



# Research and innovation

## SUMMARY

With less than seven per cent of the global population, the European Union (EU) accounts for almost 20 per cent of global investment in research and innovation (R&I). However, despite the well-known correlation between research, development, innovation and competitiveness, when it comes to R&I expenditure as a percentage of GDP, the Union performs poorly compared to South Korea, Japan, the United States (US) and China. Moreover, regional disparities in R&I and a lack of private investment are significant indicators of certain R&I related shortcomings at EU level.

While the EU has reacted relatively rapidly to the challenges deriving from the coronavirus pandemic, challenges remain. To better withstand unexpected future shocks and to strengthen the EU's R&I capacity, this Briefing explores a number of options: (i) R&I related funding and budget lines should be increased. Public and private investments should be promoted to bridge regional disparities and to meet the Barcelona objective of spending 3 % of GDP on R&I; (ii) European and national laws could be more innovation-friendly, while the Union should further promote guidelines and best practice to enhance R&I; (iii) the EU could translate visions into meaningful EU-wide missions and better support the market launch of promising innovations; (iv) The Union should enhance its strategic autonomy in the digital field and empower entrepreneurs and citizens to use digital skills; and (v) the realisation of the European research area and European universities initiative has to proceed while further promoting the open access/science approach.

## Background: Research and innovation (R&I) in the EU

According to the European Commission, [investing](#) in research and innovation is investing in the EU's future, helping it to compete globally and preserve its social model. About two-thirds of the Union's economic growth over recent decades has been driven by innovation. Investing in R&I is therefore investing in Europe's future.

To this end, research became a shared competence between the European Union and the Member States in the 1980s. Today, the EU runs a number of programmes to finance research, development and innovation activities in various sectors. These programmes provide a total estimated budget of more than €100 billion to support research, development and innovation activities in the current, 2014-2020 [Multiannual Financial Framework \(MFF\)](#).

In 2002, the EU Member States agreed on the [Barcelona objective](#) to increase investment in scientific research and development (R&D) to 3 % of national GDP. The aim was to catch up with high R&D expenditure countries such as South Korea, the US and Japan.<sup>1</sup> In this regard, many governments in the Union actively promote research and innovation, for instance through [tax incentives](#) and the introduction of good practices in administration, such as one-stop shops that are equally accessible to R&I businesses (including start-ups) and investors, easy online application procedures, and short waiting times for decisions on funding eligibility.

According to 2019 [figures](#) from Eurostat, in 2017 (the latest available data), the EU-28 spent almost €320 billion on research and development activities. R&D expenditure as a percentage of GDP stood

at 2.06 % in 2017, compared with 2.03 % in 2016 and 1.77 % in 2007. With respect to other major economies, however, R&D intensity in the EU in 2017 was lower than in South Korea (4.55 %), Japan (3.20 %), the US (2.78 %) and China (2.13 %).

Most Member States' expenditure on scientific R&D had risen by 2017 compared with 2007 – in terms of percentage of national GDP. The highest R&D intensities among the Member States were recorded in Sweden (3.33 %) and Austria (3.16 %), followed by Denmark (3.06 %) and Germany (3.02 %). These were the only Member States to report levels of R&D intensity above the Barcelona objective of 3 %, followed by Finland (2.76 %) and Belgium (2.58 %). However, there is not only a divide between Member States, but also between regions, with several areas (mostly in southern and eastern Europe) lagging significantly behind in terms of investment, innovation capacity and performance. These [regional disparities](#) in terms of innovation gap are one major explanation for the EU's slow aggregate productivity growth over the last two decades.

Between 2006 and 2017, the majority of the Member States' R&D expenditure was in the business enterprise sector, which rose from 1.12 % of GDP in 2006 to 1.36 % by 2017. The second largest sector was the higher education sector, whose R&D intensity reached 0.45 % of GDP. The R&D intensities of the next two other sectors are the government sector, with 0.23 % of GDP, and the private non-profit sector (0.02 % of GDP). Again, both private and public spending were below the Barcelona objective, which stipulates that governments should provide one third of the 3 % R&D funding, with business providing the remaining two-thirds.

