early stages may be adequately served by a simple consortium, or another arrangement based on a MoU signed by a few institutions, whereas creation of the final collaboration may require a complex intergovernmental agreement, negotiated over a period of several years. The choice of the right status for successive phases may be linked to the type of funds that are used to support each phase.

- Establishing an IDRIS benefits from a strong, constructive relationship with policy makers, funding agencies or ministries, who can usefully be engaged even in early stages, when most of the consultations take place among scientists. At the appropriate time (which is sometimes difficult to gauge), consultations have to involve non-scientific experts, for example, lawyers or foreign service officers. This transition may be easier if strong support emerges from the government of a potential host country, or from a prestigious scientific institution that is willing to serve a hosting function. Agency-level engagement/commitment is also needed at the national level, so that the distributed nodes or facilities can be supported as part of the infrastructure. In Europe, the creation of the ESFRI Roadmap motivated a number of countries to develop or update a national roadmap to define their needs, and to prioritise their national and international engagements. It is helpful if the infrastructure can be brought forward in the context of a wider process of international co-operation, or be linked to high-profile consultations regarding an issue of global-scale importance. In Europe, the inclusion of an IDRIS project in the ESFRI Roadmap can be a real utility during the preparatory and establishment phases.
- While the creation of an IDRIS is inherently a collective undertaking, involving scientists and other experts from many countries, the importance of personal leadership by one or several outstanding, dedicated individuals of high reputation, cannot be over-emphasised. The entire process may take many years, so vision and determination (sometimes bordering on obstinacy) may be needed.
- An option for shortening and simplifying the establishment of an IDRIS is to create it within a pre-existing national or international organisation, with a degree of autonomy that needs to be carefully negotiated with the host institution and its funding source. In this scheme, the IDRIS can instantly “inherit” the legal standing (and some of the prestige and reputation) of the host. Many tangible benefits can accrue, depending on the degree of interest and commitment of the host, such as scientific equipment, office space, contracting and personnel services, utilities, maintenance. But there could be potential downsides as well: the reluctance of international Partners to accept an identity of limited independence/autonomy, a lack of a stand-alone legal form, or restrictions on employment, purchasing or contracting options.

4.2 Members/partners

The members/partners are the parties that commit themselves to participating in the research programme, and to providing adequate resources for the establishment and operation of the IDRIS. As already mentioned, they may be the entities that will actually perform the research, but they may also designate those entities, who will then act on their behalf. The status of members/partners may be constrained by the legal form that is selected. This is, for example, the case for ERIC:

“Membership ... should comprise at least three Member States [of the European Union] and may include qualified associated countries [i.e., countries associated to an EU Framework Programme for research, technological development and demonstration activities] and third countries other than associated countries as well as specialised intergovernmental organisations”. Governments can delegate operational leadership to an institute or agency.

Different categories of members can be specified in the agreement: full members, funding members, hosting members, observers, associate members. Experience shows that it is easier to establish an IDRIS when all of the members/partners are of the same type (e.g., funding agencies, academic departments). In general, a proliferation of categories is not desirable, unless it is a necessity linked to funding, governance, access or IPR. Thus, for example, voting rights on the governing body of the IDRIS may depend on the level of financial contributions. Partners who are not publicly funded may need to be assigned to a separate category, and it may be necessary to define rules that apply when more than one

partner is associated with one country. In all cases, the rights and obligations linked to the categories have to be clearly described, including the conditions under which new partners can join the IDRIS, or existing ones can leave it. In the early planning stages, it is worth devoting some thought to a hypothetical future expansion of the membership, and to not inadvertently create unnecessary legal or procedural obstacles.

4.3 Duration

An IDRIS agreement is usually valid for a long time period (for example, 99 years in the case of an Association under Belgium law, indefinite for an *Asociación Civil* in Uruguay or for an ERIC). Normally, the agreement will stipulate periodic reviews or evaluations, carried out by a group of independent external experts.

Financial contributions, if any, will be explicitly subject to national regulations and rules which, typically are subject to an annual reauthorisation.

For an IDRIS that has no legal form, the situation is variable, and the duration of the infrastructure may simply be defined as the amount of time that is needed to accomplish the scientific mission.

