The Societal Challenge 2 Practical Guide

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BioHorizon is a network of specialised national contact points (NCPs) for Horizon 2020, the EU Framework Programme for Research and Innovation, operating within the scope of Societal Challenge 2 (SC2) 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' and the Key Enabling Technology (KET) 'Biotechnology' (KET-B). The BioHorizon network consists of officially appointed NCPs and contact points in international cooperation partner countries (ICPCs).

The role of NCPs is to help improve the quality of research project proposals submitted in SC2 and KET-B, and to lower the barriers to entry by newcomers, in particular SMEs. The NCP systems can vary from one country to another, from highly centralised to decentralised networks, and comprise a number of very different actors, from ministries to universities, through research centres and special agencies to private consulting companies. You can search for NCPs in the different countries.

Although the type and level of services offered by the NCPs may differ, a number of basic services are outlined in the NCP Guiding Principles and agreed by all countries:
- Guidance on choosing relevant Horizon 2020 topics and types of action;
- Advice on administrative procedures and contractual issues;
- Training and assistance on proposal writing;
- Distribution of documentation (forms, guidelines, manuals, etc.);
- Assistance in partner search.

This Societal Challenge 2 Practical Guide is made by the BioHorizon NCP network and is a tool to support (possible) applicants of Horizon 2020 and especially those applicants who are preparing proposals within the Societal Challenge 2 domain. The Practical Guide is divided in four chapters; Information Horizon 2020, What else to take into account, Related networks and instruments and Where to find partners.

The figure on page 2 could be construed as a conceptual index: a PERT diagram of the different sections of the Practical Guide. We trust this user-friendly guide will help the reader navigate easily through the text. By clicking on the home button on the bottom left of every page, the reader can go back to the conceptual index.

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2.1 General information Horizon 2020

Horizon 2020 is the biggest EU research and innovation programme ever, with nearly €80 billion of funding available over 7 years (2014-2020). It is the successor to the 7th Framework Programme (FP7), which was the seventh such investment programme stretching back to 1984. Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. Europe 2020 is the European Union's ten-year growth strategy and its three main priorities are:

- Smart growth – developing an economy based on knowledge and innovation;
- Sustainable growth – promoting a more resource efficient, greener and more competitive economy;
- Inclusive growth – fostering a high-employment economy delivering economic, social and territorial cohesion.

Horizon 2020 is built around three pillars:

- Support for '**excellent science**' – focusing on basic science and including grants for individual researchers;
- Support for '**industrial leadership**' – including grants for small and medium-sized enterprises and indirect finance for companies through the European Investment Bank;
- Support for research to tackle social and economic problems, the so-called '**societal challenges**'.

Excellent Science	Industrial Leadership	Societal Challenges
European Research Council (ERC) Marie Skłodowska-Curie Actions (MCSA) Future and Emerging Technologies (FET) Research Infrastructures (RI)	Leadership in enabling and industrial technologies - ICT - Nanotechnologies - **Biotechnologies** - Space - Advanced manufacturing and processing - Advanced materials Access to risk finance Innovation in SMEs	1. Health, demographic change and wellbeing **2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy** 3. Secure, clean and efficient energy 4. Smart, green and integrated transport 5. Climate action, environment, resource efficiency and raw materials 6. Europe in a changing world – inclusive, innovative and reflective societies 7. Secure societies – protecting freedom and security of Europe and its citizens

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In addition to the three pillars there are several horizontal activities:
• Spreading excellence and widening participation;
• Science with and for society;
• European Institute of Innovation and Technology (EIT);
• Euratom.

Funding opportunities under Horizon 2020 are set out in multi-annual work programmes. The work programmes are prepared by the European Commission within the framework provided by the Horizon 2020 legislation and through a strategic programming process integrating EU policy objectives in the priority setting. The main Horizon 2020 work programme comprises an introduction, the thematic sections and the general annexes describing general rules such as standard admissibility conditions and eligibility criteria, types of action, selection and award criteria, etc. Each thematic section is self-contained, and describes the overall objectives, the respective calls for proposals, and the topics within each call. Each call topic provides information according to the same structure: 'specific challenge', 'scope' and 'expected impact':
• **Specific challenge**: this text sets the scene, describes the problem and context to be addressed and explains why European action is needed in the field concerned;
• **Scope**: this section outlines what actions are expected in order to solve the challenge. Projects should neither deliver too much nor too little. This section provides an indication of the project budget;
• **Expected impact**: in a sense, 'impact' is the motto of Horizon 2020: funded projects should result in concrete, meaningful and Europe-wide benefits to many stakeholders, thereby solving pressing issues faced by many.

Horizon 2020 covers the whole innovation value-chain, from fundamental research to market replication. Various funding instruments, or 'types of action', exist in order to meet the different needs of such projects. The applicable type of action is defined for each call topic. The most common types of action are '**Research and Innovation Action (RIA)**', '**Innovation Action (IA)**', '**Coordination and Support Action (CSA)**', '**European Joint Programme Cofund (EJP)**' and '**ERA-Net Cofund**'. Horizon 2020 also adds some new schemes, such as:
• The **SME Instrument**, which targets innovative SMEs that would like to grow their business, especially internationally;
• **Fast Track to Innovation (FTI)**, supporting innovative projects from the demonstration stage through to market uptake. This instrument provides important funding (up to €3 million) to small consortia of up to five participants.

EU funding covers up to 100% of all eligible costs for all Research and Innovation Actions and Coordination and Support Actions. For Innovation Actions, funding generally covers 70% of eligible costs, but may increase to 100% for non-profit organisations. Indirect eligible costs (e.g., administration, communication and infrastructure costs, office supplies) are reimbursed with a 25% flat rate on the direct eligible costs (those costs directly linked to implementation of the action).

2.2 Societal Challenge 2

Agriculture, forestry, fisheries and aquaculture, together with the bio-based industries, are integral parts of the European economy and society. Relying on the use of limited natural resources, these sectors produce and process biological resources to satisfy the demands of consumers and a wide range of industries for food, feed, bio-energy and bio-based products. While they enhance Europe's self-sufficiency and provide jobs and business opportunities essential for rural, coastal and marine areas, these sectors are also facing significant challenges that require solutions based on research and innovation. The main themes within SC2 are:

Agriculture and forestry

Agriculture and forestry have always had, and maintain, an important role within EU society. They supply reliable, healthy and nutritious food, feed and non-food products for a wide range of industries, shape and care for our landscapes, provide public goods, and keep the countryside alive by providing jobs. Research activities and policies will help to cope with the three main challenges these sectors are facing today: securing viable food production in the face of a growing global demand for food; ensuring sustainable management of natural resources and climate action; and contributing to a balanced territorial development of the EU's rural areas and their communities.

Agri-food sector for a safe and healthy diet

Ensuring food security goes beyond securing a sufficient supply of food. It also requires social and economic access to safe and nutritious food. Food consumption has an impact on human health and the environment.

The challenge is finding a way to meet consumer needs and preferences while minimising the related impact on health and the environment. Research and innovation will address food and feed security and safety, the competitiveness of the European agri-food industry and the sustainability of food production, processing and consumption. It will cover the whole food chain and related services from primary production to consumption.

Aquatic living resources and marine research

Oceans and seas represent over 70% of the Earth's surface, and living aquatic resources can provide a significant contribution to food, energy and bio-based products. The objective is to sustainably manage and exploit aquatic living resources to maximise benefits from Europe's oceans, seas and inland waters. This includes optimising the sustainable contribution of fisheries and aquaculture to food security, boosting innovation through blue biotechnologies and fostering cross-cutting marine and maritime research to harness the potential of Europe's oceans, seas and coasts for jobs and growth.

Bio-based industries

The transition from fossil-based European industries to low carbon, resource efficient and sustainable industries is a major challenge. It entails the transformation of conventional industrial processes and products into environmentally friendly bio-based approaches, the development of integrated bio-refineries and opening of new markets for bio-based products. Research and innovation will provide the means to reduce the Union's dependency on fossil resources and contribute to meeting its energy and climate change policy targets for 2020.

The themes previously mentioned are translated into five priorities in the work programme 2018-2020:

1. Addressing climate change and resilience on land and sea

The actions funded in the work programme will contribute to meeting Europe's ambitious climate targets, while at the same time satisfying the need for food, feed, bio-based products and energy for a global population projected to reach 10 billion by the year 2030.

2. Making the transition towards a circular bioeconomy

Research and innovation actions across all sectors covered by SC2 will support resource-efficient production and distribution systems, value chains based on new and more efficient uses of waste, residues and by-products, as well as new business models that maintain and enhance the natural capital of the EU.

3. Fostering functional ecosystems, sustainable food systems, healthy lifestyles

The investments in research and innovation in this work programme will future-proof our food systems, making them more sustainable, resilient, responsible, diverse, competitive and inclusive.

4. Boosting major innovations on land and sea – new products, value chains and markets

The testing, demonstrating and scaling-up of new technologies and business models that create breakthrough innovations are crucial to ensure the long term competiveness of the primary and secondary sectors covered by SC2. This will lead to the creation of sustainable value chains, resulting in new jobs, products and services.

5. Developing smart, connected territories and value chains in rural and coastal areas

The aim of the proposed research and innovation activities is to achieve better capitalisation of territorial assets, taking account of long term drivers, to open new and sustainable avenues for products, services and value chains in support of rural and coastal communities, promoting new partnerships between producers, processors, retailers and society.

The work programme is structured around three calls: '**Sustainable Food Security'**, '**Blue Growth'** and '**Rural Renaissance'**. In addition to these three calls, the Thematic Investment Platform on Circular Bioeconomy was launched in the second half of 2018.

