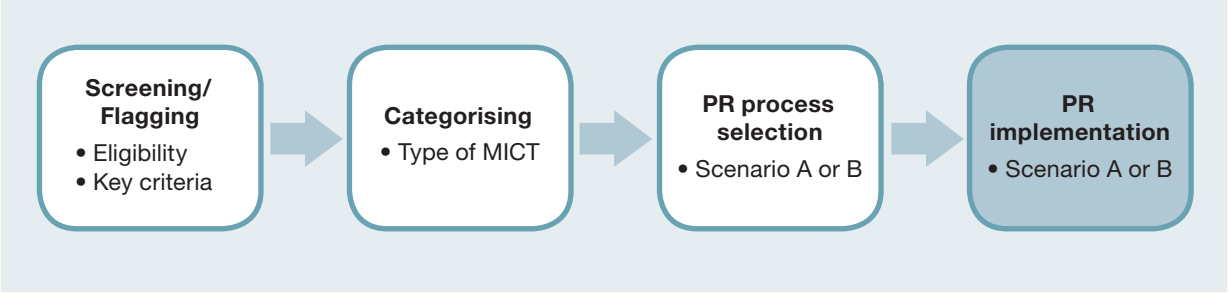

Figure 10. Schematic description of the peer review process for Category I and II

RECOMMENDATIONS

- Whether or not a programme is exclusively designed for pluridisciplinary research, it is recommended to devote the necessary time, expertise and attention at an early stage of filtering or eligibility screening such that proposals that are genuinely of MICT type can be identified and undergo the most appropriate peer review process according to their disciplinary characters.
- For any instrument (whether or not explicitly devoted to pluridisciplinary research), it is recommended to have proposals that are found to be genuinely of MICT character peer reviewed in a two-stage or three-stage evaluation process using individual expert assessments followed by appropriate review panel deliberations and decisions.
- • • •

4.12.2 Peer Review scenarios for pluridisciplinary proposals

It appears that for the purpose of peer review and to cover the full spectrum of pluridisciplinary research, it is sufficient to consider at most three scenarios: A, B and C as outlined below.

The first two (A and B) are actually very similar and could effectively be regarded as one approach with slight differences in conducting the individual assessments and review panel ranking. All dedicated peer review processes for MICT proposals must include the opportunity for the applicants to exercise the right to reply to the remote assessments before the review panel meeting. Therefore all three assessments suggested below should include a step to collect feedback from the applicants.

Scenario A

For most multidisciplinary proposals (as defined in this Guide), a *central* or a *host* discipline may be *clearly identifiable* as being the main *driver* of the research objectives. In these cases the engagement of the other disciplines is seen as *supporting* or *complementary*. Within this scenario the resulting scientific discoveries, innovations, new knowledge or breakthroughs are expected to occur predominantly within the host discipline, facilitated by the support from the other disciplines; for example, development of new applications within the host discipline for concepts, methods, devices and systems that are primarily conceived within the complementing disciplines.

A suggested approach for Peer Review Implementation in Scenario A

For this scenario a two-stage process of individual assessments followed by panel reviews is recommended. The following features are suggested:

- *Stage 1: Individual assessments.* For this stage, one of the following two options may be considered:
  a) Matching of reviewers' profiles with research topics: if available, a sufficient number of experts (minimum of three) with appropriate depth and breadth of expertise to assess all the crossdisciplinary merits stemming from the interactions between the host and all the complementing disciplines. In this option, topical keyword matching may be used to identify the required profiles instead of matching of disciplines and profiles.
  b) Matching of reviewers' profiles with disciplines: include at least three individual referees from the host discipline plus one expert reviewer from each of the complementary disciplines. For this option, slightly different assessment criteria may be considered for the two groups of individual reviewers (from the host versus complementary disciplines) in order to sharpen the respective evaluations seen from the various disciplinary vantage points.
- *Stage 2: Panel assessment.* One review panel should synergise all the information and decide on ranking, prioritisation and the final decision. The membership of the panel will be from the host

discipline and should include members with the relevant crossdisciplinary profiles.

RECOMMENDATION

Care should be taken in putting in the right context the assessments from the host and the complementing reviewers, especially when having large numbers of assessments, such that the chances of unduly penalising the proposals is minimised.

• • • •

Scenario B

It may happen that for many of the MICT-type proposals as defined in this Guide, one *host* discipline may be *identifiable* as being the main *driver* for the formulation of the research objectives. However, the linkages or triggers from other disciplines in motivating the scope of the proposal are strong enough such that cross-fertilisations, innovations and new applications are probable and expected not only in the host discipline, but also to varying degrees within the other disciplines. The expected cross-fertilisation in this scenario goes beyond finding new applications in the host discipline for concepts, methods, devices and systems that are primarily conceived within one of the other disciplines.

A suggested approach for Peer Review Implementation in Scenario B

The same general peer review approach described for Scenario A may be used for cases falling within Scenario B with the following features needing particular attention:

- *Stage 1: Individual assessments.* To account for stronger synergy and interactions that may be present between the host and any of the complementing disciplines, and in case it is not possible to use A.1.a (*i.e.*, matching of required research profiles to topics), it will be important to incorporate more than one assessment from the complementing discipline having strong interactions (*i.e.*, in applying A.1.b).
- *Stage 2: Review panel.* Similar to the first scenario, one review panel should synergise all the information and decide on ranking, prioritisation or the final decision. However, in this scenario, although the panel membership should be predominantly from the host discipline, it is recommended to include experts from the complementing disciplines with strong relevance and expectations.

Scenario C

In contrast to the two groups above, when dealing with some of the MICT-type and the majority of transdisciplinary proposals, it may not be possible to identify only one host discipline. In these cases, it is necessary to engage all the driving disciplinary perspectives to the same level and in the same manner within the peer review process. In this scenario the need for strong integration is present and cross-fertilisation across disciplines is expected. Successful transdisciplinary research can lead to the creation of new paradigms or disciplines.

A suggested approach for Peer Review Implementation in Scenario C

For this scenario a three-stage process of individual assessments followed by two levels of review panel discussions may be considered. The following features are worth mentioning:

a) Enough experts (ideally three) from each of the *host* disciplines are needed. Efforts are to be made in identifying reviewers who are familiar with pluridisciplinary research, ideally on the same topics but if not possible on closely related topics;
b) One individual/remote reviewer from each of the complementary disciplines is also needed;
c) Reviewers from all host disciplines use the same assessment criteria while those from the complementing disciplines use a slightly different set of criteria;
d) Applicants are given the opportunity to reply to the remote assessments as part of the information to be considered by the review panel meeting;
e) One review panel for each host discipline is assembled to synergise individual assessments coming from that discipline plus the ones from the complementing discipline;
f) As the final stage of peer review, a consolidating panel will decide on the proposal based on the recommendations of the single disciplinary panels. The members of the consolidating panel could be either completely independent or representatives of the disciplinary panels.

The three suggested peer review scenarios and related specificities are summarised in Table 6 below.

Multidisciplinary → Interdisciplinary → Crossdisciplinary → Transdisciplinary

	Scenario A	Scenario B	Scenario C
Main features	• Clear distinction between the relevance of ONE driver or host discipline with other complementing disciplines • Scope of the research motivated in host discipline • Expected results will occur in host discipline • New applications within the host discipline for concepts, methods, devices and systems that are primarily conceived within the complementing disciplines	• Distinction between the relevance of ONE host discipline and other complementing disciplines • Scope of the research motivated in host discipline but triggered by or strongly linked to other complementing disciplines • Cross-fertilisation expected in host and some of the strongly complementing disciplines • Results go beyond finding new applications in the host discipline	• Similar degree of relevance and connection to all implicated (host) disciplines • Scope of the research motivated collectively by all host disciplines • Strong need for integration of disciplinary perspectives and approaches • Cross-fertilisation expected across host disciplines • May lead to new paradigms or new disciplines
Peer review stages	• Two-stage: individual assessments plus one review panel with rebuttal	• Two-stage: individual assessments plus one review panel with rebuttal	• Three-stage: individual assessments in each host discipline plus two review panels with rebuttal
Individual assessment reviewers	• Three from the host discipline + one from each of the complementing disciplines, or • at least three experts covering all the topical expertise (keyword matching)	• Sufficient number of experts (at least three) with the required levels of topical expertise (keyword matching), or • three from the host discipline + two from the strongly complementing discipline + one from other disciplines	• Three from each of the host disciplines • One from each of the complementing disciplines
Review panel	• One panel with members from host discipline will make final peer review decision	• One panel with members from host discipline and from strongly complementing disciplines will make final peer review decision	• One panel for each host discipline with members from that discipline making a preliminary disciplinary judgment • A second consolidating panel will synergise all the information and make a final decision • Some or all members of the consolidating panel may be representatives from the disciplinary review panels

Table 6. Summary of the suggested peer review scenarios

4.13 Programmes explicitly designed for breakthrough research

A comprehensive review of the topic of 'breakthrough' or 'high-risk/high-gain' research has been conducted at the Academy of Finland providing both international and national contexts[44]. The key difference between interdisciplinary and breakthrough research is that "whereas interdisciplinary research should set out its strategic challenges and commitments in advance, breakthrough research should remain open in this respect".

Breakthrough research may result from all fields of science with potential for profound scientific or societal consequences and transformations, for example: fully understanding and developing treatments for life-threatening diseases such as cancer, or genetic disorders in life sciences and medicine; answers to some of the fundamental questions in physics and cosmology; consciousness, cognition and evolutionary psychology in social sciences and humanities.

As noted in §2.2.4, the survey's results show that there are not many programmes explicitly designed for breakthrough research in Europe. Some organisations regard their standard instruments as being targeted to breakthrough research by default. The comments received in response to this question point to a clear need to establish common approaches or raise awareness on the complex relationship between breakthrough research and appropriate peer review. Several organisations that currently do not have a dedicated instrument have commented that they would be considering these in the future.

The main intent of this section is therefore to help raise awareness on the issues and the available approaches. Hence, it seems necessary first to provide some of the main features that separate breakthrough research as a dedicated instrument from normal means of dealing with innovative and original research ideas that are proposed through standard instruments. One main problem with the promotion of breakthrough research using conventional instruments is that the latter are often conservative when dealing with exploratory or adventurous ideas.

Breakthrough research is original, novel, ambitious, innovative, unique, at the forefront, and aims to radically change the understanding of an existing scientific concept, or lead to the creation or changing of paradigms or fields of science. It is bold in adventuring into the borders of current understanding and states-of-the-art. This is in contrast with original and innovative research proposals that normally lead to *incremental* results and are submitted through standard 'mainstream' instruments. Because of their adventurous character, there is an inherent level of risk associated with breakthrough ideas that is generally higher than would normally be expected in mainstream instruments. Therefore, breakthrough research is also referred to as high-risk/high-return.

It should be underlined that breakthrough research is desirable not because it is risky but because of its scientific potential for major advancements and transformations. However, due to the uncertainties and risks in taking on 'adventurous' ideas, it is necessary to balance through appropriate peer review systems the potential for gains versus the risks for failure and therefore loss of investments. In fact, this balancing act is a central challenge when designing a peer review process dedicated to breakthrough research and thus forms the basis of the elaborations in this section.

4.13.1 Peer review process for breakthrough research

In the context of peer review and selection of breakthrough research ideas, it seems appropriate to pay more attention first to the means of effectively measuring the potential for breakthroughs, impacts and long-term advancements rather than to effectively determining the levels of associated risks as a filter. Once 'good' ideas are identified with an acceptable degree of confidence, associated risks can then be considered and traded off against the potential gains.

It is therefore clear that instruments dedicated to promoting breakthrough research in the sense mentioned above stand out separately from the instruments that are in place to promote or maintain a national research base for the overall advancement of science, education and technology. Thus, to be able to truly promote and identify breakthrough ideas, it appears more appropriate to design dedicated instruments with specialised peer review procedures. If the right amount of attention and structure are not provided, it is quite possible to miss the target by creating yet another *de facto* 'standard' instrument.

Using the aforementioned interplay between the potential gains versus the risk, and the loss of investment, the following two different scenarios can be considered:

44. See Häyrynen (2007), p. 22; Danish Agency for Science Technology and Innovation (2009); and NordForsk NORIA-net (2010)

1. Breakthrough research funded by one-stage grants

Some of the main features of the peer review process suited for this suggested scheme are:

- The grants are full-size and are awarded to successful proposals in order to develop their suggested research from beginning to end;
- The amount of funding for each grant can therefore be significant considering the risky nature of the proposals;
- Because of the 'higher-than-normal' levels of risk in achieving the stated objectives of the proposals, it is necessary to pay equal or more attention to effectively determining the levels of risks while measuring the potential for impact and transformation or innovation, etc.;
- The peer review process appropriate to this scheme may thus entail a two-stage proposal submission (*e.g.*, outline followed by full proposals) and a two-stage assessment through individual reviewers (minimum of three) plus a dedicated and authoritative committee or review panel capable of identifying ideas with reasonable potential for breakthroughs;
- Because of the potentially high stakes under this scheme, care should be taken in maintaining the required levels of ambitiousness and risk-taking for both individual assessments and especially for the review panel consensus making.

