SCIENCE|BUSINESS

New Edition 2014

Horizon 2020

BIGGER SIMPLER BOLDER

Fifth edition of the guide to Europe's innovation strategy and its first work programmes

SCIENCE|BUSINESS

Horizon 2020: Bigger, Simpler, Bolder
Fifth edition of the Science|Business guide

2014

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Speak up!

How to get the word out – and broaden democratic debate – on EU research policy

Horizon 2020 is the biggest-ever European research and innovation programme. It's also the most complicated – despite the European Commission's efforts to simplify. So we at Science|Business figure it could use a bit of explanation. Hence, this guide – which has been evolving and growing since the legislative journey of Horizon 2020 began on 30 November 2011.

But there's a whole lot more about Horizon 2020 that needs explaining by someone, somewhere. Which brings me to a point that we at Science|Business have been making with increasing stridency: The EU, if it is to improve its research and innovation policy, needs to be more open – to new voices and new ideas. To be sure, the conception of Horizon 2020 has involved consultation with thousands across the EU (and beyond.) One project, Voices, ran 99 focus groups with citizens to ask them directly how they felt about recycling, sustainability, and how innovations might help. And Horizon 2020 includes interesting experiments for science and society interaction. Bravo.

But we need more. Research in Brussels is no longer a "fringe" show to be acted out by a dedicated few. It's now big money, with €79 billion to spend on Horizon 2020 over seven years by the Commission directly, and another €100 billion in the Cohesion Fund for various technology and environmental projects by regional governments. The essence of these projects is choices: The choice that research into dementia and ageing is more important than asthma and allergies, and their environmental and behavioural causes. The choice that energy security is more important than social "inclusion" (as measured by budget.) The choice that small companies need special access to money, and that southern and eastern European universities need special help catching up. I don't personally dispute any of those decisions – all reflected in Horizon 2020. But who decided it? On what evidence? By asking whom?

These are questions for a democracy. If we, as a society, are going to keep spending money at this pace on research and innovation, we need many more "average" citizens involved in the debate. So here is what I would like to see by 2020:

■ A European Parliament with a majority of members engaged in research and innovation policy, rather than a dedicated few.

- To do: Parliamentary candidates, this May, should publish positions on key science and technology issues. (Warning: Science|Business will ask for them.)

■ A European press with at least 100 journalists who understand how the Brussels EU research machine works – and can interest their viewers and readers in the choices it makes.

- To do: Find a foundation to fund journalist bursaries to visit Brussels for a few months, and see first-hand. Most will get hooked on the story.

■ A European Commission with Nordic transparency built into its basic processes.

- To do: When it starts drafting the Horizon 2020 work programmes for 2016 and beyond, publish them immediately rather than try to hide them. (We caused a stir last year by finding and publishing unauthorised online links to the 2014/15 drafts.)

■ A European grass-roots organisation for science with the budget and reputation truly to mobilise and speak for the scientific community.

- To do: Increase EU support for this – either to existing groups, or to new ones.

■ A larger European community of innovation policy experts, plugged into the wider world.

- To do: Fund more innovation-policy research in more universities, with networks to Brazil, China and other rising nations.

■ A European citizenry that includes more scientific amateurs and fans – in astronomy, ornithology, ecology and other fields – ready to speak up.

- To do: Invest more – at both EU and national level – in science education from kindergarten onwards.

There's much more; you may have your own list. Tell us about it, at www.sciencebusiness.net. Speak up.

Richard L. Hudson
CEO & Editor

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Introduction

Horizon 2020

Europe's new research & innovation plan

The European Union's new omnibus R&D programme promises more money, less red tape, broader benefits, more jobs and economic growth – but will it deliver? Science|Business follows the launch of the first Horizon 2020 calls, as more details emerge about where the real money lies, and what proposals are more likely to be successful

After three years of preparation, the first calls for Horizon 2020 were launched by EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn on 11 December 2013. While the final budget of €79 billion (€70.2 billion in constant price) is less than many had hoped for, it is the only major programme in the EU's budget for the next seven years whose resources will increase, and it's nearly 30 % bigger than the previous research funding round, Framework Programme Seven.

Certainly the ambitions are big. "Over the next seven years, we will use every cent of Horizon 2020's budget to build a stronger, more innovative and more competitive Europe, and improve the quality of life for everyone," said Geoghegan-Quinn, speaking at a Horizon 2020 conference in Dublin on December 10. As well as tackling seven grand societal challenges – food, health, security, social sciences, transport, climate change and energy - it is hoped that this programme will leverage greater investment from industry in R&D, while also encouraging and facilitating innovation in Europe.

With the paperwork now finalised, it is possible for researchers, universities and companies to survey the contours of what research and innovation funding from the EU will look like through the remainder of this decade:

- It will be fairly large – increasing the financial and political weighting of European Union funding in European research overall.

- It will add more of an emphasis on market-facing innovation rather than basic research.

- It will, within basic research, magnify efforts to fund the best science through open competition – chiefly through the European Research Council, which will receive over €13 billion over the seven years, a significant boost in funding.

- Within the innovation portion, it will include more support to small companies, a new bottom-up fast track to innovation, and new forms of public-private collaboration – such as public procurement of innovative products and services, and the knowledge triangle (industry, research and education) consortia of the European Institute of Innovation and Technology.

- It will strive to be simpler, to stop driving away companies horrified by the old bureaucratic mill that EU funding had become, with a single set of rules, a flat-rate reimbursement model and a reduced time to grant.

- It will involve new measures designed to bridge the innovation divide in Europe and to better co-ordinate research programmes with EU structural fund investments.

- It marks an acceleration of the EU's move towards open access publication of publicly-funded research. As of 2014, all journal articles reporting research funded from Horizon 2020 will have to be freely available – in an attempt to secure a greater return on public R&D investment.

This Science|Business guide provides insight into the highlights of the political debate, the resulting agreement and the first calls under the new programme, and how they might affect R&D in Europe. ■

EU Commissioner Máire Geoghegan-Quinn visiting a lab

Commission gears up for a spate of applications as Horizon 2020 kicks off

Science|Business interviews Máire Geoghegan-Quinn, the EU Commissioner at the centre of formulating Horizon 2020 and steering it over the finishing line

"It's all about simplification – radical simplification," said EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, putting forward her vision of how the €79 billion Horizon 2020 programme will chip away at the huge problems of our age, in ageing and chronic disease, energy supply and climate change, and sustainable and adequate food production - and why she expects to see willingness from industry to engage with academics in dealing with these challenges.

A new Participant Portal is intended to make it as easy as a Google search for researchers and businesses to find opportunities for participation, she said, while a reduced time to grant of eight months will help people get their money faster. "At the end of the day, that is what we want," Geoghegan-Quinn told Science|Business.

The first calls for Horizon 2020 funding streams went live on December 11 and will run for three to four months. The Commission expects 40,000 applications to the programme every year. "If the inquiries that are being made at the moment are anything to go by, I think we will have an enormous amount of people that want to apply," said Geoghegan-Quinn.

What's it all about?

Tackling the so-called Grand Challenges lies at the heart of Horizon 2020. "We have a huge energy challenge at the moment, food security is a huge issue, and healthy ageing is going to be very important," said Geoghegan-Quinn. "We have to invest in these challenges." In all, €29.7 billion, or 38.53 per cent of the total budget, will be dedicated to these areas.

Against the backdrop of the Grand Challenges is the more immediate, and for many the more pressing problem, of the on-going economic crisis and crippling youth unemployment, with Europe's competitiveness fading in comparison to many emerging markets.

This is why Horizon 2020 is placing a greater focus on translating research into innovation, said Geoghegan-Quinn. "It's important to bring industry back into the

programme," she said, reflecting on the infamous bureaucracy that has discouraged businesses from seeking EU funding. "I have met research groups, universities, and businesses, big and small, right around Europe and the main message from them all was that EU research programmes were too complicated," the Commissioner noted.

Changes to streamline the process include a single set of rules, flat-rate reimbursement and a reduced time to grant. An important practical change is on the way, in that the Commission is moving away from paper and bringing everything online in a single portal.

"I think people will be pleasantly surprised with the portal," said Geoghegan-Quinn. "It's going to be much more user-friendly. I have seen it in action and for me, it's like any of the good search engines, where you can put in a word or sentence and you get a menu of all the relevant calls."

Time for researchers to step out of their comfort zone

At a time when member states are cutting national research budgets, funding from Brussels is of increasing importance. Given this, Geoghegan-Quinn believes researchers of all disciplines will be happy to see that the European Research Council as, "the benchmark of excellence", will receive over €13 billion, a significant boost from Framework Programme Seven (FP7).

The new challenge-based approach in Horizon 2020 means researchers could bid to take part in calls right across the spectrum of the programme, not just those tied specifically to their discipline. "There are no little boxes anymore," said Geoghegan-Quinn, "Before this, every discipline knew exactly where to go for funding, now they realise they all have to step outside their boxes, and I think that's a good thing."

Social scientists, for example, will benefit from increased ERC funding , and will also be involved in each of the seven societal challenges. Within the section of Horizon 2020 focusing on rebuilding Europe's industrial leaderships, companies will increasingly be looking for external expertise. "Companies are developing things that are going to be different and need to understand what their customer wants and whether there will be acceptance from the customer. To do that, they need the social sciences."

Working on collaborative projects will increase the dialogue between industry and academia, and the Commissioner hopes this will lead to improved career mobility.

"I think a wonderful thing would be if it was a natural thing for academics to move between academia and industry," she said. "We're setting the architecture for that to be able to happen, but at the end of the day it's going to be up to those who work in academia and those who work in business as to whether that happens or not."

Máire Geoghegan-Quinn

"It's a question of not staying pigeon-holed in the same area but being prepared to be bold and brave and to step outside, and that's what we're asking people to do," she said.

A broader impact on Europe

When the money is spent and the reckoning made, Geoghegan-Quinn wants the results of the programme to be felt across Europe. "I'm hoping the money invested in the societal challenges will make my life better as I grow older," she said, noting energy and food security, as well as better healthcare as factors in achieving this.

But more important is the chance to use the money to give hope to young people, especially the unemployed, or those with a qualification that no longer matches requirements. "I'm hoping that what we do with Horizon 2020 will change that landscape for them," said Geoghegan-Quinn.

"I also hope that many, many more young people will have chosen to go into a scientific career, because that's where the highly-skilled, well-paid jobs are going to be. That's where I want to see my grandchild." ■

CHAPTER ONE

How was Horizon 2020 created?

Horizon 2020 Timeline

30 November 2011
European Commission adopts Horizon 2020 package. Beginning of negotiations between the European Parliament and Council of Ministers.

January 2012
The European Parliament (ITRE committee) appoints rapporteurs for the Horizon 2020 dossier.

July 2012
MEPs release a number of draft reports proposing amendments to the Commission's Horizon 2020 plan

10 October 2012
Council reaches partial general approaches on the EIT regulation and on the rules for participation and dissemination in Horizon 2020.

2012

Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | De

5-6 December 2011
Commission presents Horizon 2020 to Council of Ministers

31 May 2012
Council reaches partial general approach on the Horizon 2020 Framework Programme

28 November 2012
ITRE Committee presents the final reports on Horizon 2020 with amendments to the Commission's proposals.


11 December 2012
Council reached partial general approaches on the Specific Programme implementing Horizon 2020 and on the Strategic Innovation Agenda (SIA) of the EIT.
7-8 February 2013
European Council agreement on long term budget (MFF)
25 June 2013
Trilogue agreement reached on programme for Horizon 2020
10 July 2013
Commission announced its €6.5 billion plan for five Joint Technology Initiatives under Horizon 2020
18 September 2013
ITRE Committee votes on consolidated texts of Horizon 2020 package
3 December 2013
Adoption of Horizon 2020 legislative acts by Parliament and Council
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January 2013
Start of 'trialogue' meetings between European Parliament, Commission and Council
13 March 2013
Parliament rejects Council's deal on the MFF
27 June 2013
Political agreement reached by negotiators from Council, Commission and Parliament on €960 billion long-term budget
17 July 2013
Diplomats from each member state, acting through the Committee of Permanent Representatives, endorsed the agreement reached in June on Horizon 2020 and prepared draft legal texts
21 November 2013
Parliament votes on Horizon 2020 in plenary session
11 December 2013
First calls launched

Who shaped Horizon 2020?

Some of the most influential figures from the two-year long debate

Máire Geoghegan-Quinn

EU Commissioner for Research, Innovation and Science

Máire Geoghegan-Quinn became the European Commissioner for Research, Innovation and Science in February 2010. Her responsibilities include the European Research Area and the policy framework for European research policy, especially Horizon 2020. Geoghegan-Quinn previously served as a member of the European Court of Auditors from March 2000 to February 2010. Following election to the Irish Parliament in 1975, Geoghegan-Quinn became the country's first female cabinet Minister in 1979, serving as Minister for the Gaeltacht (Ireland's Gaelic speaking regions), and later as Minister for European Union affairs; for Tourism, Transport and Telecommunications; and for Justice. Prior to entering politics, she qualified and worked as a primary school teacher. ■

Commissioner Máire Geoghegan-Quinn

Maria da Graça Carvalho MEP

Maria da Graça Carvalho MEP

Rapporteur for the Specific Programme implementing Horizon 2020

Maria da Graça Carvalho has been an MEP since 2009, as part of the European People's Party. She is a member of the Industry, Research and Energy Committee, and a substitute member of the Budgets Committee. Carvalho is a former Minister of Science and Higher Education and former Minister of Science, Innovation and Higher Education in Portugal. She is a full professor at the Technical University of Lisbon and has 30 years' experience as a researcher in energy, environment and climate change. ■

Christian Ehler MEP

Rapporteur on the rules for the participation in, and dissemination of, Horizon 2020

Christian Ehler has been an MEP since 2004 and is a member of the Bureau of the German Christian Democratic Union in the European Parliament. He is a member of the Industry, Research and Energy, Committee, as well as the Subcommittee on Security and Defence. He is also a substitute member of the Committee on Foreign Affairs. Since 2012, he has acted as Chairman of the delegation for relations with the United States. In addition, Ehler is the managing director of Biotech GmbH – a biotechnology centre in Hennigsdorf, Germany. Before joining the European Parliament, he was a member of the Brandenburg regional parliament. Ehler holds a doctorate in political science. ■

Christian Ehler MEP

Philippe Lamberts MEP

Philippe Lamberts MEP

Rapporteur for the regulation establishing the European Institute of Innovation and Technology

Philippe Lamberts has been a member of the European Parliament since 2009. He focuses on economic and financial matters, and has become a specialist in fiscal, banking and macroeconomic issues. He also deals with industrial, research and innovation matters, and has an interest in relations with China. From 1999 onwards, he became involved in European politics and more specifically with the European Green Party. He has served as co-president of the party since 2006. ■

Marisa Matias MEP

Rapporteur on the Strategic Innovation Agenda of the European Institute of Innovation and Technology: the contribution of the EIT to a more innovative Europe

Marisa Matias was elected to the European Parliament in 2009. She is a member of the Industry, Research and Energy Committee and a substitute on the Economic and Financial Affairs Committee. In addition, Matias acts as Vice-Chair of the delegation for the relations with the Mashreq countries (Egypt, Jordan, Lybia and Syria). She is a researcher at the Centre for Social Studies at the University of Coimbra, Portugal, where she obtained a doctorate in sociology. Her areas of interest include environmental health, sociology of science, sociology of health, and political sociology. ■

Marisa Matias MEP

Minister Sean Sherlock

Peter Skinner MEP

Peter Skinner MEP

Rapporteur for the Research and Training Programme of the European Atomic Energy Community, complementing Horizon 2020

Peter Skinner was elected as a member of the European Parliament in 1994 and has been a member of the Economic and Finance Committee for 16 years, as well as a member of the Industry, Research and Energy Committee. As the Parliament's longest serving member on the Transatlantic Economic Council, he is also closely involved in the European Parliament relations with the US. He graduated from Bradford University in economics and politics, and completed post-graduate studies at Warwick Business School. ■

Sean Sherlock

Irish Minister of State, Research & Innovation; Chair of the Competiveness Council January-June 2013

During the Irish Presidency of the Council of the European Union, Sean Sherlock chaired Competitiveness Council meetings and took part in inter-institutional negotiations as a representative of the national governments. He was appointed Irish Minister of State for Research & Innovation in March 2011. Sherlock was first elected to the Irish Parliament in May 2007, where he acted as the Labour Party spokesperson on agriculture and food. He was first co-opted onto Mallow Town Council and Cork County Council in 2003 and was then elected to both institutions in 2004. He graduated from the National University of Ireland, Galway with a degree in economics and politics. ■

Teresa Riera Madurell MEP

Rapporteur on Horizon 2020

Teresa Riera Madurell was first elected to the European Parliament in 2004. She is the Socialists & Democrat party coordinator on the Industry, Research and Energy Committee, and a substitute member of the Committee on Foreign Affairs.

Riera Madurell was a Member of the Balearic Islands Parliament and of the Mallorca Island Council from 1989 to 1996, as well as a member of the Congress of Deputies in Spain from 1996 to 2004. A former chair of the College of Business Studies and Information Technology at the University of the Balearic Islands, Riera Madurell later became Vice-Rector of the university from 1991-1994. ■

Robert-Jan Smits

Director-General, Directorate-General for Research and Innovation, European Commission

Robert-Jan Smits was appointed Director-General of DG Research and Innovation in July 2010 after a stint as Deputy Director-General at the Joint Research Centre, where he was responsible for programmes and stakeholder relations; resource management; and the institutes for Energy, for Environment and Sustainability and for Prospective Technological Studies. Before joining the European Commission, Smits was Deputy Head of International Technology Policy at the Dutch Ministry of Economic Affairs. ■

Director-General Smits

Teresa Riera Madurell MEP

How the negotiations played out

Budget versus details: A look at how the political agreement was achieved

The Commission's best-laid plans for Horizon 2020 were dealt a serious blow at a summit in February 2013, when European government leaders in the Council decided for the first time to make cuts to the EU's long-term budget, the Multiannual Financial Framework (MFF). This covers everything the Commission will do over the next seven years: subsidising agriculture, funding development projects, paying its own staff – and funding research and innovation programmes. The agreed budget of €960 billion from 2014 to 2020 represented a cut of 3.4 per cent from the current spending period.

For Horizon 2020, the outcome was a budget of €70.96 billion, according to Michael Jennings, spokesman for Máire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science. This represented a net increase on the €55 billion of its predecessor, the Seventh Framework Programme (FP7), but was a reduction of almost €10 billion from the Commission's proposal, and a far cry from the ambitions of some MEPs, who had called for €100 billion.

Parliament weighs in on the debate

Since the Lisbon Treaty came into force on 1 December 2009, however, the budget also needs the endorsement of the European Parliament – a responsibility MEPs take very seriously.

The four biggest political groupings immediately issued a statement rejecting the Council's proposal, "The real negotiations will start now with the European Parliament," said the group leaders.

The Parliament said the proposed cutbacks would weaken Europe's competitiveness, "We want a modern EU budget that is oriented towards growth and employment," said Göran Färm, vice-president of the Socialists & Democrats group. "We need sufficient spending in areas such as research, youth unemployment, infrastructure and climate change policies, to achieve the EU 2020 strategy."

This vehement opposition, however, seemed to stem less from concerns over future spending and more from the Parliament's urge to assert its role in the budgetary process. "The Parliament wants to be taken as a serious partner," said President Martin Schulz. "We want to come to a compromise and improve the MFF."

Parliament's budget demands:

In a defiant move, MEPs voted 506 to 161 against the Council's proposal in March 2013. As well as seeking an increase to the "austerity era" figures, MEPs sought a number of changes to the structure of the budget, including:

- The fulfillment of all unpaid payment claims for 2012, in order to begin the 2014 - 2020 funding programme with a clean slate.
- Greater flexibility between years and budgetary lines, allowing unspent funds to be redirected to areas that need it.
- The introduction of a review procedure, whereby the allocation of funds within the Horizon 2020 budget could be reconsidered over the seven year programme.

The R&D community had reason to hope the original €80

billion for Horizon 2020 might be restored after this vote, with a prominent clause in the text reading, "The MFF for 2014-2020 should ensure the successful implementation of the Europe 2020 strategy and endow the EU with the necessary means to recover from the crisis and come out stronger; [The Parliament] stresses, therefore, the importance of substantially increasing its investments in innovation, research and development."

A very public negotiation

The big question, however, was how much flexibility really existed at Council level to unpick its figures. Lengthy talks were needed for governments to secure a deal in February, amidst a growing divide between countries looking to reduce EU spending (led by the UK) and those seeking to maintain current spending levels (including France and Italy).

If an agreement was to be reached in time to finance the next round of EU projects, however, national ministers needed to move to meet MEPs. In the months following the Parliament's vote, lead MEPs met with negotiators from the Commission and Council in tripartite meetings, or "trilogues", with the Irish government at the helm of the rotating Presidency of the Council.

On 19 June, Ireland's Deputy Prime Minister, Eamon Gilmore, announced that a deal had been reached with Alain Lamassoure, MEP and Chairman of the Parliament's Budgets Committee. "We have agreed a package that we are both going to recommend to our respective institutions," said Gilmore. "This is a balanced package that addresses all four of the issues identified by the European Parliament as important for the EU budget."

Janusz Lewandowski, EU Commissioner for Financial Programming and Budget, also welcomed the agreement, but MEPs were not happy and several denied that any agreement had been reached. "The statement by the Irish Council Presidency of an alleged agreement on the financial framework is nothing more than a manipulation," said Reimer Böge, MEP and Rapporteur for the Parliament's response to the MFF. "The European Parliament's negotiating team last night decided not to continue the negotiations, if they can be called such at all, and submit the texts to the European Parliament," he said. Böge was so unhappy with the move that he resigned from his position as rapporteur.

His outrage appeared to be at odds, however, with the response from Lamassoure, who issued a statement defending both Gilmore's handling of the negotiations and the deal reached. Lamassoure clarified that while Parliament negotiators were unable to agree to the final text unanimously, he as chief negotiator was happy with it. "As lead negotiator, I will present the agreed text to the parliament and I will personally defend it," he said.

An outcome, finally

The inter-institutional spat was resolved on 27 June 2013, eight days after Gilmore's announcement, when the negotiations were concluded at the highest level between Schulz and Ireland's Prime Minister, Enda Kenny. "This is a good deal for Europe. This is a good deal for Europe's citizens. This is a good deal for the European economy," said José Manuel Barroso, President of the European Commission.

The big question for all was how much the Parliament's dramatic rejection of the February deal managed to change. While it did lead to increased flexibility of the budget, the Council stuck to its guns in spending and the overall limits remain unchanged – €960 billion in spending commitments and €908bn in actual payments (in constant prices, based on 2011 figures).

Parliament's gains:

- Flexibility to move unused appropriations between budget headings and fiscal years, rather than returning it to national budgets as at present;
- A review of the programme in 2016 with implementation in 2017, allowing the new Parliament and Commission coming into office in 2014 to put their stamp on the budget, and to facilitate changes in spending should the economic climate improve;
- "Front-loading" of up to €2,543 million to tackle youth unemployment and strengthen research, including
    - An additional €200 million for Horizon 2020 in 2014-2015
    - An additional €150 million for Erasmus in 2014-2015
    - An additional €50 million for COSME to improve the competitiveness of SMEs in 2014-2015
    - €2143 million for Youth Employment in 2014-2015

These amounts will be fully offset against appropriations within and/or between headings in order to leave unchanged the total budget for each programme from 2014-2020.

The European Parliament gave its formal consent in a vote on 19 November. The MFF package was formally adopted by the Council on 2 December 2013.

Horizon 2020 negotiations

Running parallel to the MFF debate were negotiations on the programme for Horizon 2020 – deciding what activities would be funded and where emphases would be placed. The six reports produced by MEPs from the Industry, Research and Energy Committee (ITRE) framed the Parliament's response to the Commission's proposal and their authors – the "rapporteurs"- were the Parliament's main negotiators.

While the trilogues took place behind closed doors, one part of the Horizon 2020 debate became very public. As

late as June 2013, agreement had not been reached on a reimbursement model for the programme - with national governments favouring a flat-rate system and lead MEP Christian Ehler defending the existing full-cost model.

The Council proposed a flat-rate reimbursement model - paying 100 per cent of direct research costs plus an additional 25 per cent of this amount to cover indirect expenses—in order to simplify the programme. It was suggested that this could be paired with a 'Bonus+' scheme, allowing supplementary payments of up to €8,000 per researcher per year.

Ehler said such a model would be more expensive than under Framework Programme Seven, and instead proposed the reintroduction of a full-cost reimbursement option. Along with lobby groups including the European Association of Research and Technology Organisations (EARTO), Ehler argued that participants with large, expensive research facilities would need reimbursement of actual infrastructure costs.

At a May 2013 trilogue session, MEPs presented a compromise proposal including the Council's flat-rate reimbursement model —with an additional full cost option for non-profit organisations at 70 per cent. This held little sway with the ministers and it looked as though a stalemate might arise in negotiations, with Seán Sherlock, Ireland's Minister for Research and Innovation, saying the funding model, "is a red line for the Council", but Ehler being equally adamant, saying, "If we need a second reading, we will have one."

But at the eleventh hour, a trilogue agreement was reached on 25 June, and it quickly became clear that the Council had won out in the money stakes – both overall spending (approximately €70.2 billion in constant prices) and the reimbursement model (100 per cent direct costs plus 25 per cent flat-rate for indirect costs) remained unchanged.

In order to get these politically sensitive issues passed, ministers showed great flexibility towards the content of the programme and many of the Parliament's ideas were accepted, including:

- An independent activity line with a dedicated budget of 1.06 per cent of the Horizon 2020 budget for "Spreading Excellence and Widening Participation", including new activities such as teaming and twinning actions between research institutions;

- A pilot "Fast Track to Innovation" scheme to run permanently open calls with a reduced time to grant of six months, designed to attract small consortia with innovative ideas;

- The creation of Return Grants within the Marie Skłodowska Curie Actions for the reintegration of researchers after an international experience or to attract those already working in the EU towards less innovation-intensive regions;

- The ear-marking of at least 20 per cent of the combined budget of Leadership in Enabling and Industrial Technologies (part of pillar II) and Societal Challenges (pillar III); for SMEs;

- A dedicated budget and a single management structure for the SME instrument, with seven per cent of the combined budget of Leadership in Enabling and Industrial Technologies (part of pillar II) and Societal Challenges (pillar III);

- Introduction of "Innovation Vouchers" to fund research and innovation activities within Phase Two of the SME instrument.