Focus Areas

A small number of major actions that cut across the Horizon 2020 programme boundaries are implemented as 'focus areas'. Each of these focus areas aligns with major political or policy drivers, and is endowed with a substantial budget to allow for work of sufficient scale, depth and breadth, thereby also supporting better integration across work programme parts. Focus areas are expected to create an exceptional impact, addressing 'big ticket' challenges. Focus areas are in effect virtually linked calls; they constitute a linking of topics from respective parts of Horizon 2020 through a new rationale, unlocking new types of impact and added value.

The focus area **'Building a low-carbon, climate resilient future (LC)'** will align research and innovation investments with the climate change targets of the Paris Agreement, which marked the beginning of a new era in the fight against climate change, as well as with the UN's Sustainable Development Goals. This focus area reflects the fact that research and innovation is essential if we are to find the ground-breaking solutions needed, including in particular current needs in relation to the energy system. It aims to develop solutions to help achieve carbon neutrality and climate resilience in Europe in the second half of the 21st century.

Work related to the circular economy and the focus area **'Connecting economic and environmental gains – the circular economy (CE)'** will also align research and innovation towards these targets. This focus area, building on the Commission's ambitious circular economy package, will consolidate relevant research and innovation initiatives and will make a strong contribution to jobs, growth and industrial competitiveness.

A dedicated focus area on **'Digitising and transforming European industry and services (DT)'** will foster better integration and coordination of the efforts in the area of digitisation. The digitisation of products, services and processes will transform industry and provide solutions to several major societal challenges. Research and innovation under this focus area aims to seize the opportunities offered by digitisation. A particular emphasis will be put on cybersecurity and on addressing the societal impact of the digital transformation.

The focus area **'Boosting the effectiveness of the Security Union (SU)'** will support the implementation of the Security Union priorities and help tackle the challenges that Europe is facing on multiple fronts, such as cyber-crime and other crime, security threats and threats to infrastructures, natural and man-made disasters, as well as hybrid threats. Research into these threats, notably the threats posed by terrorism, will underpin an effective and coordinated EU response, and better tools will reduce loss of life and material damage.

2.3 Key Enabling Technology 'Biotechnology'
Key Enabling Technologies (KET) are among the major objectives under the 'Industrial Leadership' pillar of Horizon 2020. Six KETs have been identified as important for Europe's future competitiveness, one of which is biotechnology (**KET-B**). With applications in a broad variety of sectors, biotechnology has been a main driver of innovation in the knowledge-based bio-economy (KBBE), leading to new growth and competitiveness in traditional sectors, such as food and agriculture, and the creation of emerging sectors, such as bio-based products and biofuels. The activities will focus on mission-oriented research in the life sciences, biotechnology and biochemistry for the development of sustainable non-food products and processes. It has been divided into six linked areas:

- Novel sources of biomass and bio-products;
- Marine and freshwater biotechnology (blue biotechnology);
- Industrial biotechnology: added value bio-products and bio-processes (white biotechnology);
- Biorefinery;
- Environmental biotechnology;
- Emerging trends in biotechnology.

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2.4 Bio-Based Industries Joint Undertaking (BBI JU)

The Bio-Based Industries Joint Undertaking (BBI JU) is a public-private partnership between the European Commission and the Bio-based Industries Consortium (BIC). The BIC brings together almost 200 members including large companies, SMEs, SME clusters, research and technology organisations, universities, technology platforms and associations spread across Europe. The sectors they cover are agriculture, food, technology providers, forestry, pulp and paper, chemicals and energy. They have committed to invest in collaborative research, development and demonstration of bio-based technologies. The overall budget of the BBI JU for the entire period of Horizon 2020 is €3.7 billion (€975 million from Horizon 2020 and €2.7 billion private investment). The BBI JU publishes annual calls for proposals.

The calls and all the related information are published on the Participant Portal. The focus areas in BBI JU are:

- Feedstock: fostering a sustainable biomass supply with increased productivity and building new supply chains;
- Biorefineries: optimising efficient processing through research and development and demonstrating the efficiency and economic viability of large-scale demo / flagship biorefineries;
- Markets, products and policies: developing markets for bio-based products and optimising policy frameworks.

Goals and benefits for Europe
- Develop the potential of waste as well as agriculture and forestry residues;
- Diversify and grow farmers' incomes: up to 40% additional margins with existing residues;
- Replace at least 30% of oil-based chemicals and materials with bio-based and biodegradable ones by 2030;
- Create a competitive bio-based infrastructure in Europe, boosting job creation, 80% of which will be in rural and underdeveloped areas;
- Deliver bio-based products that are comparable and/or superior to fossil-based products in terms of price, performance, availability and environmental benefits;
- The new bio-based products will on average reduce CO_2 emissions by at least 50% compared to their fossil alternatives.

2.5 Where to find information?

Participant portal

The Participant Portal was established as an internet portal for the stakeholders of EU research and innovation programmes. It provides a set of services to facilitate participation in the programmes and related interactions with the Commission. People are encouraged to register with the portal to benefit fully from these services.

The participant portal is divided into four tabs, namely:
- Funding opportunities;
- How to participate;
- Experts;
- Support.

Funding opportunities

Search to find topics that belong to open or forthcoming calls. You can search in the text of the call, in topic titles, call and topic identifiers, in the topic description, by keywords and tags related to the topic. Proposals must be submitted electronically using the electronic submission system of the Participant Portal. Access to the electronic submission system is available after selection of a topic.

H2020 Online Manual

Reference Documents

Beneficiary Register

Financial Viability Self-Check

SME Participation

How to participate

The Horizon 2020 Online Manual offers:
- An overview of all steps needed for the electronic management of proposals or grants;
- Easy navigation by process steps;
- Brief descriptions of how to complete tasks;
- Links and references to:
  - Guidance notes, templates;
  - User manuals for the relevant tools;
  - Frequently asked questions.

The Reference documents page includes all of the Horizon 2020 & FP7 reference documents: legal documents, Commission work programmes for research and innovation, model grant agreements, guides for specific actions and horizontal issues. The documents are grouped by category. Also included are reference documents for other EU programmes, such as health and consumer programmes as well as programmes of the COSME and Research Fund for Coal and Steel.

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Projects & Results

The Horizon 2020 Dashboard is a new source of information that also offers powerful analytical functions that will inform programme reporting, impact analysis, feedback to policy-making as well as decisions on future priorities.

All data can be viewed and analysed in aggregated form. In addition, the new tool also offers detailed views on individual calls, topics, countries, organisation types, etc., down to the level of individual projects and beneficiaries.
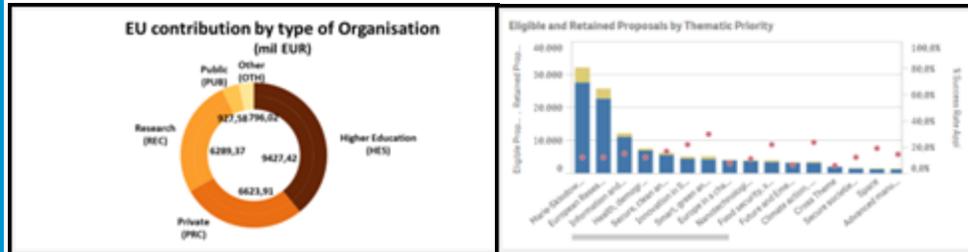
Register of beneficiaries

To participate in a project proposal, an organisation must register with the Commission to obtain a 9-digit **participant identification code (PIC)**. This PIC must be quoted in all correspondence with the Commission. The register contains all beneficiaries participating in EU research and innovation, education, audio-visual and cultural programmes.

Financial viability self-assessment

Before granting funding, the Commission may check an organisation's financial viability, depending on the type of organisation and various other criteria. An organisation can evaluate its own financial viability using the financial self-assessment tool.

SME participation

In this section more information on the role of SMEs in the different Horizon 2020 instruments can be found. To qualify as an SME, an organisation must be engaged in an economic activity and must have:

- Fewer than 250 employees;
- An annual turnover of no more than €50 million and/or an annual balance sheet of no more than €43 million.

Experts

The Commission needs input from external experts given the broad range of research domains covered by the framework programmes. The Commission is seeking to substantially increase the number of specialists from the commercial and business communities working on the programme, in addition to the numbers of researchers and academics.

Upon registering as an independent expert, these individuals may be asked to:

- Evaluate proposals to select the best projects for funding;
- Monitor the progress of ongoing projects;
- Evaluate research and innovation programmes;
- Design research and innovation policies for the EU.

Experts perform their tasks as independent individuals and not as representatives of a company or organisation. The Commission recruits experts from a central database, to which interested parties can register at any time. Registration is open to experts of any nationality, including those outside of the EU and Associated Countries.

Support

National Contact Points

NCPs are national structures established and financed by the governments of the 28 EU Member States and of the states associated to the framework programme. NCPs give personalised support on participation in Horizon 2020 on the spot and in the applicants' own languages. The NCP systems can vary from one country to another, from highly centralised to decentralised networks, and comprise a number of very different actors, from ministries to universities, through research centres and special agencies to private consulting companies. You can search for NCPs in the different countries.

Horizon 2020 Helpdesk

If you have questions about any aspect of European research in general, and the EU Research Framework Programmes in particular, send them to the Horizon 2020 Helpdesk. To do so, use the contact form on their page and select the most relevant subject area fitting to your question.

Enterprise Europe Network

Any company that wants to apply for Horizon 2020 funding or that is already in receipt of funding for an innovation project under the SME instrument is entitled to free support from the Enterprise Europe Network.

Glossary

In the glossary you will find all keywords and definitions related to Horizon 2020.

FAQ

The FAQ section provides answers to the questions most frequently submitted to the Horizon 2020 Helpdesk, IT Helpdesk, Call Coordinators and Horizon 2020 NCPs.

IT Helpdesk

You can address any IT-related problems you may experience using the Participant Portal to the IT Helpdesk.

Other help services

You can contact specific helpdesks for information concerning ethical issues, intellectual property rights (IPR) and standardisation or get advice and networking opportunities from the IGLO group of research and development liaison offices.