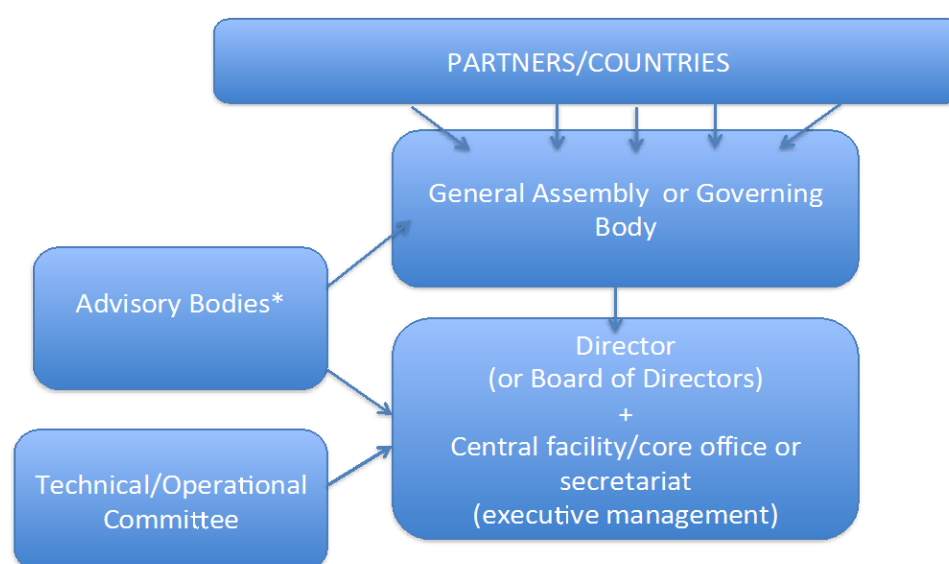
5. Governance

Any IDRIS, regardless of whether it has a legal form, needs to have a governance structure, that is, a set of bodies, rules and procedures for making decisions, for carrying out administrative and managerial tasks, for dealing with financial matters, and for executing the scientific work programme, including managing relations with external users. In general, the partners will want the governance to be characterised by simplicity, flexibility and transparency, and to reflect the fundamental values of the scientific enterprise: informality, a relatively “flat” command and communication structure, an emphasis on intellectual merit rather than bureaucratic authority. But these *desiderata* have to be balanced with a need for operational effectiveness in a structure that is, by definition, geographically and administratively dispersed, plus the need for accountability with respect to multiple national partners and their funders. As in the case of all international infrastructures, the participating entities have to reconcile their desire to pursue their national interests and to maintain control over how their contributions are utilised, with the need to give the infrastructure a degree of independence and self-governance that reflects international and scientific diversity. Ultimately, the partners must accept a certain loss of control, in return for collective scientific benefits. Accordingly, all IDRIS partners should be involved in the design and establishment of the governance structure to ensure, as much as possible, a fruitful international collaboration based on trust and common interests.

The options for the governing structure are linked to the selected legal form (if there is one). A common governance model used among the IDRIS, regardless the category or the type of legal form, incorporates a governing body (such as a general assembly) representing the collective interests of the partners and that is the ultimate decision-making body, a director (or Board of Directors) in charge of implementing the decisions of the governing body, and an executive management (secretariat) in charge of operating the infrastructure. It is a good practice to clearly define the boundaries between the oversight and executive structures and functions, since the responsibilities, motivations, constraints and interests of associated individuals (and institutions) may be quite different. These natural divergences can lead to tensions during the operational phase so, to the extent possible, the governance structure should, by design, incorporate mechanisms for dealing with problems.

Formal governance structures are important, but history shows that success in establishing an infrastructure often depends on the talent, energy, skill and tenacity of a small group (or, often, just one) of very special individuals. While always maintaining appropriate oversight and accountability, proponents of any infrastructure should seek out such individuals, recognise their special qualities, and give them the authority and resources to pursue the common goals.

Generic governance structure of an IDRIS



* Can be Administrative/
Financial/ Scientific

The governing body is composed of representatives of the partners. Often, there are two representatives per partner sharing one vote. This allows the simultaneous presence of officials and scientific experts. As described previously, the governing body can have several categories of membership, with differing rights and responsibilities. The governing body defines the strategic direction of the IDRIS and sets the budget. Another important function is establishing the terms of reference and launching of periodic external evaluation exercises. In the case of a large governing body, a small executive committee can be designated for making certain decisions on a short time scale.