- The earmarking of 70 per cent of the energy budget for renewable energy, energy efficiency, smart grid and storage, and an additional 15 per cent for activities for the market uptake of existing renewable energy and energy efficiency technologies;

- Reduction in the general time-to-grant to eight months from an average of a year under Framework Programme Seven.

The Horizon 2020 package was formally adopted by the Parliament on 21 November 2013, followed by an approval by national science ministers at a meeting of the Competitiveness Council on 2-3 December. ■

A round-up of major research developments and initiatives

A number of new research funding programmes and policies will complement the final Horizon 2020 package

1. The Single European Patent

After four decades of talk and negotiations, the Council and European Parliament struck a deal on the long-awaited single European patent in December 2012, with the patent due to be launched in early 2015.

The promise is that the new patent will be cheaper and more effective in protecting inventions, with one patent grant providing protection in 25 member states, patent languages limited to English, French and German (in line with the European Patent Office system) and a single court to deal with disputes.

There is a long bedding-down process, with a transition period of 12 years to move from the existing system, in which a patent granted by the European Patent Office in Munich must then be translated into the language of any country in which it is to have effect, to the new three language system.

When it is up to speed, the estimate is that a patent granted under the unitary scheme will cost €4,725, compared to the European Commission's current estimate of the average cost, which stands at €36,000.

2. COSME – the first EU programme designed to specifically support SMEs

The Programme for the Competitiveness of Enterprises and SMEs – COSME – named, as Commission Vice-President Antonio Tajani noted, after the Renaissance merchant-prince Cosimo de'Medici – will run in parallel to Horizon 2020, with an independent budget of €2.3 billion over the next seven years.

Approximately sixty per cent of this sum, €1.4 billion, will be spent on instruments to improve access to finance for SMEs. This includes an equity facility that will provide risk capital to funds investing in SMEs in their growth phase, and a loan guarantee facility, which will provide financial intermediaries with risk-sharing arrangements so that they can provide finance to SMEs.

Support services, such as international contacts and advice on EU legislation and funding programmes, provided by the Enterprise Europe Network will seek to facilitate business expansion both within the internal market and further afield.

COSME and Horizon 2020 will together replace the Competitiveness and Innovation Framework programme (CIP) and will complement each other. The equity and loan facilities will operate across both programmes and the Enterprise Europe Network will be set up under COSME but provide support to all SMEs.

The budget of COSME is almost double that of its predecessor - the competitiveness part of CIP. The new initiative is a reflection of the rising status of SMEs on the political agenda – now seen as a prime vehicle for economic recovery and job creation.

3. International collaboration in data-sharing

Europe is joining forces with the US and Australia in a bid to underpin data sharing through the formation of the Research Data Alliance (RDA), an international body set up to

promote the development of new infrastructures, standards and tools for sharing and mining research outputs.

John Wood, the EU Co-Chair of the RDA, said, "The aim is to ensure that when scientists want access to the data of their peers, this data is available for them in a format that they can use."

The RDA has a long and difficult agenda, but at its heart is a mission to unlock the innovation potential of research data.

At present, only 25 per cent of researchers share their research data openly. This slows innovation, with a recent study on Danish SMEs showing that without speedy access to scientific research results, it takes firms on average 2.2 years longer to develop or introduce new products.

The objectives of the RDA are in tune with the open access theme of Horizon 2020 – where all journal articles reporting research funded under the programme will have to be freely available.

4. Future and Emerging Technologies – Graphene and the Human Brain Project

The two winners of the biggest basic research grants in EU history – with €54 million for starters in 2013 alone - have been guaranteed the funding will be maintained over ten years regardless of any cuts to the EU's overall R&D programme. In total, the two programmes are in line to receive €2 billion in EU funding.

The Future and Emerging Technologies Flagships on Graphene and the Human Brain will also be the most collaborative projects ever funded by the EU, with Graphene involving 126 academic and industrial groups in 17 countries, while the Human Brain Project is comprised of 87 organisations in 23 countries, of which 16 are in the EU.
The two Flagships received €54 million from the European Commission's ICT 2013 Work programme to get off the ground, with the majority of the remaining funding coming from Horizon 2020.

5. The European Space Agency

The European Space Agency (ESA) has been allocated €10 billion for its programmes from 2013 – 2017. While this was €2 billion less than hoped for, it represented a welcome conclusion to negotiations at a time of austerity, when the national governments that fund ESA directly are cutting spending elsewhere. The investment will be focused on fields which the ESA claims have high growth potential or with a direct and immediate impact on the economy, such as telecommunications and meteorology.

6. Reform of public procurement rules

One key boost for innovative start-ups and SMEs in Europe is likely to come from increased public procurement of innovation from smaller and medium-sized companies. Under new rules, agreed by political negotiators from the Parliament and Council on 26 June 2013, it will be possible to divide contracts into lots to improve access for small firms.

An Innovation Partnership Procurement tool will apply to contracts where there is a need for the development of an innovative product or solution that is not already available on the market. 'Innovation Partnerships' will enable contracting authorities to establish a long-term innovation collaboration for the development and subsequent purchase of new, innovative products, services or works. Forward-looking customers can provide the necessary 'market-pull' and underwrite the development of the innovative solution without foreclosing the market.

Simplification will come from a standard 'European Single Procurement Document' form, to be provided in all languages. The system will be based on self-declarations and only the winning bidder will have to provide original documentation. This aims to save companies filling in a lot of initial paperwork and make it easier for them to bid.

Malcolm Harbour MEP, Chairman of the Committee on Internal Markets and Consumer Protection in the European Parliament, has spearheaded the movement to get government agencies to spend a greater slice of the EU's €2.3 trillion procurement budget on innovative products. "Public procurement has immense power," Harbour said. "We have now ensured that the [European] legal framework is simple, easy to operate and encourages good innovative procurement – and doesn't discourage it, he added.

7. Erasmus Plus

Erasmus will continue for the next seven years, with the €14.7 billion programme enabling over four million people to study and train abroad between 2014 and 2020 - almost doubling the existing number. Erasmus Plus represents an increase in spending of 40 per cent from the last funding round, and brings together all existing EU and international schemes for education, training and youth and, for the first time, includes sport.

Of the total funding, 77.5 per cent will be allocated to education and training, with 3.5 per cent going to the Loan Guarantee Facility, which will allow students to borrow €12,000 for one, or € 18,000 for two years, to do a masters' degree abroad. The EU will provide a partial guarantee to the financial institutions offering the loans.

"Knowledge Alliances" at university level and "Sector Skills Alliances" in vocational institutions are intended to promote the exchange of good practice. Meanwhile, the private sector will be encouraged to foster innovation and to help promote learning and education. ■

CHAPTER TWO

How the money will be spent

Big and bold What's new?

A look at some of the most striking features of the revised programme

In all the hyperbole surrounding the launch of Horizon 2020, the Commission and many Members of the European Parliament have been keen to convince researchers and SMEs across Europe that this new framework programme will have more to offer than ever before.

But what are the facts behind this great promise? Science|Business takes a look at the real differences in Horizon 2020.

The programme at a glance:

■ The final budget figure of €79 billion, although almost €10 billion less than the Commission had hoped for (€70.2 billion in constant prices compared to €80 billion) is an almost 30% increase on Framework Programme Seven. It also reflects a new perception of science and technology as Europe's way out of the crisis, as Horizon is the only major programme in the EU's budget for the next seven years whose resources will increase.

■ A significant boost for the basic science funded by the European Research Council, which will receive €13 billion, 17 per cent of the overall Horizon 2020 budget, for its elite research grants, up from 15 per cent (€7.5 billion) in FP7. The agency, has won wide praise for funding excellence in science since it began in 2007. However, there has been some political backlash in eastern and southern Europe because most of the ERC grants to date have gone to science-rich north-western Europe. The Commission's responses include several measures to reverse the brain drain from newer member states, including the creation of 'ERA Chairs', which fund special professorships to recruit "outstanding academics to institutions with a clear potential for research excellence".

■ A 30% boost for the Marie Skłodowska Curie Actions, which will receive €6.16 billion (up from €4.7 billion in FP7) to provide training opportunities to excellent researchers, such as fellowships and the possibility to gain experience abroad and in the private sector. Return Grants have been introduced to attract researchers currently working outside of Europe to return, and to support researchers already working in Europe who wish to move to a region with a less well-developed science infrastructure.

■ A dedicated SME instrument, with a budget of approximately €3 billion, has been introduced to fill gaps in funding for early-stage, high-risk research and innovation activities. The instrument will cover all fields of science, technology and innovation in a bottom-up approach. SMEs will benefit from at least twenty per cent of the combined budget from the Leadership in Enabling and Industrial Technologies banner in Pillar Two and Societal Challenges in Pillar Three, about €8.65 billion.

■ A bottom-up "Fast Track to Innovation" pilot scheme will be implemented in order to speed up the time from idea to market with open calls and a reduced time to grant of six months, and to increase the participation of industry, SMEs and first time applicants in Horizon 2020. This will be open to all participants, but is intended to attract small consortia with close-to-market projects and small budgets.

■ Reduced administrative burdens, a shortened time to grant of eight months (in Framework Programme Seven the average was a year), and the abandonment of the full-cost reimbursement model (despite a determined fight from Christian Ehler MEP and large-scale research organisations), represent an attempt to cut red-tape in the programme. A flat-rate reimbursement model will apply, with universities and research and technology organisations receiving 100 per cent of eligible costs, as well as a flat rate of 25 per cent to cover indirect costs.

■ An eye-popping rise, from €309 million to €2.7 billion for the European Institute of Innovation and Technology, which will be integrated into Horizon 2020. This Budapest-based organisation is a new EU model for

getting industrialists, researchers and educators working together via Knowledge and Innovation Communities (KICs) in specific sectors – so far, energy, climate change and ICT. Five new KICs will be rolled out over Horizon 2020, starting with 'Healthy living and active ageing' and 'Raw materials' in 2014, followed by 'Food4future' and 'Added value manufacturing' in 2016. The final theme for 2018 will be 'Urban mobility'.

■ The biggest chunk of the budget - 38.53 per cent or €29.7 billion - will go to 'Societal Challenges' – a set of hot-button social and environmental issues that have risen high on the political agenda across Europe over the past five years. These are health, demographic changes and wellbeing; food quality and marine research; clean and secure energy; smart and green transport; climate action, resources and raw materials; inclusive, innovative societies; and secure societies.

■ In an attempt to secure greater access to and return from publicly-funded research, all articles produced with funding from Horizon 2020 will have to be made accessible - either immediately online by the publisher ('Gold' open access) or through an open access repository no later than six months (12 months for social sciences and humanities) after publication ('Green' open access).

■ A new budget line, Widening Participation, has been introduced to address the innovation divide in Europe and will receive 1.06 per cent of the overall budget, or €816 million. This includes new activities such as teaming and twinning of research institutions in less-developed regions with well-established counterparts, and the establishment of European Research Area chairs to attract leading academics to less-developed institutions. The programme will also see closer co-ordination with structural funds in a move designed to encourage member states to spend more of their regional development funds on research and innovation.

■ In total, 10.5 per cent of the Horizon 2020 budget will be spent on energy, of which EURATOM, the nuclear energy programme, will get €1.6 billion. EURATOM 2014-2018 will have a stronger focus on nuclear safety and nuclear training, as well as funding work in the fields of fusion energy research, nuclear fission and radiation protection. For the first time, it will have the same rules for participation as Horizon 2020 – as part of the move towards simplification.

■ Horizon 2020 also sees the Commission's belated arrival into the 21st century, with a new participant portal, designed to act as a one-stop-shop for researchers and businesses to find opportunities and to manage their grant application. The Commission aims for a completely paperless management of Horizon 2020 grants, with the introduction of e-signatures and new online functions for appointment and payment of experts. ■

Budget Breakdown Horizon 2020

	%	Total budget	The 2014 budget – the first calls
I. Excellent science, *of which:*	**31.73**	**€24.4B**	**About €3 billion, including:**
1. The European Research Council	17	€13.07B	€1.662M to fund approximately 1,000 top scientists.
2. Future and Emerging Science and Technologies	3.5	€2.69B	€200 million in four Calls for Future and Emerging Technologies for project proposals in bio-economy, advanced manufacturing, and other cutting-edge fields.
3. Marie Sklodowska-Curie Actions	8	€6.16B	€800M for six fellowships for (mostly) younger researchers seeking to develop their careers.
4. European research infrastructures	3.23	€2.49B	€277M in four calls for Research Infrastructure – "big science" projects like synchrotrons and databases.
II. Industrial leadership, *of which:*	**22.09**	**€17B**	**€1.8 billion to support industry, including:**
1. Leadership in enabling and industrial technologies	17.6	€13.54B	€700M for ICT €500M for nanotech, advanced materials, biotech €128M for space
2. Access to risk finance	3.69	€2.84B	Remainder: Access to risk finance, innovation in small companies, and a new "SME Instrument" to fund individual, innovative small companies for the first time.
3. Innovation in SMEs	0.8	€616M	
III. Societal challenges, *of which:*	**38.53**	€29.7B	**€2.8 billion to help solve some of society's greatest problems, including:**
1. Health demographic change and wellbeing	9.7	€7.47B	€600M
2. Food Quality and marine research	5	€3.85B	€300M
3. Secure, clean and efficient energy	7.7	€5.93B	€600M
4. Smart, green and integrated transport	8.23	€6.33B	€540M
5. Climate action, resources and raw materials	4	€3.08B	€300M
6. Inclusive, innovative societies	1.7	€1.31B	€112M
7. Secure societies	2.2	€1.69B	€200M
Science for and with society	0.6	€462M	€45M
European Institute of Innovation and Technology	3.52	€2.71B	
Non-nuclear direct actions of the JRC	2.47	€1.9B	
Spreading Excellence and Widening Participation	1.06	€816M	€50M
TOTAL BUDGET FOR 2014 – the first calls			**Approx. €7.8B**
HORIZON 2020 (excl. EURATOM) TOTAL	**100**	**€76.96B**	
EURATOM		**€1.6B**	
HORIZON 2020 PACKAGE		**€78.6B**	

A look at the first “calls,” and how they will be judged

Competition for grants is expected to be stiff. Key to winning: Excellence and impact

On 11 December 2013, the European Commission gathered journalists into its main briefing room in Brussels for presentations by a series of PowerPoint-equipped Eurocrats. Horizon 2020 had begun.

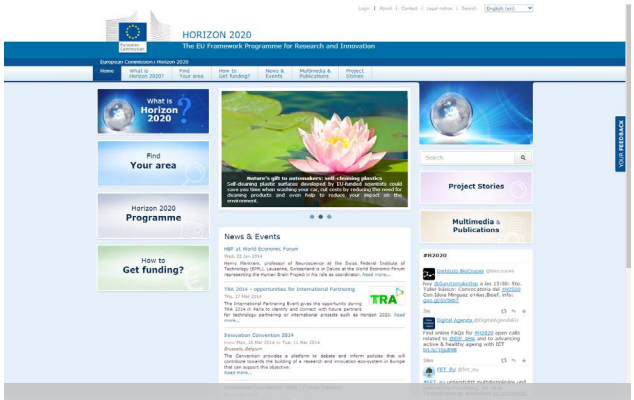
The first Calls for Proposals were announced that day – and in the weeks following, EU officials toured Europe (and beyond) to build excitement for the programme in the world of science and technology. Paradoxically, at the same time, they were privately worrying that the programme would be too popular: They fear that, given pent-up demand for research funding in a time of austerity, applications will flood in and the average success rate could fall below 15 per cent, from 20 to 22 per cent previously – and for some parts of the programme (such as the European Research Council) the competition could be harder still.

The first set of Calls, for 2014, totals €7.8 billion; in subsequent years the spending will rise. The announced priorities will “provide researchers and business with more certainty than ever before on the direction of EU research policy,” said Commissioner Máire Geoghegan-Quinn. She outlined twelve priority areas, including personalised healthcare, digital security and smart cities. For many of the Calls, the application deadlines are in March and April – but more Calls will be launched as the year progresses. Details are at the new EU portal, http://ec.europa.eu/programmes/horizon2020/

How to get your hands on the money

Despite the simplification efforts, there are still a confusing number of programmes and instruments for funding available under Horizon 2020, each with different eligibility criteria and different reimbursement rates. The broad lines: For research, grants can cover up to 100 per cent of direct research costs (e.g. full-time staff, certain equipment), and 25 per cent can be added to cover indirect costs (office, electricity and the like.) For “innovation actions”, closer to market, the direct cost coverage is 70 per cent for a minimum of three participants. There will also be a number of “coordination and support” actions, such as studies and networking activities, funded at 100 per cent of direct cost and requiring just one participant.

Reflecting the renewed focus on innovation, there will be a number of pre-commercial procurement (PCP) actions, designed to steer development to fit public sector needs, while public procurement of innovation solutions (PPI) are actions designed to ensure that innovation in the market is rewarded by the public sector being the first buyer of these innovations. Prizes both recognising innovations already taken to market, and also inducing companies to take those that are promising to market, will also be included.



Horizon 2020 Participants Portal

To apply, first step is to go to the Participants Portal and read. Lots. In fact, many universities have their own EU grant offices to do the paperwork for professors, and companies often hire consulting firms for it. Still, thousands of individuals will be trying to figure this out on their own. For them:

Once a proposal is submitted to the Commission, it will be checked against the programme’s eligibility criteria. In most of the programme, all eligible proposals will be assessed independently by at least three experts against pre-determined evaluation criteria.
Evaluation for all projects will be based on three criteria:

1. **Excellence** – only state of the art research will be funded. For calls under the European Research Council, this will be the sole criterion.

2. **Impact** – particularly important for the innovation actions. Each call will describe the impact expected from the activity, and the proposals will be measured accordingly.

3. **Quality and efficiency of implementation** – including the management capabilities of the consortium and the quality of the work-plan.

At a briefing for journalists, Commission officials said the evaluation process will be faster than in prior programmes, and evaluators will be told to take a more “take it or leave it approach,” with no tweaking or improvement of proposals. Lesson: Get it right, first time. ■

Award criteria

Type of action	Excellence The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work programme.	Impact The extent to which the outputs of the project should contribute at the European and/or International level to:	Quality and efficiency of the implementation The following aspects will be taken into account:
All types of action	**Clarity and pertinence of the objectives;** Credibility of the proposed approach.	**The expected impacts listed in the work programme under the relevant topic**	Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources; Complementarity of the participants within the consortium (when relevant); Appropriateness of the management structures and procedures, including risk and innovation management.
Research and innovation; Innovation; SME instrument	**Soundness of the concept, including trans-disciplinary considerations, where relevant;** **Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art (e.g. ground-breaking objectives, novel concepts and approaches)**	Enhancing innovation capacity and integration of new knowledge; Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; and, where relevant, by delivering such innovations to the markets; Any other environmental and socially important impacts (not already covered above); Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant.	
Coordination & support actions	**Soundness of the concept;** **Quality of the proposed coordination and/or support measures.**	Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant.	
ERA-NET Cofund	**Level of ambition in the collaboration and commitment of the participants in the proposed ERA-NET action to pool national resources and coordinate their national/ regional research programmes.**	Achievement of critical mass for the funding of trans-national projects by pooling of national/ regional resources and contribution to establishing and strengthening a durable cooperation between the partners and their national/regional research programmes; Effectiveness of the proposed measures to exploit and disseminate the project results and to communicate the project.	
Pre-commercial procurement Cofund/ Public procurement of innovative solutions Cofund	**Progress beyond the state of the art in terms of the degree of innovation needed to satisfy the procurement need.**	Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global procurement markets Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project. More forward-looking concerted procurement approaches that reduce fragmentation of demand for innovative solutions	

Source: European Commission

Jean-Pierre Bourguignon, new President of the ERC

Interview

A new activist at the European Research Council

Jean-Pierre Bourguignon, new President of the ERC , tells Science|Business he is charting a 'political' course – to help boost science in Europe's weaker regions, and to promote young scientists

For Jean-Pierre Bourguignon, his tenure at the helm of the European Research Council began in January with an unexpected problem: he stumbled on a hole in the pavement, and broke an arm. For some time after, the distinguished French mathematician greeted visitors in his new Brussels office with a bit of discomfort, left arm in a sling – but no slackening in the enthusiasm with which he views the job ahead: a strategic, activist role to improve the lot of science and scientists who need it most.

"The position and role of the ERC president should have a political and strategic dimension," Bourguignon says. For him, that means prodding the EU system to also help upgrade the state of science in those southern and eastern European countries that need help most. And it also means being an advocate for better, easier career paths for young scientists. The aim is, "To make it clear to somebody who has the talent and is interested in science, that there are career perspectives in science, of course in academia but also in industry."

In a wide-ranging interview with Science|Business, Bourguignon outlined several steps he can take to make a difference – acting as an ambassador to less-developed scientific regions, seeking to improve relations between scientists and politicians, working with other EU organisations for change. He emphasises, however, that these initiatives as ERC President need to be backed up by the ERC Scientific Council, and don't augur any slackening in scientific standards for getting a grant. "Ultimately the scientific quality of the projects makes the difference" in winning an ERC grant, he says.

Advice to grant applicants

His advice to new grant applicants is to, "Focus the attention on the quality of the scientific content of the application. Frontier research, creativity, matters more than the number of published papers," he says.

Bourguignon's comments reflect the growing political tussles within Europe, as the poorer and richer regions

compete for cash at a time of austerity. The ERC began life in 2007 as the first, pan-European research agency with a classic, peer-review system of impartially administering grants for cutting-edge research. Under the EU's Horizon 2020 research and innovation programme running from 2014 - 2020, it is due for a 60 per cent increase in funding, to €13 billion – a testimony to a hard-won reputation for excellence.

But to date the biggest grant recipients are the countries with the best-developed scientific infrastructures – the UK, Germany, France, the Nordics, Belgium, the Netherlands and Switzerland (a participant, even though not an EU member). By contrast, researchers in several poorer countries have received virtually no grants. And Bourguignon underlines that the ERC should ensure that this gulf will not widen further.

"My fear, that could become very pressing in the future, is that the gap could jeopardise the success of the ERC in the long run. Because at some point some politician might say, 'we are not playing this game anymore, because it has adverse effects on us'," explains Bourguignon. While he will oppose weakening ERC standards to help them, he intends to use his office of president to advocate that stakeholders take a broader perspective on developing research, he says.

A Q&A with Jean-Pierre Bourguignon, President of the European Research Council

Science|Business: What would you like to accomplish at the ERC?

Jean-Pierre Bourguignon: The development of the ERC is a fantastic success story, but at some point you reach a plateau and you would want that plateau to be sustainable. The ERC gives grants by merit, excellence and quality of research; as a result the [geographical] distribution of grants is quite uneven. The ERC should help find ways to balance the distribution of grants, but without departing from the principle of basing funding on scientific excellence only. I would like to visit countries in Central and Eastern Europe and maybe Southern Europe, and assess, also through discussions with scientists, what could be the possible EU measures to help in developing more competitive infrastructures, and increasing the chances for ERC success.

Another pressing issue is the lack of interest for science in the younger generation. This is a threat for the emergence of the next generation of young scientists in Europe. The ERC Scientific Council has taken this problem very seriously because two thirds of ERC grants are dedicated to younger scientists, and only one third to senior researchers. The whole point is to make it clear to somebody who has the talent, and the interest in science, that there is the possibility to have a successful scientific career. This is particularly true for young women, as gender balance is a major issue.
I think that my role as ERC president is to be an advocate looking for answers to these questions. People must be aware that there is a real threat there. I hope to enroll in this campaign the relevant institutions and people from the industry as well.

Science|Business: What concrete measures you can take to achieve these goals?

Jean-Pierre Bourguignon: The ERC will not create a dedicated programme, but one of the very specific features of the ERC Scientific Council is its connections with the scientific community. We can pull all the networks of the members of the Scientific Council together to reach many countries and many disciplines. I think we can really provide good linkage between the scientific community and politicians in countries where currently links are very weak. The role of the ERC and of me as the President, is to make sure that locally these links are strengthened.

Science|Business: Under your tenure the role of Secretary General and President of the Council have been merged. What difference will this make?

Jean-Pierre Bourguignon: First of all, I am physically here, in Brussels, almost every day. On my part at least, I fully trust what the ERC Executive Agency is doing, and I do not want to interfere with the scientific evaluation of the ERC panels. In my new role I have the possibility to access European Commission officials directly. That means that I can help the long-term development of the ERC. Ultimately, I think that my specific role here is mostly strategic and political.
I would like to be able to address questions at the strategic level – time will tell if this is realistic. I would like that, together with the ERC Scientific Council, we prepare a roadmap for the future, and what are the threats and the potential for research in Europe, so that as soon as the new Commissioner is appointed we can tell her or him about the achievements and the future challenges for the ERC.

Science|Business: The number of applicants for grants is increasing. What will the ERC do to address this?

Jean-Pierre Bourguignon: Indeed, we have had a 46 per cent rise in Consolidator grant applicants, and this is an ongoing trend. However, the ERC has taken measures to reduce the number of applicants who, for obvious reasons, have no chance. Some applicants who are rejected in a given year will not be allowed to apply again in the following year, or the following two years, depending on the grade they received. This one to two year wait can be used by applicants to improve their projects. Also, there are a number of countries where the people who pass the first ERC threshold but who are not selected will actually be funded through national programmes and structural funds. Of course, these scientists do not get the prestigious title of ERC grantee, but still they get the funding and the quality of their work is recognised. This means that the effort put into applying to the ERC has not been wasted and that the considerable work it takes to evaluate applications is put

to use. Countries with such schemes, that are currently active, are the Czech Republic, Finland, Greece, Ireland, Luxembourg, Norway, Poland, Slovenia, Sweden, as well as the region of-Flanders in Belgium. Other countries run such schemes occasionally for a particular call or year.

Science|Business: Do you have any advice to new applicants?