Terms and conditions

Terms and conditions of use of the electronic exchange system.

What's new

Publication of news items concerning Horizon 2020.

Participant Portal Application Programming Interfaces (APIs)

This page provides a description of the external interfaces exposed by the Participant Portal for use by third party systems.

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CORDIS
CORDIS is the European Commission's primary public repository and portal for the dissemination of information on all EU-funded research projects and their results in the broadest sense. The website and repository include all public information held by the Commission (project factsheets, publishable reports and deliverables), editorial content to support communication and exploitation (news, events, success stories, magazines, multilingual 'results in brief' for the broader public) and comprehensive links to external sources such as open access publications and websites.

The projects and results service
You can search and access all the European Commission's information concerning the lifecycle of each project: the grant details, funding and participants, the projects' own report summaries, the latest multilingual results in brief and links to specific publications and other documents. CORDIS project data includes Horizon 2020, FP7, FP6, FP5 and earlier programmes going back to 1990.

You can search projects by entering the search terms as free text words or a specific project identifier: project acronym, project reference (grant agreement number), or project RCN (CORDIS record number).

You can search for project results by entering your search terms and selecting a filter option for all results, results in brief, or report summaries.

The European Union Open Data Portal is the single point of access to a growing range of data from the institutions and other bodies of the European Union. Data are free for you to use and reuse for commercial or non-commercial purposes.
The search field on the data tab allows you to search for datasets using plain text or to look into particular fields of the datasets. Two datasets of interest are:
- CORDIS - EU research projects under Horizon 2020 (2014-2020)
- CORDIS - EU research projects under FP7 (2007-2013)

Horizon Europe - the next research and innovation framework programme
The Commission is working on a proposal for the framework programme that will succeed Horizon 2020. This will be done in the context of the EU's proposal for the next 7-year EU budget, the Multi-Annual Financial Framework (MFF). How Horizon Europe is being designed, legal framework, factsheets, reports and timeline can be found here.
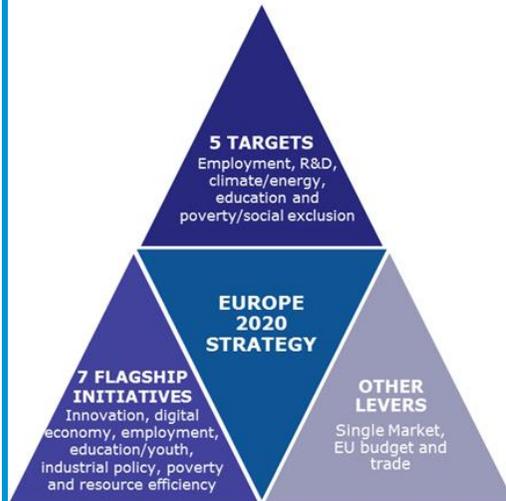
3.1 Policy backgrounds

The Multi-Annual Financial Framework 2014-2020 (MFF) sets out the ceilings for EU expenditures during the 7 years it covers. This works as a prediction of the appropriations made under each heading of EU policy for the annual EU budgets over the period in question. By allocating resources in such a way, the MFF is the first line of EU policy priority-setting, and provides a convenient backdrop for the implementation of policy. The Europe 2020 Strategy (COM[2010] 2020 final, 3/03/2010) is the overarching EU policy document for the 2014-2020 period, putting forward the vision, targets and trajectories for 'smart, sustainable and inclusive growth'. Europe 2020 makes use of seven flagship initiatives to implement its vision, including the flagship 'Innovation Union', with the aim "to improve conditions and access to finance for research and innovation, to ensure that innovative ideas can be turned into products and services that create growth and jobs." Research and innovation, therefore, are at the core of the Europe 2020 Strategy and the Horizon 2020 Framework Programme is a key tool for its implementation. In addition to research and innovation ('smart growth'), Horizon 2020 also has a considerable focus on sustainable development ('sustainable growth'), with at least 60% of the total budget targeted towards sustainability. In SC2, in particular, the strong focus on the whole research-to-innovation cycle, and on the 'interactive innovation' approach, provides tools for a more effective uptake of innovation by the economy and for greater territorial cohesion ('inclusive growth').

Europe is setting course for a resource-efficient and sustainable economy. The goal is a more innovative, low-emissions economy, reconciling the demands placed on sustainable agriculture and fisheries, food security objectives, and the sustainable use of renewable biological resources for industrial purposes, while also ensuring biodiversity and environmental protection.

The Commission works to ensure a coherent approach to the bioeconomy through different programmes and instruments, including the common agricultural policy (CAP), the common fisheries policy (CFP), Horizon 2020, European environmental initiatives, the blue growth initiative for the marine sector and the European Innovation Partnership on Sustainable Agriculture (EIP-AGRI).

Given the multi-dimensional nature of the challenges to be addressed by European policy, several instruments of the European Structural and Investment Funds (ESIF), in coordination with research and innovation funds (e.g., Horizon 2020) and Member State national funds need to be mobilised and coordinated. Although funding for the CAP will come primarily from the European Agricultural Fund for Rural Development (EAFRD) and funding for the CFP from the European Maritime and

5 TARGETS
Employment, R&D, climate/energy, education and poverty/social exclusion

EUROPE 2020 STRATEGY

7 FLAGSHIP INITIATIVES
Innovation, digital economy, employment, education/youth, industrial policy, poverty and resource efficiency

OTHER LEVERS
Single Market, EU budget and trade

Fisheries Fund (EMFF), their deployment in Member States is carried out under the same Common Strategic Framework (CSF), allowing for coordination between all ESIF and alignment with the Europe 2020 Strategy.

The Common Agricultural Policy (CAP)
The CAP was created in 1962 with the objective of establishing a partnership between agriculture and society, and between Europe and its farmers. Its current version has resulted from the fifth reform process, concluded in 2013. It is an important European policy, as measured by budget allocation, capturing roughly 40% of the MFF 2014-2020 appropriations, corresponding to over € 50 billion/year, on average.
The CAP is structured into two pillars:
Pillar 1: Direct payments to farmers constitutes ~75% of the CAP budget and was established as a way to acknowledge and compensate farmers for the provision of public goods. Under CAP 2014-2020, it is structured into a multi-purpose payment system, with seven components (three mandatory, four optional). These include a basic payment per hectare, a 'greening' component (must make up for 30% of each Member State's Pillar 1 funding), a young farmers component, and optional components of redistribution for the first 30 hectares, for areas with natural constraints, particular areas or types of farming and a simplified system for small farmers.
Pillar 2: Rural development policy is the main tool for the implementation of the Europe 2020 Strategy under the CAP. It promotes the uptake of innovation and the development of regionally and environmentally balanced agricultural systems that promote growth and jobs.

The challenge for EU agriculture – and CAP – is "to attain higher levels of production of safe and quality food, while preserving the natural resources that agricultural productivity depends upon."
The publication of the Europe 2020 Strategy preceded and informed the CAP reform process, which assimilated the objectives of 'smart, sustainable and inclusive growth' in the strategy for CAP 2014-2020. This is explicit in the objectives of the Pillar 2, but is also an increasingly important component of Pillar 1, with the provisions for the 'greening' component.

The Common Fisheries Policy (CFP)
The common fisheries policy (CFP) and the integrated maritime policy (IMP) are the two instruments financed through the EMFF. Coordination with other ESIF under the CSF umbrella contributes to their alignment with the Europe 2020 Strategy.
The CFP is the "set of rules for managing European fishing fleets and for conserving fish stocks." Designed to manage a common resource, it aims to ensure that fishing and aquaculture are environmentally, economically and socially sustainable and that they provide a source of healthy food for EU citizens, fostering a dynamic fishing industry and ensuring a fair standard of living for fishing communities.
The CFP was first introduced in the 1970s and, like CAP, it has gone through successive reforms, the latest of which was implemented in 2014. It sets (i) the rules to ensure the sustainability of EU fisheries, (ii) enforcement mechanisms, (iii) support for aquaculture, and (iv) rules for market organisation.

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The CFP determines that fisheries management shall be implemented through a multi-annual ecosystem-based approach, to minimise negative environmental impacts. This objective is also to be achieved by establishing fish stock recovery areas, avoiding unwanted bycatch and eliminating discard, and through a species quota allocation for Member States based on environmental, social and economic factors. The reliance on strong scientific evidence for both domestic and international fishing activities, through bilateral sustainable fishing agreements, underlies the links between CFP/IMP and the research and innovation activities under SC2 of Horizon 2020.
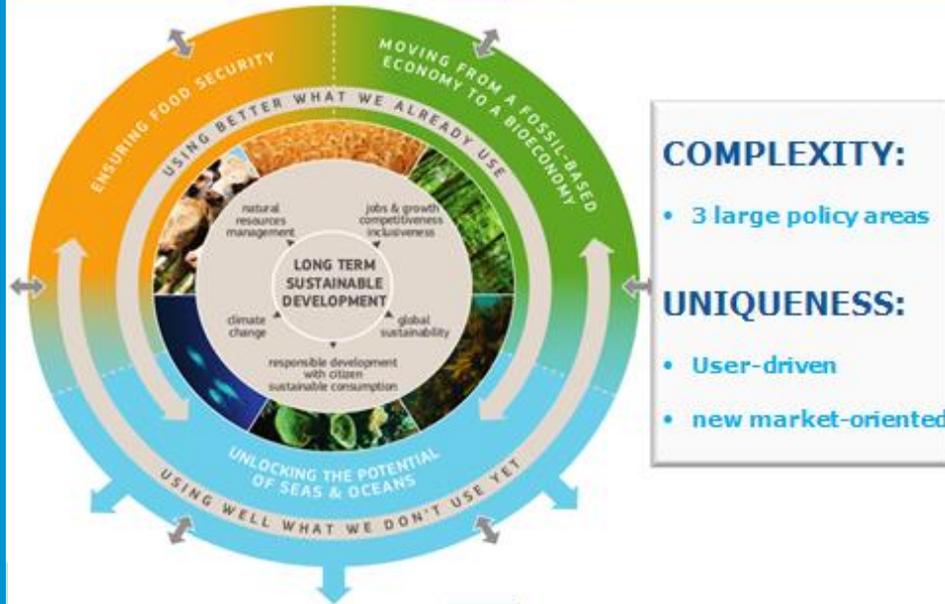
Bioeconomy strategy

The Europe 2020 Strategy identifies bioeconomy as a key element for smart and green growth in Europe. In fact, advancements in bioeconomy research and the uptake of innovations are expected to help Europe improve the management of its renewable biological resources and to open new and diversified markets in food and bio-based products. This in turn will contribute to economic growth and the creation of jobs in rural, coastal and industrial areas, a reduction of fossil fuel dependence and improved economic and environmental sustainability of primary production (agriculture, forestry, fisheries and aquaculture) and processing industries. In this way, bioeconomy can contribute significantly to the objectives of the Europe 2020 flagship initiatives 'Innovation Union' (COM[2010] 546 final, 6/10/2010) and 'A Resource Efficient Europe' (COM[2011] 21 final, 26/01/2011).