2. Breakthrough research funded by two-stage grants

In contrast to the one-stage grants, and because of the elevated levels of risk, the two-stage grant schemes would first aim at providing smaller-size funding of selected breakthrough ideas (*e.g.*, as *seed projects*) followed by full-size development grants given to thriving and promising seed projects.

In this format, risk-taking or adventurous peer review can be promoted while maintaining potential loss of investments under better anticipation and control.

Some of the main features of the peer review process suited for this suggested scheme are:

- First, a responsive-type opportunity to promote and select breakthrough ideas based on short outline proposals;
- Breakthrough ideas may be flagged by dedicated and experienced scientific staff with the required levels of disciplinary knowledge (who are also active in their respective fields) within the organisation, or dedicated review panels should conduct this first-stage selection;
- Seed grants given to successful applicants can then be regarded as feasibility studies in order to demonstrate the real potential of the proposed ideas, and to characterise and propose ways of achieving the main results while analysing the associated risks for failure;
- Based on the progress made by the small grants at their target completions, applications are to be submitted for larger full-size grants suitable to conduct the entire envisaged research. Full proposal submissions can be applied to all seed projects or through invitations based on the recommendation of the dedicated review panel;
- A second-phase peer review should select among competing breakthrough proposals the ones with the highest merits, *i.e.*, higher scientific value and expected transformations; progress made within the seed projects; acceptable levels of risk for failure as demonstrated in the seed projects, etc. These are to be measured based on the initial small grant proposal and the reports illustrating the achievements and progress made therein. This would normally include:
  - At least three individual assessments covering all disciplinary perspectives, followed by
  - Dedicated and authoritative review panels to provide consensus, ranking or prioritisations.

Part II
Guidelines for Specific Funding Instruments

1.

Introduction to Part II

Despite some particularities and nuances that differentiate the processes of peer review adopted across different programmes and their variants, the general logic, architecture and main building blocks remain the same for similar instruments. Part II of the Guide is meant to complement Part I by elaborating on these particularities.

Key characteristics and variations are elaborated in more detail in the following chapters, dedicated to specific instruments. These instantiations and elaborations of the generic models described in Part I are made based on the results of the survey on peer review practices, other available and relevant literature, as well as consultations with practitioners, principally the ESF Member Organisation Forum on Peer Review.

The survey on peer review practices, which was intended to map out the current landscape of peer review practices in Europe[45], highlighted some particularities inherent in peer review procedures and provided data mainly for three selected instruments: *Individual Research Programmes*, *Career Development Programmes* and *International Collaborative Research Programmes*. These instruments were regarded as most representative for the purpose of the study by the Member Organisation Forum on Peer Review. For the other programmes where valuable information has been provided but by fewer respondents (*i.e.*, *National Collaborative Research Programmes*, *Scientific Networks,* and *Centres of Excellence Programmes*) the results are included when appropriate. Hence, although the *ESF Survey Analysis Report on Peer Review Practices* contains data only for the three selected instruments mentioned above, it should be noted that in Chapter 7 of this Guide devoted to the *Creation and Enhancement of Scientific Networks*, some of the key observations emerging from the survey results are quoted.

As a result of these differences, and despite having made conscious efforts to maintain uniformity of the structure of Part II, the format of the chapters can vary to some extent. For example, some chapters make more substantial use of the survey results to support the suggested good practice while some others – having access to fewer data from the survey – have in turn relied more on the expertise of the MO Forum on Peer Review and on consultation with members of the other ESF Member Organisation Fora.

In particular, Chapter 5, *Individual Research Programmes and Career Development Programmes*, and Chapter 9, *New Research Infrastructures Programmes*, have been presented for comments and contribution to the forum's observing members from the European Commission, the European Research Council and to key members from the ESF MO Fora on Career Development and on Research Infrastructures.

45. 30 research funding and performing organisations from 23 European countries, one from the USA, and some supranational European organisations participated in the survey. The ESF Survey Analysis Report on Peer Review Practices is available at: http://www.esf.org/activities/mo-fora/peer-review.html

5.
Individual Research Programmes and Career Development Programmes

5.1 Purpose and scope

Although very different in scope and objectives, *Individual Research Programmes* and *Career Development Programmes* share commonalities in their implementation and their required peer review steps. Hence, the detailed process description for adopted good practices on peer review is described for both instruments in this chapter.

Individual Research Programmes are intended to finance research projects enabling individual researchers to pursue their ideas and projects. Collaboration and networking are often not explicitly promoted and covered by *Individual Research Programmes*. Under these programmes, each grant is awarded to one research team with one budget line and one set of work-plan and research objectives.

Career Development Programmes are intended to support career progression of researchers and scholars and to recognise their achievements.

The main purpose of *Individual Research Programmes,* whether thematic or non-thematic, is to support scientific research. Therefore, the main focus of these programmes is on the *research* being proposed. This is in contrast with the *Career Development Programmes* in which the main focus is on the *proposers* of the research and on supporting or recognising their career progression and achievements through awards, fellowships, appointments, professorships, Chairs, etc.[46,47].

Breakthrough research applications may be supported in particular for *Individual Research Programmes* where the speculative, experimental or exploratory nature of the work means that results or outcomes are uncertain or cannot be guaranteed, *i.e.*, a significant degree of risk is present in achieving the anticipated breakthroughs (see Section 4.10 of this Guide for the peer review features that need to considered). Furthermore, some types of more advanced Career Development grants could also contain higher levels of risks. As an example, academy professorships in Estonia are granted according to the past achievements of the applicants while providing them with great flexibility on how to use their grants in conducting their research.

There is a significant degree of variation in the aims, target groups, length of funding, etc. across the various *Career Development Programmes*, including, for example, awards that are given in recognition of outstanding contributions to a particular research field either with or without a bursary (*e.g.*, EMBO Gold Medal, valued at 10,000 €[48]); awards which also provide substantial funding for research (*e.g.*, NWO Spinoza Prize, providing up to 2.5 M€[49]); first postdoctoral research fellowships and professorships for two or more years. Furthermore, there are

46. Scholarship is a form of financial aid awarded to students to further their education and training. Fellowship is a stipend, or a financial endowment, to support graduate students and, most often, postdoctoral candidates in completing or enhancing their academic careers (teaching or research).

47. The definitions of the career steps are very heterogeneous. A first attempt to develop taxonomy (and a common terminology) for research career can be found in: European Science Foundation (2009) *Research Careers in Europe. Landscape and Horizons*.

48. http://www.embo.org/aboutembo/embo-gold-medal.html

49. http://www.nwo.nl/nwohome.nsf/pages/NWOP_5VNCW6_Eng

other programmes which combine elements from both *Individual Research* and *Career Development Programmes*; examples include the DFG's Emmy Noether Programme, the SFI's Starting Investigator Research Grant (SIRG) and the SNF's Ambizione Programme, to name but a few from across Europe's national funding agencies.

Such programmes may aim to support researchers who are at the stage of starting or consolidating their own independent career with additional aims such as promoting the incoming or outgoing mobility of researchers. As a distinct example in the European Commission's 'Marie Curie Actions', mobility is a fundamental aspect of the programme. This chapter does not attempt to provide a comprehensive overview of all these types of programmes, but rather to provide general guidelines on the peer review process involved, while touching on some aspects specific to career development.

The progression of research careers differs significantly between national systems and even across disciplines and, as pointed out in footnote 47, the terms normally used to define the different career steps are extremely heterogeneous. Therefore, the nature and scope of the funding programmes can vary according to the location of funding organisation or to their specific programmes. For example, the European Research Council (ERC) uses the terms 'starting grants' and 'advanced grants'; the first grant addresses researchers with 2 to 12 years of experience after their PhD, and the second is meant for research leaders with at least 10 years of experience and significant research achievements.[50] There are other similar distinctions used by other organisations when referring to the two foregoing broad categories of career development regimes, *e.g.*, young (or early career) researchers and advanced (well-established) researchers.

The *ESF Member Organisation Forum on Research Careers* has proposed a four-stage scheme for grouping European research careers, based on a mapping survey of research career structure in Europe. These are: Stage I – Doctoral training; Stage II – Postdoctoral fellowships; Stage III – Independent research; Stage IV – Established research. In some countries Stages II and III are combined[51].

For the purpose of this chapter, the following four categories with the related specific features that may have an impact on peer review are considered:

1. Doctoral Training Grants (DTG)

Doctoral training is the third cycle of the Bologna Process[52], but the specific titles and durations vary throughout Europe and could also depend on the disciplines.

DTG are commonly intended for qualifying doctoral students and to facilitate advanced academic training and conducting research. These grants are normally funded by government (national and regional), universities or foundations, and they can be embedded in large funding schemes or *ad hoc* university grants[53]. A single grant is awarded to a doctoral student, offered for three or four years depending upon the nature of the project and/or research training needs. The grant usually covers academic fees, annual living allowances and additional funds for fieldwork and travel.

The peer review is usually carried out by internal committees evaluating full applications (in particular in the case of university grants) or by panels and individual/remote reviewers or boards of trustees, including international reviewers and representatives of the funding organisation (usually directors and faculty members).

2. Postdoctoral Fellowships and Grants

Postdoctoral (Training) Fellowships provide to researchers who have completed their doctorate degree a vehicle for further training in basic or applied research either in their own country or elsewhere. The postdoctoral fellows are normally given the opportunity to work on research projects with certain degree of autonomy but under overall supervision of a designated adviser. These awards may not be offered beyond five to eight years after the completion of the relevant doctorate degree. The grants are offered to candidates of outstanding ability who wish to make research a significant component of their career.

The peer review is usually carried out by *ad hoc* internal committees evaluating full applications and/or by panels or individual/remote reviewers. In many organisations eligible applications are selected for an interview. For example, for the *EMBO Long-Term Fellowships,* which are awarded for a period of up to two years and support postdoctoral research visits to laboratories throughout Europe and the world, the peer review is organised according to the following steps[54]:

50. See http://erc.europa.eu/index.cfm?fuseaction=page.display&topicID=498

51. European Science Foundation (2009), *Research Careers in Europe. Landscape and Horizons*, p. 9 and pp. 16-28.

52. See the related documents available at: http://www.ond.vlaanderen.be/hogeronderwijs/bologna/

53. See, *e.g.*, the EU *Marie Curie Network* or the DTGs scheme in UK.

54. See http://www.embo.org/programmes/fellowships/long-term.html

a) **Eligibility check:** The applications are examined at the EMBO Fellowship office for completeness and other eligibility criteria;
b) **Pre-screening:** A Fellowships Committee conducts pre-screening of all eligible applications;
c) **Interview with experts:** An individual expert in the area of the application may be assigned to conduct an interview with the selected applicant;
d) **Overall assessment of the application:** All dossiers are considered by an *International Selection Committee* of EMBO Members. Each application is scored independently and the scores forwarded for compilation to the Fellowship office;
e) **Consensus meeting:** The *Selection Committee* convenes to examine and discuss all the applications and their scores in order to make a final selection.

3. Grants for the creation of Independent Research Groups

These very competitive and prestigious grants are meant for emerging research leaders with great potential who aim to create or consolidate an independent research team. Grants are usually offered to finance outstanding young scientists, in the initial period of their independent careers, in a position to formulate and carry out innovative and fertile research projects[55,56].

The peer review is usually carried out in the following main stages[57]:

a) **Remote assessments:** These are conducted by individual reviewers who could also be members of the review panel;
b) **Panel review:** Members of the review panel convene to discuss applications and make a selection for the next step;
c) **Interviews:** Depending on the programme, there may an interview required in which some or all members of the panel will meet and interview the applicants;
d) **Final decision:** This is usually taken by an *ad hoc* programme committee.

For some organisations[58] the submission stage includes first a letter of intent based on which a pre-selection is made and a number of applicants are invited to submit full applications (*i.e.*, *Young Investigator Grants* for the Human Frontier Science Programme). For other funding programmes, such as, for example, the *EMBO Young Investigators programme*[59] supporting young researchers in the start-up of their first independent research laboratories, the eligible applications are sent to a Selection Committee for pre-screening and then candidates are invited for interview by an EMBO Member expert in their area of research. The subsequent steps of the selection follow a similar approach as those described above under EMBO's Long-Term Fellowships.

Interdisciplinary consideration: Under the schemes described above, interdisciplinary applications are usually considered by two or more panels as appropriate.

4. Advanced career grants

These are prestigious grants meant to support outstanding independent leaders to conduct risk-taking, interdisciplinary and frontier research. Candidates must have a distinguished scientific or research track-record and profile. The European Research Council, for example, has a dedicated funding scheme, the *ERC Advanced Investigator Grant*[60] supporting scientists for up to five years.

