# Horizon 2020 - Overview

Horizon 2020 will be the Framework Programme for Research and Innovation between 2014 and 2020 and the successor to the current programme (FP7) which will run until the end of 2013.

Horizon 2020 will bring together all existing EU research and innovation funding currently provided through the Framework Programme for Research and Technological Development (FP7), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).

In early February 2013 with discussions on the EU seven-year budget, it was proposed that H2020 be reduced to just under €70B but the Parliament wants to increase this.

## Overview of Structure of Horizon 2020

According to the proposal, Horizon 2020 will be based around a single specific programme which will consist of three separate pillars, addressing key priorities where there is clear Union added value.

1. **Excellent Science**

- European Research Council
- Future and Emerging Technologies
- Marie Curie Actions
- Research Infrastructures

2. **Industrial Leadership**

*Key enabling and industrial technologies*

- Information and Communication Technologies
- Nanotechnologies
- Advanced Materials
- Biotechnology
- Advanced Manufacturing and Processing
- Space
- Support for cross cutting actions
    - Access to risk finance
    - Support to SMEs with high growth potential

3. **Societal Challenges**

- Health, demographic change and well-being
- Food security, sustainable agricultures, marine and maritime research and the bio-based economy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resource efficiency and raw materials
- Inclusive, innovative and secure societies

The European Institute of Innovation and Technology (EIT) also falls under Horizon 2020 and will be closely linked to the societal challenges but separate in the sense that EIT activities will be outlined in the EIT's Specific Innovation Agenda (SIA).

## Horizon 2020 Proposed Activities

Horizon 2020 will be based on a single specific programme, split into three pillars. The EIT will be closely linked to the societal challenges. Additionally a separate specific programme will cover Euratom. Although the overall structure is new, there is a lot of continuity in the proposed activities compared to FP7. At this stage, a number of the details are not yet known, for example, regarding how the calls will operate and the exact nature of the research and innovation activities that will be funded under the societal challenges. With the exception of the European Research Council and the Marie Curie Actions, the majority of Horizon 2020 is expected to be based on pan-European collaborative projects with opportunities for international co-operation. The first work programmes will start to be developed during mid-2013, ahead of the programme starting in 2014.

## 1. Excellent Science

This pillar brings together 'bottom-up' investigator driven funding activities. The activities covered under these areas are already within FP7 and largely the objectives will remain the same with some rationalisation of the number of programmes.

### European Research Council (ERC)

The proposal for the ERC under Horizon 2020 shows much continuity with current ERC funding.

*It will continue -*

- To operate autonomously lead by a Scientific Council consisting of top researchers which establishes the scientific strategy of the ERC and has full authority over the funding schemes
- To operate on a 'bottom-up' basis without predetermined research priorities
- To have research excellence as the sole criterion on which grants are selected
- To fund the 'individual teams' consisting of excellent individual researcher(s) and their research teams
- To include as a priority funding to assist excellent starting researchers to make the transition to independence by providing adequate support at the critical stage where they are setting up or consolidating their own research team or programme
- To support, as necessary, new ways of working with the potential to create breakthrough results and facilitate exploration of the commercial and social innovation potential of the researcher which it funds

Although the proposal does not set out exact funding schemes that the ERC will run, the text does give the scope for the continuation of the current four schemes (Starting Grants, Advanced Grants, Synergy Grants, and Proof of Concept Funding). In addition, the ERC's Scientific Council has flexibility to 'develop the ERC's mix of support measures as necessary to respond to emerging needs'.

*By 2020, the ERC aims to demonstrate -*

- That the best researchers are participating in the ERC's competitions
- That ERC funding has led directly to scientific publications of the highest quality and to the commercialisation and application of innovative technologies and ideas

- That the ERC has contributed significantly to making Europe a more attractive environment for the world's best scientists

**Future and Emerging Technologies (FET)**

Under FP7 Future and Emerging Technologies (FET) activities are funded under the Information Communication Technology (ICT) and Energy themes, FET is proposed to be a cross-cutting funding instrument in Horizon 2020.