The strategy 'Innovating for Sustainable Growth: A Bioeconomy for Europe' (COM[2012] 60 final, 13/02/2012) proposes a comprehensive approach to address the ecological, environmental, energy, food supply and natural resource challenges that Europe and the world are facing. It was launched in March 2012 at the conference 'Bioeconomy in Action', under the auspices of the Danish presidency of the European Union, and gave rise to the Copenhagen Declaration for a Bioeconomy in Action. Under the lead of DG Research and Innovation, the strategy also reflects joint efforts involving other Commission departments, namely DG Agriculture and Rural Development, DG Environment, DG Maritime Affairs and DG Industry and Entrepreneurship.

EU Bioeconomy Strategy

ENSURING FOOD SECURITY · USING BETTER WHAT WE ALREADY USE · MOVING FROM A FOSSIL-BASED ECONOMY TO A BIOECONOMY · UNLOCKING THE POTENTIAL OF SEAS & OCEANS · USING WELL WHAT WE DON'T USE YET

natural resources management · jobs & growth competitiveness inclusiveness · global sustainability · responsible development with citizen sustainable consumption · climate change

LONG TERM SUSTAINABLE DEVELOPMENT

COMPLEXITY:
- 3 large policy areas

UNIQUENESS:
- User-driven
- new market-oriented

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With this strategy, the European Commission is committed to taking action, seeking synergies and respecting complementarities with other policy areas, instruments and funding sources addressing the same objectives, such as the common agricultural policy, common fisheries policy, integrated maritime policy, environmental, industrial, employment, energy and health policies and also through other initiatives such as Horizon 2020. The strategy also calls for a closer collaboration between public and private stakeholders in the Member States in order to develop markets and promote competitiveness in bioeconomy sectors.

The intention behind the bioeconomy strategy is to support a better alignment of EU research and innovation funding with the established priorities of bioeconomy-related policies. The European Innovation Partnerships (EIPs) have a key role in this respect, as well as the public-public partnerships (e.g., Joint Programming Initiatives [JPIs]) and the public-private partnerships in bioeconomy related areas (e.g., Bio-based Industries Joint Undertaking [BBI-JU]). As the bioeconomy provides alternatives to fossil-based products and energy, the bioeconomy strategy is of high relevance to the recently published Circular Economy Package, one of the major EC initiatives taken to realise the Juncker Commission priorities.

The bioeconomy strategy and its action plan inform research and innovation agendas in bioeconomy sectors and contribute to a more coherent policy environment, better connectivity between national, EU and global bioeconomy policies and a more engaged public dialogue.

The bioeconomy strategy is structured around three pillars:

1) Investment in research, innovation and skills

The strategy promotes research and innovation activities to increase EU leadership and investment in the bioeconomy, increase the share of skilled labour in the bioeconomy work force and promote entrepreneurship.

The need to increase public funding for bioeconomy research and innovation has been recognised in the Horizon 2020 programme, with €3.8 billion allocated to the Societal Challenge 2 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy'. Additional support can be found under elements of the Societal Challenges 'Climate action, environment, resource efficiency and raw materials' (SC5), 'Secure, clean and efficient energy' (SC3) and 'Health, demographic change and wellbeing' (SC1). Furthermore, the European Institute of Innovation and Technology (EIT), with its Knowledge and Innovation Communities (KICs) in different areas addresses questions related to the bioeconomy, in particular EIT Food. This is also complemented by research and innovation in

enabling and industrial technologies (biotechnology, nanotechnology and ICT) and the promotion of emerging technologies.

2) Reinforcement of policy interaction and stakeholder engagement
The EU's bioeconomy strategy calls for a more informed dialogue and better interaction and coordination across various policies in place at the EU and Member State level, which will provide a more coherent policy framework and promote investment. This includes: (i) the establishment of a Bioeconomy Panel and encouragement for the creation of similar panels at Member State and regional level, (ii) the launch of a Bioeconomy Observatory at EU level to assess the progress and impact of the bioeconomy in Europe and to inform further policy making, (iii) support for the development of regional and national bioeconomy strategies and (iv) the promotion of researchers, end-users, policy-makers and civil society participation in an open and informed dialogue throughout the research and innovation process of the bioeconomy (e.g., bioeconomy stakeholder conferences).

3) Policy implementation and enhancement of markets in bioeconomy sectors
Enhancing market development and better resource efficiency in the bioeconomy sectors will create additional growth and jobs. The new markets can be established by: (i) developing standards and standardised sustainability assessment methods for bio-based products and food production systems while also supporting demonstration and scale-up activities, (ii) facilitating green procurement for bio-based products by developing specific labels, an initial European product information list and specific training for public procurers, (iii) putting in place incentives

and mutual learning mechanisms for resource efficiency, and (iv) starting negotiations for the establishment of research and innovation focused public-private partnerships for bio-based industries at European level.
The global dimension of the societal challenges the bioeconomy is addressing requires even greater cooperation at European and international level. The bioeconomy strategy aims to advance Europe to a lead role in promoting the transition towards a global bioeconomy.
Several Member States have put in place bioeconomy research programmes and agreed to improve coordination of their research activities through public-public partnering. bioeconomy strategies are already in place in Belgium (Flanders), Denmark, Finland, Germany, Ireland and the Netherlands. On the international stage, Canada, China, South Africa and the US are among the countries with or currently developing their own ambitious strategies (overview of bioeconomy strategies).

Revision of the EU bioeconomy strategy
After five years of activity, the Commission has reviewed the progress made in relation to its bioeconomy strategy and action plan. The strategy promotes the substitution of fossil-based products, and addresses the sustainable supply of bioresources and food security in the context of climate change and global population increase. However, it is now time to step up a gear. That is the main message of the review of the bioeconomy strategy, presented by the European Commission in 2018. The review paves the way for a revision of the strategy, expected to be published some time in 2019.
Carlos Moedas, Commissioner for Research, Science and Innovation, said: "Faced with the current challenges of food security, climate change

and industrial transformation, we have the responsibility to figure out how to best deal with the biological resources we have and how to put them to the best use. In the past five years, the EU has made major progress in this respect. We have taken stock of this progress to make sure that we focus our efforts in the right direction in this diverse and fast-changing part of the economy."

The review shows that the EU has successfully mobilised research and innovation funding in this area. Dedicated EU funding for the bioeconomy has more than doubled; from €1.9 billion in the seventh framework programme (2007-13) to €4.52 billion in its successor, Horizon 2020 (2014-20).

The Commission's public-private partnership with industry – the Bio-Based Industries Joint Undertaking – is a major step towards leveraging private investment for funding. It provides successful examples of how the bioeconomy can help local economies by converting old industrial sites and through the creation of skilled 'green' jobs. For example, the First2Run biorefinery, funded through the EU's partnership with the bio-based industry, shows that it is possible to replace fossil-based products with those made from low input crops or agricultural and forestry waste.

Numerous projects and analytical work show how Europe can radically change its approach to production, consumption, processing and disposal of biological resources. The PROTEIN2FOOD project, alternatively, is developing innovative prototypes of high value protein-enriched food, which will improve food security and human health. And the Commission's Science Advice Mechanism (SAM) is finalising a paper on how to obtain more food from the ocean in a sustainable way, which will inform important upcoming initiatives.