The peer review procedure of this funding scheme is based on a single-stage submission and a two-step evaluation and selection assessing both the Principal Investigator and the research being proposed. The process outlined below is used for peer review and selection of the *ERC* Advanced Investigator Grants Scheme which does not include interviewing the applicants as a step in peer review and selection. However variations may exist in the application and selection process used for national grant schemes with comparable purpose and scope[61]:

a) **Eligibility:** This is conducted by the Executive Agency of the ERC (ERCEA);
b) **Remote assessments:** In addition to the members of the review panel, this stage is conducted by external expert referees;

55. See http://www.hfsp.org/how/PDFs/LI_Guidelines_2011.pdf
56. See ERC Starting Independent Researcher Grants (ERC Starting Grants): http://erc.europa.eu/index.cfm?fuseaction=page.display&topicID=65
57. See, for example, the *European Young Investigator Awards* (EURYI) scheme designed by the European Heads of Research Councils (EUROHORCs) and the European Science Foundation to attract outstanding young scientists to create their own research teams at European research centres: http://www.esf.org/activities/euryi.html
58. See http://www.hfsp.org/how/appl_forms_RG.php
59. See http://www.embo.org/programmes/yip/programme.html
60. See ERC *Grant Schemes Guide for Applicants for the Advanced Grant 2011 Call*, 11/11/2010, pp 3-5: http://erc.europa.eu/index.cfm?fuseaction=page.display&topicID=66
61. For example, interviewing all or possibly a short-listed group of applicants is part of the selection process for the *vici-stage* (the highest stage grant) in the NWO Career Development Scheme. A two stage submission is used for this grant, *i.e.*, pre-proposals followed by detailed applications submitted by a selected group. See: http://www.nwo.nl/nwohome.nsf/pages/nwop_5ttcva_eng

c) **Review Panel deliberations and selection:** The panels comprising 10-15 members in each disciplinary domain will convene to discuss the applications and the remote assessments;
d) **Consolidation meeting:** Final meeting of the panel chairs to consolidate the results of the different panels.

Interdisciplinary consideration: The broad definition of the panels allows many interdisciplinary proposals to be treated within a single panel. Interdisciplinary proposals will be flagged as such, and the panel may request additional reviews by appropriate members of other panel(s) or additional remote referees. This funding scheme makes provision for a so-called 'fourth domain' where interdisciplinary proposals not funded within the individual panel budgets can be brought forward for further discussion by the panel chairs.

5. Mobility Grants

For more than 15 years the European Commission has offered research grants on the condition that the individual researchers involved must move from one country to another in order to carry out the research – the 'Marie Curie Actions'. These grants, typically but not invariably for two years, are offered to researchers of all levels, from postgraduate upwards, through a variety of funding schemes, some aimed directly at individual researchers and some funding networks.

The actions are peer-reviewed according to the good practices outlined elsewhere in this document, with the additional consideration that the value of the mobility to the researcher's career, and to the European Research Area, must be assessed. For this reason the international character of the expert panel mentioned above is not only desirable, but absolutely necessary for a rigorous process.

5.2 Recommended peer review approaches specific to Individual Research and Career Development proposals

In this section some of the specific features will be highlighted. Although there seems to be some degree of variability in the processes and the way these are applied across different programmes and different scientific domains, the procedures suggested below are meant to be applied across various domain and programmes.

5.2.1 Proposal submission

For both instruments, *Individual Research Programmes* and *Career Development Programmes,* applicants are generally required to submit a full proposal, rather than a letter of intent or outline proposal followed by selection and invitation to submit a full proposal.

5.2.2 Peer review stages

The most common peer review process adopted in European organisations for both of these instruments is based on a *two-stage process*. This includes assessments by three individual/remote reviewers (see §4.4.2) followed by a prioritisation or ranking done by a dedicated review panel or a committee. The peer review process is ended by a final funding decision often carried out at the organisation level.

For both instruments, applicants are generally required to submit a full proposal, rather than a letter of intent or outline proposal followed by selection and invitation to submit a full proposal. The latter practice tends to be more common for Collaborative Research Programmes.

For larger and more competitive grants, it may be a common step to include interviews or a presentation by the applicants as part of the peer review process, while for smaller programmes this step may not be necessary.

The following elements can complement the peer review process:

- **Review Panel**
  As explained above, for a two-stage evaluation there are two groups of experts: individual/remote reviewers and review panel members. One common practice is to have a clear distinction between the two groups.

According to the *ESF Survey Analysis Report on Peer Review Practices*, 15 out of 22 organisations indicated that their process included a review panel

for their Individual Research Programmes while for Career Development Programmes this was 11 out of 19 organisations. For both types of instruments, the size of the review panel depended on factors such as the number and length of the proposals submitted and the grant durations and amounts.

- **Reader System** (see §4.5) is not routine across the two programmes but can be used for specific cases such as short-term fellowships or small-scale grants.

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Results from the *ESF Survey Analysis Report on Peer Review Practices* showed that 4 out of 27 respondents use it for Individual Research Programmes while, similarly, 3 out of 25 respondents use it for Career Development Programmes[62].

- **Right to Reply:**
  Applicants are provided the right to comment on individual/remote reviewers' reports, before the review panel or committee makes a selection, prioritisation or ranking of proposals (see §4.7.4).
  For calls that are continuously open or have fixed collection dates during the year, instead of a right to reply, the applicant can submit the proposal again, taking the individual/remote reviewers' and panel reports into consideration.

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According to the *ESF Survey Analysis Report on Peer Review Practices*, from 30 respondents, 16 organisations do not use the right to reply for any of their instruments, 4 organisations use it across all their instruments and 10 organisations use it for some of their instruments. For Individual Research Programmes, 7 out of 27 respondents use the right to reply while for Career Development Programmes 7 out of 25 respondents use it. This is an element that can add robustness and reliability to the process[63].

- **The use of 'consensus', 'ranking', or prioritisation meetings between the individual reading and the review panel** (See §4.8.2).

62. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices,* §4.2.2, in particular Question 102, Table 4.5.
63. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 3.8, Questions 55 and 58, Tables 3.35 and 3.37.

5.2.3 **Conflict of interest**

According to survey results, in response to the question "*How is a possible bias/conflict of interest identified on the side of the reviewers in this Instrument*?" the following table illustrates the responses provided for Individual Research Programmes and Career Development Programmes respectively (see table).

5.2.4 **Timelines**

The timeline (from launch of the call until the final decision, including the final communication to the applicants) for both *Individual Research* and *Career Development Programmes* should be limited to a maximum of one year. Other timelines can be adapted depending on the nature and number of proposals submitted; the duration and amount of the grant; and whether the call is a regular or an exceptional[64] one.

5.3 Processing of applications

Depending on the number of proposals submitted, an organisation can opt to make a preliminary selection of proposals, which is commonly based on either an outline or full proposal. For larger *Individual Research Programmes*, applicants may submit the outline proposal first, followed by selection and invitation to submit a full proposal. It must be noted that such a process lengthens the timeline of the call. Another possibility is to ask the applicant to submit both an outline and full proposal at the same time. The preliminary selection, generally made by either individual/remote reviewers or review panel members, will then be based only on the outline proposal.

Submission of outline proposals is appropriate for the first stage of a call when there are a great many project proposals submitted, while full proposals are suitable in a second stage when a reduced number of applicants apply. In this way the quality of the evaluation process improves.

The practice of preliminary selection may appear to be less commonly used for Career Development Programmes because of the greater variability among those programmes, which can tend

64. As an example, 500 submissions for a four-year research grant may require longer timeline; while 100 submissions for a first postdoctoral fellowship of two years could be managed faster. Moreover, duration of the decision making process is important in postdoctoral grant programmes in that as a usual practice candidates just after receiving or while finishing a PhD, may submit proposals to several host organisation and, if the timeline is too long, optimal opportunities and matching may be lost.

Individual Research Programmes	Individual/ Remote Reviewers	Panel Reviewers
Checked by the members of staff in the organisation. If there are conflicts, the potential reviewer is excluded	64.0% 16/25	79.2% 19/26
Reviewers are asked to check for potential conflicts themselves and possibly withdraw from the assessment	92.0% 23/25	95.8% 23/26
Reviewers have to sign a statement confirming that there are no conflicts of interest	60.0% 15/25	75.0% 18/26
Other	4.0% 1/25	–
There is no conflict of interest	4.0% 1/25	–
Career Development Programmes	**Individual/ Remote Reviewers**	**Panel Reviewers**
Checked by the members of staff in the organisation. If there are conflicts, the potential reviewer is excluded	77.3% 17/22	71.4% 15/21
Reviewers are asked to check for potential conflicts themselves and possibly withdraw from the assessment	90.9% 20/22	95.2% 20/21
Reviewers have to sign a statement confirming that there are no conflicts of interest	59.1% 13/22	71.5% 15/21
Other	–	–
There is no conflict of interest	–	–

to be smaller in scale than Individual Research Programmes.

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According to the *ESF Survey Analysis Report on Peer Review Practices*, 36.8% of the responding organisations do a preliminary selection carried out by the organisation's scientific staff (50%) or by external reviewers based in institutions outside the organisation country (50%). The preliminary selection is based on a preliminary proposal for 85.7% of the respondents, and on a letter of intent for 14.1%. 78.9% proceeds without a preliminary selection; in this latter case the evaluation is based on full proposals for 42.9% of the organisations[65].

Applicants should be provided with clear and concise guidelines for submitting their proposal.

Depending on the aim and scope of the programme, either English or the organisation's national language can be used for the application and review process. However, if international individual/remote reviewers or review panel members are to be selected, the language used should be English.

5.3.1 Eligibility criteria

The main criteria for the eligibility screening are those detailed in §4.3.1, in Part I of this Guide. In the case of Individual Research Programmes that are targeted at researchers starting or consolidating their independent research career, some additional eligibility criteria can be included (see below).

For some calls the Scientific Councils (or standing committees) can decide to consider scientific and other research results as eligibility criteria. So, for (potential) applicants, pre-filtering focused on scientific criteria is already done in a stage of eligibility screening. Hence funding schemes do provide a minimum threshold requirement on the scientific production of the applicants, normally in the form of number of publications over a five-year period prior to the time of the application.

The summary of the results of the survey on peer review practices on most used eligibility criteria applied to *Individual Research Programmes* is provided in the table below:

65. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.7, §4.7.2, Question 94, Table 4.19.

For *Career Development Programmes* the survey's results are the following:

Eligibility Criteria:	Completeness of the application	General fit of the proposal with the Instrument's purpose	Timeliness of the submission	Institutional, regional, national affiliation of applicants	Other
Total of 27 Respondents	92.6% 25/27	70.4% 19/27	74.1% 20/27	66.7% 18/27	51.9% 14/27

For *Career Development Programmes*, and pertinent to the five categories mentioned before, the following specific eligibility criteria may also be considered in addition to the general items provided above:

Eligibility Criteria:	Completeness of the application	General fit of the proposal with the Instrument's purpose	Timeliness of the submission	Institutional, regional, national affiliation of applicants	Other
Total of 25 Respondents	88.0% 22/25	84.0% 21/25	84.0% 21/25	56.0% 14/25	40.0% 10/25

1. Doctoral Training Grants

- Applicant's Career Stage:
  - Full-time graduate students pursuing a doctoral study (diploma equivalent to the minimum qualification needed to study for a doctorate in a given country),
  - Completed graduate coursework (usually for grants awarded by universities a certified list of the exams/courses taken at university, grades/marks awarded and (if applicable) the final degree result is required);
- Two or three letters of recommendation or the names of two or three academic referees.

2. Postdoctoral Fellowships and Grants

- Applicant's Career Stage:
  - Candidates are eligible after the successful completion of their PhD degree,
  - There is a wide-ranging upper limit for the eligibility condition in terms of the time after completion of the PhD degree of the applicants. This range generally varies from four to 10 years;
- Two letters from referees;
- Mobility: Candidates are often required (or encouraged) to conduct their postdoctoral training in universities and institutes other than those they graduate from;
- Appropriateness of the host institution.

3. Grants for the creation of Independent Research Groups

- Applicant's Career Stage:
  - Eligible during the two to 12 year period following the completion of their PhD (exceptions may be made in some organisations for periods not spent in research – notably compulsory military service, parental leave).

4. Advanced career grants

- Applicant's Career Stage:
  - At least 10 years of significant research achievements (for example for the ERC Advanced Grant Scheme: three major research monographs of which at least one is translated into another language – especially for humanities and social science – 10 publications as senior author in major international peer-reviewed multidisciplinary scientific journals, and/or in the leading international peer-reviewed journals of their respective field[66]).

5.3.2 Evaluation criteria

The general evaluation criteria that can be used in these programmes are described in §4.7.2 in Part I of this Guide.

Besides these, for Individual Research Projects particular attention should be devoted to:

- Independent thinking and leadership abilities of the applicant;
- The balance between the disciplines involved in the case of interdisciplinary proposals.

In the case of *Career Development Programmes* some different criteria can be applied according to the target category of the funding programme:

1. Doctoral Training Grants

66. See http://erc.europa.eu/pdf/Guide_for_Applicants_%20Avanced_Grants_2011.pdf pp. 11-12.

- The originality of the Ph.D. project;
- The feasibility (access to the resources, etc.) and the impact of its potential outcomes;
- Applicant's academic performance.

2. Postdoctoral Fellowships and Grants

- Scientific/technological quality and potential of the project;
- Training quality (relevance, capacity, complementary skills, etc.);
- Applicant (experience, publications, suitability to perform the project, etc.);
- Feasibility and implementation (access to infrastructure, management, practical arrangements);
- Impact (on career development).

