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A Roadmap for Strengthening International Collaboration in Research and Innovation under Horizon 2020

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Abstract

This background brief looks into the new research and innovation strategy introduced by the European Union embodied in the Horizon 2020 funding programme. It focuses on the prospect for international collaboration in Horizon 2020, and presents a roadmap for both European institutions and those from key third countries to get ready for the opportunities provided by this funding instrument to embark on interesting research and innovation. The brief begins by outlining the efforts by the EU to address issues of economic competitiveness with a new growth strategy Europe 2020 in response to the enormous challenges faced by Europe in the midst of the debt crisis. It looks at the introduction of the Innovation Union as a Europe 2020 initiative, and explains how the new financial instrument, Horizon 2020, may be used to support the primary goals of more jobs, improved lives, better society and the global competitiveness of Europe. The brief also outlines the major differences of Horizon 2020 from the previous framework programmes, and recommends close collaboration between the European and the key third countries. The brief also proposes general and priority-specific strategies for national research councils, universities and research institution to get ready to participate in the Horizon 2020 programme.

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A Roadmap for Strengthening International Collaboration in Research and Innovation under Horizon 2020

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Introduction

The economic and political challenges Europe faced in the past couple of years has necessitated a change in the growth strategy as well as the research and innovation approach. Europe 2020 was introduced in 2011 to help the European Union improve its competitiveness and create new job opportunities. Research and innovation is perceived as an integral part of this growth strategy, and Innovation Union as a significant Europe 2020 initiative to be implemented.

Horizon 2020 is defined as the financial instrument of the Innovation Union. Being the successor of the previous framework programmes, Horizon 2020 intends to develop a new research and innovation strategy with different priorities and targets. It offers an opportunity to start cooperation with some of the third countries, and exchange knowhow not only within Europe but also with strategic partners from other regions. Hence, for researchers interested in international collaboration, it is crucial to comprehend the priorities, guidelines and features of Horizon 2020, and to take the necessary steps to prepare for participation in the programme.

This brief offers some suggestions on preliminary strategies for universities and research institutions to start or strengthen international cooperation through participation in Horizon 2020. It elaborates firstly on the reasons for the strategic change in Europe as reflected in Europe 2020 and the Innovation Union. The launch of Horizon 2020 and its priorities and the novel approach brought to research and innovation can be understood in light of the current economic challenges facing Europe. Secondly, it examines the priorities and targets of Horizon 2020 as well as its key difference from the previous framework programmes. It elaborates on the emphasis on cooperation with

strategic partners of the EU. Lastly, the brief develops a roadmap, and proposes general and priority-specific strategies for national research councils, universities and research institutions to leverage on the opportunities offered by the Horizon 2020 programme.

Global challenges and the EU's new growth strategy: Europe 2020

The world has experienced significant challenges in both economic and political terms since the emergence of the global economic crisis in 2008. The EU was not spared the crisis, and its member states have been considerably affected by the banking crisis and credit crunch. These morphed later into serious sovereign debt crisis for a number of the member states in the euro zone.

Countries such as Portugal, Italy, Ireland, Greece and Spain were among the most seriously affected economies. Besides country-specific economic and political actions, and the various austerity measures to deal with the debt crises, there was also increasing consensus on the need for structural reforms and an urgency to produce a new growth strategy for the EU. The result was the launch of a new growth strategy, entitled Europe 2020. It aimed to address the shortcomings of the previous growth model, to eliminate the obstacles to competition and job creation and to create "the conditions for a different type of growth that is smarter, more sustainable and inclusive" (European Commission, 2012c). For this purpose, it has clearly set out the main priorities and key targets at the national level to improve growth and competitiveness in the EU.

Europe 2020

Priorities

Smart Growth: more effective investments in education, research and innovation

Sustainable Growth: decisive move towards a low-carbon economy

Inclusive Growth: strong emphasis on job creation and poverty reduction

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Key targets

Employment: 75% of the 20-64 year-olds to be employed

Research and Development: 3% of the European Union's GDP to be invested in R&D

Poverty/Social Inclusion: at least 20 million fewer people in or at risk of poverty and social exclusion

Education: reducing school drop-out rates below 10%; above 40% of 30-34 year-olds completing third level education

Climate Change/Energy: greenhouse gas emissions 20% (or even 30%) lower than 1990; 20% of energy from renewables; 20% increase in energy efficiency

(European Commission, 2012c; 2011d)

The Europe 2020 targets are designed to be mutually reinforcing. All targets anticipate aligning with the primary objectives of Europe 2020; namely, engendering growth and creating jobs. Accordingly the underlying assumptions are that “educational improvements help employability and reduce poverty; more R&D/innovation in the economy [makes Europe] more competitive and creates jobs; [and] investing in cleaner technologies combats climate change while creating new business/job opportunities” (European Commission, 2011d).

