Proposal to ESFRI on "INDICATORS OF PAN-EUROPEAN RELEVANCE OF RESEARCH INFRASTRUCTURES"

(Giorgio Rossi on behalf of the Expert Group on Indicators, October 1st , 2013)

The Expert Group on "indicators for the evaluation of the pan-European relevance" of research infrastructures has completed its mandate and here presents to the ESFRI Forum the results of its work. This concluding document includes four parts: an accompanying note, a note on the method of work adopted by the EG, a table of ex-post indictors (Annex 1), a table of ex-ante indicators (Annex 2).

Accompanying note

The indicators

The ESFRI Expert Group on Indicators has followed the mandate to develop a compact set of ex-post and ex-ante indicators of the pan-European relevance of a given Research Infrastructure (operational or project proposal).
The indicators will be a tool-kit for the evaluation of the pan-European relevance of ESFRI roadmap projects and future new candidate entries.

The selection of indicators has been subject to the availability of reliable data to support them. Indicators must be measureable on the basis of (updated) data available from open sources or other reliable sources, including, but not limited to, the RI management data and planning. The RI management remains a primary data source in many aspects, but third party (independent) data sources are necessary to evaluate the pan-European added value of a given RI project.

A short set of "macro-indicators" has been identified, each one further detailed by a subset of specific indicators that may apply to all RIs in spite of their different structure and the specific character of the user communities, their bibliometrics, and impact on society and economic activities. The specific type of RI projects, in particular concerning the type of organization (single site, distributed, sample collection, e-infrastructure), and/or different fields of research will lead to differences in the completeness and reliability of the data (e.g., usage data) and in the validity of indicators (e.g., bibliometrics). This can be partially remedied by applying different weights to the specific indicators, allowing altogether to substantiate the "macro-indicators".

Normalization is relative to the data available for the specific field of action of the RI, and the solidity of the normalization data is a crucial ingredient for the indicator. The comparison of "absolute numbers" in the reference data for RIs of different nature (different organization and/or different users community) may lead to inhomogeneity since normalization is not easy in all cases. Nevertheless the "high, medium, low" scale should be applicable in all cases.

The "ex-post" indicator list is, by definition, based on stronger evidence since data can be retrieved and "time averaged" over the construction and operation phase. These indicators can provide a useful input also to the management of an RI in the operation phase comparing their score on each indicator to improve or overcome any shortcomings.

A standardization of the data collection and a "weight" of the indicator and its score should be developed in applying the indicators, based on the actual solidity of the reference data used to formulate the score. The RIs should be involved in this assessment and a consensus score should be established if possible.

Ex-post indicators should be *periodically revised* and *updated by ESFRI* in collaboration with the RIs and their stakeholders. This exercise should improve the definition and perception of the pan-European relevance and added-value of the individual RIs, also aiming at its general adoption as an assessment tool by all EU relevant RIs. Its general adoption could help to define an assessment of the overall pan-European relevance of the RI eco-system.

Ex-ante indicators are intrinsically weaker since the evidence basis of data is thinner and more weight is given to foresight, expectations, landscape analysis and horizon scanning.
The ex-ante indicators are therefore most useful as instruments of dialogue with the project managers in order to assess the degree of expected pan-European relevance and added value at the given stage of the project and may become reference instruments for the coaching or "incubator" role that ESFRI may pursue with respect to a given project, or ensemble of complementary projects, in order to develop the concept and help maturing the RI proposal according to its pan-European relevance.

The indicator lists are introduced by "background data" that are purely descriptive. The relevant point of landscape structuring of the RI, the contribution to optimize the geographical distribution of the RIs in Europe, are hardly objects of quantitative indicators, but should be mentioned in the background data as most relevant aspects of the overall pan-European relevance of a RI.

Both Indicators lists are "open" and should be refined by testing and using them.