3. Grants for the creation of Independent Research Groups

- Focus on person;
- Evidence of excellence (awards, achievements, publication record).

4. Advanced career grants

- Outstanding track record of research;
- Proven scholarly and scientific contributions;
- Scientific/research independence;
- Creativity and originality of proposed approaches;
- Unconventional methodologies and investigations.

5.4 Final selection and funding decisions

The final decision is normally taken by a committee or board within or on behalf of the organisation in charge of the programme. Usually the final decision is taken on the basis of a priority list proposed by a review panel and made on the basis of the external peer review recommendations (remote reviews), comments and arguments of applicants, and discussion during a panel session.

According to the ESF Survey Analysis Report on Peer Review Practices, in 40% of the responding organisations the final decision is taken by a Standing Scientific Committee composed of well-established researchers who in turn make their decision based on remote peer review recommendations. In 24% of the organisations the final funding decision is taken by the organisation's executive management that also decides on the basis of the external peer review recommendations[67].

67. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Question 91, Figure 4.1.

6. Collaborative Research Programmes

6.1 Purpose and scope

Collaborative Research Programmes (CRPs) offer opportunities for groups of scientists, researchers and, if appropriate, other specialists from the public and private sectors to join forces in tackling problems that would require joint actions. They promote collaborative research targeting broader or more complex topics of research within or across scientific domains. In general, collaborative research projects are in fact larger in size and scope than typical individual research projects. They must involve several principal investigators and may sometimes comprise more than one individual project. Therefore, CRPs may include projects with more than one set of research goals, work plans or work packages as they may also include different budget lines integrated into a collaborative framework. Moreover, the CRPs are a particularly appropriate vehicle for supporting pluridisciplinary research.

There are variations that may influence specific aspects of the peer review process as elaborated below:

(i) Thematic or non-thematic calls

In the former, the themes or topics that are to be addressed by the project are defined in advance. The proposed research must therefore fall within the thematic or topical scope of the call, and the relevance of the proposal to the call can be an important measure in the peer review evaluation. In non-thematic calls, normally, a broad scientific field or domain of research activity is determined within which collaboration is to be promoted. The scope of the proposals can then vary substantially within that field.

(ii) National versus multinational

Whether a programme is national or international can significantly affect the nature of the required peer review process. The implications can span the whole life-cycle of the process from beginning to end. National programmes can be used to:

- Stimulate research within targeted areas with the goal of enhancing innovation capacities;
- Promote synergies;
- Maintain or enhance research and knowledge base within the country;
- Promote pluridisciplinary research.

Within a larger context, the above-mentioned targets can be defined for a group of countries. These can take the form of bilateral agreements or larger scale multilateral programmes.

According to the survey, from the 30 respondents, 19 organisations have reported that they have *International Collaborative Research Programmes* while only two indicated they (also) have *National Collaborative Research Programmes*[68].

(iii) Responsive (continuous calls) versus non-responsive (through solicited and time-bound calls)

Because of their nature, *it is usually preferable to consider non-responsive mode for managing collaborative programmes,* particularly for multinational collaborative programmes, since they require specific preparatory steps that need careful attention (*e.g.*, programmatic agreements, guidelines, dissemination needs, themes or domains of research, etc.).

68. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular §4.1.2, Table 4.1.

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The results of the survey show that for *International Collaborative Research Programmes* 31% (6/19) of the responding organisations have continuous calls (responsive mode) while 36% (7/19) have indicated that they issue these calls regularly at intervals of 12 months (for 57% of respondents or 4/7) and 24 months (for 42.9% or 3/7)[69].

6.2 Recommended peer review approaches specific to Collaborative Research proposals

In this section some of the specific features will be highlighted. Although there seems to be some degree of variability in the processes and the way these are applied across different scientific domains, the procedures suggested below are meant to apply across various domains.

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According to the survey, for *International Collaborative Research Programmes*, 13 respondents (out of 19) have indicated that in their organisations the procedures and their applications are the same across all scientific domains; while three organisations have indicated that for them the procedures differ only slightly; another three have reported substantial differences across different scientific fields[70].

6.2.1 Proposal submission

Calls may be organised on the basis of *one- or two-stage submissions*. A two-stage process may be most appropriate when a high volume of proposals is expected (and a relatively low success rate). This approach saves time and effort for applicants who are ultimately unsuccessful. Other factors to be considered are the increased total time to a final grant, and the greater administrative effort required of the funding body.

It is generally found that a two-stage approach is more appropriate for collaborative research.

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For *International Collaborative Research Programmes*, 7/19 (36.8%) of the responding organisations have reported that their peer review process contains a preliminary selection. Preliminary selection based on an outline proposal is indicated by the majority of these respondents at 85.7% (6/7); the preliminary selection is carried out both by external reviewers working outside the organisation's country (50% or 3/6) and by organisation's own scientific staff (50%)[71].

In addition to the conventional and most used channels for the diffusion of the call and information on the programme, *National Collaborative Research Programmes* are mainly advertised in the national press and generally at a national level while international collaborative opportunities should be disseminated widely and using diverse means of communication to the appropriate targeted communities.

With regard to the language regime, it is common for proposals to be written in English. This is an important factor when proposals are submitted by multinational teams, and/or when the peer review will be carried out by international panels of experts. However, other national languages may be acceptable in the case of *National Collaborative Research Programmes*, or multilateral collaborations involving a shared common language.

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For *International Collaborative Research Programmes*, the survey shows that 78.9% (15/19) of the participants use English, while 16% (3/19) use the official language(s) in their own country[72].

As described in Chapter 4 it is recommended good practice to provide detailed guidelines for applicants, describing the submission process, the rules of the game, and explaining the subsequent steps in the selection process.

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In *International Collaborative Research Programmes*, 14 out of 19 (73.7%) provide the applicants with detailed Guidelines[73].

6.2.2 Peer Review stages

A *two-stage evaluation process*, which includes individual/remote reviewers (at least three) and a panel assessment, is usually *most appropriate for collaborative research projects*.

69. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Chapter 2, Question 6, Table 2.3.
70. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.1, §4.1.2, Question 6, Table 4.2.
71. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.7, Table 4.17.
72. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.2, Question 78: "Which language is commonly used in the application and review process for this instrument?", Table 4.11.
73. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular §4.2.2, Question 84: "Does your organisation provide the applicants with detailed guidelines (*i.e.* dedicated document) for writing the proposals for this instrument?" (Table 4.6).

Some variants can occur in the number and the typology of the reviewers as individual/remote (external) versus members of the review panel according to the type of proposals.

From the 19 responding organisations for *International Collaborative Research Programmes*, 15 (or 79%) have indicated that they utilise such a two-stage evaluation. According to the results of the survey, 10/15 (or 67%) of the respondents for international collaboration schemes indicate that there is no overlap between the set of individual/remote reviewers and the members of the panel they employ[74].

- **Individual/Remote Reviewers**
  - Conventional proposals: the number can typically vary between three and four; some organisations require at least two;
  - Interdisciplinary proposals: can require a higher number of individual/remote reviewers;
  - Breakthrough proposals: reviewers should be able to flag the transformative character of the proposed research;

According to the survey, seven out of the 10 respondents (with fixed-duration calls for *International Collaborative Research Programmes* using individual/remote reviewers) assign as a minimum 1-10 proposals per individual/remote reviewers. For three of the 10 respondents there is no fixed range. For five respondents 1-10 is both the minimum and the maximum range while five organisations do not specify a range for maximum[75].

- **Confidentiality**

16 out of 17 respondents in the survey have indicated that the identity of the individual/remote reviewers is kept confidential from the applicants. One organisation has indicated that the applicants themselves suggest the reviewers. All 17 organisations disclose the identity of the applicants to the individual/remote reviewers. 14 organisations do not disclose the identity of their individual/remote reviewers, two organisations always disclose this information and one does this only on demand[76].

- **Review panel**
  - Interdisciplinary proposals: The composition of the panel should comprise a core group of experts representing a wide range of disciplines to ensure the necessary disciplinary expertise in any given competition, including where possible individuals who themselves have an interdisciplinary outlook;
  - Proposals per reviewers.

According to the survey, five out of the 10 respondents with fixed-duration calls for *Collaborative Research Programmes* using review panels assign 1-10 proposals per reviewer as both minimum and maximum ranges. One organisation uses 11-20 as both the minimum and maximum ranges and the rest do not apply a fixed range[77].

- **Reader system**

According to the survey, a reader system is rarely used for International *Collaborative Research Programmes* with only one out of the 19 using it[78].

- **Right to reply**

The inclusion of right to reply when applied as part of the peer review process will add to the robustness and quality of the selection process and should be considered whenever feasible.

According to the survey, only 3/19 (or 15.8%) of the respondents include the right to reply (or rebuttal) as a component of the review procedure for *International Collaborative Research Programmes*[79].

6.2.3 Conflicts of Interest

Collaborative proposals often bring together large sections of the available scientific community in a particular field, and so can present particular difficulties when it comes to avoiding conflicts of interest. If the proposal language and thematic content so permit, it is *strongly encouraged to use international reviewers and panels of experts* including experts from emerging countries.

74. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular §4.10.2, Question 99: "Please specify the composition of the review panel." (Figure 4.7).
75. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular §4.12.2, Question 112.4: "How many proposals is every reviewer responsible for on average per call in this instrument?" (Figure 4.11).
76. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.13.
77. European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.12, Table 4.30.
78. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.2, §4.2.2, Question 102, Table 4.5.
79. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.2, §4.2.2, Question 98, Table 4.4.

International Collaborative Research Programmes	Individual/ Remote reviewers	Panel reviewers
Checked by the members of staff in the organisation. If there are conflicts, the potential reviewer is excluded	82.4% 14/17	86.7% 13/15
Reviewers are asked to check for potential conflicts themselves and possibly withdraw from the assessment	82.4% 14/17	73.3% 11/15
Reviewers have to sign a statement confirming that there are no conflicts of interest	58.8% 10/17	66.7% 10/15

According to the survey's results, in response to the question "How is a possible bias/conflict of interest identified on the side of the reviewers in this Instrument?" the following responses were provided for *International Collaborative Research Programmes* (see table above).

6.2.3 Timeline

Collaborative projects can present particular administrative challenges, and funding agencies are encouraged to streamline their procedures as far as possible to minimise the time to grant. For national programmes a shorter timeline is usually possible, and 6 months represents a useful benchmark, whereas a period of the order of 12 months may be the norm for multinational programmes.

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According to the survey, for *International Collaborative Research Programmes* the entire process from submission deadline to grant takes normally about one year with the following stages:

- From launch of the call to deadline for submission (duration of the call): 1-5 months for 10 out of 13 (or 76.9%) respondents with fixed-duration calls. This average is subject to changes according to the particularity of the call and the specific guidelines.
- From proposal submission deadline to funding decision: 6-10 months (13/19 or 68.4%).
- The time granted to the individual/remote reviewers to complete their assessment is 16 to 30 days (for 7/17, or 41%); this range is stated to be 1-15 days for three of the respondents[80].

80. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.3, Table 4.10.

6.3 Processing of applications

6.3.1 Eligibility criteria

Beside the recommended standard criteria (see §4.3.1 in Part I of this Guide), some additional criteria should be considered, depending on the nature of the programme:

- In *National Collaborative Research Programmes*, applicants would usually be expected to be affiliated to a research institution or region in the funding organisation's country;
- In the case of *International Collaborative Research Programmes*, there are normally a minimum number of countries that must be represented by applicants.

Generally it is recommended that in the case of calls requiring interdisciplinary and breakthrough research, the eligibility screening is carried out by experienced and dedicated administrative staff or science officers. Some of the issues surrounding the peer review of these variants are discussed in Part I of the Guide.

The summary of the results of the survey on most used eligibility criteria applied to *Collaborative Research Programmes* is provided in the table below.

6.3.2 Evaluation criteria

With reference to the criteria described in §4.7.2 in Part I of this Guide, the following should be taken into consideration in evaluating collaborative proposals:

- Relevance to the scope of the call (if the scientific scope is described in the call, for example, in the case of thematic calls);
- Evaluation of the applicant implies an evaluation not only of the competence of the project leader, but of the whole proposal team;
- The evaluation of broader impact may be left as a task solely for the panel review, and not necessarily for the individual experts;

Eligibility criteria	Completeness of the application	General fit of the proposal with the Instrument's purpose	Timeliness of the submission	Institutional, regional, national affiliation of applicants	Other
Total of 19 Respondents	94.7% 18/19	78.9% 15/19	78.9% 15/19	73.7% 14/19	36.8% 7/19

- Evaluation of the leadership and management aspects;
- It is good practice to include some form of assessment of:
  - added value: why is a collaborative approach necessary?
  - integration: how well do the teams devoted to various components and work packages link together?
  - synergy: is the proposed work likely to yield benefits greater than the sum of the parts?
- In the specific case of *National Collaborative Research Programmes* the strategic and national importance of the proposed research should also be evaluated. However, this may be a task for the funding body rather than expert evaluators.

6.3.3 Referee assessments

As noted in Part I of this Guide (Chapter 4) it is recommended as good practice to use standard assessment forms and online procedures.