When looking at [innovation performance](#), the EU is [strong](#) in adding value for existing products or services in pharmaceuticals, electronics, and renewable energy fields, which is also known as 'incremental' innovation. However, the EU lags behind when it comes to disruptive and breakthrough innovations.<sup>2</sup> There are several reasons for this – inter alia, lack of venture capital (see also section on 'Funding and investments' in the next chapter); a different economic culture that translates into risk-aversion (compared, for instance, to many Asian countries); poor translation of new technologies from the research base into markets; and a weak ability to exploit the full scale and potential of the EU, which should be more than the sum of its Member States. Moreover, few EU start-ups survive beyond the critical initial phase, namely the first two to three years, and less than 5 % of the Union's small and medium-sized enterprises (SMEs) grow internationally.

In terms of funding R&I activities on EU level, the Union co-finances most initiatives through its framework programme for research, [Horizon 2020](#). The programme's current budget is €74.8 billion, making it the fourth highest budget heading (after agriculture, regional development and external action) in the current Multiannual Financial Framework. Horizon 2020 is based on three main pillars: Excellent Science (32 % of the Horizon 2020 budget), Industrial Leadership (22 %), and Societal Challenges (39 %). Horizon 2020 provides grants for individual researchers and their mobility, funds cooperative research projects, supports public-public and public-private partnerships, and provides specific instruments supporting research and innovation in SMEs. As of September 2020, Horizon 2020 has so far [supported](#) over 30 400 projects with more than €56.3 billion.

While Horizon 2020 is the largest EU programme specifically supporting R&I activities, complementary funds exist, including sectoral programmes (for example, nuclear energy, coal and steel) and the [European structural and investment funds](#) (such as the European Regional Development Fund and the European Social Fund), which are implemented at regional level. Five other programmes are connected to research and innovation activities: the [COSME programme](#) to support SMEs, the [Erasmus+](#) programme to support education, the [Health programme](#), the [LIFE programme](#) for environment and climate action, and the [Connecting Europe Facility](#) (CEF) to support investments in energy, transport and digital infrastructure.

The European Commission continues to seek more effective and efficient ways to interlink its research activities horizontally and create synergies with other EU instruments and programmes, such as the [European space programme](#) and the [European Defence Fund](#).

## EU R&I response to the coronavirus pandemic so far

R&I has become an essential part of the EU's coordinated response to the global coronavirus crisis. According to the European Commission, which [coordinates](#) European and (some) global research efforts, R&I related actions address epidemiology, preparedness and response to outbreaks, the development of diagnostics, treatments and vaccines, and the infrastructure and resources that enable this research.

As part of the common European [response](#) to the coronavirus outbreak, the Commission has mobilised [€1 billion](#) under Horizon 2020. This €1 billion can be broken down as follows: €400 million acts as guarantee for European Investment Bank (EIB) lending to finance pre-commercial stage investments in Covid-19 research and development. A further €150 million has been allocated to the European Innovation Council (EIC) to support disruptive innovations on coronavirus. The remaining €450 million will be allocated for developing scientific solutions for testing, treating and preventing coronavirus, and to developing countries' health systems.

In the latter context, in April 2020, Member States' ministers responsible for research and innovation supported the European Commission's [ERAvsCorona action plan](#). Building on the European Research Area (ERA) tools, the action plan will cover short-term coordinated actions based on better cooperation and data-sharing as well as joint funding efforts. The 10 priorities are:

- (1) coordination of R&I funding for coronavirus measures;
- (2) extension of large, EU-wide clinical trials for clinical management of coronavirus patients;
- (3) provision of new funding for innovative and rapid health-related approaches and better health system preparedness;
- (4) increase in support for innovative companies;
- (5) creation of opportunities for other funding sources to contribute to R&I actions on coronavirus;
- (6) establishment of a [one-stop shop for R&I funding](#) to tackle the coronavirus;
- (7) creation of an ad hoc high-level R&I task force on coronavirus;
- (8) extension of access to research infrastructures;
- (9) creation of a research [data-sharing portal](#); and
- (10) organisation of a pan-EU 'hackathon' ([#EUvsVirus](#)) to mobilise European innovators and civil society.

