

Public and Private Funding Opportunities



Grant Agreement Number: 723633

Project Acronym: FUTURING

Project Title: "Futuring European Industry"

Website: www.futuring-project.eu

Document title	Public and Private Funding Opportunities
Deliverable type	Document
Date	31-12-2017
Dissemination Level	Public
Lead beneficiary	INESC TEC
Involved partners	CEA, COTEC, LMS, TECNALIA
Version	1.0



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723633

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List of Acronyms/ Abbreviations used in this document

Acronym/ Abbreviation	Definition
AC	Associated Countries
BBI	Bio-Based Industries
CDE	Centre for Defense Enterprise (UK)
CEF	Connecting Europe Facility
cPPP	Contractual Public Private Partnership
CRM	Critical Raw Materials
CSA	Coordination and Support Action
E2BA	Energy Efficient Buildings Association
EC	European Commission
ECS	Electronic Components and Systems
ECSEL	Electronic Components and Systems for European Leadership
EeB	Energy-Efficient Buildings
EEN	Europe Enterprise Network
EFSD	European Funds for Strategic Investment
EGVI	European Green Vehicles Initiative
EGVIA	European Green Vehicles Initiative Association
EIB	Europe Investment Bank
EIC	Europe Innovation Council
EIF	European Investment Fund
EIP	European Innovation Partnership
ERA	European Research Agenda
ERC	European Research Council
ESF	European Social Fund

ESIF	European Structural and Investment Funds
ETC	European Territorial Co-operation
ETP	European Technology Platform
EU	European Union
FET	Future and Emerging Technologies
FI	Financial Instruments
FTI	Fast Track to Innovation
GDP	Gross Domestic Product
GNI	Gross National Income
H2020	Horizon 2020
IA	Innovation Action
ICT	Information and Communication Technologies
IPR	Intellectual Property Rights
JTI	Joint Technology Initiative
KET	Key Enabling Technology
KIC	Knowledge and Innovation Communities
LEIT	Leadership in Enabling and Industrial Technologies
MS	Member States
NCP	National Contact Points
NMBP	Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing, and Biotechnology
PCI	Projects of Common Interest
PPP	Public and Private Partnerships
RIA	Research and Innovation Action
R&D	Research and Development
R&D&I	Research, Development and Innovation

RTO	Research and Technology Organization
SIRA	Strategic Innovation and Research Agenda
SPIRE	Sustainable Process Industry through Resource and Energy Efficiency
SRA	Strategic Research Agenda
STC	Specific Territorial Characteristics
TRL	Technology Readiness Level
UN	United Nations
WP	Work Package

1 Executive Summary

This document, which is the Deliverable D3.4 for FUTURING Task T3.4 – Public and Private Funding Opportunities, aims at providing a **comprehensive identification and analysis of public and private funding and financing mechanisms available in Europe to support the innovation cycle** (R&D&I activities), in the **manufacturing and production technologies domain**, with a special focus on **circular economy**.

The scope of this document is to present concise, accurate and easy to consult information on funding and financing opportunities currently available at a European level, as well as at a National level, in countries where the FUTURING consortium is present (Belgium, France, Germany, Greece, Italy, Poland, Portugal, Spain, The Netherlands, The United Kingdom), responding to the needs of the Research Community and Public and Private Entities. This Deliverable is a tool for providing the key information available to all of those interested in EU funding Programmes as well as EU Members National and Regional Programmes specifically in the advanced manufacturing and production technologies domains, during the period of 2018-2020.

A general overview of the **financing needs** throughout the **innovation cycle** is provided at the beginning of the document. Even though the main goal of this Task is mainly focused on R&D&I activities, this Deliverable also references financing mechanisms that support later stages of the innovation cycle, in order to provide a more comprehensive approach.

Several funding and financing mechanisms are presented and analysed in detail, including **European Programmes** [Horizon 2020, with emphasis on **Public and Private Partnerships (PPP)**, **COSME**, **Financial Support to Third Parties** and **The European Institute of Innovation and Technology (EIT); Eureka; Interreg; Europe Investment Bank (EIB)**] and **National and Regional Programmes** in the scope of **FUTURING Countries and Regions**. For each considered Programme, examples of open calls relevant to address the theme of advanced manufacturing and production technologies are provided, including links for an easy access.

The document closes with conclusions deriving from the extensive EU and National Programmes identification and investigation, addressing funding gaps, barriers and limitations, and recommendations.

The conducted analysis made it possible to conclude that at a **European level, Horizon 2020** is the broadest Programme covering advanced manufacturing and production technologies, as well as circular economy, identified as a strategic area for future manufacturing. The Work Programme 2018-2020 represents an investment of approximately **€30 billion** and includes a new feature – measures to support market-creating innovation and highly integrated activities called **Focus Areas**, which have been designed around priorities that are fundamental for the future of advanced manufacturing: “A low-carbon, climate resilient future” (with a €3,3 billion budget); “**Circular Economy**” (**€941 million**); “Digitising and transforming European industry and services” (€1,7 billion); “Security Union” (€1 billion).

The Horizon 2020 Work Programme also comprehends **Financial Support to Third Parties or Cascade Funding** (with **€777 million** to be distributed among third parties) which can be used to fund the implementation of technology in SMEs; the **EIT (Europe Institute of Innovation and Technology)**, with an allocated budget of **€2.4 billion** during the 2014-2020 period, that will have a 2018 Innovation Community call for Manufacturing; and **COSME**, the EU programme for the competitiveness of enterprises and SMEs, which plays a crucial role in providing access to finance for SMEs, with a **€2.3 billion** budget for the period of 2014-2020.

Public and Private Partnerships (PPP), also under Horizon 2020, are crucial for advanced manufacturing and production technologies projects. The **SPIRE (Sustainable Process Industries and Resource Efficiency)** and **FoF (Factories of the Future)** initiatives accommodate topics under the Circular Economy Focus Area, as well as other relevant topics for advanced manufacturing.

EUREKA Network Programmes and **Interreg Europe Programmes** are targeted at SMEs and regional development, encompassing research, technology development, innovation, environment and resource efficiency.

Regarding **private funding**, The **EIB Group** (the European Investment Bank and the European Investment Fund) plays a fundamental role in financing SMEs, being one of its top priorities, among Innovation and Skills and Climate Action and Environment. The EIB conducts an initiative in the **circular economy** domain, since it supports all EIB priorities, by providing finance and advisory for CE projects. **EFSI (European Funds for Strategic Investment)**, a joint initiative between the EIB and the European Commission, mobilises private investment in projects which are strategically important for the EU, such as advanced manufacturing and production technologies projects.

At **National and Regional levels**, Programmes of the **European Structural and Investment Funds (ESIF)** support the EU 2020 strategy for smart, sustainable and inclusive growth. With an estimated budget of **€450 billion**, these programmes enable Member States and Regions to fully exploit their potential to achieve the 2020 goal, while ensuring territorial cohesion.

National and Regional funds, which are different for each EU country, as they depend on National budgets, can be used to fund National and Regional projects, as well as to conduct interregional cooperation initiatives under European Programmes such as **EUREKA and INTERREG**.

Combining public funding and private financing, considering their characteristics, advantages and disadvantages, is a **crucial factor for conducting an initiative in the advanced manufacturing domain**. **Public funds** play an important role during **experimental and applied research (TRLs1-5)**, since these phases require **high investments** and hold a **significant risk**. Public funds generally provide large monetary contributions and are designed to support strategic activities. The downside of this type of funding is the heavy bureaucratic processes associated and long lead times. For **later stages of the innovation lifecycle**, **private funds** are more appropriate, since they usually encompass less administrative workload and are **more efficient and leaner**, even though the amounts provided are **lower** than the amounts available in private funding.

The identified funding gaps, barriers and limitations were classified as **critical** and **accessory**. While **critical gaps** are those who can compromise the strategic goals of future advanced manufacturing and production technologies initiatives, **accessory barriers and limitations** are related to administrative processes and level of dissemination.

The **critical funding gaps** are essentially concerned with **insufficient public and private funding** available, especially in the **circular economy** domain, which is a strategic area for advanced manufacturing. From the conducted analysis, it was possible to conclude that the **EIB is the only relevant public actor with a lending instrument at European level**, since private financing by other European parties (ex.: banks) is generally insufficient and difficult to obtain. Despite the critical role of the EIB, its **current EIB instruments do not address the specific challenges of circular economy**. The EIB finances mostly projects who meet minimum size requirements and are economically viable and bankable, which means that CE projects conducted by SMEs usually do not meet these requirements, making this type of funding inaccessible for most SMEs. In the public funding domain, there is **insufficient funding and topics for circular economy initiatives under Horizon 2020**. Funding for the Horizon 2020 Circular Economy Focus Area is low compared to other Focus Areas. It was also identified that circular economy topics lack initiatives related to **product design**, focusing exclusively on resource efficiency and later stages of product lifecycle such as retrofitting, remanufacturing, refurbishment and recycling. **Circular business models** are also not covered under this Programme. At a National and Regional level, there are **differences between funding and financing instruments in European Countries**. While the majority of European countries have CE and advanced manufacturing strategies under their National programmes, there are differences between the budgets.

The **accessory barriers and limitations** include complex rules of public funds and high resource-consuming administrative processes, which have an aggravated impact on SMEs since they have limited internal resources, general lack of knowledge regarding funding possibilities by industry, and misalignment between European, National and Regional Programmes.

The identified funding gaps, barriers and limitations enabled the production of a series of **recommendations** for improving framework conditions for advanced manufacturing and production technology innovation initiatives, with a special focus on circular economy.

The first recommendation is to **increase funding and financing instruments diversity under Horizon 2020, with focus on SMEs and circular economy**. By devising **Financial Support to Third Parties calls in circular economy**, there would be conditions for the creation of high-quality demonstration environments and pilots for the implementation of advanced manufacturing and circular economy solutions in SMEs. The creation of a **Public and Private Partnership in Circular Economy** and the **increase of investment in circular economy** under European Programmes, while covering a **wider range of topics** related to this area, such as **product design, business models** and **industrial symbiosis**, is seen as a fundamental measure. While actions focused on the supply side of circular economy are very relevant, they are not sufficient to reach a successful implementation of circular economy. **Financial measures to support the consumption/ use of circular economy products and services** are equally important and therefore should be considered.

Due to the lack of **private funding in circular economy projects**, the creation of **alternative financial instruments**, such as crowd-funding, social impact bonds and equity in people should be considered. These examples could be used to create funding alternatives in larger-scale financing. Additionally, more **differentiated risk assessment methods** which take into account the benefits of a circular economy should be developed and adopted by financial organizations, using metrics and indicators suited for circular business models, instead of traditional assessment methods designed for linear models.

A **one-stop shop for applicants** or interested parties in advanced manufacturing and circular economy projects would help selecting and identifying the most suitable funding and financing programmes and the best way to combine them, removing barriers regarding timings, lack of knowledge and misinformation.

Finally, the transition to a circular economy is only possible based on an **integrated and systemic approach**, in which all the involved stakeholders (RTOs, SMEs and large organizations, policy makers, financial institutions, among others) engage proactively. **Funding is also required beyond production and technology on a systems level.**

Despite the existence of the referred funding gaps and barriers, the **diversified nature of funding and financing options** currently available to support advanced manufacturing projects, including public Programmes and private Products; as well as European, National and Regional initiatives, make it possible to achieve a considerably **wide coverage of the innovation cycle**. These efforts play a fundamental role in supporting organizations to accomplish their mission of developing and implementing concepts that can be materialized in innovative technological products brought to the market, creating economic value.

2 Introduction

Financing plays a critical role in supporting innovation activities conducted by organizations of different nature (SMEs, RTOs, large companies, start-up companies, Universities) during the innovation cycle.

Access to finance is a key driver in the creation, survival and growth process of organizations, especially small and innovative organizations. Besides being important for organizations activities, access to finance can subsequently foster economic growth and positively influence innovation, which on its turn also has a positive impact on economic growth. The correlation of these two variables has placed innovation at the heart of Europe 2020 Strategy¹.

Promoting R&D activities is the main goal of the EU 2020 Strategy in order to achieve an R&D spending of at least 3% of the GDP². The Innovation Union is one of the seven flagship initiatives of the EU 2020 Strategy, which aims at improving access to finance for R&D; to get innovative ideas to market; to ensure growth and jobs. Despite the importance of promoting access to finance for R&D activities, which is more difficult to obtain due to its risk, demonstration and pilot production activities, closer to the market, are also critical in terms of financing needs, since the capital intensity is higher.

This Deliverable provides an overview of funding and financing mechanisms designed to support the innovation cycle in the field of advanced manufacturing and production technologies. Each funding and financing instrument considered relevant to address the advanced manufacturing scope is categorized and described in detail. Some examples are also provided, as well as links for more information.

The document starts by presenting the financing needs during the innovation cycle, throughout experimental research, applied research and technology implementation, in Chapter 3 – The Innovation Lifecycle.

In Chapter 4 – Main Types of Funding and Financing, the main types of financing, including public funding, private financing and combined financing (public and private) are firstly defined. Funding and financing sources are classified in public, private and combined. The term funding is used in the scope of public Programmes, where no repayment is expected, while the term financing is used to describe circumstances where future repayment is required along with interest or other financial charges (loans). Then, an overview the most popular financing and funding mechanisms to support the innovation cycle available at European and National levels, in the regions where the FUTURING consortium is present (Belgium, France, Germany, Greece, Italy, Poland, Portugal, Spain, The Netherlands, The United Kingdom), is presented. The combination of these mechanisms is analysed relating the different phases of the innovation cycle, as well as the characteristics of public and private financing and their synergies.

Chapter 5 – Examples of Funding and Financing Mechanisms presents examples of funding and financing instruments aiming at supporting activities within the innovation cycle, in the scope of

¹ <http://www.solvay.edu/sites/upload/files/WP016-2015-4.pdf>

² http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_R%26D_and_innovation

advanced manufacturing and production technologies. The instruments include open or forthcoming calls for European Programmes – Horizon 2020, including PPP, COSME, Financial Support to Third Parties and EIT; Eureka; Interreg; EIB; as well as National Programmes within each FUTURING region. This Chapter concludes with examples of the synergies of combined funding as well as an example of how EIB Products can be used to finance circular economy projects.

The document is closed with the main conclusions deriving from this work, in Chapter 6 – Conclusions, including funding gaps, barriers and limitations and recommendations. This Chapter starts with a general analysis of the financial instruments mentioned throughout the document. Then, critical and accessory funding gaps, barriers and limitations are explored. Finally, in the last section, a series of recommendations to overcome funding gaps, barriers and limitations is suggested.

3 The Innovation Lifecycle

As defined by the European Commission³, TRLs are indicators of the maturity level of particular technologies. This measurement system provides a common understanding of technology status and addresses the entire innovation chain. There are nine TRLs; TRL 1 being the lowest and TRL 9 the highest. The definition of TRLs, according to the European Commission, is shown in Table 1 – Definition of TRLs.

Table 1 – Definition of TRLs

TRL 1	Basic principles observed
TRL 2	Technology concept formulated
TRL 3	Experimental proof of concept
TRL 4	Technology validated in lab
TRL 5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7	System prototype demonstration in operational environment
TRL 8	System complete and qualified
TRL 9	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Figure 1 – Technology Innovation Lifecycle shows the technology innovation lifecycle, and how it maps with TRLs.

³ <https://ec.europa.eu/research/participants/portal/desktop/en/support/faqs/faq-2890.html>

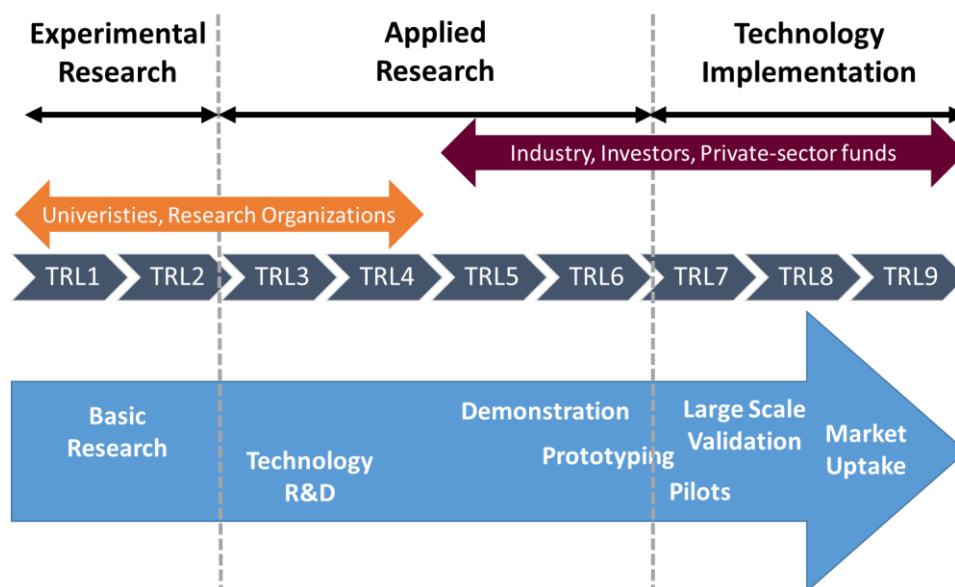


Figure 1 – Technology Innovation Lifecycle

According to the adopted convention, the Innovation Lifecycle is divided in three main phases: Experimental Research, Applied Research and Technology Implementation, represented at the top of the diagram. These phases were adapted from a CDE (Centre for Defense Enterprise – UK) publication⁴. The arrow at the bottom of the diagram represents the main activities within the innovation chain considered by the European Commission⁵: Basic Research, Technology R&D, Demonstration, Prototyping, Large Scale Validation, Pilots and Market Uptake. The nine TRLs are presented in the middle of the Figure.

The Experimental Research phase encompasses TRL1 and TRL2 activities, corresponding to Basic Research. During Experimental Research, basic principles are observed and a technology concept is formulated. Applied Research covers TRL 3 to TRL 6, including experimental proofs of concept and technology lab validation, followed by a broader technology validation in a relevant environment and its demonstration in the same environment. This corresponds to Technology R&D and Demonstration in the European Commission representation. The Technology Implementation phase includes TRL 7, TRL 8 and TRL 9, considering system prototype demonstration in an operational environment, system complete and qualified and finally, the actual system proven in operational environment. These TRLs map with Prototyping, Large Scale Validation and Pilots, followed by the Market Uptake.

⁴ <https://www.ukdsc.org/press-releases/innovation-challenge-autonomy-big-data/>

⁵ <http://slideplayer.com/slide/4144593/>

4 Main Types of Funding and Financing

This Chapter describes the main types of financing sources relevant for the financing of R&D&I activities in the field of advanced manufacturing and production technologies, including public funding, private financing and combined funding. The complementarities between these types of funding are explored in regards to the support of the whole innovation cycle.

4.1 Public Funding and Private Financing

Public funding

Funding is defined as providing financial resources to finance a need, program or project. In general, the term “public funding” is used when governmental entities provide money to organizations so that they can develop goods and services⁶.

Public funding exists at European, National, Regional and local levels, in order to provide support to different phases of the innovation cycle, application domains and geographical locations. This type of funding is fundamental for Experimental Research and to allow new technologies to overcome the valley of death and reach the market.

In general, public funding plays a critical role in the initial phases of the innovation lifecycle (Experimental Research and Applied Research), while private financing and direct revenues play a more important role in the technology implementation phase. Depending on its TRL, the funding of advanced manufacturing and production technologies may be a combination of private and public funding⁷.

Private Financing

Financing is the act of providing funds for business activities. Financial institutions and banks are the main players in the business of financing as they provide capital to organizations to help them achieve their goals. The use of financing is vital on any economic system, as it allows organizations to perform activities or purchase goods or services out of their immediate reach. There are two main types of financing for companies: debt and equity. While debts are required to be paid, equity does not need to be paid back, but it relinquishes ownership to the shareholder. Both debt and equity have their own advantages and disadvantages. Companies can use a combination of both in order to finance operations.

Private financing can also be provided by other organizations with business interests such as venture capital, business angels, incubators or companies, among others.

For early stage, high risk activities of innovation, business angels can play an important role in exploring the potential of new ideas, even at pilot/ demonstration stages. Additionally, venture capital provides

⁶ <http://www.investopedia.com/terms/f/financing.asp>

⁷ EU-GREAT! Project Deliverable 5.2, November 2016

access to financing and managerial guidance when other sources of financing are not available. Private financing organizations, such as banks, tend to avoid early-stage activities where risks are high and cash flow is uncertain. However, for activities closer to the market, loans can be feasible as a specific financing instrument⁸.

4.2 Available Funding and Financing Mechanisms

Table 2 – Overview of Funding and Financing Mechanisms provides an overview of the most popular funding and financing mechanisms to support the R&D&I phase of the innovation lifecycle, both public and private, available at European and National levels. The combination of these mechanisms will be explored in the next section.

Table 2 – Overview of Funding and Financing Mechanisms

Financing Mechanism	Description
European Programmes	<p>European Programmes are the cornerstone of Experimental and Applied Research funding in Europe. Horizon 2020, together with other Union research and/or innovation Programmes, involves a large consortium consisting of multiple partners from several different Countries and Regions. European Programmes are organized according to main themes, led by societal trends and guided by the multiannual thematic roadmap.</p> <p>While Horizon 2020 is considered the largest and most popular European funding Programme, there are multiple relevant Programmes that must also be taken into account, such as Eureka, Interreg and the EIB (private).</p> <p>These Programmes are described in detail in Chapter 5 – Examples of Funding and Financing Mechanisms and Annex 1 – Examples of Relevant Calls at European Level.</p>
National/ Regional Programmes	<p>Besides specific Programmes supported by the European Commission, such as ESIF and PCI, most European Countries design and implement their own National and Regional Programmes, supported exclusively by their respective National or Regional budgets. These National and Regional Programmes are very useful complementary funding instruments for advanced manufacturing and production technologies R&D&I.</p> <p>In Chapter 5 – Examples of Funding and Financing Mechanisms and Annex 2 – Examples of Relevant National/ Regional Funding Instruments, Programmes for Countries and Regions where FUTURING consortium is present are shown in detail.</p>

⁸ EU-GREAT! Project Deliverable 5.2, November 2016

In the later stages of the innovation cycle, closer to the market, other financing mechanisms can be used to support implementation activities. **Loans** are the most common financing mechanisms available from financial institutions, such as banks, and normally the least costly type of long-term financing. Despite the associated interest rate, this financial leverage can be used to multiply yield on investment. The **exploitation of intellectual property rights**, such as patents, licences, technology transfer and copyrights by third parties may also be a source of additional revenue on close to the market activities. **R&D, product development** and **consultancy** services to inside or outside partners are another means of generating revenue.

4.3 Combined Funding/ Financing

Combined funding/ financing encompasses public and private funds, by mixing various public and/or private funding or financing mechanisms.

As an example, funding of a specific innovation can be done at multiple levels such as European level, by the means of Europe Commission (public) and the Europe Investment Bank (EIB) (private); National Level, by the means of National Programmes; and even by Regional and municipal sources.

The relationship between funding and financing mechanisms and the innovation cycle stages can be observed in Figure 2 – Financing at different stages of the Innovation Cycle.

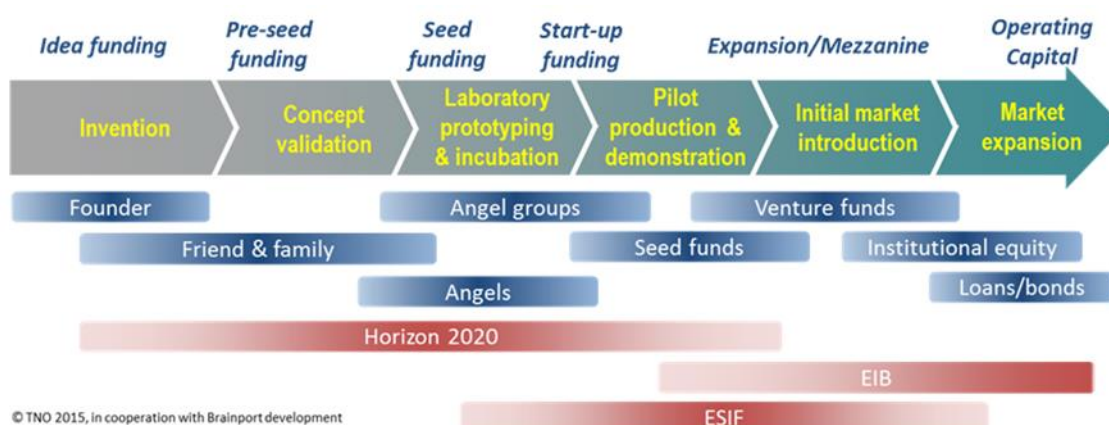


Figure 2 – Financing at different stages of the Innovation Cycle

The most pressing public-private funds advantage is the improvement of the risk-return profile of investments, making opportunities more attractive to potential private investors and thus increasing the amount of available private financing. Therefore, public funding acts as leverage to encourage the application of private financing.

5 Examples of Funding and Financing Mechanisms

Chapter 5 presents examples of funding and financing instruments aiming at supporting activities within the innovation cycle, in the scope of advanced manufacturing and production technologies. The instruments include open or forthcoming calls for proposals and opportunities at European level and National level, in regions where the FUTURING consortium is present, which are the following: Belgium, France, Germany, Greece, Italy, Poland, Portugal, Spain, The Netherlands, The United Kingdom.

In Section 5.1 – European Programmes, the European Programmes considered fundamental by the Consortium are presented, divided by thematic areas. This section starts with the description of the largest and most popular Programme – Horizon 2020 and its actions that can be used to conduct R&D&I activities within the defined scope. A comprehensive description of the thematic areas is done, including NMBP, ICT, as well as “cross-cutting activities” which combine different themes. In addition to the thematic areas, a set of horizontal mechanisms targeting innovation are also described (Innosup, SME Instrument, and Fast Track to Innovation). Public and Private Partnerships (PPP), where industry plays a central role in defining the priorities, aligned with their own challenges and needs, were also considered a fundamental type of European Programme and are therefore described as well. A specific instrument to support SMEs – COSME is introduced, as well as Financial Support to Third Parties and the European Institute of Innovation and Technology (EIT). Specific mechanisms such as Eureka and Interreg, mostly targeting cross-border cooperation to innovation are also presented. This section includes a description of products from the European Investment Bank (EIB), including the European Fund for Strategic Investments (EFSI), in partnership with the European Commission.

Section 5.2 – National/ Regional Programmes provides an overview of National and Regional Programmes identified in the Countries and Regions where the FUTURING Consortium is present. The European Structural and Investment Funds (ESIF) and The Projects of Common Interest (PCI) instruments are also highlighted.

Finally, Section 5.3 – Combined Funding/ Financing addresses the synergies between combined funding and financing (public and private). An example of how EIB products can be used to support projects in the field of circular economy is explored.

5.1 European Programmes

In this section, a set of European Programmes and Instruments aiming at supporting advanced manufacturing innovation is presented, including Horizon 2020, Public-Private Partnerships (PPP), COSME, Financial Support to Third Parties, The European Institute of Innovation and Technology (EIT), Eureka, Interreg Europe and The European Investment Bank (EIB). Each Programme is described in detail in the following sub-sections.

5.1.1 Horizon 2020

Horizon 2020 is the biggest EU Research and Innovation Programme that was ever created. With nearly **€80 billion** of funding available over 7 years (**from 2014 to 2020**), this programme goal is to take innovative ideas from the lab to the market, promising more breakthroughs, discoveries and world-firsts. In addition to the available funding, this programme also attracts **private and national public investments**. Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness.

Seen as a means to drive economic growth and create jobs, Horizon 2020 has the political backing of Europe's leaders and the Members of the European Parliament. They agreed that research is an investment in our future and so put it at the heart of the EU's blueprint for smart, sustainable and inclusive growth and jobs.

By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

Horizon 2020 is open to everyone, with a simple structure that reduces red tape and time so participants can focus on what is really important. This approach makes sure new projects get off the ground quickly – and achieve results faster.

The EU Framework Programme for Research and Innovation is complemented by further measures to complete and further develop the European Research Area (ERA). These measures aim at breaking down barriers to create a genuine single market for knowledge, research and innovation.

Horizon 2020 is divided in 3 pillars: **Excellent Science, Competitive Industry and Societal Challenges**. The targeted funding helps to ensure that the best ideas are effectively brought to market, with direct applications in cities, factories, hospitals, stores and households. The Horizon 2020 pillars are presented and described in Table 3 – Horizon 2020 Pillars and Specific Objectives:

Table 3 – Horizon 2020 Pillars and Specific Objectives

<i>Pillar 1: Excellent Science</i>	<p>Horizon 2020 has a role in boosting EU's position as a world leader in science, by developing, attracting and retaining research talent, creating jobs and contributing to a higher standard of living. The following actions are being implemented:</p> <ul style="list-style-type: none"> • Frontier research funded by the European Research Council (ERC) <ul style="list-style-type: none"> ○ Curiosity driven research. • Marie Skłodowska-Curie Actions <ul style="list-style-type: none"> ○ Support to young and experienced researchers through training and placement in other countries or in the private sector. • Future and emerging technologies <ul style="list-style-type: none"> ○ Dynamic multi-disciplinary cooperation on new and future technologies. • World-class infrastructure <ul style="list-style-type: none"> ○ State-of-the-art resources (equipment and infrastructure) for large-scale projects.
<i>Pillar 2: Industrial Leadership</i>	<p>Horizon 2020 invests in promising and strategic technologies, such as those used in advanced manufacturing. It also aims at attracting more private investment into R&I and supporting the increase of innovative SMEs in Europe. This Pillar includes the following actions:</p> <ul style="list-style-type: none"> • Leadership in enabling & industrial technologies <ul style="list-style-type: none"> ○ ICT, nanotechnologies, materials, biotechnology, manufacturing, space. • Access to risk finance <ul style="list-style-type: none"> ○ Financing for high-risk new ideas and their development; ○ Leveraging private finance & venture capital; ○ Investment in innovative SMEs and small midcaps.
<i>Pillar 3: Societal Challenges</i>	<p>Horizon 2020 supports R&D that target society and citizens (climate, environment, energy, transport, etc.). It supports the development of breakthrough solutions coming from multi-disciplinary collaborations, which include social sciences and humanities. The EU has identified seven priority challenges:</p> <ul style="list-style-type: none"> • Health, demographic change & wellbeing;

	<ul style="list-style-type: none"> • Food security, sustainable agriculture and forestry, marine/maritime/inland water research and the bio economy; • Secure, clean & efficient energy; • Smart, green & integrated transport; • Climate action, environment, resource efficiency & raw materials; • Inclusive, innovative & reflective societies; • Secure societies.
<p>Specific Objectives</p> <p><i>Spreading excellence and widening participation</i></p> <p><i>Science with and for society</i></p>	

Horizon 2020 is implemented through several types of actions (funding schemes). Each action has specific characteristics and is focused on different stages of the innovation cycle. These action types are described in Table 4 – Horizon 2020 Action Types:

Table 4 – Horizon 2020 Action Types

Type of Action	Position in Innovation Chain	Who?
Research and Innovation Actions (RIA)	<p>Research projects tackling defined challenges that can lead to the development of a new knowledge or technology.</p> <p><i>Experimental Research</i></p>	Consortia of partners from different counties, industry and academia.
Innovation Actions (IA)	<p>Closer-to-the-market activities such as prototyping, testing, demonstrating, piloting, scaling-up.</p> <p><i>Applied Research</i></p>	Consortia of partners from different counties, industry and academia.
Coordination and Support Actions (CSA)	<p>Coordination and networking of research and innovation projects, programmes and policies.</p> <p><i>Experimental Research</i></p>	Single entities or consortia of partners from different counties, industry and academia.