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The survey shows that 88.2% (15/17) of the organisations use online standard assessment forms for the reviews of *International Collaborative Research* proposals made by individual/remote reviewers and 73.3% (11/15) for those used by panel reviewers[81].

81. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.9, Table 4.22.

6.4 Final selection and funding decisions

Final decisions are usually taken by a committee or board within or on behalf of the organisation in charge of the programme.

It is very important to set clear ground rules on the procedure for making final decisions, particularly in the case of transnational programmes. Even when the national organisations maintain the responsibility for final funding decisions nationally, there should be a strong expectation that the ranking established by the expert evaluators will be respected.

In the case of proposals having an equal rank, it may be legitimate for the funding body to differentiate proposals, where necessary, using previously agreed methods. Here, diversity issues (*e.g.*, gender) might be taken into account.

According to the survey results, for *International Collaborative Research Programmes* the following practices have been stated:

	International Collaborative Research Programmes
Organisation's own executive management decides on the basis of peer review recommendations	31.6% 6/19
A standing scientific committee composed of researchers decides on the basis of the peer review recommendations	31.6% 6/19
A board or committee composed of researchers, administrators and/or politicians decides on the basis of the peer review recommendations	26.3% 5/19
The review panel decides	10.5% 2/19

7. Programmes for the Creation or Enhancement of Scientific Networks

7.1 Purpose and scope

Programmes for the *Creation or Enhancement of Scientific Networks* are meant to promote networking, by facilitating discussion and exchange of ideas on a specified thematic area, issue or problem. Unlike the *Collaborative Research Programmes*, these programmes do not contain funding of the research itself. The main aim of *Scientific Network Programmes* is to facilitate interactions among researchers with established research programmes and between researchers and stakeholders, to create interdisciplinary fora, to encourage sharing knowledge and expertise, to develop new techniques and to train new scientists. To this end, the organisation of science meetings (workshops, seminars, conferences or schools), networking activities, exchange visits or other events are supported.

Furthermore, some programmes support activities related to scientific diffusion, such as the publication of information brochures and leaflets, CDs, books and meeting proceedings as well as the creation and management of dedicated scientific websites or scientific databases. These networks may also serve to stimulate new debate across boundaries, for example, disciplinary, conceptual, theoretical, methodological, at national and (especially) at international level. This may lead in particular to later pluridisciplinary proposals.

There are variations that may influence specific aspects of the peer review process as elaborated below:

(i) Thematic or non-thematic calls

In the former, the theme or topics to be addressed by the project are defined in advance. The proposed network must therefore fall within the thematic or topical scope of the call, and the relevance of the proposal to the call can be an important measure in the peer review evaluation. In non-thematic calls, a broad scientific field or domain is normally determined within which collaboration is to be promoted. The scope of the proposals can then vary substantially within that field.

(ii) National versus multinational

Whether a programme is national or international can significantly affect the nature of the required peer review process. The implications can span the whole life-cycle of the process from beginning to end. National programmes can be used to:

- Create new networks in order to stimulate research within targeted areas with the goal of enhancing synergy;
- Further enhance synergies among disparate existing networks;
- Extend the scope of national networks into international arenas;
- Promote and/or create pluridisciplinary networks.

Within a larger context, the above-mentioned targets can be defined for a group of countries. These can take the form of bilateral agreements or larger scale multilateral programmes.

According to the survey, from the 30 respondents,

only six organisations have indicated that they have programmes for the *Creation or Enhancement of Scientific Networks*[82].

(iii) Responsive (continuous calls) versus non-responsive (time-bound calls)

Because of their nature, it is usually preferable to consider the non-responsive mode for managing networking programmes, particularly for multinational programmes, since they require specific preparatory steps that need careful attention (*e.g.*, programmatic agreements, guidelines, dissemination needs, themes or domains of research, etc.).

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The results of the survey show that for programmes for the *Creation or Enhancement of Scientific Networks*, from the six respondents, one has indicated a continuous call and four with calls at regular intervals, of 6 months (for 1/4 respondents) and 12 months (for 3/4).

7.2 Recommended peer review approaches specific to Scientific Network proposals

In this section some of the specific features will be highlighted. Although there seems to be some degree of variability in the processes and the way these are applied across different scientific domains, the procedures suggested below are meant to apply across various domains.

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According to the survey, for the *Creation or Enhancement of Scientific Networks*, all six respondents have indicated that their procedures are the same across all disciplines.

7.2.1 Proposal submission

Calls may be organised on the basis of one- or two-stage submissions. A two-stage process may be most appropriate when a high volume of proposals is expected (and a relatively low success rate).

Other factors to be considered are the increased total time to a final grant, and the greater administrative effort required of the funding body. It is generally found that a single submission stage may be sufficient.

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For programmes for the *Creation or Enhancement of Scientific Networks* two of the six respondents of the survey have indicated that they have preliminary selection, with one using outline proposals and the other based on full proposals.

With regard to the language regime, it is common for proposals to be written in English. This is an important factor when proposals are submitted by multinational teams, and/or when the peer review will be carried out by international panels of experts. However, other national languages may be acceptable in the case of national network programmes, or multilateral collaborations involving a shared common language.

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For the *Creation or Enhancement of Scientific Networks* programmes, three out of six organisations responded that English is used as the language of their calls and two organisations (33%) stated that they use their own country's official language(s).

As described in Part I of this Guide (Chapter 4) it is recommended good practice to provide detailed guidelines for applicants, describing the submission process, the rules of the game and explaining the subsequent steps in the selection process.

7.2.2 Peer Review stages

A *two-stage evaluation process*, which includes individual/remote reviewers (at least three) and a panel assessment, is usually is the *most appropriate*. However, for *Scientific Network Programmes* a *single stage may be sufficient*.

Some variants can occur in the number and the typology of the reviewers as individual/remote (external) versus members of the review panel according to the type of proposals.

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For programmes for the *Creation or Enhancement of Scientific Networks* two out of the six survey respondents reported using a two-stage selection process: one utilises fully disjointed individual/remote reviewers and panel members, the other one sometimes allowing some overlap between the two sets.

- **Individual/Remote Reviewers**
  - Conventional proposals: the number can typically vary between three and four;
  - Interdisciplinary proposals: can require a higher number of individual/remote reviewers;
  - Breakthrough proposals: reviewers should be able to flag the transformative character of the proposed research;
  - Confidentiality: similar to the Collaborative Research programmes discussed in the previ-

82. See European Science Foundation (2010b), *ESF Survey Analysis Report on Peer Review Practices*, in particular Section 4.1, Table 4.1.

ous chapter, and using the results of the survey, it is recommended to keep the identity of the reviewers confidential as much as possible. In some European countries, due to constitutional requirements on openness of the peer review process, this may not be possible.

- **Review Panel**
  - Interdisciplinary proposals: the composition of the panel should comprise a core group of experts representing a wide range of disciplines to ensure the necessary disciplinary expertise in any given competition, including where possible individuals who themselves have an interdisciplinary outlook;
  - Proposals per reviewer.

- **Reader system**

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According to the survey, none of the six respondents for *Creation or Enhancement of Scientific Networks* programmes have indicated the usage of reader system.

- **Right to reply:**
  The inclusion of right to reply when applied as part of the peer review process will add to the robustness and quality of the selection process and may be considered whenever feasible. Although, for programmes for the *Creation and Enhancement of Scientific Networks*, none of the six respondents have indicated its use.

7.2.3 Conflicts of Interest

Networking proposals often bring together large sections of the available scientific community in a particular field, and so can present particular difficulties when it comes to avoiding conflicts of interest. If the proposal language and thematic content so permit, it is strongly encouraged to use international reviewers and panels of experts including experts from emerging countries.

According to survey results, in response to the question "How is a possible bias/conflict of interest identified on the side of the reviewers in this Instrument?" the following responses are provided for programmes for the *Creation or Enhancement of Scientific Networks* (see table below)

7.2.4 Timeline

Since Networking programmes normally do not contain funding for research, funding agencies are encouraged to streamline their procedures as far as possible to minimise the time to grant.

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For programmes for the *Creation or Enhancement of Scientific Networks*, the consensus of the six respondents indicates that their process takes about 10 months with the following breakdown:

- Duration of the call: 1-5 months for 3/6 organisations.
- From proposal submission deadline to funding decision: 1-5 months for 3/6 respondents.

7.3 Processing of applications

7.3.1 Eligibility criteria

Beside the recommended standard criteria (see §4.3.1 in Part I of this Guide), some additional criteria should be considered for networking proposals:

- It is good practice to indicate what is expected to be an optimum range for the number of partners, while still allowing proposals falling outside of this range, duly justified;
- in order to maximise viability and in light of the fact that these grants normally do not include funding of research, it may be considered to include criteria that would ascertain the existence of current and relevant research funding at the disposal of the participants.

Generally it is recommended that in the case of calls requiring interdisciplinary and breakthrough research, the eligibility screening is carried out by experienced and dedicated administrative staff or

Programmes for the *Creation or Enhancement of Scientific Networks*	Individual/ Remote reviewers	Panel reviewers
Checked by the members of staff in the organisation. If there are conflicts, the potential reviewer is excluded	100.0% 3/3	100.0% 3/3
Reviewers are asked to check for potential conflicts themselves and possibly withdraw from the assessment	66.7% 2/3	100.0% 3/3
Reviewers have to sign a statement confirming that there are no conflicts of interest	66.7% 2/3	100.0% 3/3

Eligibility criteria:	Completeness of the application	General fit of the proposal with the Instrument's purpose	Timeliness of the submission	Institutional, regional, national affiliation of applicants	Other
Total of 6 Respondents	83.3% 5/6	66.7% 4/6	66.7% 4/6	16.7% 1/6	83.3% 5/6

science officers. Some of the issues surrounding the peer review of these variants are discussed in Part I of the Guide.

The results of the survey on most used eligibility criteria applied to programmes for the *Creation or Enhancement of Scientific Networks* are summarised in the table above.

7.3.2 Evaluation criteria

With reference to the criteria described in §4.7.2 in Part I of this Guide, the following should be taken into consideration in evaluating networking proposals:

- Scientific Quality: As mentioned before, proposals submitted for the creation of scientific networks do not contain request for research funding, and therefore scientific quality is less relevant for evaluating these proposals. Instead, the scientific context and rationale for creating the network should be considered, *e.g.*, why would such a network be needed or add value?
- Assessment of applicants might involve not only the core team submitting the proposal but also the wider network which they plan to form, and the criteria (possibly including diversity issues) to be used to that end;
- When briefing experts, it is important to emphasise the main intention of this type of grants and that it is not meant to fund research activities.

As noted in Part I of this Guide (Chapter 4) it is recommended as good practice to use standard assessment forms and online procedures.

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For programmes for the *Creation or Enhancement of Scientific Networks*, the survey shows that for the individual/remote reviewers only two of the three respondents provide standard assessment forms and both do this electronically, while for panel reviewers two of the three provide paper copies of the forms and one makes available electronic assessment forms.

7.4 Final selection and funding decisions

Final decisions are usually taken by a committee or board within or on behalf of the organisation in charge of the programme.

It is very important to set clear ground rules on the procedure for making final decisions, particularly in the case of transnational programmes. Even when national organisations maintain funding decisions nationally, there should be a strong expectation that the ranking established by the expert evaluators will be respected.

In the case of proposals having an equal rank, it may be legitimate for the funding body to differentiate proposals, where necessary, using previously agreed methods. Here, diversity issues (*e.g.*, gender) might be taken into account.

According to the survey results, for programmes for the *Creation or Enhancement of Scientific Networks* the following practices have been stated:

	Programmes for the *Creation or Enhancement of Scientific Networks*
Organisation's own executive management decides on the basis of peer review recommendations	33.3% 2/6
A standing scientific committee composed of researchers decides on the basis of the peer review recommendations	16.7% 1/6
A board or committee composed of researchers, administrators and/or politicians decides on the basis of the peer review recommendations	16.7% 1/6
The review panel decides	0.0% 0/6

8. Centres of Excellence Programmes

8.1 Purpose and scope

This funding line is dedicated to proposals, often submitted by a large group(s) of researchers, which target the establishment of an institutional or regional centre for given areas of research. Such centres should encourage the pursuit of excellence in research at national and international levels, promoting knowledge, technology transfer, training and international competitiveness. The centre might also interlink research institutions, establish research topic priorities and promote high-quality research in the long term. When applicable, the centre should integrate research and enterprises, and also represent a solid base for national and international innovation. Centres should harness existing research talent and be attractive to new world-class researchers, as well as making efficient use of the existing resources[83].

Proposals in this type of programme are usually funded for a long period of up to 10 years, although their longer-term sustainability (beyond 10 years) and evolution are vital considerations that should be incorporated into the longer view when planning new calls, making funding decisions and progressing reviews.

It is also important to recognise and encourage different models of centres. For instance, both physical centres and virtual centres involving networks of smaller groups and clusters are increasingly relevant and should be included in the key considerations made in this chapter. Also, if a centre presents a national resource, the means by which access to that resource is organised and funded needs to be given careful evaluation. An example might be a national access programme, where projects with specific investigators at a national level are undertaken within the centre.