Applying the indicators

Applying the indicators to a project implies verifying if for each specific indicator there exist an adequate database, understanding the accuracy and statistical value of the available data, and acquiring robust normalization data, as defined in the tables. When these conditions are met than the indicator can be quantitative. In some cases the information comes only from the project management who shall provide the data and the evidence of their source or the method of collection. Many differences, in particular between non-homogeneous types of RIs or RIs in different domains, will appear in the first application of the indicators and their refinement will require some trials.
The individual indicators of pan-European relevance should be applied to each single project to help gaining evidence on its "absolute" added value as a pan-European project, and should not be used for direct comparison between projects, especially when projects belong to different areas of research.
Nevertheless each indicator may lead to attributing a "value" to the project on the specific aspect, if the evidence (data) is substantial. There are enough specific indicators to substantiate the attribution to the "macro-indicators" of a score on a "high, medium, low" scale providing a "merit" of the given RI according to that macro-indicator. There is no simple arithmetic for determining the score since some specific indicators may be differently relevant, or differently measureable, for projects of different nature. The ensemble of the specific indicators will guide to the "high, medium, low" value of the macro-indicator. The

ensemble of the macro indicators will therefore provide a picture of the aspects that substantiate the pan-European relevance of the RI project. As the project progresses, both in the preparatory and feasibility study phases (ex-ante indicators) and in the operation phase (ex-post indicators) the values of the specific and macro-indicators will most probably evolve.

Testing the indicators requires collaboration and agreement with the RI and could be proposed by ESFRI to some RIs of the current set, or to those of a given domain, who may accept to volunteer to such test-phase of the indicators.

Method of work

The ad hoc expert group of indicators for the evaluation of "pan-European relevance" of research infrastructures met four times in 2012 and 2013 (4 September 2012, 21 February 2013, 18 July.2013 and 10 September 2013). All meetings were held at the premises of RTD in Bruxelles, also making use of the videoconference facilities.

Active members of the group and other participants to the meetings were: Giorgio Rossi (ESFRI EB member and chair of the group, IT), Rainer Lange (German Council for Science and Humanities, DE), Peter Fletcher (STFC, UK), Tove Andersson (Swedish Research Council, SE), Bonnie Wolff-Boenisch (Science Europe, BE), Daniel Deybe (EC, BE), Maria Theofilatou (EC, BE), Philippe Froissard (EC, BE), Peter Elias (SWG SCI, UK), Andre Luxen (ESFRI delegate, BE) and were assisted by Claudia Ritter (Bureau of the ESFRI-Chair, DE).

After agreement to the ToR, a working document had been developed by the chair of the group to stimulate the discussion process. The document was based on an analysis of the current culture on "performance indicators" and identified a number of potential indicators (about 50) in order to evaluate the strategy that could be followed by the EG. Preliminary presentations of these intermediate documents to the EB and Forum were done. A general request was to reduce the total number of indicators to a much smaller number. The working document was consecutively adapted by discussion and comments. Between each meeting, the EG members, commented on the documents via e-mail.

At the meetings it was stressed that indicators should be "useful" meaning that they should be "measureable" and practically implementable. A basic consideration was that indicators of "pan-European relevance" were applicable only on "excellent projects" (as a prerequisite to be of pan-European interest, but that purely "excellence indicators" should not be in the list since they were beyond the scope and mandate of the EG.
The EG agreed that the "excellence" of projects was to be taken as granted, i.e. already acquired by ESFRI, BEFORE the "pan-European interest was addressed. This led to a substantial reduction of the number of indicators.
As a result the group developed two tables for the evaluation of the pan-European relevance of RI. Each of the tables consists of 15 indicators.
The EG then analysed thoroughly the existence of available databases upon which to quantify the indicators. In some cases we eliminated indicators that were considered highly indicative, but that could not be applied for diverse reasons, including "privacy" rules on the careers of people who has benefited from RIs and then joined industry or other administrations. The resulting indicators are, in the EG's opinion, implementable either on values obtained from

the management of the projects or from independent evidence to be provided by different authorities including the EC, Eurostat, the national ministries, other public databases.
The EG agreed to deliver the indicator tables for ex-post (in-itinere) and ex-ante analysis of the "pan-European interest of the RI projects" accompanied by a short note including the present "methodological note" and a general "introduction note" that warns on the specificities of the application of the indicators to the different typologies of the RIs (distribute, single site, e-infrastructures).