Frontier Research Grants – European Research Council (ERC)	<p>Funding for projects evaluated on the sole criterion of scientific excellence in any field of research.</p> <p><i>Experimental Research</i></p>	Early-career researchers, independent researchers and senior research leaders.
Support for training and career development – Marie Skłodowska-Curie Actions	<p>Funding for international research fellowships in the public or private sector, research training, staff exchanges.</p> <p><i>Experimental Research</i></p>	Early-career researchers or experienced researchers, technical staff.
SME Instrument (SME)	<p>This instrument is aimed at highly innovative SMEs with the ambition to develop their growth potential.</p> <p>It offers funding for feasibility studies, grants for an innovation project's main phase (demonstration, prototyping, testing, application development...); lastly, the commercialisation phase is supported indirectly through facilitated access to debt and equity financial instruments.</p> <p><i>Applied Research, Experimental Research, Implementation (indirect)</i></p>	Exclusive to SMEs (either a single SME or a consortium of SMEs established in an EU or Associated country).
Fast Track to Innovation (FTI)	<p>Innovation projects addressing any technology or societal challenge field.</p>	Industry, including SMEs, with a minimum of three and a maximum of five partners. Limited EU contribution of maximum 3M€ per project.

Relevant Horizon 2020 types of Actions

Research and innovation actions (RIA)⁹

- **Description:** Action primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution. For this purpose, they may include basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment. Projects may contain closely connected but limited demonstration or pilot activities aiming to show technical feasibility in a near to operational environment.
- **Position in the innovation chain:** RIA is a good instrument to fund specific projects in the experimental and applied research domain, in partnership with other organisations.
- **Funding rate:** 100%.

Innovation actions (IA)¹⁰

- **Description:** Action primarily consisting of activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services. For this purpose, they may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication.
A 'demonstration or pilot' aims to validate the technical and economic viability of a new or improved technology, product, process, service or solution in an operational (or near to operational) environment, whether industrial or otherwise, involving where appropriate a larger scale prototype or demonstrator. A 'market replication' aims to support the first application/deployment in the market of an innovation that has already been demonstrated but not yet applied/deployed in the market due to market failures/barriers to uptake. 'Market replication' does not cover multiple applications in the market of an innovation that has already been applied successfully once in the market. 'First' means new at least to Europe or new at least to the application sector in question. Often such projects involve a validation of technical and economic performance at system level in real life operating conditions provided by the market. Projects may include limited research and development activities. Projects may include limited research and development activities.
- **Position in the innovation chain:** Specific topics and calls for proposals support specifically the set-up and implementation of new pilot lines and other relevant activities.
- **Funding rate:** 70% (except for non-profit legal entities, where a rate of 100% applies).

Coordination and support actions (CSA)¹¹

- **Description:** Actions consisting primarily of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support

⁹http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-d-ria_en.pdf

¹⁰http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-d-ia_en.pdf

¹¹http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-d-csa_en.pdf

services, policy dialogues and mutual learning exercises and studies, including design studies for new infrastructure and may also include complementary activities of strategic planning, networking and coordination between programmes in different countries.

- **Position in the innovation chain:** These actions may help to define new research initiatives, identify upgrades or updates, design roadmaps, characterize funding, among others.
- **Funding rate:** 100%.

The SME Instrument (SME)¹²

- **Description:** The aim of the SME Instrument is to fill the gaps in funding for the early stages, Research and Innovation and accelerating the exploitation of innovation. Projects are selected through a bottom-up approach within a given societal challenge or enabling technology within Horizon 2020. They must be of clear interest and benefit to SMEs and have a clear European dimension. When applying for funds through this instrument SMEs can form collaborations according to their needs, including for subcontracting research and development work to apply for funding and support.¹³

It comprises 3 phases:

- Phase 1 – feasibility assessment (optional)
 - Phase 2 – innovation project
 - Phase 3 – commercialisation
- **Position in the innovation chain:** Three phases supported by the SME Instrument: feasibility assessment, innovation project, commercialization.
- **Funding rate:** Several, depending on the phase: Phase 1: lump sum of €50K/ project; Phase 2: 70% of eligible costs; Phase 3: minor funding.

Fast track to innovation Pilot (FTI)¹⁴

- **Description:** The FTI pilot aims to reduce the time from idea to market and to increase the participation in Horizon 2020 of industry, SMEs and first-time industry applicants. It should stimulate private sector investment, promote research and innovation with a focus on value creation, and accelerate the development of innovative products, processes and services. The FTI pilot is testing a new approach to give the development of innovations the last push needed before introduction to the market. It is the only fully bottom-up measure in Horizon 2020 promoting close-to-market innovation activities that is open to all types of participants
- **Position in the innovation chain:** It can be used to accelerate the introduction of new technologies into the market.
- **Funding rate:** 70% (except for non-profit legal entities, where a rate of 100% applies).

¹² <https://ec.europa.eu/digital-single-market/en/sme-instrument-0>

¹³ <https://ec.europa.eu/digital-single-market/en/sme-instrument-0>

¹⁴ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fast-track-innovation-pilot>

ERA-NET¹⁵

- **Description:** the ERA-NET instrument under Horizon 2020 is designed to support public-public partnerships, including joint programming initiatives between Member States, in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as topping up of single joint calls and 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. This aims at increasing substantially the share of funding that Member States dedicate jointly to challenge driven research and innovation agendas.

In addition to the joint calls they implement, ERA-NETs have developed over the past years a vast range of networking and other joint activities that contribute significantly to the impact of the ERA-NET scheme and that should be sustained.

- **Position in the innovation chain:** It supports transnational research and innovation activities that can be used to fund specific projects, in partnership with other organisations. It can also support relevant networking and joint activities.
- **Funding rate:** The maximum EU contribution is 33% of the eligible costs, which is complemented by national funding, with specific conditions for each programme.

¹⁵ http://ec.europa.eu/research/era/era-net-in-horizon-2020_en.html

Table 5 – Summary of types of actions in Horizon 2020

Type of action	Minimum participations	Funding Rate	Typical Duration	Average EC Contribution	Goal
Research & Innovation Action – RIA	≥ 3 legal entities from 3 MS/AC	100%	36-48 months	€2.0 – 5.0M	Collaborative research projects
Innovation Action – IA	≥ 3 legal entities from 3 MS/AC	70% or 100% for non-profit organisation	30-36 months	€2.0 – 5.0M	Produce plans & arrangements or designs for new, altered or improved products, processes or services
Coordination & Support Action – CSA	1 legal entity	100%	12-30 months	€0.5 – 2.0M	Accompanying measures (standardisation, dissemination, policy dialogues etc.); Does not include research
SME Instrument	1 SME from MS/AC	3 phases: Phase 1: lump sum of € 50K / project Phase 2: € 1 – 2.5M / project (1-2 years) (70% of eligible costs reimbursed) Phase 3 : minor funding (other support)			Combination of demonstration activities (testing, prototyping, ...), market replication
Fast Track to Innovation – FTI	≤ 5 legal entities from 5 MS/AC	70% or 100% for non-profit organisation		≤ €3.0M	Produce plans & arrangements or designs for new, altered or improved products, processes or services
ERA-NET	≥ 2 legal entities from MS/AC	33% Maximum EU contribution, complemented by national funds		≤ €10M	Co-funding of regional, national & international doctoral & fellowship programmes

Relevant Topics

Horizon 2020 is implemented through Calls for proposals that are open during the Programme lifetime to address specific research and innovation topics. Horizon 2020 (2014-2020) has three Work Programmes implemented chronologically: Work Programme 2014-2015, Work Programme 2016-2017 and Work Programme 2018-2020. These thematic areas are implemented using different types of actions (RIA, IA, CSA, SME, etc.).

At the date of this Deliverable, Work Programme 2016-2017 is at its final stage, with all its Calls closed. Work Programme 2018-2020 has been released for some sub-programmes.

The 2018-2020 Work Programme builds on the success of Horizon 2020 so far, and takes into account the extensive interim evaluation of the programme. The Work Programme also responds to the European Commission's political priorities and paves the way for its successor programme. The investment for the budgetary years of 2018, 2019 and 2020 is **€30 billion**¹⁶.

The new features include measures to support market-creating innovation, highly integrated activities called Focus Areas, emphasis on better dissemination of results and a focus on open access to data.

The Focus Areas encompassed by Horizon 2020 2018-2020 are as follows:

- Building a low-carbon, climate resilient future
- Connecting economic and environmental gains – the Circular Economy
- Digitising and transforming European industry and services
- Boosting the effectiveness of the Security Union

The Work Programme also includes measures to increase simplification (e.g. lump sum funding), to widen participation from less performing countries, and to address skills mismatches¹⁷.

The most relevant specific priorities (or sub-programmes) for advanced manufacturing and production technologies are presented in this section. Open and Forthcoming Calls for each sub-programme can be found in Annex 1 – Examples of Relevant Calls at European Level.

1) Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing, and Biotechnology (NMBP)

The NMPB sub-programme is part of Horizon 2020 Pillar 2 - Industrial Leadership, under Leadership in enabling & industrial technologies (LEITs - that aims to support the development of technologies underpinning innovation across a range of sectors). This programme has a strong focus on developing European industrial capabilities in Key Enabling Technologies (KETs) in the scope of Nanotechnologies, Advanced materials, Advanced manufacturing and processing and Biotechnology.

¹⁶ <https://ec.europa.eu/programmes/horizon2020/en/news/horizon-2020-work-programme-2018-2020>

¹⁷ http://europa.eu/rapid/press-release_MEMO-17-4123_en.htm

Activities of the Work Programme address the whole innovation chain with TRLs spanning from basic research to the crucial range from medium levels to high levels preceding mass production. These activities address research and innovation agendas defined by industry and business, together with the research community and the EU Commission, and have a strong focus on leveraging private sector investment.

For the higher TRLs, dedicated support is available for larger-scale pilot lines and demonstrator projects to facilitate industrial take-up and commercialisation. There is a strong focus on the contribution of KETs to societal challenges.

URLs:

<http://ec.europa.eu/programmes/horizon2020/en/h2020-section/nanotechnologies-advanced-materials-advanced-manufacturing-and-processing-and>
http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-leit-nmp_en.pdf

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-nmbp-st-ind-2018-2020.html#c,topics=callIdentifier/t/H2020-NMBP-ST-IND-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

2) Information and Communication Technologies (ICT)

The ICT priority is part of Horizon 2020 Pillar 2 Industrial Leadership, under Leadership in enabling & industrial technologies (LEITs - that aims to support the development of technologies underpinning innovation across a range of sectors).

ICT underpins innovation and competitiveness across a broad range of private and public markets and sectors. The potential and capabilities of modern ICT systems are still growing exponentially fuelled by the progress in electronics, microsystems, networking, the ability to master increasingly complex cyber-physical systems and robots, and progress in data processing and human machine interfaces. These developments provide major opportunities for Europe to develop the next generation of open platforms on top of which a multiplicity of innovative devices, systems and applications can be implemented.

These new solutions will enable a wealth of new business developments in particular for SMEs, and will contribute to boost competitiveness, create jobs and support growth.

The ICT-LEIT Work Programme under Horizon 2020 provides a balanced response to the main challenges faced by Europe in the field: firstly, the need to maintain a strong expertise in key technology value chains; secondly, the necessity to move quicker from research excellence to the market.

It combines a strong support to industrial roadmaps with new mechanisms to encourage disruptive innovation. The former will reinforce medium to long term commitment to industrial strategies and provide continuity and stability. The latter will offer flexibility and openness and will help develop dynamic eco-systems in which innovators can operate. Both strands will require the involvement of new actors, on one hand to exploit and leverage new technologies and on the other to initiate and drive change.

Six main activity lines have been identified in the ICT-LEIT part of the Work Programme:

- A new generation of components and systems
- Advanced Computing
- Future Internet
- Content technologies and information management
- Robotics
- Micro and Nano-electronic technologies, Photonics

In addition, the Work Programme features several cross-cutting topics addressing Cyber-Security, Internet of Things and Research on a Human-Centric Digital Age. All activities are complemented with support to innovation and take-up, international cooperation and a dedicated action for SMEs to propose bottom-up innovative ideas, using the SME instrument.

URL:

<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/information-and-communication-technologies>

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-ict-2018-2020.html#c.topics=callIdentifier/t/H2020-ICT-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

3) Cross-Cutting Activities

Horizon 2020 includes cross-cutting activities that are divided in Focus Areas. Focus Areas cut across thematic boundaries and bring together contributions from various programme parts to pursue a common objective and create sustained impact.

The 2018-2020 Work Programme focuses efforts on fewer topics with bigger budgets, supporting the Commission's political priorities, and is structured in Four Focus Areas: (i) Building a low-carbon, climate resilient future (LC), (ii) Connecting economic and environmental gains – the Circular Economy, (iii) Digitising and transforming European industry and services, and (iv) Boosting the effectiveness of the Security Union.

The Focus Area “Building a low-carbon, climate resilient future” aligns R&I investments towards 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 the UN's Sustainable Development Goals. This Focus Area reflects the fact that research and innovation is essential to find the ground-breaking solutions needed, including in particular in the energy system. It aims to develop solutions for achieving carbon neutrality and climate resilience of Europe in the second half of the century.

Work related to the circular economy and the Focus Area on “Connecting economic and environmental gains – the Circular Economy” will also align R&I towards these targets. This Focus Area, building on the Commission’s ambitious Circular Economy package, will consolidate relevant R&I initiatives and it will make a strong contribution to jobs and growth and industrial competitiveness.

A dedicated Focus Area on “Digitising and transforming European industry and services” will foster a better integration and coordination of the efforts. 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 help fully seize these digital opportunities. In addition, 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” will support the implementation of the Security Union priorities and help tackling 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 on these threats, notably from terrorism, will underpin an effective and coordinated EU response, and better tools will reduce loss of life and material damage.

Focus Areas are implemented as ‘virtual calls’, which constitute the linking of specific calls/topics from the participating parts of Horizon 2020.

URL:

<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/cross-cutting-activities-focus-areas>

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-lc-sc3-2018-2019-2020.html#c.topics=callIdentifier/t/H2020-LC-SC3-2018-2019-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

4) SME Instrument

Horizon 2020 supports innovative SMEs that are EU-based or established in a country associated to Horizon 2020 through a dedicated SME instrument that enables breakthrough innovation projects with

a market-creating potential.¹⁸ The EIC SME instrument will boost fast company growth and market-creating innovation thanks to staged funding and ramped up business acceleration services.

The SME instrument is part of the European Innovation Council pilot (EIC pilot). This was launched on 27th October 2017 as part of the Horizon 2020 Work programme 2018-2020, when the EIC SME Instrument, EIC Fast Track to Innovation (FTI), Future and Emerging Technologies (FET)-Open and EIC Horizon Prizes, were brought under the EIC pilot umbrella, to provide a 'one stop shop' for funding of innovators/innovations in the EU.

Horizon 2020 funds high-potential innovation developed by SMEs through the EIC SME instrument. The EIC SME instrument offers Europe's brightest and boldest entrepreneurs the chance to step forward and request funding for breakthrough ideas with the potential to create entirely new markets or revolutionise existing ones.

Provided with about **€1.6 billion** in funding over the period 2018-2020, the EIC SME Instrument supports ground breaking innovative ideas for products, services or processes that are ready to conquer global markets. Available to SMEs only, the new scheme offers phased, progressive and complementary support to the development of out-of-the-box ideas. There are no predefined topics for the EIC SME instrument call; only the most excellent and impactful ideas will receive support.

In the last three years of implementation, around 4000 SMEs will be selected to receive funding under the EIC SME instrument call.

The SME Instrument is divided into 3 phases covering different stages of the innovation cycle. The evaluation processes for proposals are based on simple rules in order to reduce the time it takes to establish a contract.

- **Phase 1** aims to cover the assessment of technical feasibility and market potential of new ideas. The project will be supported by an investment of € 50K and the typical duration should be no longer than 6 months.
- **Phase 2** aims to cover R&I activities with a particular focus on demonstration activities (testing, prototype, scale-up studies, design, piloting innovative processes, products and services, validation, performance verification etc.) and market replication encouraging the involvement of end users or potential clients. Project funding should amount to no more than €2,5 million and the typical duration of the third phase should range from 12 to 24 months (more funding and longer durations are possible if duly justified).
- **Phase 3** concerns support measures aimed at helping SMEs move towards commercialising their innovative products and services through measures like networking, training, coaching and mentoring, facilitating access to private capital or better interaction with key stakeholders. SMEs will not be funded directly under phase 3.

¹⁸ <https://ec.europa.eu/digital-single-market/en/sme-instrument-0>

URL:

<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/sme-instrument>

Calls URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-eic-smeinst-2018-2020.html#c,topics=callIdentifier/t/H2020-EIC-SMEInst-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

5) INNOSUP

This set of calls is one element of a broader action to develop the ecosystem of innovation support to SMEs in Europe. Where appropriate, a highly specialised support service may be established at European level to complement existing national and regional services. Generally, the actions are designed to provide opportunities to Member States and regions to enhance their services through collaboration, peer-learning and uptake of new approaches.

Many of the Horizon 2020 measures designed to strengthen the dynamism and the resilience of the SME innovation ecosystem will be continued in 2018-2020 in the frame of the "Innovation in SMEs" activities. They will be strengthened through new initiatives on advice regarding intellectual property right protection, and on Key Enabling and distributed ledger technologies. Together with the SMEs, also the innovation agencies who work with them will be supported to innovate and evolve.

INNOSUP actions are designed to provide opportunities to Member States and regions to enhance their services through collaboration, and peer-learning. The emphasis is on further testing new approaches for better innovation support, such as block chain technologies, workplace innovation, a network for Open Innovation, training on advanced manufacturing, experimentation in innovation agencies and a tool for investors in financing SMEs. These large pilot actions will consolidate the results and provide recommendations for the preparation of the next framework Programme. The Enterprise Europe Network (EEN), the National Contact Points (NCPs) and the Member States are expected to continue playing an important role in implementing these pilot actions and transferring the result 'in-real-time' to their regions and managing authorities of their European Structural and Investment Funds (ESIF).

URL:

http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-sme_en.pdf

Calls URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-innosup-2018-2020.html#c,topics=callIdentifier/t/H2020-INNOSUP-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

6) Fast Track to Innovation Pilot

The Fast Track to Innovation (FTI) pilot provides funding for bottom-up proposals for close-to-market innovation activities in any area of technology or application. This thematic openness – combined with the possibility for all kinds of innovation actors to work together and deliver innovation onto the market and/or into society – should nurture trans-disciplinary and cross-sectoral cooperation. FTI can help partners to co-create and test breakthrough products, services or business processes that have the potential to revolutionise existing or create entirely new markets.

FTI is part of the European Innovation Council pilot (EIC pilot). This was launched on 27th October 2017 as part of the Horizon 2020 Work programme 2018-2020, when the EIC SME Instrument, EIC Fast Track to Innovation (FTI), Future and Emerging Technologies (FET)-Open and EIC Horizon Prizes, were brought under the EIC pilot umbrella, to provide a 'one stop shop' for funding of innovators/innovations in the EU.

FTI's objective is to:

- Reduce time from idea to market;
- Stimulate the participation of first-time applicants to EU research and innovation funding;
- Increase private sector investment in research and innovation.

URL:

<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fast-track-innovation-pilot>

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-eic-fti-2018-2020.html#c.topics=callIdentifier/t/H2020-EIC-FTI-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Horizon 2020 Calls and Topics addressing advanced manufacturing, production technologies and circular economy under the 2018-2020 are presented in Table 6 – Horizon 2020 Calls and Topics addressing Advanced Manufacturing, Production Technologies and Circular Economy. For more detail, please see Annex 1 – Examples of Relevant Calls at European Level.

Table 6 – Horizon 2020 Calls and Topics addressing Advanced Manufacturing, Production Technologies and Circular Economy (2018-2020)

Call	Topics
Industrial Sustainability (H2020-NMBP-ST-IND-2018-2020)	<p>CE-NMBP-26-2018: Smart plastic materials with intrinsic recycling properties by design</p> <p>LC-EEB-02-2018: Building information modelling adapted to efficient renovation (RIA)</p>
Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)	<p>DT-NMBP-19-2019: Advanced materials for additive manufacturing (IA)</p> <p>DT-NMBP-20-2018: A digital 'plug and produce' online equipment platform for manufacturing (IA)</p>
Information And Communication Technologies (H2020-ICT-2018-2020)	<p>ICT-01-2019: Computing technologies and engineering methods for cyber-physical systems of systems</p> <p>ICT-08-2019: Security and resilience for collaborative manufacturing environments</p> <p>ICT-13-2018-2019: Supporting the emergence of data markets and the data economy</p> <p>ICT-26-2018-2020: Artificial Intelligence</p>
Digitising and transforming European industry and services: automated road transport (H2020-DT-ART-2018-2019-2020)	<p>DT-ART-03-2019: Human centred design for the new driver role in highly automated vehicles</p>
Digitising and transforming European industry and services: digital innovation hubs and platforms (H2020-DT-2018-2020)	<p>DT-ICT-07-2018-2019: Digital Manufacturing Platforms for Connected Smart Factories</p> <p>DT-ICT-11-2019: Big data solutions for energy</p> <p>DT-ICT-13-2019: Digital Platforms/Pilots Horizontal Activities</p>
Building a low-carbon, climate resilient future: secure, clean and efficient energy (H2020-LC-SC3-2018-2019-2020)	<p>LC-SC3-CC-5-2018: Research, innovation and educational capacities for energy transition</p> <p>LC-SC3-RES-2-2018: Disruptive innovation in clean energy technologies</p>

Greening the Economy in Line with the Sustainable Development Goals (SDGS) (H2020-SC5-2018-2019-2020)	CE-SC5-05-2018 : Coordinated approaches to funding and promotion of research and innovation for the circular economy CE-SC5-07-2018-2019-2020 : Raw materials innovation for the circular economy: sustainable processing, reuse, recycling and recovery schemes CE-SC5-08-2018-2019-2020 : Raw materials policy support actions for the circular economy
SME Instrument (H2020-EIC-SMEINST-2018-2020)	EIC-SMEInst-2018-2020 : SME instrument
For a better innovation support to SMES (H2020-INNOSUP-2018-2020)	INNOSUP-07-2019 : European Open Innovation network in advanced technologies INNOSUP-01-2018-2020 : Cluster facilitated projects for new industrial value chains
Fast Track to Innovation Pilot (FTI) (H2020-EIC-FTI-2018-2020)	EIC-FTI-2018-2020 : Fast Track to Innovation (FTI)

5.1.2 Public-Private Partnerships

Public-private partnerships (PPPs) are vehicles to implement technological roadmaps in particular areas and achieve leverage of private funding.

Multi-annual research and innovation roadmaps are proposed by a constituted high-level industry group and open for stakeholder consultation, to be finally adopted by the European Commission. The PPPs are implemented through open calls under Horizon 2020, specifically under the pillar “Leadership in Enabling Industrial Technology” (LEIT).

PPPs are accomplished either through **Joint Technology Initiatives (JTIs)** using Joint Undertakings based on article 187 TFEU, or through dedicated calls for proposals and topics (**Contractual PPPs - cPPPs**).

The LEIT pillar of Horizon 2020 includes the following PPPs:

Joint Technology Initiatives (JTIs)

JTIs are a means to implement the Strategic Research Agendas (SRAs) of a limited number of European Technology Platforms (ETPs). In these few ETPs, the scale and scope of the objectives is such that loose co-ordination through ETPs and support through the regular instruments of the Framework Programme for Research and Development are not sufficient. Instead, effective implementation requires a dedicated mechanism that enables the necessary leadership and coordination to achieve

the research objectives. To meet the needs of this small number of ETPs, the concept of "Joint Technology Initiatives" has been developed¹⁹.

The JTIs encompassed in the Horizon 2020 2018-2020 Work Programme are the following:

- The Joint Technology Initiative on Electronic Components and Systems for European Leadership (ECSEL)
- The Joint Technology Initiative on Bio-based Industries

These two JTIs will develop their own work programmes, which will be decided and implemented through their specific governance mechanisms and rules.

Contractual PPPs (cPPPs)

The cPPP instrument aims at implementing actions and strategies to increase the competitiveness impact of European R&D funding via Horizon 2020, offering a more active role to industry in the management of the instrument and promoting higher technology readiness level (TRLs) of the projects.

The cPPPs encompassed in the Horizon 2020 2018-2020 Work Programme are the following:

- Factories of the Future (FoF)
- Energy-efficient Buildings
- Sustainable Process Industries (SPIRE)
- Advanced 5G Network Infrastructure (5G)
- Robotics
- Photonics
- High Performance Computing
- Big Data
- Cybersecurity
- Green Vehicles Initiative

The implementation of these cPPPs is done according to the contractual arrangements signed on 17 December 2013 (all except for Big Data cPPP which was signed on 13 October 2013 and Cybersecurity which was signed on 5 July 2016) by the European Commission (representing the public side and the respective industrial research) and the Innovation European Association (representing the private side of each cPPP). These contractual PPPs are implemented in Horizon 2020 2018-2020 Work Programme through different topics and calls. Robotics, Photonics, 5G and Cybersecurity are exclusively covered under the ICT part, while Factories of the Future, Energy Efficient Buildings and SPIRE are cross-thematic, with some of their topics placed elsewhere in the work Programme. In addition, a significant part of the activities supporting the implementation of the Cybersecurity cPPP is also covered in the part dedicated to the Societal Challenge on 'Secure Societies'.

¹⁹ EU-GREAT! Project Deliverable 5.2, November 2016

URLs:

<http://www.etp4hpc.eu/en/news/160-mid-term-review-of-the-contractual-public-pri.html>
<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/ftags/cppps.html#c,topics=cPPPsubDivision/t/FoF/0/1/1/default-group&cPPPsubDivision/t/SPIRE/0/1/1/default-group&cPPPsubDivision/t/EeB/0/1/1/default-group&cPPPsubDivision/t/EGVI/0/1/1/default-group&cPPPsubDivision/t/5G/0/1/1/default-group&cPPPsubDivision/t/BigData/0/1/1/default-group&cPPPsubDivision/t/Robotics/0/1/1/default-group&cPPPsubDivision/t/Photonics/0/1/1/default-group&cPPPsubDivision/t/HPC/0/1/1/default-group&cPPPsubDivision/t/Y/0/1/1/default-group&cPPPsubDivision/t/Y/0/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/0/1/0/default-group&+identifier/desc>

The PPPs and JTIs considered more relevant are detailed in the following subsections.

Joint Technology Initiatives (JTIs)

Joint Technology Initiative on Electronic Components and Systems for European Leadership (ECSEL)

Electronic components and systems (ECS) are a pervasive Key Enabling Technology, impacting all industrial branches and almost all aspects of life. A smartphone, a smart card, a smart energy grid, a smart city, even smart governance; everything “smart” is based on integrating semiconductor chips running embedded software. They provide the fabric on which the internet runs; they give life to portable phones and tablets; they drive driverless cars and trains, fly airliners, drones and satellites. In modern times, no national economy can win in the global competition without mastering this technology, with unparalleled systemic and strategic impact²⁰.

ECSEL has the following objectives:

- Contribute to the development of a strong and globally competitive electronics components and systems industry in the European Union;
- Ensure the availability of electronic components and systems for key markets and for addressing societal challenges, keeping Europe at the forefront of technology development, bridging the gap between research and exploitation, strengthening innovation capabilities and creating economic and employment growth in the Union;
- Align strategies with Member States to attract private investment;
- Maintain and grow semiconductor and smart system manufacturing capability in Europe;
- Secure and strengthen a commanding position in design and systems engineering;
- Provide access for all stakeholders to a world-class infrastructure for design and manufacturing;

²⁰ <http://www.ecsel-ju.eu/web/index.php>

- Build a dynamic ecosystem involving SMEs, strengthening existing clusters and creating new clusters.

URL:

<http://www.ecsel-ju.eu/web/index.php>

Calls URL:

<http://www.ecsel-ju.eu/web/calls/Calls2017.php>

Calls for 2017 closed on 11th September 2017. Calls for 2018 have not been published at the date of this deliverable.

Joint Technology Initiative on Bio-based Industries (BBI)

The Bio-Based Industries Joint Undertaking is a **€3.7 billion** Public-Private Partnership between the EU and the Bio-based Industries Consortium. Operating under Horizon 2020, it is driven by the Vision and Strategic Innovation and Research Agenda (SIRA) developed by the industry.

It aims at increasing investment in the development of a sustainable bio-based industry sector in Europe by providing environmental and socio-economic benefits for European citizens, increasing the competitiveness of Europe and contributing to establishing Europe as a key player in research, demonstration and deployment of advanced bio-based products and biofuels. The BBI Joint Undertaking will also play an important role in achieving a bio economy in Europe²¹.

The Joint Technology Initiative on Bio-based Industries has the following objectives:

- Objectives: The objectives of the BBI Joint Undertaking are to contribute to a more resource efficient and sustainable low-carbon economy and to increasing economic growth and employment, in particular in rural areas, by developing sustainable and competitive bio-based industries in Europe, based on advanced bio refineries that source their biomass sustainably and in particular to:
 - Demonstrate technologies that enable new chemical building blocks, new materials, and new consumer products from European biomass, which replace the need for fossil-based inputs;
 - Develop business models that integrate economic actors along the value chain from supply of biomass to bio refinery plants to consumers of bio-based materials, chemicals and fuels, including through creating new cross-sector interconnections and supporting cross-industry clusters;
 - Set-up flagship bio refinery plants that deploy the technologies and business models for bio-based materials, chemicals and fuels and demonstrate cost and performance improvements to levels that are competitive with fossil-based alternatives.