FET in Horizon 2020 will support frontier research; alternative ideas, concepts, or paradigms of risky or non-conventional nature. Under Horizon 2020, FET activities will be funded under three separate strands which are similar to the three FET strands in the FP7 ICT theme:

- *FET Open: fostering novel ideas*
  As in FP7, the Horizon 2020 FET scheme supports novel research carried out by young researchers and/or high-tech research intensive SMEs. Horizon 2020 proposal states: "*By being explicitly non–topical and non-prescriptive, this activity allows for new ideas, whenever they arise and wherever they come from, within the broadest spectrum of themes and disciplines."* While the FP7 ICT theme stresses the importance of global collaboration within FET Open, this is not specifically mentioned in the Horizon 2020 proposal.

- *FET Pro-Active: nurturing emerging themes and communities*
  Under Horizon 2020, the FET Pro-Active scheme aims to build and structure research communities around emerging and novel research areas that are not yet ready for inclusion in industry or research road maps.

- *FET Flagships: tackling grand interdisciplinary science and technology challenges*
  Like the FP7 FET Flagships, Horizon 2020 is looking to fund science-driven, large-scale, multi-disciplinary research initiatives which are built around a visionary unifying goal. Instead of focusing on ICT (related) research, the Horizon 2020 Flagships are expected to tackle grand science and technology challenges requiring co-operation among a range of disciplines, communities and programmes.

The overall scientific strategy of the FET schemes, including their definition in the work programme, will be set by a FET Advisory Board, which will consist of various relevant stakeholders.

In providing support for science-driven research towards future technologies, FET aims to bring together actors from science, technology and innovation.

**Marie Curie Actions**

The overarching objective of the Marie Curie Actions in Horizon 2020 is "*to ensure optimum development and dynamic use of Europe's intellectual capital in order to generate new skills and innovation and, thus, to realise its full potential across all sectors and regions*". In the next proposal for the Research and Innovation programme "Horizon 2020", the Marie Curie Actions will be renamed "Marie Skłodowska-Curie Actions" (MSCA). The objective of the actions will however remain the same: supporting career development and training of researchers through worldwide mobility and skills development.

As reported previously, activities which in FP7 are mainly delivered through nine separate actions will be delivered instead through four broader lines of activity:

- *Fostering new skills by means of excellent initial training of researchers* – this strand will aim to provide excellent and innovative training to early-stage researchers at post-graduate level, to improve career prospects for young post-graduate researchers from both the public and private sectors, and will deliver the kinds of activity currently funded under the Initial Training Networks scheme.
- *Nurturing excellence by means of cross-border and cross-sector mobility* – this will aim to enhance the creative and innovative potential of experienced researchers at all career levels by creating opportunities for cross-border and cross-sector mobility. It will cover the opportunities currently covered by the individual fellowships within FP7.
- *Stimulating innovation by means of cross-fertilisation of knowledge* – the goal of this strand is to "reinforce international cross-border and cross-sector collaboration in research and innovation by means of exchanges of research and innovation personnel in order to be able to face global challenges better". This will be a broad programme supporting the activities currently funded under the Industry-Academia Partnerships and Pathways scheme (IAPP) and International Research Staff Exchange Scheme (IRSES).
- *Increasing the structural impact by co-funding the activities* – this will extend the current COFUND mechanism, which focuses on individual fellowships at post-doctoral level, across all of the above strands, with the aim of "leveraging additional funds to increase the numerical and structural impact of Marie Curie Actions and to foster excellence at national level in researchers training, mobility and career development".

There will also be support for policy actions related to monitoring the progress and impact of Marie Curie Actions which will be co-ordinated with the policy actions to be funded through the Inclusive, innovative and secure societies challenge.