The review of centres of excellence presents unique and specific challenges, making it important to fully appreciate that no single mechanism of review will accommodate the various possible models and structures that proposals for centres may include. While it is only possible to present key principles in this chapter, it is important to recognise that different approaches of peer review should taken in the design of a particular call.

8.2 Recommended peer review approaches specific to Centre of Excellence proposals

In this section some of the specific features of the overall process will be highlighted. Although there seems to be some degree of variability in the process, the procedures suggested below are meant to apply across various domains.

A high-level illustration of the main components of the selection process applicable to the creation of centres of excellence is provided in Figure 11.

8.2.1 Proposal submission

In the case of a multi-stage process, the call can include a pre-proposal or letter of intent. This stage of a pre-proposal or letter of intent evaluation often requires a panel or remote-based evaluation (followed by internal agency considerations) resulting in the selection of a small number of proposals that will progress to the next stage. Full proposals will be specifically invited (following the first stage of review) or will be received during the call opening period in the case when no pre-proposal is required (see below).

83. See Academy of Finland (2001).

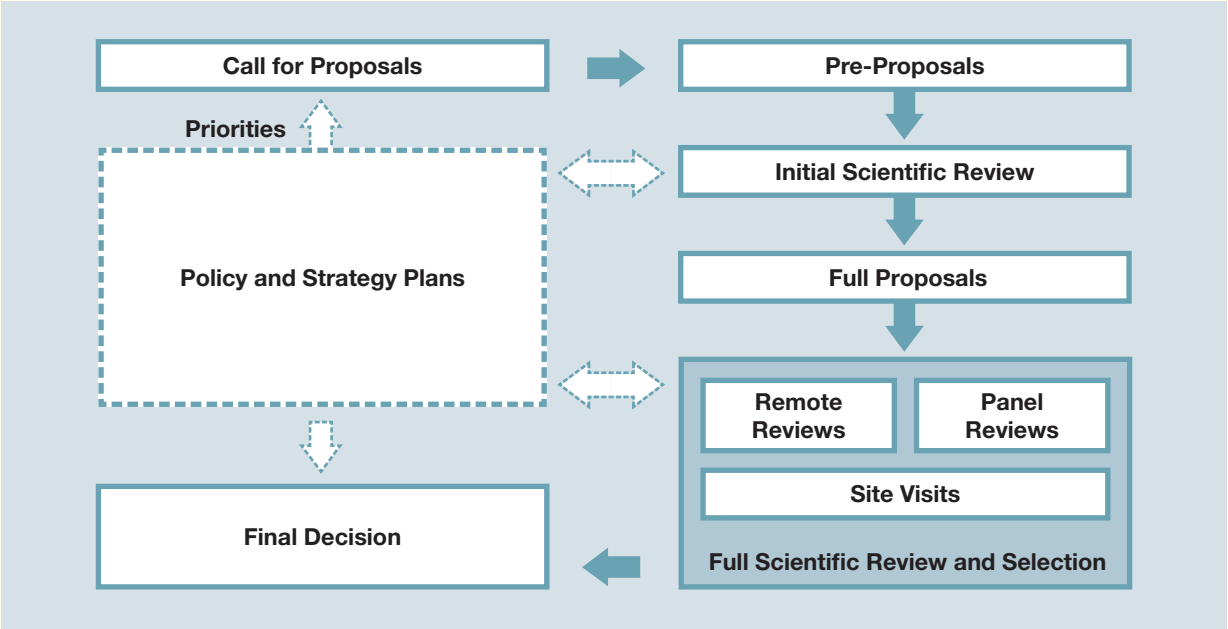

Figure 11. Overview of the whole process for the peer review and selection of Centres of Excellence

8.2.2 Peer review stages

Peer review as part of the evaluation of a *Centres of Excellence* programme will usually be a *two- or three-stage process,* utilising high-level and experienced reviewers culminating in a panel-based site review, usually conducted by the same members (or extended version) of the panel involved in earlier stages of review. In addition, it is likely that a form of strategic review will be incorporated in the process, so that national priorities and the needs of industry can be appropriately assessed. The process in fact may begin with a strategic decision for area(s) of national priority, resulting in open calls or dedicated calls for thematic areas or grand challenges.

Although several stages are likely to be involved in the review of centre proposals, other models, such as specifically invited applications or one-stage review, may also be appropriate.

In the case of a multi-stage process, the following are likely to be incorporated:

- **Call for proposals:** The call can optionally include a pre-proposal or letter of intent;
- **Pre-selection:** This stage of a pre-proposal or letter of intent evaluation often requires a panel or remote-based evaluation (followed by internal agency considerations) resulting in the selection of a small number of proposals that will progress to the next stage;
- **Formal invitation for full application**: Full proposals will be specifically invited (following the first stage of review) or will be received during the call opening period in the case when no pre-proposal is required;
- **Remote written reviews:** The full application will usually be sent for evaluation by individual/remote experts who submit detailed written reviews. The reviews will usually contain sections focusing on the detailed scientific proposal, track record of the applicants, as well as other criteria that are outlined in later sections and also considered by the visiting panels;
- **Panel site visit(s) and scientific review:** For centres of excellence, particularly those of large scale, a detailed site visit is critical. These will ideally use an international panel of experts with a broad range of expertise and experience. The panel will often include experts who provide some of the written evaluations from earlier stages.
  - Centres are often, but not necessarily, defined by their pluri-interdisciplinary nature and the panel constitution should be tailored to reflect such differences.
  - As with the written reviews, the panel will evaluate scientific quality of the proposal and competence of the applicants. The review may very likely also examine areas such the governance and management of the centre, training and education and possibly any industrial collaborations that the centre may have.
- **Strategic review**: A strategic evaluation of a centre proposal may often be required and should be made in the context of the scientific review, but performed separately. It may consider the following criteria:
  - National priorities, other science policy issues;
  - May involve a variety of national agencies and

other relevant stakeholders, scientists and industry experts. Importantly, the potential for such stakeholders to overtly influence the final funding decision needs to be carefully taken in to account;
  - As outlined in Figure 11 a formal strategic review may be specifically undertaken as part of the full review, although more generally the national policy and strategy plans, or those of the funding agency, may influence any stage of the process, from the launch of the call to the final decision.
- **Progress Reviews:** Once funded the centre will likely be subject to progress evaluations over its lifetime. This is especially important given that the review may often be made prior to the start of the centre and any physical structure. Progress reviews should be regular and begin as soon as the project is underway and may take the form of agency visits and scientific panel-based site visits.

8.2.3 Timeline

The timeline for evaluating centres is by necessity often extensive, largely because of the scale of the projects and the requirement for two or three principal review stages and site visits.

- The timeline for centres will inevitably be influenced by the scale and scope of the project, as well as by the extent of interdisciplinary research or if large networks are involved. Nevertheless, it would generally be expected that an 18-month time frame would be usual between the call launch and the funding decision.
- Mechanisms should be put in place within the review process to ensure that scientific evaluation is executed within defined time periods, to avoid unnecessary delays in the process. The process is well coordinated with the strategic review that will take place in a 'parallel mode'.
- Timelines and procedures should be established ahead of the call and delineated on procedural maps.

8.3 Processing of applications

Commonly, applications will be submitted directly by the institutions, or have a clear documentation of support by the principal institution(s). A number of additional points should be made in processing these applications:

- Optimally, dedicated Programme Officers should be assigned to the application and be responsible for looking after it, from the application through to the funding decision. It is also ideal if the same programme officer takes custody of the award after it has been made, so that major issues can be dealt with efficiently as they arise and so that working knowledge of the award can be brought to bear during further evaluation and progress reviews;
- Strong administrative support will be needed by the agency in managing the review process and resources appropriate with the scale of the investment should be provided and decided well ahead of the start of the review process;
- In case of preliminary selection, clear guidelines for succinct and well written pre-proposals should be given to aid effective panel evaluation.

Preliminary selection

The outline of the proposal accompanied by an expression of interest and/or letter of intent will be evaluated internally by the funding agency in conjunction with individual/remote reviewers in the first stage of the peer review process.

Preliminary selection can involve remote or physical panel input. This will be followed by internal agency considerations of the reviews.

For applications that are not progressed beyond this initial stage, a good level of feedback should be provided, given the potential scale and scope of the projects in such applications. This may be done via face to face meetings between the agency and applicants.

8.3.1 Eligibility criteria

Eligibility criteria for applications will be largely similar to those of other proposals in other funding instruments (for the standard criteria see Section 4.5 in Part I of this Guide). However, some specific eligibility considerations related to *Centres of Excellence* programmes that may apply are as follows, in particular in the case of proposals involving a host institution:

- The host institution should be an eligible research body in the eyes of the funding agency, (also for other partners if the centre represents a network cluster of collaborating centres);
- The host institution should present the application through its research office, signed by an appropriately senior individual (Dean or Provost of the University, for example);
- Appropriate evidence of support should be presented by the host institution.

8.3.2 Evaluation criteria

The evaluation of the proposal will not only concern the scientific quality of the proposal and of the

applicant(s) (for the standard criteria see §4.7.2 in Part I of this Guide) but, according to the specificity of the programme, the following criteria can be also taken into consideration:

- Scientific profile and excellence of the key leaders in the project;
- Excellence of the research plan;
- Feasibility of the research plan;
- Business plan including a proposed budget;
- Good management, governance oversight and clear strategic aims;
- Level of potential impact for the research system (at both national or international levels);
- Interdisciplinary nature of the project and collaborative efforts;
- Long-term potential impact and sustainability;
- For existing research centres: progress report in which is described the centre's progress in achieving its own goals and objectives since the last review was undergone[84].

Additional criteria will also be evaluated:

- Whether the centre will provide an innovative and target-oriented research environment;
- Whether the application presents a clear and challenging research vision;
- Whether there is clear documentation of efficiency of the proposed administration;
- Critical mass of the researchers in the proposed centre;
- Promotion of young researchers and training at all stages – career progression;
- Gender balance;
- National and international collaboration/networking provided;
- Expected international impact;
- Societal impact.

Ongoing evaluation of the award once it has been made

- Evaluation of large centres will require ongoing monitoring of the award and with investments of this scale will usually also require independent peer review.
- Regular reporting to the funding agency on outputs and performance of the centre will be vital. This is ideally done at pre-defined intervals (*e.g.*, half-yearly or quarterly) using standard reporting documentation. This may also involve a specific reporting structure such as: Governing Board, host institution's research office, funding agency.
- Progress reviews and mid-way evaluation by external reviewers will also help in effective monitoring of the award and early detection of problems and issues.
- Managing conflicts will be important, given the size of awards.
- Again, the above issues will benefit from the familiarity of an experienced officer within the agency which would be important in helping to facilitate this.

8.3.3 Budget

Financing for centres is a long-term commitment and financing should aim to achieve a balance between investment and operational resources and resources to enable researchers to conduct their work. Governance and management plans will be essential to include in the budgets presented for evaluation.

It is important to understand how researchers will be funded under their own grants and how much central funding under the *centre award* will contribute to their support and those of their teams. In addition, it is also important to understand how common shared resources, such as equipment and large infrastructural facilities will be funded and managed (*e.g.*, indirect funds such as overheads and how the host institution will use these in supporting the centre need careful evaluation, *e.g.*, operational costs such as energy, rent and salaries). Supplementary awards for usage, such as equipment charges and other access, need particular clarity to avoid double costing on awards.

8.4 Final selection and funding decisions

The final decision to fund will be made by the funding agency taking into account all the above input. Internal agency procedures for assessing the case for final funding decisions should be decided upon before the launch of the call to ensure fairness and consistency.

84. See the Program Guide for the Centres of Excellence for Commercialization and Research (CECR) – of the Networks of Centres of Excellence of Canada at: http://www.nce-rce.gc.ca/ReportsPublications-RapportsPublications/CECR/Program-Guide-Programme_eng.asp#eligib (May 2010).

9. New Research Infrastructures Programmes

9.1 Purpose and scope

This funding line is dedicated to supporting the creation of new Research Infrastructures (RIs). According to the definition of the European Strategy Forum on Research Infrastructures (ESFRI), RIs are defined as follows[85]:

The term 'research infrastructures' refers to *facilities, resources and related services* used by the scientific community to conduct top-level research in their respective fields, ranging from social sciences to astronomy, genomics to nanotechnologies. Examples include singular large-scale research installations, collections, special habitats, libraries, databases, biological archives, clean rooms, integrated arrays of small research installations, high-capacity/high-speed communication networks, highly distributed capacity and capability computing facilities, data infrastructure, research vessels, satellite and aircraft observation facilities, coastal observatories, telescopes, synchrotrons and accelerators, networks of computing facilities, as well as infrastructural centres of competence which provide a service for the wider research community based on an assembly of techniques and know-how.

RIs may be 'single-sited' (a single resource at a single location), 'distributed' (a network of distributed resources), or 'virtual' (the service is provided electronically).