²¹ <http://bbi-europe.eu/>

URL:

<http://bbi-europe.eu/>

Calls URL:

<http://bbi-europe.eu/participate/calls-proposals>
<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-bbi-jti-2017.html#c,topics=callIdentifier/t/H2020-BBI-JTI-2017/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Calls for 2017 closed on 11th September 2017. Calls for 2018 have not been published at the date of this deliverable.

Contractual Public and Private Partnerships (cPPPs)**Factories of the Future (FoF)**

The Factories of the Future Public-Private Partnership (FoF PPP) initiative aims at helping EU manufacturing enterprises, in particular SMEs, to adapt to global competitive pressures by developing the necessary key enabling technologies across a broad range of sectors. It will help European industry to meet increasing global consumer demand for greener, more customized and higher quality products through the necessary transition to a demand-driven industry with less waste and a better use of resources.

In 2008, the Public-Private Partnership (PPP) for Factories of the Future (FoF) was launched under the European Economic Recovery Plan. PPP activities - funded under the EU's 7th EU Framework Programme for Research (FP7 - 2007-2013) – comprised 150 high level projects involving top industrial companies and research institutions in Europe.

Under Horizon 2020, contractual Public-Private Partnership (PPP) on Factories of the Future (FoF) are built on the successes of the FP7 Factories of the Future PPP.

- Challenge: Industrial production accounts for 16% of Europe's GDP and is a key driver for innovation, productivity, growth and job creation. Manufacturing employs around 30 million persons and twice as many in support activities such as logistics. In addition, 80% of the EU's exports are manufactured products. However, Europe's position as an industrial power house is eroding and its leadership in many important sectors is being challenged by global competitors, leading to a decline in employment in recent years. FoF sets a vision and outlines routes towards high added value manufacturing technologies for the factories of the future, that will be clean, highly performing, environmentally friendly and socially sustainable. With the engagement of the EU manufacturing industry, this cPPP is expected to deliver the technologies needed for the new sustainable and competitive factories of the future.

URLs:

http://ec.europa.eu/research/industrial_technologies/factories-of-the-future_en.html
<http://www.effra.eu/>

Calls URL:

<http://www.effra.eu/calls-proposals>
<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-nmbp-tr-ind-2018-2020.html#c,topics=callIdentifier/t/H2020-NMBP-TR-IND-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Sustainable Process Industry (SPIRE)

SPIRE is a PPP created by the European Commission together with eight sectors of the process industry: chemicals, cement, ceramics, minerals, steel, non-ferrous metals, industrial water and process engineering. The SPIRE association proposes a clear vision for the future of the process industry in Europe, a long term commitment and ambitious targets. SPIRE supports the development of novel technologies for improved resource and energy efficiency in the process industry, making it more sustainable and competitive²².

- Challenge: EU process industry is at the core of most industrial value chains and faces the key challenge of having a high dependence on resources (energy, materials and water). An alliance of eight sectors of the European process industry (cement, ceramics, chemicals, engineering, minerals and ore, non-ferrous metals, steel and water) launched a new initiative on Sustainable Process Industry through Resource and Energy Efficiency (SPIRE), which is now becoming a contractual public-private partnership (PPP) under the new EU framework Programme Horizon 2020. The sectors united under SPIRE include more than 450K individual enterprises, provide jobs for 6,8 million employees and generate annually more than €1.6 billion in turnover. As such they are vital for Europe, representing 20% of the total European industry, both in terms of employment and turnover.

URL:

http://ec.europa.eu/research/industrial_technologies/sustainable-process-industry_en.html and <https://www.spire2030.eu/>

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-nmbp-st-ind-2018-2020.html#c,topics=callIdentifier/t/H2020-NMBP-ST-IND-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default->

²² http://ec.europa.eu/research/press/2013/pdf/ppp/spire_factsheet.pdf

[group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc](#)

Photonics

The Photonics PPP brings together all players from the European photonics sector and related activities including end-user industries and professionals. Together they have created a strategic roadmap which outlines the main research and innovation objectives for the European photonics sector for 2014-2020 which includes securing technology leadership in key areas, translating that leadership into a competitive advantage for European companies and skills generation. As partners in the PPP, all parties have made a long-term commitment to invest in achieving these objectives. In particular, the PPP will help formulate photonics-related research and innovation priorities for Horizon 2020²³.

- Challenge: Photonics is the science and technology of light, in particular generating, guiding, manipulating, amplifying and detecting light. It is behind many familiar innovations such as lasers, optical fibres and the cameras and displays in our phones but it also affects our daily lives in many less obvious areas. It is driving innovation in a broad range of sectors like, laser-based manufacturing, energy efficient lighting, health care and safety and security which are of economic and strategic importance for Europe. The global photonics market was €350 billion in 2012 and Europe had a €66 billion share, around 18% of the total.

The challenge for this PPP is to secure leadership in those areas where Europe is strong or where there is potential for creating new markets. The PPP will accelerate Europe's innovation process and the time to market for solutions. It will encompass the entire innovation and value chain from advanced materials to manufacturing and from advanced research to technology take-up, pilot production lines and demonstration actions.

URLs:

<http://ec.europa.eu/digital-agenda/en/photonics>

<http://www.photonics21.org/>

Calls URL:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-ict-2018-2020.html#c.topics=callIdentifier/t/H2020-ICT-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

²³ http://ec.europa.eu/research/press/2013/pdf/ppp/photonics_factsheet.pdf

Robotics

The PPP in robotics results from teaming efforts of the robotics industry, research, academia and the European Commission to launch a joint research, development and innovation Programme in order to strengthen the competitive position of European robotics²⁴.

The basic aim of the PPP in robotics is to boost robotics research, development and innovation in Europe, by better connecting academia and industry. To do this, the EC will translate the research requirements of industry and academia into concrete work programmes and calls for proposals and organize a strategic dialogue with them on these matters. Doing so will mean that the research results of calls for proposals will be more relevant for these stakeholders.

- Challenge: Robotics is a key enabling industry for manufacturing. Without a strong robotics industry, Europe would quite simply not be able to maintain or expand its current level of manufacturing. To maintain a strong base in manufacturing, it is thus imperative to develop the next generation of industrial robots which can work in close proximity to humans, are easy to program and can also be adapted to the needs of SMEs. Furthermore, future growth is expected in new domains of service robotics such as agriculture or healthcare. If Europe wants to seize these opportunities, it has to move into these domains now and make the necessary investment.

URL

<https://eu-robotics.net/eurobotics>

Calls URL

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-ict-2018-2020.html#c.topics=callIdentifier/t/H2020-ICT-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Energy-efficient Buildings (EeB)

The EeB is a partnership between the European Commission and the private sector as represented by the Energy Efficient Buildings Association (E2BA), an initiative of the European Construction Technology Platform. The multiannual EeB roadmap is the document containing the research and innovation priorities of the private sector, which are essential inputs for the design of the research work programmes by the European Commission. To improve transparency, this partnership is based on a contractual agreement between the Commission and the industry partners, setting out the objectives, commitments, key performance indicators and outputs to be delivered²⁵.

²⁴ http://ec.europa.eu/research/press/2013/pdf/ppp/robotics_factsheet.pdf

²⁵ http://ec.europa.eu/research/press/2013/pdf/ppp/eeb_factsheet.pdf

- Challenge: With a yearly turnover above €1.2 trillion in 2011, the European construction sector, including its extended value chain (e.g. material and equipment manufacturers, construction and service companies), is the largest European single activity (10% of GDP) and the biggest industrial employer. Moreover, the built environment affects the quality of life and work of all EU-citizens. The construction sector is crucial to EU environment and energy policies as buildings use 40 % of total EU energy consumption and generate 36% of greenhouse gases in Europe. While the replacement rate of existing stock is very small (1-2% per year), the construction sector is on the critical path to decarbonize the European economy by 2050. This is a unique opportunity for sustainable business growth provided that products and related services for both new and refurbished buildings are affordable and of durable quality. Yet, the sector is highly fragmented (over 95% SMEs) and sensitive to economic cycles²⁶.

URLs:

www.ec.europa.eu/research/industrial_technologies/energy-efficient-buildings_en.html
<http://e2b.ectp.org/>

Calls URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-nmbp-st-ind-2018-2020.html#c.topics=callIdentifier/t/H2020-NMBP-ST-IND-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

European Green Vehicles Initiative (EGVI)

EGVI is a PPP based on Article 19 of the Horizon 2020 Regulation setting out a contractual arrangement between the Commission and the private sector. The private side of the PPP will be represented by the European Green Vehicles Initiative Association (EGVIA). The role of the Association is to engage in the contractual PPP with the EC and collaborate with the EC services responsible for the implementation of Horizon 2020 on research, technological development along the value chain, and demonstration.

The technologies developed under the EGVI will help reaching the targets set under the EU's climate, energy and transport policies, notably the 2020 targets on reducing greenhouse gas emissions, increasing use of renewable energy and more energy efficiency. Expected innovations will support a sector that directly employs some 12 million jobs and have a significant impact on growth and international trade (In 2011 the European automotive sector had a positive contribution to the EU trade balance of €92 billion).

- Challenge: The automotive industry is a key sector for Europe, with 12 million direct jobs and over €500 billion/year in turnover, but it is under growing pressure from global competitors. At the same time, the vehicle market is facing technological challenges to comply with more

²⁶ http://www.ec.europa.eu/research/industrial_technologies/energy-efficient-buildings_en.html

ambitious environmental regulations. The quick introduction of new, greener vehicles with higher energy efficiency and alternative powertrains is pivotal for the ongoing success of the sector, the wider economy and Europe's environment. Meeting these challenges requires innovation coming from several technological areas and EU industries to join their research and innovation forces.

URL:

<http://www.egvi.eu/>

Calls URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-lc-gv-2018-2019-2020.html#c,topics=callIdentifier/t/H2020-LC-GV-2018-2019-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Horizon 2020 PPP Calls and Topics addressing advanced manufacturing, production technologies and circular economy under the 2018-2020 are presented in Table 7 – Horizon 2020 Calls and Topics addressing Advanced Manufacturing, Production Technologies and Circular Economy (2018-2020) - PPP. For more detail, please see Annex 1 – Examples of Relevant Calls at European Level.

Table 7 – Horizon 2020 Calls and Topics addressing Advanced Manufacturing, Production Technologies and Circular Economy (2018-2020) - PPP

PPP	Call	Topics
FoF	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)	<p>DT-FOF-01-2018: Skills needed for new Manufacturing jobs (CSA)</p> <p>DT-FOF-02-2018: Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)</p> <p>DT-FOF-03-2018: Innovative manufacturing of opto-electrical parts (RIA)</p> <p>DT-FOF-04-2018: Pilot lines for metal Additive Manufacturing (IA 50%)</p> <p>DT-FOF-06-2019: Refurbishment and re-manufacturing of large industrial equipment (IA)</p> <p>DT-FOF-12-2019: Handling systems for flexible materials (RIA)</p> <p>DT-FOF-08-2019: Pilot lines for modular factories (IA 50%)</p>

SPIRE	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)	CE-SC5-01-2018 : Methods to remove hazardous substances and contaminants from secondary raw materials CE-SC5-04-2019 : Building a water-smart economy and society
	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)	CE-SPIRE-02-2018 : Processing of material feedstock using non-conventional energy sources (IA) CE-SPIRE-03-2018 : Energy and resource flexibility in highly energy intensive industries CE-SPIRE-04-2019 : Efficient integrated downstream processes CE-SPIRE-05-2019 : Adaptation to variable feedstock through retrofitting CE-SPIRE-10-2018 : Efficient recycling processes for plastic containing materials

5.1.3 COSME

COSME is the EU programme for the Competitiveness of Enterprises and SMEs. It runs from 2014 to 2020 with a planned budget of **€2.3 billion**.

COSME supports SMEs in the following areas:

- **Access to Finance**

One of COSME main objectives is to facilitate SMEs' access to finance in all phases of their lifecycle – creation, expansion and business transfer. In order to achieve this objective, the EU will mobilise loans and equity investments for SMEs, which are channelled through local financial institutions in EU countries. The main financial instruments to implement better access to finance are **Loan Guarantee Facility** and **Equity Facility for Growth**.

- **Internationalization and Access to Markets**

COSME helps businesses to access markets in the EU and other international locations. COSME funds the **Enterprise Europe Network (EEN)**, which has the mission of helping SMEs find business and technology partners and to understand EU legislation; the **Your Europe Business Portal**, that provides practical online information for entrepreneurs who want to become active in another EU Member State; and the **SME Internationalisation Portal** for companies who want to develop their activities outside Europe. It also finances a number of **IPR (intellectual property rights) SME Helpdesks**, such as ASEAN, China and MERCOSUR. Additionally, COSME also provides financial assistance to the **EU-Japan Centre for Industrial Cooperation**, to promote cooperation between EU and Japanese businesses.

- **Improving framework conditions for the competitiveness and sustainability of Union enterprises**

COSME aims to reduce the administrative and regulatory burden on SMEs by creating a business-friendly environment. COSME also supports businesses to be competitive by encouraging them to adopt new business models and innovative practices.

- **Promoting entrepreneurship and entrepreneurial culture**

COSME backs the implementation of the **Entrepreneurship 2020 Action Plan** that supports entrepreneurs by strengthening entrepreneurship education, mentoring, guidance and other support services. Actions support specific groups who may find it difficult to reach their full potential, such as young people, women and senior entrepreneurs. The programme also aims to help businesses access opportunities offered by digital technologies²⁷²⁸.

URL:

<https://ec.europa.eu/easme/en/cosme>

Open calls:

At the date of this deliverable, there are two calls for proposals open: Access to markets (COS-LINKPP-2017-2-02 – Innovation procurement broker: creating links for the facilitation of public procurement of innovation) and Enterprise Europe Network (COS-Art-7-001 – Call for Expressions of Interest). Respective URLs:

<https://ec.europa.eu/easme/en/cos-linkpp-2017-2-02-innovation-procurement-broker-creating-links-facilitation-public-procurement>

<https://ec.europa.eu/easme/en/cos-clusint-2017-03-6-clusters-go-international-defence-and-security-sector>

5.1.4 Financial Support to Third Parties or Cascade Funding

The Horizon 2020 Work Programme (2018-2020) contemplates financial support to third parties or cascade funding, where a topic allows for grant proposals which foresee a financial support to third parties. Cascade funding represents an opportunity for getting public funds at EU level for SMEs²⁹.

Table 8 – Financial Support to Third Parties or Cascade Funding Scheme Opportunities shows a summary of the programs identified from the date of this Deliverable until 2020.

²⁷ http://ec.europa.eu/growth/smes/cosme_en

²⁸ <https://ec.europa.eu/easme/en/cosme>

²⁹ http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-k-fs3p_en.pdf

Table 8 – Financial Support to Third Parties or Cascade Funding Scheme Opportunities

2017 -2020 (Public Funding opportunities already existing)
Projects with calls open until 2020: 22 projects, 45 Calls, €60K per SME/experiment in average.
2018 – 2020 (Public Funding opportunities articulated under 2018-2020 Work Programme)
21 Topics including FSTP from 2018-2020, with 2 to 4 areas per topic and 2 calls per project (in average). It will reach around 120 Calls, and more than €777 million to be distributed among third parties (mainly SMEs) in 2 years.

5.1.5 European Institute of Innovation and Technology (EIT)

The European Institute of Innovation and Technology (EIT) is an independent EU body with the aim of enhancing Europe’s ability to innovate by nurturing entrepreneurial talent and supporting new ideas. EIT’s mission is to³⁰:

- Contribute to the competitiveness of Europe, its sustainable economic growth and job creation by promoting and strengthening synergies and cooperation among businesses, education institutions and research organisations.
- Create favourable environments for creative thought, to enable world-class innovation and entrepreneurship to thrive in Europe.

The EIT is an integral part of Horizon 2020 and aims to support innovators and entrepreneurs across Europe to turn their ideas into products and services for the market.

Knowledge and Innovation Communities (KIC) are the EIT main instruments, and bring together businesses (industry and SMEs), research centres and universities as partners, creating a favourable environment for creative thought and innovation to flourish, allowing innovative products and services to be developed in every area imaginable, including climate change, healthy living and active ageing, new companies to be started, and a new generation of entrepreneurs to be trained. They carry out a whole range of activities that cover the entire innovation chain – including training and education programmes, reinforcing the journey from research to the market, innovation projects as well as business incubators and accelerators. KICs have been conceived so that they are able to react in an effective and flexible way to new challenges and changing environments³¹.

At the date of this deliverable, there are six KICs, each focusing on a different societal challenge:

- Climate-KIC: addressing climate change mitigation and adaptation
- EIT Digital: addressing Information and Communication Technologies
- EIT Food: addressing food innovation and production, and its value in society

³⁰ <https://eit.europa.eu/eit-community/eit-glance/mission>

³¹ EU-GREAT! Project Deliverable 5.2, November 2016

- EIT Health: addressing healthy living and active ageing
- KIC InnoEnergy: addressing sustainable energy
- EIT Raw Materials: addressing sustainable exploration, extraction, processing, recycling and substitution

During the period 2014-2020, the EIT is funded through a contribution of **€2.35 billion** from Horizon 2020. The EIT budget covers three main priorities during this period: the necessary expenditure for consolidating the five established KICs, the set-up of three new KICs (EIT Food, launched in 2016; EIT Manufacturing and EIT Urban Mobility, to be launched in 2018), and the dissemination and outreach activities and administrative expenditure.

The EIT's contribution to the KIC's budget does not exceed 25% of its overall budget. The remaining 75% is financed from other non-EIT sources, mainly partners' own resources and other sources including national/ regional funding, EU funds, among others³². The objective of this combined funding scheme is to ensure long-term involvement of partners, to incentivise financial commitment from partners and to provide a catalyst for investment in innovation³³.

Calls:

As established in the EIT's Strategic Innovation Agenda and in the Horizon 2020 Regulation, the next innovation community to be established by the EIT in 2018 will address the thematic field of Urban mobility: smart, green and integrated transport. Additionally, the EIT has decided to relaunch the call for Added value manufacturing. At the date of this Deliverable, the details of the 2018 Calls were not released.

Calls URL: <https://eit.europa.eu/collaborate/2018-call-for-proposals>

However, Climate-KIC currently has an open call for a Loop & Reindustrialize Project, addressing the circular economy theme, closing in 12th January 2018. Details can be accessed in the following URL: <https://view.officeapps.live.com/op/view.aspx?src=http://www.climate-kic.org/wp-content/uploads/2017/11/Proposal-Form-SPS-Flagships.docx>.

5.1.6 Eureka

EUREKA is a publicly-funded, intergovernmental network, involving over 40 countries, including the European Union. Launched in 1985, EUREKA's aim is to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe, between small and large industry, research institutes and universities. By doing this, EUREKA concentrates the existing potential of experts, of knowledge, research facilities and financial resources in a more efficient way. EUREKA is constantly proving its value through a wealth of success stories – innovative products, processes and services that have been launched onto the market over the last 30 years, creating additional turnover and jobs for

³² <https://eit.europa.eu/sites/default/files/EIT%202016%20Call%20for%20KICs%20proposals.pdf>

³³ https://eit.europa.eu/sites/default/files/webinar_presentation_eit_call_manufacturing_20170907.pdf

European companies, small and large – and by supporting the internationalization of businesses with innovative ideas.

EUREKA is a leading open platform for international cooperation in innovation. It remains to this day the only initiative of its kind committed to the ‘bottom-up’ principle - ensuring that any R&D project with a good business plan receives the support it deserves, independent of its technological nature, or the type of organisations involved³⁴.

URL: <http://www.eurekanetwork.org/>

The most relevant types of actions are described below:

Network Projects

EUREKA Network Projects are transnational, market-driven innovative research and development projects, labelled by EUREKA and supported by the public administrations and public funding agencies that represent EUREKA in each of its 40+ member countries.

The EUREKA "bottom-up" approach to project creation continues to be a characteristic which differentiates EUREKA from other such initiatives. This approach allows the project consortia to define the nature of the technologies to be developed and how the project comes together, agree upon the intellectual property rights and build partnerships, to share expertise and ease access to international markets with the results of their research.

EUREKA individual projects are market-driven international R&D projects. They aim to develop marketable products, services or processes. Participation in international cooperation projects through EUREKA offers businesses, research institutes and higher education institutions a range of advantages.

- **URL:** <http://www.eurekanetwork.org/content/eureka-network-projects>
- Open continuously

EUREKA Clusters

EUREKA Clusters are long-term, industry-led initiatives. They pursue an objective of strategic significance for the European economy in a particular domain. They are public-private partnerships with broad industrial participation, aiming to foster innovation.

Initiated by European industry, EUREKA Clusters are long-term and strategically significant initiatives that develop technologies of key importance for European competitiveness. Addressing the needs of both large companies and SMEs, they are the engine for industrial innovation and economic growth.

³⁴ <http://www.eurekanetwork.org/about-eureka>

Clusters catalyse the generation of innovative, industry-driven, near to the market and pre-competitive R&D projects in their respective domains. Through their industrial representation, EUREKA Clusters have a prominent and active role to play in bringing innovation to the market.

The Cluster instrument reflects synergies where European industry's research and collaboration interests, innovation capacity - and national funding opportunities meet.

- **URL:** <http://www.eurekanetwork.org/eureka-clusters>

EUREKA Clusters encompass 7 domains: Telecommunications (Celtic-Plus Cluster³⁵); Smart Electronic Systems (Euripedes2 Cluster³⁶); Low Carbon Energy Technologies (Eurogia Cluster³⁷); Software Intensive Systems and Services (ITEA Cluster³⁸); New Cluster on Metallurgy (Metallurgy Europe Cluster³⁹); Micro and Nano Electronic Technologies and Applications (Penta Cluster⁴⁰); Advanced Manufacturing Program (Smart Cluster⁴¹).

The status of EUREKA Clusters (as of June 2013) is illustrated in Figure 3 – EUREKA Clusters. ITEA3, Euripedes2, Celtic Plus and Eurogia 2020 are currently ongoing. In addition to the Clusters represented in Figure 3 – EUREKA Clusters, new Clusters Smart, Metallurgy Europe and Penta are also ongoing, with open and forthcoming calls.

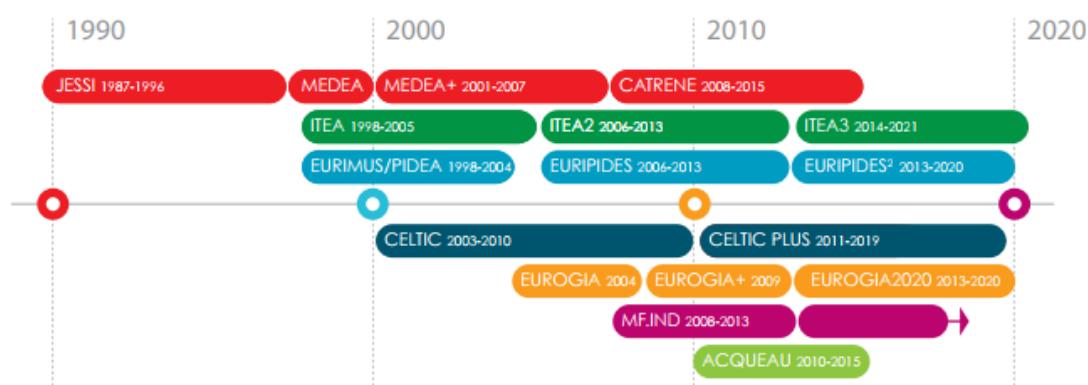


Figure 3 – EUREKA Clusters⁴²

³⁵ <http://www.eurekanetwork.org/content/celtic-plus>

³⁶ <http://www.eurekanetwork.org/content/euripides%C2%B2>

³⁷ <http://www.eurekanetwork.org/content/eurogia2020>

³⁸ <http://www.eurekanetwork.org/content/itea-3>

³⁹ <http://www.eurekanetwork.org/content/metallurgy-europe>

⁴⁰ <http://www.eurekanetwork.org/content/penta>

⁴¹ <http://www.eurekanetwork.org/content/smart-advanced-manufacturing>

⁴² http://www.eurekanetwork.org/sites/default/files/cluster_report_2012.pdf

Next Calls

Cluster	URL
Celtic-Plus	https://www.celticplus.eu/online-submission-of-proposals/
Euripedes	https://www.euripides-eureka.eu/calls
Eurogia2020	http://www.eurogia.com/projects/upcoming-calls.html
ITEA3	https://itea3.org/call-process.html
Metallurgy Europe	http://metallurgy-europe.eu/calls/
Penta	http://www.penta-eureka.eu/calls/2018PENTACall.php
Smart	http://www.smarteureka.com/en/submit-your-proposal/project-calls/

Eureka Clusters do not provide funding for projects. Funding is granted via Eureka's Countries' national programmes. The Public Authorities Committee for each Cluster informs Project Proposers about the funding possibilities at the beginning of submission process. The Eureka label provides Project Partners with the possibility of applying for public funding from their national authorities.

Some countries have a dedicated Eureka budget, while others provide funding through the normal funding programmes. More information about funding details for each country can be found in the following URL: <http://www.eurekanetwork.org/eureka-countries>.

Eurostars Projects

Eurostars supports international innovative projects led by research and development performing SMEs. With its bottom-up approach, Eurostars supports the development of rapidly marketable innovative products, processes and services that help improve the daily lives of people around the world. Eurostars has been carefully developed to meet the specific needs of SMEs. It is an ideal first step in international cooperation, enabling small businesses to combine and share expertise and benefit from working beyond national borders.

Eurostars is a joint programme between EUREKA and the European Commission, co-funded from the national budgets of 36 Eurostars Participating States and Partner Countries and by the European Union through Horizon 2020. In the 2014-2020 period it has a total public budget of **€1.14 billion**.

Eurostars has previously funded projects in the advanced manufacturing domain. Examples can be seen in the Eurostars Project Portfolio: https://www.eurostars-eureka.eu/eurostars-projects?&field_shared_technologies%5B0%5D=359&field_shared_technologies%5B1%5D=81.

Eurostars has two submission deadlines per year. **Submission deadlines for 2018 are March 1st and September 13th.**⁴³

5.1.7 Interreg Europe - European Territorial Co-operation

European Territorial Co-operation (ETC), also known as Interreg, is a programme financed by the European Regional Development Fund (ERDF) with the aim of developing and delivering better policy, providing a framework for the implementation of joint actions and policy exchanges between national, regional and local actors from different Member States. By creating an environment and opportunities for sharing solutions, Interreg's goal is to ensure that government investment, innovation and implementation efforts all lead to integrated and sustainable impacts on people and places. In order to achieve this goal, Interreg allows regional and local public authorities and other players of regional relevance across Europe to exchange practices and ideas on the way public policies work, and thereby find solutions to improve their strategies for their own citizens⁴⁴.

The Interreg Europe Programme has an **ERDF budget of €359 million for the 2014-2020 period** and a thematic focus on the following four policy topics, each related to regional development⁴⁵:

- Research, technological development and innovation
- Competitiveness of SMEs
- Low-carbon economy
- Environment and resource efficiency

These four priority axes are related to the Europe 2020 strategy, which promotes actions designed to make the European territory more innovative, more sustainable and more inclusive:

1. Strengthening research, technological development and innovation (corresponding to thematic objective 1)
2. Enhancing the competitiveness of SMEs (corresponding to thematic objective 3)
3. Supporting the shift towards a low carbon economy in all sectors (corresponding to thematic objective 4)
4. Protecting the environment and promoting resource efficiency (corresponding to thematic objective 6)

The Programme funds two types of actions:

- a) **Interregional cooperation projects:** partnerships made up of relevant policy organisations from different countries in Europe that work together for 3 to 5 years to exchange their experiences on a particular policy issue. Each region involved in the cooperation project produces an action plan, specifying what will be done in the region to ensure that the lessons learnt from the cooperation project are put into action. Projects are also required to monitor the progress of their action plans, to determine the impact of cooperation.

⁴³ <https://www.eurostars-eureka.eu/start-your-eurostars-project>

⁴⁴ <https://www.interregeurope.eu/about-us/what-is-interreg-europe/>

⁴⁵ https://www.interregeurope.eu/fileadmin/user_upload/documents/Call_related_documents/Interreg_Europe_Programme_manual.pdf

- b) **Policy learning platforms:** a space for continuous learning where any organisation dealing with regional development policies in Europe can find solutions and request expert support to improve the way they manage and implement their public policies in the four topics listed above. Calls for project proposals are launched throughout the programming period.

Any of the following organizations based in the 28EU Member States, as well as Norway and Switzerland, are eligible for Interreg Europe funding:

- National, regional or public authorities;
- Institutions governed by public law (regional development agencies, business support organizations, universities);
- Private non-profit bodies.

URL: <http://www.interregeurope.eu/>

At the date of this deliverable, Interreg Europe has held three calls for project proposals: 2015, 2016 and 2017. A fourth call will be organized in the first semester of 2018.

Calls URL: <https://www.interregeurope.eu/projects/apply-for-funding/>

5.1.8 Europe Investment Bank (EIB)

The Europe Investment Bank (EIB) is the European Union's bank, representing the interests of the European Union Member States, by providing finance and expertise for sustainable investment projects that contribute to EU policy objectives. The EIB works closely with other EU institutions (such as the European Commission) to implement EU policy.

The EIB supports projects that make a significant contribution to growth and employment in Europe. EIB's activities focus on four priority areas⁴⁶:

- Innovation and skills
- Access to finance for smaller businesses
- Infrastructure
- Climate and environment

EIB activities are divided in 3 areas. Each area encompasses several financial products, solutions and programmes. Table 9 – EIB's Activities, Financial Products and Programmes summarizes EIB's main activities and products.

⁴⁶ <http://www.eib.org/about/index.htm>

Table 9 – EIB's Activities, Financial Products and Programmes

Activity	Financial Products and Programmes
Lending⁴⁷ EIB's main activity. EIB uses its financial strength to borrow at competitive rates, passing the cost advantage onto economically viable projects that promote EU policy objectives.	Project Loans; Intermediated Loans; Venture Capital; Microfinance; Equity and Fund Investments.
Blending⁴⁸ Combination of EIB standard financing (lending) with additional sources of investment.	Structured Finance; Guarantees; Project Bonds; Trust Funds; InnovFin – EU Finance for Innovators; Flexible SME funding (JEREMIE); European Structural and Investment Funds (ESIF); Private Finance for Energy Efficiency (PF4EE).
Advising⁴⁹ Companies or public authorities can call on EIB's financial and technical expertise through the European Investment Advisory Hub.	InnovFin advisory; Public-Private Partnerships; JASPERS – Joint Assistance to Support Projects in European Regions; FELICITY – Sustainable solutions for cities.

