



European
Commission



Horizon 2020: boosting industrial competitiveness

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Foreword

The EU is a major player in international science and technology production, and a clear leader in many areas such as transport, renewable energy and environment. EU Member States also account for a substantial part of global expenditure on research and innovation, high impact publications and patent applications.

However, the EU is facing increased global competition in research and technology production, and we need to do better in translating our innovative ideas into successful new products and technologies.

Restoring growth and prosperity in Europe requires a stronger focus on industrial competitiveness based on advanced technological products and processes across the global value chain. This requires a concerted effort by all stakeholders to get the maximum value out of public and private money invested for this purpose.

Horizon 2020, our new Research Framework programme, is the EU's flagship financing programme to strengthen Europe's innovation leadership, by fostering excellence in research and the development of highly innovative technologies. Almost 80 billion Euros will be invested in the period 2014-2020 in R&I projects. This will help the EU to compete in the supply of new, highly developed and manufactured EU products and services on the international market. This comes on top of the funding available under the European Structural and Investment Funds, which should be used to modernise research and innovation capacities at national and regional level.

The philosophy and governance of the Horizon 2020 have also been radically modernised. Public-private partnerships, in which industrial stakeholder participate in the setting of priorities for research and contribute to the support programmes, are at the core of the approach. In the industry-led Joint Technology Initiatives for aviation, new medicines, energy storage, electronics and bio-technology, industry investments are expected to be more than 1.5 times the EU budget contribution of 6.2 billion Euros. Horizon 2020 is already the biggest single instrument in Europe to support the development of key enabling technologies such as nano-electronics or photonics, fostering their application in the products and services of the future.

Horizon 2020 will make a vital contribution in supporting innovative SMEs at all stages of the innovation cycle, from lab to market. As SMEs provide two out of every three private sector jobs and contribute to over half the total value-added by EU businesses, it is of the crucial importance that the innovative potential of these businesses is fully realised. With the EU helping to fill funding gaps for pioneering research and innovation and to bring new products to the market, our SMEs can become true innovation leaders worldwide.

With Horizon 2020, the Union has committed itself to an ambitious programme for R&I in Europe. Let's now work together at all levels to ensure that Horizon 2020 mobilises the maximum potential across the Union, engaging entrepreneurs and researchers to help us achieve sustainable growth and industrial competitiveness based upon scientific excellence and vibrant innovation.