EU Bioeconomy Governance
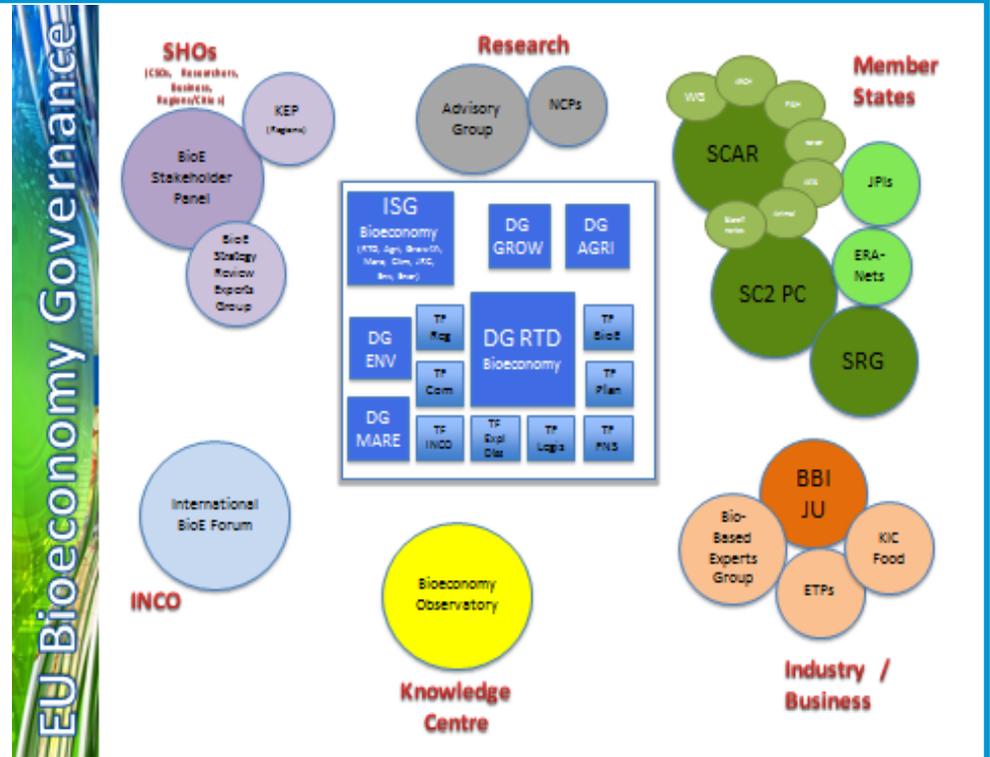
In addition, the review of the bioeconomy strategy concluded that EU Member States and regions increasingly benefit from the opportunities that the bioeconomy offers. However, it also recognised that further mobilisation of investments and a stable regulatory environment are needed to scale-up and roll-out existing and new technologies and demonstrators. The review also highlighted the need for better policy coherence and improved monitoring and assessment of the progress being made.

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Circular economy strategy

The European Commission adopted an ambitious Circular Economy Package, which includes revised legislative proposals on waste to stimulate Europe's transition towards a circular economy which will boost global competitiveness, foster sustainable economic growth and generate new jobs.

The Circular Economy Package consists of an [EU Action Plan for the Circular Economy](#) that establishes a concrete and ambitious programme of action, with measures covering the whole cycle: from production and consumption to waste management and the market for secondary raw materials. The annex to the action plan sets out the timeline when the actions will be completed.

The proposed actions will contribute to 'closing the loop' of product lifecycles through greater recycling and re-use, and bring benefits for both the environment and the economy.

The revised legislative proposals on waste set clear targets for reduction of waste and establish an ambitious and credible long-term path for waste management and recycling. Key elements of the revised waste proposal include:

- A common EU target for recycling 65% of municipal waste by 2030;
- A common EU target for recycling 75% of packaging waste by 2030;
- A binding landfill target to reduce landfill to maximum of 10% of all waste by 2030;
- A ban on landfilling of separately collected waste;
- Promotion of economic instruments to discourage landfilling;

- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- Concrete measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material;
- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g., for packaging, batteries, electric and electronic equipment, vehicles).

The following legislative proposals on waste have been adopted:
- Proposed directive on waste;
- Annex to the proposed directive on waste;
- Proposed directive on packaging waste;
- Annex to the proposed directive on packaging waste;
- Proposed directive on landfill;
- Proposed directive on electrical and electronic waste, on end-of-life vehicles, and batteries and accumulators and waste batteries and accumulators;
- Analytical note on waste management targets;
- Staff working document - Implementation Plan.

The circular economy offers an opportunity to reinvent our economy, making it more sustainable and competitive. This will bring benefits for European businesses, industries, and citizens alike. With this new plan to make Europe's economy cleaner and more competitive, the Commission is delivering ambitious measures to cut resource use, reduce waste and boost recycling.

Blue growth initiative

[Blue growth](#) is the long term strategy to support sustainable growth in the marine and maritime sectors as a whole. Seas and oceans are drivers for the European economy and have great potential for innovation and growth. It is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth.

The 'blue' economy represents roughly 5.4 million jobs and generates a gross added value of almost €500 billion a year. However, further growth is possible in a number of areas which are highlighted within the strategy.

The strategy consists of three components:
1. Develop sectors that have a high potential for sustainable jobs and growth, such as:
   a. aquaculture;
   b. coastal tourism;
   c. marine biotechnology;
   d. ocean energy;
   e. seabed mining.
2. Essential components to provide knowledge, legal certainty and security in the blue economy
   a. marine knowledge to improve access to information about the sea;
   b. maritime spatial planning to ensure an efficient and sustainable management of activities at sea;
   c. integrated maritime surveillance to give authorities a better picture of what is happening at sea.

3. Sea basin strategies to ensure tailor-made measures and to foster cooperation between countries
   a. Adriatic and Ionian Seas;
   b. Arctic Ocean;
   c. Atlantic Ocean;
   d. Baltic Sea;
   e. Black Sea;
   f. Mediterranean Sea;
   g. North Sea.

EU forest strategy

EU forests and other wooded land now cover 155 million ha and 21 million ha respectively. This together means more than 42 % of the EU land area is covered by forest and other wooded land. As a result of afforestation programmes and due to natural regeneration on marginal lands, forest cover in the EU has increased over the past few decades.

There is great diversity of natural forest types, forest coverage, and forest ownership structures in the EU. Forests are one of Europe's most important renewable resources and provide multiple benefits to society and the economy. They are one of Europe's main sources of biodiversity. Forests are a key resource for improving quality of life and job creation, in particular in rural areas, and they protect and provide ecosystem services for the benefit of all citizens.

The new [EU forest strategy](#) was adopted by the European Commission on 20 September 2013. Based on a new, broader approach to forests, the strategy deals with the new challenges forests and the forest sector face at present. It stresses the importance of forests for rural

development, as well as for the environment, for forest-based industries, bioenergy, and in the fight against climate change. In this it underlines the need to follow a holistic approach, bringing together different internal and external forest-policy issues, covering the multiple benefits of forests, and addressing the whole forest value-chain (i.e., the way forest resources are used to generate goods and services).

The strategy also emphasises that forest-linked EU policies should be taken into account in national forest policies. Furthermore, it calls for a forest information system to be set up, for Europe-wide harmonised information on forests to be collected and to integrate diverse information systems and data platforms.

FOOD 2030

Food 2030 – a timely EU research and innovation policy response to recent international policy developments, including the SDGs and COP21 commitments – is built on key food and nutrition security priorities:
- *Nutrition* for sustainable and healthy diets: ensuring that nutritious food and water is available, accessible and affordable for all. It involves reducing hunger and malnutrition, ensuring high levels of food safety and traceability, reducing the incidence of non-communicable diet-related diseases, and helping all citizens and consumers adopt sustainable and healthy diets for good health and well-being.
- *Climate*-smart and environmentally sustainable food systems: building climate-smart food systems able to adapt to a changing climate, contributing to climate change mitigation and conserving limited natural resources. It seeks to support healthy, productive and biologically diverse ecosystems. Ensuring diversity in food systems (including production, processing, distribution and logistics) is a priority, also in terms of cultural and environmental diversity. Natural resources (water, soil, land and sea) must be used sustainably within the planetary boundaries and remain available to future generations.
- *Circularity* and resource efficiency of food systems: implementing resource-efficient circular economy principles across the whole food system while reducing its environmental footprint. The application of a circular approach is necessary to achieve sustainable and resource-efficient food systems and to ensure that food losses and waste are minimised.
- *Innovation* and empowerment of communities: boosting innovation and investment, while empowering communities. A broad innovation ecosystem leading to new business models and value-added products, goods and services, meeting the needs, values and expectations of society in a responsible and ethical way. More and better jobs across the EU, fostering thriving urban, rural and coastal economies and communities. Through closer partnerships with industry and food producers, markets that function in a responsible manner in turn foster fair trade and pricing, inclusiveness and sustainability. Scientific evidence and knowledge from a wide variety of actors underpinning the development and implementation of food and nutrition relevant policies, at all geographic scales (local to global).

Food 2030 was launched after the 2015 Milan World Expo, when Commissioner for Research and Innovation, Carlos Moedas, announced his intention to launch a Food Research Area by World Food Day 2016.

3.2 Cross-cutting issues

Most bio-related topics can be found in SC2 and KET-B, but there are often also relevant topics in other societal challenges like SC1 (Health, demographic change and wellbeing), SC3 (Secure, clean and efficient energy), SC4 (Smart, green and integrated transport) and SC5 (Climate action, environment, resource efficiency and raw materials). Relevant topics can also be found in the Space work programme. Therefore, it is important that you read the different work programmes carefully. The implementation of Horizon 2020 should contribute to cross-cutting issues across all three pillars of Horizon 2020. Such issues are:

• Sustainable development and climate change;
• Bridging the gap from discovery to market application;
• Responsible research and innovation (RRI);
• Social sciences and humanities (SSH);
• International cooperation;
• Inclusion of gender issues;
• Open access and data management;
• Spreading excellence and widening participation.

Five of these cross-cutting issues will be explained in more detail below.

Responsible research and innovation

Responsible research and innovation (RRI) is a cross-cutting issue in Horizon 2020, but also a key action of the 'Science with and for society' objective. This approach anticipates and assesses potential implications and societal expectations regarding research and innovation and should ensure that research and innovation activities are designed to be inclusive and sustainable.

RRI can be defined as, "*a process for better aligning research and innovation with the values, needs and expectations of society. It implies close cooperation between all stakeholders in various strands comprising: science education, definition of research agendas, access to research results and the application of new knowledge in full compliance with gender and ethics considerations.*"

RRI requires that all societal actors, such as researchers, citizens, policy makers, entrepreneurs, NGOs, etc., work together during the whole research and innovation process in order to better align both the process and its outcomes with the expectations of society. It is implemented as a package that includes multi-actor and public engagement in research and innovation; i.e., co-creating the future with citizens and civil society organisations and thus bringing together a wide variety of actors that would not normally interact with one another.

This facilitates easier access to scientific results, and uptake of gender and ethics issues in research and innovation and in formal and informal science education.