The products and programmes considered more relevant for the support of advanced manufacturing activities during the innovation cycle, which are highlighted in Table 9 – EIB's Activities, Financial Products and Programmes, are described with more detail in the following topics.

Lending

Project Loans

The EIB provides lending to individual projects for which total investment cost exceeds **€25 million**.

In certain cases, the EIB can also provide direct loans to midcap companies with up to 3000 employees where the loan volume requested is between **€7.5 million** and **€25 million**. The EIB also provides loans to finance research and innovation programmes.

⁴⁷ <http://www.eib.org/products/lending/index.htm>

⁴⁸ <http://www.eib.org/products/blending/index.htm>

⁴⁹ <http://www.eib.org/products/advising/index.htm>

EIB support is often the key to attracting other investors. These loans can cover up to 50% of the total cost for both public and private sector promoters, but on average this share is about one-third.

URL: <http://www.eib.org/products/lending/loans/index.htm>

Blending

InnovFin – EU Finance for Innovators

"InnovFin – EU Finance for Innovators" is a joint initiative launched by the European Investment Bank Group (EIB and EIF) in cooperation with the European Commission under Horizon 2020. InnovFin consists of a series of integrated and complementary financing tools and advisory services offered by the EIB Group, covering the entire value chain of research and innovation (R&I) in order to support investments from the smallest to the largest enterprise.

InnovFin is available across all eligible sectors under Horizon 2020, in EU Member States and Associated Countries.

By 2020, InnovFin is expected to make over **€24 billion of debt and equity financing** available to innovative companies to support **€48 billion of final R&I investments**.

The InnovFin products are subjected to regular updates to reflect market evolution. Since its launch in 2014, a dozen products have been tailored and made available to accommodate niche markets previously suffering from access to finance gaps and to reinforce the complementarity with the European Fund for Strategic Investments (ESIF).

URL: <http://www.eib.org/products/blending/innovfin/index.htm>

InnovFin's products are summarized in Figure 4 – InnovFin's Products.

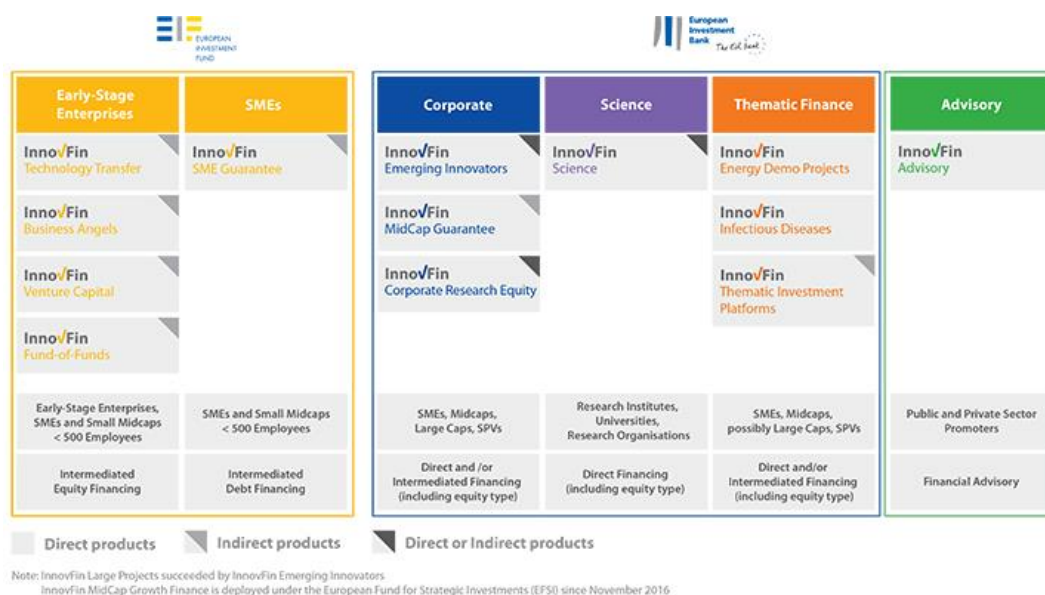


Figure 4 – InnovFin's Products⁵⁰

InnovFin's products considered more relevant to fund advanced manufacturing projects are the following:

- InovFinn SME Guarantee – a guarantee instrument targeting innovative SMEs;
- InnovFin MidCap Guarantee Facility (InnovFin MCG) – a guarantee instrument for innovative MidCaps;
- InnovFin Science – aims at supporting research and innovation (R&I) investments by public or private research institutes/organizations and universities;
- InnovFin Energy Demo Projects – a thematic instrument for innovative renewable energy projects.

European Structural and Investment Funds (ESIF)

Financial Instruments (FIs) transform EU resources under the European Structural and Investment Funds (ESIF) into financial products such as loans, guarantees, equity and other risk-bearing mechanisms. These are then used to support economically viable projects which promote EU policy objectives.

FIs aim to put EU funds to good and efficient use, ensuring that grants are complemented by other financial products so that EU funding can be used time and time again in a revolving fashion. FIs can be combined with technical support or guarantee/interest rate subsidies⁵¹.

From 2014-2020, the EIB Group will be involved in ESIF Financial Instruments through⁵²:

⁵⁰ <http://www.eib.org/products/blending/innovfin/products/index.htm>

⁵¹ <http://www.eib.org/products/blending/esif/index.htm>

⁵² <http://www.eib.org/products/blending/esif/eib-role-in-2014-2020/index.htm>

- A technical assistance platform for Financial Instruments
- Bilateral ex-ante assessments and advisory activities
- Blending activities
- Fund management activities

5.1.8.1 European Fund for Strategic Investments (EFSI)

The European Fund for Strategic Investments (EFSI) is an initiative launched jointly by the European Investment Bank Group (EIB) and the European Commission to help overcome the current investment gap in the EU by mobilising private financing for strategic investments⁵³.

URL: <http://www.eib.org/efsi/index.htm>

EFSI is a **€16 billion guarantee from the EU budget**, complemented by a **€5 billion allocation of the EIB's own capital**. EFSI has been integrated into the EIB Group and projects supported by EFSI are subject to the normal EIB project cycle and governance.

In addition, EFSI has its own dedicated governance structure which has been set in place to ensure that investments made under EFSI remain focused on the specific objective of addressing the market failure in risk-taking which hinders investment in Europe. In doing so, EFSI will also increase the volume of higher risk projects supported by the EIB Group⁵⁴.

With EFSI support, the EIB Group provides funding for economically viable projects where it adds value, including projects with a higher risk profile than ordinary EIB activities. It focuses on sectors of key importance where the EIB Group has proven expertise and the capacity to deliver a positive impact on the European economy, including:

- Strategic infrastructure including digital, transport and energy
- Education, research, development and innovation
- Expansion of renewable energy and resource efficiency
- Support for smaller businesses and midcap companies

EFSI is demand driven and provides support for projects everywhere in the EU, including cross-border projects. There are no geographic or sector quotas. Projects are considered based on their individual merits.

Private sector entities; public sector entities; banks, national promotional banks or other financial institutions; funds and any other form of collective investment vehicles can apply for EFSI financing. Project promoters should follow the usual EIB loan application procedures.

URL for application: http://www.eib.org/projects/cycle/applying_loan/index.htm.

⁵³ <http://www.eib.org/efsi/index.htm>

⁵⁴ <http://www.eib.org/efsi/what-is-efsi/index.htm>

5.2 National/ Regional Programmes

In this section, a set of National and Regional Programmes is presented for all the countries who are part of the FUTURING consortium: Belgium, France, Germany, Greece, Italy, Poland, Portugal, Spain, The Netherlands and The United Kingdom. The European Structural and Investment Funds (ESIF), as well as Projects of Common Interest (PCI) are also highlighted.

5.2.1 National and Regional Programmes

The identified instruments are summarized in Table 10 – National and Regional Programmes in the FUTURING areas. These instruments provide a broad picture of the available opportunities in this group of Countries and respective Regions and their possible applications to support R&D projects in the advanced manufacturing and production technologies domain.

Annex 2 – Examples of Relevant National/ Regional Funding Instruments provides more detail on each instrument identified in Table 10 – National and Regional Programmes in the FUTURING areas.

Table 10 – National and Regional Programmes in the FUTURING areas

Country/ Region	Instrument Name	Main Goal
Belgium	VIS-Trajectories (Flemish cooperative innovation networks), Innovation mandates, Tetra-fund	To assist research centres in realising their projects, to help companies with the start-up of their activities and investment in innovation, by offering funding, advice and network.
	Vinnof, TINA fund, SOFI and SOFI2	To invest in projects that are strategic for the Flemish economy: risk capital, loans, mezzanine finance to fund prestart phase to international growth of innovative companies. SOFI and SOFI2 are more dedicated to support the setting-up of start-up companies based on research results.
France	FUI – Fond Unique Interministeriel	To involve industries and particularly SMEs in collaborative projects. The projects should be labelled by a French competitive pole and involve at least 2 SMEs and a RTO.
	Fonds Déchets/ R&D Programmes/ Programme Investissement d’Avenir	For the Fonds déchets: Support investment of equipment for recycling valorization. For the call for projects: To increase the maturity of research and technologies.
Germany	Central Innovation Programme for SMES-ZIM (Zentrale Innovationsprogramm Mittelstand)	To sustainably increase the innovative capacity and competitiveness of SMEs including craft businesses and independent professions. It supports SMEs willing to develop new or significantly improve existing products, processes or technical services.
	Framework Programme for Research for Sustainable Development- Green	To achieve a sustainable economy that is both competitive and environmentally friendly at a global scale.

	Economy Research Agenda	
	6th Energy Research Programme	Restructuring the German energy supply by 2050 on the basis of renewables and high efficiency by using innovative technologies and systems-based solutions. This will require a broad approach of applied research and technological development in close cooperation with the scientific and business communities.
	Innovative Technologies for Resource Efficiency - Impetus for Industrial Resource Efficiency (r + Impuls)	To overcome existing barriers to the development and diffusion of industrial efficiency technologies and to contribute to the transformation of the economy into a green economy.
	Renewable resources funding programme	To support the further development of the sustainable bio economy and to open up new opportunities and perspectives for Germany as an industrial location and for the development of rural areas. It supports, on the one hand, the development of innovative, internationally competitive bio-based products, processes and technologies for their production and, on the other hand, the development of concepts aimed at improving the sustainability of the bio-based economy and taking account of societal expectations.
Greece	EPAnEK – Operational Programme “Competitiveness, Entrepreneurship & Innovation”	<p>To create a new developmental model for the Greek economy, built on and supported by four strategic pillars:</p> <ul style="list-style-type: none"> • Adaptation of enterprises and the workforce to new developmental requirements • Focus on productive, competitive and potentially extroverted and innovative sectors • Targeted selection of investments/enterprises/activities with the characteristics required for the new developmental model • 4) Safeguarding of the factors that facilitate business activity in the Greek operational environment.
Italy	National Operational Programme (NOP) on Research and Innovation (R&I)	<p>To cover EU funding to the less developed and transition regions of Italy under the "Investment for growth and jobs goal".</p> <p>The programme is focused on:</p> <ul style="list-style-type: none"> • Investing in education, training and vocational training for skills and lifelong learning by developing education and training infrastructure • Strengthening research, technological development and innovation.
Poland	BIOSTRATEG	<p>This programme acts within the following scope:</p> <ul style="list-style-type: none"> • Food security and food safety;

		<ul style="list-style-type: none"> • Rational management of natural resources with a special focus on water management; • Prevention and adaptation to climate change, with particular emphasis on agriculture; • Protection of biodiversity and sustainable development of the agricultural production area; • Forestry and wood industry.
Portugal	Mobilization Programmes	<p>The main goals of Mobilization Programmes are the following:</p> <ul style="list-style-type: none"> • Creation of new products, processes, or services with highly technological and innovative profiles contributing to their value chain and with commercially exploitable potential; • Increase the corporate investment in RDI, promoting the growth of knowledge-intensive economical activities and the creation of innovation-based value; • Improve the Portuguese qualification and the promotion of innovation in the economy through reinforcing the R&D investment; • Mobilization of the manufacturing sector, stimulating the qualified jobs.
	Demonstration Projects	<p>The main goals of Demonstration Projects are the following:</p> <ul style="list-style-type: none"> • To validate new technologies in industrial environment, to be applied in products, processes, or systems. • To demonstrate to a specialized audience, in a real situation, the economic advantages. • To publicize the new technology.
	R&D in Co-Promotion Projects	<p>The main goals of R&D in Co-Promotion Projects are the following:</p> <ul style="list-style-type: none"> • Support co-promotion projects between companies or between companies and other entities in the R&I System. • Industrial research and/or experimental development activities that may lead to the creation of new products, processes or systems, or to the introduction of significant improvements in existing products, processes or systems.
	Research Infrastructures	<p>The main goals of Research Infrastructures are the following:</p> <ul style="list-style-type: none"> • To reinforce the technical and scientific capacity of high impact research infrastructures, including their integration in European networks (e.g. ESFRI).

		<ul style="list-style-type: none"> • To ensure quality services to the scientific, educational, and enterprise communities to support their role in the accomplishment of national/regional development strategies, allowing an R&I system more integrated, with more capacity • To increase the R&I competitiveness, improving its strategic orientation and focus, including at international level.
Spain	State Programme for Research, Development and Innovation to address Societal Challenges	<p>The main goals of this Programme are the following:</p> <ul style="list-style-type: none"> • To generate a critical mass in R+D+I of interdisciplinary and intersectorial character, necessary to advance in the search of solutions according to the priorities of each of the challenges. • To promote a close relationship between scientific and technical research, the development of new technologies and the business application of new ideas and techniques and contribute to their translation into products and services. • To strengthen the international leadership capacity of the Spanish System of Science, Technology and Innovation and to contribute to improve the competitiveness of the business landscape.
	Research and Development (R&D) Projects	<p>To support business projects of applied character for the creation and significant improvement of a productive process, product or service.</p> <p>The supported project types are:</p> <ul style="list-style-type: none"> • Individual R&D projects; • R&D projects- national cooperation; • International technological cooperation projects (for instance, ERANETs, IPCEIs, JTI's projects); • R&D projects in specific calls.
	Strategic Programme of Consortia of National Business Research - Programa Estratégico de Consorcios de Investigación Empresarial Nacional (CIEN)	To finance large industrial research and experimental development projects, developed in collaboration by business groups and aimed at carrying out planned research in strategic areas of the future and with a strong international profile.
Spain/ Basque Country	HAZITEK- Programme to support businesses' R&D	To support the development of industrial research and experimental development projects, both of strategic and competitive character.

	ELKARTEK- Programme to support collaborative research in strategic areas	To support the development of collaborative research, carried out by Basque R&D&I institutions.
The Netherlands	KIEM-VANG 2 (Knowledge Innovation Mapping (KIEM) - From Waste to Raw Material (VANG))	To finance small targeted research projects which focus on applied research for the transition to CE. The scheme aims at closing some material chains, prevention of waste and the stimulation of high-quality material. Additionally, cooperation between SMEs, research organizations and government is developed.
	Innovation Credit	To provide SMEs with financial support for risky innovation projects. In this way the government fills the gap in the capital market in a phase where entrepreneurs are busy getting things going, but have not yet generated returns.
	Biobased Economy and Green Gas	The focus is on projects aiming at the conversion of biomass to marketable end products via chemical catalytic and biotechnological conversion routes, and/or the conversion of biomass and organic raw materials containing residues to green gas via fermentation or gasification.
	MIA (Environmental Investment Rebate) and Vamil (Arbitrary Depreciation of Environmental Investments)	The main goal of these programmes is to support entrepreneurs: <ul style="list-style-type: none"> • To invest in environmentally friendly products or company resources with a tax advantage; • Get innovative environmentally friendly products onto the market more quickly.
United Kingdom	European Regional Development Fund operational Programme (2014-2020)	The focus is on the core objectives of innovation, SME competitiveness and the low carbon economy but the need for targeted interventions under other objectives where EU funding can unlock barriers that matter strategically to specific areas in England is also recognized.

5.2.2 European Structural and Investment Funds (ESIF)

The adoption of programmes of the European Structural and Investment (ESI) Funds supports the EU 2020 strategy for smart, sustainable and inclusive growth. With an estimated budget of **€450 billion**, these programmes enable Member States and Regions to fully exploit their potential to achieve the 2020 goal, while ensuring sound contribution to the Fund-specific purposes of the ESI Funds; in particular, the objectives of economic, social and territorial cohesion, sustainable development of rural and maritime areas and sustainable management of natural resources⁵⁵.

⁵⁵ http://ec.europa.eu/regional_policy/sources/docgener/guides/blue_book/blueguide_en.pdf

The ESIF includes five different funds, which are all covered by Regulation (EU) No 1303/2013 of the European Parliament and of the Council, the so-called ‘Common Provisions Regulation’. The Structural Funds have two components: **The European Regional Development Fund (ERDF)** and the **European Social Fund (ESF)**. The other three funds constituting the ESIF are the **Cohesion Fund**, which supports exclusively less-developed Member States; the **European Agricultural Fund for Rural Development**; and the **European Maritime and Fisheries Fund**⁵⁶. The programmes considered more relevant for advanced manufacturing and productions technologies are described below:

Cohesion Fund

The Cohesion Fund supports Member States with a Gross National Income (GNI) per capita in less than 90% of the average GNI per capita of the EU-27.

The Cohesion Fund allocates a total of **€63.4 billion** to activities under the following categories:

- Trans-European transport networks, notably priority Projects of European Interest (PCI) as identified by the EU. The Cohesion Fund supports infrastructure projects under the Connecting Europe Facility (CEF);
- **Environment:** here, the Cohesion Fund can also support projects related to energy or transport, as long as they clearly benefit the environment in terms of energy efficiency, use of renewable energy, developing rail transport, supporting intermodality, strengthening public transport⁵⁷.

Around 21% of the resources for the investment in growth and jobs goal are sourced from the Cohesion Fund and allocated to the eligible Member States: Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Croatia, Latvia, Hungary, Malta, Poland, Portugal, Romania, Slovenia, Slovak Republic.

URL: http://ec.europa.eu/regional_policy/index.cfm/en/funding/cohesion-fund/

The European Regional Development Fund (ERDF)

The ERDF focuses its investments on four key priority areas: Innovation and research; The digital agenda; Support for SMEs; The low-carbon economy. ERDF has two types of programmes: European Territorial Cooperation (ETC) and Specific Territorial Characteristics (STC). Under the ETC programmes, at least 80 % of funds are be concentrated on the four priority areas mentioned above. The ERDF also gives particular attention to specific territorial characteristics. ERDF action is designed to reduce economic, environmental and social problems in urban areas, with a special focus on sustainable urban development. At least 5 % of the ERDF resources are set aside for this field, through 'integrated actions' managed by cities.

Interreg, also known as European Territorial Cooperation, described in the previous Chapter, is one of the two goals of cohesion policy. Interreg is financed by the ERDF. Its total budget of **€10.1 billion** represents 2.75% of cohesion policy spread across 107 programmes. This budget which supports cross-

⁵⁶ http://ec.europa.eu/regional_policy/en/policy/what/glossary/e/esif

⁵⁷ http://ec.europa.eu/regional_policy/en/funding/cohesion-fund/

border cooperation, transnational cooperation and interregional cooperation, also includes ERDF allocation for Member States to participate in EU external border cooperation programmes supported by other instruments (Instrument for Pre-Accession Assistance and European Neighbourhood Instrument).

URL: http://ec.europa.eu/regional_policy/en/funding/erdf/

5.2.3 Projects of Common Interest (PCI)

Projects of common interest (PCIs) are key infrastructure projects, especially cross-border projects, that link the energy systems of EU countries. They are intended to help the EU achieve its energy policy and climate objectives: affordable, secure and sustainable energy for all citizens, and the long-term decarbonisation of the economy in accordance with the Paris Agreement. Every two years, the European Commission draws up a new list of PCIs. PCIs are supported by Connecting Europe Facility (CEF), part of the EU's €30 billion fund for boosting energy, transports and digital infrastructure. PCIs have a total budget of **€5.35 billion** for the 2014-2020 period.

URLs:

<https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest>

https://ec.europa.eu/energy/sites/ener/files/documents/annex_to_pci_list_final_2017_en.pdf

5.3 Combined Funding/ Financing

Synergies between public and private funding are essential for the efficient application of such funds and to the R&D process implementation. In this section, examples of synergies between different types of Programmes are presented. The section concludes with an example addressing the combination between several EIB instruments and COSME in order to fund circular economy projects.

5.3.1 Examples of Combined Funding Synergies

Ideally, the combined funding of Horizon 2020 with European Structural and Investment Funds (ESIF) Programmes should be used to improve the innovation cycle coverage. Nevertheless, this combination does not substitute other National/ Regional or private co-funding to EU projects, since there are EU countries where ESIF do not represent a large share of public funding. In addition, under no circumstances can the same costs be financed twice by any budget (double financing).

Synergies among programmes imply joint or coordinated efforts to achieve greater impact and efficiency. These synergies can be achieved not only by combining ESIF and Horizon 2020 funding in the same project, but also through:

- Successive projects that build on each other's results with further research, namely by applying at National or Regional level R&D results from European-level projects;
- Parallel projects that complement each other, by establishing complex products, or even a value chain;
- ESIF programmes could also be designed and implemented to allow the take up of high quality project proposals from Horizon 2020 (or other programmes), that were not funded by the European Programme because of lack of enough budget in the respective programmes.

Figure 5 – The synergies of Combined Funding illustrates the synergies of combined funding between several instruments⁵⁸.

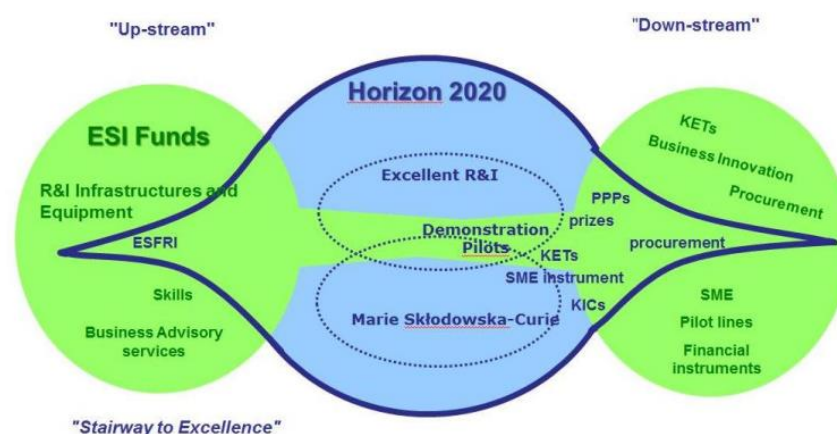


Figure 5 – The synergies of Combined Funding

⁵⁸ EU-GREAT! Project Deliverable 5.2, November 2016

5.3.2 EIB - Circular Economy Projects

The EIB and the European Commission recently released a document addressing the EIB financial products that could support circular economy projects⁵⁹. As previously described, the EIB is a European organisation that provides loans and guarantees to a wide range of beneficiaries across the EU and beyond, mainly for “projects for modernizing or converting undertakings or for developing fresh activities called for by the establishment or functioning of the internal market.”

The implementation of innovation initiatives in the scope of advanced manufacturing and production technologies, as well as CE projects, could be potentially eligible for EIB financing from its own resources, as they encompass resource and energy efficiency, research and innovation and support to SMEs.

Figure 6 – EIB Products to fund Circular Economy Projects shows an overview of the EIB Group’s guarantee and debt products and how circular economy-related projects could benefit from the support of such instruments.

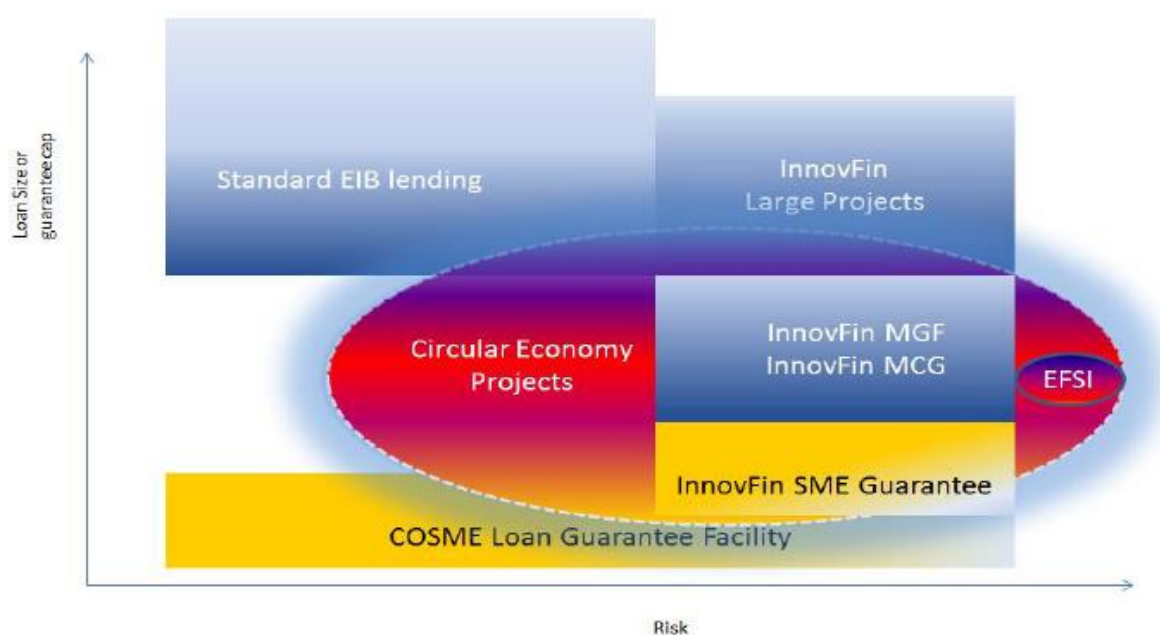


Figure 6 – EIB Products to fund Circular Economy Projects

Circular economy projects can be financed by the EIB by the means of the following joint financial products developed together with the European Commission:

- **COSME Loan Guarantee Facility** – Guarantee instrument destined for SMEs in general which do not qualify for financing under the InnovFin SME Guarantee. However, loan sizes are reduced when compared to InnovFin SME Guarantee.

⁵⁹ http://www.eib.org/attachments/pi/access_to_finance_study_on_circular_economy_en.pdf

- **InnovFin SME Guarantee** – Guarantee instrument targeting innovative SMEs.
- **InnovFin MidCap Growth Facility (InnovFin MGF)** – Debt facility destined at innovative MidCaps⁶⁰.
- **InnovFin MidCap Guarantee Facility (InnovFin MCG)** – Guarantee instrument for innovative MidCaps.
- **InnovFin Large Projects** – Debt instrument for innovative projects with a total cost between €50-600 million.
- **EFSI** – Instrument launched under the Investment Plan for Europe, aimed at organizations of all sizes and mainly targeting projects concerning the development and the modernisation of the energy sector, renewable energy, security of energy supply and resource efficiency. High risk profile.

Besides these instruments developed together with the European Commission, circular economy projects can also apply to **standard EIB lending**, with a lower risk than InnovFin MGF, InnovFin MCG, InnovFin large Projects and EFSI. In addition, the **European Investment Fund (EIF)**, part of the EIB Group, also invests in venture capital funds, growth funds and mezzanine funds that support SMEs. However, these type of instruments are not depicted in Figure 6 – EIB Products to fund Circular Economy Projects, since the risk profile and the amount of the investments made by the intermediary funds vary significantly⁶¹.

⁶⁰ According to EU recommendation 2003/361/EC, mid-caps employ 250-3000 people.

⁶¹ http://www.eib.org/attachments/pi/access_to_finance_study_on_circular_economy_en.pdf

6 Conclusions

This final Chapter aims at presenting the main conclusions of this work. The conclusions were developed by the Consortium, with the contribution of external Experts during the FUTURING Workshop at The Hague, which was conducted on October 11th 2017, and the FUTURING Workshop which took place in Athens on December 12th 2017.

The analysis made it possible to conclude that at a **European level, Horizon 2020** is the broadest Programme covering advanced manufacturing and production technologies themes, encompassing the whole Innovation Lifecycle: Experimental Research, Applied Research and Technology Implementation. The **Work Programme 2018-2020** represents an investment of approximately **€30 billion**. **LEIT-NMBP**, standing for “Leadership in enabling and industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing”, with an estimated total budget of **€1,7 billion**, and **LEIT-ICT**, standing for “Leadership in enabling and industrial technologies – Information and Communication Technologies”, with an estimated total budget of **€2,7 billion**, are the parts of the Work Programme more relevant for advanced manufacturing and production technology initiatives. The new features of the Programme include measures to support market-creating innovation and highly integrated activities called Focus Areas, which have been designed around priorities that are fundamental for the future of advanced manufacturing: “A low-carbon, climate resilient future” (€3,3 billion); “**Circular Economy**” (**€941 million**); “Digitising and transforming European industry and services” (€1,7 billion); “Security Union” (€1 billion).

In the advanced manufacturing domain, the Programme covers production technologies, under topics that address **software technologies, robotics, big data, IoT, 4D printing, 5G, artificial intelligence, cyber physical systems of systems**; as well as **skills needed to new manufacturing jobs, circular economy and industrial sustainability**.

Like in the previous editions, the Horizon 2020 Work Programme 2018-2020 comprehends **Financial Support to Third Parties or Cascade Funding** (with **€777 million** to be distributed among third parties) which can be used to fund the implementation of technology in SMEs, playing a very important role in enabling the adoption of advanced manufacturing technologies in SMEs.

The **EIT (Europe Institute of Innovation and Technology)**, also an integral part of Horizon 2020, with an allocated budget **€2.4 billion** during the 2014-2020 period, will have a 2018 Innovation Community call for Manufacturing, aligned with the objectives of Horizon 2020: to increase Europe’s competitiveness within the global market while developing more sustainable and environment friendly manufacturing processes⁶².

COSME, also a part of Horizon 2020, which is the EU programme for the competitiveness of enterprises and SMEs, plays a crucial role in providing access to finance for SMEs, including access to loans and

⁶² https://eit.europa.eu/sites/default/files/webinar_presentation_eit_call_manufacturing_20170907.pdf

equity finance, that can be used to fund advanced manufacturing projects. This programme has a budget of **€2.3 billion** for the period from 2014-2020.

Public and Private Partnerships (PPP) are also very relevant to fund advanced manufacturing and production technologies projects. In the 2018-2020 Work Programme (under Horizon 2020), the **SPIRE (Sustainable Process Industries and Resource Efficiency)** initiative accommodates topics such as **secondary raw materials, non-conventional energy sources and recycling processes**, under the Circular Economy Focus Area. The **FoF (Factories of the Future)** initiative encompasses relevant topics for advanced manufacturing, such as **refurbishment and re-manufacturing of industrial equipment, skills needed for manufacturing jobs, pilot lines for additive manufacturing and modular factories, industrial human-robot collaboration**, as well as **digital manufacturing platforms and collaborative manufacturing environments**.