As a consequence of the *EUROHORCs and ESF Vision on a Globally Competitive ERA and their Road Map for Actions*[86], an ESF Member Organisation Forum on Research Infrastructures was launched in particular for discussing and sharing best practice in funding and operating research infrastructures. Delegates from more than 30 member organisations and convened observers from the European Commission, ERC, ERF, ESFRI and ALLEA work within this framework on a joint understanding of modern research infrastructures, with evaluation being a major focus. Readers of this chapter are strongly recommended to consult the dedicated MO Forum on Research Infrastructures for more specific information [87,88].

Research infrastructures vary widely, not only in the scientific fields and communities they serve, but also in their organisational form, their size and – last but not least – their costs. There are probably almost as many ways of establishing a new research infrastructure as there are research infrastructures themselves.

The ESFRI process, for instance, has foreseen an individual preparatory phase for each ESFRI project of typically two to four years to define the governance and legal model, the funding streams and the operational model. But the ESFRI roadmap contains only mature projects that have already been developed to a certain expected degree of maturity by the scientific community. Altogether it usually takes several, if not many, years from the original idea to the beginning of the construction phase. In the

85. See the website of the European Commission on research and infrastructures: http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=what

86. The Road Map can be downloaded at: http://www.esf.org/publications/science-policy-briefings.html

87. See http://www.esf.org/activities/mo-fora/research-infrastructures.html; also see Swedish Research Council's Guide to Infrastructure, 2007, 2nd edition, Stockholm.

88. The support and development of European RIs is also the subject of the European Council Regulation, dated 25 June 2009, entitled *Community legal framework for European Research Infrastructure Consortium (ERIC)* available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:206:0001:0008:EN:PDF

course of developing a new research infrastructure there will typically be one or several steps where peer review will be used to assess a proposal asking for funding or for political support.

This chapter will not deal with the whole process towards the decision to build a new RI. Instead it concentrates on the peer review steps included in the process, which are also applicable to small scale Research Infrastructures. In addition to the general aspects of peer review discussed in Part I, in this section some of the specific features relevant to selection of RI proposals will be indicated.

9.2 Recommended peer review approaches specific to New Research Infrastructure proposals

Research infrastructures are often of unique character and can be quite expensive, concerning both the costs of implementation and the running costs. Medium- to long-term commitments are in many cases required in order to recruit the staff, to maintain and renew equipment, to update databases and so forth. Thus, the establishment of RIs will typically not follow uniform procedures but is rather the result of complex, sometimes dedicated discussions on the needs and requirements of the research community.

Moreover, infrastructures will often represent both nationally and internationally relevant investments. Sometimes, it will be critical to ensure that the review and evaluation should carefully consider how the projects align to European research agendas or national/European road maps, *e.g.*, ESFRI, Joint Programming, etc. On the other hand, distributed RIs require special consideration of the collaboration and networking of the sites forming a research infrastructure while the costs of a part of the distributed RI might not be so critical. Information-based RIs might focus on adoption of accepted standards or working in close connection with similar RIs elsewhere.

There are many other features that might play a significant role. Therefore it is difficult to establish merely a set of procedures covering all research infrastructures. However, some common elements can be identified that are strongly recommended to be part of any modern funding scheme, be it an open programme, a specific call, or even a tailor-made process.

- Any process towards the establishment of research infrastructures should contain a peer review step. Already within the initial steps towards the idea of a new research infrastructure one has to consider if the infrastructure will meet the needs of the scientific community and carry out an assessment of the scientific scope and (inter)disciplinary nature of the project. Regardless of how this stage of the discussion is conducted[89], there should be a call for a detailed proposal. This is the moment at which peer reviewing is required to ensure the assessment and selection of the applications. Peer review will usually be the method of choice to measure the success of an established research infrastructure.
- Review panels will be established with membership from scientific experts, active scientists and also experts in evaluating and/or managing infrastructures and large capital projects[90]. It might be reasonable to nominate members who would serve for designated periods if the future evaluation of the RI can already be foreseen. This would allow continuity, experience and competency to review infrastructural projects to be retained.
- The review process will typically be based on a proposal indicating the scientific and strategic concept of the RI. The process may additionally offer the opportunity to discuss open questions with the applicants. The review panel would primarily assess the scientific merit of the application according to a well-defined set of critical criteria, as well as other review criteria as described below.
- The review panel evaluation report will form the most important basis for the final selection of the proposal.
- In addition to the review panel there is a decision board with membership different from the review panel. This decision board might consider additional aspects such as strategic goals, financial budgets and others. The discussion in the decision board would benefit from the evaluation report provided by the review panel.

9.2.1 Timeline

Like the Centres of Excellence, infrastructural projects, particularly those larger projects, require longer timelines for the whole decision process.

89. It might be a competitive process selecting a proportion of projects for further evaluation which would already mean a peer review process on initial concepts. In other cases, individual or political decisions might determine the procedure.
90. Though not in the focus of this chapter but for the sake of completeness, peer review will also be used in any cases of major updates or upgrades of existing RIs, for instance of instrumentation, databases, etc. Finally, peer review plays a role in assessing proposals submitted to RIs to get access to the RIs' resources.

Exceptions may be smaller awards, such as databases described above.

Although timelines may inevitably be protracted, mechanisms should be incorporated to minimise delays.

9.3 Processing of applications

In evaluating research infrastructure projects it is essential to consider the full life-cycle of the project – from concept and construction to operation and phase-out. Though it is essential that the funding should facilitate long-term planning and promote long-term projects in operating and using infrastructures, a proposal has to focus on the funding period which could for instance be a five-year term.

Two particular aspects of the peer review when applied to RI are eligibility and evaluation criteria. The first set of criteria will determine which proposals are accepted to go through the peer review and which ones will not be accepted. Evaluation criteria are used for the peer review and selection process to determine comparative merits of competing proposals.

9.3.1 Eligibility criteria

Applicants will generally be eligible research bodies or institutions, although in other cases applications may be made directly by scientists, with commitment of support from the host institution. National eligibility criteria will apply.

9.3.2 Evaluation criteria

The evaluation concerns not only the scientific quality of the proposal and competence of the applicants, but also the detailed evaluation of the infrastructure itself. National or European priorities might play a significant role as well. Usually, the criteria for assessing proposals on research infrastructure will comprise the scientific excellence of the research to be performed, the management of the infrastructure, and the service the infrastructure can provide. A set of criteria could, for instance, verify that the infrastructure should:

- Provide scope for unique, outstanding research;
- Represent a truly relevant resource to be used by several research groups/users with highly advanced research projects;
- Be of broad national or European interest;
- Have clear plans for maintenance and management of the infrastructure;
- Have a long-term plan addressing scientific goals, financing and use;
- Be open and easily accessible for researchers and have a plan for improving accessibility (concerns both use of the infrastructure, access to collected data and presentation of results).

Other criteria that may be addressed are:

- Training requirements and availability of the programmes (*e.g.*, seminars, workshops) associated with the infrastructures;
- Concepts for scientific service (*e.g.*, sample preparation, data analysis, etc.);
- Contribution to the development or enhancement of relevant standards.

Apart from judging the fulfilment of the criteria above, there is also an assessment of the infrastructure's relevance to the research that it intends to support. In addition, an assessment of the infrastructure's potential users is also included in the evaluation.

9.3.3 Budget

Financing for research infrastructures is usually long-term funding. Financing should aim to achieve a balance between investment and operational resources and resources to enable researchers to use the infrastructures. A planning grant, which could run for one or two years, is adequate when an infrastructure is in a preparatory phase. The planning grant will essentially cover costs for salaries, meetings, maintenance of the equipment, training, etc.

An investment grant is suitable for an infrastructure in the construction phase and would fund essentially equipment and salaries/material for the construction.

Finally, for an infrastructure in operation, an operation grant, which would essentially fund operational costs like energy, rent and salaries, is adequate.

Governance and management plans will be essential to include in the budgets presented for evaluation. It may be suitable to have:

- Different budget lines for the different phases of a research infrastructure;
- Supplementary awards for usage – but also avoiding double costing on awards;
- Personnel dedicated to building up infrastructure as opposed to those engaged directly in research need to be included.

9.4 **Final selection and funding decisions**

The final decisions on selection and funding should include broad strategic relevance and importance of the infrastructure for research, or its role in building up expertise.

The funding decisions are usually taken by boards described above. The government(s) involved or the funding bodies will establish these decision boards. The final selection of which infrastructures to fund is based upon the recommendation made in the peer review process described above.

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Part III
Appendices

Appendix 1. **Glossary**

***Ad hoc* (scientific) committee**
Committee set up for a limited duration (typically less than one or two years) and for a particular purpose.

Administrative staff
Staff members who are mainly responsible for supporting the scientific staff and dealing with routine tasks.

Eligibility criteria
The minimum conditions which a proposal must fulfil if it is to be retained for further evaluation.

Evaluation criteria
The criteria against which eligible proposals are assessed by independent experts.

Expert
An individual who is qualified to evaluate a research proposal, by virtue of his or her scientific background, and/or by knowledge of broader aspects relevant to the evaluation process.

Funding instrument
An activity with the aim of distributing funding based on explicit requirements. These requirements are typically related to scientific focus, eligibility, competitive selection, etc. A funding organisation will normally make use of a number of instruments to meet its needs.

Grants
Funding awarded through *competitive merit-based selection*: competitive selection of proposals on the basis of the quality of the applicant(s) and/or the quality of the proposed research activity and/or the quality of the research environment.

Incentives
Distribution of monetary or other forms of rewards meant to motivate and encourage participation in peer review.

Individual/remote review
The evaluation of a proposal by one or more experts who do not discuss their views with other experts. In some organisations these are also referred to as 'external reviewers'.

Letter of intent
Short document containing a brief scientific summary and a list of participating scientists and/or institutions, stating the interest to apply for funding. This is the first step in expressing interest and is normally followed by a more detailed proposal.

Panel review
The collective evaluation of a number of proposals by a group of experts, involving a discussion or other interaction before arriving at a conclusion.

Peer review
The process of evaluating research applications (proposals) by experts in the field of the proposed research.

Preliminary or outline proposal
Research proposal containing an overview of the scientific scope of the project, the requested budget, project plan and the scientist(s) involved.

Redress
Formal opportunity offered to the applicants of proposals under peer review to clarify correction of procedural mistakes and/or legal issues, after the final decision.

Scientific staff
Staff members who are mainly responsible for tasks needing scientific experience, background or judgment, for example, on selection of reviewers, writing of review minutes, reports, analysis, etc.

Standing (scientific) committee
Committee set up with a mandate for a relatively longer duration (typically several years) and for one or multiple purposes.

Appendix 2. **ESF Survey Analysis Report on Peer Review Practices**

The results of the ESF survey on peer review practices are available in the *ESF Survey Analysis Report on Peer Review Practices* through the ESF website at:

http://www.esf.org/activities/mo-fora/peer-review.html

European Code of Conduct for Research Integrity

This code – developed through a series of workshops involving the ESF (European Science Foundation) and ALLEA (All European Academies) – addresses the proper conduct and principled practice of systematic research in the natural and social sciences and the humanities. It is a canon for self-regulation, not a body of law. It is not intended to replace existing national or academic guidelines, but to represent Europe-wide agreement on a set of principles and priorities for the research community.

The Code

Researchers, public and private research organisations, universities and funding organisations must observe and promote the principles of integrity in scientific and scholarly research.
These principles include:

- honesty in communication;
- reliability in performing research;
- objectivity;
- impartiality and independence;
- openness and accessibility;
- duty of care;
- fairness in providing references and giving credit; and
- responsibility for the scientists and researchers of the future.

Universities, institutes and all others who employ researchers, as well as agencies and organisations funding their scientific work, have a duty to ensure a prevailing culture of research integrity. This involves clear policies and procedures, training and mentoring of researchers, and robust management methods that ensure awareness and application of high standards as well as early identification and, wherever possible, prevention of any transgression.

Fabrication, falsification and the deliberate omission of unwelcome data are all serious violations of the ethos of research. Plagiarism is a violation of the rules of responsible conduct vis-à-vis other researchers and, indirectly, harmful for science as well. Institutions that fail to deal properly with such wrongdoing are also guilty. Credible allegations should always be investigated. Minor misdemeanours should always be reprimanded and corrected.

Investigation of allegations should be consistent with national law and natural justice. It should be fair, and speedy, and lead to proper outcomes and sanctions. Confidentiality should be observed where possible, and proportionate action taken where necessary. Investigations should be carried through to a conclusion, even when the alleged defaulter has left the institution.

Partners (both individual and institutional) in international collaborations should agree beforehand to cooperate to investigate suspected deviation from research integrity, while respecting the laws and sovereignty of the states of participants. In a world of increasing transnational, cross-sectional and interdisciplinary science, the work of OECD's Global Science Forum on *Best Practices for Ensuring Scientific Integrity and Preventing Misconduct* can provide useful guidance in this respect.

The principles of research integrity

These require *honesty* in presenting goals and intentions, in reporting methods and procedures and in conveying interpretations. Research must be *reliable* and its communication fair and full. *Objectivity* requires facts capable of proof, and transparency in the handling of data. Researchers should be *independent* and *impartial* and communication with other researchers and with the public should be *open* and honest. All researchers have a *duty of care* for the humans, animals, the environment or the objects that they study. They must show *fairness* in providing references and giving credit for the work of others and must show *responsibility for future generations* in their supervision of young scientists and scholars.