Social sciences and humanities

As a cross-cutting issue of broad relevance, social sciences and humanities (SSH) research is fully integrated into each of the general objectives of Horizon 2020. Embedding SSH research across Horizon 2020 is essential to maximise the returns to society from investment in science and technology. Embedding means that SSH can contribute where most needed.

The implementation of the new policy priority of full integration of SSH requires the adoption of a multidimensional approach as a variety of areas and activities need to be targeted:

1. SSH experts need to be included in the Horizon 2020 expert advisory groups (EAGs);

2. SSH experts need to be part of the evaluation panels for topics with SSH dimensions;

3. Work programme topics with SSH dimensions, and projects resulting from these topics with SSH dimensions, need to fully integrate SSH research and SSH researchers (SSH flagged topics).

Topics addressing competitiveness, climate change, energy, food security and public health are complex and multi-faceted and need to be considered across disciplines. The focus in Horizon 2020 on societal challenges rather than on disciplinary fields of research illustrates this new approach. It represents an opportunity for the social sciences and humanities.

It is vital the societal challenges encountered in attempts to ensure food security are understood. Some examples are:

- Technology-driven intensification of farming practices – for example, in aquaculture – is seen by some people as being something that will destroy natural environments and produce unhealthy, substandard food sources;

- Governments can introduce policies that will help ensure food security, but they will struggle to gain the acceptance of citizens and be sustainable in the long-term unless the fears and beliefs surrounding potential technological innovations are known and understood;

- Rural communities could be disrupted by new farming practices; SSH research will be vital to understanding potential social changes and thus help ensure that any transformation of rural communities is positive;

- Cultural aspects of food in European societies need to be researched for a better understanding of consumer preferences, attitudes, needs, behaviour, and lifestyles;

- Discussions of food ethics can promote understanding of the underlying conflicts between the rights of different societal groups, value conflicts between sustainability, and the economic and aesthetic dimensions of agriculture that are important for responsible food and agriculture policies.

International cooperation

Horizon 2020 is open to the world. This means that participants from all over the world, regardless of their place of establishment or residence, can participate in most of the Horizon 2020 calls. Furthermore, in many cases, the EU will fund at least partly the participation of the international partners. In addition, in some parts of Horizon 2020, topics have been flagged as being particularly suitable for international cooperation and consortia are encouraged to include non-EU partners.

Inclusion of gender issues

In Horizon 2020 gender is a cross-cutting issue and is mainstreamed in each of the different parts of the work programme, ensuring a more integrated approach to research and innovation. Three objectives underpin the strategy on gender equality in Horizon 2020:

- Fostering gender balance in research teams, in order to close the gaps in the participation of women;

- Ensuring gender balance in decision-making, in order to reach the target of 40% of the under-represented sex in panels and groups and of 50% in advisory groups;
- Integrating the gender dimension in research and innovation content helps improve the scientific quality and societal relevance of the produced knowledge, technology and/or innovation.

When applying for a grant under Horizon 2020, applicants are required to explore whether and how the gender dimension is relevant to their research. The way sex and/or gender analysis is taken into account in a proposal will be assessed by the evaluators alongside the other criteria highlighted in the proposal template. Addressing the gender issues requirement is even more important when addressing a topic in which gender-related issues are explicitly mentioned in the topic text.

Integrating the gender dimension into research and innovation is an added value in terms of excellence, creativity and business opportunities. It requires researchers to question gender norms and stereotypes, to rethink standards and reference models. It leads to an in-depth understanding of the genders' needs, behaviours and attitudes. It enhances the societal relevance of the knowledge, technologies and innovations produced. It also contributes to the production of goods and services better suited to potential markets.

More information can be found in the publication 'Gendered Innovations: How Gender Analysis Contributes to Research'.

Open access and data management

Open access can be defined as the practice of providing online access to scientific information that is free of charge to the reader. In the context of research, development and innovation, open access typically focuses on access to 'scientific information' or 'research results', which refers to two main categories:

- Peer-reviewed scientific research articles (primarily published in academic journals);
- Research data.

Open access to publications

Under Horizon 2020, each beneficiary must ensure open access to all peer-reviewed scientific publications relating to the project. Beneficiaries are free to choose the open access option most appropriate for them:

- Self-archiving (also referred to as '**green**' open access) means that a published article or the final peer-reviewed manuscript is archived (deposited) in an online repository before, at the time of or after its publication. Repository software usually allows authors to delay access to the article ('embargo period'). If this route is chosen, beneficiaries must ensure open access to the publication within a maximum of six months (twelve months for publications in the social sciences and humanities).
- Open access publishing (also referred to as '**gold**' open access) means that an article is immediately provided in open access mode (on the publisher/journal website). Publishers sometimes charge so called article processing charges (or APCs) to make articles open. Such costs are eligible for reimbursement during the duration of the project as part of the overall project budget. In the case of gold open access publishing, open access must be granted at the latest on the date of publication and a copy must also be deposited in a repository.

Open access to research data
Research data is information (particularly facts or numbers) collected to be examined and considered, and to serve as a basis for reasoning, discussion, or calculation.
Open access to research data refers to the right of third parties to access and reuse digital research data collected under the terms and conditions set out in the Grant Agreement.

Horizon 2020 Open Research Data Pilot and Data Management Plan
In year 3 of Horizon 2020 the Commission launched a flexible pilot for open access to research data. The pilot is now a fixed feature of Horizon 2020 aims to improve and maximise access to and re-use of research data generated by Horizon 2020 projects, taking into account:
- the need to balance openness and protection of scientific information;
- commercialisation and IPR;
- privacy concerns;
- security;
- data management and preservation questions.

In the 2014-16 work programmes, the open research data pilot applied only to selected areas of Horizon 2020 (including certain selected SC2 topics). Under the revised version of the 2017 work programme, the open research data pilot was extended to cover all the thematic areas covered by Horizon 2020.
While this means that open access to research data is now applicable by default within Horizon 2020, the Commission also recognises that there are good reasons to keep some or even all research data generated in a project closed.
Therefore, the Commission provides the option of an opt-out at any stage:
- during the application phase;
- during the grant agreement preparation phase;
- after the signature of the grant agreement.

The pilot does not necessarily apply to *all* data generated or used within a project but primarily to the data needed to validate the results presented in scientific publications. Other data can also be provided by the beneficiaries on a voluntary basis, as outlined in the project data management plan.

In the data management plan the consortium will specify what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, how it will be curated and preserved, and what data will be made open.
The costs associated with open access to research data, including the creation of the data management plan, can be claimed as eligible costs in any Horizon 2020 grant.

3.3 Multi-actor approach
The multi-actor approach is a concept introduced to Horizon 2020 in 2014 for SC2 projects. Knowledge exchange between partners generates new insights and ideas and integrates existing tacit knowledge. This stimulates innovation from all sides and helps to focus the research

agenda on the needs of practitioners. Following such a strategy, proposers succeed in building concrete innovation projects, combining different skills and capacities (practical and scientific).

Things to remember:

- All multi-actor projects are indicated by the following sentence in the description of the topic: "Proposals should fall under the concept of multi-actor approach";
- A clear role for the different actors should be included in the work plan. This work plan should describe all multi-actor actions, from participation in the planning of work and experiments, through execution, to the dissemination of results and the possible demonstration phase;
- Project proposals should illustrate a sufficient quantity and quality of knowledge exchange activities;
- Bear in mind that innovative solutions are more likely to be applied thanks to the cross-fertilisation of ideas between actors, the co-creation and co-ownership of results;
- A multi-actor project needs to take into account:
  a) how the project objectives and planning are targeted to the needs, problems and opportunities of end-users;
  b) the consortium must reflect sufficient involvement of key actors with complementary types of knowledge needed to achieve the project objectives and ensure the results are broadly implemented;
- The innovation in multi-actor approach projects is demand-driven;
- A multi-actor project should result in substantial, readily understandable practical knowledge for broad dissemination.

3.4 Technology readiness levels (TRL)

According to section '1.3 Concept and methodology' of the proposal template for Research and Innovation Actions, Innovation Actions and for proposals submitted under the SME Instrument and the Fast Track to Innovation, applicants are required under the heading '(a) Concept' to: "*Describe the positioning of the project, for example, where it is situated in the spectrum from 'idea to application', or from 'lab to market'. Refer to technology readiness levels where relevant.*"

All proposals submitted under Societal Challenge 2, with the exception of Coordination and Support Actions, therefore, are required to include a statement on the 'positioning' of the project. This statement indicates where the project lies on the gradient between fundamental research and market entry. The 'where relevant' above in relation to technology readiness levels in this case means: where the call text in the work programme pertaining to the topic makes explicit reference to technology readiness levels.

Originally developed and implemented by NASA in 1988, technology readiness levels are an index used to assess the maturity level of a particular technology. Each technology project is evaluated against the parameters set down for each technology level and is then assigned a corresponding rating based on the project's progress.

The European Commission has maintained the nine levels proposed by NASA, with slight amendments to the description of the parameters. These are contained in General Annex G of the Horizon 2020 work programme.

TRL 1 is the lowest and TRL 9 is the highest. An overview of the TRL system applied in Horizon 2020 is presented in the figure.