EUREKA network programmes, funded under EUREKA **Member Countries' National and Regional Programmes** and **Horizon 2020**, also play a very important role in promoting collaboration between SMEs, large organizations, research institutes and universities. Under EUREKA, there are opportunities for cooperation projects in the domain of advanced manufacturing and production technologies, aligned with EUREKA's objective to bring innovative products, processes and services to the market. There are calls open continuously every year.

Interreg Europe Programmes, funded by the **ERDF – European Regional Development Fund**, also under **Horizon 2020**, have a thematic focus aligned with the Europe 2020 strategy. This Programme is also aimed at SMEs and regional development, targeting research, technology development and innovation; competitiveness of SMEs; low-carbon economy; and environment and resource efficiency. A call for 2018 is expected, but has not been published at the date of this deliverable.

The **EIB Group** (the European Investment Bank and the European Investment Fund) plays a fundamental role in financing SMEs, being one of its top priorities, among Innovation and Skills and Climate Action and Environment. The EIB conducts an initiative in the **circular economy** domain, since it supports all EIB priorities, by providing finance and advisory for CE projects. This financing instrument is crucial for the implementation of circular economy, which is a strategic area for advanced manufacturing. During the last 5 years, the EIB co-financed projects worth **€2.4 billion** with a positive impact on sustainable and economic growth, competitiveness and employment. **EFSI (European Funds for Strategic Investment)**, a joint initiative between the EIB and the European Commission, mobilises private investment in projects which are strategically important for the EU, such as advanced manufacturing and production technologies.

At **National and Regional levels**, Programmes of the **European Structural and Investment Funds (ESIF)** support the EU 2020 strategy for smart, sustainable and inclusive growth. With an estimated budget of **€450 billion**, these programmes enable Member States and Regions to fully exploit their potential to achieve the 2020 goal, while ensuring territorial cohesion. The ESIF is constituted by five different funds, including **ERDF (European Regional Development Fund)** and the **Cohesion Fund**, which play a key role in the Countries in which they are available. ERDF and the Cohesion Fund contribute to reducing disparities between the levels of development of European regions and to reduce the

backwardness of the least favoured regions. Its objectives encompass the conversion of declining industrial regions, investment for growth and jobs and European territorial cooperation, representing an opportunity for projects in the advanced manufacturing domain.

National and Regional funds, which are different for each EU country, as they depend on National budgets, can be used to fund National and Regional projects, as well as to conduct interregional cooperation initiatives under European Programmes such as EUREKA and INTERREG.

Combining public funding and private financing, considering their characteristics, advantages and disadvantages, is a crucial factor for conducting an initiative in the advanced manufacturing domain. Public funds play an important role during experimental and applied research (TRLs1-5), since these phases require high investments and hold a significant risk. Public funds generally provide large monetary contributions and are designed to support strategic activities. The downside of this type of funding is the heavy bureaucratic processes associated and long lead times. For later stages of the innovation lifecycle, private funds are more appropriate, since they usually encompass less administrative workload and are more efficient and leaner, even though the amounts provided are lower than the amounts available in private funding.

6.1 Funding Gaps and Limitations

The work conducted under this Task enabled the identification of funding gaps as well as barriers and limitations, which are explained in the following paragraphs. The identified funding gaps are classified according to their impact: **critical** gaps and limitations are those who can compromise the strategic goals of future advanced manufacturing and production technologies initiatives, while **accessory** gaps and limitations are related to administrative processes and level of dissemination.

6.1.1 Critical Funding Gaps and Limitations

1 – The EIB is the only relevant actor with a lending instrument at European level

From the conducted analysis, the EIB is the only relevant public actor with a lending instrument at European level. Private financing by other European parties (ex.: banks) is generally insufficient and difficult to obtain, making the combination of public and private funding hard to realise, which is a barrier to explore the synergistic possibilities of combined funding.

2 – Current EIB instruments do not address the specific challenges of circular economy

Even though the EIB has financed circular economy projects in the past, none of the current EIB instruments address the specific challenges of CE. The report “Access-to-finance conditions for Projects supporting Circular Economy”, developed by the EIB, corroborates the Consortium and Experts statement, by proclaiming that “EIB has built a track record in financing circular economy projects through its standard lending practices, but there is more that needs and could be done to support CE transitions”. The EIB finances mostly projects who meet minimum size requirements, are economically viable and bankable, which means that CE projects conducted by SMEs (approximately 99% of all EU’s businesses) usually do not meet these requirements, making this type of funding inaccessible for most SMEs, therefore creating a barrier for the uptake of CE on a larger scale.

3 – Insufficient funding and topics for circular economy initiatives under Horizon 2020

In the specific domain of circular economy, which is considered a critical area for the future of advanced manufacturing, the amount of funding for the Horizon 2020 Circular Economy Focus Area is low compared to other Focus Areas. It was also identified that circular economy topics lack initiatives related to **product design**, focusing exclusively on resource efficiency and later stages of product lifecycle such as retrofitting, remanufacturing, refurbishment and recycling. **Circular business models** are also not covered under this Programme. Limited funding in this domain compromises the ability to fund initiatives of Experimental and Applied Research (TRLs 1-5), which is the foundation for the creation of PPS (product service systems).

In later stages of the innovation lifecycle, circular economy solutions usually need investment volumes that are too small to be attractive for financial institutions (ex.: banks) and too large to pay for from own equity. While there are European Programmes designed to support these kind of investments, such as COSME, EFSI and Horizon 2020, the total budget available from these funds is not sufficient to provide finance to all promising initiatives, especially from SMEs. Although the Commission has proposed to increase the budgets of COSME and EFSI, additional support to circular economy scale-up is required⁶³.

4 – Differences between funding and financing instruments in European Countries

The majority of European countries have CE and advanced manufacturing strategies under their National programmes. However, there are **differences between the budgets**.

Even though ERDF funding is available for all FUTURING countries, there are still some European regions that do not have access to ERDF and therefore show an increased difficulty to access funding.

6.1.2 Accessory Funding Gaps and Limitations

5 – Combination of Calls at different levels

From the analysis of the Programmes and based on the experience of Experts, there is often a difficulty to combine timings of calls from different programs at European, National and Regional Level. Some Programmes have a single call per year, which can lead to the loss of funding opportunities due to timing.

6 – Complexity of application processes

According to SMEs, the current processes to receive funding from European Programmes are too bureaucratic and resource-consuming. SMEs have also pointed that in some cases, there is a lack of coherence between different instruments.

7 – Lack of knowledge about funding possibilities

⁶³ Recreate Policy Brief No. 6, October 2017

Additionally, despite the amount of funding and financing instruments available, there is a general lack of knowledge about funding possibilities, especially at industry level. Companies often have difficulty identifying the most suitable funding and financing Programmes to satisfy their needs.

6.2 Recommendations

The identified funding gaps, barriers and limitations enabled the production of recommendations for improving framework conditions for advanced manufacturing and production technology innovation initiatives, with a special focus on circular economy. The most relevant recommendations are explained in the following paragraphs.

1 – Increase funding and financing instruments diversity under H2020, with a focus on SMEs and circular economy

The FUTURING Consortium and Experts agree that while funding and financing instruments promoting the uptake of leading-edge technologies by lead manufacturers are crucial to maintain and reinforce Europe's global leadership in advanced manufacturing, these instruments remain inaccessible to most European SMEs. As SMEs represent approximately 99% of Europe's enterprises, they are the cornerstone for the creation of added value, growth and jobs. Hence, shared pilot plants and demonstrators capable of propagating the immediate technological and economic benefits of adopting novel, yet established advanced manufacturing technologies will have a broader effect on the uptake of advanced manufacturing across the EU. Industrial SMEs need **high-quality demonstration environments** and **suitable framework conditions** that allow them to **pilot the implementation of advanced manufacturing technologies** and to adopt lessons from relevant research projects in cooperation with Research and Technology Organizations (RTOs) as well as other manufacturing organizations from relevant fields.

1.1 – Financial Support to Third Parties Calls on circular economy (SMEs)

As previously described, besides the public funding opportunities existing at National Level, there is also a huge opportunity for getting public funds at EU level for **SMEs** through the Cascade Funding scheme or **Financial Support to Third Parties**. This type of funding is appropriate for SMEs and should be disseminated more intensely, since there is a general lack of knowledge at industry level. Even though there are approximately €777 million to be distributed among third parties under the Horizon 2020 2018-2020 Work Programme, this Programme does not encompass specific calls in the circular economy domain, which is a fundamental aspect for advanced manufacturing. It would be fundamental to include **Financial Support to Third Parties calls** in the **circular economy** domain on future initiatives.

1.2 – Circular economy Topics and PPP

It is recommended that future **public funding initiatives** include a **larger budget for circular economy**, covering a wider range of topics, aiming at **initial stages of the innovation lifecycle**, such as **product design**. Another topic in which investment should be reinforced is **industrial symbiosis**, with an emphasis on **supply chains**.

The creation of a **Public and Private Partnership for Circular Economy** is also considered a very important measure to accelerate circular economy uptake.

The FUTURING Consortium supports the decision of the Commission to **increase the budgets of COSME and EFSI**, with the objecting of accommodating circular economy initiatives for SMEs.

3 – Implement financial measures to support the consumption of circular economy

In order to reach a successful implementation of circular economy, a focus on the supply side of circular economy is insufficient. **Financial measures to support the consumption/ use of circular economy** products and services are equally important for a successful implementation of circular economy and therefore should be considered.

4 – Diversify lending methods by creating alternative financial instruments

Financial organizations should consider **alternative financial instruments** and models that are emerging, such as crowd-funding, social impact bonds, equity in people, to fund circular economy projects, since current funding is insufficient. These examples could be used to create funding alternatives in larger-scale financing⁶⁴.

4.1 – Diversify risk assessment methods

More differentiated risk assessment methods which take into account the benefits of a circular economy should be developed and used by financial organizations, instead of traditional assessment methods. These assessment methods should use better metrics and indicators, suited for circular models, since most current indicators are designed for linear models. An example would be to expand EIB's InnovFin eligibility criteria to include non-technological innovation, since circular economy widespread adoption is enabled not only technology but also other aspects such as business models, environmental sustainability, policy and finance, education and training, humans and society, as stated in FUTURING's Building Blocks.

Low threshold entry funding measures are required for SMEs engaging in technology-oriented innovation.

5 – Tailor advisory service for companies

A **one-stop shop for applicants** or interested parties in advanced manufacturing and circular economy projects would help selecting and identifying the most suitable funding and financing programmes and the best way to combine them, removing barriers regarding timings, lack of knowledge and misinformation.

6 – Funding on a systems level on circular economy Projects

The transition to a circular economy is only possible based on an **integrated and systemic approach**, in which all the involved stakeholders (RTOs, SMEs and large organizations, policy makers, financial

⁶⁴ Recreate Policy Brief No. 6, October 2017

institutions, among others) engage proactively. **Funding** is also required beyond production and technology on a **systems level**. An example is spanning regional ecosystems to create blueprints for circular economy networks and relationships. EIB's report "Access-to-finance conditions for Projects supporting Circular Economy" recommends the creation of a dedicated financial circular economy multilateral platform bringing together the European Commission, the EIB, National Promotion Banks (NPB's) and private sector investors with the objective of creating knowledge, intelligence and awareness among business and financial communities.

Despite the existence of the referred funding gaps and barriers, the **diversified nature of funding and financing options** currently available to support advanced manufacturing projects, including public Programmes and private Products; as well as European, National and Regional initiatives, make it possible to achieve a considerably **wide coverage of the innovation cycle**. These efforts play a fundamental role in supporting organizations to accomplish their mission of developing and implementing concepts that can be materialized in innovative technological products brought to the market, creating economic value.

7 Annex 1 – Examples of Relevant Calls at European Level

7.1 Horizon 2020

7.1.1 Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing and Biotechnology - NMBP

Table 11 – Horizon 2020 – NMBP – Smart plastic materials with intrinsic recycling properties by design (CE-NMBP-26-2018)

European Programme	H2020 NMBP
Call	Industrial Sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Smart plastic materials with intrinsic recycling properties by design
Topic identifier	CE-NMBP-26-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-nmbp-26-2018.html
Closing Date	28 June 2018
Type of action	RIA Research and Innovation action
Challenge	Developing of multifunctional materials based products with smart intrinsic recycling and/or sorting abilities that harmonise with circular economy principles will create a real paradigm shift in the market and a clear benefit for society. It will also help industry to better match the EU environmental targets at the same time as improving their competitiveness.
Impact	<p>The development of novel plastic materials would aid in:</p> <ul style="list-style-type: none"> • Meeting the EU's circular economy and environmental targets while demonstrating a clear benefit, i.e. more efficient or economic than the state of the art in order to enable market uptake in the short to medium term; • Create new technologies and business opportunities for the recycling industry across Europe, especially in the area of composites and plastics where the challenge is high; • Demonstrate a potential reduction in landfill waste volume by > 50%; • Reduction of the carbon footprint of the corresponding products by > 30% (based on a full Life Cycle Assessment).
Observations	Activities should start at TRL 3 and achieve TRL 5 at the end of the project. Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Table 12 – Horizon 2020 – NMBP – Building information modelling adapted to efficient renovation (LC-EEB-02-2018)

European Programme	H2020 NMBP
Call	Industrial Sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Building information modelling adapted to efficient renovation (RIA)
Topic identifier	LC-EEB-02-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-eeb-02-2018.html
Closing Date	22 February 2018
Type of action	RIA Research and Innovation action
Challenge	<p>The Building Information Modelling (BIM) tools developed so far are adapted mainly to new buildings (all types). In order to offer easy, practical, operational tools for all stakeholders, including constructing companies, designers, architects and service companies, we need to deploy attractive tool kits also for existing buildings. A particular important challenge will be to produce compatible tools that would allow collecting of data from existing buildings (e.g. geometric data) and exploit data from different sources. This will also contribute to more accurate knowledge of the existing building stock by providing methods and tools to generate data for existing buildings. Such BIM tools will be exploited first and foremost in existing residential buildings.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • A reduction of the renovation working time of at least 15-20% compared to current practices with the baseline defined in the proposal; • Acceleration of the market uptake across Europe, by speeding-up industrial exploitation, in particular amongst constructing/renovations companies with a target of 50% of their renovation business based on BIM; • Creation of best practice examples for the construction retrofitting sector with benefits for the operators and associated stakeholders (architects, designers, planners, etc.).
Observations	<p>Activities should start at TRL 4 and achieve TRL 6 at the end of the project. Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.</p>

Table 13 – Horizon 2020 – NMBP – Advanced materials for additive manufacturing (DT-NMBP-19-2019)

European Programme	H2020 NMBP
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Advanced materials for additive manufacturing (IA)
Topic identifier	DT-NMBP-19-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-nmbp-19-2019.html
Closing Date	03 September 2019
Type of action	IA Innovation action
Challenge	<p>Additive manufacturing (AM) is now applied in the processing of most industrial metals, ceramics, polymers and composites, albeit at quite different levels of industrial readiness. The challenge is to develop equipment that allows the additive layer manufacturing of multi-materials items and multi-functional materials (for research, transport including aeronautic, consumer customised goods, communications, biomaterials and energy).</p> <p>The development of novel materials is a primary challenge in the future development of AM. The challenge is also to use nanotechnologies to aggregate multiple materials within a single process, while improving or expanding their functionality, and enhancing their performance. This may include optical, rheological, mechanical, RF, electrical, magnetic, surface, thermal or process properties, controlled release, durability (accelerated aging and life time prediction) and quality.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Improvement of the efficiency, quality and reliability of the product by at least 40%; • Better use of raw materials and resources with reduced environmental impact and to lower cost by 35% as demonstrated by Life Cycle Assessment; • New opportunities and business for SMEs across Europe (which are key players in advanced materials research for Additive Manufacturing).
Observations	Activities should start at TRL 4 and achieve TRL 6 at the end of the project. Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Table 14 – Horizon 2020 – NMBP – A digital 'plug and produce' online equipment platform for manufacturing (DT-NMBP-20-2018)

European Programme	H2020 NMBP
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	A digital 'plug and produce' online equipment platform for manufacturing (IA)
Topic identifier	DT-NMBP-20-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-nmbp-20-2018.html
Closing Date	08 March 2018
Type of action	IA Innovation action
Challenge	One of Europe's strengths in manufacturing is its abundance of SME equipment manufacturers with the capability to offer world-class products of highest quality and precision. A further strength is the large number of actors having off-the-shelf prototypes ready for experimentation and for market uptake. To increase their visibility towards global users of equipment and to further support digitisation of manufacturing, industrial online platforms needs to be developed and set up for use on the market.
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Deliver a B2B online platform covering at least one key industrial equipment domain and mobilising actors across Europe; • Demonstrate the full capability of the platform in one dedicated industrial domain, including associated product services (e.g. digital models enabling functional simulation) and including the services from all third parties selected in line with the conditions set out in Part K of the General Annex; • Showcase the platform's scalability capability (towards all relevant industrial domains) via a reference architecture; • Deliver a credible business plan that ensures long-term deployment and profitability, as well as scalability beyond the initial public financing phase; • Demonstrate industry-wide support through an inclusive governance structure; • Increase market opportunities for the users of the platforms, including SMEs.
Observations	It is recommended to also use established networks reaching out to SMEs like the Enterprise Europe Network and the NCP network for calls publications and awareness raising towards SMEs.

7.1.2 Information and Communication Technologies - ICT

Table 15 – Horizon 2020 – ICT – Computing technologies and engineering methods for cyber-physical systems of systems (ICT-01-2019)

European Programme	H2020 ICT
Call	Information And Communication Technologies (H2020-ICT-2018-2020)
Topic	Computing technologies and engineering methods for cyber-physical systems of systems
Topic identifier	ICT-01-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-01-2019.html
Closing Date	28 March 2019
Type of action	CSA Coordination and support action, RIA Research and Innovation action
Challenge	Cyber-physical Systems of Systems (CPSoS), like transport networks or large manufacturing facilities, interact with and are controlled by a considerable number of distributed and networked computing elements and human users. These complex and physically-entangled systems of systems are of crucial importance for the quality of life of the citizens and for the European economy. At system level the challenge is to bring a step change to the engineering techniques supporting the design-operation continuum of dynamic CPSoS and to exploit emerging technologies such as augmented reality and artificial intelligence. At computing level the challenge is to develop radically new solutions overcoming the intrinsic limitations of today's computing system architectures and software design practices.
Impact	Proposals should achieve all of the following: <ul style="list-style-type: none"> • Availability of innovative technologies supporting compute-intensive applications in industrial and professional domains, demonstrating significant and measurable improvement over the state of the art. • Availability of engineering practices and tools for CPSoS, resulting in a demonstrable improvement in quality and cost of development and operation for large SoS. • Increased synergies and collaboration between industrial and academic communities; dissemination of high-quality roadmap for future research and innovation activities in the relevant areas.
Observations	Projects will target TRLs 2-5, and will deliver a working prototype tested in at least two different use cases, demonstrating improvement over the state of the art in industrial and professional domains.

Table 16 – Horizon 2020 – ICT – Security and resilience for collaborative manufacturing environments (ICT-08-2019)

European Programme	H2020 ICT
Call	Information And Communication Technologies (H2020-ICT-2018-2020)
Topic	Security and resilience for collaborative manufacturing environments
Topic identifier	ICT-08-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-08-2019.html
Closing Date	28 March 2019
Type of action	RIA Research and Innovation action
Challenge	<p>As addressed in the multi-annual roadmap [1] of the FoF cPPP, physically-entangled systems used in manufacturing environments have some specific requirements in terms of reliability and security, which are now challenged by the need for manufacturing facilities to be digitally connected with external partners in the value chain. While free flow of data is a primary requirement for digitisation of industry, it poses significant challenges in terms of data security, which cannot be solved easily because the factory of the future must exchange digital information with the outside world just like raw materials and components. There is a need to develop practically usable solutions which can guarantee an adequate level of security without limiting the capability to exchange data and information both on the manufacturing floor and beyond the factory.</p> <p>[1] See roadmap document "Factories 4.0 and Beyond" on http://www.effra.eu/</p>
Impact	Take-up by industry of practically usable solutions which guarantee significantly increased cyber-security levels in daily operations for manufacturing facilities and other actors in the value chains.
Observations	<p><i>Cross-cutting Priorities</i></p> <p>Contractual Public-Private Partnerships (cPPPs)</p> <p>FoF</p> <p>Proposals will target TRL 5 to 7, and will include at least one use case which will demonstrate measurable and significant improvements over state of the art tools and methods under real-world conditions.</p>

Table 17 – Horizon 2020 – ICT – Supporting the emergence of data markets and the data economy (ICT-13-2018-2019)

European Programme	H2020 ICT
Call	Information And Communication Technologies (H2020-ICT-2018-2020)
Topic	Supporting the emergence of data markets and the data economy
Topic identifier	ICT-13-2018-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-13-2018-2019.html
Closing Date	17 April 2018
Type of action	CSA Coordination and support action, RIA Research and Innovation action
Challenge	<p>The lack of trusted and secure platforms and privacy-aware analytics methods for secure sharing of personal data and proprietary/commercial/industrial data hampers the creation of a data market and data economy by limiting data sharing mostly to open data. This need strongly emerges from recent evidence from stakeholders, both for personal data platforms [1] and for industrial data platforms. [2], [3], [4] The lack of ICT and Data skills seriously limits the capacity of Europe to respond to the digitisation challenge of industry. Specific attention needs to be put in involving SMEs and give them access to data and technology. IT standardisation faces new challenges as technologies converge and federated systems arise, creating new gaps in interoperability.</p> <p>[1] See a Commission paper on "Personal information management services – Current state of service offers and challenges" analysing feedback from public consultation [2] See "Industrial Data Platforms – Key Enablers of Industry Digitization", IDC study report 28/7/2016 [3] See "Report on the alignment of priorities and programmes and mobilisation of investments towards platform/standardisation initiatives" DEI Working Group 2 "Strengthening Leadership in Digital Technologies and in Digital Industrial Platforms across Value Chains in all Sectors of the Economy", to be published in April 2017. [4] See European Commission Staff working document accompanying the communication "Building the European Data Economy", published in January 2017.</p>
Impact	<p><u>Innovation Actions (IA) and Research and Innovation Actions (RIA)</u></p> <ul style="list-style-type: none"> • Personal data protection is improved, and compliance with the General Data Protection Regulation (and other relevant legislation) is made easier for economic operators • Citizens' trust is improved as privacy-aware transparency and control features are increasingly streamlined across data platforms and Big Data applications. • Better value-creation from personal and proprietary/industrial data. • 20% annual increase in the number of data provider organisations in the personal and industrial data platforms • 30% annual increase in the number of data user/buyer organisations using industrial data platforms • 50% annual increase in number of users (data subjects) in the personal data platforms • 20% annual increase in volume of business (turnover) channelled through the platforms

	<u>Coordination and Support Actions (CSA)</u> <ul style="list-style-type: none"> • Demonstrated success stories among clients as a result of the services offered by the CSA and at least 50 clients (e.g. start-ups, SMEs) served annually in partner finding, matchmaking, venture capital raising, training, coaching etc. • Improved standardisation and interoperability especially in the context of cross-sector applications and technology convergence (data, Cloud, IoT, connectivity a.o.)
Observations	Cross-cutting Priorities Contractual Public-Private Partnerships (cPPPs) BigData Socio-economic science and humanities

Table 18 – Horizon 2020 – ICT – Artificial Intelligence (ICT-26-2018-2020)

European Programme	H2020 ICT
Call	Information And Communication Technologies (H2020-ICT-2018-2020)
Topic	Artificial Intelligence
Topic identifier	ICT-26-2018-2020
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-26-2018-2020.html
Closing Date	17 April 2018
Type of action	RIA Research and Innovation action
Challenge	<p>Artificial Intelligence (AI) is a key technology for the further development of the Internet and all future digital devices and applications. Driven by the wider availability of large amounts of data and increasingly higher performance computing and networking, AI brings additional autonomy to all types of physical and virtual artefacts and opens the door to a wave of innovations and opportunities. It is already transforming important sectors ranging from data analytics and Web platforms up to driverless vehicles and new generation of robots for our homes, hospitals, farms or factories.</p> <p>The challenge is to fully exploit the potential of AI in the economy and society. Building notably on Europe's Scientific and Technology strengths in the field, the supported activities should reinforce industrial competitiveness across all sectors including for SMEs and non-tech industries and help address societal challenges (e.g. ageing, transport). The focus is on R&I areas in AI where collaborative work at European level can make a difference amidst the fierce world-wide competition in the field. The ambition is therefore to make AI technologies and resources available to developers and innovators in all sectors and actively engage with a wide user community, including non-AI experts.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Building a sustainable AI-on-demand platform, becoming a reference, mobilising the entire European AI community, and ensuring a leading position for Europe in AI. • Reinforcing European excellence and leading position worldwide in major research and application domains, especially through the research and innovation efforts to fill important technology gaps. • Boosting technology transfer of AI, especially towards SMEs and non-technology sectors, and disseminating the economic benefits of AI to a large user base.
Observations	It is expected that this topic will continue in 2020.

7.1.3 Cross-Cutting Activities

Table 19 – Horizon 2020 – DT – Human centred design for the new driver role in highly automated vehicles (DT-ART-03-2019)

European Programme	H2020 Smart, green and integrated transport
Call/ Focus Area	Digitising and transforming European industry and services: automated road transport (H2020-DT-ART-2018-2019-2020)
Topic	Human centred design for the new driver role in highly automated vehicles
Topic identifier	DT-ART-03-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-art-03-2019.html
Closing Date	24 April 2019
Type of action	RIA Research and Innovation action
Challenge	Significant research efforts are addressing driver performance and behaviour in automated driving conditions still requiring the driver to be prepared to assume control (SAE automation level 3 and lower). In highly automated driving conditions (SAE automation level 4) the role of the driver will change dramatically since driver intervention is not required during defined use cases. This means that during a single trip there will be a coexistence of different automated driving functions demanding various degrees of human attention. When a vehicle is in highly automated driving mode the driver may take on different behaviours. Solutions need to be developed and they have to ensure both a safe transfer between use cases with different automation levels and that drivers always have a very clear understanding about the degree of automation enabled in each situation.
Impact	<ul style="list-style-type: none"> • Innovative solutions, concepts and algorithms for a safe human-machine interface of highly automated driving functions and for safe and controlled transfer between use cases of different automation levels. • Reduction of risks for driver behaviour related incidents by ensuring that drivers/operators are adequately alerted, made aware and engaged when the highly automated vehicle encounters situations or use cases that it cannot handle and thus will turn to lower automation levels. • The research will help achieve the European Transport White Paper "Vision Zero" objective by preventing road accidents caused by human errors. Once on the market the developed concepts and solutions will also contribute to Sustainable Development Goal 3 (Ensure healthy lives and promote well-being for all at all ages; in particular goal 3.6. "By 2020, halve the number of global deaths and injuries from road traffic accidents").
Observations	Cross-cutting Priorities International cooperation (projects or partners from the US, Japan, South Korea, Singapore, and/or Australia) Socio-economic science and humanities

Table 20 – Horizon 2020 – DT – Digital Manufacturing Platforms for Connected Smart Factories (DT-ICT-07-2018-2019)

European Programme	H2020 Information and Communication Technologies
Call/ Focus Area	Digitising and transforming European industry and services: digital innovation hubs and platforms (H2020-DT-2018-2020)
Topic	Digital Manufacturing Platforms for Connected Smart Factories
Topic identifier	DT-ICT-07-2018-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-ict-07-2018-2019.html
Closing Date	17 April 2018 (IA Innovation action) 02 April 2019 (CSA Coordination and support action, IA Innovation action)
Type of action	CSA Coordination and support action, IA Innovation action
Challenge	Digital manufacturing platforms play an increasing role in dealing with competitive pressures and incorporating new technologies, applications and services. Advances are needed in digital manufacturing platforms that integrate different technologies, make data from the shop floor and the supply network easily accessible, and allow for complementary applications. The challenge is to fully exploit new concepts and technologies that allow manufacturing companies (especially mid-caps and SMEs) to fulfil the demands from changing supply and value networks.
Impact	Proposals should achieve all of the following: <ul style="list-style-type: none"> • Significant increase in the options for SMEs and mid-caps to integrate different technologies, unlock the value of their data, deploy complementary applications, and to become a more responsive link in changing supply and value networks. • Strengthened competitive position of European platform providers. • Increased cooperation between industrial and academic communities; increased synergy and collaboration between projects.
Observations	Cross-cutting Priorities Contractual Public-Private Partnerships (cPPPs) FoF

Table 21 – Horizon 2020 – DT – Big data solutions for energy (DT-ICT-11-2019)

European Programme	H2020 Information and Communication Technologies
Call/ Focus Area	Digitising and transforming European industry and services: digital innovation hubs and platforms (H2020-DT-2018-2020)
Topic	Big data solutions for energy
Topic identifier	DT-ICT-11-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-ict-11-2019.html
Closing Date	02 April 2019
Type of action	IA Innovation action
Challenge	Tomorrow's energy grids consist of heterogeneous interconnected systems, of an increasing number of small-scale and of dispersed energy generation and consumption devices, generating huge amounts of data. The electricity sector, in particular, needs big data tools and architectures for optimized energy system management under these demanding conditions.
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Effective integration of relevant digital technologies in the energy sector, resulting in integrated value chains and efficient business processes of the participating organizations; • Enhancing energy asset management, increasing consumer participation and innovative network management, creating new data-driven business models and opportunities and innovative energy services; • Contribution to increasing the use of renewable energy and increased energy efficiency based on optimised energy asset management, offering access to cheaper and sustainable energy for energy consumers and maximising social welfare; • New data-driven paradigms for energy management systems able to deal with increased complexity of the energy systems; • Improving availability of big data and big data management & analysis facilities for real-life scale research, simulation and test purposes.
Observations	Cross-cutting Priorities Contractual Public-Private Partnerships (cPPPs) Big Data

Table 22 – Horizon 2020 – DT – Digital Platforms/Pilots Horizontal Activities (DT-ICT-13-2019)