Jean-Pierre Bourguignon: First of all, I would like to reassure that the ERC will continue to strive for less bureaucratic procedures. But, most importantly, new applicants should put a lot of emphasis on the scientific content. While the technical part of the application is important too, applicants should focus on the science. I would encourage them to make it clear whether the proposal is about frontier research and whether their project has cutting-edge features. Also, they must keep in mind that the ERC does not put an emphasis on the impact of the research when evaluating applications. ■

The new ERC president – in brief

Jean-Pierre Bourguignon is a French mathematician, working in the field of differential geometry. He has held many high-level positions in academia and research, as the president of the Societé Mathématique de France, the second president of the European Mathematical Society, and the director of the Institut des Hautes Études Scientifiques. Prof. Bourguignon also taught for 26 years at the French École Polytechnique, Paris at graduate level.

Alongside his academic career, Bourguignon has a particular interest in developing links between science, policy, and industry, and a keen interest in the development of a strong European scientific community. This is reflected in his role as a co-founder of Euroscience, the pan-European grassroot organisation of scientists, which supports and promotes science and technology in Europe.

ERC: Managing a flood of applications

Being popular is a usually positive. But the European Research Council may have too much of a good thing.

The European Research Council (ERC) is striving to manage a high volume of applications – and a correspondingly low success rate.

At present, about 10 - 12 per cent of ERC applicants win grants; that's a relatively low rate by international standards, and has helped cement the agency's reputation for top-quality research. But with Horizon 2020, cut-backs in national funding budgets and pent-up demand among researchers could make the success rate fall further – causing administrative and political headaches.

As a result, the ERC "is sending a clear message that you should think twice before applying," said one official. "Do you have the right level of excellence" to win a grant?

To put force behind that message, the ERC is changing its re-submission rule so that people who apply and are rated below a specified quality level are restricted from re-applying. Specifically, a scientist whose proposal is given a C grade by the ERC's review panels in the main grant programmes in 2014 will not be allowed to re-apply until 2017 – a two-year ban. B grades get a one-year ban. "These restrictions are designed to allow unsuccessful Principal Investigators the time necessary to develop a stronger proposal," according to a diplomatically worded ERC statement.

The problem, one official said, is that even before Horizon 2020, ERC applicant numbers were climbing by 40 - 50 per cent a year. Continued growth at that rate would be "unstable," he said. And at all costs, the ERC appears to be striving to avoid a repetition of its very first grant call in 2007 when it received more than 9,000 applications for just 300 grants – an astonishingly low 3 per cent success rate.

Over the full seven years of Horizon 2020, the ERC will award €13.1 billion, around 17 per cent of the total budget. For the first calls, in 2014, €1.66 billion is being allocated under three schemes: Starting, Consolidator, and Advanced Grants – reflecting the different stages of scientific careers. In addition, about 100 projects will be funded under the Proof of Concept scheme, which aims to help researchers translate their research into a marketable product. No call will be open for a fifth type of ERC grant, for 'synergy' among collaborating researchers, in 2014.

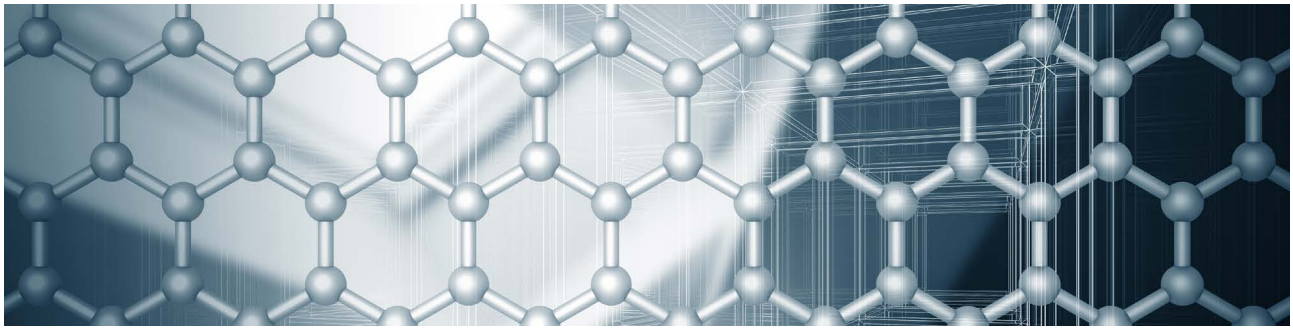
On the day of the launch of the first calls, the then ERC President Helga Nowotny said, "With the publication of these first calls, Horizon 2020 is becoming a reality for many scientists. Competition in the ERC calls will remain fierce in the next seven years and only exceptional proposals are likely to be funded, with scientific excellence as the only criterion for selection. More than ever, I encourage researchers to submit their proposal only if they feel ready to take up the challenge." ■

Summary of main calls from the 2014 budget:

	Starting Grant	***Consolidator Grant***	***Advanced Grant***	***Proof of Concept Grant***
Publication date	11 December 2013	11 December 2013	17 June 2014	11 December 2013
Deadline(s)	25 March 2014	20 May 2014	21 October 2014	1 April 2014 1 October 2014
Budget million EUR *(estimated number of grants)*	485.04 (370)	712.59 (400)	450 (200)	15 (100)

High risk/high reward – a look at FET under Horizon 2020

Future and Emerging Technologies – the EU's scheme for high-risk, breakthrough research projects – will see a significant boost to its budget over the next seven years, as well as a broader scope beyond the confines of ICT



With a budget of €2.696 billion over seven years, representing 3.5 per cent of total Horizon 2020 spending, the Future and Emerging Technologies (FET) programme will fund high-risk, collaborative research into novel ideas for emerging technologies. Science|Business takes a look at the programme for the first two years, with €200 million to spend in 2014 alone.

FET will continue to operate through three different calls: FET Open, FET Proactive and FET Flagships. The aim is to identify and realise new opportunities for technology to make an impact, by providing support to goal-orientated interdisciplinary research and by adopting innovative research practices.

FET was previously housed in the ICT part of the EU R&D Framework Programmes, but this will change under Horizon 2020, said Ales Fiala, Head of Unit, FET, DG Connect, "There will be raised ambitions for FET in Horizon 2020," he said, "which will now be part of the excellent science pillar."

But the relevance of the programme, which will now be open to more sectors, extends beyond just one pillar of Horizon 2020, Fiala said, "The mission of FET is to achieve leadership in future technologies to improve Europe's industrial leadership and tackle social challenges. It is thus a natural bridge between the three pillars of Horizon 2020."

The programme kicked-off on 11 December 2013 with the launch of the first four calls, which include interdisciplinary research into global system science, quantum simulation and research on new concepts and paradigms in cognitive systems, as well as research on developing the next generation of high performance computing.

The next stage of FET will put a special emphasis on issues such as gender, age and culture, in the research topics and teams it promotes. Collaborations involving women, young researchers, and high-tech SMEs will be a priority.

FET Open – no longer just for ICT

While the FET Flagship programmes on the super material graphene and the Human Brain Project, which aims to develop a full computer model of a functioning brain, receive much of the limelight, forty per cent of the FET budget in Horizon 2020 will go to FET Open – a bottom-up scheme that supports early-stage joint science and technology research around new ideas for future technologies.

While proposals are welcome from any research area, "Those looking to submit a proposal to FET Open need to consult the so-called FET gatekeepers," said Fiala. These six key-words describe characteristics which each submitted proposal should satisfy:

- Long-term vision: the research must be new and beyond state-of-the-art; the idea must not be anticipated by existing technology roadmaps;
- Breakthrough science and technology: the project must target scientifically ambitious and technologically concrete breakthroughs;
- Foundation-laying: breakthroughs must establish a basis for a new line of technology, which is not currently anticipated;

■ Novelty: the research must be based on new ideas and concepts – not an incremental refinement of existing ideas and research;

■ High-risk: countered by an interdisciplinary research approach;

■ Interdisciplinary: proposals must go beyond current mainstream collaboration configurations and aim to advance different disciplines together towards a breakthrough

There will be regular deadlines for collecting proposals, with the first taking place on 30 September 2014. "This is an end-to-end, fast and light scheme," said Fiala. The Commission has committed to inform applicants of the outcome of their proposals within five months after the deadline, and to sign the grant agreement within another three months.

Projects will be expected to either establish proof-of-principle for a new technological opportunity and its scientific underpinning, or kick-start an emerging innovation eco-system of high-potential actors around a solid baseline of feasibility and potential for a new technological option, ready for early take-up.

The Commission anticipates spending between €2 million and €4 million on each project, with an overall budget for the programme of €80 million in 2014.

Building critical mass – FET Proactive

The second pillar of the FET programme, FET Proactive, is concerned with gaining momentum in promising research areas that are not yet ready for inclusion in industry research roadmaps. Emerging research themes, such as quantum simulation, will be supported by working towards structuring emerging communities and designing and developing coordinated research themes.

The 2014-2015 work programme has identified three such promising research areas:

■ Global Systems Science: aims to improve the way in which scientific knowledge can stimulate, guide, and help evaluate policy and societal responses to global challenges, such as climate change, urbanisation and the financial crisis

■ Knowing, doing and being, cognition beyond problem solving: aims to renew ties between the different disciplines studying knowledge and cognition from various perspectives, such as neural, physical, social, to artificial cognitive systems. It is hoped this project will stimulate new interdisciplinary configurations and boost future innovation in robotics, materials and cyber-physical systems

■ Quantum Simulation: aims to use quantum technologies to address problems beyond the reach of classical computing

These topics were selected from a wide bottom-up consultation, said Fiala. "The Commission undertook an online consultation last year, because it wanted to look beyond the traditional FET communities and scope," he said.

These three initiatives will have budgets of €35 million in the first two years of Horizon 2020.
FET Proactive will also include a special action on exascale high performance computers to support the development of new architectures, new algorithmic approaches and the interdisciplinary co-design of software and applications.

The show-stoppers – FET Flagships

"Flagships are ambitious, science-driven, goal-orientated research initiatives, which require long-term commitments from all stakeholders," said Fiala. Under Framework Programme Seven, two projects were chosen for this significant funding: the Graphene flagship and the Human Brain Project.

"The aim is to move graphene from academic labs to industry and towards applications," said Fiala, "and to better understand the human brain by reconstructing it in supercomputer-based models and simulations with a prospect of learning how we can combat brain diseases and build completely new computing technologies."

Under Horizon 2020 there will be further funding available to continue these initiatives, including competitive calls to expand the existing project consortia. ■

Marie Skłodowska-Curie in Horizon 2020: €6 billion to support 65,000 researchers to move across Europe

There's a 30% increase for funding in young researchers under Horizon 2020: Science|Business looks at how the Commission plans to spend it

The Marie Skłodowska-Curie actions have not only got a new name - to reflect the famous scientist's Polish roots - but also a 30 per cent boost from €4.7 billion under Framework Programme Seven to more than €6 billion for the next seven years in Horizon 2020 to support research and mobility of researchers.

"In the next seven years we will be able to fund a total of 65,000 researchers, who will make a vital contribution to science and innovation in Europe," said European Commissioner for Education Androulla Vassiliou.

The first calls, launched on 11 December 2013, are targeted at research organisations, universities, companies and non-governmental organisations. Total spending in 2014 will be €800 million.

"We're a bottom-up programme, we fund any field of research, depending on demand," said Paul Harris, Policy Officer, Training and Mobility of Researchers, DG Education and Culture.

Research excellence is a key criterion, but the quality of the training programme and human resources policy is also important for evaluation, said Harris.

Developing the skill-set

Innovative Training Networks (ITNs), aimed at early-stage researchers without a PhD, will have the largest share of the budget, awarding more than €400 million in 2014 to provide these young researchers with experience outside academia to encourage innovation, entrepreneurship and employability.

"We are very much known as the mobility programme," said Harris. "The minimum for any involvement in our programme is transnational mobility – researchers moving from one country to another – but researchers often also move sector in their fellowship, from academic to the non-academic sector and vice versa."

This principle is reflected in the three different types of ITNs, all of which aim to train early-stage researchers: European Training Networks, which involve at least three partners in three different countries; European Industrial Doctorates, which will receive €25.5 million and involve at least one company and one research institution; and European Joint Doctorates, which will receive €30 million and include consortia of at least three institutions in three different countries.

€240.5 million will be spent on individual fellowships in 2014, to support experienced researchers in the diversification of their skills and competences.

International Cooperation

€70 million will be spent in 2014 on staff exchanges across sector and transnationally, as part of the Research and Innovation Staff Exchange programme (RISE), while another €80 million will go to co-funding regional, national and international programmes that promote research mobility. Better interaction and exchange of good practices between National Contact Points for the Marie Skłodowska-Curie actions will also be supported with €1.5 million, with the aim of raising the general standard of support to applicants. ■

€2.29B backbone: how the Commission plans to build world-class research infrastructures

Here's the agenda for European Research Infrastructures over the next two years

The Horizon 2020 programme will invest €2.49 billion between now and 2020 to build what the Commission promises will be, "New leading-edge research infrastructures in all fields of science and technology", to keep the European scientific community at the forefront of research, and help industry strengthen its knowledge base and technological know-how.

Most immediately in 2014, €277 million will be available to investigate how Europe can better create, share and use research infrastructures (RIs). Such facilities include: major scientific equipment, knowledge-based resources such as archives and e-infrastructures, including data and computer systems and communication networks.

As the mantra goes, excellent RIs attract excellent researchers, and so the creation and maintenance of high-quality facilities in Europe is seen as a key component of the European Research Area, and pivotal in the global competition for the best scientists. Lack of access to research infrastructures is also seen as a factor in the innovation divide within Europe, and the work programme includes calls that aim to improve virtual access to RIs, thus allowing researchers in less-developed regions to work with top-quality resources.

RIs are also important meeting places, where industrial researchers can meet academics. "Because of their ability to assemble a 'critical mass' of people, knowledge and investment, they contribute to national, regional and European economic development," says the Commission.

The programme outlines four calls for the first two years of the programme: developing new world class research infrastructures; integrating and opening research infrastructures of European interest; e-Infrastructures; and support to innovation, human resources, policy and international cooperation.

Developing new world-class research infrastructures

This call, which was launched on December 11 2013, with a budget of €70 million in 2014 and €129 million in 2015, will work in two ways: first, to support and implement the infrastructures already identified as important by the European Strategy Forum on Research Infrastructures (ESFRI) and secondly, to identify the next generation of RIs through design studies.

Work on infrastructures already identified by ESFRI will include funding of up to €5 million for consortia – made up of all the relevant stakeholders, such as the relevant government ministries, funding agencies, and research councils - to lay the legal and financial groundwork for the construction of these RIs.

For the next generation of RIs, the Commission will fund proposals to the tune of €1 million to €3 million to look at the conceptual and technical design of new infrastructures. Research should assess the scientific and technical feasibility of the projects, as well as any legal and financial concerns, and result in a conceptual design report, which can later be used as a guideline for policymakers in the discussion on Europe's RI needs.

The MareNostrum supercomputer at the Barcelona Supercomputing Center

Integrating and opening research infrastructures of European interest

"Effective and convenient access" is needed "to the best research infrastructures" says the Commission, and this serves as the motivation behind a new call with €140 million over two years, to open up national RIs to researchers from Europe.

Networking will be encouraged to foster a culture of co-operation between stakeholders, as well as improvements in virtual access, and joint research activities to improve the integrated services provided at European level by RIs.

These activities will be targeted to address specific types of RIs or research communities, across all fields, including: biological and medical sciences, social sciences and humanities, energy, environmental and earth sciences, and physical sciences.

e-Infrastructures – underpinning the data revolution

The Commission has lofty plans for the creation and exploitation of data in Europe over the coming years, including increasing the exchange of data between researchers in different countries and different disciplines, the new "open access" requirement in Horizon 2020 for participants to make all articles resulting from funding publicly available, and a move in many disciplines towards greater use of data-mining.

This requires new tools to make data understandable, exchangeable and exploitable, while also catering for data privacy and security. e-Infrastructures will play a major role in meeting this demand, and €177 million will be spent in the first two years of this programme to addresses four main priorities:

- Integration of e-infrastructure resources and services across the board – networking, computing, data, software, user interfaces – to provide seamless services tailored to user needs

- Implementation of the e-infrastructure necessary to fully exploit the opportunities presented by big data

- Support for the successful deployment of the new principle of open access under Horizon 2020, including researcher electronic identities and issues surrounding data deposition, storing, access and preservation

- Implementation of the e-infrastructure part of the EU strategy on high performance computing (HPC), in particular the provision of services, infrastructure for computing applications and a network of HPC competence centres for SMEs.

Support to innovation, human resources, policy and international cooperation

Even when all the financial, legal and technical obstacles have been overcome, RIs are of minimal benefit unless people know how to use them. As technologies and opportunities evolve new profession such as data scientists are emerging and this call will focus on skills development.

A number of other support measures, such as networking and awareness campaigns, will aim to increase the use made by industry of research infrastructures, especially amongst smaller firms, which are often simply unaware of the opportunities available. ■

ICT - How can Europe profit from its mountains of data and new technologies, while competing worldwide?

A look at the first work programme under Horizon 2020's industrial leadership pillar: information and communication technologies

Information and Communication Technologies (ICT) will receive more than €6 billion over seven years in a bid to reinforce Europe's position in advanced technologies and exploit opportunities in big data, social media, and other new growth markets.

The ICT challenges from FP7 have been regrouped under Leadership in Enabling and Industrial Technologies in Horizon 2020, and projects will be funded under six main headings: new generation of components and systems; advanced computing; future internet; content technologies and information management; robotics; and micro-and nano-electronic technologies and photonics.

The first work programme, with a total budget of €774 million in 2014 and €845m in 2015, will see the majority of this —€703.5m— devoted to calls on computing, components and systems, internet technologies, nanotechnologies and big data.The programme has had a mixed reception, with Tom Phillips, Chief Regulatory Officer at GSMA, a mobile operator industry group, saying, "It has identified some of the main challenges that will affect the development of the digital market," including spectrum sharing and cyber-security.

However, the European Association of Software Science and Technology (EASST) would have preferred to see an enlarged role for software science, "the missing key enabling technology", in the programme, said Tiziana Margaria, Vice President. This is needed "to strengthen the role of Europe in worldwide software science and innovation, a field currently dominated by other players," she said.

Internet for a modern Europe

The Internet has evolved to assume functions far beyond its original brief and a number of calls under the Future Internet theme will address its capacity to serve this multitude of new usages. There will also be research to investigate the power of the Internet to generate social and economic benefits, investigating the use of cloud computing to reduce spending and improve services in the public sector across Europe, for example.

GSMA has welcomed this theme, and calls related to smart optical and wireless network technologies, future Internet research and experimentation, and advanced 5G network infrastructure in particular. Phillips said progress in these areas, "Is necessary to ensure that Europe will be a leader in the digital revolution."

The Commission anticipates that mobile traffic volumes will be 1,000 times larger by 2020, leading to a spectrum crunch. This is the motivation behind the 2014 call on advanced 5G network infrastructures. It is encouraging to see recognition of this issue, said Phillips. But while "research can contribute to building better networks to support unprecedented volumes of mobile traffic, we cannot expect real change without proper regulatory initiatives at the EU and national levels," he said.

Robots and languages

The Commission estimates that worldwide "big data" technology and services will grow from €2.4 billion in 2010 to €12.7 billion in 2015,

but before European companies and researchers can exploit these opportunities fully, some sort of order will need to be placed on the mountain of information being generated in different forms and different languages.

Under the content technologies and information management branch of the ICT work programme, Horizon 2020 aims to improve the ability of European companies to build multilingual data products and services. This part of the programme will also fund R&D in machine translation technology to allow for multilingual online communication and break down barriers in cross-border commerce.

The robotics theme will involve calls aimed at developing a new generation of robust, flexible and autonomous robots for use in manufacturing, agriculture, and commerce, as well as service robots for professional or domestic use. "Large and core business sectors including automotive, aerospace and agro-food or microelectronics, representing more than 20 per cent of our GDP would quite simply disappear from Europe without intensive use of advanced robotics," according to the Commission.

Cross-cutting initiatives

2014 and 2015 will see four calls for cross-cutting ICT issues: Internet of things and platforms for connected smart objects, Human-centric digital age, cybersecurity and trustworthy IT, and transnational cooperation among national contact points.

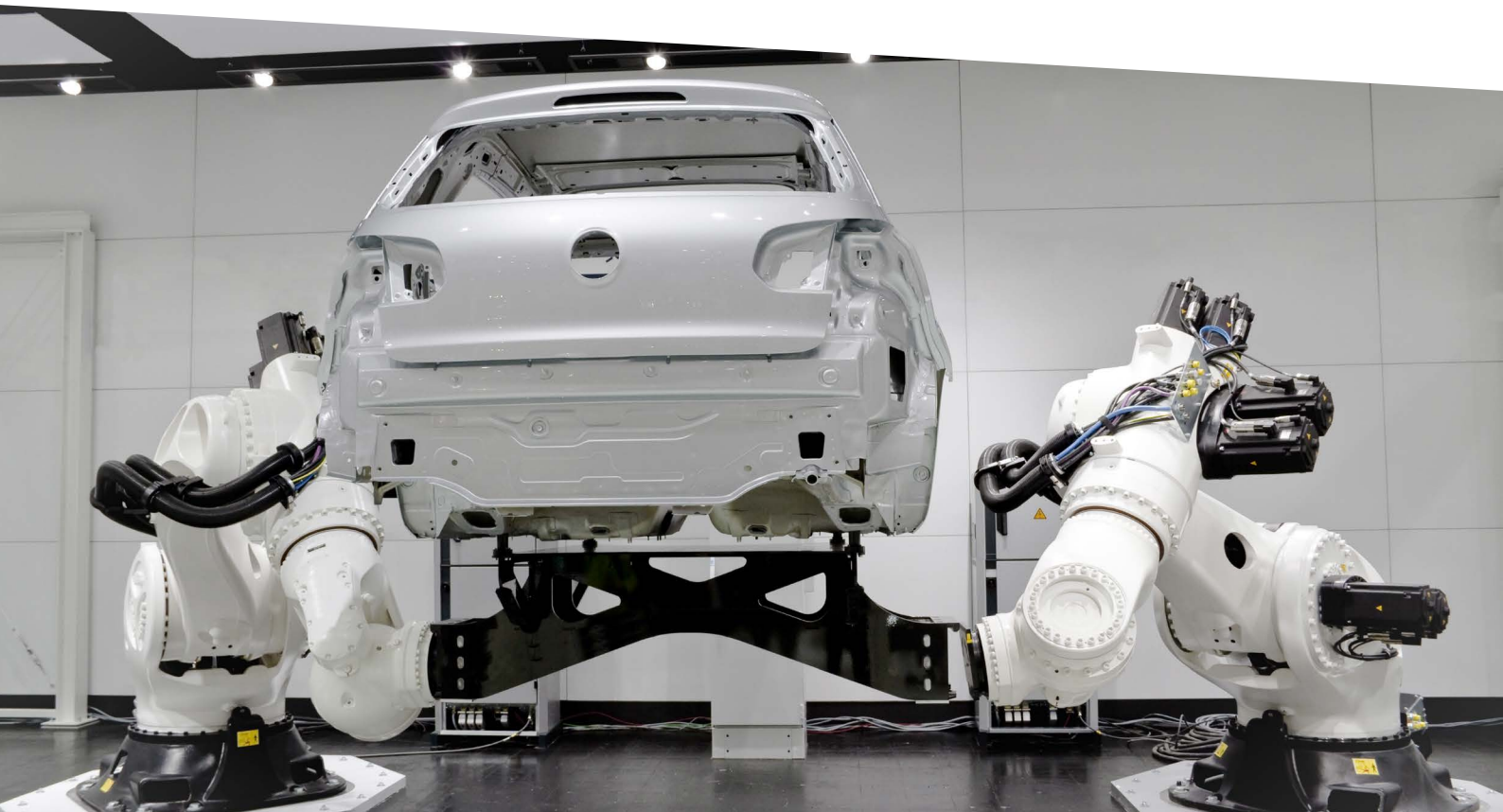
"Continued innovation in ICT largely depends on consumers' trust in new technologies," said Phillips. "Making cyber-security and trustworthy ICT among the priorities of the work programme is a clear step in the right direction."

R&D on platforms for connected smart objects will aim to capture the benefits of consumer-orientated platforms across many sectors, including e-health, intelligent transport and energy. mHealth services alone, which deliver healthcare information in real-time using mobile phones or tablets, "have the potential to deliver cost savings in healthcare delivery of up to €99 billion, whilst adding €93 billion to European GDP by 2017," said Phillips. At the same time, mhealth will also address issues around quality of life and mortality rates for millions of people, he said.

Next generation technologies

A significant chunk of the new work programme will be dedicated to R&D on a new generation of components and systems, which includes electronics, microsystems and embedded systems found in devices such as mobile phones, credit cards, washing machines, cars and planes.

Under the advanced computing pillar researchers will work to reduce the energy consumption of computers and data centres. ■



Horizon 2020: increase the role of space in the future while reaping benefits now

Space research will move from intellectual curiosity to providing the underpinnings of a major industrial sector, if the Horizon 2020 work programme bears fruit

Space research will be supported under "Industrial Leadership" in Horizon 2020. This is in line with the main objective of fostering a cost-effective, competitive space industry and research community, to develop and exploit space infrastructure

Building on the successes of the Seventh Framework Programme, Horizon 2020 will enable the European space research community to develop technologies and operational concepts from idea to demonstration, and to use space data for scientific, public, or commercial applications.

Research will be carried out in conjunction with research activities of Member States and of the European Space Agency, backed by a system of enhanced coordination.

The Commission has coined the following motto for EU Space R&D for 2014 to 2020: 'Prepare for the increasing role of space in the future and reap the benefits of space now'.

The work programme will do this by:

- Prioritising the existing EU European Global Navigation Satellite System (EGNSS) and Earth Observation, to reap the benefits they generate in the coming years and ensure they remain up to date in the future;
- Support for the third priority of the EU space policy, which is the protection of space infrastructure and the setting up of a Space Surveillance and Tracking system at European level;
- Providing support to EU industry to meet the objectives defined in the Commission's Space Industrial Policy, to maintain and enhance industry's competitiveness and its value-chain in the global market;
- Ensuring Europe's investments made in space infrastructure are exploited to the benefit of citizens and in supporting European space science;
- Enhancing Europe's standing as attractive partner for international partnerships in space science and exploration.