The new growth strategy Europe 2020 has also defined seven flagship initiatives focusing on innovation, youths, the digital agenda, resource efficiency, industrial policy in tune with the globalised world, agenda for new skills and new jobs, and alleviating poverty (European Commission, 2012a). The initiatives have been designed to be mutually reinforcing so that they serve the goal of enhancing European competitiveness in different sectors.

In sum, Europe 2020 has been introduced to create a more competitive and socially inclusive Europe. In the next section of this paper, Innovation Union will be given special importance since it constitutes the intellectual core of Horizon 2020.

Innovation Union as a Europe 2020 initiative

The EU is a world leader in research and innovation with “24% of world expenditure on research, 32% of high impact publications and 32% of patent applications” (European Commission, 2012e: 2). However, over the past decade, emerging economies such as Brazil, China, India and South Korea have been strengthening their research and development (European Commission, 2012e). The EU will need to increase investments in its research and innovation potential to maintain its lead in the world.

The EU believes it is essential to “promote itself as an attractive location for carrying out research and innovation and be successful in the global competition for talent, while at the same time preserving its economic interests, for instance, with regards to the protection of intellectual property” (European Commission, 2012e: 2). In addition to creating an innovation-friendly market (European Commission, 2011c), enhancing the quality of research and having access to knowledge produced in other parts of the world have gained priority in Europe's new strategy.

The need for Europe to “remain competitive in the global marketplace and improve the quality of life in Europe” brought a sense of urgency to turn research into “new and better services and products” (European Commission, 2011c). Hence, the term Innovation Union has been used to suggest a greater focus on applied research that could lead to more jobs, improved lives and better society (European Commission, 2012d). Innovation Union has been placed at the core of Europe 2020 since “Europe's future economic growth and jobs will increasingly have to come from innovation in products, services and business models” (European Commission, 2012d).

Innovation Union is designed to make Europe a world-class science performer by removing obstacles to innovation and revolutionising the way the public and private sectors work together. It also gives particular emphasis on partnerships and international cooperation to achieve the best possible results (European Commission, 2012g).

These initiatives have prioritised completing the European Research Area; supporting business-academia collaborations; creating a genuine single European market for innovation through patent protection, standardisation, public procurement and smart regulation; stimulating private sector investment; involving everyone in innovation; bringing together

public and private actors to commercialise ideas and create new jobs; and to encourage international collaboration.

Horizon 2020: The EU Framework Programme for Research and Innovation

Announced in June 2011, Horizon 2020 defines a new strategy for international cooperation in research and innovation. As Máire Geoghegan-Quinn, the EU Commissioner for Research, Innovation and Science states, Horizon 2020 marks another step in the “endeavour to establish research and innovation... at the centre of EU policy making” and, hence, “an important symbol of... the new, integrated funding system” in research and innovation (European Union, 2011). It is the financial instrument for implementing the Innovation Union, which in turn is “part of the drive to create new growth and jobs in Europe” and aims at securing Europe’s global competitiveness (European Commission, 2012h). The European Research Area will be enhanced to create a genuine single market for knowledge, research and innovation (European Commission, 2012h).

Horizon 2020 will run from 2014 to 2020 with an estimated budget of about €80 billion. It targets to simplify the funding system by merging all research and innovation funding currently provided through the Framework Programmes for Research and Technical Development (FPs), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).

Horizon 2020: main objectives

Reinforcing the EU’s position in science

Strengthening industrial leadership in innovation

Helping address major concerns shared by all Europeans

(European Commission, 2012h)

Horizon 2020: Budget distribution

Thematic areas/objectives	Millions of euro
<i>Excellent Science</i>	24.5
European Research Council	13.268
Future and emerging technologies	3.100
Marie Curie Actions	5.572
Research Infrastructures	2.478
<i>Industrial Leadership</i>	17.9
Leadership in enabling and industrial technologies	13.781
Access to risk finance	3.538
Innovation in SMEs	619
<i>Societal Challenges</i>	31.7
Health, demographic change and wellbeing	8.033
Food security, sustainable agriculture, marine & maritime research and the bio-economy	4.152
Secure, clean and efficient energy	5.782
Smart, green and integrated transport	6.802
Climate action, resource efficiency and raw materials	3.160
Inclusive, innovative and secure societies	3.819