European Programme	H2020 Information and Communication Technologies
Call/ Focus Area	Digitising and transforming European industry and services: digital innovation hubs and platforms (H2020-DT-2018-2020)
Topic	Digital Platforms/Pilots Horizontal Activities
Topic identifier	DT-ICT-13-2019
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-ict-13-2019.html
Closing Date	14 November 2018
Type of action	CSA Coordination and support action
Challenge	<p>Coordination and Support activities are needed to support the operation of the pilot projects under the Platforms and Pilots topics in this Focus Area, and to support exploitation of the outcomes of these projects. These activities are expected to identify synergies among the pilot projects of the Focus Area, to promote cross-fertilisation, and to exchange best-practices and lessons learned. There is a need to increase coverage in technological, application, innovation, and geographic terms of these projects, as well as improve their engagement with relevant external stakeholders, and their links with regional/national and other European initiatives.</p> <p>In addition, coordination and support activities are needed to pave the way for future digital industrial platforms in another promising sector, the construction sector. There is major improvement potential in optimising resource use, environmental performance, health, comfort, and resilience to climate change.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Tangible contributions from European key players to actively engage with the platform building process; • Efficient information sharing across the Programme stakeholders for horizontal issues of common interests; • Maintaining and extending an active eco-system of relevant stakeholders, including start-ups and SMEs; • Validation in usage context of usability, risk and security assessment and identification of gaps related to trust, security and privacy, respect for the scarcity and vulnerability of human attention, and liability and sustainability; • Strengthening of the role of EU on the global scale, in particular in terms of standardisation activities and access to foreign markets; • Increased prospects on productivity improvements in the construction sector, and on a contribution to a more sustainable construction sector.
Observations	N/a

Table 23 – Horizon 2020 – LC – Research, innovation and educational capacities for energy transition (LC-SC3-CC-5-2018)

European Programme	H2020 Information and Communication Technologies
Call	Building a low-carbon, climate resilient future: secure, clean and efficient energy (H2020-LC-SC3-2018-2019-2020)
Topic	Research, innovation and educational capacities for energy transition
Topic identifier	LC-SC3-CC-5-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-cc-5-2018.html
Closing Date	06 September 2018
Type of action	CSA Coordination and support action
Challenge	<p>The energy sector is evolving rapidly creating new job opportunities while requiring new skills and expertise to be developed. The challenges are significant. Over the coming years, the growing low-carbon energy sector requires many employees to be educated, trained or re-skilled. At the same time, energy innovation creates a massive need for new talents, able to cope and conduct the energy transition with a systemic approach. Therefore, curricula and programmes, including the modules organised in operating environment, need to be upgraded or new ones developed.</p> <p>Due to their interdisciplinary work in research, innovation, education and training, universities are core stakeholders in Europe's energy transition towards a low carbon society. They also are important change agents that will be instrumental in responding to the above mentioned challenges.</p> <p>In order that European universities contribute fully to the objectives of the Energy Union and to the SET Plan [1] they need to cooperate further with innovative businesses and offer appropriate curricula/programmes [2]. To do so silos need to be broken between energy technologies and interdisciplinarity that is conducive to addressing the challenges of the whole energy system needs to be fostered. The appropriate skills for tackling the energy transition, going beyond separate technologies and incorporating social, entrepreneurial/managerial and market aspects of the energy system, need to be developed.</p> <p>In addition, solutions need to be clearly targeted, oriented to meet skills needs quickly, easily replicable in other domains and scalable to other European universities/institutions. For this purpose, it is crucial to have active networks in place among universities and between universities and business.</p> <p>[1] https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan [2] The SET Plan Education and Training Roadmap can serve as a general reference document https://setis.ec.europa.eu/setis-output/education-training-roadmap</p>
Impact	<ul style="list-style-type: none"> The funded proposals are expected to lead to a generation of researchers and engineers who are equipped to develop, improve

	<p>and deploy new energy technologies, thereby contributing to meeting the challenges of the energy transition.</p> <ul style="list-style-type: none"> At the same time, the capacities of the European universities in energy research, innovation and education will be enhanced, as will their ability to engage with industry, cities, regions and other key societal actors. This will increase European universities' abilities to facilitate the swift deployment of technological and non-technological innovations in the energy sector.
Observations	Cross-cutting Priorities Socio-economic science and humanities

Table 24 – Horizon 2020 – LC – Disruptive innovation in clean energy technologies (LC-SC3-RES-2-2018)

European Programme	H2020 Information and Communication Technologies
Call	Building a low-carbon, climate resilient future: secure, clean and efficient energy (H2020-LC-SC3-2018-2019-2020)
Topic	Disruptive innovation in clean energy technologies
Topic identifier	LC-SC3-RES-2-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-res-2-2018.html
Closing Date	19 April 2018
Type of action	RIA Research and Innovation action
Challenge	<p>The challenge is to take exceptionally promising and innovative energy solutions with high potential impact to real breakthrough and market application. Boosting the breakthrough of particular promising technologies requires both a focused and adaptive approach, to secure that investment brings innovation that is taken up by the market - or discontinues an investment that has too limited expected impact. Specific fields where disruptive rather than incremental innovation is needed are the integration of renewable energy into smart buildings, and sustainable fuels. A specific challenge is to develop efficient fully transparent photovoltaic (PV) cells that only absorb light in the non-visible part of the spectrum, so that they can be integrated on a wide scale as windows in buildings. Another specific challenge is to enable production of sufficient quantities of liquid fuels that do not compete with food for land, do not displace land uses, are cost competitive to fossil fuels and substantially reduce greenhouse gas emissions.</p>
Impact	<ul style="list-style-type: none"> • Transparent, visually non-intrusive PV windows have a significant market potential, because they could be fitted to existing buildings, without the need to cover large new areas to collect solar energy; every glass surface could produce solar power. As such PV windows block much of the infrared radiation, they would cut down on air conditioning needs, further reducing energy use and operating costs in buildings. • An economically viable bionic leaf technology with increased efficiency well beyond the state-of-the-art has significant market potential and environmental impact, because it will enable development of sustainable fuel for transport that will completely replace fossil fuels and their best alternatives. Converting 50% of all industrial CO₂ emissions into fuels using this process at an efficiency of only 15% would avoid half of today's transport GHG emissions. Moreover, this will improve Europe's energy security while at the same time create economic growth.
Observations	<p>Cross-cutting Priorities</p> <p>Open Innovation; Clean Energy</p>

Table 25 – Horizon 2020 – SC5 – Coordinated approaches to funding and promotion of research and innovation for the circular economy (CE-SC5-05-2018)

European Programme	H2020
Call	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)
Topic	Coordinated approaches to funding and promotion of research and innovation for the circular economy
Topic identifier	CE-SC5-05-2018
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-sc5-05-2018.html
Closing Date	27 February 2018
Type of action	CSA Coordination and support action
Challenge	<p>Authorities throughout the EU continue to fund research and innovation in the field of circular economy at a national or regional level. Programme owners do so on the basis of their own mandates, though doubtlessly to a large extent in accordance with national and European priorities. Nevertheless, fragmentation of scarce resources, difficulties in implementing international synergies without a joint platform and lack of institutionalized outreach throughout Europe all hamper progress towards achieving common EU objectives. Moreover, the progress made in research and innovation underpinning circular economy varies throughout the EU.</p> <p>This calls for a strategic approach to the coordination of objectives and programming of the regional, national and European funding programmes throughout the area of research and innovation for a circular economy. A strategic approach would help build international synergies among programme owners (in order to overcome and avoid fragmentation), and strengthen dissemination of lessons learned and new solutions for the circular economy resulting from currently isolated national programmes and funding.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Alignment and coordination of regional, national and European programming of R&I in the area of the circular economy and associated environmental impacts; • Effective regional, national and European R&I funding in the field of the circular economy, with special attention to SMEs; • Accelerated diffusion of state-of-the-art circular economy solutions and best practices in circular economy R&I throughout Europe; • Implementation of national and EU-level action plans including the Circular Economy Action Plan, the Green Action Plan for SMEs, and Eco-Innovation Action Plan.
Observations	N/a

Table 26 – Horizon 2020 – SC5 – Raw materials innovation for the circular economy: sustainable processing, reuse, recycling and recovery schemes (CE-SC5-07-2018-2019-2020)

European Programme	H2020
Call	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)
Topic	Raw materials innovation for the circular economy: sustainable processing, reuse, recycling and recovery schemes
Topic identifier	CE-SC5-07-2018-2019-2020
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-sc5-07-2018-2019-2020.html
Closing Date	04 September 2018; 04 September 2019
Type of action	IA Innovation action
Challenge	<p>Securing the sustainable access to raw materials, including metals, industrial minerals, wood- and rubber-based, construction and forest-based raw materials, and particularly Critical Raw Materials (CRM), is of high importance for the EU economy. Complex primary and secondary resources contain many different raw materials. Their processing, reuse, recycling and recovery schemes are complex and imply different steps, ranging from collection, logistics, sorting and separation to cleaning, refining and purification of materials.</p> <p>The challenge for industry is to scale up promising raw materials production technologies and to demonstrate that raw materials can be produced in an innovative and sustainable way in order to make sure that research and innovation end up on the market, to strengthen the competitiveness of the European raw materials industries, meet ambitious energy and climate targets for 2030, minimise environmental impacts and risks, and gain the trust of EU citizens in the raw materials sector.</p> <p>This specific challenge addresses the development of "innovative pilot actions", which is one of the major targets of the European Innovation Partnership (EIP) on Raw Materials.</p>
Impact	<p>Proposals should achieve all of the following:</p> <ul style="list-style-type: none"> • Pushing the EU to the forefront in the area of raw materials processing and/or recycling technologies and solutions through generated know-how (planned patents, publications in high impact journals and joint public-private publications etc.); • Improving significantly the economic viability and market potential that will be gained through the pilot, leading to expanding the business across the EU after the project is finished, as well as creating added value and new jobs in raw materials producing, equipment manufacturing and/or downstream industries; • Unlocking a significant volume of various primary/secondary raw materials currently unexploited/underexploited within the EU, hence improving their 'circularity' in the economy;

	<ul style="list-style-type: none"> • Improving significantly the health, safety and environmental performance throughout the whole life cycle considered, including better energy and water efficiency, a reduction in waste generation and wastewater and a better recovery of resources from generated waste or a better recovery and recycling of resources from complex end-of-life products; • Additionally, only for sub-topic b) 'Recycling of raw materials from end-of-life products', in the shorter term, increasing measurably the efficiency and effectiveness (range, yield, quality and selectivity of recovered materials) of the exploitation of complex and heterogeneous secondary raw materials deposits ('urban mines') when compared to the state of the art; • Additionally, only for sub-topic c) 'Recycling of raw materials from buildings', lead to wider application of smart demolition techniques, C&DW processing, quality assurance practices, traceability and standardization for secondary raw materials in the construction sector, thus improving the material and value recovery rate.
Observations	<p>Actions should develop and demonstrate innovative pilots for the clean and sustainable production of non-energy, non-agricultural raw materials in the EU from primary and/or secondary sources finishing at Technology Readiness Levels (TRL) 6-7.</p>

Table 27 – Horizon 2020 – SC5 – Raw materials policy support actions for the circular economy (CE-SC5-08-2018-2019-2020)

European Programme	H2020
Call	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)
Topic	Raw materials policy support actions for the circular economy
Topic identifier	CE-SC5-08-2018-2019-2020
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-sc5-08-2018-2019-2020.html
Closing Date	27 February 2018; 19 February 2019
Type of action	CSA Coordination and support action
Challenge	<p>In order to secure the sustainable access to primary and secondary raw materials, including metals, industrial minerals, construction raw materials, wood, and particularly Critical Raw Materials (CRMs) for the EU economy, there is a need to tackle a number of specific non-technological challenges at local, regional, national, EU and global levels.</p> <p>Illegal shipments of waste, both within the EU and to non-EU countries, and poor recycling have adverse effects on human health and the environment, create unfair competition for law abiding operators and give rise to the loss of valuable resources in the case of poor or no treatment. However, port authorities and enforcement authorities have limited resources to control the ever increasing amount of material shipped and this without blocking normal traffic. In addition, at the moment there is no distinction in customs codes between “new goods” and “second hand goods” which implies that illegal waste shipments are often disguised as “second hand goods”.</p> <p>Currently, at most only one third of waste wood is recycled, the rest being landfilled or incinerated and there are great differences between Member States in wood recycling performance. Increasing production costs combined with stagnating product prices in recent years have put pressure on the profit margins of the EU woodworking industries, mostly dominated by SMEs. There is a need for higher resource efficiency and increased use of recycled wood in wood processing that can provide measurable improvements in company profitability.</p> <p>Sub-topics:</p> <ul style="list-style-type: none"> a) Voluntary scheme for certification of treatment facilities for key types of wastes (2018); b) Resource efficiency in wood processing, recovery and recycling (2018); c) Responsible sourcing of raw materials in global value chains (2019)
Impact	<p>sub-topic a)</p> <ul style="list-style-type: none"> • Achieving the objectives and the implementation of both the Raw Materials Initiative and the EIP on Raw Materials, in particular in

	<p>terms of strengthening the enforcement of the Waste Shipment Regulation and improving access to critical raw materials (CRMs);</p> <ul style="list-style-type: none"> • Increased recovery rates in the EU as regards key types of waste/recyclates containing significant amounts of CRMs; • In the longer term, reduced EU dependency on imports of CRMs; • creating added value and new jobs in metallurgy, equipment manufacturing and/or downstream industries; • Improving the environmental (control of emissions, residues, effluents), health and safety performance of operations throughout the whole life cycle. <p>sub-topic b)</p> <ul style="list-style-type: none"> • Achieving the objectives and the implementation of the EU Forest Strategy, Circular Economy Action Plan and the EIP on Raw Materials on resource-efficient use of resources; • Improving knowledge and conditions for efficient wood processing when compared to the state of the art, resulting in increased competitiveness of the EU woodworking industries; • Increased wood waste recycling across the EU (including from furniture, construction and demolition, packaging, household) and increased acceptance in the use of secondary wood; • Better informed decision-making at EU, national and local levels in the private and public sectors on wood recycling and resource efficiency; and improved knowledge of EU stakeholders about proposed solutions, including authorities involved in wood recycling; • In the medium and long term, creating added value and new jobs and increasing the overall competitiveness of the EU woodworking industries and related value-chains through an uptake of resource-, water- and energy-efficient solutions. <p>sub-topic c)</p> <ul style="list-style-type: none"> • Achieving the objectives of both the Raw Materials Initiative and the EIP on Raw Materials in terms of the access and responsible sourcing of raw materials; • Improved awareness of consumers/corporates and improved perception of responsible sourcing as a source of competitive advantage through more responsible sourcing and responsible business conduct initiatives with regards to raw materials; • Increased visibility of responsible sourcing in global political agenda-setting and emergence of a globally accepted definition of responsible sourcing.
Observations	<p>Cross-cutting Priorities: International cooperation Open Innovation Socio-economic science and humanities</p>

7.1.4 SME Instrument

Table 28 – Horizon 2020 – SME – SME instrument (EIC-SMEInst-2018-2020)

European Programme	H2020 Towards the next EU Framework Programme for Research and Innovation: European Innovation Council (EIC) Pilot
Call	SME Instrument (H2020-EIC-SMEINST-2018-2020)
Topic	SME instrument
Topic identifier	EIC-SMEInst-2018-2020
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/eic-smeinst-2018-2020.html
Closing Date	Multiple cut-off dates: - SME-1 SME instrument phase 1 (February 2018 – November 2020) - SME-2 SME instrument phase 2 (January 2018 – October 2020)
Type of action	SME-1 SME instrument phase 1 SME-2 SME instrument phase 2
Challenge	The SME Instrument supports high-risk, high-potential small and medium-sized enterprises to develop and bring to market new products, services and business models that could drive economic growth. The SME Instrument is for innovators with ground-breaking concepts that could shape new markets or disrupt existing ones in Europe and worldwide. These innovations must meet user and customer needs and tackle societal, technological and business challenges in a sustainable way.
Observations	There are no set topics. Negative impacts on climate and the environment should be avoided.

7.1.5 INNOSUP

Table 29 – Horizon 2020 – INNOSUP – European Open Innovation network in advanced technologies (INNOSUP-07-2019)

European Programme	H2020 Innovation in small and medium-sized enterprises
Call	For a better innovation support to SMES (H2020-INNOSUP-2018-2020)
Topic	European Open Innovation network in advanced technologies
Topic identifier	INNOSUP-07-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/innosup-07-2019.html
Closing Date	01 August 2019
Type of action	CSA Coordination and support action
Challenge	<p>Open innovation is a paradigm that assumes that companies can benefit from external ideas/technologies (Outside-In) and valorise internal ideas/technologies with external partners (Inside-Out) to reduce the financial risks associated to innovation, and quickly get a competitive advantage. Open Innovation implies accelerating internal R&D and innovation along value chains through collaboration between the technological supply - and demand – side [1] within networked, multi-collaborative ecosystems.</p> <p>Open innovation today is a well-known concept in large companies. However, SMEs are less aware of the opportunities offered by open innovation. Innovation intermediaries such as technology centres can help SME solution providers get closer to large industrial users to co-create [2] new products/services through a better anticipation of their needs.</p> <p>One major role of technology centres is "to bridge the gap between internal and external know-how". [3] They are thus well-positioned as innovation intermediaries in an open innovation context. Technology centres help companies move technologies (such as digital and other key enabling technologies) from lab to market. They often achieve innovation by adapting existing ideas and concepts to other industrial ambits and usually collaborate with both large companies and SMEs.</p> <p>[1] Open innovation, open science, open to the world - a vision for Europe, DG RTD, 2016 (http://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe)</p> <p>[2] Co-creation refers to the joint development of knowledge through relationships with specific partners. Relationships can be consortia of competitors, suppliers, customers as well as universities and Public Research Organisations (such as RTOs).</p> <p>[3] Boosting open innovation and knowledge transfer in the European Union, Independent expert group report on open innovation and knowledge transfer ; Directorate-General for Research and Innovation, 2014 (http://bookshop.europa.eu/fr/boosting-open-innovation-and-knowledge-transfer-in-the-european-union-pbKI0214284/)</p>
Impact	<ul style="list-style-type: none"> • Critical mass of collaboration projects between SME solution providers and (large, multinational) industry users.

	<ul style="list-style-type: none"> • Sustainable network ensuring effective matchmaking, at pan-European level, between innovative solutions from SME providers and needs/usages of (large, multinational) industries. • Positive business impacts (e.g. increased sales) for SME providers having benefited from the brokerage services. • Increased provision by SMEs of innovative solutions based on advanced technologies matching the needs of industrial users.
Observations	N/A

Table 30 – Horizon 2020 – INNOSUP – Cluster facilitated projects for new industrial value chains (INNOSUP-01-2018-2020)

European Programme	H2020 Innovation in small and medium-sized enterprises
Call	For a better innovation support to SMES (H2020-INNOSUP-2018-2020)
Topic	Cluster facilitated projects for new industrial value chains
Topic identifier	INNOSUP-01-2018-2020
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/innosup-01-2018-2020.html
Closing Date	IA Innovation action (13 September 2018) IA Innovation action (12 September 2019)
Type of action	IA Innovation action
Challenge	<p>To develop new cross-sectoral industrial value chains across the EU, by building upon the innovation potential of SMEs. The EU needs to support the development of emerging industries, which will provide the growth and employment of the future. The reindustrialisation of the EU's industrial base has to focus on the development of long-term internationally competitive goods and services that require combining different competences and innovative solutions. The development of new industrial value chains calls for the collaboration and integration of different innovation actors, including large enterprises and especially SMEs, across different sectors towards the implementation of a joint vision.</p> <p>SMEs need help to generate, take up and better capitalise on all forms of knowledge, creativity, craftsmanship and innovation - including for the application of existing cross-cutting or emerging technologies, advanced manufacturing, ICT, eco-innovative and resource- efficient solutions, new business models, service innovation and design. The potential of clusters - that represent favourable ecosystems for innovation and entrepreneurship - need to be better exploited in this respect.</p>
Impact	<ul style="list-style-type: none"> • Strengthen industrial leadership in the EU Member States and Associated Countries by reinforcing value chains that integrate innovative solutions in SMEs, along and across existing value chains. • Stimulate the creation of new globally competitive industrial value chains across the EU Member States and Associated Countries to accelerate the development of emerging industries, which will boost industrial competitiveness and underpin future economic growth, jobs, and progress towards a resource-efficient economy. • Further leverage and complement support for innovation in SMEs and other funding, which may be provided by national or regional authorities (including under the European Structural and Investment Funds) and/or by private investors (upfront or as follow-up investments), including in relation to the European Fund for Strategic Investments. • Contribute to the implementation of regional and national research and innovation strategies for smart specialisation strategies (RIS3), modern cluster policies as well as of strategic inter-regional collaboration under thematic Smart Specialisation Platforms and

	<p>cluster partnerships supported by the European Cluster Collaboration Platform and the European Observatory for Clusters and Industrial Change by capitalising upon concentrated and complementary competences for the development of new industrial value chains and emerging industries with a clear EU added-value.</p> <ul style="list-style-type: none"> • Provide a clear and measurable contribution to the innovation performance of the supported SMEs in the short-term - as revealed by indicators such as numbers of new or significantly improved products (goods and/or services), processes, new marketing methods, or new organisational methods -, and to its impact on resource efficiency and/or turnover. A wider impact is also expected in the medium-term. • Improve the business environment of the supported SMEs by establishing open collaboration spaces that can involve innovation actors from different sectors and countries. This will lead to the creation of new ideas for innovation and new collaboration partnerships, which will be subject of further development and with the potential for further impact on business turnover.
Observations	N/A

7.1.6 Fast Track to Innovation Pilot (FTI)

Table 31 – Horizon 2020 – FIT – Fast Track to Innovation (EIC-FTI-2018-2020)

European Programme	H2020 Towards the next EU Framework Programme for Research and Innovation: European Innovation Council (EIC) Pilot
Call	Fast Track to Innovation Pilot (FTI) (H2020-EIC-FTI-2018-2020)
Topic	Fast Track to Innovation (FTI)
Topic identifier	EIC-FTI-2018-2020
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/eic-fti-2018-2020.html
Closing Date	Multiple cut-off dates (February 2018 - October 2020)
Type of action	IA Innovation action
Challenge	<p>Innovation is fostered when new ideas can emerge and easily translate into socio-economic value, shaping new markets and laying the foundations of a stronger, high-tech industrial base for Europe.</p> <p>Working together, partners with complementary backgrounds, knowledge and skills, in both new and established value-chains, can turn ideas into world-beating products, processes and services that tackle societal challenges.</p> <p>Participation by industry — defined as private-for-profit organisations — is mandatory; industry is best-placed to ensure the due commercial exploitation of the innovation developed; in addition, company growth and development in order to strengthen Europe's industrial leadership are explicitly pursued with FTI support.</p> <p>FTI supports actions undertaking innovation from the demonstration stage through to market uptake, including activities such as piloting, test-beds, systems validation in real-world working conditions, validation of business models, pre-normative research, and standard-setting.</p> <p>FTI actions are encouraged to be interdisciplinary, cutting across different sector and technologies. Actions supporting innovative concepts that have the potential to disrupt or to create new markets are particularly welcome.</p>
Observations	<p>Possible impacts on sustainability or climate change, in particular, or on other cross-cutting objectives of Horizon 2020, must be highlighted.</p> <p>Participation from industry in your consortium is mandatory. Universities and research and technology organisations can also participate. Actors with an important role in commercialisation are encouraged to take part, such as cluster organisations, end-users, industry associations, incubators, investors, and the public sector. Including start-ups with ground-breaking ideas that could create new markets is encouraged.</p>

7.2 Public-Private Partnerships (PPP)

7.2.1 FoF - Factories of the Future

Table 32 – Horizon 2020 – PPP – FoF – Skills needed for new Manufacturing jobs (DT-FOF-01-2018)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Skills needed for new Manufacturing jobs (CSA)
Topic identifier	DT-FOF-01-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/fof-01-2016.html
Closing Date	22-02-2018
Type of action	CSA Coordination and support action
Challenge	Advanced Manufacturing, one of the six Key Enabling Technologies (KETs), is a highly innovative sector in Europe. In line with the New Skills Agenda for Europe, there is a need to strengthen human capital, employability and competitiveness for this KET.
Impact	<ul style="list-style-type: none"> • Real and measurable steps towards the reduction of identified skill gaps leading to the upskilling of the existing workforce in Europe and, as a consequence, increased innovation performance in the industry concerned; • At least 15 new job profiles per industrial area analysed, leading to a longer work life for jobholders; • Close and continuous engagement between relevant industry, trade union, academia, educational centres (including vocational schools) across Europe to stimulate networks in the European Research Area as a whole.
Observations	In view of CE vision, new skillsets are needed to be identified to cover the existing gap in access to human capital.

Table 33 – Horizon 2020 – PPP – FoF – Effective Industrial Human-Robot Collaboration (DT-FOF-02-2018)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Effective Industrial Human-Robot Collaboration (RIA)
Topic identifier	DT-FOF-02-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-02-2018.html
Closing Date	22-02-2018
Type of action	RIA Research and Innovation action
Challenge	In order to move from a structured factory floor where robots work behind closed fences to an open environment with smart mechatronic systems and humans collaborating closely, interdisciplinary research in the fields of robotics, cognitive sciences and psychology is required, also taking into account regulatory aspects.
Impact	<ul style="list-style-type: none"> • Demonstrating the potential to bring back production to Europe; • 15% increase in OECD Job Quality Index through work environment and safety improvement; • 20% reduction in production reconfiguration time and cost.
Observations	Human - Robot collaboration has been identified as an enabling technology of CE. The impact is about reshoring and production flexibility, quality lob etc.

Table 34 – Horizon 2020 – PPP – FoF – Innovative manufacturing of opto-electrical parts (DT-FOF-03-2018)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Innovative manufacturing of opto-electrical parts (RIA)
Topic identifier	DT-FOF-03-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-03-2018.html
Closing Date	22-02-2018
Type of action	RIA Research and Innovation action
Challenge	New processes need to be introduced into production systems. When going into the scale-up phase, many processes need to be adjusted to fit the production of complex, often free-form components. The adjustments include both component specific changes as well as standard process steps. Due to the need to produce large varieties of parts in small batches, process adjustments have to be both rapid and accurate.
Impact	<ul style="list-style-type: none"> • 15% yield improvement because of the introduction of new sensor equipment, related metrology and automatic non-destructive control; • 15%-time reduction for reconfiguration of key process tools in a production line due to change of type of component; • A tangible part (> 10%) of the production cost of the parts should originate from recycled products and materials.
Observations	Flexibility in production and product customization are elements involved in the core of CE. The impact is also of direct interest to the CE concepts.

Table 35 – Horizon 2020 – PPP – FoF – Pilot lines for metal Additive Manufacturing (DT-FOF-04-2018)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Pilot lines for metal Additive Manufacturing (IA 50%)
Topic identifier	DT-FOF-04-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-04-2018.html
Closing Date	22-02-2018
Type of action	IA Innovation action
Challenge	The industrial demonstration in a pilot line will show the full potential of metal AM in real manufacturing conditions and it will serve as a flagship example for other stakeholders. Quality aspects to be significantly improved include robustness, stability, repeatability, speed and right-first-time manufacturing.
Impact	<ul style="list-style-type: none"> • Increase in robustness of metal AM-based processes by 40% and production speeds by 25%; • Reduction of time to market by 25% and 'right first time' capability by 40%; • Reduction of uncertainties of selected material quality parameters by 50%, resulting in improving product quality by 40%; • New certification schemes for industrial "3D-Printed" parts and products in collaboration with relevant certification stakeholders; • New standardisation of specific categories not included in current ISO/ASTM/CEN CENELEC TCs.
Observations	Additive manufacturing is key enabling production technology that will support the concepts related to CE.

Table 36 – Horizon 2020 – PPP – FoF – Refurbishment and re-manufacturing of large industrial equipment (DT-FOF-06-2019)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Refurbishment and re-manufacturing of large industrial equipment (IA)
Topic identifier	DT-FOF-06-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-06-2019.html
Closing Date	21-02-2019
Type of action	IA Innovation action
Challenge	In line with the circular economy, lifetime extension can limit high replacement costs of major industrial infrastructures. This can be achieved through refurbishment, re-manufacturing, re-use, upgrading, in-situ repair, improved maintenance and more conservative utilisation of large industrial equipment of the kind used in manufacturing.
Impact	<ul style="list-style-type: none"> • Material and resource efficiency increased by at least 10%; • Life time extension of the targeted large machinery and plants by at least 20%; • Increased return on investment from major capital items.
Observations	The topic is in direct relation to CE.

Table 37 – Horizon 2020 – PPP – FoF – Handling systems for flexible materials (DT-FOF-12-2019)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Handling systems for flexible materials (RIA)
Topic identifier	DT-FOF-12-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-12-2019.html
Closing Date	21-02-2019
Type of action	RIA Research and Innovation action
Challenge	The handling of soft materials with the involvement of robots remains limited. The control systems of the robot need to be very sensitive, accurate and fast to prevent unwanted irreversible deformations and damages. Further research is needed in order to develop handling devices which are not pre-programmed for one specific task, but are intelligent and universally dexterous.
Impact	<ul style="list-style-type: none"> • Demonstrating the potential to bring back production to Europe; • 15% increase in OECD Job Quality Index through work environment and safety improvement; • 20% increase in productivity.
Observations	Increasing job quality is directly related to the People pillar of CE and increase in productivity is directly related to Profit pillar of CE.

Table 38 – Horizon 2020 – PPP – FoF – Pilot lines for modular factories (DT-FOF-08-2019)

European Programme	Horizon 2020
Call	Transforming European Industry (H2020-NMBP-TR-IND-2018-2020)
Topic	Pilot lines for modular factories (IA 50%)
Topic identifier	DT-FOF-08-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-fof-08-2019.html
Closing Date	21-02-2019
Type of action	IA Innovation action
Challenge	Rapid changes in a production line require a significant flexibility of reconfiguration. Modular production equipment can create highly adaptable production lines to enable efficient production of small series tailored to customer demands. Previous research has shown that the modularity can be at two levels, either as complete machines with their own interface and material handling system or as interchangeable tool heads. In both cases, the advantage of modularity should be demonstrated by the ease of use and plug-and-produce features allowing for rapid modification.
Impact	<ul style="list-style-type: none"> • At least 15% reduction of time to reconfigure the production line (alternatively 15% reduction in downtime); • 10% higher resource efficiency due to more suitable processing equipment for customised products; • Reduction of at least 15% of the overall cost of production; • Measurable yield improvement from run-to-run for small lot sizes.
Observations	The impact is directly related to CE concepts.