The European Commission has also [approved](#) an additional €100 million for vaccine research in July 2020, and in August 2020, it [allocated](#) €128 million for 23 new research projects to address the crisis and its consequences by strengthening the industrial capacity to manufacture and swiftly deploy solutions, develop medical technologies and digital tools, and improve understanding of citizens' behaviour during the pandemic.

## How to strengthen EU R&I capacity to tackle future shocks?

To develop greater resilience to withstand unexpected future shocks and to strengthen its capacity for collective action, the EU and its Member States may wish to consider strengthening their R&I capacity in a broad range of areas and policies. Such measures could also address pre-coronavirus problems, such as low private R&I investment and regional disparities in research, development and innovation activities. The analysis below sets out a range of possible initiatives.

### 1. EU funding for investment: Budgets to stimulate public and private investment

At the EU level, it is very important that R&I related programmes are adopted swiftly during the ongoing interinstitutional negotiations on the next MFF. Most notably, this holds true for [Horizon](#)

[Europe](#), the successor to Horizon 2020 and the Union's framework programme for research for the 2021-27 period. Before the coronavirus crisis, in June 2018, the Commission had proposed a budget totalling €100 billion in current prices for Horizon Europe (€94.1 billion plus €3.5 billion from the Invest EU Fund) and the Euratom Research and Training Programme (€2.4 billion) over the period. However, that figure of €94.1 billion equals €83.5 billion in 2018 prices (2018 being the reference year used by the Commission for its proposal). By contrast, the European Parliament has proposed a much higher financial envelope of €120 billion (2018 prices).

In July 2020, in reaction to the global coronavirus pandemic, a special European Council meeting took place to discuss the impact of the pandemic on the 2021-27 MFF, introducing, among other things, a new recovery instrument, '[Next Generation EU](#)' (NGE). Regarding Horizon Europe, the European Council decided to increase the budget to €89.4 billion (2018 prices). This is €5 billion more than the Commission's initial proposal, but still significantly below the Parliament's proposed financial envelope of €120 billion.

Beyond Horizon 2020, several [European structural and investment funds](#) are co-financing R&I activities, inter alia, aimed at accelerating the uptake of innovation in less developed regions. In this context, these funds co-finance the development of regional innovation eco-systems, including 'innovation hubs' targeted to support SMEs to get access to infrastructure and expertise on new technologies. One of these funds, the European Regional Development Fund, for instance, supports entrepreneurship, digitisation and business research, in particular in the least developed regions. The Common Agricultural Policy, among other things, aims to strengthen innovation capacity in rural areas through support for the uptake of digital-based opportunities. However, the EU should also address the tension between making the funding easily available and protecting the EU's resources from fraud.

Over the last years, the focus on innovation within the European structural and investment funds has been reinforced through more than 100 [smart specialisation strategies](#), which promote innovation based on the strengths of each region. Smart specialisation strategies are key to enabling inter-regional innovation support. Further synergies could be created with other EU funding programmes, such as the InvestEU Fund, the European Social Fund or the Digital Europe Programme (see 'Digitisation and skills').

At national level, EU Member States should take the necessary measures to meet the Barcelona objective. As mentioned above, only four of 27 Member States have met the Barcelona objective, with low private investment in innovation a persistent weakness in the Union. Industrial research, for example through [public-private partnerships](#), is key in global competition. To boost private investment, the EU needs an improved environment for business, with simple and effective laws (see next section), as well as [providing](#) the right incentives for R&I investment and better access to finance, in particular for SMEs. Many SMEs still experience difficulty in actually accessing the funding available because of fractured procedures and distribution paths.

Since the [Capital Markets Union](#) has not yet been completed in the EU, venture capital – an important source of financing for innovative start-ups – is still not available in the quantity that many entrepreneurs need. Overall investment in venture capital in the EU is one-fifth of the level in the US. To this end, the EU should urgently complete the realisation of the Capital Markets Union, since this would, among other things, open up greater possibilities for investors to raise funding beyond the traditional banking sector.

