

The New Framework for EU Research and Innovation

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On 30 November, the European Commission is to issue legislative proposals for a decision of the European Parliament and Council of the European Union (EU) concerning Horizon 2020, the next Framework Programme (FP) for Research and Innovation. The decision process and adoption by the Parliament and the Council is to follow from December 2011 to December 2013, with Horizon 2020 to guide and support EU-wide research and innovation from 2014 to 2020. I offer a critical preview of Horizon 2020, addressing new political contexts, challenges, and opportunities. The analysis is mainly based on information currently available from the EU Budget Review (1) and the Budget for Europe 2020 (2).

FP7 and the New Policy Frame

The EU FP, begun in 1984, is expected to add value compared with national activities by fostering cross-border and cross-sectoral cooperation, organizing competition toward excellence beyond national capacities, and combining complementary competences. Evaluations (3) show that it attracts high-quality project ideas, top researchers, and excellent consortia involving researchers from Europe and other countries. However, evaluations also identified areas for improvement, such as further sharpening of objectives, better alignment of instruments for participation, and simplification of procedures, management and administration. The current FP7 is the world's largest competitive transnational program, with a €50 billion budget for the 2007–2013 period (4).

The new EU policy frame relevant for the 2014–2020 period is the Europe 2020 strategy (5, 6) for jobs and growth. It defines three priorities: (i) smart, sustainable, and inclusive growth; (ii) measurable headline targets (7), such as meeting the EU's climate change and energy objectives (8); and (iii) investment of 3% of EU's GDP in research and development (R&D) by 2020. The three priorities



This is a time of changing, sometimes conflicting, priorities for the organization and support of research and innovation. Scientific opportunities abound, but so do societal challenges and economic turmoil. As prosperity and well-being increasingly rely on science and technology, many nations are turning to other countries in pursuit of mutually beneficial collaborations. In the coming months, we will explore different approaches to collaborations and issues that arise from changes in the cooperation landscape. We begin with a preview of the proposed new European Union Framework Programme for Research and Innovation, Horizon 2020. Look for the Dimensions of Science Cooperation icon through 2012.

—Lisa Chong, Brad Wible, Barbara Jasny

are supported by seven "Flagship Initiatives" (9). Although research and innovation will be important for all seven initiatives, the Innovation Union (10, 11) has a particular focus there. Through more than 30 commitments, it addresses issues such as higher investments in research, increasing the number of researchers, modernizing universities, and spending resources more efficiently.

One of the commitments is to complete, by 2014, the European Research Area (ERA), a single unified market for research and innovation that will allow free movement of researchers, knowledge, and technology (12). In 2012, the Commission will propose an ERA Framework (13) encompassing measures for strengthening the position of researchers, including career and social security issues; improving the interoperability of national research councils; facilitating access to and cooperation of research infrastructures; and joining the forces of EU member states and the Commission in international cooperation. Another commitment of the Innovation Union is that, by 2015, member states and the Commission will complete or launch construction of 60% of the pan-European priorities identified by the European Strategy Forum for Research Infrastructures (14).

Horizon 2020—Three Pillars: Top-Down to Bottom-Up

For Horizon 2020, the Commission proposes a structure oriented toward three policy objectives (15) (see the chart). In a Common Strategic Framework, Horizon 2020 will cover EU research and innovation funding currently provided through FP7, parts of the Competitive and Innovation Framework Programme (CIP) (16), and the European Insti-

tute of Innovation and Technology (EIT) (17). CIP supports small and medium enterprises (SMEs) through programs on enterprise and innovation, intelligent energy, and information and communication technology (ICT). Innovation-related parts of CIP, particularly "access to finance," will be integrated into Horizon 2020 to provide equity finance and loan guarantees.

Established in 2008, the EIT (18) seeks to educate innovators and entrepreneurs and catalyze translation of research results into innovation. The effort is implemented by means of three Knowledge and Innovation Communities (19): Climate Change and Mitigation, Sustainable Energy, and ICT, each involving main actors in several regional colocation centers. The EIT, steered by a governing board of independent experts, is still in the development phase (20) which needs careful monitoring. Embedding it in Horizon 2020 is a move in the right direction so that the close interaction with the activities under the three pillars will be of mutual benefit.

Compared with the current programmes (FP7, CIP, and EIT), the proposed €80 billion (U.S.\$108.5 billion) budget for Horizon 2020 presents an increase of about 46%. The breakdown of this budget across the three pillars is anticipated on 30 November. In fact, member states' finance ministers will have the final say in the course of the codecision process of the Parliament and the Council.