When a technology is at TRL 1, scientific research is just beginning and the results generated are being translated into future research and development. TRL 2 occurs once the basic principles have been studied and practical applications can be applied to those initial findings. Technology at TRL 2 is very speculative, with little to no experimental proof of concept for the technology. When active research and design begin, and proof of the concept is attained, the technology is elevated to TRL 3. Generally both analytical and laboratory studies are required at this level to see if a technology is viable and ready to proceed further

constructed during TRL 3. Once the proof of concept technology is ready, and the component parts are validated in the laboratory, the technology advances to TRL 4. TRL 5 is a continuation of TRL 4, however, a technology at TRL 5 has undergone more rigorous testing in the laboratory or relevant environment than technology that is only at TRL 4. A technology may advance to TRL 6 once a corresponding fully functional prototype or representational model has been developed. TRL 7 technology requires that the working model or prototype be demonstrated in an operational environment. TRL 8 technology has been tested, is complete and ready for integration into an existing technology or technology system. Once a technology has been proven in an operational environment and is market ready it can be called TRL 9.
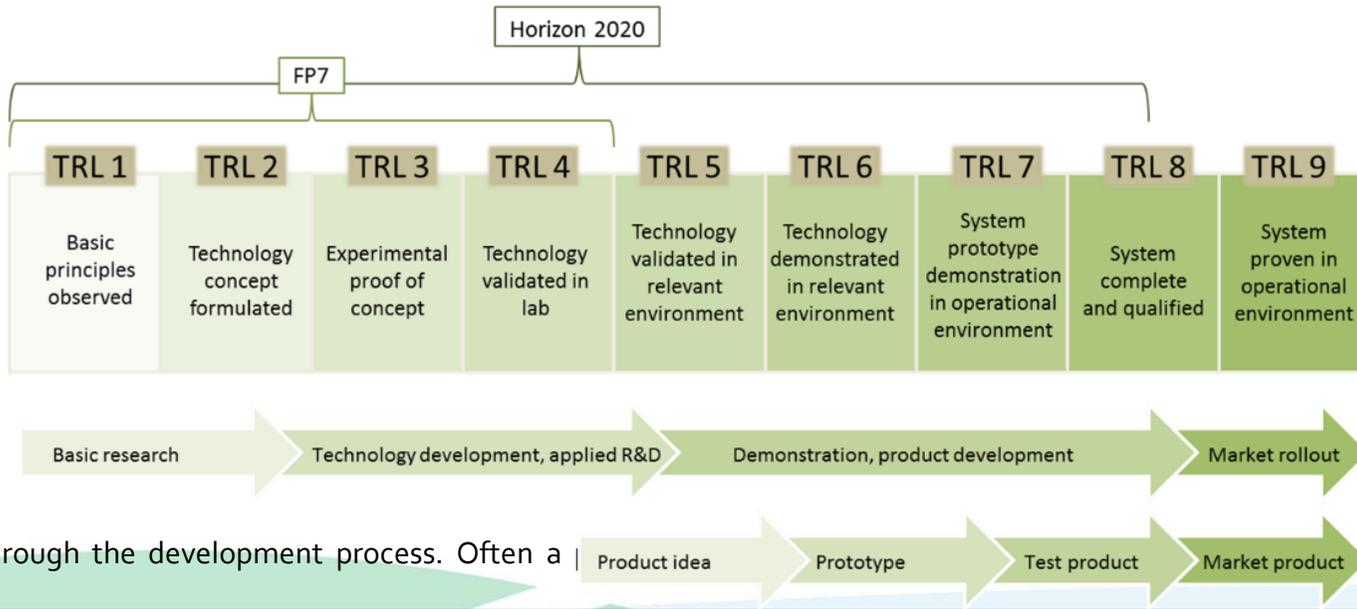
through the development process. Often a

4 Related networks and instruments

In the framework of Horizon 2020, alongside the classic work programmes, a few complementary schemes and instruments are in operation to address all related issues and stakeholders so as to facilitate the successful and efficient implementation of the strategic agenda of Horizon 2020. Some of these schemes and initiatives, and their relevance to Societal Challenge 2 and KET-B, are described below.

4.1 Joint Programming Initiative (JPI)

The 'Joint Programming Initiative' is a relatively new approach that provides additional funding opportunities for stakeholders from states participating in the initiative. The overall aim of the JPI process is to pool national research efforts in order to make better use of Europe's precious public research, development and innovation resources and to tackle common European challenges more effectively in a few key areas. The JPIs target funding organisations and policy makers at the national level (i.e., governmental, regional authorities and research funding agencies that implement national research policies). The countries participating in the JPI agree, on a voluntary basis and in a partnership approach, on common visions and strategic research agendas to address major societal challenges that may not be fully addressed at the national levels. They concentrate efforts around the specific challenge by coordinating their respective national research activities and by pooling financial resources. A strategic research agenda is implemented through the publication of joint transnational calls for proposals. Each member may choose to participate in the activities that adhere most closely to its respective national strategy. The calls and relevant information are published on the official JPI website.

Partners in successful collaborative projects will be funded directly by their respective national funding organisations. Funding will be administered according to the terms and conditions of the national funding organisations responsible, taking into account all other applicable national regulations and legal frameworks.

Currently, there are three JPIs in the SC2 domain:
Agriculture, Food Security and Climate Change (FACCE JPI)
This JPI brings together 21 states that are committed to building an integrated European research area addressing the linked challenges of sustainable agriculture, food security and the impacts of climate change. The five key challenges of this initiative, as defined in the strategic research agenda, are:
a. Sustainable food security under climate change;
b. Environmentally sustainable growth and intensification of agriculture;
c. Assessing and reducing trade-offs between food supply, biodiversity and ecosystem services;
d. Adaptation to climate change;
e. Mitigation.

A Healthy Diet for a Healthy Life (JPI HDHL)
The JPI HDHL provides a roadmap for harmonised and structured research efforts in the area of food, nutrition, health and physical activity, and offers defined priorities to reach the stated goals. The following three key interacting research areas were identified and are described in the strategic research agenda:

a. Determinants of diet and physical activity;
b. Diet and food production;
c. Diet-related chronic diseases.

JPI Healthy and Productive Seas and Oceans (JPI Oceans)

The goals and objectives of JPI Oceans address the intersections between the marine environment, climate change and the maritime economy enabled by observations, infrastructure, technologies and human capacities. The goals of JPI Oceans are to:

• Enable the advent of a knowledge-based maritime economy, maximising its value in a sustainable way;
• Ensure the good environmental status of the seas and to optimise the planning of activities in the marine space;
• Optimise the response to climate change and mitigate human impacts on the marine environment.

4.2 ERA-NET

The ERA-NET instrument under Horizon 2020 is designed to support public-public partnerships in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as topping up of single joint calls and of actions of a transnational nature.

The ERA-NET under Horizon 2020 merges the former ERA-NET and ERA-NET Plus into a single instrument with the central and compulsory element of implementing one substantial call with top-up funding from the Commission. The focus of ERA-NETs is therefore shifting from the funding of networks to the top-up funding of single joint calls for transnational research and innovation in selected areas with high European added value and relevance for Horizon 2020.

The ERA-NET scheme aims to increase substantially the share of funding that Member States dedicate jointly to challenge-driven research and innovation agendas. The EU contribution is limited to a maximum of 33% of the total eligible costs of the action (i.e. costs for support for or implementation of transnational projects) and the duration of the actions should not be longer than 5 years. The EU contribution is limited to one call per grant agreement. The EC funding may be used to finance transnational research projects but also as a means to cover (partially) the preparation and management of additional joint activities to be performed by the consortium with the aim of increasing coordination of national/regional programmes.

The PLATFORM of bioeconomy ERA-NETs was initiated to bring together European Research Area Networks (ERA-NETs) and other relevant public-to-public (P2P) networks in the bioeconomy: food, agriculture, aquaculture, fisheries, forestry, climate, biodiversity and biotechnologies. PLATFORM established a forum for funders and programme managers and since 2012 it has played a central role in facilitating and improving the coherence between the P2P networks active in the bioeconomy.

4.3 European Institute of Innovation and Technology (EIT)

Created in 2008, the European Institute of Innovation and Technology (EIT) is a unique EU initiative that boosts innovation and entrepreneurship across Europe with one simple idea: through diversity, there is strength. It supports the development of dynamic pan-European partnerships between leading universities, research labs and companies.

Together, they develop innovative products and services, start new companies, and train a new generation of entrepreneurs. They bring ideas to market and turn students into entrepreneurs. These partnerships are known as EIT Innovation Communities. There are currently six Innovation Communities and each focuses on a different societal challenge: EIT Climate-KIC, EIT Digital, EIT InnoEnergy, EIT Health, EIT Raw Materials and EIT Food.

EIT Food (addressing sustainable supply chains from resources to consumers) is a pan-European consortium that focuses on entrepreneurship and innovation in the food sector. The members of the EIT Food community are world-class players in the international food domain: over 50 partners from leading businesses, research centres and universities across 13 countries.

EIT Food has six strategic objectives:

1. Overcome low consumer trust: support Europeans in the transition towards a smart food system that is inclusive and trusted;

2. Create consumer valued food for healthier nutrition: enable individuals to make informed and affordable personal nutrition choices;

3. Build a consumer-centric connected food system: develop a digital food supply network with consumers and industry as equal partners;

4. Enhance sustainability: develop solutions to transform the traditional 'produce-use-dispose' model to a circular bioeconomy;

5. Educate to engage, innovate and advance: provide 'food system' skills for students, entrepreneurs and professionals through advanced training programmes and open online courses, and

6. Catalyse food entrepreneurship and innovation: foster innovation at all stages of business creation.

4.4 COST

The European Cooperation in Science and Technology (COST) is Europe's longest-running intergovernmental framework for cooperation in science and technology. Founded in 1971, COST holds a successful history of funding science and technology networks for over 40 years, offering scientists the opportunity to embark upon bottom-up, multidisciplinary cooperation across all science and technology domains. Also known as COST Actions, these science and technology networks allow scientists to grow their ideas by sharing them with their peers. This gives impetus to their research, career and innovation. Researchers, engineers and scholars from both public and private sectors can set up

COST Actions with a funding period of 4 years. The funding covers networking activities such as meetings (e.g., travel, subsistence, local organiser support), conferences, workshops, short-term scientific exchanges, training schools, publications and dissemination activities. COST does not fund research.