Applications in Satellite Navigation - Galileo

The European Global Navigation Satellite System (EGNSS) encompasses the satellite radio-navigation system established under the Galileo programme and European Geostationary Overlay System (EGNOS). The Galileo programme will provide GNSS services and increase availability and reliability of other GNSS, while ensuring Europe maintains an independent system.

Horizon 2020 will foster the further uptake of EGNSS in applications; prepare for secure utilisation; and oversee the future evolution of the EGNSS infrastructure.

These Horizon 2020 activities are complementary to the funding of the infrastructure and the operations of the EGNSS, which will come from the budget of the Regulation of the European Parliament and of the Council on the implementation and exploitation of European satellite navigation systems.

To meet the overall objectives of the Galileo programme and to foster the uptake of EGNOS and Galileo, the development of applications

ESOC main control room

is vital. New satellite navigation applications are being developed every day, covering numerous sectors of the world economy. The expected global market will reach €240 billion by 2020. The Horizon 2020 Space research programme will give European industry the opportunity to acquire knowledge and expertise required to compete in the international environment.

The Commission will devote €38 million to the call in 2014 and €25 million in 2015.

Earth Observation

The last decade has seen the establishment of capacity for space observation and operational services in the field of environment and environmental management, climate change, civil protection and security. Operational satellites are providing data on a free and open data policy and are complemented by first-of-a-kind research satellites.
Horizon 2020 will be supporting the maintenance of pre-operational services until end of 2014, fostering the development of uptake of Earth Observation data in applications and commercial exploitation.

In 2014 and 2015, scientific, operational and commercial exploitation of the existing and emergent European space infrastructure needs to be enhanced, by stimulating the emergence of novel ideas on what can be observed from space, and what information might still be hidden in existing Earth Observation data of various kinds.

This call is limited to 2014, with €21.5 million available.

Protection of European assets in and from space

This concerns space weather and Near Earth Objects (NEOs). Action to support the emergence of a Space Surveillance and Tracking capacity at European level will be dealt with in the call 'Other actions'.

With increasing dependence on space-based services, the ability to protect space infrastructures has become essential. Any shutdown of even a part of space infrastructures could have significant consequences for the economy and safety, and would impair the provision of emergency services.

Space radiation and particles can damage spacecraft and ground infrastructure, such as power grids and telecom networks. Space Weather activity aims at understanding, monitoring and forecasting such phenomena, to mitigate and prevent them.

There will be a coordinated international effort to predict and mitigate the threats of NEOs including asteroid and comets. There is €8 million in the 2014 budget to begin this work.

Competitiveness of the European Space Sector: Technology and Science

The overarching objective of this call is to contribute at a European level, in conjunction with Member States

and the European Space Agency, to the safeguarding and further development of a competitive, independent space industry. This will require advances in space technologies and operational concepts from idea to demonstration in representative terrestrial environments and/or in space.

Competitiveness of European space industry is strongly dependent on performance in a global market. The ability to react to contract opportunities world-wide for satellites is a critical success factor, and depends on ready access for integrators to subsystem and equipment capacities in Europe.

Subsystems and/or equipment have to be technologically mature and be accompanied by adequate production rates. European focus in future space technologies, beyond the current state of the art, needs to be strengthened along the entire technology-readiness chain.

Technologies that can be re-used enhance industrial competitiveness, and research on modular, reusable elements is therefore encouraged. Standardisation of such modular components by existing initiatives such as the European Space Components Coordination (ESCC) and the European Cooperation for Space Standardisation (ECSS), and their interfaces across Europe will optimise the investments and will facilitate access to emerging commercial markets.

Synergies will be sought with ongoing work with ESA in the area of technology standardisation.

The overall budget for this call is €52 million in 2014.

Coordination and support actions

There is a specific call for action to facilitate trans-national co-operation between National Contact Points in the Space domain, to identify and share good practices and raise the standard of support for programme applicants.
Support will be given to a consortium of National Contact Points working together on aspects such as benchmarking, joint workshops, enhanced cross-border brokerage events and specific training linked to Space research.

The Commission considers that one proposal requesting a contribution from the EU in the range of €2 million would allow this specific challenge to be addressed appropriately.

Earth Observation

New commercial geo-spatial products are enabled by space data, and directly enhance the competitiveness of the European geo-information service sector. This will also further validate the premise that space systems produce information complementary to in-situ data, which often cannot be acquired in any other way. This is key to getting a return on the major space investments made in Earth Observation space infrastructure, and validating EU investments made.

€26 million will be made available to develop new application of geo-spatial data in 2015.

Competitiveness of European Space Technology

The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs independent access to critical space technologies to achieve its strategic objectives.

Reaching independence in certain technologies will open new markets and increase the overall competitiveness of the European Space sector. Activities to be proposed in this call will address technologies identified on the list of urgent actions as part of a task force on Critical Technologies (Excerpt from Critical Space Technologies for European Strategic Non-Dependence – List of Urgent Actions for 2012/2013 – June 2012 and the update for the 2015 call http://ec.europa.eu/enterprise/policies/space/research), focusing on those areas that have not so far benefitted from Framework Programme funding and which can be addressed through the co-funding instruments available in Horizon 2020.

A total of €36.5 million will be available under this call in 2015. ■

Horizon 2020 puts its weight behind high value manufacturing

The work programme on Leadership in Enabling and Industrial Technologies, Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing, aims both to bring new materials into use and to improve manufacturing processes and systems overall

The programme consists of five separate elements, looking at nanotechnologies and other advanced materials; biotechnology, factories of the future, energy efficient buildings and sustainable process industries

Nanotechnologies, Advanced Materials and Production

This call includes topics on nanotechnologies, advanced materials and production. So for example, Bridging the gap between nanotechnology research and markets will carry out work in three of the key European nano-enabled industrial value chains: lightweight multifunctional materials and sustainable composites; structured surfaces; and functional fluids. Although there is clear potential here, a number of barriers stand in the way of large-scale market introduction of safe and sustainable products. This challenge will therefore support the next steps towards the deployment and market introduction of lightweight, nano-enabled products for different applications, by scaling up laboratory experience to industrial scale and demonstrating the viability of a variety of manufacturing technologies.

The main requirement is to develop seamless integration of technologies and processing for using nanomaterials in production; to improve the control and monitoring of the conditions required for the use of nanomaterials in industrial processes, including metrology; to increase the level of robustness and repeatability of such industrial processes; to optimise and evaluate the increased performance and functionality of the product and of the production line.

Other areas covered in this call are the use of nanotechnologies in healthcare; low carbon energy technologies and energy efficiency; exploiting the cross-sector potential of nanotechnologies and advanced materials; and governance, standards and models.
There is €230.70 million on offer in 2014 and €254 million in 2015, under this call.

Biotechnology

Biotechnology has the power to drive long term sustainability and growth across a number of sectors. Within the challenge "Biotechnology-based industrial processes driving competitiveness and sustainability" activities are aimed at bridging the gap from lab to market and at creating a path for participants in projects, in particular SMEs and large industries, to continue investing in commercialisation. The challenges "Cutting-edge biotechnologies as future innovation driver" and "Innovative and competitive platform technologies" will develop generic technological enablers across sectors including health, agriculture and industry. The topics are broad, to allow one or several projects with complementary approaches to be funded under a single topic.

Some areas such as synthetic biology raise ethical and safety concerns and ethical issues will be embedded in the corresponding topics. Funding for biotechnology will be €51.7 million in 2014 and €32 million in 2015.

Factories of the Future

Manufacturing in Europe provides about 20 per cent of all jobs, employing more than 30 million, in 25 different industrial sectors and over 2 million companies, largely dominated by SMEs. Each job on the factory floor generates two other jobs in services. Turnover in 2010 was approximately € 6,400 billion with a value added of more than €1,500 billion.

A long-term shift from a cost-based competitive advantage to one based on high added value requires that European manufacturing increases its technological base and develops a number of enabling trans-sectorial production technologies.

The Factories of the Future Public-Private Partnership (PPP) initiative aims to help EU manufacturing enterprises, in particular SMEs, to adapt to global competitive pressures by developing key enabling technologies to support EU manufacturing across a broad range of sectors. It will help European industry to meet the increasing global demand for greener, more customised and higher quality products, through the transition to a demand-driven industry with lower waste generation and energy consumption.

"The research call topics under Horizon 2020 will be based upon the priorities of our roadmap which has been developed through a broad public consultation," said Željko Pazin, Executive Director, European Factories of the Future Research Association. **"**In Horizon 2020 our aim will continue to be a strengthening of European industry's competitiveness and sustainability through collaborative research and innovation," she said.

The PPP will concentrate on the development and integration of the key enabling technologies, such as adaptable machines, ICT for manufacturing, and the novel industrial handling of advanced materials.
There will be total funding of €261 million over the next two years, with €116 million to be awarded in 2014 and €145 million in 2015.

Energy-efficient Buildings

With annual turnover of €1.3 trillion in 2010, the European construction sector and its extended value chain, including material and equipment manufacturers, construction and service companies, is the largest European single activity at 9.6 per cent of GDP. Not only that, the built environment affects the life and work of all EU-citizens.

The construction sector also has a crucial impact on the EU environment and energy policies: buildings use 40 per cent of total EU energy consumption and generate 36 per cent of green house gases. Meanwhile, the replacement rate of the existing stock is very small at 1-2 per cent per year.

The construction sector is critical to the ambition to decarbonise the European economy by 2050. In order to achieve this objective, the sector must reduce its CO2 emissions by 90 per cent and its energy consumption by as much as 50 per cent. This presents a unique opportunity for sustainable business growth if products and related services for new and refurbished buildings are affordable and durable.

However, the sector is not only affected by the on-going financial and economic crisis, it is also highly fragmented with over 95 per cent of SMEs.

The objective of the Energy-efficient Buildings Public-Private Partnership (PPP) Initiative is to drive the creation of a high-tech building industry which turns energy efficiency into a sustainable business, fostering EU competitiveness in the construction sector on a global level.

Priority will be given to delivering new building technologies, materials and components for energy saving and energy generation, thermal energy storage systems, advanced insulation systems, thermal distribution systems, lighting, windows and glazing, energy generation systems based on renewable sources.

In the next two years the overall budget will be €50 million in 2014 and €64.00 million in 2015 budget.

Sustainable Process Industries

Process industries sit at the core of most industrial value chains providing inputs to discrete manufacturing in automotive and housing sectors, for example. The SPIRE Public-Private Partnership (PPP) brings together cement, ceramics, chemicals, engineering, minerals and ores, non-ferrous metals, steel and water sectors.

These all have a high dependence on energy, raw materials and water in their production and processing technologies and a clear and urgent interest in improved efficiency and competitiveness.

The sectors in the SPIRE PPP represent a key part of the manufacturing base in Europe, including more than 450,000 companies, with over 6.8 million employees, generating more than €1,600 billion in annual turnover.

The overall goal of this call is to optimise industrial processing, reducing the consumption of energy and resources, and minimising waste.

The specific aims are:

- A reduction in fossil energy intensity of up to 30 per cent from current levels, by 2030.
- A reduction of up to 20 per cent in non-renewable, primary raw material intensity compared to current levels by 2030.
- A reduction of greenhouse gas emissions to 20 per cent below 1999 levels by 2020, with further reductions up to 40 per cent by 2030.

There will be €60.30 million from the 2014 budget, and €77.00 million from the 2015 budget for this call. ■

Better access to risk finance for innovative companies – the Commission's plan for €2.84B of the Horizon 2020 budget

Technology start-ups, established businesses, and universities will all find something of interest in Horizon 2020's loan and venture capital instruments – all part of the Access to risk finance programme

The Access to Risk Finance programme, part of the Leadership in Enabling and Industrial Leadership pillar in Horizon 2020 will operate through two main financial instruments - loan services and equity facilities - which will see the European Investment Bank (EIB) and European Investment Fund (EIF) linking up with banks across Europe to ease access to credit. There will be €300 million available for this programme in 2014 alone.

"These instruments will leverage more investment from private funds", said Marie-Cécile Rouillon, Policy Officer, Financial Engineering, DG Research and Innovation. She said this represents, "an important element missing in the plan to spend three per cent of Europe's GDP on research and innovation by 2020."While firms of all size will be able to get advice on how to make themselves more attractive to banks and investors, one third of the budget has been earmarked for research-driven SMEs and companies with 250 - 499 employees. "That's a big effort along with all that is already done in Horizon 2020 to support SMEs," Rouillon said.

Innovative companies with more than 500 employees will also receive more attention, said Nick Jennett, Director, New Products and Special Transactions Department, EIB. This follows a market research survey which found that the most pressing need for company financing lay in this sector. "We are piloting a new risk-sharing initiative with partner banks, and a direct growth financing programme designed for these companies, which is already showing some very exciting results," Jennett said.

These investments are likely to be warmly received by industry groups, but Patrick de Boer, partner at ttopstart, a consultancy representing clients in the life sciences and medical technology sectors, would like to see the money, "Become available to venture capital funds and to dedicated government loan facilities. We do not see a key role for banks in this process," he said.

Sharing the risk

In a continuation of the successful Risk-Sharing Finance Facility (RSFF) and Risk-Sharing Instrument (RSI) for SMEs from Framework Programme 7, the Horizon 2020 loan facility will see the EIB and EIF providing banks across Europe with a guarantee against a proportion of their potential losses when they provide loans. This should allow projects to get financing that would otherwise be too high-risk for individual banks.

Loans of between €7.5 million and €25 million will be available for companies with 500-3,000 employees, while larger firms will be eligible for loans of up to €300 million.

This facility will have a budget of up to €200.2 million in 2014 and 2015, but "the EU contribution is not lent to the company," said Rouillon. "It serves as a guarantee in case of default by the company."

"If the company is successful, the money will be repaid and used for supporting other companies," she said.

A separate instrument, implemented by the EIF, will cover loans of between €25,000 and €7.5 million for small firms, with a budget of €160.45 million in the first two years.

While the loan facility is a demand-driven instrument, with no prior allocations between sectors or countries, the Commission will incentivise the EIF to make a particular effort to ensure that a significant proportion of loans go to SMEs and small-midcaps developing eco-friendly products.

Investing in risk capital

Horizon 2020 and COSME, the Programme for the Competitiveness of Enterprises and SMEs, will together run an equity facility to provide risk capital through financial intermediaries to innovative enterprises, primarily in the form of venture capital. "Horizon 2020 will support the very early stage of companies," said Rouillon, "because that is where the technology transfer really happens," whereas COSME funds will be directed at businesses in their growth and expansion phase.

€76 million will be taken from the Horizon 2020 budget in 2014 and 2015 for these investments, and the Commission hopes this will attract more private investment. The predecessor to COSME, the Competitiveness and Innovation Framework Programme, mobilised more than €2.3 billion in venture capital.

Individual measures

The Commission has also proposed a €30 million investment in 2015 in a new pilot for co-investments by business angels in innovative ICT firms. Photonics, microelectronics, microsystems and robotics and the ICT-related creative industries are eligible.

There are also two new calls related to technology transfer, with a €2.5 million call in 2014 to encourage and incentivise the more experienced players to share their expertise and best practices in order to boost Europe's ability to turn research into new products and services.

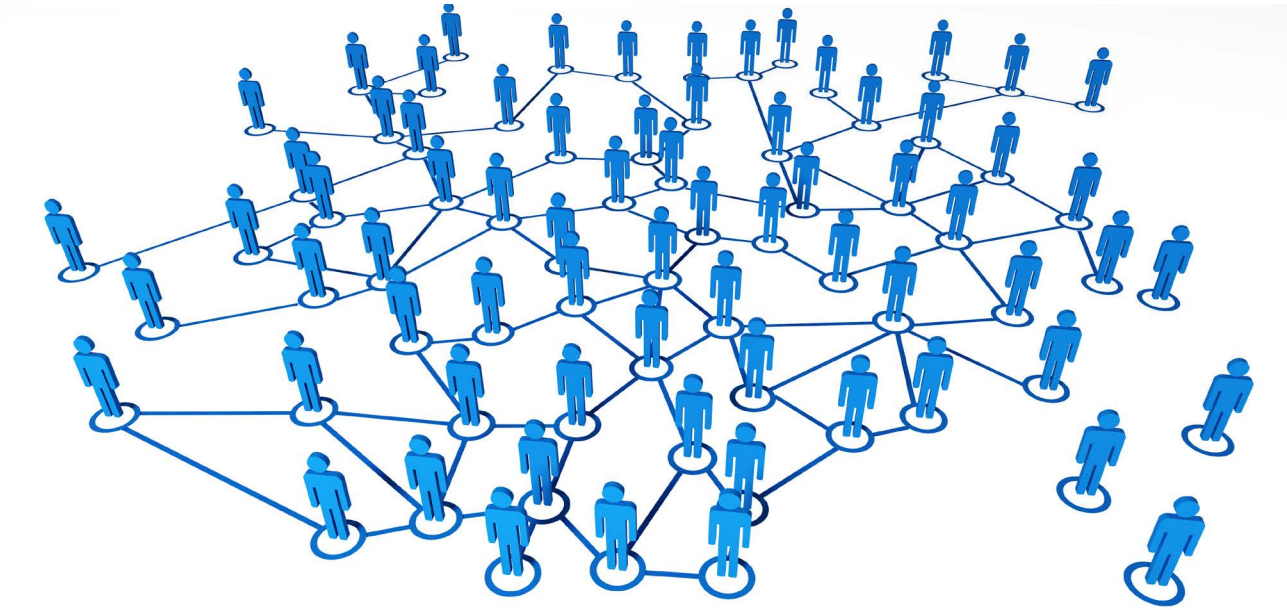
A €60 million technology transfer financing facility pilot in 2015 call will co-finance investments made by existing tech transfer funds and vehicles and will focus on the creation of new companies and the licensing of IP.

In addition to putting a special emphasis on providing access to finance for SMEs developing green technologies, the Commission has also proposed a 2015 call for demonstration projects to show the technical and commercial viability of new generations of low carbon technologies.

€2.5 million in funding will also be available for a study and analysis of the major investment-readiness schemes in Europe, including training and pitching events, and the development of strategies involving a wide range of early stage investors. ■

New funding for small business in Europe - a look at how the Commission will spend €500 million on SMEs in the next two years

Lobbying pays off for interest groups, as SMEs stand to get a significant boost under Horizon 2020. Here's the agenda for Innovation in SMEs for 2014-2015



Speaking at the launch of the first tranche of Horizon 2020 calls on 11 December 2013, EU Commissioner for Research and Innovation, Máire Geoghegan-Quinn, said there is good news for businesses big and small, but the biggest boost is for small and medium-sized enterprises (SMEs), which will benefit from simplification, a shorter time to grant, improved access to risk finance, as well as a new dedicated instrument, which kicks off with €500 million in the first two years.

The new SME instrument, which will be integrated across the societal challenges and industrial leadership topics in Horizon 2020, will find its home in the "Innovation in SMEs" programme. This programme will also provide funding for Eurostars, the pan-European programme for international collaboration between research-intensive SMEs, as well as various actions aiming at developing and providing better innovation support services to SMEs.

Another first under Horizon 2020 is the possibility for small companies to apply for EU funding on their own bat, rather than as part of a consortium as under Framework Programme Seven.

There was a warm response from the sector, with Patrick de Boer, partner at ttopstart, a consultancy representing clients in the life sciences and medical technology sectors, saying, "Our clients widely applaud the new SME instrument. We strongly believe that such tools will accelerate innovation within SMEs."

An SME instrument

To help simplify the process, a dedicated SME instrument has been created under Horizon 2020 to finance innovative companies. The idea is to let SMEs in all fields of science, technology and innovation apply for funding singly, or in groups.

SMEs are particularly invited to participate in the societal challenges, such as health, energy, transport, as well as the leadership in enabling and industrial technologies

programme, including activities in nanotechnologies, ICT and advanced materials. Calls under the SME instrument in 2014 will include €66.1 million for clinical research in the validation of biomarkers and diagnostic medical devices; €33.95 million to stimulate the innovation potential of SMEs for a low carbon and efficient energy system; and €35.87 million for innovation research in transport.

"The SME instrument addresses the financing needs of internationally-oriented SMEs, in implementing high-risk and high-potential innovation ideas," says the Commission's work programme.

The programme consists of three separate phases, along with coaching and mentoring services.
It begins with funding for technical feasibility and economic viability studies (duration approximately six months; funding of €50,000), and continues to a second stage of funding for development, prototyping and other demonstration work (duration 12-24 months; funding of between €0.5million and €2.5 million). In the final phase of commercialisation, the Commission will not directly fund work, but will connect SMEs to other programmes that could provide the funding. This includes access to the financial facilities supported by Horizon 2020, as well as various other support measures, for example on intellectual property protection.

Innovation support

One of the calls launched on December 11, 'Enhancing SME innovation by providing better innovation support', will receive €9.58 million in 2014 to develop an ecosystem of innovation support for small business across Europe. Actions under this call include the further development of the European Intellectual Property Rights Helpdesk, peer learning activities for national and regional agencies, and research to capitalise on the potential of online-collaboration.

The Commission sees this as a necessary add-on to the public support already given to SMEs through grants, subsidised loans, and equity, saying, "SMEs receiving innovation support often remain dissatisfied with the services they receive while the public expects a higher return from the support provided." But de Boer disagrees, saying, "We do not see the immediate need for these networks and platforms, since SMEs have an intrinsic motivation to find the service and support that is best suited to them."

In another action, €5 million from Horizon 2020's 2014 budget will be spent on establishing services to enhance the innovation management capacity of SMEs, in an attempt to address the imbalance in quality, price and availability of consulting services offers available to SMEs across Europe.

Internationalisation of SMEs

The programme will place a strong emphasis on the need for Europe's SMEs to take advantage of the growing opportunities available in external markets, and in international collaboration. "Radical innovations" are possible "by collaborating with partners from different economic, scientific and socio-cultural backgrounds," said the Commission.

An international conference will be held in 2014 to start a discussion in this area and to study the internationalisation of European SMEs to date.

Eurostars

Another significant programme for SMEs in the next seven years will be Eurostars, a joint programme between the EUREKA network of funding agencies and the European Commission.

Eurostars is the only Europe-wide funding programme to be specifically designed for innovative SMEs, with each project bringing together at least two different partners from two different countries under the leadership of an SME. While projects can address any technological area, Eurostars is a market-driven venture, and every project funded must result in the launch of a commercial product onto the market within two years of completion.

Under Framework Programme 7 (FP7), the lead SME for each project needed to have ten per cent of its labour force or of turnover dedicated to R&D activities. Under Horizon 2020, this will be adapted to help medium-sized companies involved in research processes linked to industrial manufacturing. This will be welcome news for Mittelstand companies, the German middle-sized companies with anything from a couple of dozen to several hundred workers and responsible for more than half of the country's economic output. While Eurostars was originally a very Internet start-up heavy programme, it is hoped that this fine-tuning of the programme will enable it to better support the European manufacturing sector and job creation.

Eurostars 2 is expected to total around €1.14 billion over seven years, with €287 million coming from Horizon 2020 and €861 million from participating member states. This represents an increase of more than 200 per cent over FP7. ■

Health in Horizon 2020 - A move towards personalised healthcare

The Commission sets out to invest €7.45 billion over seven years in the societal challenge "Health, demographic change and well-being". Here's a look at what's in store for 2014-2015

In a speech at the 5th World Health Summit in Berlin in October, José Manuel Barroso, the President of the European Commission said, "Health…is a value in itself, but it is also a crucial component [of] economic success. The importance of this sector and Europe's long tradition and wide experience in this field provides plenty of opportunities for future growth."

For the societal challenge 'Health, demographic change and wellbeing', the path for growth is predominantly in the area of personalised health care, which will receive more than €1 billion in the first work programme for a single call, called personalising health and care, which covers topics as diverse as robots for assisted living, e-health, vaccine development and screening technologies.

The Commission has argued that by better understanding the causes of health and disease and making best use of Big Data, Europe's ability to develop better diagnostics, therapies and drive forward health promotion and disease prevention strategies will be greatly improved at the personal and societal level. This will also work towards increasing employment and developing new and improved technologies in one of the faster growing sectors in Europe.

Magda Chlebus, Director of Science Policy at EFPIA, is largely happy with the first calls, which she says, "Set a tone that is very complementary with the Innovative Medicines Initiative (IMI) 2 Strategic Research Agenda, as well as the various projects supported by IMI1, which cover a range of research areas from Alzheimer's disease to antimicrobial resistance."

But Chelbus sees a missed opportunity in the decision on the budget, "We are just disappointed that the EU decided to cut the Horizon 2020 budget by 12.5 per cent," she said. "At a time of crisis, investment in research and health more than ever should be seen as investment in the future."

The programme was also subject to criticism from public health groups, who argued in a letter to Commissioner Geoghegan-Quinn that the work programme overlooks areas such as non-communicable diseases and health services in favour of a narrow focus on biotechnology and personalised medicine.

Dual focus, one goal

The societal challenge 'Health, demographic change and wellbeing', will involve two calls in 2014 and 2015, with a budget of €549 million in the first year. The 'Personalising health and care' call is structured into seven main themes with a total of 34 topics:

- Understanding health, ageing and disease
- Effective health promotion, disease prevention, preparedness and screening
- Improving diagnosis
- Innovation treatments and technologies
- Advancing active and healthy ageing
- Integrated, sustainable, citizen-centered care
- Improving health information, data exploitation and providing an evidence based for health policies and regulation

For the Commission, the choice to focus on personalising health and care is informed by the ageing of the European population, an increasing communicable and non-communicable disease burden and the fall-out from the economic crisis. "In combination, these factors are jeopardising the sustainability and equity of European health and care systems, on which Europe already spends nearly 10 per cent GDP."