Horizon 2020 also proposes an increase in funding of 77% for the European Research Council, which was established in 2007 as the “first pan-European organisation for funding research” (European Research Council, 2013). The European Research Council plays a vital role “in supporting European leadership in world class research” and supports “the most talented and creative individuals and their teams to carry out frontier research” (European Commission, 2012h). It provides grants to projects “headed by young and established researchers, irrespective of their origins, who are working in Europe, – and the sole criterion for selection is excellence” (European Commission, 2011b). The aim here is to “encourage high quality research in Europe through competitive funding” (European Research Council, 2013). Hence, the Council intends to “reinforce excellence, dynamism and creativity in European research and improve the attractiveness of Europe for the best researchers from within and outside of Europe, as well as for industrial research investment” (European Commission, 2011b). In Horizon 2020, the European Research Council will be given more funding and leeway to support “investigator-driven frontier research”. Compared to the Seventh Framework Programme (FP7), its budget will be

increased from € 7.5 billion for the period of 2007-2013 to € 13.2 billion for the period of 2014-2020 (European Commission, 2011b).

Horizon 2020 also underlines the role of individuals in European research excellence and therefore accords special significance to the Marie Curie Actions as an integral element of the new research and innovation strategy. The budget of Marie Curie Actions is increased from € 4.7 billion in FP7 to € 5.5 billion in Horizon 2020. The Marie Curie Fellowships highlights the importance of mobility within and beyond Europe in order to achieve research excellence. The Marie Curie Fellowships provide researchers with generous research grants and opportunities to gain experience abroad and achieve research excellence (European Commission, 2013b), and are available to researchers of all ages and levels of experience, “regardless of their nationality or field of research” (European Commission, 2013b).

Under the priority of industrial leadership, Horizon 2020 has a strong focus on developing European industrial capabilities, and has set aside €5.894 million for Key Enabling Technologies (KETs) (European Commission, 2011e). These include micro- and nano-electronics; photonics; nanotechnologies; advanced materials; biotechnology; and advanced manufacturing and processing. Development of these technologies requires a “multi-disciplinary, knowledge and capital-intensive approach” (European Commission, 2011e).

Differences from previous Framework Programmes

Horizon 2020 has significant differences from the previous framework programmes. It introduces substantial simplifications to the application processes in comparison to the previous framework programmes. There will be a single set of rules; one project-one funding rate; and simpler evaluation criteria. To encourage innovation and public-private partnerships, it will also pay particular attention to bring about participation by Small and Medium Enterprises (SMEs) and improved rules on intellectual property rights. These can be summarised in four points (European Commission, 2012i):

- *A Single Programme:* To bring together three separate programmes and initiatives under one Single Programme;
- *Coupling Research to Innovation:* To transfer more good ideas from research to market;

- *Focus on Societal Challenges:* To focus on key challenges such as health, clean energy, transport facing EU society;
- *Simplified Access:* To make it simple for all companies, universities, institutes in all EU countries and beyond to access the Horizon 2020 funding

To encourage strong involvement of SMEs in Horizon 2020, an integrated approach is introduced, and around 15% of the total budget for societal challenges and the *Leadership in Enabling and Industrial Technologies (LEIT)* programme will be for the SMEs (European Commission, 2012e). Moreover, to promote and encourage strong SME participation in research and innovation, there will be simplification of particular benefits to SMEs, a new SME instrument, a dedicated activity for research-intensive SMEs in the form of “Innovation in SMEs”, and access to risk finance (European Commission, 2012e). All these are ultimately aim at enhancing Europe’s global competitiveness.

Horizon 2020: strengthening international collaboration

As “research and innovation are increasingly interlinked internationally, aided by rapidly developing information and communication technologies”, Europe needs to “strengthen its dialogues with international partners” (European Commission, 2012e: 2). It aims to strengthen the European Union’s “excellence and attractiveness in research and innovation and its economic and industrial competitiveness”, tackle “global societal challenges”, and support the Union’s “external policies” (European Commission, 2013a).