As mentioned above, some Member States use tax incentives to foster R&I activities. At the EU level, according to the Commission, the proposed directive on a [common consolidated corporate tax base \(CCCTB\)](#) would, inter alia, [allow](#) the costs of research and innovation investment to be tax deductible, with additional allowances for start-ups.

## 2. Laws and guidelines: Making rules more innovation-friendly

The EU needs an innovation-friendly regulatory framework to maximise the impact of R&I investments, with sufficiently flexible laws to take account of the needs of rapidly developing industries and technologies. To this end, the Union has introduced the [innovation principle](#), which aims to make EU policy objectives and laws more innovation-friendly by, for example, assessing the impact of new rules on innovation (whether private or public level). The Commission has also introduced [innovation public procurement guidelines](#) to encourage public buyers of goods and services to use public procurement as a tool to stimulate innovation.

The June 2019 adoption of the [Directive on preventing restructuring frameworks](#) (business insolvency) at EU level is important in terms of R&I, as it allows struggling companies to restructure early on and to prevent bankruptcy. Moreover, it provides entrepreneurs and start-ups, following a business failure, with a second chance, as well as offering measures to increase the efficiency of restructuring, insolvency and discharge procedures (for instance, by being fully discharged of debt from previous business ventures after three years). The transposition of the directive into national law starts gradually as of July 2021 and should not be postponed.

In the wake of the coronavirus pandemic, the Commission has further simplified the [state aid rules](#) to enhance synergies and to support public funding of innovative projects. The updated rules aim to facilitate the blending of EU and national funds. The simplification of state aid rules would also allow future Horizon Europe projects – labelled with the 'seal of excellence', but excluded from structural and investment funds.

More flexibility would also be needed at national level to introduce some experimental approaches to forthcoming laws, including '[regulatory sandboxes](#)' (monitored spaces in which new tools and approaches can be tested live) and [policy labs](#) (space to foster creativity and experimentation, and involve citizens and stakeholders in policy-making – co-design). This would allow national law-makers to better assess the potential impact of new regulation on the ground. One encouraging example here is the use by some Member States of 'regulatory sandboxes' in the case of [fintechs](#) – firms using new technologies to provide or improve financial services.

## 3. Missions and markets: Translating vision into action and bringing world-class innovations to market

One new element of the upcoming Horizon Europe programme is the introduction of '[missions](#)'. The basic idea is to set common, ambitious and time-bound objectives and to translate a vision – whether plastic-free oceans, combating cancer, or space travel to Mars – into a concrete EU-wide mission. These missions would be defined in close cooperation with Member States, stakeholders and citizens, and should, among other things, strengthen the *esprit de corps* within the EU and provide the Union with a strong, modern, R&I related public brand, as well as involving European added value. According to the Commission, such missions would [encourage](#) investment and participation across multiple (public and private) sectors throughout the value chain, policy areas and scientific disciplines.

The Commission has created five 'mission boards' to help specify, design and implement missions for Horizon Europe. By the end of June 2020, each mission board had produced an interim report proposing concrete targets and timelines for possible missions. These interim reports will be the basis for further discussion and engagement with Europeans, running until September 2020, to ensure that they are relevant for them and make a real difference. [Five possible missions](#) with the following targets to be met by 2030 were proposed by the boards:

- **Conquering cancer:** More than three million more lives saved, helping people to live longer and better, achieving a thorough understanding of cancer, improving prevention, diagnosis and treatment, supporting the quality of life of those exposed to cancer, and ensuring equitable access to these measures throughout Europe.

- Accelerating the transition to a **climate prepared and resilient Europe**: Preparing Europe to deal with climate disruptions, accelerating the transition to a healthy and prosperous future within safe planetary boundaries, and scaling up solutions for resilience, triggering transformations in society.
- **Regenerating our ocean and waters**: Cleaning marine and fresh waters, restoring degraded ecosystems and habitats, and decarbonising the blue economy to sustainably harness the essential goods and services they provide.
- **100 climate-neutral cities**: Supporting, promoting and showcasing 100 European cities in their systemic transformation towards climate neutrality by 2030, and turning these cities into experimentation and innovation hubs.
- **Caring for soil is caring for life**: The mission's goal is to ensure that 75 % of soils are healthy (by 2030) and are able to provide essential ecosystem services, such as providing food and other biomass, supporting biodiversity, storing and regulating the flow of water, or mitigating the effects of climate change. The target corresponds to a 100 % increase in healthy soils against the current baseline. To be successful, the mission intends to improve the monitoring of soil health or to encourage changes in policies.