The decision-making processes of the governing body are specified in the agreement that establishes the IDRIS. Consensus may be favoured, but voting procedures (and the situations in which they apply, for example, budget decisions) are also described. Concerning voting, the rule of “one partner one vote” is used most often with, possibly, exceptions for the case of multiple partners from the same country, or in the matter of decisions about the budget, when the magnitude of the contribution may be used as a vote weighting factor.

The director is in charge of implementing the governing body’s decisions and is responsible for the execution of the work programme. The respective roles of the governing body and of the director are described in the agreement. Responsibility and authority for staffing and organisation of the central office is usually assigned to the director. In the case of a collective board of directors, the individuals may serve part-time, each one having a separate role. The position of director can rotate on a fixed time scale (for example, every one or two years) between different individuals representing different partners. The temporary assignment of a director can then be considered to be an in-kind contribution by a partner to the IDRIS (although this requires special sensitivity to the potential for bias or conflict of interest).

The director should have the authority to make decisions within limits set by the governing board, and to promote the interests of the research infrastructure internationally, without impediment or interference from individual partners or from the host institution (if there is one). Diplomatic and language skills, plus extensive international experience, are valuable attributes of a director, since he/she may well need to become involved in resolving disagreements among the representatives of the many nodes of the IDRIS, each of which will have its own interests and constraints. While the director probably needs to have good scientific credentials, organisational and managerial skills are at least as important, especially during the operational phase. Thus, it may well be that the individual(s) who played the most prominent roles in getting the IDRIS established is not necessarily the right choice for the top managerial/administrative position.

The secretariat staff work for the director. In addition to fulfilling scientific and administrative roles, the staff can provide services such as training, communication, evaluation of requests for access to the infrastructure, management of scientific calls and projects.

Different approaches exist for recruitment of the central staff that, ideally, should be multinational. Local laws will apply to the secretariat office and this may impact the recruitment in terms of age, nationality or other criteria. The most common practice is to open the recruitment at the international level through open calls and to select the best appropriate candidate. Or it may be possible to extend the appointments of the persons already involved in the establishment of the IDRIS, due to their special expertise and proven dedication to the project. The IDRIS can also accept secondees from the Partners, which may simplify the human resources management (employment contracts, insurance and other benefits, pensions). Secondees benefit from training and international experience but there may be a negative impact on accountability and the efficient exercise of authority by the director, who may not be, in a strict administrative/legal sense, the secondee's supervisor. Variations in remuneration among seconded and non-seconded members of the secretariat team can lead to problems.

In some IDRIS, as in other international organisations, the positions are inherently temporary, leading to some difficulties in terms of selection of appropriate staff, housing and relocation issues, pensions, employment of spouses, taxation, etc.

The central facility/headquarters will need to be selected based on scientific, financial and political considerations. In any IDRIS, due to its inherently distributed nature, efficiency of co-ordination is a crucial requirement, so even a small IDRIS will usually have a central facility in charge of management of the infrastructure and operational aspects such as co-ordination of the research activities, provision of core services, and management of access to the infrastructure. The central staff may be located in a single location (central facility at the host country), several locations (in case of shared central responsibility between several partners) or the staff may be distributed among all of the different partners (if the activity itself is so distributed and requires an involvement of the staff in the scientific or administrative operations).

The role and function of the core unit may need to evolve during the duration of the IDRIS, and the optimal structure may only be arrived at following a certain period of operations. The link to the host (and the power the host may have in exerting influence and promoting its national interests) is an important aspect that may influence the decision taken by the partners. Several configurations can be noted among existing IDRIS:

- A “natural” choice of the host institution due to the location of the main facility, the presence of strong scientific expertise, leadership in the initiation and development of the project, a link with an already existing facility, or an objective geographical reason. In that case, there is no need for an extensive selection process.

- The selection can be the result of discussions during the establishment phase. The selection is then based on the best possible option, taking into account the advantages (e.g., provision of facilities and staff, financial advantages under national law) and disadvantages (e.g., geographical remoteness, difficulty in terms of employment policy or elevated salaries) of the different locations. The final choice can be the selection of one of the partners, or a neutral location to avoid any undue influence and conflict within the IDRIS. Or a rotating host location can be preferred.
- The selection can be based on a formal competition, with a selection based on well-defined criteria (both for the objective requirements and the competitive process), evaluation of the applications by an independent committee of experts, and a final decision by the partners.

The process used for the selection of the host and central facility can also be applicable in the distributed nodes, at the national level.

