



EUROPEAN ASSOCIATION  
OF  
RESEARCH AND TECHNOLOGY  
ORGANISATIONS



**ADDRESSING THE GRAND CHALLENGES:  
THE CONTRIBUTION OF RESEARCH AND TECHNOLOGY  
ORGANISATIONS**



## **ADDRESSING THE GRAND CHALLENGES: THE CONTRIBUTION OF RESEARCH AND TECHNOLOGY ORGANISATIONS**

*The present paper is offered to the European Commission, to EU Member States, and others, as a basis for further discussion about the implementation of ambitious long-term research and innovation programmes to address societal grand challenges.*

There appears to be an emerging consensus that European research and innovation policies should in the future focus more than previously on tackling societal "grand challenges"<sup>1</sup>, which often are simultaneously strategic economic opportunities. Examples of such challenges/opportunities are climate change, ageing populations, food safety, and security of energy supply.

In parallel there is a growing demand from society that science and technology must sign a new "social contract" that emphasises responsibility for action<sup>2</sup>.

The EU has introduced in recent years several new instruments in its research and innovation policies which are intended, *inter alia*, to address grand challenges. Thus:

- Joint Technology Initiatives (JTIs) and Public-Private Partnerships (PPPs) are addressing major challenges where industry has an established strong self-interest, e.g. green cars, clean skies, innovative medicines, factories of the future etc.
- The European Institute of Innovation and Technology (EIT), which also has an educational objective, is addressing challenges of both a societal and economic character: energy, climate, ICT.
- Joint Programming, introduced more recently with the strong support of several Member States, and still operationally untested, is an instrument which may be suited especially to challenges of societal relevance where private sector self-interest is absent or not yet established.

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<sup>1</sup> cf. Aho report, Rietschel Expert Group report, Soete Expert Group report, confirmation hearing of Commissioner MGQ, the EU2020 proposals

<sup>2</sup> ERAB (2009), *Preparing Europe for a New Renaissance – A Strategic View of the European Research Area*

## RTOs and the Grand Challenges

RTOs play a key role in tackling the major social concerns and economic opportunities of the day. Differences of emphasis apart, RTOs share a general mission which may be defined as "contributing through science and technology to improved collective and individual welfare, and to sustainable economic development and competitiveness, by working with government and business to develop and deploy relevant technologies".

The major RTOs in Europe were mostly created 50 or more years ago by governments concerned for the future of their respective country. The issues to be tackled then were very much the equivalent of today's grand challenges. Thus RTOs have half a century and more of experience in addressing such issues through ambitious research and technology programmes.

RTOs are consequently key players in many of the recent Europe initiatives directed at grand challenges: they are present in all of the EIT Knowledge and Innovation Communities; they have taken a leading role in establishing the research agendas of the first Public-Private Partnerships, and are also participating in JTIs<sup>3</sup>.

The present paper focuses more particularly on Joint Programming (JP). It is in the nature of JTIs and PPPs that industry should take the lead. For its part, the EIT is a politically driven initiative which has been equipped with a governance structure of mixed composition<sup>4</sup>. JP initiatives, by contrast, are for now little more than a concept. This paper offers proposals for their operationalization, for we consider that RTOs have rare and valuable experience to contribute to the design and implementation of ambitious programmes targeting major societal concerns.

## Joint Programming Initiatives

In December 2008, the EU Member States committed to JP, which may be defined thus: "*Member States shall coordinate national research activities, bundle resources, profit from complementarities and develop common research agendas, in order to face grand societal challenges – all in variable geometry and therefore on a voluntary basis. Joint Programming intends to tackle the challenges that cannot be solved solely on the national level and allows Member States to participate in those joint initiatives where it seems useful for them*"<sup>5</sup>.

A high-level group within CREST has been formed to develop the concept of JP and to implement first JP Initiatives (JPIs). The CREST group has identified the following themes for the first three JPIs:

- Agriculture, food security and climate change
- Health, food and prevention of diet-related diseases
- Cultural heritage, climate change and security

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<sup>3</sup> RTO participation in JTIs is, however, well below potential as a consequence of unfavourable funding rules, in particular with regard to overhead costs, and also IP-handling arrangements in some JTIs.