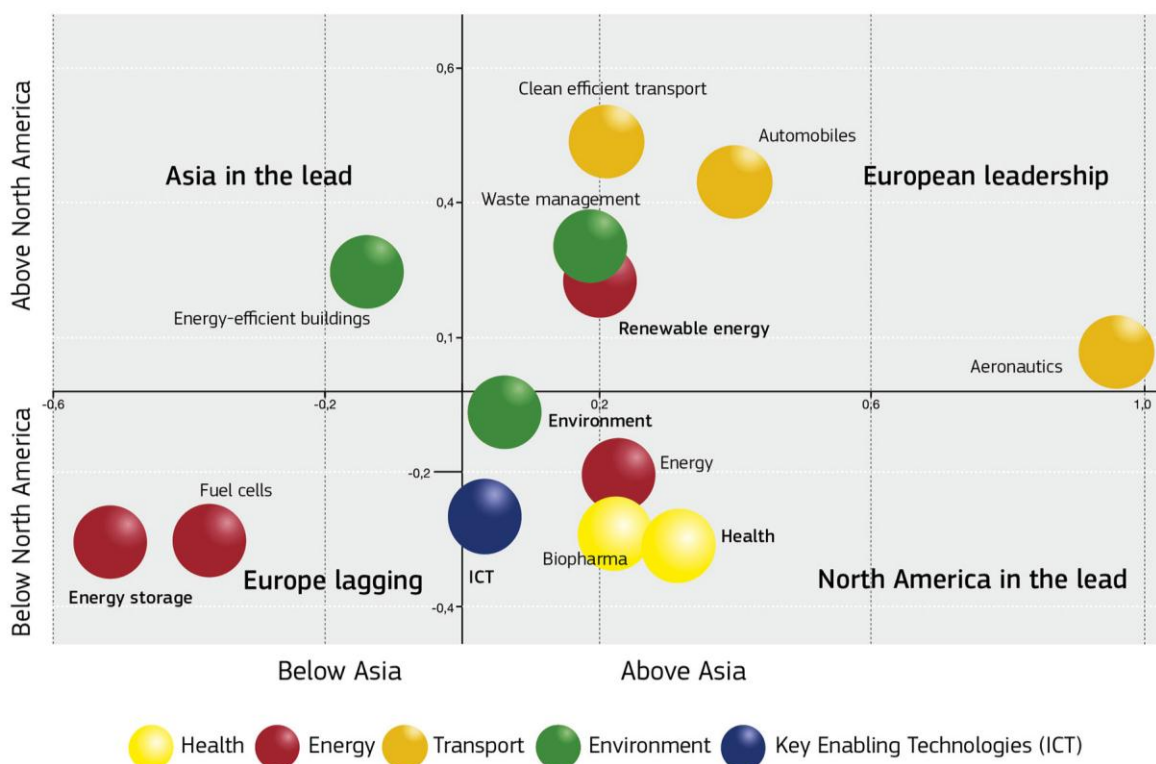
José Manuel BARROSO

President of the European Commission

Europe today

The EU is the main knowledge factory in the world. It accounts for almost a third of global science and technology production. Despite the economic crisis, the EU and its Member States have managed to maintain this competitive knowledge position, notably in the areas of transport, renewable energy and environment (see graph below). The EU also remains an attractive location for R&D investment, receiving in 2011 around 30% of FDI inflows worldwide, more than the United States or Japan.¹

Technology development in key global markets



Source: European Commission

Data: OECD patent database

However, Europe has deficits in translating its knowledge advantage into new products and services. It needs to provide a financial and regulatory environment fit for the purpose of allowing fast-growing companies to get their innovative ideas quicker to market. Research systems are still too fragmented, as are markets for high-tech products. Within the EU we have the talent to rise to this competitive challenge but need to be better and faster at translating the knowledge that our researchers generate into new industrial products and services. To get Europe back on track, research and innovation – getting ideas from the lab to the market – were placed at the centre of the Europe 2020 strategy for smart, sustainable and inclusive growth.

¹ Innovation Union Competitiveness Report 2013 (http://ec.europa.eu/research/innovation-union/pdf/competitiveness_report_2013.pdf)

The Innovation Union, one of the seven flagship initiatives of this strategy, sets that agenda. It defines 34 concrete actions to improve the framework conditions for research and innovation in Europe. These range from the creation of a unitary patent, faster standard setting, and modernised EU procurement rules, to a European passport for venture capital funds.

The objective of investing 3% of GDP in research and innovation at the national and regional level remains at the top of the policy agenda. It is part of a smart fiscal consolidation strategy that does not view research and innovation investments as a cost, but rather as a structural investment in our future prosperity and well-being.

At EU level, Horizon 2020, with a budget of almost **€80 billion** between 2014–2020, is one of the few areas of the EU budget that will receive a major increase in resources. It is the main EU financial instrument for implementing the Innovation Union. For the first time, all EU-level funding for research and innovation is included in one single framework programme, providing support at every step of the value chain, from the lab to the market. Red tape and administrative burdens have been reduced to create a coherent, simpler and more accessible programme.

From 1 January 2014, Horizon 2020 has been open for business. It is the most business-friendly EU research and innovation programme to date. Spanning industrial leadership, major societal and scientific challenges, it features a series of dedicated support measures addressing both industry in general and SMEs in particular.

Strengthening Europe's industrial competitiveness

The economic crisis has highlighted both the central role played by the EU's industrial base and the need to rejuvenate it. But market failures prevent the private sector from rallying the financial and knowledge resources needed for the modernisation of our industrial base.