Note:
After each meeting the "Minutes" were drafted by Dr. Claudia Ritter developed by GR and circulated to the EG for approval. Formal approval was the first agenda item in subsequent meetings. The minutes of the final meeting are to be approved by the participants by e-mail.

ANNEX 1

ANNEX 2

ANNEX 1
Table of Indicators for the ex-post evaluation of “pan-European interest” of a research infrastructure

No.	MACRO-Indicator	Comment on interpretation of the indicator	Data source
0 Background Information			
	International agreement type: ERIC or other, or explicit international mission if funded by one country	Level of shared responsibility, long term commitment of consortium	EC, ERIC committee, Project management
	Geographical distribution of service points or nodes	Level of accessibility by EU and international users flux analysis	Project management, EC TNA ststistics
	Upgrade/reuse of national pre-existing investments that acquired European/international dimension in the RI	Re-use of existing resources/operating costs in the new mission of the new RI *Re-orientation of national science sites/institutions to new pan-Eu mission*	EU, MS
	Place in the landscape of RIs in Europe	Flux analysis of users, coordination with other RIs (complementary, supplementary)	ESFRI, Project management
1 Membership Indicator High, Medium, Low			
1.1	No. of MS/AC and global partners contributing to (a) construction, (b) operation and c) to equipment	total no., quantitative indicator	Project management
1.2	Structure of commitments to (a) construction and (b) operation/GBAORD	Cash+in-kind, quantitative indicator *declared/expected total commitment to the RI normalized to the general effort in research of the MS-AC/Europe in the*	Project management and EUROSTAT or MS-AC authorities

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		relevant research field (“added effort” represented by the RI in the given field at pan-EU level)	
1.3	Estimated value of national nodes contributing to a distributed RI to (a) construction and (b) operation/ GBAORD	Cash+in-kind, quantitative indicator (see above)	Project management and EUROSTAT or MS-AC authorities
2 Usage Indicator High, Medium, Low			
2.1	No. of users of the RI per country/ total no. of scientists per country (in the given field)	geographical distribution, interdisciplinarity, demand (users pressure, overbooking), trans-national access (TNA) *impact on structuring the research in the field of RI over all Europe*	Data bases of RIs and EUROSTAT or MS data on total employment in the field, Data base of EC I3 for TNA
2.2	No. of user accesses	Absolute values of access to the RI (services, samples, data, expertise etc.)	Data bases of RI, possibly compared with “successful” international RIs in same or comparable field
2.3	No. of users-partnerships (when relevant for the kind of RI)	Number of collaborating research teams or consortia investing long term instrumentation and manpower resources on contractual basis to use the RI	Data bases of RI, to be compared (and scaled) with “successful” international RIs in same or comparable field

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3 Networking INDICATOR High, Medium, Low			
3.1	No. of joint proposals/total users	Level of cooperation, number of cooperative projects between EU, international and national institutions connected with the use or upgrade of the RI *increase of collaborative research proposals at intl-/European level due to the joint work at RIs e.g. normalized to the level of intl. cooperation in the field without RI*	Proposal data bases of RIs, Programme Committes, Statistics of I3s and proposals for suggested topics Statistics of cooperation projects in the field
3.2.1	Co-publication analysis: international	Increase in international collaborative research due to joint application at the RI	Publication data base of Ris bibliometrics
3.2.2	Co-publication analysis: interdisciplinary	Incerease in interdisciplinary research results (published) that is based on the RI	Publication data base of Ris bibliometrics
3.3	Fraction of non-European users (with non-EU affiliation)	Indicator of internationalisation	RI management
4 Excellence INDICATOR High, Medium, Low			
4.1	Share publication in top 10 journals in each field of reference of respective facilities	Indicator of excellent production	Bibliometrics, RI management (for publication data)