4.5 European Technology Platforms (ETPs)
The European technology platforms (ETPs) are working groups or fora. They are made of industry and research partners. Each forum focuses on its own specific domain. The ETPs are among the important channels funnelling external advice into the programming and implementation of Horizon 2020. Each ETP develops an industry-focused strategic research and innovation agenda (including technology roadmaps and implementation plans), encourages industry participation in Horizon 2020 and identifies opportunities for international cooperation. As a member of such a forum, the individual entity has an opportunity to take part in consultations and decision making processes that are eventually reflected in the contents of the respective Horizon 2020 work programmes. The relations between the ETPs and the European Commission are well established. A central contact point within DG Research and Innovation is responsible for the coordination of the ETPs. From the ETP side, there is a dedicated contact point for the relevant Directorate General. ETPs are independent and self-financing entities. Relevant ETPs in the SC2 domain are:
1. European Aquaculture Technology and Innovation Platform (EATIP)
2. European Technology Platform for Global Animal Health
3. Farm Animal Breeding & Reproduction Technology Platform (FABRETP)
4. Food for Life
5. Forest-Based Sector Technology Platform (FTP)
6. Plants for the Future
7. TP Organics

4.6 EIP-AGRI
In general terms, the European Innovation Partnerships (EIPs) help to achieve the aim of enhancing European competitiveness and to tackle societal challenges through research and innovation. The EIP on 'Agricultural Productivity and Sustainability' (EIP-AGRI) was established in 2012 and represents a new approach to advancing innovation by linking existing policies and using existing funding instruments. The EIP-AGRI is implemented and funded through two existing EU policies:
- The rural development policy (through 'operational groups', see below);
- Horizon 2020 (through 'thematic networks' and 'multi-actor projects', refer to chapter 2.2.1).

Focus groups
EIP-AGRI focus groups are temporary groups bringing together several experts, including farmers or foresters, advisers, researchers and agri-business representatives. They collect and summarise knowledge on best practices in a specific field, listing problems as well as opportunities. Each

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group presents their findings and recommendations in a focus group report, which is made available through the EIP-AGRI Network. Calls for EIP-AGRI focus groups are published and also announced in the EIP-AGRI e-newsletter. Each call is made for a different EIP-AGRI focus group, on a specific theme.

Operational groups
Operational groups consist of several partners from a wide variety of practical and scientific backgrounds (e.g., farming, agri-business, science and others). They share a common interest in a specific, practical innovation project funded by the EU rural development policy, which each Member State or region develops. The types of projects or areas of action for operational groups can be very broad, but the project must contribute to the EIP-AGRI objective of promoting agricultural innovation. The project could target the development of new products, practices, processes and technologies in the agriculture, food and forestry sectors, including the testing and adaptation of technologies and processes in specific geographic and environmental contexts.
The EIP-AGRI Service Point provides information on questions such as funding opportunities, upcoming events organised by EIP-AGRI, information on operational groups and many other issues related to EIP-AGRI.

EIP-AGRI brings together innovation actors (farmers, advisors, researchers, businesses, NGOs, etc.) and it helps to build bridges between research and practice by providing them with a forum in which they can cooperate in order to address barriers hindering innovation. The aim of this partnership is to foster a competitive and sustainable agriculture and forestry sector that 'achieves more from less'. It contributes to ensuring a steady supply of food, feed and biomaterials, and to the sustainable management of the essential natural resources on which farming and forestry depend, working in harmony with the environment.

4.7 Eurostars
Eurostars is a joint programme co-funded from the national budgets of 36 Eurostars and by the European Union through Horizon 2020. In the 2014-2020 period, it has a total public budget of €1.14 billion.
If you are a small company in need of public funding for your innovative idea, then Eurostars has been carefully developed to meet your specific needs. With its bottom-up approach, it stimulates international collaborative research and innovation projects that will be rapidly commercialised.

Joining Eurostars will enable companies to:
•	Turn an idea into a product and commercialise it;
•	Combine and share expertise and benefit from working beyond national borders;
•	Grow faster.

Eligibility criteria
The main eligibility criteria Eurostars applicants will need to follow are:
•	Research-performing SMEs can apply for funding under Eurostars. Other SMEs, research institutes, universities and large enterprises may also participate but the project leader must be an R&D-performing SME from a Eurostars country;

- Eurostars is open to all projects in all technology areas and market fields, but projects must have a civilian purpose;
- The consortium must include at least two partners independent from each other and established in at least two different Eurostars countries. Organisations from any other country may participate (as a third country), but only if two Eurostars countries are already in the project. Subcontractors are not considered as project partners;
- The project must be completed in 36 months or less. The Eurostars project market introduction of the project results should be within 24 months of the completion of the project.

You can find all of eligibility rules in the guidelines.

Funding details
Eurostars adopts a decentralised funding procedure. As such, participants do not receive funding directly from the EUREKA Secretariat or the EU. All funding to participants in approved projects is managed by their respective funding body, according to national funding rules and procedures.
If you are interested in joining Eurostars your first step is to contact your National Project Coordinators. They will help you prepare your application or even find a project partner.

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5 Where to find partners

Any natural or legal persons (e.g., any company, big or small, research organisations, universities, non-governmental organisations, etc.) regardless of their place of establishment or residence can apply for Horizon 2020 projects. They must possess the operational and financial viability to carry out the research tasks that they propose. Most of the Horizon 2020 themes including the societal challenges support collaborative research projects where at least three organisations from different countries form a consortium. This means that any legal entity planning to submit a proposal under Horizon 2020 should find partners who are complementary to its own expertise. There are a number of partner search services provided by NCPs, CORDIS and other entities.

5.1 Participant Portal

To find experienced partners with past or ongoing projects, or to browse the database of registered organisations, potential applicants should visit the Partner Search page of the Participant Portal. There they can search by keyword, geographical area, funding type, etc. Search results include complete organisation profiles with lists of funded projects and the possibility to contact representatives.

Having selected an area of interest via the topic search, potential applicants may publish your offer/interest for one or more of the open/forthcoming topics of a call on the Participant Portal.

5.2 CORDIS

CORDIS is the European Commission's primary public repository and portal to disseminate information on all EU-funded research projects and their results. One of the facilities provided by CORDIS is the partner search service. You can direct your clients to register in this database and upload profile forms/partnership requests. Via CORDIS it is possible to access more than 10,000 partner profiles and many partnership requests on Horizon 2020 calls.

5.3 Enterprise Europe Network

Enterprise Europe Network (EEN) is a business support network, initiated by the European Commission, promoting competitiveness and innovation at local level via its 600 member organisations present in over 50 countries. It offers professional support services to bridge the gap between research and the market by facilitating transnational business-business and business-academia innovation partnerships across Europe, Asia and the Americas. EEN helps companies, especially SMEs, find international business partners, source new technologies, access EU funding and find business applications for a new technology.

EEN publishes an extensive number of innovation and technology profiles from international companies and research organisations to help identify suitable partners for bilateral business, innovation and technology cooperation.

The database has the following types of profiles:

• Research and technology offers to further develop an existing technology;

- Research and technology requests to complement a product in the development stages;
- Research and development partner searches to participate in funded projects.

In order to support researchers in their search finding appropriate partners, the EEN database is updated with new profiles on a weekly basis. All profiles are published anonymously. Researchers can express their interest in collaboration by filling in and sending the expression of interest form to their local EEN office, who will establish the contact. The database is also a simple way of following the development of technologies and trends.

5.4 Other
EIP Agri meeting point
On the website of EIP Agri you can find the meeting point. This meeting point brings **people**, ideas and resources together to catalyse innovation in agriculture.

Bio-based Industries Joint Undertaking partnering platform
The BBI JU partnering platform is an essential tool to identify and to cooperate with European stakeholders of the annual BBI JU calls for proposals. To create and search for profiles users must register. The BBI JU partnering platform includes comprehensive information about BBI JU calls and provides detailed information on the application process. It is possible to upload partnering profiles of European stakeholder organisations to the database and to communicate directly with other candidates interested in the same topic. It is also possible to arrange online meetings through the platform.

NCP networks
Ideal-ist (ICT NCP network)
The partner search tool was developed by the ICT NCPs network, but the partner profiles are not limited only to ICT. The service includes advice on creating your profile by your local NCP and there is a quality control process in place for all data published.

NMPTeAm3 (NMP NCP network)
The web service is strictly focused on the open calls for proposals within the Horizon 20202 Key Enabling Technologies Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing, and under related actions like FET open, ERA-NET such as SIINN and M-ERA.NET and inducement prizes (Horizon Prize on materials for clean air).

Cosmos 2020 (Space NCP network)
This partner search tool seeks to provide support identifying possible project partners within Space calls.

C-Energy 2020 (Energy NCP network)
The purpose of the partner search tool is to offer a comprehensive and easy to use web-based tool that supports the building of consortia for promising proposals that target the open calls under the Energy work programme.

ETNA2020 (Transport NCP network)
The partner search tool is dedicated to the project proposals to be submitted under the Smart, Green and Integrated Transport work programme.

NCPs CaRE (Environment NCP network)
This partnering tool supports potential applicants for the work programme of the Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' in finding partners and building a consortium for a project proposal.

Infodays
Every year the European Commission is holding an infoday for potential applicants to the calls under Horizon 2020 Societal Challenge 2. Registration for the event is compulsory and free of charge. All sessions are webstreamed and recorded, and presentations are published online after the event. This yearly event is a nice opportunity for applicants to get to know more about the calls and to meet potential partners.

The SC2 Infoday will be complemented by a brokerage event organised by the BioHorizon project. The brokerage events support applicants seeking the right partners to participate in the upcoming calls. Following a general introduction to the topics and some information on aspects to consider when building a consortium, the main part of the event comprises a series of bilateral meetings between individuals interested in the same call topics. Following successful registration for the event, participants can pre-arrange these bilateral meetings automatically by means of a sophisticated, user-friendly matchmaking tool. With this tool users can select their desired discussion partners based on the profiles and research interests input into the system by participants themselves.

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