The EU needs to develop urgently new sources of economic growth based on advanced manufacturing supported by a modern and dynamic business environment. The private sector is not able to bring about this transformation alone: Horizon 2020 provides support instruments for public-private partnerships based on ambitious strategic research agendas and for key enabling technologies, and will help industry develop the necessary skills base through dedicated training schemes.

Achieving industrial competitiveness through public-private partnerships (PPPs)

Horizon 2020 will leverage private investment in key industrial sectors through PPPs at EU level to create the critical mass needed to reinvigorate industrial competitiveness across the EU.

Five of these PPPs are industry-led Joint Technology Initiatives (JTIs) for **aviation, new medicines, energy storage, electronics and bio-technology**. They are expected to mobilise a total investment of over **€17 billion**, of which the EU budget contribution would be up to **€6.2 billion**. JTIs are a specific type of PPP in which industry defines ambitious research agendas and manages the calls for proposals that bring together industry (including innovative SMEs), universities, research laboratories, and other groups and users.

Leveraging private investment through Joint Technology Initiatives

Boosting investment in the EU's aeronautics industry: The Clean Sky 2 Initiative will develop new technologies for the civil aircraft market to cut pollution, reduce energy consumption, lessen noise and secure the future international competitiveness of the European aviation industry.

Fast-tracking the development of new medicines in the EU: The Innovative Medicines Initiative 2 will pave the way for breakthrough vaccines, medicines and treatments to tackle Europe's growing health challenges, notably chronic and neurodegenerative diseases.

Getting Europe moving using hydrogen and fuel cell technologies: The Fuel Cells and Hydrogen 2 Initiative will demonstrate at large scale the feasibility of using these technologies as competitive energy storage medium.

Boosting the EU's electronic design and manufacturing base: The Electronic Components and Systems Initiative, a merger of two recent initiatives, will boost Europe's manufacturing capability in this sector, which underpins product and productivity innovation across the whole economy.

Unleashing the potential of the EU's nascent bio-based industrial sector: The new Bio-based Industries Initiative will turn agricultural and forestry waste into commercial scale bio-based products. It will lead to green growth and the creation of significant new employment opportunities, products and markets.



SUCCESS STORY NEW TECHNOLOGIES TO REDUCE AIRCRAFT EMISSIONS AND NOISE

The first phase of the Clean Sky partnership has resulted in a number of breakthrough technologies that have undergone wind tunnel testing vital for further development. One of these is the [Natural Laminar Flow](#) wing. This new wing has the potential to substantially reduce drag and provide up to 4% fuel savings.

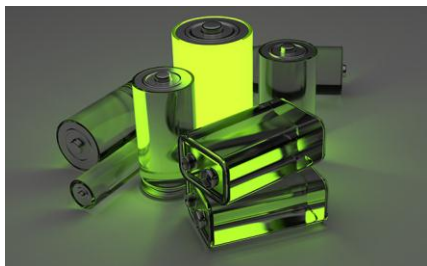
Two other innovative technologies developed under Clean Sky, the [Open Rotor](#) (an innovative type of aircraft engine) and wing anti-icing and de-icing systems, also underwent successful wind tunnel testing and demonstrated a first level of maturity. This innovative type of engine design has successfully been assessed by Rolls Royce and SNECMA. Clean Sky 1 runs between 2008 and 2017.



SUCCESS STORY AIMING HIGH AGAINST AUTISM

Around one child in 100 suffers from autism. The [EU-AIMS](#) project is the world's biggest effort to target autism, turning Europe into a hotspot for research in this area. It gathers 14 European academic centers, 6 large European pharma companies, charities, representatives of patients and carers, and 3 innovative smaller companies. The total funding for this project is €29 million of which €9.5 million come from pharma companies funding. Among other pioneering results, this unique partnership has already delivered new knowledge on the genetic origin of autism and identified close to 5,000 new mutations. The success of this project will be key for developing new, safe and effective autism medicines and therapies for both children and adults. The project runs between April 2012 and April 2017.