**European Research Infrastructures**

The scope of the Research Infrastructures objective closely follows the remit of the FP7 research infrastructures programme and addresses a number of policy developments arising from Innovation Union and the European Economic Recovery Package including the need for training in research infrastructures and activities to strengthen technological innovation and industrial access to infrastructures.

Research Infrastructures will be implemented through three main specific objectives -

- Developing the European research infrastructures for 2020 and beyond developing new world-class research infrastructures, integrating and opening existing national research infrastructures of pan-European interest and developing, deploying and operating ICT-based e-infrastructures.
- Fostering the innovation potential of research infrastructures and their human capital, exploiting the innovation potential of research infrastructures and strengthening the human capital of research infrastructures.
- Reinforcing the European research infrastructure policy and international cooperation; reinforcing European policy for research infrastructures; and facilitating strategic international cooperation.

## 2. Industrial Leadership

The Industrial Leadership priority brings together a number of FP7 thematic areas along with the SME activities currently funding in FP7 and in the Competitiveness and Innovation Programme and new risk financial instruments.

### Key Enabling and Industrial Technologies (KETs)

Funding is expected to take the form of collaborative research and innovation projects with a strong focus on industrial involvement and applied research. Research into KETs, defined as micro-and nanoelectronics, photonics, nanotechnology, biotechnology, advanced materials and advanced manufacturing systems will form a major components in of 'Leadership in enabling and industrial technologies'. A joint work programme for cross-cutting KETs will be developed to take account of the market needs of the societal challenges and aim to provide generic KET building blocks for addressing the societal challenges.

### Information and Communication Technologies (ICT)

ICT which is a separate theme across FP7 will be embedded across all areas, in addition, there will be six dedicated activity lines funded under Industrial Leadership.

- New generation of components and systems
- Next generation computing
- The future of the internet
- Content technologies and information managements
- Advanced interfaces and robots
- Micro and nanoelectronics and photonics

The six activity lines will also cover ICT-specific research infrastructures.

### Nanotechnologies

Activities under Horizon 2020 will cover similar areas to FP7 with a greater focus on the societal dimension of nanotechnologies and their safe developments. Nanotechnologies are expected to be funded under five headings.

- Developing next generation nanomaterials, nanodevices and nanosystems
- Ensuring the safe development and application of nanotechnologies
- Developing the societal dimension of nanotechnology
- Efficient synthesis and manufacturing of nanomaterials, components and systems
- Developing capacity-enhancing techniques, measuring methods and equipment.

### Advanced Materials

In FP7 Materials is an activity area funded under the Nanosciences, Nanotechnologies, Materials and new Production Technologies (NMP) theme where there is an emphasis on materials science for industrial innovation and socio-economic progress. In order to achieve this, a multi-disciplinary approach is adopted, involving chemistry, physics, engineering sciences, theoretical and computational modelling and the biological sciences. Advanced materials research in Horizon 2020 takes a similar approach, in that it has the objective to achieve innovation *"in all industrial sectors, particularly for high value markets"*.

- Cross-cutting and enabling materials technologies
- Materials development and transformation
- Management of material components
- Materials for a sustainable industry
- Materials for creative industries
- Metrology, characterization, standardisation and quality control
- Optimisation on the use of materials

**Biotechnology**

In FP7, Biotechnology research is funded under the theme for Food, Fisheries, Agriculture and Biotechnology. This activity will be structured under three key areas:

- Boosting cutting-edge biotechnologies as future innovation drivers
- Biotechnology-based industrual processes
- Innovative and competitive platform technologies

**Advanced Manufacturing and Processing**

This area of research falls largely into the FP7 NMP theme, although it is not defined as a separate area, rather research for manufacturing is integrated into a number of areas and also covered in the FP7 Public Private Partnerships for *"Energy Efficient Buildings*" and *"Factories for the Future*".