Most of the legal forms allow flexibility in the governance structure and the possibility of establishing various boards that deliver information and advice to the governing body and/or to the director. These advisory boards can be scientific, administrative, or financial. They are usually composed of persons external to the IDRIS. Their role and authority should be clearly defined, e.g., whether they can provide unsolicited input, or carry out their work only on request.

6. Funding and contributions

The funding entities involved in IDRIS can be the national funding agencies, ministries, scientific institutions and organisations, international organisations, foundations, associations, or private companies. The contributions can cover a variety of activities, as desired by the partners: scientific research itself (including an experimental or observational or computational programme, defining standards, taxonomies and ontologies, organising conferences and workshops, etc.), administrative functions (including support for staff, headquarters operations), training, outreach, even support of the work of the individual nodes of the IDRIS. The costs of operating the central facility can be partly or wholly covered by the host country/institution via a so-called “host premium”, agreed to as part of the establishment process.

The details of the financial arrangements (and especially the size of the contributions from the partners) need to be described in the agreement. They are usually based on a previously developed business plan and subject to periodic discussion and revision. The director is usually charged with preparing, on an annual basis, a budget for review and approval by the governing body.

If there is an explicitly defined required contribution from each partner, it can be based on different modes of calculation, for example:

- Fixed, identical contribution for all the partners.
- Contributions based on GDP or GDP per capita, or some other relevant indicator.
- Contributions based on an algorithm agreed between the partners.

To promote the participation of all potential partners who can advance the goals of the IDRIS, a mechanism can be incorporated that takes into account the “ability to pay” (typically, lower rates for developing countries). Or the rate of contributions may be a function of the category of membership (e.g., supporting or associate members) with appropriate consequences for the governance of the IDRIS (e.g., voting rights on the governing body). However, the excessive proliferation of “reduced contribution” categories is usually not in the long-term financial interest of the IDRIS.

Contributions can be made in cash or in kind. The distinction can be a critical one, and needs to be the subject of dedicated discussions during the establishment phase. Usually, in-kind contributions (such

as personnel, equipment, office space, utilities, software, hosting of meetings, editing and publishing) are easier to arrange, but IDRIS proponents need to carefully analyse the need for cash resources. Whenever a funding formula for contributions is used, there should be a well-defined process for assessing the value of in-kind contributions (based, for example, on a depreciation scale for contributions of new or used equipment).

Due to the distributed nature of an IDRIS, part of the funding can be decentralised and provided at the national level to the national node. If desired, this support (or some fraction of it) can be then considered as in-kind contribution to the IDRIS.

For cash contributions, a reference currency needs to be chosen, and a method should be agreed to for dealing with fluctuations in exchange rates, and inflation.

National contributions can be subject to scientific and industrial *juste retour* requirements. In the case of industrial *juste retour*, there is an expectation that some fraction of the contribution returns to the source country (in the form, typically, of contracts for equipment or personnel services). When national funds are spent by the national node, the requirement can be straightforward and relatively easy to fulfil, but it can become difficult or even contentious when central funds are involved. Occasionally, it may be necessary to devise a valuation scheme for intangibles, both for contributions (e.g., local biodiversity, or indigenous knowledge) and benefits (e.g., improved quality of life). It should be noted that data-oriented, web-based infrastructures are, to a large extent, immune from scientific *juste retour* considerations, since benefits accrue to all Partners equally (and, often, to a much wider group of users).

Long-term financial sustainability is a universal preoccupation for IDRIS proponents and administrators. The early phases of an IDRIS can benefit from special start-up funding, without clear prospects after the initial period ends. Often, funders can only make commitments for finite periods (they can be as short as one year). Funding for the national components of an IDRIS can be subject to uncertainties even when the national contribution to the IDRIS itself is stable (or vice-versa). Nonetheless, a solid business plan is required in both the start-up and operational phases, proposing a realistic budget that is commensurate with an attractive, important set of deliverables within a finite timeframe, and based on credible expectations for cash and/or in-kind contributions.

7. Access and other policies

As with other factors that are the subject of this report, there is great diversity, and no one-size-fits-all policy, that applies to access, whether it be access to scientific resources (e.g., observing time or computing cycles) to data or to tools (for example, software developed by the IDRIS). While the general imperative of “open access” is widely recognised, a detailed analysis has to be performed by proponents of a potential new IDRIS, and a set of explicit policies and practices need to be defined for consideration by the potential partners. These need to be compatible with the requirements of all of the partners. The following are some of the considerations that may apply.