<sup>4</sup> ... in which, however, RTOs are much under-represented, which may reflect the educational objectives of the EIT (its sponsoring Commission Directorate-General being EAC).

<sup>5</sup> Cf. <http://www.era.gov.at/space/11442/directory/11767.html>

Further JPIs are due to be announced in May of this year. Likely themes are:

- Urban Europe
- Climate change knowledge for decision-making
- Water challenges
- Ageing society

## **Implementing JPIs: General Considerations**

JPIs targeted at major societal concerns will require the mobilisation of major resources over long periods, perhaps seven, nine, twelve or more years.

Ambitious targets and long-term engagement will require that each JPI can rely on a hard core of long-term players. While many organisations may contribute to achieving the objectives of a particular JPI by participating in one or two short-term projects, there will need to be a permanent core of strong players with strategic commitment and deep, multidisciplinary scientific-technical competence able to generate and maintain innovation momentum by integrating and exploiting interim results, further developing technologies, and deploying outputs. Most probably, no single organisation can perform this role alone, on account of the multiplicity of scientific-technical competences required, and as a consequence of the continuing exponential growth of knowledge. It is therefore critically important to ensure a complementary core group of organisations combining strategic commitment, technological excellence and innovation focus, capable of working together effectively and reliably over time.

In their special domains of competence, RTOs have demonstrated their ability to pool resources and knowhow transnationally for the purposes of ambitious long-term programmes. Examples include the European Energy Research Alliance (EERA) within the SET-Plan, the Heterogeneous Technology Alliance (HTA), Working Groups established under the aegis of EARTO-EUROTECH (e.g. for defence and security research), and more recently the AERTOs ERA-NET project.

JPIs will be focussed on delivering innovative solutions. R&D alone will not be sufficient, nor R&D performed in isolation. Early engagement with implementers (public agencies, civil society groups, private enterprise...) and with other critical players (venture capital, IP services, public procurers ...) will be essential, as will attention to non-technological aspects of innovation such as new business models, networked organisation forms, consumer-centric learning ... The watchword in commissioning and executing research will be relevance as well as excellence. Here, too, RTOs offer considerable advantages from their long experience of working with the public sector as well as with private enterprise – and of not only producing new knowledge but also of developing and deploying innovative technologies through collaborative and contract research, licensing, operating pilot and demonstration plants, creating spin-off companies ...

A contextual consideration is that the mid-term fiscal perspective in Europe is likely to be characterised by tight public budgets as a consequence of accumulated, high public debt in response to the recent financial crisis. While many politicians seem open to the idea of investing in knowledge and innovation

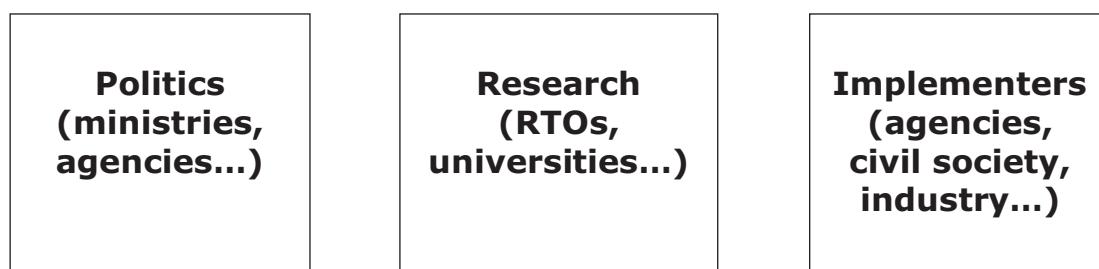
in order to “secure the future”, tight public budgets are likely to bring demands for “high-impact” results, guaranteed delivery, value for money, etc.

All of the foregoing implies a different approach to that practised generally in EU research programmes to date: where, previously, bottom-up approaches have predominated, JPIs will require a much greater degree of top-down leadership, both in the programming of research and in its implementation.