To this end, Horizon 2020 builds its funding principles on a dual approach: it will be “open to participation from entities from across the world”; and “targeted activities will be developed where cooperation will be sought on particular topics and with well identified countries and/or regions” (European Commission, 2012f). International collaboration will focus on global challenges in areas on sustainable energy, food security and climate change. The following criteria will be used for assessing the engagement with the third countries: “research and innovation capacity, including investment, output (publications, patents, citations, licensing), human resources and infrastructure; risks of and opportunities for access to existing, new or emerging markets, and their impact on the Union's competitiveness; contribution to the Union's international commitments, as reflected in the Millennium Development Goals, the post-2015

development framework, Rio+20, G20 and the international objectives of sectoral policies; and, the legal and administrative frameworks in place, among the international partners, and where appropriate the Member States, to engage in cooperation, also including lessons learnt from previous cooperation” (European Commission, 2012e: 5).

Funding emphasis by country grouping

EFTA countries, EU enlargement countries and countries under the European Neighbourhood Policy:

To foster integration of, or alignment with the European Research Area, including through their possible association to Horizon 2020.

Industrialised and emerging countries:

To increase the Union's competitiveness, to jointly tackle global challenges through common innovative solutions, and to develop enabling technologies by accessing new sources of knowledge.

Developing countries

To complement the Union's external policies and instruments by building partnerships – in particular bi-regional partnerships – to contribute to the sustainable development of these regions and address challenges such as the green economy, climate action, improved agriculture, food security and health.

(European Commission, 2012e: 6)

Horizon 2020 introduces an opening for collaborative research with Asian countries as Asia has a particular strategic advantage in terms of technology, scientific knowhow and academic output. Moreover, Asia as a region has a growing and dynamic economy based on technological development, good economic fundamentals and financial market stability. Hence, the cooperation between Europe and Asia will open up the opportunity of Europe benefiting from the economic experiences in Asia.

Preliminary strategies to get ready for Horizon 2020:

Horizon 2020 funding is open to researchers, research groups and networks, and public and private institutions in Europe and all eligible third countries. As it differs from the previous framework programmes, national research councils and research institutions in Europe who would like to participate in the programme

should familiarise and prepare themselves. Instead of waiting until 2014, many European countries such as Britain, Norway, Denmark, Spain, Italy and Switzerland have started to discuss the scope of Horizon 2020 and released position papers on their own priorities and where the synergies lie. The European University Association has also organised debates, and Ireland has worked on engaging academic researchers and SMEs.

It is crucial to develop a road-map for both the European countries and the third parties in order to have a greater chance of success in the bids and funding under Horizon 2020. The following are some suggestions on preparing for Horizon 2020 and increasing prospect for international collaboration.

General Strategies

– *Invite Main Players of FP7 for Brainstorming:* Meeting, workshop or roundtable discussion organised within research institutions with participants of the previous framework programmes to better understand and interpret the priorities set by Horizon 2020. This strategy offers national research councils, universities and research institutions an opportunity to develop its own position and strategy for participation. These discussions also strengthen the potential to produce concrete and relevant proposals fitting the priorities of Horizon 2020.

– *Observe Best Practices and Approaches Abroad:* Many leading research institutions abroad have programmes on how to enhance public-private partnership, involve SMEs in research activities and take part in research excellence by supporting individual researchers and research groups. For this reason, observing best practices abroad can provide universities and research institutions with a broader perspective and contribute to the quality of the proposals.

– *Initiate Dialogue for Science Diplomacy:* Universities and research institutions should engage in science diplomacy and initiate discussions on improving research excellence. As stated by the European Commission, science diplomacy uses “international cooperation in research and innovation as an instrument of soft power and a mechanism for improving relations with key countries and regions” (2012e). Keeping in mind the importance given to the emerging economies such as Brazil, China, India and South Korea in the Innovation Union and the openness in international cooperation, engaging in science diplomacy with these countries can be a long-term target for research excellence in both Europe and the

world. To be more specific, national research councils can take the initiative in discussing the possibility of posting *Research Counsellors* to strategically important countries.

– *Relay Information on Intellectual Property Rights and Patenting*: With the growing importance of innovation in Europe, the prominence of issues relating to Intellectual Property Rights (IPR) also increases. Sessions and meetings dedicated to specific IP or IPR queries can be conducted by National Research Councils (European Commission, 2012j). National research councils and universities can also offer to relay information on intellectual property rights and patenting to researchers from partner countries and in the process increase their visibility in Europe and the world.

Priority-Specific Strategies

Besides the general strategies, interested institutions should also look into priority-specific strategies to boost the potential for participation.