In addition to joint technology initiatives, Horizon 2020 will also implement other strategic partnerships with industry. So far eight have been launched covering: **energy efficient buildings, green vehicles, factories of the future, the process industry, robotics, photonic, high performance computing, and 5G for the future internet.** They will leverage more than **€6 billion** of investment to be allocated through calls for proposals under Horizon 2020. Each euro of public funding is expected to trigger additional investments of between €3 and €10 to develop new technologies, products and services.

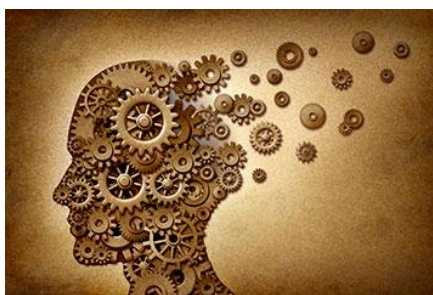


SUCCESS STORY NEW MATERIALS FOR NEW BATTERIES

Lithium-ion battery technology has paved the way for the roll-out of a new generation of electrified vehicles, not to mention providing the power for a whole host of energy-hungry portable devices. Researchers are seeking new ways of improving the efficiency of the technology, and several EU projects such as [SOMABAT](#), are prototyping new variants showing great potential. Experts agree, however, that to go beyond 250Wh/kg - the predicted limit for lithium-ion battery technology – new materials for the next generation post-lithium-ion batteries are needed. The new Li-air technology developed under the project [LABOHR](#) is being assessed, and the project [ORION](#) is looking 5-10 years ahead at novel hybrid organic-inorganic alternatives for energy conversion and storage that could help the EU become a market leader in this area. SOMABAT and ORION both ended in 2013; LABOHR started in April 2011 and will end in March 2014.

Supporting key enabling technologies

Key enabling technologies - micro- and nano-electronics, nanotechnology, industrial biotechnology, photonics, advanced materials and manufacturing - define the functionality of many of the products and devices that shape our daily lives. They drive innovation in many traditional and newly emerging sectors and are already a major source of employment in Europe. Globally the market is estimated to be worth more than €1 trillion by 2015 – but the benefit will go only to those who master these key enabling technologies and embed them into new products. Europe is currently the global leader in the development of these technologies and must retain its leadership. Building on these strengths, **Horizon 2020 is the biggest single support instrument in Europe for key enabling technologies.**



SUCCESS STORY NANOPARTICLES FOR THERAPY AND DIAGNOSIS OF ALZHEIMER'S DISEASE

The EU-funded [NAD](#) project is developing innovative nanoparticle therapies to treat Alzheimer's. The team have designed nanoparticles able to cross the blood-brain barrier so that MRI or PET scans of the brain can detect the disease. The project also confirmed the therapeutic potential of 'carrier nanoparticles', engineered to channel therapeutic substances into the brain barrier and prevent disease-causing beta-amyloid peptide aggregation. The project ran between September 2008 and August 2013.

Developing the industrial skills base

Breaking down barriers between academia and other sectors, especially commerce and business, is key to developing the multidisciplinary skills that industry needs. Through the Marie Skłodowska-Curie Actions, companies play an important role in developing the human resources behind research and innovation to ensure that the next generation of researchers are trained with the skills needed to suit business needs. The Marie Skłodowska-Curie Innovative Training Networks, including the European Industrial Doctorates, will invest more than **€3 billion** to train 25,000 PhD candidates with the research and innovation skills required to enhance their employability in all sectors.