Misconduct

Research *misconduct* is harmful for knowledge. It could mislead other researchers, it may threaten individuals or society – for instance if it becomes the basis for unsafe drugs or unwise legislation – and, by subverting the public's *trust,* it could lead to a disregard for or undesirable restrictions being imposed on research.
Research misconduct can appear in many guises:

- *Fabrication* involves making up results and recording them as if they were real;
- *Falsification* involves manipulating research processes or changing or omitting data;
- *Plagiarism* is the appropriation of other people's material without giving proper credit;
- Other forms of misconduct include *failure to meet clear ethical and legal requirements* such as misrepresentation of interests, breach of confidentiality, lack of informed consent and abuse of research subjects or materials. Misconduct also includes *improper dealing* with infringements, such as attempts to cover up misconduct and reprisals on whistleblowers;
- *Minor misdemeanours* may not lead to formal investigations, but are just as damaging given their probable frequency, and should be corrected by teachers and mentors.

The response must be proportionate to the seriousness of the misconduct: as a rule it must be demonstrated that the misconduct was committed intentionally, knowingly or recklessly. Proof must be based on the preponderance of evidence. Research misconduct should not include honest errors or differences of opinion. Misbehaviour such as intimidation of students, misuse of funds and other behaviour that is already subject to universal legal and social penalties is unacceptable as well, but is not 'research misconduct' since it does not affect the integrity of the research record itself.

Good research practices

There are other failures to adhere to good practices – incorrect procedures, faulty data management, etc. – that may affect the public's trust in science. These should be taken seriously by the research community as well. Accordingly, *data practices* should preserve original data and make it accessible to colleagues. Deviations from *research procedures* include insufficient care for human subjects, animals or cultural objects; violation of protocols; failure to obtain informed consent; breach of confidentiality, etc. It is unacceptable to claim or grant undeserved authorship or deny deserved authorship. Other *publication-related* lapses could include repeated publication, salami-slicing or insufficient acknowledgement of contributors or sponsors. Reviewers and editors too should maintain their independence, declare any conflicts of interest, and be wary of personal bias and rivalry. Unjustified claims of authorship and ghost authorship are forms of falsification. An editor or reviewer who purloins ideas commits plagiarism. It is ethically unacceptable to cause pain or stress to those who take part in research, or to expose them to hazards without informed consent.

While principles of integrity, and the violation thereof, have a universal character, some rules for good practice may be subject to cultural differences, and should be part of a set of national or institutional guidelines. These cannot easily be incorporated into a universal code of conduct. National guidelines for good research practice should, however, consider the following:

1. **Data**: All primary and secondary data should be stored in secure and accessible form, documented and archived for a substantial period. It should be placed at the disposal of colleagues. The freedom of researchers to work with and talk to others should be guaranteed.
2. **Procedures**: All research should be designed and conducted in ways that avoid negligence, haste, carelessness and inattention. Researchers should try to fulfil the promises made when they applied for funding. They should minimise impact on the environment and use resources efficiently. Clients or sponsors should be made aware of the legal and ethical obligations of the researcher, and of the importance of publication. Where legitimately required, researchers should respect the confidentiality of data. Researchers should properly account for grants or funding received.
3. **Responsibility:** All research subjects – human, animal or non-living – should be handled with respect and care. The health, safety or welfare of a community or collaborators should not be compromised. Researchers should be sensitive to their research subjects. Protocols that govern research into human subjects must not be violated. Animals should be used in research only after alternative approaches have proved inadequate. The expected benefits of such research must outweigh the harm or distress inflicted on an animal.
4. **Publication**: Results should be published in an open, transparent and accurate manner, at the earliest possible time, unless intellectual property considerations justify delay. All authors, unless otherwise specified, should be fully responsible for the content of publication. Guest authorship and ghost authorship are not acceptable. The criteria for establishing the sequence of authors should be agreed by all, ideally at the start of the project. Contributions by collaborators and assistants should be acknowledged, with their permission. All authors should declare any conflict of interest. Intellectual contributions of others should be acknowledged and correctly cited. Honesty and accuracy should be maintained in communication with the public and the popular media. Financial and other support for research should be acknowledged.
5. **Editorial responsibility**: An editor or reviewer with a potential conflict of interest should withdraw from involvement with a given publication or disclose the conflict to the readership. Reviewers should provide accurate, objective, substantiated and justifiable assessments, and maintain confidentiality. Reviewers should not, without permission, make use of material in submitted manuscripts. Reviewers who consider applications for funding, or applications by individuals for appointment or promotion or other recognition, should observe the same guidelines.

The primary responsibility for handling research misconduct is in the hands of those who employ the researchers. Such institutions should have a standing or *ad hoc* committee(s) to deal with allegations of misconduct. Academies of Sciences and other such bodies should adopt a code of conduct, with rules for handling alleged cases of misconduct, and expect members to abide by it. Researchers involved in international collaboration should agree to standards of research integrity as developed in this document and, where appropriate, adopt a formal collaboration protocol either *ab initio* or by using one drafted by the OECD Global Science Forum.

July 2010

Appendix 4. ESF Member Organisation Forum on Peer Review

List of Forum Members 2007-2010
* *Current Forum Participation*

Member Organisations

Country	Organisation	Contact Person
Austria	Austrian Science Fund (FWF)	Christian Fischer* Falk J. Reckling* Rudolf Novak
	Austrian Academy of Sciences (ÖAW)	Walter Pohl* Arnold Schmidt*
Belgium	Fund for Scientific Research (FNRS)	Pascal Perrin
	Research Foundation – Flanders (FWO)	Hans Willems*
Croatia	The National Foundation of Science, Higher Education and Technological Development of the Republic of Croatia (NZZ)	Alenka Gagro* Janja Trkulja*
Czech Republic	Czech Science Foundation (GAČR)	Bohuslav Gaš* Radka Smrzova
Denmark	Danish Agency for Science, Technology and Innovation	Jette Kirstein*
	The Danish Council for Independent Research – Technology and Production (FTP)	Marcel A.J. Somers
Estonia	Estonian Science Foundation (ETF)	Meelis Sirendi*
Finland	The Academy of Finland	Risto Vilkko* Riitta Mustonen Saara Leppinen
France	French National Research Agency (ANR)	Nakita Vodjdani*
	National Centre for Scientific Research (CNRS)	Pierre Gilliot*
	French National Institute of Health and Medical Research (Inserm)	Isabelle Henry*
Germany	German Research Foundation (DFG)	Catherine Kistner* Frank Wissing
	Max-Planck-Society (MPG)	Helene Schruff*
Hungary	Hungarian Scientific Research Fund (OTKA)	Előd Nemerkényi*
Iceland	Icelandic Centre for Research	Magnus Lyngdal Magnusson*
Ireland	Health Research Board (HRB)	Oonagh Ward* Aoife Crowley Anne Cody*
	Science Foundation Ireland (SFI)	Stephen Simpson*
Italy	National Research Council (CNR)	Marta Caradonna*
	National Institute for Nuclear Physics (INFN)	Valerio Vercesi*
Luxembourg	National Research Fund (FNR)	Frank Bingen*
Netherlands	Netherlands Organisation for Scientific Research (NWO)	Anko Wiegel* Patricia Vogel
	Royal Netherlands Academy of Arts and Science (KNAW)	Jacco van den Heuvel
Norway	Research Council of Norway	Janicke Anne Giæver*
Portugal	Foundation for Science and Technology (FCT)	Maria do Rosário Costa* Maria Anjos Lopez Macedo*
Slovak Republic	Slovak Research and Development Agency (APVV)	Martin Filko* Sonia Ftácnikova
Slovenia	Slovenian Research Agency (ARRS)	Stojan Pečlin*
Spain	Council for Scientific Research (CSIC)	José González de la Campa*

Sweden	Swedish Research Council (VR)	Jonas Björck* Sofie Björling
Switzerland	Swiss National Science Foundation (SNF)	Thomas Zimmermann* Juliette Pont
Turkey	The Scientific and Technological Research Council of Turkey (TÜBITAK)	Arif Adli* M. Necati Demir*
United Kingdom	Engineering and Physical Sciences Research Council (EPSRC)	Susan Morrell* Andrew Bourne Jo Garrad
	Medical Research Council (MRC)	David Cox Declan Mulkeen

Observers

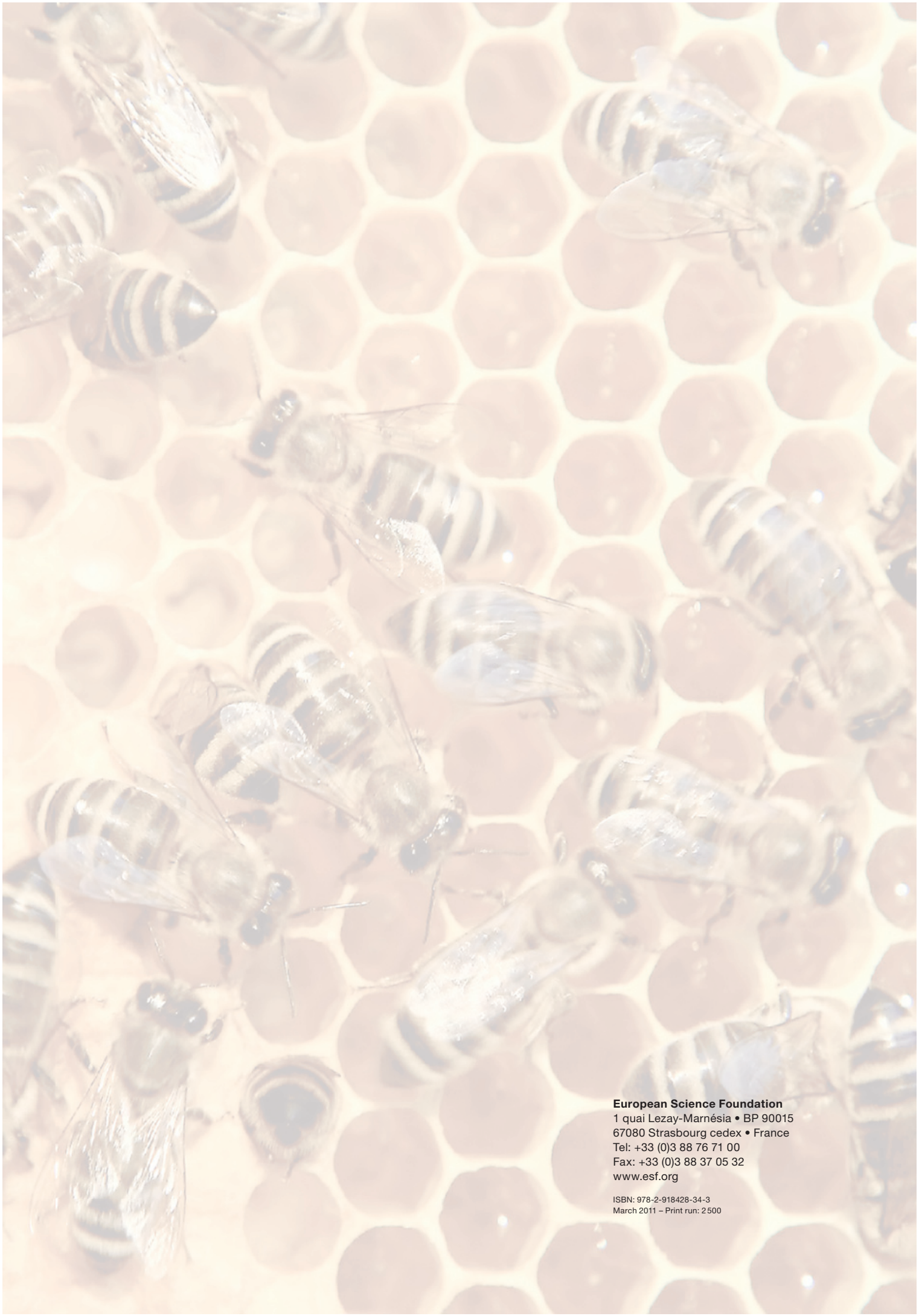
Country	Organisation	Contact Person
	European Commission (EC)	Alan Cross* Jimmy Bruun-Felthaus*
	European Research Council (ERC)	Fiona Kernan* Frank Kuhn*
Italy	Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)	Gian Piero Celata* Carlo Cremisini*
Poland	Foundation for Polish Science	Marta Lazarowicz-Kowalik*
	Research Executive Agency (REA)	Renat Bilyalov*
United States	National Science Foundation (NSF)	David Stonner

Coordination of the Forum

Marc Heppener, Chair, ESF
Laura Marin, Coordinator, ESF

Contributions from ESF Staff

Staff member	Role
Cristina Marras (on Secondment from CNR, Italy)	Co-author
Farzam Ranjbaran	Co-author
Katharina Fuchs-Bodde	Editorial advice and coordinator of the Survey
Hilary Crichton	Editorial advice



European Science Foundation
1 quai Lezay-Marnésia • BP 90015
67080 Strasbourg cedex • France
Tel: +33 (0)3 88 76 71 00
Fax: +33 (0)3 88 37 05 32
www.esf.org

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