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4.2	Field normalised citation rate	Indicator of impact of publications	Bibliometrics, RI management (for publication data)
5 Knowledge Transfer INDICATOR High, Medium, Low			
5.1	No. of PhD theses and post doctoral programmes/ citations (absolute and relative to total in each field) Normalised to total number of PhD theses in the given field based on Eurostat categorisation as an experimental indicator	attractiveness of RIs to young talents for thesis and doctorate research	Number of PhD thesis based on or citing RI results / total number of PhD thesis in the field From University council statistics and from RI data base
5.2	No. of patents and licenses based on the work of the RI, normalised to no. of patents and licenses in the field	Indicator of primary and secondary (through industry grants to Univ.) impact on innovation	Data base of RI, EUROSTAT data
5.3	No. of industrial users and projects with industrial cooperation	Indicator of for-profit use	RI Management

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Table of Indicators for the ex-ante evaluation of the “pan-European relevance” of a research infrastructure

Objective	Indicator	Comment on interpretation of the indicator	Data source
0 Background of new RI or Upgrade Project			
EC			
	Previous Design Study Project	Successfully completed DS	EC (FP6, FP7)
	Previous Preparatory Phase Project	Successfully completed PP	EC (FP7)
	Well established I3 or equivalent networking in the science community that needs the RI	number / size of I3 networks in the field	EC Statistics of I3s and proposals for suggested topics
Other			
	Addressing new scientific challenges with unique / innovative approach strenghtening European leadership	Expectation of new knowledge by the international science community	International Science press, evidence of international competition
	Upgrade of an existing operational RI to pan-European or Global RI	Background of RI	Project Management, EC, MS, GSO
	Re-orientation of existing science sites to host new RI	Background of RI	MS-AS, Project Management
	Landscape analysis of RI in the field and the territorial distribution of service points in Europe	Background of RI	ESFRI
1 Membership INDICATOR High, Medium, Low			
1.1	No. of MS/AC and global partners engaged with	Fraction of total funding which has been	Project management

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	determined share to (a) construction and (b) operation. Mission statement from ownership	comitted so far, quantitative indicator	
1.2	Maturity of international organisation	Existence of a credible project organisation (e.g. statutes, legal form)	ERIC committee, EC, MS, Project management
1.3	No. of nodes of Distributed RI, partner facilities	Number of nodes and flux analysis of users	Project management
1.4	Structure of commitments to (a) construction and (b) operation/GBAORD	Strength of partners involvement in terms of Cash+in-kind, w/r GBAORD	Project management Ministerial sources
1.5	Estimated value of national nodes contributing to a distributed RI to (a) construction and (b) operation/ GBAORD	Cash+in-kind, quantitative indicator (see above)	Project management and EUROSTAT or MS-AC authorities
2 User strategy Indicator High, Medium, Low			
2.1	Fraction of possible users of the RI per country/ total no. of scientists per country (in the given field)	geographical distribution, different science fields, interdisciplinarity, expected demand (users pressure), users initiatives to complement the project	Data base of the research field by reference research communities, Ministerial sources Project management Eurostat
2.2	Scale of service (expected number & time of access per year w.r. size of reference community)	Absolute values of access in the specific form of the RI	Data base of RI, possibly compared with existing “successful” international RIs in similar/comparable field

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2.3	Data management and access structure	% of investment planned in data infrastructure normalized to the most advanced international standards in the field	Project management, data from successful international RIs in similar fields
3 Networking INDICATOR High, Medium, Low			
3.1	Number/size of users consortia willing / planning to contribute own resources to use the RI on contractual basis	number / size of perspective collaborating research teams or consortia	Project management
3.2	Expected % of non-European users	Indicator of internationalisation	Project management
3.3	Expressions of interest by diverse scientific communities	Multidisciplinarity	Project management
4 Excellence INDICATOR High. Medium. Low			
4.1	Attractiveness at international level of staff	Package offer to staff	Project management, EC, ERC
5 Knowledge Transfer INDICATOR High, Medium, Low			
5.1	PhD programme agreements with universities	Estimated number of thesis and doctorate research projects associated with the RI staff and (separately) with users	Project Management
5.2	Industrial involvement in pre-procurement studies and in the construction phase, including IPR	Indicator of industrial interest in innovation through participation to RI pre-procurement and procurement, relative to type of structure and services of the RI	Project management EC – SME related projects connected to the RI

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			Reference to successful intl. projects
5.3	Accessibility by industrial users	Indicator of “for profit” share of use of RI	Project management