The second call, 'Co-ordination activities' has a total of 16 projects dedicated almost entirely to ERA-NET, a scheme launched in 2002 under the Sixth Framework Programme, which is designed to increase the cooperation and coordination of research activities carried out at national and regional level in the Member States and associated countries, through two specific actions:

- Providing a framework for actors implementing public research programmes to coordinate their activities e.g. by developing joint activities or by mutually supporting joint calls for trans-national proposals.
- Providing, in a limited number of cases with high European added value, additional EU financial support to facilitate joint calls for proposals between national and/or regional programmes. ■

Feed the world: How Horizon 2020 aims to ensure supplies of safe, high quality food

The work programme 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' will award €248.5M over the next two years to help Europe make the best of its biological resources

The Food Security work programme has the dual objectives of securing sufficient supplies of safe, healthy and high quality food, and also ensuring efficient provision of other bio-based products, by developing productive, sustainable and resource-efficient primary production systems and fostering related ecosystem services.

The programme will also support projects to promote recovery of biological diversity and the development of competitive and low carbon supply chains. Overall, it is intended that this will accelerate the transition to a sustainable European bioeconomy, by bridging the gap between new technologies and their implementation.

Delivering this will require projects that cut across different fields of research and technology with a market-driven approach. The involvement of end users including farmers, fishers, consumers and public authorities will be a key to achieving this. In particular, several topics will involve a multi-disciplinary approach that integrates social and economic sciences and humanities.

The programme is divided into three areas: Sustainable Food Security; Blue Growth: Unlocking the Potential of Seas and Oceans; and Innovative, Sustainable and Inclusive Bioeconomy

Sustainable food security

This part of the work programme is broken down into three parts, looking at production systems, good and healthy diets and global driver of food security.

Ensuring the availability of, and access to, sufficient safe and nutritious food is a key priority, while at the same time the production and processing of food is a significant part of the economy. Given the economic importance of the food sector, the potential gains from research and innovation, and the structure of the sector - which involves many SMEs - the aim is to develop competitive and resource-efficient aquatic and terrestrial food production systems by funding projects on: eco-intensification of production and sustainable management of natural resources, while addressing climate change mitigation and adaptation.

Overall, this will cover the whole food chain, including both the supply and demand sides. The economic and strategic importance of the agri-food sector is reflected in the fact that in 2011 agricultural exports were worth €105 billion, or 7 per cent of the total value of EU exports. The food and drink industry is the largest manufacturing industry in the EU, generating turnover of €956 billion in 2010, almost half by SMEs, with over

four million jobs. The whole agri-food sector employs 17 million people.

In total, there are 20 separate projects, with €138 million available in 2014 and €110.5 million in 2015.

Blue Growth: Unlocking the potential of Seas and Oceans

Rapid progress in working offshore in ever-deeper waters, coupled with the need to look at how the 71 per cent of the planet that is seas and oceans can deliver food and energy in a sustainable way, have opened up an opportunity for blue growth.

This area addresses the overall challenge through five cross-cutting project areas: capitalising on the diversity of marine life; sustainable harvesting the deep-sea resources; new offshore challenges; ocean observation technologies; and the socioeconomic factors. The aim is to improve the understanding of the complex interrelations between various maritime activities and technologies, to boost the marine economy.

At present sea and ocean bio-resources provide 15 per cent of the animal protein consumed globally; blue biotechnology has an expected yearly growth rate of 5 to 10 per cent. Meanwhile, deep-sea mineral extraction could grow to represent up to 10 per cent of the world's minerals and marine renewable energy will generate 40 gigawatts per annum by 2020.

The Blue economy in the EU is expected to employ 7 million people by 2020. To maximise the impacts, there will be a specific effort to mobilise the critical mass to tackle these large cross-cutting challenges with adequate scale and scope.

In 2014, the sustainable exploitation of the diversity of marine life will put emphasis on valuing and mining marine biodiversity, while in 2015 the focus will be on the preservation and sustainable exploitation of marine ecosystems and climate change effects on marine living resources.

There will be €100 million under the 2014 budget and €45 million from the 2015 budget for this research.

Innovative, Sustainable and Inclusive Bioeconomy

This call includes work to support sustainable agriculture and forestry management processes providing public goods and innovative products for sustainable growth; fostering innovation, including social innovation, in rural areas; and enhancing innovation in the bio-based industry for smart growth.

Most research relating to sustainable and competitive bio-based industries will be implemented through the Joint Technology Initiative (JTI) on Bio-based Industries. Activities proposed in the current call are complementary to those undertaken by the JTI, and target the supply side of the biomass to bioproducts value chain, through the development of innovative feed stocks, research on next generation bio-refineries using CO2 as direct feedstock, and supporting markets for bio-based products.

A total of €86.5 million will be available over the next two years, of which €44.5 million will be awarded in 2014. ■

Energy in H2020 – paving the way to a secure, sustainable and competitive energy system

The EU has set ambitious climate and energy targets for 2020 that require improvements and innovation in the generation, supply, delivery and use of energy. Research to be funded in Horizon 2020 should help

Europe needs greater energy security and it also needs to develop new energy technologies. But emerging technologies have to be able to compete with existing ones both in price and in reliability. The primary instrument for coordinating EU energy research and innovation policy, the 2007 Strategic Energy Technology (SET) Plan is now being updated by the European Commission to be able to take on the upcoming challenges.

The Horizon 2020 Secure, Clean and Efficient Energy challenge, which will operate with a budget of €5.9 billion over the next seven years (up from €2.4 billion in Framework Programme Seven), contributes to three focus areas of the SET Plan: Energy Efficiency; Competitive Low-Carbon Energy, Smart Cities and Communities.

Activities in the first work programme, published on December 11, cover the innovation cycle from proof of concept to market uptake, as well as looking to exploit synergies with other areas. The challenge-based approach means that the topics are broadly defined, providing the opportunity for different ideas and approaches to be brought to bear in these areas. Another important element of this work programme is that it encourages cooperation between member states and the EU.

Energy Efficiency

Energy efficiency is addressed by both short and long term policies. The long term aim is to, "hold 2030 energy consumption down to an appropriate level." In order to achieve this, the programme will fund research and development into more efficient technologies and actions to remove market barriers.

The call covers four main areas:

- Buildings and consumers
- Heating and cooling
- Industry and products
- Finance for sustainable energy

Competitive Low-carbon Energy

The 2050 EU energy roadmap sets the target of reducing the EU's greenhouse gas emissions by 20 per cent of the 1990 levels by 2020, followed by a further reduction of 85-90 per cent by 2050. Renewables should cover a growing share of energy consumption. Given this, the call has a special focus on new technologies, biofuels, renewable electricity and modernising the grid, while providing flexibility in the system with energy storage technologies.

Smart Cities and Communities

As home to almost 70 per cent of the population and consumers of 70 per cent of energy, cities have a major role to play in the transition to a low-carbon economy. However, sustainable urban development requires interaction between different fields including energy, transport and ICT.

The goal is to deliver commercial-scale solutions in technologies such as smart buildings, smart digital services for better-informed citizens; identification, optimisation and integration of flows (of data, energy, people and goods); smart and sustainable digital infrastructures; smart and sustainable energy systems and smart mobility services including the use of space-enabled applications.

The challenge will be to meet local and regional specifications, and in recognition of this the European Innovation Partnership Smart Cities and Communities will fund collaborations between cities and industry that propose to deliver projects in particular cities that can be scaled for deployment elsewhere.

SMEs and Fast Track to Innovation for Energy

SMEs are viewed as key to developing cost-effective and innovative low-carbon solutions and are expected to take a large role in Horizon 2020. The H2020 energy challenge will reinforce their role and offer coaching and mentoring services. ■

Pillar three: Societal Challenge

€6.33B in Horizon 2020 for a European transport system that's better for the environment and for citizens

With a boost on funding from FP7, the first work programme for transport kicks off with three calls to tackle three main challenges: how to meet growing mobility needs, while helping the environment and boosting the performance of EU industry

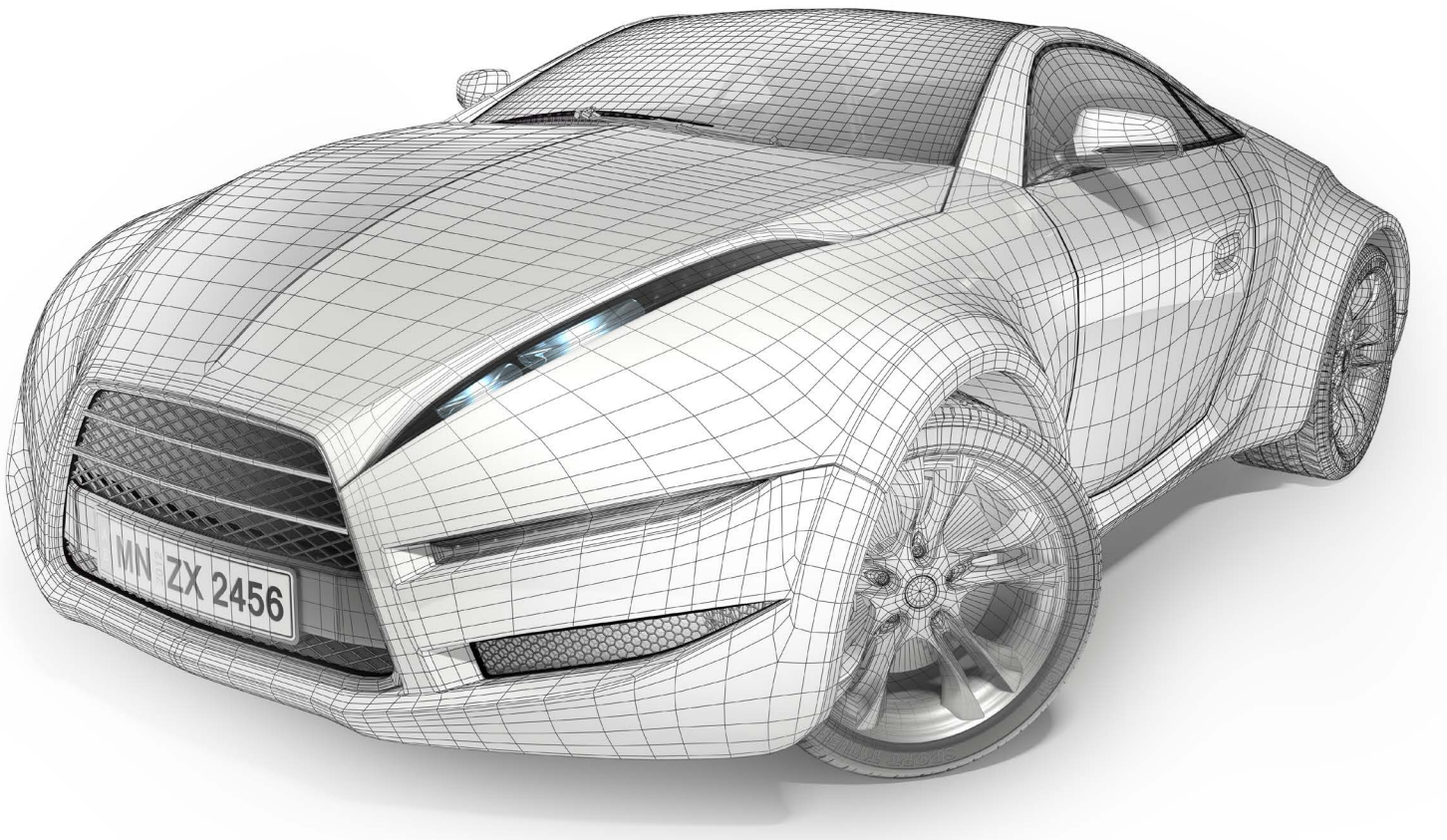
With a budget of €6.3 billion over seven years, the 'Smart, green and integrated transport' challenge in Horizon 2020 is the world's largest R&D programme in transport research and innovation. The aim is to make Europe's transport system more competitive and resource-efficient, climate- and environmentally-friendly, safe and seamless for the benefit of all citizens, the economy and society. The programme will kick-off with €540 million for three calls in 2014, as announced by the Commission on December 11 2013, while also earmarking €35 million of that for SMEs and the new fast track to innovation scheme.

The programme is structured in four broad lines of activities:

a) **Resource efficient transport that respects the environment**: this will aim to make more efficient use of natural resources, while reducing dependency on fossil fuels

b) **Better mobility, less congestion, more safety and security:** to meet growing mobility needs, while also providing modern transport systems

c) **Global leadership for the European transport industry**: Aim to reinforce the competitiveness and performance of European transport manufacturing industries and retain areas of European leadership, such as aeronautics



d) **Socio-economic and behavioural research and forward looking activities for policy making**: Improved policy making to promote innovation and meet the challenges raised by transport, whilst meeting citizen's needs

These activities are addressed under three calls for proposals:

1. Mobility for Growth
2. Green Vehicles
3. Small Business and Fast Track Innovation for Transport

Mobility for growth

The Commission has identified mobility for growth as one of twelve priority focus areas across the entire Horizon 2020 package, a status which reflects startling statistics such as the €80 billion cost to the EU every year from congestion.

One of the main aims of this call, which will receive €375 million in 2014, is the deployment of traffic management and information systems, advanced traveller services and efficient construction and maintenance technologies in transport networks. This will include funding for research in low-emission vehicles and vessels, projects to reduce urban road congestion and intelligent mobility.

The call will be structured around the aviation, rail, road, and water transport sectors, as well as four cross-cutting issues – urban mobility, logistics, intelligent transport systems and infrastructure.

The final funding line under this call will be for, 'Socio-economic and behavioural research and forward looking activities for policy making'.

Green vehicles

This second call will see €159 million spent in 2014 on research and innovation to improve the energy efficiency of vehicles, including the use of unconventional energies in road transport such as electricity and renewable fuels.

Activities will include advanced power-train technologies and new vehicle architectures, weight reduction, improved aerodynamics and component development for alternative fuel vehicles.

Projects under this call will attempt to bridge the gap between research and the market in areas such as electrical vehicles, which so far have failed to entice consumers. This will include a complete revision of the electric and electronic architecture of electrical vehicles to improve energy efficiency and an ICT-based recharging system management.

Small business and fast track to innovation

The new dedicated SME instrument, which will allow SMEs in all fields of science, technology and innovation to apply for funding singly, or in groups, will feature strongly in the transport research programme, with €35.87 million in 2014 available for small companies.

The funding will be split into two phases, beginning with a grant of €50,000 for technical feasibility and economic viability studies over six months, followed by a second stage of funding of between €0.5 million and €2.5 million for development, prototyping and other demonstration work for 12-24 months. After this, the Commission will connect SMEs to other programmes that provide funding for the commercialisation phase. ■

Horizon 2020 zeros in on waste and aims to conserve water and natural resources

Building a green economy featuring the sustainable use of natural resources and resilience to the effects of climate change is the ambitious objective of the Horizon 2020 work programme, 'Climate action, environment, resource efficiency and raw materials'

The era of seemingly plentiful and cheap resources is coming to an end, with raw material supply, water, air, biodiversity and terrestrial, aquatic and marine ecosystems all under pressure, says the Commission in its introduction to the work programme on 'Climate action, environment, resource efficiency and raw materials, in which it sets out a wide-ranging package of research on topics ranging from waste reduction to adapting to climate change.

The objective is to de-couple economic growth from resource use by promoting the development of a resource-efficient and climate change-resilient economy, the protection and sustainable management of natural resources and ecosystems, and a sustainable supply and use of raw materials.

To build a green economy that is in sync with the natural environment, the Work Programme will address gaps in the knowledge base, to understand changes in the environment and come up with policies, methods and tools to tackle these challenges, and support innovators and businesses to bring green products and services to the market.

Waste and water are particular priorities, on the grounds of their substantial potential for business opportunities and job creation, while also tackling important resource efficiency challenges.

Efforts have been made to encourage SME participation, through the SME Instrument and innovation actions, where SMEs can get follow up research projects by getting funding for work linked to closer to market activities.

In addition to the calls in this programme, research on climate action, environment, resource efficiency and raw materials will also be funded in three other programmes, 'Blue growth: unlocking the potential of the oceans'; 'Energy-efficiency' ; and 'Disaster-resilience: safeguarding and securing society, including adapting to climate change'.

Waste not, want not

Under 'Waste: A Resource to Recycle, Reuse and Recover Raw Materials - Towards a near-zero waste society' there will be ten calls in 2014 and 2015, with €73 million available in 2014 and €58 million in 2015.

As the Commission notes, a smart economy minimises waste production and reuses waste as a resource. Creating a near-zero waste society not only has an environmental rationale, it will drive competitiveness. Europe is at the forefront of innovation in waste reduction and the call intends to further boost this, to reduce environmental depletion and Europe's dependency on the import of raw materials.

The global waste market, from collection to recycling, is estimated at € 400 billion per annum and holds significant potential for job creation. The call addresses EU research priorities for 'Urban Waste and Innovation' identified through a consultation process carried out in the Seventh Framework Programme project. This identified 'economic instruments'; 'education and communication'; 'modelling business and consumer behaviour'; 'policy'; 'product /production design'; and 'waste treatment /management', as themes to be addressed.

The call also aims to deal with specific challenges in food, agricultural and construction waste. The Public-Private Partnerships on Sustainable Process Industries and on Bio-Based Industries will contribute to these objectives of this call.

The overall aim is that by 2020 waste is managed as a resource, waste generated per capita is in decline, and recycling and re-use of waste are viewed as economically attractive options.

Water, water everywhere

Water resources are under pressure from climate change, urbanisation, pollution, overexploitation of freshwater resources and increasing competition between various user groups. Improvement of the state of water resources, both in terms of quantity and quality, will trigger

substantial economic benefits.
The world market for drinking and waste water was €250 billion in 2008, with corresponding investments of more than €33 billion per annum. Pollution of water from run-off, predominantly of agricultural origin, was estimated in 2011 to cost the EU €30 billion per annum.

At the same time, the market for technologies to adapt to climate change – such as protecting from floods and droughts – is rapidly growing and the cost of repairing damage is estimated to be about six times higher than the cost of adaptation.

There is significant potential to boost the competitiveness and growth of the European water sector, which includes 9,000 SMEs and provides 600,000 jobs in water utilities alone. A one per cent increase of the rate of growth of the water industry in Europe could create 10,000 to 20,000 new jobs, while synergies with other sectors could generate even larger returns, with some estimates indicating the application of ICT in water management and monitoring could produce growth of 30 per cent per year.
In total there are eleven separate calls relating to water, with €67 million to be awarded in 2014 and €189 million in 2015.

Innovation for a green economy

The call 'Growing a Low Carbon, Resource Efficient Economy with a Sustainable Supply of Raw Materials' forms part of an overall focus on investing in the development of a green economy.

The Commission says multi-disciplinary research and innovation required to tackle this challenge in a sustainable way will entail pooling of knowledge and resources, and the active involvement of socio-economic disciplines.

Actions under this call aim to support companies in commercialising eco products and encourage their take-up by public authorities. They will also help move towards a new era of climate information systems and services, providing accessible, high quality and data for the public and private sectors.

Given the transnational and global nature of climate and the environment, and the scale and complexity, research is foreseen at both EU level and beyond. In addition to bilateral and regional cooperation, there will be support for international projects.

The total budget for the calls in this part of the programme is €344.8 million in 2014 and €391.32 million in 2015. ■

€1.31B for social science and humanities in new Horizon 2020 challenge

'Europe in a changing world - inclusive, innovative and reflective societies' will address the update and deployment of new technologies within society, as well as youth issues of identity, heritage and youth unemployment

After a sustained period of campaigning in Brussels, social sciences and humanities (SSH) have found a home in Horizon 2020, with a newly dedicated funding chapter. But funding for this programme remains lower than all of the other six social challenges to be addressed under Horizon 2020 – the budget of €1.31 billion compares to a figure of €7.47 billion for health, demographic change and well-being, for example.

However, EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, claims there is plenty of funding for social scientists, "If you look at the excellent science pillar, and the ERC in particular, there is almost €1 billion [greater] funding for social sciences than they ever had before," she told Science|Business. "But on top of that, they have funding in the societal challenges pillar – huge funding," she said. In addition, there is increased opportunity for participation in the industrial leadership pillar.

It's not just a question of how much money is given to the programme, however, but also a question of how this funding will be spent. The two-year work programme will see a total of 43 topics funded, an "enormous multitude", said Kurt Deketelaere, Secretary General of the League of European Research Universities (LERU). "It may have been a better idea to set aside half of this budget for a flagship programme, and use the remainder to fund a few other worthwhile topics," he said.

On December 11 2013, the Commission launched the first five calls for the programme, with a total spending of €112 million in 2014. These calls are: Overcoming the Crisis: New Ideas, Strategies and Governance Structures for Europe; the Young Generation in an Innovative, Inclusive and Sustainable Europe; Reflective Societies: Cultural Heritage and European Identities; Europe as a Global Actor; New Forms of Innovation.

New ideas to overcome the financial crisis in Europe

This first call has been identified as one of twelve focus areas for the European Commission in 2014 and 2015, and will include socio-economic research on how to make the European economic and monetary union more resilient and stable, while also looking at the social, political and cultural consequences of the crisis. With a total budget of €35 million for the

first year, this call will also include research into the future of urban areas and the potential for increased use of emerging ICT technologies in the public sector.

In a statement on the programme, LERU welcomed this call as an example of where the Commission has allocated a sufficient amount of money to a limited number of topics – €35 million for six calls.

Helping Europe's next generation maximise its potential

With an ageing population, Europe needs to capitalise fully on the potential of its youngest citizens. But the ongoing economic crisis means that the opposite is happening, with nearly one in four young people in the labour market unemployed, a rate that rises to 50 per cent in some regions.

Getting a foot on the career ladder is becoming more and more difficult and today's graduates are faced with longer jobless periods, a higher likelihood of getting only temporary contracts and of getting a job below their qualification level.

This call, with a budget of €19 million in 2014, looks to provide policy-makers with a comprehensive picture of the current young generation – their capabilities, prospects and needs – in an attempt to improve the youth unemployment rate and to take advantage of the social and economic benefits young people can bring to the society. Actions will include mobility studies and research in adult education, while specific attention will be placed on gender equality aspects and the diversity of young people.

Preserving Europe's cultural and historical heritage

A third call, reflective societies: cultural heritage and European identities, has a budget of €23 million in 2014 to enhance understanding of Europe's intellectual and creative foundations and form the basis for a critical reflection of its historical, cultural and normative roots. "This research will contribute to a more resilient, innovative and creative European society, pursuing the goal of 'Unity in diversity' a principle whose importance and relevance has been highlighted by the recent financial and economic crisis," the Commission said.

To take one example, using digital technologies to enhance the understanding and preservation of European cultural heritage, through modelling and advanced search technologies, will allow for richer interpretations and user experiences, and for creative re-use.

Finding partners of strategic interest abroad

The smallest budget amongst the five calls goes to 'Europe as a global actor', which has €8.35 million in 2014 to encourage strategic collaboration in research and innovation with international partners. It will cover neighbouring regions – including Turkey, the Balkans, and the Mediterranean.

This relatively small budget will be split over 12 topics, some of which are "overlapping" according to LERU. "Fewer and more innovative topics could have created a more robust call," LERU said in a statement.

New forms of innovation

The final call – new forms of innovation – get €26.5 million in 2014 budget to look at the potential of public sector innovation, social innovation and new business models to improve productivity and competitiveness in Europe.

"ICT can be an important enabler of this innovation process, as the take-up of new technologies increases connectivity, collaboration and openness," said the Commission in its work programme. "Moreover, the introduction of new processes will also transform the interaction between citizens, businesses and civil servants."

The move towards open government, including making data, services and processes available to service users, requires a culture change and exchanging best practices would be helpful here. ■

Pillar three: Societal Challenge

€1.69B for security research on cybercrime, natural disasters and better border security

‘Secure societies - protecting the freedom and security of Europe and its citizens’, may seem an unlikely theme for scientific research. Science|Business looks at what is involved in the first calls of this Horizon 2020 programme

‘Secure Societies’, the seventh societal challenge in Horizon 2020, will receive €1.69 billion to improve Europe’s border control, cyber security and disaster resilience systems, while also exploiting new technologies and social media networks to combat terrorism.

The research and innovation activities funded will have an exclusive focus on civil applications, although Horizon 2020 will put a stronger emphasis on dual-use technologies, including the development of technical standards for interoperable communications between civil and military operators.

The three calls launched on December 11 2013, will see €47 million spent on digital security in 2014, focusing on basic research but also on the economic and societal dimension of security and privacy in the digital ecosystem.

The other three pillars of the programme: disaster resilience, fighting crime and terrorism, and border security, will be launched in early 2014. Each of these calls will have a section dedicated to social sciences and humanities, including research into the social, psychological and economic aspects leading to organised crime and terrorism, and the role new social media networks could play in national security.

Safeguarding societies from disasters, from climate change to terrorism

Over €168 million will be spent in the first two years of Horizon 2020 to fund R&D aimed at improving Europe’s resilience to natural and manmade disasters, reducing loss of human life and the environmental, economic and material damage caused.

There will be a focus on developing new technologies and running large-scale demonstrations across five topics: crisis management, disaster resilience, critical infrastructure protection, communication technologies and the ethical and social dimension.

SMEs can benefit from a specific call for small scale demonstrations of technologies and tools covering any aspect of urban critical infrastructure protection, such as designing resilient buildings and protecting energy grids.

Using technology to confront crime and terrorism

This part of the programme will fund researchers looking at new technologies to fight and prevent crime, as well as illegal trafficking and terrorism. The budget of €75.16 million over the first two years will include research into exploiting big data for forensic investigations and projects that aim to get a greater understanding of terrorists’ ideas and beliefs. Calls will be divided into four parts: forensics, law enforcement capabilities, urban security, and the ethical and societal dimension.

Improving the security of Europe’s borders

This call aims to improve the methods and systems used by officials at Europe’s borders to identify risks faster, such as projects to identify low-flying aircraft, research to explore the possibility of using biometric data, for example DNA string, in e-passport chips, in place of fingerprints or photos. ■

Partnerships in industrial research

A look at the Commission's plans for €8 billion of Horizon 2020's budget
Five public/private partnerships are set to get €6.5 billion from Horizon 2020, pulling in a further €9.9 billion from industry. Total investment in these and five other projects unveiled on 10 July 2013 will be €22 billion

Most of the money in the €22 billion headline figure will go to five Joint Technology Initiatives (JTIs) funded by the EU and industry and covering innovative medicines, aeronautics, bio-based industries, fuel cells and hydrogen, and electronics. "These initiatives not only strengthen our economy, they are an investment in a better quality of life," said R&D Commissioner Máire Geoghegan-Quinn, when she announced the JTIs.