In consequence, research programming will require focus and informed choices, and on-going evaluation and, on occasion, redirection. Research execution will need strong, deliverables-driven management.

## **Implementing JPIs: Research Programming**

JPI research programming must be predicated on as clear as possible a statement of the problem(s) to be tackled and targets to be achieved. In this, ambition has to be combined with realism. Thus it is critical to involve all relevant stakeholders from the beginning. As a general model, we would recommend a three-pillar approach, with a manageable number of key players in each pillar (who they are in any particular case would depend on the subject(s) being addressed):



Together, the three “constituencies” would agree priorities, targets, and research themes. The agreed research agenda would be subject to periodic review aimed at assessing results achieved and, when necessary, re-directing the joint endeavour in the light of those results and other new knowledge.

The research constituency, in close liaison with the implementers, would take a leading role in establishing the techno-economic roadmaps to guide strategic decisions about longer-term research and technology investment priorities: identifying technology gaps where new knowledge is required, recommending incremental research to complete existing knowledge and to facilitate exploitation.

## **Implementing JPIs: Executing Research**

Ambitious, resource-intensive, multi-year, high-risk research programmes of this kind require strong top-down management. A useful analogy is with major mission-driven initiatives such as space programmes. Strong management is needed in order effectively and efficiently to mobilise and manage resources, to network diverse players, to ensure delivery of work packages and respect for

schedules, and to abort false starts and to set new paths when necessary. RTOs are particularly well equipped to manage and undertake research in this “directed mode”, given their long experience of demanding contract and collaborative research with industry and with the public sector.

### **Framework Conditions: Funding**

The Commission’s original proposal for JP appears to have been based on the premise that the countries participating in a particular JPI should themselves provide all of the required funding, in whatever form: each funding their own national players, virtual common pots, real common pots ... We consider that the strong central management necessary for JPIs will require a minimum of secure core funding in the form of a real common pot, European or intergovernmental: any other solution is likely to be exposed to political vicissitudes and hence to suffer inefficiency, if not outright failure.

The specific needs of any given JPI are likely to be so varied that a range of instruments should be available for commissioning and funding research: open, bottom-up calls may be appropriate for certain research topics; pre-qualified contract research for others; public procurement for yet others, and perhaps even prize competitions in still others. Unlike some of today’s JTIs, with funding rules which discourage the participation of many excellently qualified organisations, JPIs must proceed from the principle of the full economic cost of the research to be performed.

### **Framework Conditions: JPI Governance**

We have emphasised already the need to embrace all relevant players and suggested a general three-pillar model for this purpose. The SET Plan, while not a JPI *per se*, provides useful lessons and models for how to organise and manage an ambitious long-term strategic research programme addressing a grand challenge.

The SET Plan Steering Board illustrates a mechanism for ensuring strategic orientation and coherence as between national and EU policies. Its European Industrial Initiatives (EIIs) engage industry in preparing for the large-scale deployment of technologies through demonstration programmes, while its European Energy Research Alliance (EERA) groups together 15 leading public energy research organisations to co-develop and implement the shared strategic research and technology programmes targeted at producing next-generation radical and incremental innovations.

### **Framework Conditions: Macro-Governance**

We noted earlier that several instruments have been introduced to target grand challenge themes, notably JTIs and PPPs, the EIT KICs, and now JP. It is evident that a governance structure is required to manage these different instruments concurrently, in particular to ensure a coordinated allocation of particular grand challenge themes to particular instruments. There is a need, too, to ensure that

other instruments for funding research and for supporting innovation – both European and national – are sustained, are adapted to the needs of JPIs, and are not neglected as a consequence of the new focus on big instruments.

For these reasons we propose the creation of a European Innovation Council. It would provide strategic guidance and advice in the identification of priority grand challenges and of the policy instrument(s) best suited to addressing them. We would propose further that the Council should have a more general strategic remit to continuously review European research and innovation policies and to give advice and make recommendations whenever the Council feels that Europe is failing to address specific challenges or opportunities with adequate resources, suitable instruments or sufficient urgency.

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