The Commission proposes a new approach including both top-down, agenda-driven activities and bottom-up approaches offering more open areas for applicants to propose innovative ideas. In the past, only the European Research Council (ERC), the Marie Curie Actions for trans-border researcher

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mobility, and parts of the ICT and nanoscience themes applied bottom-up approaches.

The first pillar will be problem-driven and will require integration of the necessary generic and key enabling technologies (KETs) and sciences. Policy coordination between relevant actors at European and national levels will be a must. For the second pillar, the agendas for the KETs will be defined in close cooperation with industry. For SMEs a bottom-up approach needs to be considered. The whole third pillar is bottom-up. The new Future and Emerging Technologies scheme is proposed as a breeding ground for new high-risk ideas. In addition to collaborative research projects, thematic networks should be considered for facilitating access to European cooperation for excellent researchers from less connected institutions and regions. It will be important to consider the role of social sciences, economics, and humanities that will underpin all areas of the program.

Simplification

Discussions on the FP have often been dominated by complaints and criticism about bureaucracy and administrative overload. For Horizon 2020, the Commission proposes a substantial overhaul toward simplification and harmonization; rationalization of the funding schemes and instruments; and the definition of a standard set of rules covering eligibility, accounting, reporting, auditing and cost-reimbursement (21). In addition, “A new balance will be struck between trust and control and between risk taking and risk avoidance” (22). The Commission proposals for simplification from April 2010 (23) were agreed upon by Council and Parliament. Implementation of measures—such as more flexibility regarding calculation of personnel costs, flat-rate payment of salaries for SME owners, and removing inconsistencies in the application of rules across Commission departments and agencies—provides a basis for optimism. It will be up to member states and the Parliament to agree on simplification of the rules for Horizon 2020 considering that continued priority on excessive financial control and the related burden on researchers would be a severe disadvantage for the EU compared with its competitors and partners.

Collaboration, Synergies, Opening

Collaborative research—a competitive strength of the EU compared with other regions (24)—will continue to be a main activity in Horizon 2020 (25), which will be oriented toward excellence in research and innovation independent of geographical considerations. It will be centrally managed by

the Commission and the related executive agencies. In contrast, EU Cohesion Policy funds, implemented and managed by regional or national authorities, are awarded for capacity building, on the basis of regional needs (26). In the current FP period, €60 billion (U.S.\$81.3 billion) of Cohesion Policy funds are invested in research-and innovation-related activities, with about the same amount proposed for 2014–2020 (27). Promoting regional clusters, supporting research infrastructures, and twinning with partners in more advanced regions contributes to development of ERA and will support widening of participation in Horizon 2020. Horizon 2020 and Cohesion Policy funds are distinct but complementary.

Interoperability, mutual enforcement, and synergies between them will be essential (28).

Openness for collaboration with participants from all over the world is a special characteristic of the FP (29). However, by 2010, only about 7% of FP7 participants were from non-EU countries and from countries that are neither EU candidates nor EU-associated countries (30). Following the recommendations of the FP7 midterm evaluation (31), a substantial effort has to be made to strengthen international cooperation in Horizon 2020. There is a need to remove remaining legal and administrative barriers for cooperation with international partners, especially regarding contracts and intellectual property (IP) (32). However, in the EU budget proposal, there are no indications regarding the international dimension of Horizon 2020. It has yet to be seen how far this will be considered in the forthcoming formal proposal.

Public-Public, Public-Private Partnering

Building on experiences in FP7, the Commission proposes to further develop partnering initiatives (33) in Horizon 2020. This could strengthen the FP by leveraging substantial additional funds. The “ownership” of these initiatives by member states and industry is important for building ERA.

Public-public partnerships, such as ERA-Networks (ERA-NETs, started in FP6) and Joint Programming Initiatives (JPIs) still under development (34), are combining national and regional research funding programs that may be cofunded by EU financial contributions. In industry-led public-private partnerships such as Joint Technology

THREE PILLARS OF HORIZON 2020

- 1 *Tackling societal challenges* shall address issues such as health, demographics changes, and well-being; food security and the bio-based economy; secure, clean, and efficient energy; smart, green, and integrated transport; resource efficiency and climate; supply of raw materials; and inclusive, innovative, and secure societies. Activities shall cover the spectrum from research to the market, integrating innovation activities, cross-disciplinary approaches, and socioeconomic and humanities research.
- 2 *Creating industrial leadership and competitive frameworks* shall cover key enabling technologies, such as information and communication technologies (including micro- and nanoelectronics and photonics); nanotechnology, advanced materials and advanced manufacturing systems; industrial biotechnology; low carbon and adaptation technologies; and space research and innovation. Access to risk finance and venture capital; support for innovation in small and medium-sized enterprises (SMEs) with high growth potential.
- 3 *Excellence in the science base* will focus on support for frontier research through the European Research Council; training and career development of researchers through Marie Curie Actions; future and emerging technologies; and networking of, access to, and development of priority research infrastructures.