*The proposed areas of funding under Horizon 2020*

- Technologies for factories of the future
- Technologies enabling energy-efficient buildings
- Sustainable and low-carbon technologies in energy intensive process industries
- New, sustainable business models

**Space**

The activities outlined in the proposal generally follows the same remit as those currently funded under FP7, although activities related to GMES (Global Monitoring for Environment and Security) will not be funded under Horizon 2020. Research funded under the second FP7 activity area 'Strengthening the foundations of Space science and technology' will be integrated into the Horizon 2020 activity area entitled 'Safeguard a competitive space industry and research community'. The Galileo programme, currently funded under the FP7 Transport theme, will be funded under the Space theme in Horizon 2020.

While industrial, and in particular SME, participation has always been encouraged in the FP7 Space theme, there is likely to be even more emphasis placed on this and new measures are expected to be put in place to boost innovation between space and non-space sectors. International co-operation will include the development of long-term strategic road maps to align EU space priorities with those of internal European partners (e.g. the European Space Agency) and international partners (e.g. NASA).

*The proposed areas of funding*

- Enabling European competiveness, non-dependence and innovation in space activities

- Enabling advances in space technologies
- Enabling exploitation of space data
- Enabling European research in support of international space partnerships

**Access to Risk Finance**

The Commission proposes to set up a debt funding facility and an equity funding facility under Horizon 2020 building on the existing Risk Sharing Financing Facility under FP7. The debt facility will provide loans and the equity facility will focus on early stage venture capital funds. These proposed activities are likely to be the subject of extensive discussions, since to operate they will require financial institutions to provide support to manage the facilities.

**Innovation in SMEs**

The specific objective is "*to stimulate growth by means of increasing the levels of innovation in SMEs, covering their different innovation needs over the whole innovation cycle for all types of innovation, thereby creating more fast-growing, internationally active SMEs*." It aims to stimulate all forms of innovation in SMEs (including non-technical and service innovations) targeting those with the potential to grow and internationalise across the single market and beyond.

The broad lines of the activities

- *Mainstreaming SME support*
  Including a dedicated SME instrument: all of the specific objectives on societal challenges and on leadership in enabling and industrial technologies will apply the dedicated SME instrument and will allocate an amount for this. This SME instrument will provide simplified and staged support and its three phases will cover the whole innovation cycle.
    - Phase 1: Concept and feasibility assessment
    - Phase 2: Research and development, demonstration, market replication
    - Phase 3: Commercialisation

- *Specific Support* (which will be bottom-up and demand driven without predetermined research priorities).

- *Support for research intensive SMEs*
    - Will target research intensive SMEs in high-technology sectors that show the capability to commercially exploit the project results. It will be implemented by a so-called 'Article 185 initiative' building on the current 'Eurostars Joint Programme' taking into account suggestions from its interim evaluation.

- *Enhancing the innovation capacity of SMEs*
    - Activities assisting the implementation and complementing the SME specific measures across Horizon 2020, notably to enhance the innovation capacity of SMEs.

- *Supporting market-driven innovation*
    - To improve the framework conditions for innovation and tackling the specific barriers preventing, in particular, the growth of innovative SMEs.

## 3. Societal Challenges

The Horizon 2020 proposal contains six societal challenges and will adopt a challenge-based approach, by focusing on policy priorities without pre-determining the choice of technologies or solutions that should be developed. Although the exact details of the work programme format is not yet know, it is expected that the topics will be potentially more open than those in FP7 work programmes. In general, the societal challenges key enabling and industrial technologies activities show a lot of continuity in terms of research areas covered.

### Health, Demographic Change and Well-being

In FP7 Health, there are three key underlying themes; child health, health of the aging population and gender-related health. These are supported in the areas of biotechnology, generic tools and medical technologies and translating research and optimising the delivery of health care. Research into the health of the aging population and the delivery of health care will continue in Horizon 2020 where the challenge will be implemented through three key areas.

- *Prevention* – through increasing understanding of relationships in all areas that relate to health: including genetic; environmental; social and economic factors, and ensuring a healthy approach to aging.
- *Disease* – to understand the development processes and process of disease and its spread, in order to stimulate innovative drugs and therapies, and methods of treatment.
- *Health and social care* – to improve the sustainability and efficiency of care provision, whilst considering the individuals requirements and responses. It is also expected that this area will look at the management and effects of emerging health threats, for example epidemics.