"Many competitors are investing faster than us," she said, "and they are thinking big." For example while the EU has the world's first commercial-scale advanced bio-refinery for cellulosic biomass, there are reports that China plans to have nine such facilities by 2015. "So no-one can rest on their laurels. We need to bolster both public and private spending if we are to stay in - never mind ahead of - the game."

€8 billion will be taken from the Horizon 2020 budget for these collaborative projects. This will be matched with approximately €10 billion from industry and close to €4 billion from national governments. "That represents a major increase in our level of ambition compared to the current public-private partnerships," said Geoghegan-Quinn. Under FP7, a total EU contribution of €3.1 billion has been matched by an industry investment of €4.7 billion.

How JTIs work

Each JTI is managed by a dedicated legal entity, a Joint Undertaking, and not by an EU institution, as is the case for other Framework Research programmes. The governing board of each JTI establishes its own strategic research agenda and projects are selected through open and competitive calls. While most of the partnerships were started under the current Seventh Research Framework Programme (FP7), stakeholders say more time and money is needed to consolidate the objectives and scale up the technologies. There will also be an entirely new €3.8 billion investment in a bio-based industries JTI.

The guiding principle is that these five areas represent large-scale, long-term projects which, "No one company or country can deal with alone," said Geoghegan – Quinn. It is thought this type of collaboration makes for a more efficient use of funds by pooling financial, human and infrastructure resources, and also aids in removing any block on innovation to get technologies to market faster.

The five JTIs, which represent sectors already providing more than four million jobs, are:

- Innovative Medicines 2: to develop vaccines and new drugs including treatments for antibiotic resistant infections.
- Fuel Cells and Hydrogen 2: to expand the use of clean and efficient technologies in transport, industry and energy.
- Clean Sky 2: to develop cleaner, quieter aircraft which emit significantly less CO2.
- Bio-based Industries: to use renewable natural resources and develop technologies for manufacturing greener products.
- Electronic Components and Systems: to boost Europe's electronics manufacturing capabilities.

Partnership with industry

The industrial partners will commit fifty per cent or more of the total costs of the JTIs, although the

payment can consist of both in-kind contributions and hard cash.

JTIs proved popular with industry under FP7, and succeeded in attracting a high level of industrial participation, including many SMEs.

Geoghegan-Quinn said industry is committed to the JTIs. "Vice President Kallas, Vice President Kroes and I had an opportunity to eyeball eight CEOs involved in JTIs this morning," she said at the July launch. Geoghegan-Quinn is pleased with their commitment to the projects, their willingness to work with their competitors for the best of Europe and to provide the budget as promised. "They have realised that in this tough global environment, it is sometimes better to work together with a competitor than not to work at all."

What's new?

The new JTIs aim to step up activities from FP7. For example, while the first Fuel Cells and Hydrogen JTI has delivered units suitable for use in forklift trucks and small back-up power units, it now aims to scale-this up for more widespread use in road and air transport.

Industry commitments to the JTIs are significantly higher than in FP7 and include additional activities that will be solely financed by the industry partners, in particular to help ensure the effective deployment of the new technologies.

Geoghegan-Quinn claimed that the second round of JTIs will address criticisms that the current initiatives are overly complex and difficult to take part in. "We needed to bring industry back into the programme," said Geoghegan-Quinn. "When we asked industrial partners what was wrong, they all said 'It's all wrapped up in red tape. We have an enormous administrative burden'." JTIs under FP7 all had their own funding rates and rules of participation, but the new initiatives will in general follow the rules of participation for Horizon 2020.

Public/public partnerships

The Commission also launched a sixth public-private partnership SESAR, which will invest €1.6 billion in creating an integrated air traffic control system for the whole of Europe. The Commission is putting in €600 million, with the balance coming from Eurocontrol, the body that supervises European airspace.

Alongside this, the Commission announced four joint public/public partnerships with EU national governments, focussing on new treatments for poverty-related diseases, measurement technologies for industry, support for high tech SMEs, and assisted living products and services to help the elderly and disabled to live safely in their homes.

Geoghegan-Quinn said these are areas where there is not sufficient incentive for industry to invest, but which would deliver significant benefits. For example, assisted living can improve quality of life for elderly and disabled people, while reducing the burden on statutory services and carers and – eventually – developing important new markets. ■

Joint Technology Initiatives

Joint Technology Initiatives			
Innovative Medicines Initiative 2	€1725m	€1725m	€3450m
Fuel Cells and Hydrogen 2	€700m	€700m	€1400m
Clean Sky 2	€1800m	€2250m	€4050m
Bio-based Industries	€1000m	€2800m	€3800m
Electronic Components and Systems	€1215m (+ €1200m from EU Member States)	€2400m	€4815m
Total JTIs	*€7640m (€6440m from Horizon 2020 + €1200 from EU Member States)*	*€9 875m*	*€17 515m*

Joint Programmes with Member States			
European and Developing Countries Clinical Trials Partnership 2 (EDCTP 2)	€683m	€683m	€1366m
European Metrology Research Programme (EMPIR)	€300m	€300m	€600m
Eurostars 2 (for SMEs)	€287m	€861m	€1148m
Active and Assisted Living Research and Development Programme	€175m	€175m	€350m
Total joint programmes	*€1445m*	*€2019m*	*€3464m*

SESAR Joint Undertaking			
European Air Traffic Management System (SESAR)	€600m	€1000m	€1600m
TOTAL			**€22579m**

Right treatment to the right patient at the right time – the EU unveils €3.4B drug discovery collaboration

Personalised medicine, unmet medical need and faster translation of basic research will be the focus of the second stage of the Innovative Medicines Initiative

Ruxandra Dragia-Akli, director of the Health Directorate, DG Research, European Commission

In July 2013 the Commission launched five Joint Technology Initiatives to be funded under Horizon 2020.

One of these is the Innovative Medicines Initiative 2 (IMI 2), a public-private partnership bringing together pharma and biotech companies, universities, SMEs, patient organisations and regulators, with a brief to both collaborate on the discovery of new drugs and to revitalise Europe's flagging pharmaceutical research sector.

The programme will build on the €2 billion IMI programme which was set up with the backing of the European Federation of Pharmaceutical Industries and Associations (EFPIA) and the Commission in 2008 to speed up drug discovery.

To date, 4,000 researchers have participated in forty different IMI projects that have included deriving the first-ever human pancreatic beta-cell line; developing new in vitro models to better predict drug toxicity and building the world's largest database of clinical trials in schizophrenia. This has given Europe international recognition, "as a pioneer in open collaboration for health research," said Michael Goldman, Executive Director at IMI, outlining the plans for IMI 2.

The EU will contribute up to €1.725 billion from the Horizon 2020 budget, which will be matched with a commitment from EPFIA members of up to €1.5 billion.

The challenge for IMI2

"Until now we have worked in compartments", said Ruxandra Dragia-Akli, Director of the Health Directorate at DG Research, "and each compartment has incurred high costs." It is hoped that collaboration in IMI2 will reduce the expense and risk of drug discovery, ending the "innovation blockage" Europe is suffering from, said Dragia-Akli. "We need to bring all the innovation we have to patients."

Unlocking innovation in healthcare is particularly important in the context of an ageing population and the corresponding prevalence of chronic diseases. This challenge will shape the agenda for IMI2, said Dragia-Akli, "IMI 1 has been a big success, but we are moving to a different strategic research agenda - to address public health needs."

The aims for the updated initiative include:

- A thirty per cent better success rate in clinical trials of priority medicines identified by the World Health Organisation, including diabetes, cancer, autoimmune disease and respiratory diseases
- Obtaining clinical proof of concept for new drugs for treating immunological, respiratory, neurological and neurodegenerative diseases in just five years
- New and improved diagnostic markers for four of these diseases and at least two new drugs, which could either be new antibiotics, or treatments for Alzheimer's disease

Personalised medicine will be a key theme, said Dragia-Akli. This will be driven by a shift from diagnosing disease by symptoms, to molecular-based medicine, in which the underlying molecular and genetic characteristics of diseases are identified by objective diagnostics, rather than relying on subjective and erratic reporting of symptoms.

Peter Anderson, Senior Vice President of the pharma company

Lundbeck and Chair of EFPIA Research Director Group, said Parkinson's disease is a prime example where such an approach could improve diagnosis and treatment. Multiple genes have now been implicated in the initiation and progression of this disease. "It is not Parkinson's disease, it is a genetic disease and we need to treat each patient differently based on their genetic make-up," he said.

IMI 2 aims to stratify at least four diseases based on genetic analysis. Anderson said this would be revolutionary, noting schizophrenia alone has been linked to one hundred genes. If Parkinson's disease and schizophrenia were broken down and reclassified based on the genes that have been implicated in their aetiology the market would be split many ways. "Each new treatment will need a new business model and regulatory approach," said Anderson. "This is why IMI 2 has a much broader perspective."

On the other hand, the use of genetic profiling to select likely responders to a new drug, based on an understanding of the precise mechanism of action, will result in a better success rate for clinical trials, reducing costs and improving treatments, said Dragia-Akli.

The focus will not just be on drug discovery, but on successful marketing and business models. This will be particularly challenging for antibiotics, where to avoid the development of antibiotic resistance, it is necessary to limit their use, said Richard Bergstrom, EFPIA Director General. "Unlike most products, you want there to be as many variations as possible of the drug with as many tweaks as possible. We are currently working on a business model," he said.

Learning from IMI 1

IMI 2 will bring together the members of EFPIA, but will also be open to other industries and sectors. "One criticism of IMI 1 was the idea that it was a closed club," said Dragia-Alki. The impression was that it was an exclusive project for big pharmaceutical companies only, and small biotechs or companies from other industrial sectors could not participate, she said. "We are now creating a very flexible framework for others joining." ■

Electronics industry to get €4.8B boost

Electronics will be the biggest winner in European Commission's R&D plans for 2014 – 2020, landing a €4.8 billion package of investment in research and innovation to boost components, system design and manufacturing capabilities

The Horizon 2020 joint technology initiative for Europe's electronics sector - Electronic Components and Systems for European Leadership (ECSEL) - will bring in almost €5 billion of funding from the EU, member states and the industry, to boost manufacturing capacity in the sector.

ECSEL will have an EU contribution of up to €1.2 billion, matched by funding from Member States, with the industrial partners putting in around €2.4 billion.

This underlines the strategic importance of electronics, not only as an important sector in its own right, but also as one that underpins many other industries. "It's not just about one sector, it's about all the sectors that are enabled by electronics," said Neelie Kroes, EU Vice President, launching ECSEL in July 2013.

Cars, planes, trains, medical and health equipment, home appliances, energy networks and security systems, will all benefit from advanced European capabilities and capacity to design and manufacture state of the art electronic components and systems, Kroes said. "The fact is, electronics supports and enables a huge value chain, reaching across the economy."

Electronics is, "a strong and strategic sector that has grown around five per cent per year since 2000. In Europe today it directly employs 200,000 people. And there is huge demand for more skills and more workers," Kroes added.

The ECSEL programme will reinforce Europe's existing world-class electronics clusters, such as that in Dresden, and prevent Europe's market share from declining further. The plan that is in place would see a doubling of chip production by 2020, which would mean Europe outpaced the US in semiconductor manufacture, Kroes claimed.

ECSEL is the largest of the five JTIs announced by the European Commission as a key part of the €79 billion Horizon 2020 research programme. This JTI is a merger of two existing JTIs funded under the current Framework Programme 7: the ARTEMIS initiative on embedded systems and the ENIAC project on nano-electronics, both of which were set up in 2008. It also incorporates research and innovation on smart systems.

Amongst ECSEL's aims are to reverse the decline of the EU's global share in the electronic components and systems area; to maintain Europe's leadership in areas such as embedded systems, semiconductor equipment and materials supply, and the design of complex electronic systems; and also to increase energy efficiency and improve security.

Kroes said she had received a lot of support when she presented the ECSEL programme to the Council. "Electronics is a source of future growth: information and communications technology is becoming more and more important. But it's not just electronics [as a sector], it is emerging across the board. We are investing in our digital future." ■

Commission to strengthen fuel cell research with €1.4B R&D programme in Horizon 2020

New programme will bid to develop long-term clean energy supplies and reduce greenhouse gas emissions from Europe's energy and transport sectors.

The New Energy World Industry Grouping (NEW-IG), the industrial association representing Europe's hydrogen and fuel cell industry welcomed the European Commission's proposal to renew and strengthen the Fuel Cells and Hydrogen joint technology initiative set up under Framework Programme 7, boosting investment to €1.4 billion in the Horizon 2020 R&D programme.

Fuels and Hydrogen 2 will continue to develop clean, efficient and affordable fuel cell and hydrogen technologies up to the point of market introduction, helping to secure the future international competitiveness of this strategically important sector in Europe.

When the extension of the programme was announced in July 2013, Pierre-Etienne Franc, Chairman of the board of NEW-IG, noted that the JTI for fuel cells and hydrogen provides the framework to coordinate objectives, pool resources and advance the technology for the benefit of the European economy.

"This renewed political and financial support is a sign that Europe will strive to establish this technology as a key enabler for its future energy and transport roadmap," he said.

The current Fuel Cells and Hydrogen JTI, set up in 2008, has made substantial progress in both energy and transport applications. Successes include the Clean Hydrogen In European Cities (CHIC) project which has advanced towards full market commercialisation of hydrogen fuel cell-powered buses. The project is integrating 26 hydrogen fuel cell-powered buses into the daily public transport operations and bus routes in five locations across Europe – Aargau in Switzerland, Bolzano in Italy, London, Milan, and Oslo.

CHIC has demonstrated a significant reduction in fuel consumption of over 50 per cent compared to previous types of "clean bus".

Demonstrating large-scale hydrogen production

Of the €1.4 billion to be invested in Horizon 2020, €700 million will come from the Commission and €700 million from industry in the form of hard cash and in kind contributions.

Amongst the specific objectives for the second programme are reducing the cost of fuel cell systems for transport applications by a factor of ten; increasing electrical efficiency of fuel cells for power production by ten per cent, and demonstrating the viability of large scale hydrogen production from electricity generated from renewable energy sources.

When she launched the second fuel cell research programme in July 2013, Maire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, said that as a result of the research and implementation carried out in the first Fuel Cells and Hydrogen JTI, "You can take a ride on hydrogen-powered pollution-free buses in five cities across Europe. However she added, "Much research and development is still needed to make this application of FCH technology widespread, and those for clean energy production and storage to become attractive." ■

Clean Sky 2 cleared for take-off with €4.05 billion budget

The Commission is following up €1.6 billion spending on cutting noise and emissions from aircraft in Framework Programme 7 with a €4 billion package of research in Horizon 2020

There's a significant boost for the Clean Sky Joint Technology Initiative (JTI), with plans to more than double the budget in the Horizon 2020 R&D Programme.

Its predecessor, Clean Sky 1, funded by Framework Programme 7, was the largest European aeronautics research programme ever, with a €1.6 billion budget over seven years.

Clean Sky 2 will dwarf that figure, with total funding of €4.05 billion. Of this total, the Commission is putting in €1.8 billion, whilst €2.25 billion in cash and in kind resources will come from the industrial partners. However, €1 billion of this will be in the form of "additional activities" that are not included in the work plan of the JTI but that contribute to its objectives.

Speaking at the launch of Clean Sky 2, Jean Paul Herteman, chairman and CEO of Safran, the French aircraft engine manufacturer said, "Today is an important day for Europe because it is a big day for the aerospace industry" – an industry that is "one of Europe's jewels".

Clean Sky 2 will bring together companies, universities, public laboratories and SMEs to develop and demonstrate new technologies for the civil aircraft market that cut emissions and noise. Air traffic currently contributes about three per cent to global greenhouse gas emissions, a figure that is expected to triple by 2050. Although other sectors are more polluting – electricity generation and heating produce 32 per cent of greenhouse gases - pollution from air traffic is released high in the atmosphere where the impact is much greater.

In addition to improved environmental credentials, it is hoped the Clean Sky 2 JTI will secure the future international competitiveness of the European aviation industry. Europe currently has a 40 per cent share of the world market.

Amongst specific objectives, Clean Sky 2 aims to increase aircraft fuel efficiency, cutting CO2 emissions by 20-30 per cent, and reducing nitrogen oxide and noise emissions by 20-30 per cent compared to state-of-the-art aircraft entering into service as from 2014.

Other countries, and in particular the US, strongly support their aeronautics industry, meaning private investment alone is not enough to maintain the competitiveness of the sector in Europe. This highlights the importance of the synergy between private and government investment on show in Clean Sky 2.

In addition to developing technologies that can be applied within aeronautics, Clean Sky 2 may also lead to new technologies, for example, light-weight materials, that can be used in other sectors.

Eric Dautriat, Executive Director of the Clean Sky Joint Undertaking which is responsible for managing the JTI said, "Based on the successful Clean Sky experience to date, Clean Sky 2 is well positioned to become a force in shaping innovation for aviation in the decades to come. The entire aeronautics supply chain will benefit: SMEs, research organisations, universities and industry."

Clean Sky achievements to date

Those involved in Clean Sky claim that technology developments to date or in progress could reduce aviation CO2 emissions by more than 20 per cent compared to 2000 baseline levels. This is equivalent to a reduction of 2 to 3 billion tonnes of CO2 over the next 35 years. Technologies and demonstrators developed in the Clean Sky programme are said to represent major steps forward, with examples to date including innovative rotor blades and a high compression engine for light helicopters, new ice detector sensors and advanced avionics systems.

Since the Clean Sky JTI was set up in 2008 it has brought together over 560 participants of which around 40 per cent are SMEs. ■

€3.8 billion plan to boost Europe's bio-based industries

Forty eight companies have signed up for a Joint Technology Initiative (JTI) to research and bring products made from renewable natural resources to market. This will provide new markets for farmers and reduce dependency on fossil fuels

The new kid on the JTI block is a €3.8 billion public/private partnership to develop bio-based industries, bringing together 48 large and small companies from across different sectors to develop and commercialise food, animal feed, chemicals and fuel products made from sustainable biomass and waste.

BRIDGE – Biobased and Renewable Industries for Development and Growth in Europe – will be managed by the 48 corporate partners through the Biobased Industries Consortium (BIC), with the aim of enabling European companies to bridge the innovation gap between technology development and commercialisation of high-value bio-based products.

These companies have committed to put in €2.8 billion cash and in kind resources, with €1 billion coming from the Commission. Of this, €1.8 billion will be pumped into investments and infrastructure, whilst the rest will fund activities, deployment and research across the innovation chain.

Companies signing up to take part in BRIDGE said the €2.8 billion investment from industry highlights both their strong commitment to the partnership and their confidence it can achieve its objectives. Coming together to make this investment under the umbrella of BIC reflects the collaboration which is at the core of BRIDGE, with its ambition of laying down the foundations of a post-petroleum society. This will require sectors including agriculture, biotech, forestry, pulp and paper, chemicals and energy to combine strengths and resources, and build bridges between different industries.

This requirement to work across sectors was stressed by Guy Talbourdet, CEO of Roquette Freres, a company specialising in making products based on starch extracted from plants. In order to develop new technologies, collaboration and joint development and support is absolutely vital, he said when the BRIDGE project was launched in July.

New biomass resources

In the face of evidence that European Union policies for the promotion of biofuels have led food crops to be diverted to biorefineries, BRIDGE will continue research to replace petrol-based products with ones based on biomass. One aim is to develop a biorefinery able to handle different types of biomass that cannot be used as food, for example, non-food crop grasses and agricultural and forestry waste, and which can produce multiple products including biopolymers and biofuels.

Beyond the potential of the project to create jobs in a broad range of sectors in Europe, in particular in rural areas, the Commission says it will also help the EU meet climate change targets.
It will also aim to bridge the 'valley of death' that prevents research from Europe's universities being translated through to commercial bio-based products.

The BRIDGE project is a major milestone on the journey towards a smarter, more sustainable, more innovative EU economy, believes Stephan Tanda, Director of Royal DSM. "It underscores the commitment of both the Commission and of industry to work together with a broad community of European stakeholders, from farmers to foresters, to scientists and citizens, in the development of a world leading EU bio-based economy," Tanda said.■

CHAPTER THREE

Cross-cutting issues

EU streamlines the management approach for Horizon 2020

The Commission has started re-organising its main department for research and innovation. The objective, Director-General Robert-Jan Smits tells Science|Business, is better policy and more efficient grant handling

As the Horizon 2020 research programme gets underway, the European Commission is starting to reorganise its core research and innovation department to boost its efficiency at managing grants and make more time for policy planning, according to Robert-Jan Smits, Director-General for Research and Innovation.

Horizon 2020, with a budget of almost €80 billion over seven years, is the biggest-ever research programme in Europe – but although in December 2013 the EU member-states approved the 30 per cent budget increase over the current Framework Programme 7, they also ordered the Commission to cut staff by 5 per cent overall. As a result, "I had to look for new ways to manage the programmes, in a less-costly and more efficient way," Smits said in an interview with Science|Business.

His solution was to introduce radical simplification, moving to a trust-based approach in the management of projects, thereby avoiding micro-management of the Commission, and to separate the machinery of grant management from the policy making activities. The Directorate-General currently has a staff of about 1,800 that handles both tasks. This core staff will shrink substantially - by one third by 2020. Those remaining will focus on policy. Of staff leaving the DG, about 300 will retire naturally. Many will seek new opportunities in the executive agencies, where they will focus on administering the grant programmes. The remaining shrinkage of the DG will come from normal mobility – people leaving the DG for other jobs, or leaving the Commission entirely, to work elsewhere.

The changes have been rumoured for the past year in Brussels – but Smits' comments, as they start taking effect, are the first public description of them. Though partly prompted by budget and staffing constraints, they are intended to produce better policy and faster grant approvals.

A policy focus – and a new Communication

In the past, Smits said, "Our core business was spending the money. We had little time for policy-related issues, such as the Innovation Union and the European Research Area, things essential for science in Europe. So we said we have to separate policy from the administration; like in all [member-state] countries [where] there are ministries that manage the policy and agencies that manage the money. That's behind the restructuring we are doing."

Of the eleven directorates within DG Research and Innovation, three are being reinforced: Directorate A - for Policy Development and Coordination; Directorate B - for Innovation Union and the European Research Area; and Directorate C for International Cooperation. In addition, the policy units in the Directorates dealing with the Grand Societal Challenges are strengthened since they define the multi-annual work programmes and content of the calls.

Over time, the people throughout the DG will shift more towards policy tasks, which will mean fewer financial or project officers. "The idea is that we are going to focus inside the DG much more on policy issues like the Innovation Union, with its initiatives to create a unitary patent, speed up standardisation and develop innovative public procurement; and on the completion of the European Research Area, which includes measures to abolish barriers to the mobility of researchers, a full roll out of open access to publications and open recruitment in universities," Smits said.

A reflection of the policy emphasis is an upcoming Commission Communication on innovation policy now being put together by Smits' boss, EU Research, Innovation and Science Commissioner Máire Geoghegan-Quinn, and Commission Vice President Olli Rehn. Smits called it one of the most significant policy initiatives in this area that will come during 2014. It is, "A policy paper on innovation as a source for new growth for the European economy," he said. It "will have messages on the need to invest, reform and embed," innovation in the European economy. It will be a full recognition of the role and place of innovation in the economic policy of the EU.

Cranking out the grants

For grant management, Smits said a recent study by the EU Court of Auditors found that when it comes to programme management, the executive agencies do a first class job. "If you look at time to grant; if you look at replies to questions; making payments quicker – the agencies do it in a quicker and a more efficient manner. That's why more and more Commission programmes have been externalised to the executive agencies."

Indeed, as part of its new seven-year budget deal with

the member states, the Commission is pushing many routine administrative functions to agencies. These are separate legal entities from formal EU institutions like the Commission, and are set up specifically to administer various EU programmes.


Robert-Jan Smits, Director-General for Research and Innovation

Four will be dealing with Horizon 2020 grants. The biggest is the Research Executive Agency (REA), which will handle the lion's share of the business. The European Research Council Executive Agency (ERCEA) administers grants for frontier scientific research. The Innovation and Networks Executive Agency (INEA), the successor of the Trans-European Transport Network Executive Agency (TENTEA), will handle transport, energy and broadband network grants. And the Executive Agency for Small & Medium Sized Enterprises (EASME), the successor of the Executive Agency for Competitiveness and Innovation (EACI), will handle grants for new funding programmes for small and medium enterprises, and will support programmes for sustainability, climate change and environmental protection.

In part, the agencies' efficiency comes from the fact that their employees are fully committed to one task: the financial management of programmes and projects. Furthermore, the fact that they are mainly staffed by contract staff, allows for lower costs in administration. Smits said, however, that a limited number of Commission staff will, in future, also work in the agencies, but transfers of Commission staff to the agencies will be voluntary and no one will lose civil servant status or benefits when they move. The transition will take several years, he said – in part because the DG still has to finish dealing with grants under Framework Programme 7. The last of those projects will be finished in 2018. It will also take time said Smits, for the executive agencies to staff-up for the extra workload.

For grant recipients, "It doesn't really matter who makes the payment, as long as they're qualified people," Smits said. The agencies will also be handling programmes from other parts of the Commission, including DG Move (for transport) and Enterprise (for small companies.) To ensure a coherent interpretation of rules and procedures across Horizon 2020, a Common Support Centre (CSC) has been set up between the different Commission DGs that have a stake in the new programme. This CSC will be located within DG Research and Innovation.

Staying the course

As for Smits himself, he said he will stay as Director-General until at least the departure of Commissioner Geoghegan-Quinn. "She is great to work with and has done a first class job in putting science and innovation high on Europe's political agenda." Furthermore, as Smits put it, "I'm an old-fashioned guy. I will stay with my woman until the end." ■

Bridging the innovation gap with Horizon 2020 – but how?

Spreading Excellence and Widening Participation will receive €816 million over seven years to address the growing divide between Europe's innovation leaders and followers, Science|Business takes a look at the plan for the first two years

Uneven participation in the Framework Programmes has been a source of concern since the enlargement of the EU in 2004, with statistics showing that 20 top-rated institutes receive 50 per cent of European Research Council grants. The latest initiative aiming to tackle this is the Spreading Excellence and Widening Participation programme, which will receive just over one per cent of the overall Horizon 2020 budget to help less R&D intensive regions to secure funding and join partnerships.