When it comes to capitalising on its science, that is creating (new) markets by translating innovations into marketable products or services, the EU Member States lag behind, by international standards. To tackle this, the Horizon programme supports the work of the [European Innovation Council \(EIC\)](#) (pilot), with a budget of €3 billion for 2018-20. The EIC supports high-risk and high-impact 'game-changing' innovation with the potential to shape the future. In this context, the Commission introduced the [Fast Track to Innovation \(FTI\)](#), which provides a one-stop shop for funding of innovators/innovations in the EU and is part of the EIC pilot. The FTI is a bottom-up, innovation-support programme promoting close-to-the-market innovation activities open to industry-driven consortia. It can help partners to co-create and test break-through products, services or business processes that have the potential to revolutionise existing, or create entirely new, markets. The Commission has announced that the EIC will support 38 [high-risk innovative projects](#) located in new future and emerging technologies (FET) to support radically new, breakthrough products and services that might open up new markets. The projects will receive €124 million in total. In addition, in the wake of the coronavirus crisis, the Commission has allocated some €150 million to the EIC to support disruptive innovations related to the virus.

Horizon Europe also finances the [European Institute of Innovation and Technology \(EIT\)](#). The overall mission of the EIT is to boost sustainable economic growth and competitiveness by reinforcing the innovation capacity of the Member States and the Union. The EIT is not a research centre and does not directly contribute to financing individual projects. Instead, it provides its knowledge and innovation communities (KICs) with grants. Currently, the EIT operates through eight KICs. These are large-scale European partnerships that address specific societal challenges (digitalisation, health, food, urban mobility, climate, energy, manufacturing and raw materials), by bringing together education, research and business organisations – to form a 'knowledge triangle'. To this end, the EIT monitors the KICs' activities, supports cross-KIC collaboration and disseminates results and best practice. Currently, with 1 500 partners in business, education and research, more than 50 'co-locations' across Europe, and more than 6 000 jobs and 900 new products created, the EIT is Europe's largest innovation network. In the context of the coronavirus pandemic, the EIT has [mobilised](#) €60 million for Covid-19 actions and to tackle unprecedented social, health and economic challenges.

The funding of both the EIC and EIT form part of the Horizon Europe budget, and thus depend on the current interinstitutional negotiations on the 2021-27 MFF.

## 4. Digitalisation and skills: Digital single market and empowering entrepreneurs and citizens

Digitalisation is transforming R&I. Since many areas of science and innovation are becoming data-intensive, the EU needs to modernise its R&I initiatives to make it fit for the 21st century and the digital age.

While some Member States are coping with the effects of de-industrialisation and digitalisation, the EU is also still working on realising the digital single market. When looking at the pace of the technical and digital evolution, this realisation seems to have become something of a moving target. To further increase innovation and remain competitive at global level over the long term, the EU needs to better link its digitalisation strategy and the R&I dimension of its industrial strategy.

Currently, some of these issues are being debated in the framework of the MFF negotiations. In terms of digitalisation, the [Digital Europe programme](#) might be the most prominent. The programme builds on the Digital Single Market strategy launched by the Commission in May 2015, and its main objective is to boost Europe's digital transformation for the benefit of citizens and businesses. The Commission's June 2018 [proposal](#) envisages €8.2 billion (2018 prices) over 2021-27 for the Digital Europe programme. While the European Parliament has supported the Commission's initial budget allocation, during the July 2020 Special European Council meeting Heads of State or Government proposed to allocate only €6.8 billion (2018 prices).