*These will be delivered through*

- Long-term studies of large populations to collect and process data
- Developing and supporting data and biological infrastructures
- Supporting and developing appropriate tools and technologies
- The development of research findings into practical and marketable products and services, including regulation

### Food Security, Sustainable Agricultures, Marine and Maritime Research and the Bio-based Economy

*The Commission is proposing to split this theme into four main activity areas*

- *Sustainable agriculture and forestry*
  This area corresponds with the first activity area in the FP7 FAFB theme 'Sustainable production and management of biological resources'. In Horizon 2020, this activity area includes a sub-activity area on 'increasing production efficiency and coping with climate change, while ensuring sustainability and resilience' which is very similar to one of the FAFB priority areas outlined in the 2012 Work Programme 'Sustainable primary production; mitigating and adapting to climate change'.

- *Sustainable and competitive agri-food sector for a safe and healthy diet*
  This area corresponds with the second activity area in the FP7 FAFB theme: 'Fork to farm: food, health and well being'. One of the challenges highlighted under the Horizon 2020 area is to *"achieve food safety and security for all Europeans…".*

- *Unlocking the potential of aquatic living resources*
  This area seems similar to the third activity area in the FP7 FAFB theme: 'Life sciences, biotechnology and biochemistry for sustainable non-food products and processes'.

- *Sustainable and competitive bio-based industries*
  The overall objective is to accelerate the conversion of fossil-based European industries to low carbon, resource efficient and sustainable ones. This activity area appears to be strongly linked to two of the 2012 FAFB priority areas.
    - Sustainable primary production; mitigating and adapting to climate change
    - Low carbon and resource efficient industry.

**Secure, Clean and Efficient Energy**

The specific objective of this challenge is "*to make the transition to a reliable, sustainable and competitive energy system, in the face of increasingly scarce resources, increasing energy needs and climate change".* One of the key policy drivers is the Strategic Energy Technology Plan (SET-Plan).

The broad lines of the activities covered are:

- Reducing energy consumption and carbon footprint by smart and sustainable use
    - including renewable heating and cooling, as well as 'smart cities'

- Low-cost, low-carbon electricity supply
    - including wind, solar, carbon capture, transport and storage, geothermal, hydro, marine and other renewable energy options

- Alternative fuels and mobile energy sources
    - including bio-energy, hydrogen and fuel cells and new alternative fuels

- A single, smart European electricity grid
- New knowledge and technologies
- Robust decision making and public engagement
- Market uptake of energy innovation

Nuclear fission and fusion research are not covered within this challenge, since they covered separately by the Euratom component of the Horizon 2020 proposals.

**Smart, Green and Integrated Transport**

The societal challenge looks very similar to the current FP7 Transport theme with very few proposed changes. The challenge is to achieve a resource-efficient environmentally-friendly, safe, seamless and performing transport system for the benefit of all citizens, the economy and society. To achieve this, the programme is likely to respond to the following three challenges:

- Resource efficient transport that respects the environment
- Better mobility, less congestion, more safety and security
- Global leadership for the European transport industry

**Climate Action, Resource Efficiency and Raw Materials**

This challenge aims "*to achieve a resource efficient and climate change resilient economy and a sustainable supply of raw materials, in order to meet the needs of a growing global population within the sustainable limits of the planet's natural resources.*" Activities will contribute to increasing European competitiveness and improving well-being whilst assuring environmental integrity and sustainability, keeping average global warming below 2 °C and enabling ecosystems and society to adapt to climate change.