7.2.2 SPIRE - Sustainable Process Industry through Resource and Energy Efficiency

Table 39 – Horizon 2020 – PPP – SC5 – Methods to remove hazardous substances and contaminants from secondary raw materials (CE-SC5-01-2018)

European Programme	Horizon 2020
Call	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)
Topic	Methods to remove hazardous substances and contaminants from secondary raw materials
Topic identifier	CE-SC5-01-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-sc5-01-2018.html
Closing Date	04-09-2018
Type of action	RIA Research and Innovation action
Challenge	Reuse and recycling of many secondary raw materials continues to be low in the EU, while landfill and incineration rates remain high. The uptake and recyclability of secondary raw materials can be hampered by the presence of undesirable contaminants, additives and even substances of concern. The removal of such undesirable substances could improve the purity of the resulting secondary raw material and mitigate potential health and environmental concerns.
Impact	<ul style="list-style-type: none"> • Increased purity and/or desirable quality of secondary raw materials; • An increased recycling rate for, and reduced landfill and incineration of, secondary raw materials; • Reduced risk of retaining hazardous substances in recycled materials, where relevant; • The implementation of the EU Circular Economy Action Plan and the 7th Environment Action Programme; • The Commission Strategy on Plastics in a Circular Economy and to the implementation of the SPIRE PPP Roadmap, where relevant.
Observations	Direct relation to CE concepts

Table 40 – Horizon 2020 – PPP – SC5 – Building a water-smart economy and society (CE-SC5-04-2019)

European Programme	Horizon 2020
Call	Greening the economy in line with the sustainable development goals (SDGS) (H2020-SC5-2018-2019-2020)
Topic	Building a water-smart economy and society
Topic identifier	CE-SC5-04-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-sc5-04-2019.html
Closing Date	04-09-2019
Type of action	IA Innovation action
Challenge	There is a growing demand for water from various economic activities and increasing stress on natural water sources. To secure water for our society, there is therefore a need to make available alternative water resources of various qualities and which are appropriate for different functions and multiple users, and to better exploit water resources and all the valuable substances that could be obtained through the wastewater treatment and reuse process. However, innovations in this domain remain fragmented and/or only experimented at small scales; testing and deployment in operational environments and at scales suitable for encouraging wider uptake is still missing.
Impact	<ul style="list-style-type: none"> • Significantly reduced use of water from freshwater sources; • Improved recovery and use of resources (materials and water itself), including energy; • Mobilisation of water-related investments and synergies with other funding instruments. • The creation of new business opportunities and increased competitiveness of EU industries; • Supporting, as appropriate, the implementation of EU water policies, the transition to a more circular economy at different scales and economic and social conditions, water security, water use efficiency, enhanced resilience to climate change and achievement of the relevant Sustainable Development Goals; • The implementation of the objectives of the EIP Water and, where appropriate, supporting the implementation and evaluation of technology verification schemes, including the EU Environmental Technology Verification Pilot (ETV) programme.
Observations	Direct relation to CE concepts

Table 41 – Horizon 2020 – PPP – SPIRE – Processing of material feedstock using non-conventional energy sources (CE-SPIRE-02-2018)

European Programme	Horizon 2020
Call	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Processing of material feedstock using non-conventional energy sources (IA)
Topic identifier	CE-SPIRE-02-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-spire-02-2018.html
Closing Date	22-02-2018
Type of action	IA Innovation action
Challenge	Non-conventional energy sources, such as microwave, plasma, ultrasound and laser, as well as electrochemical and photochemical processes, have already been applied in process intensification, mainly at lab scale, showing significant improvements in process performance (e.g. improved selectivity, crystal nucleation, reaction speed easing raw material demand) for the benefit of energy efficiency. The processes powered by non-conventional energy sources are suitable for connection to the electricity grid. They allow variable throughputs to better follow market demand and enable leaner production paradigms (e.g. decreased stock, production on demand). Such technologies are suitable for downscaling and continuous processing, where they can also be coupled with real time monitoring allowing a finer control of the transformations.
Impact	<ul style="list-style-type: none"> • Allowing for a -30% to +30% energy input within RES fluctuations timeframes, without significant losses in specific energy efficiency; • Improvement in energy efficiency of 30%; • Improvement in resource efficiency of 30%; • Decrease in CO2 emissions by 40% (without considering the electricity generation and at steady state); • Decreased OPEX and CAPEX by 15%; • Effective dissemination of major innovation outcomes to the current and the next generation of employees of the SPIRE sectors, through the development of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programs.
Observations	Direct relation to CE concepts

Table 42 – Horizon 2020 – PPP – SPIRE – Energy and resource flexibility in highly energy intensive industries (CE-SPIRE-03-2018)

European Programme	Horizon 2020
Call	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Energy and resource flexibility in highly energy intensive industries
Topic identifier	CE-SPIRE-03-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-spire-03-2018.html
Closing Date	22-02-2018
Type of action	IA Innovation action
Challenge	<p>Energy intensive industries should adapt their production processes and unit operations to increasingly sustainable, but highly fluctuating energy supply. To this end, energy and resource flexibility in the European process industry can be improved through the development of novel processes utilising more efficiently energy streams, heat recovery and raw materials flows with variable properties (including new or modified materials as well as secondary raw materials and by-products).</p> <p>The challenge is to establish synergistic integration at a regional level among different production sectors leading to optimisation of production system as a whole and logistics, especially in terms of the supply of energy and raw materials. This should reduce emissions and environmental impact, while maintaining competitiveness and job security.</p>
Impact	<ul style="list-style-type: none"> • Cost reduction of the process of at least 10% through the implementation of a flexible scheme in raw materials, including secondary raw materials, process and product quality specifications; • Improved process efficiency through re-utilisation of energy and/or material process streams by at least 15%; • CO2 emissions reduction by at least 5% and reduction of the environmental impact in terms of the main key performance indicators by at least 15%; Effective dissemination of major innovation outcomes to the current and next generation of employees, through the development, by education/training experts, of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programmes.
Observations	Direct relation to CE concepts

Table 43 – Horizon 2020 – PPP – SPIRE – Efficient integrated downstream processes (CE-SPIRE-04-2019)

European Programme	Horizon 2020
Call	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Efficient integrated downstream processes
Topic identifier	CE-SPIRE-04-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-spire-04-2019.html
Closing Date	21-02-2019
Type of action	IA Innovation action
Challenge	<p>Today, process industry operations for downstream processing represent on average 50-60% of the total capital (CAPEX) and operating costs (OPEX) and they account for up to 45% of the process energy in industrial operations. These high costs for downstream processing are often linked to the inefficiencies in the upstream process, due to low conversion and formation of co-products, by-products and/or impurities. Hybrid processing technologies (including chemical and biochemical steps) can provide major advantages in terms of primary process selectivity and sustainability. However, they have not been widely deployed in industry so far. The development of novel technologies for upstream and downstream unit operations, as well as their better integration, could provide significant resource and energy efficiency gains.</p>
Impact	<ul style="list-style-type: none"> • 20% decrease in greenhouse gas emission; • Increased in resource and energy efficiency by at least 20%; • Novel modular and scalable integrated (upstream-downstream) pilot line technologies with 10% decrease in CAPEX and OPEX; • Effective dissemination of major innovation outcomes to the current and next generation of employees, through the development of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programmes.
Observations	Direct relation to CE concepts.

Table 44 – Horizon 2020 – PPP – SPIRE – Adaptation to variable feedstock through retrofitting (CE-SPIRE-05-2019)

European Programme	Horizon 2020
Call	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Adaptation to variable feedstock through retrofitting
Topic identifier	CE-SPIRE-05-2019
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-spire-05-2019.html
Closing Date	21-02-2019
Type of action	IA Innovation action
Challenge	<p>Process industry plants have to be operated for a long time to make their operations viable. They include equipment such as furnaces, reactors, raw materials handling and storage systems which sometimes have a lifetime beyond 30 years. Keeping these facilities up to date from a technological and from regulatory point of view (for instance related to zero waste regulations and to the circular economy) is a major challenge. Even industrial plants which are less than 10 years old, are often not equipped for new or renewable (e.g. biomass) materials and alternative or renewable energy input streams. More generally, this increased variety of inputs along with the need for energy efficiency improvements poses a real challenge and requires technological breakthroughs in the process industry.</p>
Impact	<ul style="list-style-type: none"> • Increasing the resource and energy efficiency of the targeted processes by 20%; • Decrease GHG emissions through retrofitting by at least 30%; • Decreased utilisation of fossil resources in the process industry of at least 20%; • Reduced OPEX by 30% and increased productivity by 20%; • Effective dissemination of major innovation outcomes to the current next generation of employees of the SPIRE sectors, through the development, by education/training experts, of learning resources with flexible usability. • These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programs.
Observations	Direct relation to CE concepts

Table 45 – Horizon 2020 – PPP – SPIRE – Efficient recycling processes for plastic containing materials (CE-SPIRE-10-2018)

European Programme	Horizon 2020
Call	Industrial sustainability (H2020-NMBP-ST-IND-2018-2020)
Topic	Efficient recycling processes for plastic containing materials
Topic identifier	CE-SPIRE-10-2018
Web address	https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ce-spire-10-2018.html
Closing Date	22-02-2018
Type of action	IA Innovation action
Challenge	<p>Plastics materials are produced mainly from raw materials of fossil origin (e.g. PE, PP, and PET). A variety of bio-based plastic materials are increasingly available. Plastic materials are used in a wide range of applications because of their properties, versatility, lightweight and price, for example for making lightweight polymer composites to substitute metals and in more traditional applications, such as packaging. The wide use of these materials results in a huge amount of plastic waste. Recycling and redesign of plastics are essential in reusing plastic waste material and avoiding landfill. This also allows utilising plastics as carbon sinks in an optimal way, before using them for energy recovery at the end of life. A major challenge lies in the development of process technologies, utilising plastic waste as starting material (at least in part). A better use of underexploited resource (plastic waste) for the production of added value products (not restricted to plastics but excluding fuels) and process streams would support the circular economy.</p>
Impact	<ul style="list-style-type: none"> • More efficient and sustainable chemical process and processing technologies utilising plastic waste as starting material for the production of added value products such as recyclable plastic materials (e.g. composites) and chemicals but excluding fuels); • The technologies proposed should provide a decreased utilisation of primary fossil resources in the process industry of at least 30%; • The concepts proposed should provide a decrease in CO2 emissions of at least 20%; • The concept should utilise at least 70% of waste material including at least 40% of plastic waste; • Effective dissemination of major innovation outcomes to the current next generation of employees of the SPIRE sectors, through the development, by education/training experts, of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programmes.
Observations	Direct relation to CE concepts.

7.3 EUREKA

Table 46 – EUREKA – Network Projects

European Programme	EUREKA: intergovernmental network to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe
Topic	EUREKA Network Projects
Topic identifier	N/A
Web address	http://www.eurekanetwork.org/network-projects
Closing Date	Open all year
Type of action	<p>Transnational, market-driven innovative research and development projects.</p> <p>The "bottom-up" approach to project creation allows the project consortia to define the nature of the technologies to be developed and how the project comes together.</p>
Challenge	EUREKA Network projects are market-driven international R&D projects.
Impact	They aim to develop marketable products, services or processes.
Circular Economy relation	EUREKA Network Projects address any technological area, which includes any technology related to circular economy.
Observations	<p>To set up a project there must be at least two partners from two different EUREKA countries. Partners can be of any type: SMEs, large companies, research institutions and universities.</p> <p>Projects in the frame of EUREKA Network Projects could be financed by respective national authorities in accordance with the national laws, rules, regulations & procedures in effect. Please go to the Country page to find the rules applying to your country.</p>

Table 47 – EUREKA – EUROSTARS

European Programme	EUREKA: intergovernmental network to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe
Topic	EUROSTARS
Topic identifier	N/A
Web address	https://www.eurostars-eureka.eu/
Closing Date	01/03/2018
Type of action	N/A
Challenge	Support R&D-performing SMEs in their innovative R&D projects. With its bottom-up approach, it stimulates international collaborative research and innovation projects that will be rapidly commercialised.
Impact	<p>A Eurostars project can address any technological area for any market, but must have a civilian purpose and be aimed at the development of a new product, process or service.</p> <p>The market introduction of the major project result (the main product/process/service proposed in the application) is planned to occur within 24.0 months of the completion of the project.</p>
Circular Economy relation	EUROSTARS addresses any technological area, which includes any technology related to circular economy.
Observations	<p>The countries participating in Eurostars through the EUREKA network of national offices are: Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, South Africa, South Korea, Sweden, Switzerland, Turkey, United Kingdom.</p> <p>Any type of organisation can be part of a Eurostars project consortium, although the main partner must be an R&D – performing SME.</p>

Table 48 – EUREKA – Clusters – Eurogia 2020

European Programme	EUREKA: intergovernmental network to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe
Topic	EUREKA Clusters-Eurogia 2020
Topic identifier	Eurogia 2020- Low carbon energy technologies
Web address	http://www.eurogia.com/
Closing Date	22/09/2017; 27/11/2017
Type of action	N/A
Challenge	EUROGIA2020 encourages cooperation and coordination among European companies by promoting development of Low-Carbon Energy Technologies.
Impact	Its purpose is to facilitate the deployment of existing technologies and support the development of highly innovative new technical solutions. EUROGIA2020 projects must clearly show technical innovation in the future product/process or service (either through using new devices or in the utilization of existing devices in a new application). The project must have a strong market and exploitation orientation.
Circular Economy relation	<p>EUROGIA2020 RD&D projects can address circular economy topics:</p> <ul style="list-style-type: none"> • Minimise carbon footprint; • To develop diverse clean energy sources in addition to fossil fuels; • To improve efficiency of energy use in all consumer and industrial applications. <p>Specific topics: renewable energies, efficiency, oil & gas and hydrogen.</p>
Observations	<ul style="list-style-type: none"> • The consortium must comprise at least two industrial companies – Large, Small or Medium sized enterprises- from two different EUREKA Member and Associated countries. The active participation of research institutes or universities is strongly encouraged when not made mandatory. • EUROGIA2020 projects must clearly show technical innovation in the future product/process or service (either through using new devices or in the utilization of existing devices in a new application). • The projects must have a strong market and exploitation orientation. • - The contribution from any given country must not exceed 66% of the total budget. In parallel, the contribution from any one partner (affiliated organisations count as one partner) must not exceed 66% of the total budget either.

Table 49 – EUREKA – Clusters – Celtic Plus

European Programme	EUREKA: intergovernmental network to enhance European competitiveness by fostering innovation-driven entrepreneurship in Europe
Topic	EUREKA Clusters-Celtic Plus
Topic identifier	Celtic Plus-Telecommunications
Web address	https://www.celticplus.eu/
Closing Date	16/10/2017
Type of action	N/A
Challenge	<p>Celtic-Plus strengthens the competitiveness of the European industry by fostering European R&D cooperation in telecommunications, and the well-being of the society by stimulating innovative information and telecommunication services.</p> <p>Key topics include network capacity, optics, satellite, mobility, security, robustness, energy efficiency, 5G, Smart Cities, Smart Homes, Industry 4.0, Automotive Telecom, Fintech, e-health, big data, Internet of Things, privacy, identity and public safety.</p>
Impact	N/A
Circular Economy relation	The philosophy of the programme is to facilitate projects in a bottom-up way, thus offering projects the chance of both evolutionary as well as disruptive innovation in all relevant ICT areas, this may include the application of different ICT technologies for circular economy purposes, particularly in the following Pillar Actions: virtualise and optimise.
Observations	N/A

7.4 INTERREG

Table 50 – INTERREG – Low carbon economy (Priority axis 3)

European Programme	Interreg Europe
Topic	Low carbon economy
Topic identifier	Priority axis 3: Low carbon economy
Web address	https://www.interregeurope.eu/
Closing Date	Expected in 2018
Type of action	<p>The programme finances two types of actions:</p> <ul style="list-style-type: none"> - Interregional cooperation projects: partnerships made up of relevant policy organisations from different countries in Europe work together for 3 to 5 years to exchange their experiences on a particular policy issue. Each region involved in the cooperation project produces an action plan, specifying what will be done in the region to ensure that the lessons learnt from the cooperation project are put into action. Projects are also required to monitor the progress of their action plans, to determine the impact of cooperation. - Policy learning platforms: a space for continuous learning where any organisation dealing with regional development policies in Europe can find solutions and request expert support to improve the way they manage and implement their public policies in the four topics listed above.
Challenge	<p>The Interreg Europe programme is designed to support policy-learning among the relevant policy organisations with a view to improving the performance of regional development policies and programmes. It allows regional and local public authorities and other players of regional relevance across Europe to exchange practices and ideas on the way public policies work, and thereby find solutions to improve their strategies for their own citizens.</p>
Impact	<p>The fourth specific objective deals with the transition to a low-carbon economy. Regional policies in this field include support actions and investments to increase levels of energy efficiency, including in public buildings and the housing sector. They also aim at raising the share of energy from renewable sources in the overall energy mix by encouraging and facilitating the production and distribution of renewables, while preventing possible adverse effects on biodiversity, landscape or water. Policies must facilitate the move to more sustainable, low-carbon alternatives for transport and mobility by introducing cleaner transport modes and systems, and by promoting alternative mobility behaviour. Another key field of action is the reduction of energy consumption by businesses and households.</p> <p>The introduction of ICT-based solutions can also play a key role in regional low-carbon strategies, for instance, in relation to reducing the need for physical mobility, increasing energy performance of public buildings, or as a part of public awareness strategies. Integrated regional low-carbon strategies are needed to identify the most promising areas of</p>

	action, mobilise stakeholders, facilitate and channel public and private investments and increase the awareness among inhabitants, business and other actors of the need for, and opportunities of, using low-carbon alternatives. Regional authorities can also facilitate the development of low-carbon innovations and speed up their application through green public procurement, regional experimentations and investment schemes.
Circular Economy relation	It relates to the policy measures that can be applied in order to deal with the transition to a low-carbon economy. It relates to the Environmental Responsibility and Policy & Finance BBs.
Observations	N/A

Table 51 – INTERREG – Environment and resource efficiency (Priority axis 4)

European Programme	Interreg Europe
Topic	Environment and resource efficiency
Topic identifier	Priority axis 4: Environment and resource efficiency
Web address	https://www.interregeurope.eu/
Closing Date	Expected in 2018
Type of action	<p>The programme finances two types of actions</p> <ul style="list-style-type: none"> - Interregional cooperation projects: partnerships made up of relevant policy organisations from different countries in Europe work together for 3 to 5 years to exchange their experiences on a particular policy issue. Each region involved in the cooperation project produces an action plan, specifying what will be done in the region to ensure that the lessons learnt from the cooperation project are put into action. Projects are also required to monitor the progress of their action plans, to determine the impact of cooperation. - Policy learning platforms: a space for continuous learning where any organisation dealing with regional development policies in Europe can find solutions and request expert support to improve the way they manage and implement their public policies in the four topics listed above.
Challenge	<p>The Interreg Europe programme is designed to support policy-learning among the relevant policy organisations with a view to improving the performance of regional development policies and programmes. It allows regional and local public authorities and other players of regional relevance across Europe to exchange practices and ideas on the way public policies work, and thereby find solutions to improve their strategies for their own citizens.</p>
Impact	<p>a) Improve the implementation of regional development policies and programmes, in particular Investment for Growth and Jobs and, where relevant, European Territorial Cooperation programmes, in the field of the protection and development of natural and cultural heritage. The fifth specific objective deals with the protection, promotion and development of natural heritage, biodiversity and ecosystems as well as support to cultural heritage. Regional actors need to protect ecosystems and vulnerable landscapes and prevent biodiversity loss and soil degradation in their territories to prevent (further) degradation of these natural assets. The sustainable management and exploitation of the natural environment can also foster sustainable regional development based on so-called ecosystem services (e.g. pollination for agriculture, or natural flood retention areas) and natural quality (e.g. tourism, regional attractiveness). A similar logic applies to the preservation and exploitation of regional cultural heritage. Preservation and exploitation strategies can incorporate ICT applications to, for instance, raise public awareness and ownership of natural and cultural heritage or by introducing applications on e-culture. Regional actors involved in the management of natural and cultural heritage must define coordinated, place-based strategies and actions that balance measures of preservation</p>

	<p>with the sustainable exploitation of these assets. This can include the improvement of biodiversity protection schemes, the sustainable use of NATURA 2000 or other protected areas, increasing knowledge and stakeholders' awareness.</p> <p>b) Improve the implementation of regional development policies and programmes, in particular programmes for Investment for Growth and Jobs and, where relevant, ETC programmes, aimed at increasing resource-efficiency, green growth and eco-innovation and environmental performance management.</p> <p>The sixth specific objective refers to the transition to a resource-efficient economy based on green growth and eco-innovation and to improving environmental performance management. Natural resources like metals, minerals, fuels and timber but also water, land and clean air are becoming scarcer. Making use of these resources in an efficient and conscious manner is essential to achieving sustainable growth in Europe and also brings major economic opportunities. Regional players can enable businesses to pursue green growth and eco-innovation to develop new products and services, reduce inputs, minimise waste and improve the management of resource stocks. And they can lead to the introduction of new green products and services, for instance by means of green procurement. They can also create awareness and provide incentives to businesses and households to trigger change in consumption patterns and to reduce waste and emissions of pollutants in the air, soil and water. The introduction of digital technologies as a means to contribute to a more efficient use of resources (green ICT) can be an important part of this. Moreover, regions can promote the transition to a circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised. Finally, regional authorities can invest in further improving (the governance of) waste management, water treatment and recycling.</p>
Circular Economy relation	It relates to the policy measures that can be applied in order to deal with the transition to a low-carbon economy. It relates to the Environmental Responsibility and Policy & Finance BBs.
Observations	N/A

7.5 COSME

Table 52 – Horizon 2020 – COSME – Innovation Procurement Brokers (COS-LINKPP-IPB-2017)

European Programme	COSME: Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (SME)
Topic	Innovation Procurement Brokers
Topic identifier	COS-LINKPP-IPB-2017
Web address	http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/cosme/calls/cos-linkpp-2017-2-02.html#c,topics=callIdentifier/t/COS-LINKPP-2017-2-02/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc
Closing Date	04-01-2018
Type of action	Innovation Action; Research Action
Challenge	COSME-GA Grant agreement
Impact	Bringing together potential public buyers, suppliers of innovation, and potential investors and researchers, with a view to determine projects suitable for public procurement of innovation.
Observations	Public procurement for innovative products and services is considered an enabler of circular economy

8 Annex 2 – Examples of Relevant National/ Regional Funding Instruments

8.1 National/ Regional Programmes by FUTURING Country

Belgium

Table 53 – Belgium – VIS-Trajectories, Innovation mandates, Tetra-fund

Name of instrument	VIS-trajectories (Flemish cooperative innovation networks), Innovation mandates, Tetra-fund
Type of funding	Public
Funding organisation	Flanders Innovation and Entrepreneurship (AIO)
Web address	https://www.vlaanderen.be/nl/publicaties/detail/sti-in-flanders-science-technology-amp-innovation-policy-amp-key-figures-2017
Level	Regional
Region(s)	Flanders
Start year	2016
End year	N/A
Total budget available	N/A
% of co-funding	N/A
Main goal	To assist research centres in realizing their projects, to help companies with the start-up of their activities and investment in innovation, by offering funding, advice and network.
Main application	Industrial R&D, technology transfer, entrepreneurship
Industrial focus	No specific industrial sector
Observations	Direct funding to support innovative projects of companies and research centres on a bottom-up approach, i.e. awarded to initiatives from actors that including technological innovation.

Belgium

Table 54 – Belgium – Vinnof, TINA Fund, SOFI and SOFI2

Name of instrument	Vinnof, TINA Fund, SOFI and SOFI2
Type of funding	Combined
Funding organisation	Flanders Holding Company
Web address	https://www.vlaanderen.be/nl/publicaties/detail/sti-in-flanders-science-technology-amp-innovation-policy-amp-key-figures-2017
Level	Regional
Region(s)	Flanders
Start year	N/A
End year	N/A
Total budget available	More than €1 billion for all instruments managed €200 million for the TINA fund
% of co-funding	N/A
Main goal	To invest in projects that are strategic for the Flemish economy: risk capital, loans, mezzanine finance to fund prestart phase to international growth of innovative companies. SOFI and SOFI2 are more dedicated to support the setting-up of start-up companies based on research results.
Main application	Technology transfer, entrepreneurship
Industrial focus	No specific industrial sector
Observations	TINA fund is more dedicated to the transformation of the economy in Flanders.

France

Table 55 – France – Fonds Unique – Interministériel

Name of instrument	FUI - Fonds Unique Interministériel
Type of funding	Combined
Funding organisation	Poles de Compétitivité
Web address	http://competitivite.gouv.fr/documents/commun/Documentation_poles/brochures_poles/anglais/brochure-ang-internet.pdf
Level	National
Region(s)	All
Start year	One call each year
End year	One call each year
Total budget available	Since 2005, 889 R&D projects have received €1.7 billion in public-sector financing, of which €1.1 billion was provided by the State. These projects, amounting to some €4.4 billion in R&D expenditure, involved nearly 15,000 researchers.
% of co-funding	For companies, the funding rate max is 45%. For public bodies, the funding rate max is 40% of total costs
Main goal	To involve industries and particularly SMEs in collaborative projects. The projects should be labelled by a French competitive pole and involve at least 2SMEs and a RTO
Main application	Technological research, demonstration, commercialization on the market typically 5 years max after end of the project
Application in the innovation chain	TRLs 5-7
Industrial focus	All sectors : automotive, aeronautics, bio technologies, nanotechnologies...
Circular Economy relation	Energy efficiency, ecotechnologies, bio-based materials. Example : project SOLDATING (pole Advancity and company Hesus) and ECOSTOCK1000 (Pole Derbi and company Eco-Tech Ceram)

France

Table 56 – France – Fonds Déchets/ R&D Programmes/ Programme Investissement d'Avenir

Name of instrument	Fonds Déchets/ R&D Programmess/ Programme investissement d'Avenir
Type of funding	Public
Funding organisation	ADEME- Agence de l'environnement et de la maitrise de l'Energie
Web address	http://competitivite.gouv.fr/documents/commun/Documentation_poles/brochures_poles/anglais/brochure-ang-internet.pdf
Level	National
Region(s)	All
Start year	N/A
End year	Ongoing
Total budget available	For the Fonds déchets: €193 million in 2016 total budget and Max €1 million per project For R&D program: annual budget: €25 million about and €50k to €300k/ project For PIA: €350 million total budget and > €1 million per project
% of co-funding	N/A
Main goal	For the Fonds déchets: Support investment of equipment for recycling valorisation. For the call for projects: to increase the maturity of research and technologies
Main application	Demonstration, commercialization
Application in the innovation chain	R&D programs: 4-7 Programme Investissement d'Avenir : 6-9
Industrial focus	Waste
Circular Economy relation	ADEME regularly publishes call for projects in the field of circular economy (waste management) to support innovation activities
Observations	Fonds Déchets is dedicated to public authorities, companies and associations

Germany

Table 57 – Germany – Central Innovation Programme for SMEs (ZIM)

Name of instrument	Central Innovation Programme for SMES – ZIM (Zentrales Innovationsprogramm Mittelstand)
Type of funding	Combined
Funding organisation	Federal Ministry for Economic Affairs and Energy (BMWi)
Web address	https://www.zim-bmwi.de/zim-overview
Level	National
Region(s)	All
Start year	2008 (with new guidelines published in 2015)
End year	2019
Total budget available	N/A
% of co-funding	The funding for individual and cooperation projects is awarded as non-repayable grant in the form of co-financing up to the following rates: - individual projects: up to 45% - cooperation projects: up to 50% - cooperation projects with international partners: up to 55% - cooperation networks: from 90% the first year to 30% the fourth year Research establishments can claim 100% of eligible costs.
Main goal	The aim of ZIM is to sustainably increase the innovative capacity and competitiveness of SMEs including craft businesses and independent professions. It supports SMEs willing to develop new or significantly improve existing products, processes or technical services. Whether or not an application for a grant is approved depends on how innovative the R&D project is and how marketable the results are likely to be.
Main application	Individual projects: Funding of R&D projects proceeded by one SME Cooperation projects: Funding of R&D projects between SMEs or SMEs and RTOs Cooperation networks: Funding of management of innovative company networks and R&D projects generated by them Funding is also provided for services and consultation related to the market launch of the project results (e.g. market research, quality labelling, testing and certification, etc.).
Industrial focus	The programme is open to all branches and technological sectors.
Observations	Any project related to circular economy is eligible as the programme is open to all technological sectors. International partners can be part of the cooperation projects' consortia but they will be eligible for additional funding under their respective national programmes.

Germany

Table 58 – Germany – Framework Programme for Research for Sustainable Development – Green Economy Research Agenda

Name of instrument	Framework Programme for Research for Sustainable Development – Green Economy Research Agenda
Type of funding	Combined
Funding organisation	Federal Ministry of Education and Research (BMBF)
Web address	https://www.fona.de/en/research-for-sustainable-development-fona-17833.html
Level	National
Region(s)	All
Start year	2015
End year	Not specified
Total budget available	N/A
% of co-funding	N/A
Main goal	The Green Economy initiative aims at achieving a sustainable economy that is both competitive and environmentally friendly at a global scale.
Main application	Systemic analysis for the Green Economy: - Studies and research projects on systemic questions and achieving goals on the road to the Green Economy Research for green innovations, technological and social: - Transdisciplinary projects with the involvement of stakeholders: joint funding"
Industrial focus	Production and resources: raw materials, water and land Sustainability and financial services Sustainable consumption Sustainable energy supply and use in the economy Sustainable mobility systems Infrastructures and intelligent supply systems for the City of the Future.
Observations	The following initiatives are particularly related to circular economy: -Production and resources: raw material, water and land -Sustainable consumption -Sustainable energy supply and use in the economy

Germany

Table 59 – Germany – 6th Energy Research Programme

Name of instrument	6th Energy Research Programme
Type of funding	Combined
Funding organisation	Federal Ministry for Economic Affairs and Energy (BMWi)
Web address	http://www.bmwi.de/Redaktion/EN/Artikel/Energy/research-priorities.html
Level	National
Region(s)	All
Start year	2015
End year	Not specified
Total budget available	N/A
% of co-funding	N/A
Main goal	The goal of restructuring the German energy supply by 2050 on the basis of renewables and high efficiency will only be attainable using innovative technologies and systems-based solutions. This will require a broad approach of applied research and technological development in close cooperation with the scientific and business communities.
Industrial focus	<ul style="list-style-type: none"> - Wind power - Photovoltaics - Deep geothermal energy - Solar thermal power plants - Hydropower and marine energy - Power plant technology and CCS - Fuel cells and hydrogen technologies - Energy storage - Power grids - Integration of renewable energy - Energy-optimised buildings and neighbourhoods - Energy efficiency in industry and commerce, trade and services - Key energy industry elements of e-mobility - Systems analysis
Observations	It addresses CE regarding the promotion of renewable energies and energy efficiency.