Depending on the taxonomic category of the IDRIS (as illustrated in Section 3), an important distinction may need to be made between resource and data access. The resource that the IDRIS provides may be unique and in short supply (e.g., observing or beam time), so the partners might wish to distribute it among themselves exclusively, even assigning relative fractional shares of the resource based on the contributions from individual partners. An access programme for external scientists (non-partners) can be established, or perhaps a scheme that facilitates collaboration between the outsiders and those who have inherent access rights. Alternatively, a full, open solicitation and review programme may be set up, with access based on scientific merit. A complication could arise in connection with the fact, already

mentioned, that an IDRIS could be constituted out of **portions** of distinct international entities, each with its own access policy.

Concerning access to **scientific data**, there is a relevant on-going international dialogue concerning both the generic issue of open (versus restricted) access, and the special challenges and constraints that apply to individual scientific disciplines, or to special types of data. There is broad agreement concerning the need for scientists to release the processed data that underpins any results that appear in the peer-reviewed scientific literature, but the requirements are less obvious when it comes to raw data, metadata (which can be very extensive), data from intermediate stages of analysis and processing, as well as data that issues wholly or mostly from computations (e.g., the results of large-scale modelling). Among the challenges that must be addressed are the workload and cost associated with making data available, storage, annotation, certification, protection, and long-term curation.

Access to sensitive data about individuals, to data with national security implications, to data gathered for other than scientific purposes, or to data that has been compiled by private entities, may be subject to a variety of restrictions. These may differ among countries or regions. In addition to practical impediments to providing access to data (e.g., multiple digital formats, operating systems), there may be legal obstacles, linked to differences in privacy protection and ownership of data. Some scientific data may be subject to a fixed-term embargo, so that the researchers who are linked to its creation can extract the first round of scientific results.

When an IDRIS uses existing datasets, adds value to them and subsequently creates new ones, the ownership and access status of the new data may have to be considered with great care, to avoid potential conflicts with the original providers/owners.

A separate but related matter concerns access to **software** (for example, computational models), without which, in some cases, experimental or observational data are useless.

For many research infrastructures, both distributed and fixed, the issue of the link (or the lack thereof) between access and financial contributions (particularly to operating costs) has to be confronted, resolved and clearly annunciated. Many scientists and agency officials agree that free, merit-based access is a desirable goal but, for practical reasons, it cannot always be implemented, in which case user fees may apply, especially for scientists from countries that are not contributing members.¹¹ A dedicated effort to compute or project the actual value of benefits derived can be instrumental for deciding whether or not a free access policy can be adopted.

Discussions aimed at establishing an IDRIS should also address the issue of any equipment that may be needed: its ownership, maintenance, upgrading, insurance and disposal. It may be simpler to distribute these responsibilities among the nodes of the IDRIS. Procurement and ownership of equipment by the IDRIS itself will almost certainly require it to have a legal form.

IDRIS proponents should explore the possibility that the carrying out of the work programme could generate intellectual property. If this is the case, they may wish to assert intellectual property rights, and this for any number of reasons, for example, to make the results openly accessible while preventing others from imposing restrictions on them, or in order to interest private entities in creating marketable products. In any case, legal expertise will need to be sought to properly reflect intellectual property concerns in an IDRIS agreement.

Finally, an IDRIS agreement could include a clause dealing with the potential for scientific misconduct, with emphasis on rules and procedures that would apply should a suspicion or accusation arise.

GLOSSARY

EC	European Commission
ERIC	European Research Infrastructure Consortium
ESFRI	European Strategy Forum on Research Infrastructures
GDP	Gross domestic product
GSF	Global Science Forum
IDRIS	International Distributed Research Infrastructure
MoU	Memorandum of Understanding
OECD	Organisation for Economic Co-operation and Development
RI	Research Infrastructure
ToR	Terms of Reference

MEMBERS OF THE INTERNATIONAL EXPERTS GROUP

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	Richard Banati	Australian Nuclear Science and Technology Organisation
	Rob Robinson	Australian Nuclear Science and Technology Organisation
	David Ireland	Commonwealth Scientific and Industrial Research Organisation
Belgium	Jean Moulin	Belgian Federal Science Policy Office (BELSPO)
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	Frédéric Sgard	Global Science Forum

