

## COMMENTARY

# Europe's research system must change

Science funding in the European Union needs to be revised to better serve economic, social and environmental goals, **Luke Georghiou** argues.

For researchers in Europe, the Framework Programmes have become a familiar funding source for projects and mobility. They account, however, for only about 5% of total public-research money<sup>1</sup>. Since 2000, the European Commission has sought to extend cooperation beyond its own programmes into the remaining 95% of public research, which is funded by national governments. It is doing so under the concept of the European Research Area (ERA) — that we at the Commission's ERA Rationales Expert Group have advised<sup>2</sup> — using measures such as improving cross-border access to infrastructures, coordinating national research programmes and facilitating researcher mobility.

During the past year a consultative green paper has set out ideas for a relaunch of the ERA<sup>3</sup>. This followed some innovation in the Seventh Framework Programme, which included the foundation of the European Research Council (a funding body for investigator-driven research allocated through Europe-wide competition) and the industry-led Joint Technology Initiatives — such as the Innovative Medicines initiative for pharmaceuticals and the Clean Sky initiative for green aircraft manufacture and operation — which can be worth up to €1 billion (US\$1.5 billion) each. In essence Brussels has proposed 'more of the same and better' to make the public-research system function more effectively.

These measures do not get to the core of why we need the ERA. They do not reach out beyond the research community to appeal to politicians, business or the general public. There is the chance of a major transfer of resources from agricultural subsidies to research and innovation with a new budget settlement and financial framework due for the European Union (EU). Having as the flagship policy one that focuses on remedies for perceived failings in the research system lacks ambition commensurate with this broader vision.

## Radical approach

We need a shift in thinking from deficit to opportunity. We must make a convincing case for increased investment in research by both the European Union and national governments. This will help us attain Europe's economic, social and environmental goals.

Making that case requires a radically new

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Coordinated effort: European premiers Angela Merkel and Nicolas Sarkozy confer at the Airbus factory.

approach to European research. Three key areas of action are needed. First, Europe's research system must respond to a series of 'grand challenges'. Second, Europe must become more research-friendly. This requires major reforms for many types of institution and the policies that support them. It also means that the ERA should extend to private as well as public research. Third, Europe's strategic and applied research must be re-orientated at a pan-European level to support the full range of policies that member states have agreed. This involves the Framework Programme and national programmes — coordinated through ERA-NET schemes and other instruments — engaging much more effectively with policy needs in areas such as the environment, transport, energy, agriculture and health.

Basic research has an important place, and promoting excellence through the European Research Council, and building research capacity through mobility programmes are worthy goals that deserve more support. But the bulk of the Framework Programme budget is in strategic and applied research so we need to think more deeply about its aims and future direction. Officially the budget is there to support European competitiveness

and public policies. Despite some significant achievements, successive evaluations strain to provide any overall picture of impact<sup>4</sup>. Existing structures have in general failed to provide the kind of linkage that could allow research to efficiently support economic and social priorities. National delegates return from European meetings with their performance indicator being the budget share their nationals obtain — '*juste retour*' — rather than the benefit their country sees from that money.

## Grand challenges

Historically Europe has been at its best when dealing with large projects based on public-private partnerships. These include: the development of the Global System for Mobile Communications — better known as GSM — as the standard for mobile telephony; the emergence of Airbus as a global player; the ubiquitous use of nuclear energy in France; economic leadership in wind energy; and scientific leadership at CERN, Europe's particle-physics laboratory near Geneva. Similarly, in the United States and Japan many world-shaping innovations have emerged from grand challenges and coordinated efforts, such as the atom bomb, spaceflight, semiconductors and the Internet.

Such projects created the conditions for

entrepreneurs and individual scientists or engineers to seize opportunities. Governments provided funding and constructed markets through effective regulation and procurement. Programmes may now need to be more agile to keep pace with rapidly moving fields; nonetheless the lessons of scale, vision and commitment are clear.

The grand challenges will probably require a more direct political appeal to get going. They should engage research with the problems that society recognizes as central, such as climate change, food and energy security and the ageing of western society. For these, the initiative will have to come from governments rather than business, although many business opportunities will emerge as initiatives unfold.

European governments cannot rely solely on the Framework Programme budget; they will have to coordinate their national budgets by accepting leadership of sub-sections of larger programmes, and by funding the participation of their own nationals at the very least. The challenges must be of a clear trans-national nature and require a minimum level of effort that cannot be achieved by nations acting alone. They must also be feasible: there must be a base of research and industrial capability to build on and a viable implementation path. And of course research must be a necessary and important part of the solution.