*The broad lines of activities covered*

- Fighting and adapting to climate change
- Sustainably managing natural resources and ecosystems
- Ensuring the sustainable supply of non-energy and non-agricultural raw materials
- Enabling the transition towards a green economy through eco-innovation
- Developing comprehensive and sustained global environmental observation and information systems

**Inclusive, Innovative and Secure Societies**

The specific objective of this societal challenge is to *"foster inclusive, innovative and secure European societies in a context of unprecedented transformations and growing global interdependencies."*

*It is proposed to be delivered through three main lines of activity*

- *Inclusive Societies* – activities included in this strand will focus on: promoting smart, sustainable and inclusive growth; building resilient and inclusive societies in Europe; strengthening Europe's role as a global actor; and closing the research and innovation divide in Europe. It is envisaged that humanities research will play an important role in this part of the challenge.

  This strand covers work currently funded under the Socio-economic Sciences and Humanities (SSH) theme of the FP7 Co-operation Specific Programme, as well as some of the activity currently funded through the more societally-oriented challenges within the FP7 ICT theme.

- *Innovative Societies* - activities in this strand focus on: strengthening the evidence base and support for the Innovation Union; exploring new forms of innovation, including social innovation and creativity; ensuring societal engagement in research and innovation; and promoting coherent and effective co-operation with third countries.

  This brings together activity currently funded under a range of FP7 programmes, including: the SSH theme in Co-operation; the Science in Society theme; and some of the International Co-operation and Policy activities included in the Capacities Specific Programme.

- *Secure Societies* – focus of activities will be to: fight crime and terrorism; strengthen security through border management; provide cyber security; increase Europe's resilience to crises

and disasters; and ensure privacy and freedom in the Internet and enhance the societal dimension of security.

This covers the research currently funded under the Security theme of FP7, along with some of the activity falling under the ICT theme.

**Joint Research Centre**

The Joint Research Centre will have a similar role as in FP7 by providing robust, evidence-based, scientific and technical support to EU policies which will be driven by customer needs and complemented by forward-looking activities. The JRC will accomplish this by contributing to the general objectives and priorities of Horizon 2020 (Excellent Science, Industrial Leadership, and Societal Challenges).

**Euratom**

The Euratom programme will have a similar role as in FP7 to improve nuclear safety and security, contribute to the long term decarbonisation of the energy system and enhance its role in training.

*The programme will consist of the following objectives*

- Indirect actions
- JRC direct actions
- Cross-cutting activities

**European Institute of Innovation and Technology (EIT)**

The EIT Knowledge Innovation and Communities (KICs) are expected to be the main activity of the EIT.

*The first call is proposed for 2014 and will include the KIC themes*

- Innovation for healthy living and active ageing
- food4future
- Raw materials

A second wave will be published in 2018 with proposed topics of added value manufacturing, smart secure societies and urban mobility.

The funding for the KICs has been added to the budget for the societal challenges. The scope of the EIT activities is outlined in the separate EIT proposal for the Strategic Innovation Agenda, and the proposal for the revision to the EIT regulation.

The Commission proposal will be negotiated in the coming months with the European Parliament and the Council of the EU. The final decision is expected to be adopted before the end of 2013.

**Current differences with FP7**

Following the Commission proposal of December 2011 the following changes are noted:

| | **FP7** | **Horizon 2020** | **Notes** |
|---|---|---|---|
| **Budget** | €50 Billion | €70 Billion | Included EIT and CIP – still needs to be agreed |
| **Guarantee Fund** | Set-up | Continues | |
| **RTD Maximum Funding** | 75% | 100% | |
| **Management Maximum Funding** | 100% | 100% | |
| **Demonstration Maximum Funding** | 50% | 70% | |
| **Overheads** | 20% or 60% or calculated | 20% | Excluding subcontracts – still needs to be agreed. |
| **Financial viability check** | On all beneficiaries with contribution over €500,000 | Only for coordinators | |
| **Audit certificates** | Every €375,000 | every €325,000 | |
| **VAT Charges** | No central government tax allowed to be charged | If unrecoverable - allowed to be charged | Needs to be verified |

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***Please note: all information in this document is subject to change/revision prior to final publication of the programme.***

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