– *Excellent Science - Provide Custom-made Assistance*: The first priority, excellent science, gives importance to the contribution of individual researchers and research groups to research excellence in Europe. For this purpose, funding under excellent science is designed for investigator-driven frontier research. Universities and research institutions can provide custom-made assistance to each and every researcher and research group in compliance with the specific programme. Hence, research proposals for funding under European Research Council, future and emerging technologies, Marie Curie Actions and Research Infrastructures are assisted individually. This strategy makes it possible to give different services to researchers from different levels. It helps to improve the knowledge of researchers on these programmes, their quality of proposals, and hence, their share in participation in Horizon 2020.

– *Industrial Leadership - Bringing together the Academia and the Industry, and developing an Organic Relationship with the Industry*: The priority area of industrial leadership emphasises the involvement of industry in the academic research. It underscores the urgency to bring together the academia and the industry, promote public-private partnership as well as the participation of SMEs in research and innovation activities. Research and development departments of SMEs/large-scale enterprises and research groups at universities and

research institutions should meet to discuss related topics and possible research proposals.

Starting PhD programmes sponsored by SMEs and large-scale enterprises also helps to develop an organic relationship with the industry. This strategy serves to strengthen the ties between academia and industry. For example, under the Marie Curie Actions, there is a *European Industrial Doctorates* programme in 2012. Driven by the need for “a meeting of minds, between business, academia and public authorities, to ensure our researchers are equipped with the best cutting-edge skills”, the programme aims to “upgrade and embed research within companies; to attract young talents into choosing research careers; and to provide top-quality training” (European Commission, 2010).

Another example is the PhD programme of Politecnico di Milano. The University offers doctoral programmes that “provide scientific curricula of excellence in both training and research” (Politecnico di Milano, 2013). The main objective of the programme is to carry out education and research “in high-profile international environments and with intensive promotion of outside cooperation with industry and other external public and private bodies” (Politecnico di Milano, 2013).

Case study of industrial leadership in a non-EU country: A*STAR

An example of the involvement of industry in academic research in a third country is the Agency for Science, Technology and Research (A*STAR) in Singapore. With the slogan of “where great minds come together to do great science”, Biopolis and Fusionopolis were established in Singapore to perform as a “world-class research hub” (Agency for Science, Technology and Research, 2009a). Biopolis is home to public as well as corporate research laboratories, and brings together over 2,000 scientists, researchers, technicians and administrators. Fusionopolis is Singapore’s Research and Development hub for info communication technology, media and physical sciences and engineering. At Biopolis and Fusionopolis, “the co-location of public and corporate offers unprecedented opportunities for the integration of scientific capabilities” that they act as catalysts in stimulating interdisciplinary research (Agency for Science, Technology and Research, 2009b). Close collaboration between the biomedical sciences and physical sciences at Biopolis and Fusionopolis also encourages “private companies to draw on the capabilities and expertise of the research community to grow their businesses” (Agency for Science, Technology and Research, 2009b).

– *Societal Challenges - Organise Research Clusters for Each Challenge:* The third priority area, societal challenges, aims to incorporate resources and knowledge across different fields, technologies and disciplines. Workshops and conferences can be organised to gather researchers from different disciplines, different institutional background and different countries to better define some of these challenges and improve the quality of research proposals. Emphasis should be placed on developing networks with the emerging economies such as Brazil, China, India and South Korea.

Conclusion

Europe 2020 and the Innovation Union are significant moves towards restructuring Europe as well as improving its research and innovation capacity to enhance EU's economic competitiveness. Horizon 2020, the successor of the framework programmes, is introduced to make Europe a world leader in research and innovation. It sets clear priorities and tries to simplify its procedures in order to encourage

researchers, research groups, public and private institutions to submit proposals for funding and to contribute to European excellence and European competitiveness. Moreover, Horizon 2020 encourages key third countries to work with European institutions and researchers in collaborative research, and aims to increase the quality of research conducted and extend its area of impact. In this sense, it aims to turn a new page in research and innovation history of Europe.

Since Horizon 2020 is a new programme starting in 2014, there is a need for both the European and the third countries to fully comprehend the principles introduced, to develop a roadmap for engagement. In this context, national research councils, universities and research institutions should take steps towards getting prepared for Horizon 2020. The outlined roadmap can provide them with an opportunity to start accessing Horizon 2020 funding right from the beginning and be fully engaged in the research and innovation outputs, which in turn would enhance the quality of research conducted in Europe and in the world.

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