The new partnership initiatives have received a warm reception, with Massimo Busuoli, Secretariat of the European Energy Research Alliance (EERA), saying they, "look like the perfect instruments to create bridges between relevant players in eastern countries and EERA members." This will open the door to their participation in the alliance, he said, which currently only sees two per cent participation from research stakeholders in Eastern Europe.

The first work programme for 2014 and 2015 is divided into just two calls: Widespread and Twinning.

Teaming up across Europe

The cornerstone of the Widespread call will be the teaming initiative, which will allow a research-intensive university to partner up with an organisation from a low-performing region to build or upgrade a centre of excellence in that region. "Teaming for excellence is about bringing together the reputation of Europe's leading research institutions and the ambitions of regional authorities of low research and innovation performing regions," said Herbert Reul, Member of the European Parliament. The regional authorities will provide the physical infrastructures and an excellent environment for innovation, while the leading research institution will offer its reputation and management expertise.

The scheme will start in 2014 with two phases: the first will support selected partnerships to produce a detailed business plan for a centre, demonstrating how it would contribute to the development of a cluster in that region. After a year, the Commission will evaluate all of the business plans, and choose a select few to receive further support for the start-up and implementation of the centre over a five – seven year period.

Undesirable use of Horizon 2020 funds

The teaming initiative will preside over a budget of €11.8 million in 2014, with the Commission envisaging proposals with a budget of between €200,000 and €500,000 for stage one and between €15 and €20 million for stage two. The work programme states that Horizon 2020 funds will not be used to support infrastructure or large equipment costs in stage two, but the League of European Research Universities (LERU) is concerned about this top-up investment. "What does the 'start-up' of a centre involve?" asked Kurt Deketelaere, LERU Secretary General. "Is it building the institution

itself? Does it go towards hiring people for the centre? Horizon 2020 has a limited budget of €70 billion to fund excellence, and this would be an undesirable use of its funds," he said.

In fact, LERU sees the second stage of the programme as unnecessary, "If the business plan is convincing enough, that should be enough for the relevant region to use its cohesion funds to invest in the centre," said Deketelaere. "You shouldn't expect everything to come from Europe," he said, "Charity starts at home".

Defining eligibility

In a programme where almost all actions are open only to "low performing regions" and their partners, the definition of "low performing" is crucial to determining who can take part.

The Commission has created a "composite indicator", designed to ensure that "spreading excellence" funds are targeted in the right direction. This indicator will assess the modernisation of research institutions, the vitality of the research environment, and the quality of research outputs - number of highly cited publications, patents and ERC grants - in every country.

Only institutions from countries which are below the threshold of 70 per cent of the EU average of this indicator, can act as applicant organisations: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

"I am surprised to learn that member states from the south of Europe are kept outside," said Reul, referring to the fact that Spain, Italy and Greece are classified as ineligible.

"The world is competing for excellent researchers and inventors," said Reul. "Generous offers to work at prestigious places outside of Europe are waiting for our best brains." With even the best-performing countries finding it difficult to keep their top researchers, the news that much of southern Europe may be excluded from these new initiatives is a tough blow.

Other measures

Under the twinning scheme, an emerging institution will be linked with at least two international leading counterparts in a particular field of research. This will take the form of staff exchanges, expert visits, workshops, conferences, joint summer schools, and so on.

The largest 2014 budget of €33 million will go to the European Research Area Chairs' programme, which began under a pilot in December 2012. This will enable universities and research institutions to host a leading academic for a period of five years, while also implementing structural changes to foster excellent researchers and training staff in leadership and research project management. It is hoped that a high profile appointment in a low-performing region will allow the relevant institution to attract more top researchers and thus develop the level of excellence required to compete internationally.

But Busuoli says the scheme excludes large research centres that are scattered across a country, such as the CNRS in France, by limiting participation to entities legally established in the regions targeted by the call. "This hampers those [de-centralised] research labs, which present the same problems and issues, normally related to local conditions, from having the possibility to exploit their excellence by using the ERA Chairs instrument," he said.

Inside Job: A look at what's in store for the Commission's in-house science service in 2014-2015

In total, 2.47 per cent of the overall Horizon 2020 budget will be dedicated to non-nuclear activities of the Joint Research Centre (JRC), the only Commission service responsible for direct research. In return for this €1.9 billion investment, the Commission has specifically asked the centre, "to provide customer-driven scientific and technical support to EU policies, while flexibly responding to new policy demands."

Joint Research Centre in 2014 and 2015

The work programme for the first two years has been divided into six policy clusters, funded both by institutional and competitive resources:

1. Economic and Monetary Union (EMU)
2. Single market, growth, jobs and innovation
3. Low-carbon economy and resource efficiency
4. Agriculture and global food security
5. Public health, safety and security
6. Nuclear safety and security (EURATOM programme)

The JRC's nuclear work within the EURATOM Research and Training Programme will focus on nuclear safety and security.

As well as its own fixed priorities, the JRC is expected to use its expertise to support Horizon 2020's overall objectives by providing direct support to policy; developing standards and references; upholding innovation to leverage and boost engagement of industry; and helping bolster knowledge and technology transfer.

In order to fulfil this mission, the JRC will also continue to develop and upgrade its research infrastructures. ■

Science needs an audience: €462M to increase public involvement and interest in R&D

Recognising that innovation requires market acceptance, Horizon 2020 will invest €462 million over the next seven years on a new programme, 'Science with and for society'. Science|Business looks at the plan for the first two years

Science needs people – to join its ranks as future scientists, to ensure its objectives are properly aligned to needs, and to ensure its innovations find market acceptance. Yet the numbers pursuing careers in science and technology fail to meet demand, science is still perceived as a male domain, and a recent Eurobarometer survey found that 58 per cent of people feel they are not well-informed about the outputs of publicly-funded science.

A new €462 million programme under Horizon 2020, 'Science for and with society', seeks to stem the tide by engaging with the public, increasing the attractiveness of science careers and addressing gender imbalance in the field.

The programme kicks off with a budget of €45 million in 2014, and over the first two years will fund work to build cooperation between science and society, recruit new talent, and link scientific excellence with social awareness and responsibility.

The first four calls launched in December are designed to:

- Make science education and careers attractive for young people
- Promote gender equality in science
- Integrate society in science and innovation
- Develop governance for the advancement of responsible research and innovation

Attracting new recruits

The first call, 'Making science education and careers attractive for young people,' will spend €12.2 million in 2014 to promote curricula in science education that attract more young people - and especially girls - to science and help young people to pursue scientific careers.

Promoting gender equality in research

A further €19.5 million will be spent in 2014 on four actions designed to increase the participation and interest of girls in science. The Commission will also provide support to research organisations in the implementation of gender equality strategies and develop a common framework for evaluating national initiatives to promote gender equality in research policy.

Integrating Society in Science and Innovation

This call aims to increase public engagement in science, an objective the Commission says is necessary to increase the quality, relevance, social acceptability and sustainability of research outputs.
It will include events such as exhibitions, science cafes and fora that bring citizens and scientists together.

The budget of €10.3 million in 2014 will also include actions to support structural change in research organisations and higher education institutions in order to promote responsible research and innovation.

Developing governance for the ethical, responsible research

The final call, 'Developing governance for the advancement of responsible research and innovation', will receive €12.3 million in 2014 to promote research which is relevant to societal needs and expectations. This will include activities to encourage the uptake of responsible research and innovation practices, as well as funding for new ways of disseminating research results and measuring the impact of research. ■

Building a programme around simplicity

Will Horizon 2020 be able to avoid the bureaucratic madness that is often associated with its predecessors?

Of all the new initiatives being introduced under Horizon 2020, the drive for simplification has become its centrepiece. Couple this with the fact that one of the main focuses of this new framework programme is the targeting of SMEs, and it is easy to see why the hours and hours of paperwork that plagued previous framework programmes needed to be cut drastically if this one is to be considered a success from the perspective of its applicants.

A set of measures will aim to encourage a broader and larger range of organisations to participate in open calls, with the promise that they will be met by a simpler and more efficient process. The entire structure of the programme has also been simplified and shaped towards three main goals: promoting excellent science, increasing industrial competitiveness, and finding answers to society's biggest challenges.

A brief history of red tape

The EU research programmes have gradually evolved and grown – first, from the 1957 Euratom Treaty that began funding nuclear power research, and then from the early 1980s when the Commission began funding computer and telecommunications research. That gradually grew into FP7, the economy-wide Framework Programme which, already at an aggregated cost of €55 billion from 2007-2013, is the world's second largest civilian research programme, after the US National Institutes of Health.

Pressure for change began rising a few years ago – in part because of a confrontation between the Commission and the main French research agency, the Centre national de la recherche scientifique (CNRS). The Commission tried to claw back about €20 million in research grants – not because of any alleged fraud, but because the CNRS had not been doing its paperwork in the way the Commission's auditors wanted. At the same time, universities in north-western Europe – the scientific core of the EU – began agitating against all the money they had to spend on staff to understand and comply with the EU grant rules. The European Parliament joined the no-red tape bandwagon around 2010.

Heading into Horizon 2020, a number of key changes have been designed to counteract these complaints:

- A simpler overall structure – three main goals with one common set of funding rules. The goals are: promotion of excellent science, industrial competitiveness, and finding answers to society's biggest challenges.

- Simpler and standardised rules for reimbursement – based on full reimbursement of costs that can be directly attributed to the project (or 70 per cent for close-to-market, "innovation actions") and a flat rate of 25 per cent to cover indirect costs.

- Timesheets will be eliminated – Grantees with full-time staff will only

need to certify that the researchers on a project actually worked the time they claimed, rather than keep a timesheet for each one. However, part-time and occasional workers on a project still have to keep timesheets.

- A single IT platform for all interactions with participants, based on the FP7 Participant Portal.

- A shorter time to grant of eight months, with the Commission committing to inform participants of the outcome of their application after five months and signing the common grant agreement within three months.

- An increase in bottom-up procedures, including the Fast Track to Innovation for small, innovative, close-to-market projects relating to any technology field under the specific objective "Leadership in enabling and industrial technologies" or to any societal challenge. This will operate under a permanently open call for proposals with a reduced time to grant of six months.

Validation

What does the application process today look like for a typical SME? First, you have to prove to the Commission that your company really is small. That is not as simple as it may sound. Its lawyers have written a precise definition for that, and created a series of forms you have to fill out to prove you meet the criteria. Time for each small company to fill out the form: Easily, hours and hours. Time for the Commission to read and process the forms: Easily hours and hours. In fact, handling these forms is the job of about 100 Commission staffers. And all this paperwork is just to prove you are legally eligible to apply for the grant; whether you get it is an entirely different review.

To ease this burden on both parties, and to expedite the process, the Parliament successfully amended the Commission's proposal so that previous records can now be used for the validation process. Participants from FP7 will not need to go through the validation procedure again, unless the entity's legal status has changed or, in the case of SMEs, a company no longer falls within the SME definition. Participants will need to sign a declaration to this effect.

Funding rates

The most politically sensitive aspect of the simplification process has been the Commission's proposal to replace FP7's many reimbursement rates with two flat-rates, one for research activities and one for innovative, close to market activities, "innovation actions", as they are now called. Regardless of the type of participant, a flat-rate would be assigned to cover indirect costs, such as infrastructure overheads. Many large research organisations with extensive overheads and expensive infrastructures said this proposal would leave them out of pocket.

Despite many countries endorsing full-cost reimbursement models in their national research systems, the national ministers at EU level approved the main elements of the Commission's proposal with some changes:

- The single flat-rate for indirect costs was maintained but increased to 25 per cent of direct costs for all participants in all activities.

- It introduced the possibility of a funding rate of 100 per cent of direct costs for non-profit legal entities in all activities, even those close to the market.

- A "bonus +" scheme was introduced whereby supplementary payments can be made to personnel of up to € 8,000 per person per year.

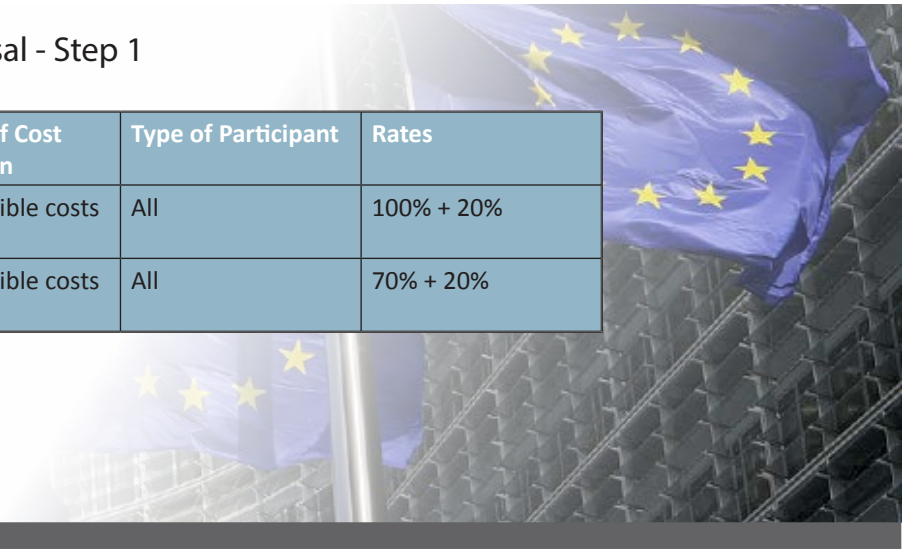
Complaints

But, while drafting the programme, there were many critics. To Christian Ehler, the MEP in charge of guiding the Rules of Participation through the Parliament, the Council's model was, "11.5 per cent more expensive and less cost-efficient than in the last Framework Programme." This would equal an additional cut of €8 billion and mean roughly 4,000 fewer projects, he said.

Ehler was adamant that the proposed flat-rate system represented more of a simplification for the Commission than for the participants. Instead, he proposed the reintroduction of an option for reimbursement of real indirect costs for all types of

The Commission's Proposal - Step 1

Type of Activity	Method of Cost Calculation	Type of Participant	Rates
Research and Development	Direct eligible costs + flat rate	All	100% + 20%
Innovation Actions	Direct eligible costs + flat rate	All	70% + 20%



Proposal by Christian Ehler MEP

Type of Activity	Method of Cost Calculation	Type of Participant	Rates
Research and Development Experimental Development	Direct eligible costs + flat rate	Universities/RTOs/SMEs --- Industry	100% + 20% --- 70% + 20%
	Full Costs	Universities/RTOs/SMEs --- Industry	70% --- 50%

The final agreement - Conclusion

Type of Activity	Method of Cost Calculation	Type of Participant	Rates
Research and Development	Direct eligible costs + flat rate	All	100% + 25%
Innovation Actions or co-funded	Direct eligible costs + flat rate	University/RTO SME/Industry	100% + 25% 70% + 25%

participants, based on their usual accounting practices. He wanted to see reimbursement rates that not only apply to the type of activity, but also by method of cost calculation (direct costs + flat-rate/ full costs) and type of participant (universities, research centres, others/ SMEs/ industry).

Negotiation

With a variety of opinions expressed, and a dogged determination on all sides to see their models accepted, this was a debate that threatened to delay the entire Horizon 2020 programme. As late as June 2013, Ehler threatened to take the legislation to a second reading, while the Council described its funding model as a "red line".

The budgetary strength of the national states prevailed, however, and the Council ultimately succeeded in passing the flat-rate system as well as the €8,000 "bonus +" option.

"The 25 per cent figure will not be enough for research institutes with large infrastructures", said Ehler. Universities with expensive facilities, for example ocean-going research vessels, as well as organisations such as Fraunhofer, would not see their costs covered under this system. In a move to address this problem, the Commission issued guidelines on how to transfer some indirect costs to direct costs for large infrastructures.

"However, these guidelines are no substitute for the missing full cost option," said Ehler. "The full-cost option will be the prevailing model for the future, because there is no other alternative".

At a meeting on 17 June 2013 between the interest group representing many of these large research organisations, EARTO, and representatives from the Commission, it was agreed that when a cost cannot be directly attributed to a Horizon 2020 project because of proven technical constraints, then an acceptable alternative would be the measurement of these costs by means of units of actual usage relevant for the project, supported by accurate technical specifications and actual data.

With the Rules of Participation explicitly foreseeing an interim evaluation of the funding levels, it remains to be seen whether research institutes with sophisticated infrastructures will really be left out of pocket from participating in EU programmes. ■

The time is right: renewed push to make the European Research Area a reality

It's been baking for 13 years but now there is a fresh effort to complete Europe's single market for research

The European Research Area (ERA) launched in 2000 with the goal of creating a single market in knowledge, to ensure the free circulation of researchers, ideas and technology across the EU.

But while some projects have met with success and continue to develop, for example the Marie Skłodowska-Curie actions and joint programming, progress in many other areas is patchy.

"We have identified the science infrastructures we need for the coming decades," said EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, in July 2012, "But have not necessarily put in place the funding to build them. Less than one per cent of national research funding is currently coordinated across borders."

"It is an idea whose time has now come," she said. "We must act quickly to turn it into a reality."

Creating the ERA was pinpointed as the main priority for Geoghegan-Quinn by Commission President José Manuel Barroso when she received her mandate in 2009. In February 2011 and again in March 2012, the European Council called for the completion of the ERA by 2014. It remains to be seen what progress can be made in this last year of the Commissioner's term.

Plan of Action for 2014

On 17 July 2012, the Commission set out five main goals:

1. More effective national research systems – including increased competition within national borders and sustained or greater investment in research

2. Optimal transnational co-operation and competition – removing the technical barriers which prevent joint actions from getting off the ground, raising quality through Europe-wide open competition, and constructing and effectively running key research infrastructures on a pan-European basis;

3. An open labour market for researchers – removing barriers to researcher mobility, training and careers by making research grants and pensions portable across borders and ensuring that recruitment to academic positions is fair, transparent and merit-based;

4. Gender equality and gender mainstreaming in research – to put an end to the scandalous waste of female talent, to diversify views and approaches in research and to foster excellence;

5. Broader and faster access to scientific papers and data, including realising the digital ERA to guarantee access to and uptake of knowledge by all.

Five key organisations signed a memorandum of understanding with the Commission on the same day, agreeing to work in partnership towards the 2014 deadline. These organisations: the European University Association, the European Association of Research and Technology Organisations, the League of European Research Universities, Nordforsk, and Science Europe, committed to improving coordination between EU research institutions and working towards harmonising Europe's research policy.

A new monitoring system will also make it much easier for the Commission to track progress in the five action areas, with Geoghegan-Quinn saying "I will not hesitate to 'name and shame' Member States which fall behind."

Regional policy will also play its part, with the introduction of Smart Specialisation Strategies (SSS). In order to secure structural fund investment in research and innovation from 2014-2020, national and regional authorities will need to draw up an SSS, identifying the unique characteristics and competitive advantages of their region. It is hoped that this targeted approach will result in more effective investments in developing regions and in greater co-ordination between structural funds and research programmes at national and EU level.

Horizon 2020 and the ERA

Commission estimates suggest that the ERA and Horizon 2020 will together give rise to an extra one per cent of growth and almost one million more jobs per year by 2030.

When it called for the ERA to be completed by 2014 the Council placed a particular emphasis on increasing researcher collaboration and mobility within Europe, and the attractiveness of Europe for foreign researchers.

Several obstacles stand in the way of a genuine European

research labour market, including inequalities in salaries, pensions and benefits across the EU; non-transparent recruitment processes; and the lack of recognition of academic diplomas.

Under Horizon 2020, the Marie Skłodowska-Curie actions will get a significant increase to €6.16 billion (eight per cent of the budget), and will see the introduction of grants to attract researchers currently working outside of Europe to return, and to support researchers already working in Europe who want to move to a region with a less-developed science infrastructure.

In order to attract world-class researchers, world-class facilities and research infrastructures and facilities are necessary. Under Pillar One – Excellent Science – Horizon 2020 will dedicate €2.49 billion to plans to ensure that all researchers in Europe have access to high quality research infrastructures, including e-infrastructures; to foster the innovation potential of research infrastructures; and to promote greater cooperation within Europe and internationally.

Boosting competitiveness

The crux of the ERA is to strengthen the scientific and technological base of Europe and to increase its competiveness and ability to tackle society's major challenges. In order to do this, synergies between national and international programmes need to be exploited, to make the best use of national and EU funds. While progress has been made, the level of alignment is presently too low to make a serious impression on big and complex challenges. This is due in part to differences between national funding rules and selection processes, but it is also a question of political will.

Horizon 2020 will build on the work done so far through a number of public-public partnerships with national governments, focusing on new treatments for poverty-related diseases, measurement technologies for industry, support for high-tech SMEs and assisted living products and services to help the elderly and disabled to live safely in their homes. The underlying logic is that these are areas where there is not sufficient incentive for industry to invest, but which would deliver significant benefits.

In spite of national and EU-level strategies on gender equality, European research still suffers from a considerable loss and inefficient use of highly skilled women. As far back as 2005, the Council set a modest goal for women to be in 25 per cent of leading public sector research positions, but according to the European Union's latest analysis, 'She Figures: Gender in Research and Innovation 2012', woman comprise only 20 per cent of senior academics in Europe's universities. For the first time in a European research programme, the aim to promote gender equality is explicitly set out in Horizon 2020. "Gender experts will be involved in the programming of research," said Geoghegan Quinn, and, "We will highlight projects that involve a gender dimension, monitor gender-balance within research teams and run pilots in relevant areas."

Open access to publicly-funded research

In an attempt to secure greater access to, and return from, publicly-funded research, and to break down barriers in the exchange of information across the ERA, all articles produced with funding from Horizon 2020 will have to be made accessible to the public. This can be in the form of "Gold access", where the publication is made available immediately online, or "Green access" where papers are made available through an open access repository, no longer than six months (12 months for social sciences and humanities) after first publication. The Commission has also recommended that EU member states adopt a similar approach in their nationally-funded research.

The new rules for Horizon 2020 comes amidst increasing clamour for open access to research papers from public R&D funding organisations worldwide. In February 2013, US President Barack Obama directed federal agencies with more than $100 million in R&D funding to develop plans to make the results of federally funded research freely available to the public within one year of publication – and at the same time to require researchers to better account for and manage their data.

The UK government has led the way here, and from 1st April 2013 all research funded through the country's research councils must be made freely and openly available, to anyone around the world.

A recent study funded by the Commission suggests that open access is reaching the tipping point, with around 50 per cent of scientific papers published in 2011 now available for free. This is about twice the level estimated in previous studies, explained by a refined methodology and a wider definition of open access. The study, which looked at publications in the ERA as well as Brazil, Canada, Japan and the US, also estimates that more than 40 per cent of scientific peer-reviewed articles published worldwide between 2004 and 2011 are now available online in open access form.

Access to underlying data is also opening up. Under Horizon 2020, the Commission will also start a pilot on open access to data collected in the course of completing publicly-funded research, taking into account legitimate concerns related to the grantee's commercial interests, privacy and security. ■

Greater Expectations: EIT gets a bigger budget

Europe is betting big on the European Institute for Innovation and Technology

Androulla Vassiliou, EU Commissioner for Education, Culture, Multilingualism, Sport, Media and Youth

One of the biggest percentage increases in funding under Horizon 2020 goes to the European Institute of Innovation and Technology (EIT). It is a uniquely European idea: Turn networking between companies and universities into a series of cross-border projects, to spark new products and jobs, train new entrepreneurs and start to improve the European culture for innovation.

It began in 2008 as a €309 million experiment, at the behest of European Commission President José Manuel Barroso. The difficulties of establishing the first three KICs were "underestimated by all parties," according to a Commission report to the European Parliament and Council in which there was a call for "clearer guidance" for future KICs; more coordination and cross-fertilisation among the KICs; regular evaluation of the KICs' progress; and a true EIT corporate identity around a set of shared values.

Since then, most of the recommendations have been adopted and the EIT has garnered broader support to get more than €2.7 billion under Horizon 2020. At present, a small staff at the headquarters in Budapest supports three clusters of partners across Europe known as Knowledge and Innovation Communities (KICs), specialising in climate change, energy, and information and communications technology (ICT).

To date, according to the EIT, it has brought together 352 partners across disciplines and countries – including ABB, Vattenfall, Imperial College London, Telecom Italia, Gas Natural Fenosa, Intel and SAP. It says that, starting with grants of €167.4 million from 2010 to 2012, the three KICs were able to raise additional resources from partners for a total budget of €777.4 million. With the money and partners, the agency has begun training a new crop of young entrepreneurs, often with an EIT brand on their masters' and PhD degrees. It counts more than 90 new services and products in 108 start-ups.

On 17 January 2014 the EIT published details of its next expansion step: The formation of two new KICs:

- Innovation for healthy living and active ageing
- Raw materials: sustainable exploration, extraction, processing, recycling and substitution

Details are at the EIT web site: http://eit.europa.eu/

(Note to Readers: Science|Business is a contractor to the EIT). ■

CHAPTER FOUR

Viewpoints

What the Parliament says

Breakthroughs in Horizon 2020 are a bigger role for SMEs and simplification for all. But securing the benefits hangs on implementation. Parliament must track whether SMEs really do find it easier to get funding, MEPs said in a Science|Business webcast

MEPs James Elles, Maria da Graça Carvalho; Science|Business CEO Richard L. Hudson; and MEP Christian Ehler, at 12 November 2013 conference in the European Parliament

Andrew Duff, MEP

Labyrinthine procedures for obtaining EU research and innovation grants have long disadvantaged most small companies, which can't afford the time or resources to apply.

Horizon 2020, the EU's new seven-year €79 billion research and innovation programme, aims to change that by simplifying the rules for small companies so many more get involved.

That should make public spending on innovation much more effective, according to three MEPs who have been pivotal in steering through the Horizon 2020 legislation. They spoke at a Webcast conference from the European Parliament, organised by Science|Business, ahead of a final vote on the programme on 21 November.