PARTICIPANTS OF THE OECD GSF WORKSHOP, 17 JULY 2013

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PRACE	Annaig Leguen
SIOS	Jon Børre Ørbæk
SKA	Miriam Roelofs

LIST OF EXPERTS INTERVIEWED

IDRIS	Interviewee
European Infrastructure of Open Screening Platforms for Chemical Biology (EU-Openscreen)	Ronald Frank
European Infrastructure for Biodiversity and Ecosystem Research (LifeWatch)	Wouter Los
European Life-science Infrastructure for Biological Information (ELIXIR)	Andrew Smith
European Clinical Research Infrastructures Network (ECRIN)	Christine Kubiak
Gravitational Wave Interferometry Network (LIGO/VIRGO)	Gabriela Gonzalez James Hough
Arabidopsis Genome Research Project	Irene Lavagi
European Mutant Mouse Archive (EMMA)	Michel Hagn
OECD International energy Agency Implementing Agreements	Stefanie Held
European Light Infrastructure (ELI)	John Collier
International Cancer Genome Consortium (ICGC)	Tom Hudson
European Very Large Baseline Interferometry Network (EVN) and Joint Institute for VLBI in Europe (JIVE)	Simon Garrington Huib van Langevelde
Global Earthquake Model (GEM)	Nicole Keller
Latin American Advanced Networks Co-operation (RedCLARA)	Florencio I. Utreras
The Svalbard Integrated Arctic Earth Observing System (SIOS)	Jon Børre Ørbæk
Survey of Health, Ageing and Retirement in Europe (SHARE)	Axel Börsch-Supan Marie Louise Kemperman
Partnership for Advanced Computing in Europe (PRACE)	Catherine Riviere
Pan-European research and education network <i>infrastructure</i> (GEANT)	John Chevers
Integrated Carbon Observation System (ICOS)	Philippe Ciais
Common Language Resources and Technology Infrastructure (CLARIN)	Steven Krauwer
European Research Infrastructure on Highly Pathogenic Agents (ERINHA)	Hervé Raoul

NOTES

1. A list of Experts Group members is provided in Appendix B.
2. The workshop benefitted from the generous support of the European Commission and of the Department of Science and Technology of South Africa.
3. http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=what.
4. European Strategy Forum on Research Infrastructures (ESFRI). Strategy report on research infrastructures. Roadmap 2010: http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-publications.
5. Community Legal Framework for a European research Infrastructure Consortium (ERIC) – Council Regulation (EC) No 723/2009 of 25 June 2009: http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=eric2.
6. If it is feasible, the lack of a legal form can be compensated by establishment of the IDRIS under the umbrella of an existing intergovernmental agreement.
7. Report of the Workshop on the Legal forms of research infrastructures of pan-European interest: ftp://ftp.cordis.europa.eu/pub/esfri/docs/march-2006_en.pdf. 23 March 2006, Brussels. Organised by ESFRI in collaboration with the European Commission, Directorate General for Research.
8. Cited from the ESFRI report “In particular, several difficulties were recognised, like the reluctance from partners in certain states to become part of a legal entity governed by another state’s laws, insufficient flexibility of International Organisation, excessive duration of the creation process, etc.”
9. Community Legal Framework for a European Research Infrastructure Consortium (ERIC) - Council Regulation (EC) No 723/2009 of 25 June 2009.
10. This model is being implemented by the Council of European Social Science Data Archives (CESSDA), hosted by Norway (establishing a Norwegian limited company).
11. This sensitive issue is addressed in section 4.3 of the 2010 OECD Global Science Forum report on “Establishing Large International Research Infrastructures: Issues and Options”.

OECD Global Science Forum

International Distributed Research Infrastructures: Issues and Options

Beside those traditional large scale research facilities commonly used in physics or astronomy for instance, new forms of research infrastructures have emerged which contribute to the development of many disciplines, such as biological, environmental or social sciences, which until recently did not require large or complex equipment or resources. These new structures are distributed geographically, are usually decentralised administratively and financially, and are usually operated on a smaller scale than large facilities such as accelerators or telescopes.

This report presents findings, analyses and conclusions regarding formal status, governance, establishment, funding, access and other issues related to the international distributed research infrastructures. The objective is to provide useful information and advice to scientists, administrators and policymakers who are faced with very specific, practical challenges related to the establishment and operation of these new types of research infrastructures.