Boosting Europe's innovative SMEs

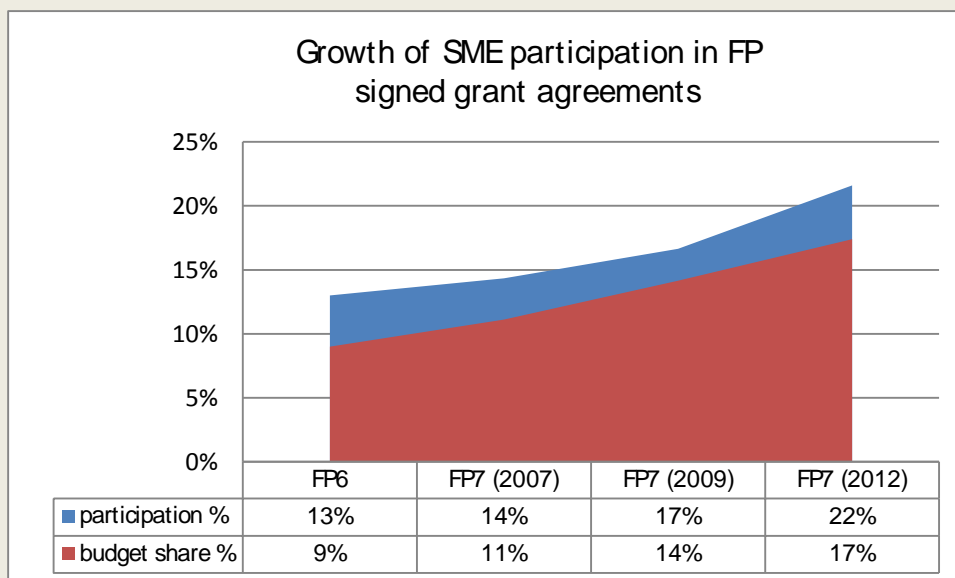
Well over 90% of all European businesses are SMEs. They provide two out of every three private sector jobs and they contribute to over half the total value-added created by businesses in the EU. Increasingly, SMEs need to innovate and internationalise to remain competitive. Horizon 2020 is an ideal tool for this since it makes it easy for SMEs to participate and increase their innovation potential. They can engage in collaborative projects as part of a consortium or seek tailored lab-to-market support for cutting edge ideas through a new dedicated SME instrument. The risk sharing instruments have become more focused on SMEs. And by putting the knowledge triangle to work, the Knowledge and Innovation Communities of the European Institute of Innovation and Technology (EIT) will continue to incubate new start-ups. **At least around €8.7 billion** is expected to go to SMEs under Horizon 2020.

A dedicated instrument for lab-to-market support

Horizon 2020 features a new SME instrument to help them at all stages of the innovation cycle, from the lab to the market regardless of whether they are high-tech and research-driven or non-research conducting, social or service SME companies. The instrument is a company-centred initiative set up specifically to fill the funding gaps for early-stage, high risk research and innovation and help them towards the commercialisation of new products and services, and become global innovation leaders.

Key facts

- In the previous EU research programme (FP7) an EU contribution of almost €6 billion has gone to 22,320 SME participants

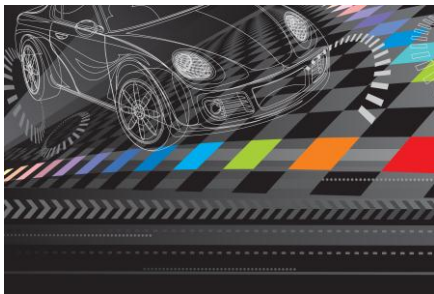


- In Horizon 2020, the integrated approach and simplification efforts should lead to a minimum of 20%, or at least around €8.7 billion, of the total combined budgets of the specific objectives 'Leadership in enabling and industrial technologies' (LEITs) and the 'Societal Challenges' going to SMEs of which at least €3 billion will be allocated to the SME instrument.

Facilitating access to finance for research and innovation

Getting finance on reasonable terms is currently very difficult - especially for research, development and innovation (RDI) activities because banks and investors view RDI as more risky. Start-ups and younger SMEs, that rely most on external sources of funding, find obtaining finance particularly difficult, as they have little or no track-record and often lack collateral. The EU can help. Through the Risk-Sharing Finance Facility (RSFF) under the previous EU research programme, loans totalling **€13 billion** for RDI were leveraged by **€1 billion** from the EU budget matched by **€1 billion** from the EIB's own resources. And the Risk-Sharing Instrument has so far provided over **€1.2 billion** in guarantees and counter-guarantees to 23 banks and guarantee societies, which will enable them to support up to an estimated 3000 innovative SMEs and small midcaps via loans, financial leases and loan guarantees.