Initiatives (JTIs), EU, national and private funds are pooled in areas of strategic industrial importance. In FP7, five JTIs have been established with budgets around €1 billion to €3 billion (U.S.\$1.4 billion to \$4.1 billion) (35). The planned ERA Framework will be particularly relevant for ERA-NETs and JPIs, which would benefit from harmonized rules and procedures of national agencies. Progress in that direction should be a task of Science Europe (36), the new association of European research funding and performing organizations.

Parliament and the Council will have to agree on improved regulations for public-private partnerships, considering JTI needs (37–39) regarding flexibility and efficient and effective management. A recent initiative of Europe’s photonics industry (40) to commit roughly 80% of the investment in a new €7 billion (U.S.\$9.5 billion) public-private partnership in the frame of Horizon 2020 shows the positive reaction and uptake. For JTIs, the possibility of applying “open innovation” business models (41) should be explored, with clear rules as a basis for IP management.

Attracting Industry and SMEs

Prioritizing a select number of KETs will increase participation of industry and SMEs leveraging private investments as the photonics initiative shows. The KET Expert Group provided recommendations (42) such as strengthening IP management in EU projects, adapting evaluation criteria to the new program, and establishing a European KETs Observatory Monitoring mechanism to provide information and decision support. Coop-

eration with the EIT could foster entrepreneurial and innovative talent.

Seamless support for the whole innovation process by different financial instruments beyond grants will be a welcome new aspect of Horizon 2020. This will allow for the support of R&D projects as well as innovation related activities like feasibility studies, pilots, prototypes, demonstrations, and test beds. Using public procurement to stimulate innovation by defining innovative requirements and targets is new and promising. New financing approaches will build on FP7 experiences of the Risk Sharing Finance Facility and the cooperation with the European Investment Bank as well as on the financial instruments of the CIP.

Following recommendations of the Synergies Expert Group (43), a Small Business and Innovation Research program should become part of Horizon 2020. Although the EU level is appropriate for EU-wide innovation strategies and measures for high-tech SMEs, for SMEs with less R&D capacities the national and regional level should be considered too. Synergies with Cohesion Policy Funds targeting SMEs will be important.

Nurturing the European Science Base

There is general agreement that the budget for the ERC, first created in 2007 under FP7, should be increased (44). The ERC organizes Europe-wide grant competitions, focused on excellence without the requirement for cross-border cooperation. However, the success of the ERC may also indicate a need to optimize the structure and organization of research funding in the EU. For example, a number of countries (45, 46) use results of ERC evaluations to make national funding decisions when the ERC budget does not suffice, and new ERC-like programmes are launched at the national level (47, 48). This issue should be discussed by the Commission, member states, the ERC, and Science Europe (49).

The Marie Curie Actions are another asset of the FP that needs to be strengthened. Targeted measures are also needed to stimulate mobility of European researchers to emerging knowledge powers, such as China, and between academia and industry. Both the ERC and the Marie Curie scheme support individual excellence and need strategic approaches for attracting researchers from non-EU countries. However, in the future, a European excellence initiative for universities should be considered too, adapted from national initiatives such those as in Germany and Spain (50, 51).

For achieving the 2015 goal regarding research infrastructure, synergies between

Horizon 2020 and the Cohesion Policy Funds (52) will be important, e.g., funding for feasibility studies and operational costs coming from Horizon 2020 and Cohesion Policy Funds contributing to the construction costs where national funding will also be essential.

The Way Forward

Enforcing the ERA partnering initiatives as integrated parts of Horizon 2020 will be a promising way forward. Developing governance of the ERA will be a main issue in coming years. For the implementation of Horizon 2020, a new quality of partnership between the Commission and the member states will be needed; the Commission has a major facilitating role because the EU Treaty commits it to taking initiatives toward achieving the ERA (53). Member states need to agree on a suitable ERA Framework in order to complete the ERA by 2014.

The economic crisis and global shifts in science and technology since FP7 may motivate member states toward more coordination and cooperation and to aligning policies and strategies with the Commission in building toward Europe 2020. A strong Horizon 2020 framework program prepared in close partnership with all actors will be key.

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