"I'm happy about a lot of things… but if I had to choose one thing, it's simplification of the rules," said Maria da Graca Carvalho, MEP, a rapporteur on the industry, research and energy committee. "I provided 70 measures where government should simplify the rules and 95 per cent of them are included in the new programme."

Previous efforts to get more SMEs involved in large European research projects through quotas failed, because small companies were forced to join large consortia, marginalising their input. The new Horizon 2020 programme includes a pilot scheme with a fast-track provision for SMEs and new participants that create smaller consortia with specific research goals.

Under the new Horizon 2020 rules, the Commission will run permanently open calls for this scheme, with three or four cut-off points every year, and will be required to give applicants a funding response within six months.

Also, for the first time, individual SMEs will be eligible to apply for funding on their own, without any partners, either academic or industrial.

Implementation is critical

"That will boost innovation. It's not top down; it's bottom up," said Christian Ehler, MEP, who acted as rapporteur on the rules for the participation in and dissemination of

Interested in evaluating proposals from some of Europe's best researchers?

The European Commission is looking for independent experts from research and academia, as well as from business and commercial communities to evaluate the 40,000 proposals expected every year for Horizon 2020.

"We need the very best experts from research, industry and elsewhere to make sure that only the very best and most innovative projects are funded," said EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn.

The call is open to people of any nationality with expertise in relevant fields. Interested candidates can apply online at the Horizon 2020 participant portal: http://ec.europa.eu/programmes/horizon2020/

Independent experts registered under the Seventh Framework Programme are invited to update their area of expertise in line with the new set of Horizon 2020 specialist fields.

Horizon 2020. The allocation of funds simply has to go faster. "We are in a competitive environment: in Asia and the US, allocation is simply faster," Ehler said.
James Elles, MEP, agreed that simplification is essential, but said the real test will come in the implementation of the new Horizon 2020 rules. Small businesses were "excoriating" in their critique of Framework Programme 7, the current R&D programme, highlighting how, despite Commission rhetoric, procedures were not simplified in the past. In some cases the impact of the bureaucracy was "horrifying," Elles said.

According to Elles, one SME that applied and received EU funding, "got something slightly wrong in the paperwork and had to hand back the money, which bankrupted the company." Given examples like this, "We need to make sure the provisions are going to result in much simplified procedures – and we want to be sure European SMEs are not deterred or pushed to other parts of the globe," said Elles.

Carvalho agreed, noting the Parliament will need to track whether SMEs are indeed finding it easier to apply for EU funding. "With simplification you need to follow up because bureaucracy grows – it never diminishes – especially with public organisations. Someone has to keep controlling the simplification process because otherwise things tend to get too complex," she said.

Budget disappoints

To the MEPs, the big disappointment of Horizon 2020 was the overall size of the research and innovation budget, which was cut from €80 billion (in constant 2011 prices) down to €70 billion (constant, adjusted for inflation to €79 billion). The European Parliament had argued vehemently that the budget should be increased to €100 million (constant), as research and innovation are key drivers of economic growth, and an investment in Europe's future.

"We messed up," said Ehler, noting that EU leaders all agreed to spend three per cent of GDP on R&D by 2020 and then simply failed to deliver the spending in Horizon 2020. Instead, the EU will spend roughly two per cent, well below the level of R&D spending in the world's most innovative countries. "And it's not just us messing it up, but the private sector not investing sufficiently in R&D," he added.

On the plus side, Horizon 2020 created a bridge between structural funds and R&D, allowing a proportion of structural funds to be allocated for R&D. "But in practical terms, we would have needed another €100 billion in R&D investment over seven years to get close to the goal of spending three per cent of GDP," Ehler said.

The question of whether EU member state governments will make any attempt to reach this figure hangs on EU election campaigns next year, Elles believes. If a number of MEPs take up the global research and innovation challenge as a major priority, it's possible. Elles argued that Europe is not moving fast enough to build out vital digital infrastructures such as 4G mobile networks needed to compete with Asia.

"How will we be competitive in a global system; how will we be competitive with our social model – this is the debate we should be having when we move into elections," Elles said. "A new Commission has to come up with new priorities. I would like to see this as priority of next Commissioners." ■

Money, money, money: Europe has the science but lacks venture financing to create technology champions

Debt instruments won't work. To leverage Europe's excellent science, the EU should back a 'fund of funds' to take equity in research-based spinouts, says Cambridge VC and entrepreneur Hermann Hauser in the inaugural Science|Business lecture

Physicist-turned-entrepreneur Hermann Hauser has no doubts about the entrepreneurial potential of Europe. He's dug deep into his own pockets over the past 20 years to fund more than 100 European start-ups. But to survive and grow fast, young technology companies need large pools of capital - and smart management. And both are lacking in Europe.

Giving the first annual Science|Business lecture in the European Parliament on 12 November, hosted by MEP Andrew Duff, Hauser argued that Europe has failed to tap equity as the most effective financing tool to grow its innovative small and medium-sized companies.

"The EU has €2.7 billion earmarked for financial support for SMEs in the Horizon 2020 research programme. That support is useless as debt," Hauser said. "Normally companies who innovate have no assets - hence they can't take debt. The right way to do it – there is a market mechanism – is fund-of-funds, which then channels the capital to successful venture capital teams in different sectors."

Such fund-of-funds are one of the key drivers of the vibrant US venture community. Each holds a portfolio of equity investments in other venture funds, rather than investing directly. "The EU continues to lack this kind of approach," Hauser said. "If Europe invested half billion euros into equity [in technology spin-outs] through a fund-of-funds, it would have a real multiplier effect. Probably 75 per cent of the total capital would be [matched] by the market. That gives you 3-to-4 times leverage of the capital invested."

Hauser said the creation of an EU fund-of-funds is, "the single most important thing that needs to be decided on [in] Horizon 2020." Anyone who knows how financing works knows the only way to finance innovation is equity. "At least €1 billion in EU funding should go into equity," he said.

Need for VC diversity

The EU currently channels significant venture funding directly to SMEs through the European Investment Fund (EIF). However, Hauser said this is undercutting private venture capital players. "The EIF has become so dominant they invest 60 per cent of the total VC – so there is no diversity – there is no competition. They have become a gorilla," he said.

Hermann Hauser, Partner, Amadeus Capital Partners

The dramatic collapse of Europe's venture capital community in the wake of the financial crisis underlines the need for a new approach. In 2000 there were some 400 venture capital companies actively investing across Europe. Years of negative returns have now shrunk the number of VCs with money to invest to about 40, Hauser noted.

VCs that survived the shakeout are particularly skilled at ferreting out promising technologies and supporting their investee companies with management expertise. Such expertise is decisive, Hauser said, noting that only one company of the 100 or more he backed failed because the technology didn't work. The rest flopped mostly as a result of management issues.

"There is no silver bullet to creating high-tech companies. There are different approaches that work in different sectors," said Hauser. As the author of a recent report on

innovation for the UK government, he canvassed start-up hotspots in Korea, Japan, Germany, Holland and the US. "The way Rolls Royce works is not a template that works for pharmaceutical, energy or Internet companies," he said. "Each sector needs different expertise and different ways of getting innovation to the market."

Developing vibrant ecosystems

Hauser said his experience of investing in start-ups does not make him smarter, but gives him "more data" about what works and what doesn't. One conclusion he draws is that innovation happens in clusters of universities and companies that have world-class expertise.

Cutting-edge science is vital to developing vibrant start-up ecosystems in Europe, he believes. "It's not a matter of filling in holes; it's a matter of building on mountains. If a centre is not leading it has no chance of competing on global scale," Hauser told the audience, which included MEPs, Commission officials, university administrators and innovation experts.

Building on the findings in Hauser's report, the UK government is in the process of setting up seven Catapult centres, modelled on Germany's Fraunhofer centres, each with a brief to provide the resources and support that SMEs need to translate specific research programmes to the market.

Getting innovation right in Europe

The stakes are high when it comes to getting innovation right in Europe, Hauser said. "It's clear this has become a race – a race between nations… Those that are well-organised translate [research] quickly into companies. We have no option but to participate in this race and organise our affairs to do this efficiently," he said.

"Innovation is the single most important subject for support in Europe," Hauser said. But the support needs to be selective, "Only do it in clusters of expertise where we can build world-class companies."

As an example, his home turf in Cambridge is benefitting from three entrepreneurship-friendly policies implemented by the UK government to help innovation clusters. First, in common with governments elsewhere in Europe, the UK introduced R&D tax credits. "If companies spend a lot on R&D you get back in tax credits (cash) what you spend," said Hauser. "My companies live on this cash for an entire quarter."

Second, the UK government allowed institutional investors such as pension funds to put a small portion of their capital in risky investments. "When they work, they deliver higher returns," Hauser said. "Pension funds in the UK were not allowed to invest in risky investments. They now can." Third, there has been a change to the way options in tech companies are taxed, reducing the tax rate from 60 per cent to 10 per cent.

Put the contribution of small companies into context

In aggregate, 1,500 Cambridge spin-outs now generate revenues of £13 billion. This outstrips the £12 billion annual turnover of one the UK's leading manufacturing companies, Rolls Royce. The spin-outs also employ more people and export more than Rolls Royce. "You need to see it in that context. Governments always see the needs of large companies as more pressing than small ones," Hauser said.

In that light, the EU's long-standing budget priority for agriculture is particularly incomprehensible. "If ever there was a political scandal of looking backwards instead of forwards it's … EU spending on agriculture." Despite commanding such a huge chunk of the EU budget, it represents only 1.6 % of total EU employment.

Rather than subsidising farmers, innovation is the answer to Europe's unemployment dilemma, Hauser argued. "Small companies create jobs. Big companies create wealth. But they do not create jobs at the same rate as small companies."

Management expertise is essential

The UK chip design company ARM, which Hauser co-founded in 1990, became the first UK technology spin-out to reach £1 billion in revenues and sold 10 billion of its microprocessors this year. These processors power 95 per cent of smartphones on the market currently.

Of the many lessons he learned along the way, Hauser said providing spin-outs with management expertise is absolutely essential to creating technology champions. His first company, Acorn Computer, which went from zero to £100 million pounds in five years, stumbled when it came to going global. "I never knew anything about stock control, I'm a physicist," Hauser said. Errors in managing growth and logistics led to serious financial difficulties. "We were very successful in the UK, but it was a global game."

On a positive note, Hauser noted that the growth of global markets now gives Europe a better shot at producing its own crop of technology winners. In the past, the US dominated technology sectors because buyers tended to assume the best products were produced in America. Now people no longer care where the products and services come from. Witness Skype, a disruptive Estonian start-up that has transformed voice communication on the Internet.

"The EU always had spectacular strength in technology and expertise. We have enough start-ups now. The problem is that we don't grow them fast enough," Hauser concluded. ■

Life Scientific: Horizon 2020 is a policy instrument. Where does this leave the scientists?

Researchers can still operate by the rules and norms of science, but under Horizon 2020 they have – with the exception of the ERC - no autonomy to decide what science they do and how the results are applied, says Professor Karl Ulrich Mayer, President of the Leibniz Association

"Maybe, the ability of science to define and impose its own norms and criteria for truth, objectivity and methodological rules is not in danger. But autonomy in regard to the selection of research questions, topics and the usage of research results is clearly at risk."

These sobering remarks come at the climax of a provocative assessment of the general state of European scientific research, and the impact of the Horizon 2020 programme in particular, by Professor Karl Ulrich Mayer.

Mayer, distinguished sociologist and president of the Leibniz Association, used the Max Weber Programme lecture series to test contemporary science against cultural theory proffered by Weber, the father of modern social science.

Mayer's paper, "From Max Weber's "Science as a Vocation (1917) to "Horizon 2020", contrasts current debates on basic versus applied research in European science policy with Weber's own lecture to the German Association of Free Students in November 1917. Mayer sees this as the seminal description of research motivation and the practicalities of an academic career and the life scientific.

Inevitably, after nearly 100 years some of Weber's messages are "outmoded and outdated". Cultural and historical contexts have shifted, but Mayer believes Weber is a useful prism through which to view the institutional tensions of contemporary German science – and of Horizon 2020.

Karl Ulrich Mayer, President, Leibniz Association

Shifting direction of EU research policy

The shaping and formulation of Horizon 2020 reflects the fact that, "In a sense, the overall direction of EU research policy has shifted from economic industrial interests to policy interests in relation to EU policy goals, and from there to research in the public interest. Put differently, the enlarged scope of the research programmes reflects the increased ambitions of the European Union."

In passing Mayer mocks the three "reinforcing priorities" of the Horizon 2020 programme, "dedicated" as they are to Excellent Science, Industrial Leadership and Societal Challenges. Does this imply, he asks, that research for Industrial Leadership and Societal Challenges is "not excellent science"?

The implicit theory is that, "the research funding spent on calls in these areas will actually bring about progress in achieving these policy objectives. So far, however, there is little evidence that this is actually the case, and almost no money is spent in the current and prior Framework Programme to find evidence for this," Mayer says.

"If one actually examines the work programmes in the 7th Framework Programme, it seems that in the physical and life sciences investigators have been more successful in making sure that research can be conducted according to the state of the art. However, in social science, the topic with which I am most familiar, few opportunities seem to be provided within the calls to develop theories, databases and methods or to allow the time frames for those involved which would permit doing first-rate research," Mayer says.

Weber set out six precepts for "Science as a Vocation"; Mayer goes one better, and it is in the seven critiques he offers that the most pointed reservations about the progress of Horizon 2020 are made.

The Seven Critiques of Horizon 2020

1. The rhetoric of fairly general values and of a multitude of policy goals can be found in great abundance in the relevant documents – page after page after page. Whoever writes proposals in these areas has to identify with, or at least pay lip service to these values and goals.

2. Only very rarely are value and goal conflicts addressed, such as that between social innovation and social inclusion – which is suspicious.

3. There seem to be large discrepancies between what is necessary to achieve certain scientific goals and the durations, forms of organisation and level of funding.

4. Secondary rationality is common, in the sense that researchers adopt the goals of the calls to get hold of a part of the cake.

5. EU science has moved from research funding on behalf of economic interests, to research funding in the EU policy interest and now also funding in the public interest.

6. The emergence of the European research area gives ample evidence of how large and important the science subsystem has become in Europe in comparison to other social subsystems and European policy areas.

7. Europe is becoming increasingly important as our research funding environment. The EU increasingly wants to coordinate and structure not only its own research budget, but national research budgets too.

Ultimately, says Mayer, "The EU science effort obviously suffers from an overload of values, goals and policies. Because of this, it also suffers from an underdeveloped sober clarification of means-ends relationships. What does it take to do industrial research successfully? What does it take to do policy-related research successfully, and what does it take to conduct science in the public interest?

"Too much of the European research effort is organised under one umbrella, with too many non-specific rules and too much administrative burden. This umbrella is too close to the political level of decision-making. What we need are institutional designs for European research funding which allow for three things: first, clarity of purpose; second, protection from direct political influence; and third, an institutional commitment to the values of science." ■

The Leibniz Association, based in Berlin, represents 86 independent research institutions throughout Germany that range in focus from the natural, engineering and environmental sciences via economics, and social sciences to the humanities. Leibniz Institutes address issues of social, economic and ecological relevance. They conduct knowledge-driven and applied basic research and provide scientific infrastructures.

Legislation is needed to bring ERA to the next level

It's time for an end to the softly-softly approach: new laws are needed to force through the formation of the European Research Area, say MEPs

MEPs Luigi Berlinguer, former Italian science minister, and Amalia Sartori, Chair of the Parliament's research committee, have called on the EU to introduce laws to speed up progress on the single market for research, the European Research Area (ERA). This follows a recent progress report showing that more than a decade after the initiative's launch, R&D in Europe continues to be underfunded and fragmented, with significant barriers to collaboration.

While the Commission has said it favours a solely political approach to reinvigorating the creation of ERA, the two MEPs say this softly-softly approach – based on encouraging member states to reform their structures on a voluntary basis – has not worked. The fact that the most prominent obstacles facing research collaboration in Europe have not changed since the initiative began in 2000, shows, "A new ERA framework is needed," Berlinguer and Sartori say.

In their manifesto, A Maastricht for Research , the two call for new laws, saying, "The most far-sighted and courageous approach should take the form of directives and, in the long run, of a constitutional commitment."

When she spoke on the issue to MEPs during the October plenary session of the European Parliament, Máire Geoghegan-Quinn, Commissioner for Research and Innovation, did not rule out the possibility of legislation, saying, "All options are on the table." Following this, the meeting of European Heads of State in Brussels last week said there is a need to "accelerate structural reforms" and to "strengthen progress monitoring" of the initiative. The EU leaders emphasised the need to improve the mobility and career prospects of researchers, but stopped short of commenting on concrete deadlines or legislative measures.

Whatever the sentiment currently, ERA will have to wait sometime before there is any major overhaul - as the decision on whether or not to enact legislation will fall to the new Commission and Parliament after the elections next year.

The MEPs' Maastricht Research manifesto, named after the 1992 treaty which granted freedom of movement of goods, capital, people, and services in Europe, lists five main obstacles that stand in the way of creating the "fifth freedom"— the free circulation of knowledge.

1. Low levels of investment and human resources

The level of investment in R&D in the EU pales in comparison to our international competitors, says the manifesto. In 2010, investment in Japan rose to 3.39 per cent of GDP, whereas spending in the US remained at 2.68 per cent. By comparison, Europe managed to spend only two per cent. This trend is also confirmed by human capital, with 2007 figures showing that over 40 per cent of the world's researchers are based in Asia, compared to 28 per cent in Europe.

Máire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science and Amalia Sartori, MEP

2. Fragmentation and lack of co-ordination

Unlike its competitors – the US, Japan, Brazil, China – research policy in Europe is coordinated not by one single centre, but by 28 national centres and the European Commission. "The complexity of too many financial schemes, conflicting systems, and administrative burdens weakens and sometimes prevents the process of development and circulation of knowledge in Europe," say Berlinguer and Sartori.

Reinforcing their recommendation for legal action, the MEPs cite a "lack of a long-term political commitment" as the major difficulty facing transnationally coordinated research.

3. Knowledge application

The manifesto highlights the importance of adopting a strategic approach for the sharing of research outputs, especially at a time where public funding for R&D increasingly needs to be justified.

To this end, cooperation between universities, public research organisations and industry is essential. Public-private partnerships, "the engine for an innovative and socially cohesive society," should be developed and increased, the MEPs suggest.

4. Research infrastructures

Europe needs to develop a better synergy between national and EU public research funds, as well as structural funds, in order to ensure optimal operation and exploitation of existing structures and to develop new, sustainable pan-European infrastructures. Strategic research infrastructures will serve European researchers and attract the best international researchers.

5. Research careers and mobility

Full freedom of movement for researchers is the cornerstone of the ERA, yet many obstacles stand in its way. Greater "portability of national grants, coordinated systems of social security, transparent publication of competitions, implementation of the Charter and Code of Conduct for researchers", would enable the next generation of researchers to enjoy true freedom of movement, say Berlinguer and Sartori.

The manifesto supports the widespread adoption of transnational doctoral programmes, such as the Marie Skodowska-Curie Actions, with the aim of creating "a new generation of European researchers." Such programmes should place a particular focus on interdisciplinary and industrial doctoral programmes, which incentivise stable and balanced relations between academia and industry, and endow researchers with relevant skill-sets. ■

‘A lot riding on’ Britain staying in the EU – scientifically speaking

MEP Andrew Duff argues that it would be a disaster for science – in both the UK and Europe – if Britain left the EU

With Britain debating whether to leave the European Union, one UK Member of the European Parliament says the argument isn’t just about trade and money – it’s also about science and innovation.

Andrew Duff, a prominent Europhile from the UK region that includes Cambridge University, says the future of UK science and innovation is dependent on Britain staying in the EU – and, conversely, the rest of Europe needs the UK to make EU science stronger.

“There’s an awful lot riding on us staying in the EU,” said Duff in an interview with Science|Business.

With a Conservative-led coalition government in power – elements of which have been hankering for a fight over Europe since the fall of former Prime Minister Margaret Thatcher – Britain’s position in the EU has come under scrutiny.

Duff, a long-time supporter of the UK in Europe, thinks Britain leaving the EU would “be a disaster” and would represent a substantial body blow for research and innovation within Britain.

However, Duff not only feels it would be bad for research and innovation in the UK if Britain left the EU, but it would also constitute a serious loss for the rest of Europe. The relative strength of the UK science base and its expertise in technology transfer and commercialisation means it has best practice to offer other EU researchers, especially in newer member states with less developed science and innovation infrastructures.

A Liberal Democrat MEP for Eastern England, Duff cited Cambridge University as a role model, with its high academic standards, world-leading science, and reputation for forming spin out companies. The city of Cambridge is also one of the longest-established high tech clusters in Europe, and remains among the strongest in both information technology and biotechnology.

Andrew Duff, MEP

A wider scholastic community

EU research funding is extremely important for the UK, and by the end of the 2007-2013 Framework Programme 7 the UK will have received around €7.5 billion in funding. Its importance is highlighted clearly at Cambridge, with estimates indicating that 20 per cent of the work undertaken by its researchers is funded by EU grants.

Whilst there have been arguments about the large amount of funding Cambridge receives from EU grants, Duff argues that the desire to remain within the EU isn’t simply about “grant grubbing”.

Instead he suggests it concerns the “cultural membership of a wider scholastic community – dating back to the Renaissance.” He sees this as a framework to grow global connections and a key reason why Britain should stay in the EU.

As well as having a new postgraduate school of public policy which is to open in October, Cambridge has been host to high profile guests such as Jose Manuel Barroso and Neelie Kroes, president and vice president of the European Commission – an example of the on-going, positive dialogue between Brussels and Cambridge and something, according to Duff, you “can’t put a price on”.

Duff is also keen to see the proposed EU/US trade agreement completed, saying it will be a boost to the world economy and create a transatlantic area of science and innovation. He predicts a protracted negotiation, but also feels the impact on services and sciences will be profound.

Whilst he’s strongly pro-European, Duff is also very aware of EU failings and is keen to update and modernise EU structures. He cites “a waste of money, duplication, and the poor quality of a lot of scientific research” within Europe as having stemmed from insufficient integration. A mutual recognition of qualifications, alongside a more meritocratic and streamlined system, is essential in helping the calibre of science within Europe across the board, Duff believes.

Britain maintaining its EU membership is vital if the integration Duff wants is to be achieved. “We need to be more permissive, to encourage scholastic exchange and immigration. To close the borders as some of my Tory colleagues seem to wish to do would be a great mistake – and I hope we’re not going to permit them to do that.” ■

Parliament got everything on its wish-list, except for the money

Defeated in the budget and costing stakes, MEPs Christian Ehler and Maria da Graça Carvalho remain hopeful that a bottom-up approach and support for SMEs can open up Europe's latest R&D programme to new participants

"The negotiations were very long", said Maria da Graça Carvalho MEP, Rapporteur for Horizon 2020, reflecting on the eleventh hour agreement on Horizon 2020, the European Union's next big R&D programme, due to run from 2014 - 2020. "There was a lack of communication at first, which meant that the Council did not fully understand the benefits of our proposals. They realised in the end that our proposal was very good for science and research," she told Science|Business.

While a €70 billion budget (in constant, 2011 figures) for Horizon 2020 appears to be a significant increase from the €55 billion budget for the current Seventh Framework Programme, it includes the budget for the European Institute of Technology and part of the Competitiveness and Innovation Framework Programme. "Put inflation on top of that, and research and innovation has been the victim [of cuts to the overall budget]", said Christian Ehler MEP.

Fast track to innovation

While the €70 billion final ticket is a long way short of the demands from some MEPs for €100 billion, there was consolation that some of Parliament's proposals squeezed into the programme. The Fast-track to Innovation scheme, introduced to the Horizon 2020 package by Ehler is a case in point. The scheme, a response to "pleas from industry and research communities," will establish a permanently open call for proposals. "This will suit small consortiums with innovative projects and uncomplicated budgets," said Ehler. Proposals may relate to any technology field under the industrial leadership and social challenges streams of Horizon 2020.
Ehler believes this instrument may help break the policy inertia in Brussels. As an example of this, Ehler pointed out that although national heads of government decided that the EU should pursue the green car initiative in 2008, it took the Commission two years to set up calls. Under the Fast Track scheme, industry and academe need no longer wait for the Commission to open a call, but instead can suggest an idea.

The hope is that this bottom-up approach, combined with a reduced time-to-grant of six months, will increase industry participation in Horizon 2020.

Time to grant

The Parliament also succeeded in getting the general time–to-grant cut to eight months. "Throughout the Seventh Framework Programme, the average time taken was a year," said Ehler. "If we want to compete with China and elsewhere, we need to be faster. The worldwide benchmark for time-to-grant in similar programmes is much less than a year."
The European Research Council and other programmes will be given the flexibility to exceed time limits where participants request more time for negotiations. Overall, the "Rules are much simpler and faster than under Framework Programme 7," said Carvalho.

Supporting SMEs

Ehler is also pleased that the Parliament's argument for more help for SMEs has translated through to the final agreement. Previous research programmes were not designed to suit SMEs. "Until now the EU has made artificial attempts to include SMEs in programmes through quotas," Ehler said, but in reality the likelihood of SMEs getting any money has been low, with the cost and time involved in submitting an application eating into their resources.
Agreeing a dedicated SME instrument, "was one of the Parliament's biggest achievements in the negotiations", said Ehler. The dedicated budget should ensure there a twenty per cent participation of SMEs in the programme, without having SME quotas in calls.
Innovation will also be supported through the inclusion of innovation vouchers for young scientists, noted Carvalho. "SMEs will be able to use these vouchers to work individually with one or more researchers," she said.

Reaching more regions

In addition, it is hoped that Horizon 2020 can also reach more regions than before. A separate budget line will include programmes such as twinning and teaming of research institutions. "All of my points are included in the package," said Carvalho. This include grants for excellent researchers working outside of Europe who want to return, or those working within the EU who want to move to less-developed regions. But in terms of hard cash, Parliament's sole achievement is linking Horizon 2020 to the cohesion policy. A clear-cut definition linking Horizon 2020 with smart specialisation strategies and investments under the structural funds was endorsed. "Certain regional funds will be ear-marked for research and development but it will also be possible to [combine] money from both sources. That could have a leveraging effect on the Horizon 2020 budget," Ehler said. ■

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