### Right condition, right coalition

An exemplary response to a grand challenge may have recently emerged. Achieving a low-carbon future is arguably the single greatest test facing us all. The recently announced European Strategic Energy Technology Plan (SET-Plan) describes itself as a “far-reaching jigsaw of policies and measures”. These include binding targets for 2020: a 20% reduction in greenhouse-gas emissions; 20% of renewable energy sources in the EU energy mix; reducing primary energy use by 20%; carbon pricing; a competitive Internal Energy Market and an international energy policy. Central to this plan is the need to accelerate the development of cost-effective low-carbon technologies.

The challenge here is great. Energy research has stagnated for decades, with total EU public spending falling to a quarter of 1980 levels in real terms and substantial declines in the private sector as well<sup>5</sup>. Energy innovation is particularly difficult, involving very large investments with long lead times and lock-in to existing infrastructures. New technologies face social acceptance issues and often begin by being more expensive than the sources they are intended to replace.

On the other hand, addressing climate change offers huge opportunities to develop business and employment. With similar investment decisions in other major economies there is a strong competitiveness rationale. The SET-Plan has also developed a series of key technology goals for 2050. These include second-generation sustainable biofuels,

CO<sub>2</sub> capture, and large-scale commercialization of renewable energy, energy conversion and efficiency. A high-level multi-government steering group will oversee the SET-Plan implementation, engaging with all stakeholders. Among other actions a series of industrial projects resembling the Joint Technology Initiatives will be launched. The hardest part will be securing the necessary finance.

We need ways to identify and mobilize similar, necessary coalitions of interest in other areas. Arguably, the SET-Plan has arisen from a once-in-a-lifetime coincidence of practical urgency, political will and technological opportunity. With grand challenges potentially costing €5 billion to €10 billion each, it is hard to see Europe affording more than three or four at a time even with an increased budget.

To pinpoint these ways, a new kind of political process is needed that combines top-down and bottom-up approaches.

A bottom-up phase would encourage stakeholders to form ‘platforms’ to develop potential responses to challenges. Like the present technology platforms, these would have a wider base of participation: science; business users and suppliers; government policy-makers, regulators and purchasers; and where relevant, non-governmental organizations and consumer groups. These would use targeted foresight to bring together socioeconomic demand and the potential of innovation and act as both incubator and lobby. The aim is not to follow the now discredited idea of picking winners among firms or even technologies (e.g. joint programmes for high-definition television that have now been abandoned), rather to create a competitive and supportive environment in which winning solutions emerge. The top-down element will require, at the highest political level, a capacity to find resources very quickly when a viable strategy has emerged. The core budget would come from a fund deployed until exhausted<sup>6</sup>.

There is currently only a very general communication between the research carried out at European level and the European-level policy and regulation setting. This is true both for the Framework Programme and for the ERANETS that have begun to link national funding bodies. Indeed it is a problem that besets much national applied research. New kinds of coordination are needed to link users and sponsors of research, at European and at national levels. This does not mean a crude customer-contractor relationship that often causes research to degenerate into consultancy. It does mean that regulating bodies, such as the sectoral Directorates-General, will need a greater voice in establishing the research agenda and greater scientific capability to do so.

Neither the grand challenges nor the policy-focused research can be achieved through the

present research system. This is where the new ecology comes in. It must consist of reformed actors and better linkages between them to configure research around these interdisciplinary challenges<sup>7</sup>. The long list of reforms that are overdue includes: giving greater strategic space and autonomy to universities; more trans-national peer review to raise quality levels; developing a true European market for applied research services (cross-border trade in applied research accounts for a negligible share of a market worth billions); and creating a market friendly to innovation through smart regulation and public procurement<sup>8</sup>.

Europe has to let go of structures and approaches that have dominated its research funding for decades. First to go should be Framework Programmes that are divided into large numbers of small, very loosely connected projects defined years ahead by ‘work

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plans’ with no clear provenance. These instruments may satisfy the clientele they fund, but they are almost impossible to direct towards real problems. The funding

breakdown needs to be tied to the big- and the medium-level challenges that policy dictates. Enough flexibility must be retained to respond to shifts in demand and to new scientific and technological opportunities. Researchers worried about losing scarce funding should recognize that those who can adapt stand to receive slices of potentially a much larger cake.

Europe should start the process of reform now. The Commission has a responsibility to take the lead and planning of the Eighth Framework Programme, due to start in 2013, is already under way. The grand challenges will not wait until then and member states, businesses and the scientific community must each play their part. The first challenge is one of leadership.

Those outside Europe who might see this discussion as parochial should consider this: Europe will be a much more effective partner for the United States, Asia and others if it can speak with one voice, take the initiative and contribute a genuine critical mass to solutions to global problems. ■

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