Horizon 2020 makes greater use of financial instruments to attract yet more investment, both public and private, into RDI. For the first time, the programme will support equity investments, including by business angels and venture capitalists, into innovative firms (mainly SMEs) at the early stage of development, and will pilot a scheme to co-invest with technology transfer funds and offices. From a total budget of **€2.84 billion** covering debt and equity financial instruments and accompanying measures, at least one-third is likely to be absorbed by SMEs and small midcaps.



SUCCESS STORY RESEARCH TO ENGINEER CLEANER ENGINES

If cars are to become more environmentally friendly, they will need radical, new methods to power their engines. An Austrian mid-cap company, [AVL](#), is aiming to develop more sustainable driving technologies. A €30 million loan under the RSFF is supporting AVL's research into hybrid systems, combustion and diesel engines, as well as transmission systems, electric drives, batteries, and simulation software.

The project runs between December 2011 and December 2014.

Making the knowledge triangle work

Under the auspices of the **European Institute of Innovation and Technology**, three Knowledge and Innovation Communities (KICs) - **targeting climate change, information and communication technologies, and sustainable energy** - are up and running. Their work is world-class, and covers the entire value chain from education to R&D, demonstration, start-up incubation, marketing and sales. Five new KICs will be created under Horizon 2020 and are expected to provide training for over 20 000 graduates and lead to around 600 start-ups. It is expected to leverage **€7.5 billion** for innovation.



SUCCESS STORY ENERGY EFFICIENCY AS SOURCE OF BUSINESS AND JOBS

The [KIC InnoEnergy](#) has kick-started [SolabCool](#), a new business venture that brings to the market products that use waste or ecologically produced heat to power highly efficient cooling systems. The idea has now become a production plant with 7 people working in production and sales. The KIC InnoEnergy started its operations in 2010 and will run for 7-15 years.

And more...

Innovating for society together with industry and SMEs

Horizon 2020 focuses heavily on tackling some of the most important societal challenges facing Europe today. Industry will play a critical role in delivering the solutions to these challenges and in addressing them significant new market opportunities for innovative products and services will be created especially for fast moving innovative SMEs.

The EU has identified seven priority challenges where targeted investment in research and innovation can have a real impact. This will cover activities from research to market with a new focus on innovation-related activities, such as piloting, demonstration, test-beds, and support for public procurement and market uptake.

Funding will focus on the following challenges:

- **Health, demographic change and wellbeing;**
- **Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio-economy;**
- **Secure, clean and efficient energy;**
- **Smart, green and integrated transport;**
- **Climate action, environment, resource efficiency and raw materials;**
- **Europe in a changing world - inclusive, innovative and reflective societies;**
- **Secure societies - protecting freedom and security of Europe and its citizens.**



SUCCESS STORY THERMAL ENERGY STORAGE

EU heating/cooling demand corresponds to about 50% of total energy consumption, hence the need to promote innovative industrial developments to remedy this situation.

One option is to stock thermal energy to use it at a later stage for heating and cooling applications and power generation. Thanks to the EU-funded '[Green Solar Cities](#)' project, Salzburg now hosts a large scale thermal solar plant, supplying 287 apartments, a kindergarten, a student hostel, other retrofitted houses and part of an industrial area with the heat of 2,000 m² thermal solar collectors. The project runs between June 2008 and May 2014.

Planting the seeds of future industries through frontier research

Without investment in excellence-driven frontier research, the EU will lose a strategic asset that underpins innovation and technological advancement and plants the seeds from which so often entirely new industries and markets grow.

The frontier research that the **European Research Council** supports is selected solely on the basis of excellence. But when the research leads to unanticipated technology breakthroughs, Horizon 2020 also provides the means to take work through to the next stages. The support for **future and emerging technologies** will enable researchers to convert results from basic scientific research into new technologies which can then be picked up by industry and high-tech SMEs to stay ahead in global competition. Horizon 2020 will also endow Europe with world-class **research infrastructures** that are accessible to all researchers in Europe to fully exploit their potential for scientific advancement and innovation.

More on Horizon 2020: <http://ec.europa.eu/programmes/horizon2020/en>