Germany

Table 60 – Germany – Innovative Technologies for Resource Efficiency – Impetus for Industrial Resource Efficiency (r + Impuls)

Name of instrument	Innovative Technologies for Resource Efficiency - Impetus for Industrial Resource Efficiency (r + Impuls)
Type of funding	Combined
Funding organisation	Federal Ministry of Education and Research (BMBF)
Web address	http://www.foerderdatenbank.de/Foerder-DB/Navigation/Foerderrecherche/suche.html?get=433755ff95eb3384b2b0f9711aa3166b;views=document&doc=12279
Level	National
Region(s)	All
Start year	2015
End year	2022
Total budget available	N/A
% of co-funding	The funding will take the form of a grant, usually for a period of up to three years: - for commercial enterprises up to 25% of the eligible costs - for universities and non-university research institutions up to 75% of the eligible expenditure.
Main goal	The aim is to overcome existing barriers to the development and diffusion of industrial efficiency technologies and to contribute to the transformation of the economy into a green economy. Development and implementation of R&D results to increase resource efficiency through pilot plants to industrial reference plants or product-ready prototypes on the basis of the research program for sustainable development.
Main application	Individual research projects; Collaborative research projects (TRL5-TRL8) The project must investigate high-risk technological or non-technological issues related to scale-up, optimization or design of components or facilities, required testing or approval procedures, development of new business models or cross-industry applications.
Industrial focus	Priority topics: - resource-efficient circular economy, recycling of used products and their components as well as recycling high-quality recyclable fractions from waste streams - increasing material and energy efficiency, especially in resource-intensive production systems (e.g. metal production and processing, chemical industry, building materials and ceramics industry) - recycling and substitution, in particular, of raw materials of strategic economic significance for key technologies and high-tech applications - material use of CO ₂ for chemical products as well as for energy storage.



Observations	N/A
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Germany

Table 61 – Germany – Renewable Resources Funding Programme

Name of instrument	Renewable resources funding programme
Type of funding	Combined
Funding organisation	Federal Ministry of Food and Agriculture (BMEL)
Web address	http://www.foerderdatenbank.de/Foerder-DB/Navigation/Foerderrecherche/suche.html?get=433755ff95eb3384b2b0f9711aa3166b;views;document&doc=7961
Level	National
Start year	N/A
End year	N/A
Total budget available	€60 million
% of co-funding	The funding is provided by a grant: <ul style="list-style-type: none"> - Basic research up to 100% of the eligible costs or expenditure - industrial research up to 50% of the eligible costs or expenditure - experimental development up to 25% of the eligible costs or expenditure - Feasibility studies up to 50% of the eligible costs or expenditure.
Main goal	The "Renewable Resources" funding program is intended to support the further development of the sustainable bio economy and to open up new opportunities and perspectives for Germany as an industrial location and for the development of rural areas. It supports, on the one hand, the development of innovative, internationally competitive bio-based products, processes and technologies for their production and, on the other hand, the development of concepts aimed at improving the sustainability of the bio-based economy and taking account of societal expectations.
Main application	Basic research; Industrial research; Experimental development.
Industrial focus	Supported areas: <ul style="list-style-type: none"> - sustainable generation and provision of renewable resources; - raw material and waste processing; - bio-based products and bioenergy sources.
Observations	N/A

Greece

Table 62 – Greece – EPAnEK – Operational Programme "Competitiveness, Entrepreneurship & Innovation"

Name of instrument	EPAnEK - Operational Programme 'Competitiveness, Entrepreneurship & Innovation'
Type of funding	Public
Funding organisation	Ministry of Economy
Web address	http://www.antonistikotita.gr/imerida_2014_en/events.asp?cs=2 http://epan2.antonistikotita.gr/uploads/Summary%20of%20EPANEK.pdf
Level	National
Region(s)	All
Start year	2014
End year	2020
Total budget available	€6 million (for action related to "Industrial materials")
% of co-funding	82% come from Public funds, 12 % comes from private funds
Main goal	"The EPAnEK strategy, aiming at the new developmental model for the Greek economy, is built on and supported by four strategic pillars. This pillars concern: 1) Adaptation of enterprises and the workforce to new developmental requirements 2) Focus on productive, competitive and potentially extroverted and innovative sectors 3) Targeted selection of investments/enterprises/activities with the characteristics required for the new developmental model 4) Safeguarding of the factors that facilitate business activity in the Greek operational environment."
Main application	- R&D - Demonstration - Commercialization
Application in the innovation chain	Technology development (TRL 3-5); - Demonstration (Prototype or Pilot line implementation) (TRL 5-6); - Qualification and testing (TRL 6-7); - Pre-production (TRL 8); · Initial market introduction (TRL 9).
Industrial focus	- Agri-nutrition/Food industry - Energy - Logistics - Cultural and Creative Industries - Environment - Tourism - Information & Communications Technologies (ICT) - Health - Materials - Construction Special action of interest ""Industrial Materials"
Circular Economy relation	There is a set of calls (1.7) on Product Life cycle and of particular interest topic No 1.7.1: Circular Economy: Recycling & reuse of building materials, secondary materials and waste from mining processes, metallurgical

	processes, industrial or/and agricultural waste for secondary production of materials.
Observations	This topic (1.7.1) is highly related with the concepts of FUTURING.

Italy

Table 63 – Italy – National Operational Programme (NOP) on Research and Innovation (R&I)

Name of instrument	National Operational Programme (NOP) on Research and Innovation (R&I)
Type of funding	Public
Funding organisation	ERDF, ESF, MIUR (Ministry of Education, University and Research)
Web address	http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/italy/2014it16m2op005
Level	National
Region(s)	Italy
Start year	2014
End year	2020
Total budget available	Total OP budget: € 1,29 billion Total EU contribution: €926 million National: €359 million
% of co-funding	N/A
Main goal	The programme covers EU funding to the less developed and transition regions of Italy under the "Investment for growth and jobs goal". The programme focuses on: (1) investing in education, training and vocational training for skills and lifelong learning by developing education and training infrastructure and (2) strengthening research, technological development and innovation.
Main application	Research, technological development
Industrial focus	Wide range
Observations	Overall, the national programme will contribute to: <ul style="list-style-type: none"> • An increase % of enterprises cooperating with research institutions, from 33% to 34% in the less developed regions and from 37% to 38% in transition regions • Around 330 million of EUR of private investment matching public support in R&I projects. • Additional 3,164 researchers working in improved research infrastructures • 885 new jobs in supported enterprises will be created • Around 117,000m2 of research infrastructures will be modernized/restructured or created ex-novo.

Poland

Table 64 – Poland – BIOSTRATEG

Name of instrument	BIOSTRATEG
Type of funding	Public
Funding organisation	The National Centre for Research and Development
Web address	http://www.ncbr.gov.pl/programy-strategiczne/srodowisko-naturalne-rolnictwo-i-lesnictwo---biostrateg/
Level	National
Region(s)	All
Start year	2014
End year	2019
Total budget available	€120 million
% of co-funding	20-60%
Main goal	Food security and food safety; Rational management of natural resources with a special focus on water management; Prevention and adaptation to climate change, with particular emphasis on agriculture; Protection of biodiversity and sustainable development of the agricultural production area; Forestry and wood industry.
Main application	R&D, pilot line, demonstration, commercialization
Industrial focus	Production, agriculture, forestry
Observations	Instrument finances initiatives for developing solutions for example for production, to make it greener.

Portugal

Table 65 – Portugal – Mobilization Programmes

Name of instrument	Mobilization Programmes
Type of funding	Public
Funding organisation	Ministry of the Economy
Web address	http://www.poci-compete2020.pt/concursos/detalhe/Aviso_10_SI_IDT_2016
Level	National
Region(s)	All
Start year	2016
End year	2020
Total budget available	€90 million
% of co-funding	40-75% (depending on the region)
Main goal	<ul style="list-style-type: none"> - Creation of new products, processes, or services with highly technological and innovative profiles contributing to their value chain and with commercially exploitable potential; - Increase the corporate investment in RDI, promoting the growth of knowledge-intensive economical activities and the creation of innovation-based value; - Improve the Portuguese qualification and the promotion of innovation in the economy through reinforcing the R&D investment; - Mobilization of the manufacturing sector, stimulating the qualified jobs.
Main application	RTD activities; Pilot line / demonstration
Application in the innovation chain	<ul style="list-style-type: none"> - Technology development (TRL 3-5); - Pilot line implementation) (TRL 5-6); - Qualification and testing (TRL 6-7); - Pre-production (TRL 8);
Industrial focus	Wide range; manufacturing industry and ICT companies
Observations	N/A

Portugal

Table 66 – Portugal – Demonstration Projects

Name of instrument	Demonstration Projects (Individual or in Co-Promotion)
Type of funding	Public
Funding organisation	Ministry of the Economy
Web address	http://ani.pt/incentivos/demonstradores/
Level	National
Region(s)	All
Start year	2016
End year	2020
Total budget available	€20.25 million
% of co-funding	40-75% (depending on the region)
Main goal	<ul style="list-style-type: none"> - To validate new technologies in industrial environment, to be applied in products, processes, or systems. - To demonstrate to a specialized audience, in a real situation, the economic advantages. - To publicize the new technology.
Main application	Pilot line/ demonstration
Application in the innovation chain	<ul style="list-style-type: none"> - Pilot line implementation) (TRL 5-6); - Qualification and testing (TRL 6-7); - Pre-production (TRL 8);
Industrial focus	Wide range of industries
Observations	N/A

Portugal

Table 67 - Portugal - R&D in Co-Promotion Projects

Name of instrument	R&D in Co-Promotion Projects
Type of funding	Public
Funding organisation	Ministry of the Economy
Web address	http://ani.pt/incentivos/idt-em-co-promocao/
Level	National
Region(s)	All
Start year	2016
End year	2020
Total budget available	N/A
% of co-funding	40-75% (depending on the region)
Main goal	<ul style="list-style-type: none"> - support co-promotion projects between companies or between companies and other entities in the R&I System - industrial research and/or experimental development activities that may lead to the creation of new products, processes or systems, or to the introduction of significant improvements in existing products, processes or systems.
Main application	R&D, technology development
Application in the innovation chain	<ul style="list-style-type: none"> - Basic Technology Research/ Feasibility (TRL 1-3); - Technology development (TRL 3-5);
Industrial focus	Wide range (many industrial sectors)
Observations	N/A

Portugal

Table 68 – Portugal – Research Infrastructures

Name of instrument	Research Infrastructures
Type of funding	Public
Funding organisation	Science and Technology Foundation
Web address	https://www.fct.pt/apoios/equipamento/roteiro/index.phtml.en
Level	National
Region(s)	All
Start year	2016
End year	2020
Total budget available	€65 million
% of co-funding	40-85% (depending on the region)
Main goal	<ul style="list-style-type: none"> - To reinforce the technical and scientific capacity of high impact research infrastructures, including their integration in European networks (e.g. ESFRI). - To ensure quality services to the scientific, educational, and enterprise communities to support their role in the accomplishment of national/regional development strategies, allowing an R&I system more integrated, with more capacity - To increase the R&I competitiveness, improving its strategic orientation and focus, including at international level.
Main application	Technology R&D; Pilot line / demonstration
Application in the innovation chain	<ul style="list-style-type: none"> - Basic Technology Research/ Feasibility (TRL 1-3); - Technology development (TRL 3-5); - Demonstration (Prototype or Pilot line implementation) (TRL 5-6);
Industrial focus	Wide range
Observations	N/A

Spain

Table 69 – Spain – State Programme for Research, Development and Innovation to address Societal Challenges

Name of instrument	State Programme for Research, Development and Innovation to address Societal Challenges
Type of funding	Combined
Funding organisation	Ministry for Economy and Competitiveness
Web address	http://www.idi.mineco.gob.es/portal/site/MICINN/menuitem.d20caeda35a0c5dc7c68b11001432ea0/?vgnextoid=33f85656ecfee310VgnVCM1000001d04140aRCRD
Level	National
Region(s)	All
Start year	2017
End year	2020
Total budget available	N/A
% of co-funding	100% of funding for basic research projects 50% of co-funding for industrial research projects 25% of co-funding for experimental development projects
Main goal	a) to generate a critical mass in R+D+I of interdisciplinary and intersectorial character, necessary to advance in the search of solutions according to the priorities of each of the challenges b) to promote a close relationship between scientific and technical research, the development of new technologies and the business application of new ideas and techniques and contribute to their translation into products and services c) to strengthen the international leadership capacity of the Spanish System of Science, Technology and Innovation and to contribute to improve the competitiveness of the business fabric
Main application	Basic research Industrial research Experimental development Complementary activities
Industrial focus	The instrument focuses on the following Societal Challenges: 1- Health, demographic change and wellbeing 2- Food security and quality; productive and sustainable agriculture; natural resources; marine and maritime research 3- Secure, efficient and clean energy 4- Intelligent, sustainable and integrated transport 5- Action on climate change and efficient use of resources and raw materials 6- Social change and innovation 7- Digital economy and society 8- Security, protection and defence
Circular Economy relation	Challenges 2, 3 and 5 include topics that are related to circular economy: - Challenge 2:

	<p>a) conservation and integral, efficient and sustainable management of agriecological systems, agroforestry, water and fisheries resources</p> <p>b) improvement and development of new systems, processes and technologies of agroindustrial production and control, bioproducts and biorefineries (includes bioproducts, biolubricants and biofuels)</p> <p>- Challenge 3:</p> <p>a) solar energy</p> <p>b) wind power</p> <p>c) bioenergy</p> <p>d) waste treatment for energy purposes</p> <p>- Challenge 5:</p> <p>a) efficient use of resources and raw materials</p>
Observations	<p>Both individual and cooperation projects are foreseen.</p> <p>Beneficiaries are companies, public and private research institutions, associations, universities.</p>

Spain

Table 70 – Spain – Research and Development projects

Name of instrument	Research and Development projects
Type of funding	Combined
Funding organisation	Centre for the Development of Industrial Technology (CDTI)- Centro para el Desarrollo Tecnológico Industrial (CDTI)
Web address	https://www.cdti.es/index.asp?MP=7&MS=20&MN=3
Level	National
Region(s)	All
Start year	2017
End year	2020
Total budget available	N/A
% of co-funding	Up to the 75% of the budget, by means of a partially repayable aid
Main goal	To support business projects of applied character for the creation and significant improvement of a productive process, product or service Supported project types: a) individual R&D projects b) R&D projects- national cooperation c) international technological cooperation projects (for instance, ERANETs, IPCEIs, JTI's projects) d) R&D projects in specific calls
Main application	Industrial research Experimental development
Industrial focus	Technology areas that address the Societal Challenges (see above)
Circular Economy relation	Challenges 2, 3 and 5 include topics that are related to circular economy: - Challenge 2: a) conservation and integral, efficient and sustainable management of agrieological systems, agroforestry, water and fisheries resources b) improvement and development of new systems, processes and technologies of agroindustrial production and control, bioproducts and biorefineries (includes bioproducts, biolubricants and biofuels) - Challenge 3: a) solar energy b) wind power c) bioenergy d) waste treatment for energy purposes - Challenge 5: a) efficient use of resources and raw materials
Observations	These projects are focused on the improvement of productive processes, products and services and therefore, primarily addressed to companies

Spain

Table 71 – Spain – Strategic Programme of Consortia of National Business Research – Programa Estratégico de Consorcios de Investigación Empresarial Nacional (CIEN)

Name of instrument	Strategic Programme of Consortia of National Business Research - Programa Estratégico de Consorcios de Investigación Empresarial Nacional (CIEN)
Type of funding	Combined
Funding organisation	Centre for the Development of Industrial Technology (CDTI)- Centro para el Desarrollo Tecnológico Industrial (CDTI)
Web address	https://www.cdti.es/index.asp?MP=7&MS=734&MN=3
Level	National
Region(s)	All
Start year	2017
End year	2020
Total budget available	N/A
% of co-funding	Up to the 75% of the budget, by means of a partially repayable aid
Main goal	To finance large industrial research and experimental development projects, developed in collaboration by business groups and aimed at carrying out planned research in strategic areas of the future and with a strong international profile.
Main application	Industrial research Experimental development At least the 50% of the budget must be devoted to industrial research activities
Industrial focus	Technology areas that address the Societal Challenges (see above)
Circular Economy relation	Challenges 2, 3 and 5 include topics that are related to circular economy: - Challenge 2: a) conservation and integral, efficient and sustainable management of agriecological systems, agroforestry, water and fisheries resources b) improvement and development of new systems, processes and technologies of agroindustrial production and control, bioproducts and biorefineries (includes bioproducts, biolubricants and biofuels) - Challenge 3: a) solar energy b) wind power c) bioenergy d) waste treatment for energy purposes - Challenge 5: a) efficient use of resources and raw materials
Observations	The beneficiaries are business consortia but the projects must have the relevant participation of research organizations.

Spain

Table 72 – Spain – HAZITEK – Programme to support businesses' R&D

Name of instrument	HAZITEK- Programme to support businesses' R&D
Type of funding	Public
Funding organisation	Basque Government- Department of economic development and infrastructures
Web address	http://www.euskadi.eus/gobierno-vasco/-/ayuda_subvencion/2017/hazitek-2017/
Level	Regional
Region(s)	Basque Country
Start year	2014
End year	2020
Total budget available	N/A
% of co-funding	Non-refundable grant. 25%, 30% or 40% depending on the typology of the project
Main goal	To support the development of industrial research and experimental development projects, both of strategic and competitive character.
Main application	Industrial research Experimental development Different typology of projects is foreseen: - projects for the development of new products - projects for launching of new scientific and technology based enterprises - strategic projects of industrial research or experimental development
Industrial focus	Advanced manufacturing, Energy, Biosciences and Territory
Circular Economy relation	The Energy focus relates with circular economy, particularly in the promotion of renewable energy and new materials. The Territory focus relates with circular economy, particularly in the promotion of the environmental industry, including urban and soil regeneration, and water treatment.
Observations	The Advanced manufacturing focus is very much related to the Basque Industry 4.0 initiative, that is, the digitalisation of the Basque industry.

Spain

Table 73 – Spain – ELKARTEK – Programme to support Collaborative Research in Strategic Areas

Name of instrument	ELKARTEK- Programme to support collaborative research in strategic areas
Type of funding	Public
Funding organisation	Basque Government- Department of economic development and infrastructures
Web address	http://www.euskadi.eus/ayuda_subvencion/2017/elkartek-2017-convocatoria-fase-ii/web01-s2ekono/es/
Level	Regional
Region(s)	Basque Country
Start year	2014
End year	2020
Total budget available	N/A
% of co-funding	Non-refundable grant. Up to the 100% of the budget
Main goal	To support the development of collaborative research, carried out by Basque R&D&I institutions
Main application	Different typology of projects is foreseen: - collaborative basic research projects - research projects with high industrial and market potential
Industrial focus	Advanced manufacturing, Energy, Biosciences and Territory
Circular Economy relation	The Energy focus relates with circular economy, particularly in the promotion of renewable energy and new materials. The Territory focus relates with circular economy, particularly in the promotion of the environmental industry, including urban and soil regeneration, and water treatment.
Observations	The Advanced manufacturing focus is very much related to the Basque Industry 4.0 initiative, that is, the digitalisation of the Basque industry.

The Netherlands

Table 74 – The Netherlands – KIEM-VANG 2 (Knowledge Innovation Mapping (KIEM) - From Waste to Raw Material (VANG))

Name of instrument	KIEM-VANG 2 (Knowledge Innovation Mapping (KIEM) - From Waste to Raw Material (VANG))
Type of funding	Combined
Funding organisation	NWO (Het ministerie van Infrastructuur en Milieu (I&M) is the one leading the VANG initiative)
Web address	https://www.nwo.nl/en/funding/our-funding-instruments/sia/kiem-vang-knowledge-innovation---from-waste-to-resource/kiem-vang-knowledge-innovation---from-waste-to-resource.html
Level	National
Region(s)	All
Start year	2016
End year	2017
Total budget available	€820 million
% of co-funding	% of co-funding depends on the maximum amount of the grant taken. The subsidy is of a maximum of €20,000 per application. The co-financing by the participants in the project amounts to at least €10,000 of the total project costs, of which at least €5,000, - comes from the SME and €5,000 from the university of applied science. The co-financing can be in cash or in-kind.
Main goal	The projects financed are small targeted research projects which focus on applied research for the transition to the CE. The scheme aims at closing some material chains, prevention of waste and the stimulation of high-quality material. Additionally, cooperation between SMEs, research organizations and government is developed.
Main application	The scheme aims at supporting small, targeted research projects that utilize concrete opportunities for circular economy - R&D.
Industrial focus	All sectors, especially those which deal with material flows such as for metals, plastics, rubber, building materials, nutrients and biotic waste streams.
Observations	<p>"Lecturers and teacher-researchers from universities of applied sciences can apply for funding for small, targeted projects relating to circular economy. The program aims to promote value creation and chain closure for specific material flows. The KIEM-VANG scheme stimulates knowledge development".</p> <p>The maximum subsidy per application is €20,000 and the application needs to come from the university of applied science.</p>

The Netherlands

Table 75 – The Netherlands – Innovation Credit

Name of instrument	Innovation Credit
Type of funding	Public
Funding organisation	Ministry of Economic Affairs and Climate Policy
Web address	https://english.rvo.nl/subsidies-programmes/innovation-credit https://www.rvo.nl/subsidies-regelingen/innovatiekrediet
Level	National
Region(s)	All
Start year	N/A
End year	Continuous (at least to 2018 for which year a budget has been set aside)
Total budget available	The budget for 2018 is set at €60 million: €20 million for clinical development projects and €40 million for technical development projects.
% of co-funding	N/A
Main goal	With the Innovation Credit, the Ministry of Economic Affairs and Climate Policy gives SMEs financial support for risky innovation projects. In this way the government fills the gap in the capital market in a phase where entrepreneurs are busy getting things going, but have not yet generated returns. Small enterprises can finance 45% of the development costs of a project with the innovation credit, medium-sized companies 35% and large companies 25%.
Main application	Any innovative risky project
Industrial focus	Any sector
Observations	This is a credit and needs to be repaid (unless the project fails). Projects related to CE will be eligible provided that they meet the other requirements.

The Netherlands

Table 76 – The Netherlands – Biobased Economy and Green Gas

Name of instrument	Biobased Economy and Green Gas
Type of funding	Public
Funding organisation	Ministry of Economic Affairs and Climate
Web address	https://www.rvo.nl/subsidies-regelingen/biobased-economy-en-groen-gas
Level	National
Region(s)	All
Start year	2017
End year	2017
Total budget available	€4 million
% of co-funding	N/A
Main goal	The focus is on projects aiming at the conversion of biomass to marketable end products via chemical catalytic and biotechnological conversion routes, and/or the conversion of biomass and organic raw materials containing residues to green gas via fermentation or gasification. Entrepreneurs, scientists and knowledge institutions can apply for a subsidy for R&D for this project.
Main application	R&D
Industrial focus	Industry sectors where the Instrument is focused
Observations	The subsidy BBEG is part of the Top Sector Energy. It is related to the biobased economy which has links to the CE.

The Netherlands

Table 77 – The Netherlands – KIEM-VANG 2 (Knowledge Innovation Mapping (KIEM) - From Waste to Raw Material (VANG))

Name of instrument	MIA (Environmental Investment Rebate) and Vamil (Arbitrary Depreciation of Environmental Investments)
Type of funding	Public
Funding organisation	Ministry of Infrastructure and Water Management
Web address	https://english.rvo.nl/subsidies-programmes/mia-environmental-investment-rebate-and-vamil-arbitrary-depreciation-environmental-investments
Level	National
Region(s)	All
Start year	MIA 2000/ VIMIL 1999
End year	Continuous (the budget for MIA is already set for 2018)
Total budget available	The budget for MIA amounts to €99 million for 2018; For Vamil, €40 million available in 2017.
% of co-funding	N/A
Main goal	The main goal of the schemes is support entrepreneurs to: 1) to invest in environmentally friendly products or company resources with a tax advantage; 2) get innovative environmentally friendly products onto the market more quickly. Using the MIA, companies can deduct up to 36% of the investment costs for an environmentally friendly investment and with the Vamil scheme entrepreneurs and companies can decide when to write off these investment costs.
Main application	The schemes can be used for a variety of environmentally investments, including investments in the CE field.
Industrial focus	All entrepreneurs in the Netherlands who pay income or company tax can make use of the MIA/Vamil. The arrangement is interesting for example to entrepreneurs in agriculture, shipping and industry. But also for those who invest in sustainable transport, sustainable recreation and sustainable buildings.
Observations	There is a list (regularly updated) which includes about 270 investments that are eligible for the MIA and/or the Vamil.

The United Kingdom

Table 78 – The United Kingdom – European Regional Development Fund Operational Programme

Name of instrument	European Regional Development Fund operational Programme (2014-2020)
Type of funding	Public/ Combined
Funding organisation	The Department for Communities and Local Government
Web address	https://www.gov.uk/government/publications/draft-european-regional-development-fund-operational-programme-2014-to-2020
Level	National (Selected Regions that qualify for ERDF finance)
Region(s)	All
Start year	2014
End year	2020
Total budget available	€3.9 million
% of co-funding	N/A
Main goal	The strategy is built around functional economic areas (in the form of Local Enterprise Partnerships) and reflects the main priorities for development across these. It focuses most resources on the core objectives of innovation, SME competitiveness and the low carbon economy but recognises the need for targeted interventions under other objectives where EU funding can unlock barriers that matter strategically to specific areas in England.
Main application	Development initiatives
Application in the innovation chain	Basic technology Research/ Feasibility (TRL 1-3); Technology development (TRL 3-5); Demonstration (Prototype or Pilot line implementation) (TRL 5-6); Qualification and testing (TRL 6-7); Pre-production (TRL 8); Initial market introduction (TRL 9)
Industrial focus	All sectors
Observations	Efficiency in resources and environment protection are call priorities that are aligned with the concepts of CE

8.2 ESIF Programmes Financial Resources

TOTAL EU ALLOCATIONS OF COHESION POLICY 2014-2020* (MILLION EUR, CURRENT PRICES)

	Cohesion Fund	Less Developed Regions	Transition Regions	More Developed Regions	Outermost and northern sparsely populated regions	European Territorial Cooperation		Youth Employment Initiative (additional allocation)	TOTAL
						Cross-Border Cooperation	Transnational Cooperation		
BE			1.039,7	938,6		219,0	44,2	42,4	2.283,9
BG	2.278,3	5.089,3				134,2	31,5	55,2	7.588,4
CZ	6.258,9	15.282,5		88,2		296,7	43,0	13,6	21.982,9
DK			84	329,2		106,3	33,8		553,3
DE			9.771,5	8.498,0		626,7	338,7		19.234,9
EE	1.073,3	2.461,2				49,9	5,5		3.590,0
IE				951,6		150,5	18,3	68,1	1.188,6
EL	3.250,2	7.054,2	2.306,1	2.528,2		185,3	46,4	171,5	15.521,9
ES		2.040,4	13.399,5	11.074,4	484,1	430,0	187,6	943,5	28.559,5
FR		3.407,8	4.253,3	6.348,5	443,3	824,7	264,6	310,2	15.852,5
HR	2.559,5	5.837,5				127,8	18,3	66,2	8.609,4
IT		22.324,6	1.102,0	7.692,2		890,0	246,7	567,5	32.825,0
CY	269,5			421,8		29,5	3,3	11,6	735,6
LV	1.349,4	3.039,8				84,3	9,3	29,0	4.511,8
LT	2.048,9	4.628,7				99,9	13,9	31,8	6.823,1
LU				39,6		18,2	2,0		59,7
HU	6.025,4	15.005,2		463,7		320,4	41,4	49,8	21.905,9
MT	217,7		490,2			15,3	1,7		725,0
NL				1.014,6		321,8	67,9		1.404,3
AT			72,3	906,0		222,9	34,4		1.235,6
PL	23.208,0	51.163,6		2.242,4		543,2	157,3	252,4	77.567,0
PT	2.861,7	16.671,2	257,6	1.275,5	115,7	78,6	43,8	160,8	21.465,0
RO	6.935,0	15.058,8		441,3		364,0	88,7	106,0	22.993,8
SI	895,4	1.260,0		847,3		54,5	8,4	9,2	3.074,8
SK	4.168,3	9.483,7		44,2		201,1	22,3	72,2	13.991,7
FI				999,1	305,3	139,4	21,9		1.465,8
SE				1.512,4	206,9	304,2	38,1	44,2	2.105,8
UK		2.383,2	2.617,4	5.767,6		612,3	253,3	206,1	11.839,9
Interregional cooperation									571,6
Urban innovative actions									371,9
Technical assistance									1.217,6
EU28	63.399,7	182.171,8	35.381,1	54.350,5	1.555,4	7.548,4	2.075,0	3.211,2	351.854,2

* Breakdown by category of allocations subject to transfers between categories at the request of the Member States. Note: if the global budget of 351.8 billion doesn't correspond with line 1b of the Multiannual Financial Framework it is due to transfers to Connecting Europe Facilities and the Fund for European aid to the most deprived.

Figure 7 – Total Allocations of Cohesion Policy 2014-2020⁶⁵

⁶⁵ http://ec.europa.eu/regional_policy/sources/docgener/guides/blue_book/blueguide_en.pdf

	TOTAL EAFRD 2014-2020 (unit EUR, current prices)
BELGIUM	647.797.759
BULGARIA	2.366.716.966
CZECH REPUBLIC	2.305.673.996
DENMARK	918.803.690
GERMANY	9.445.920.050
ESTONIA	823.341.558
IRELAND	2.190.592.153
GREECE	4.718.291.793
SPAIN	8.297.388.821
FRANCE	11.384.844.249
CROATIA	2.026.222.500
ITALY	10.444.380.767
CYPRUS	132.244.377
LATVIA	1.075.603.782
LITHUANIA	1.613.088.240
LUXEMBOURG	100.574.600
HUNGARY	3.430.664.493
MALTA	97.326.898
NETHERLANDS	765.285.360
AUSTRIA	3.937.551.997
POLAND	8.697.556.814
PORTUGAL	4.058.460.374
ROMANIA	8.127.996.402
SLOVENIA	837.849.803
SLOVAKIA	1.559.691.844
FINLAND	2.380.408.338
SWEDEN	1.763.565.250
UNITED KINGDOM	5.199.666.491
TOTAL EU-28	99.347.509.365
TECHNICAL ASSISTANCE (0.25%)	238.942.629
TOTAL	99.586.451.994

Figure 8 – Total Allocations of EAFRD 2014-2020⁶⁶

⁶⁶ http://ec.europa.eu/regional_policy/sources/docgener/guides/blue_book/blueguide_en.pdf