The Digital Europe programme supports the following areas and goals:

- (1) [High-performance computing \(HPC\)](#): to deploy a world-class supercomputer and data infrastructure, endowing the EU with its own independent and competitive technology supply, achieving excellence in applications, and widening supercomputing availability and use.
- (2) [Artificial intelligence \(AI\)](#): to provide better access for public authorities and businesses to AI testing and experimentation facilities in Member States, complemented with the investment in AI research and innovation planned under the Horizon Europe programme.<sup>3</sup>
- (3) [Cybersecurity and trust](#): to boost cyber-defence and the EU's cybersecurity industry, financing state-of-the-art cybersecurity equipment and infrastructure, as well as supporting the development of the necessary skills and knowledge.
- (4) [Digital skills](#): to support advanced digital skills through long- and short-term training courses and on-the-job traineeships (see below).
- (5) [Digital transformation of public administration and interoperability](#): to support the digital transformation of public services and their EU-wide interoperability, through, for example, digital innovation hubs providing access to technological expertise from digital transformation projects.

In addition, if the EU wants to maintain its digital sovereignty, the Union and its Member States need to raise the level of public and private investment in digital technologies (for instance to counter cybersecurity threats), as well as in [European cloud and data economy](#), supercomputers or [digital infrastructure](#), such as 5G.<sup>4</sup>

With the technological and digital evolution, new jobs will require new knowledge and skills for workers. According to Commission [estimates](#), around 40 % of the workforce in Europe needs digital upskilling, while 70 million Europeans lack basic literacy and numeracy skills. In this context, the complete and swift implementation of the [European skills agenda](#) and its 12 actions would seem to be key to supporting the digital (and green) transition.

To strengthen knowledge transfer, a [stronger link](#) between vocational education and training and innovation systems would also be needed. The modernisation of vocational education and training policies, as well as improved industrial sector involvement, are important pillars of such a stronger link.

While the European Social Fund and the Erasmus+ programme co-finance several activities to enhance people's skills, the [Digital Education Action Plan](#) is key for Member States in terms of orientation and further developing future skills. An [open public consultation](#) on the new action plan took place between June and September 2020. Once adopted, the Commission should present new actions, benchmarks and best practices to the Member States.

## 5. Infrastructure and networks: European research area, universities and open science

The EU is the most open R&I area in the world. For example, the Union, with less than 7 % of the global population, [accounts](#) for almost 20 % of global R&I investment and for around one third of all high-quality scientific publications.

However, the EU is far from a homogenous research area, since many regional disparities in terms of R&I activity, researcher income, innovator opportunities, among other things, persist. The EU was already aware of these shortcomings in 2000, and decided to [establish](#) the European Research Area (ERA) in 2002 to try to address them. The overall aim of coordinating national policies was to create an effective single area for European science by, for instance, doing away with unnecessary duplication of work, sharing information, pooling resources and harmonising procedures. There is, however, a key trade-off between the need for cooperation between Member States and the need to maintain competition between European universities and research centres.

Today, the ERA is a [coordination tool](#) for national research infrastructures and itself constitutes an infrastructure and coordination mechanism. The main objectives of the ERA are to promote the free circulation of researchers, scientific knowledge and technology, to improve the coordination of research activities at national and European level, to increase the worldwide attractiveness of European research, and to boost Europe's competitiveness. However, the ERA is far from complete.

Based on the 2015 ERA roadmap and its six priorities [adopted](#) by the Council, the Commission has announced it will present a [new communication](#) in autumn 2020. The new initiative aims to revitalise the European Research Area by providing it with a new vision, consisting of a transformative R&I policy that better addresses the major challenges of the digital and green transitions, as well as increases the Union's general resilience following the coronavirus crisis. The communication intends to establish clear objectives for the ERA and include specific actions to be carried out at EU and Member State levels.

When talking about infrastructure, many European universities face problems. They need to [enhance](#) their innovation and entrepreneurship potential in order to generate new business models, which can translate into start-ups and/or spin-offs. Universities should step-up their cooperation with business and civil society. Moreover, education should better match new business and societal needs, for example, by offering more agile learning models. New learning models have been pushed further by the coronavirus pandemic. The pandemic, however, has also put many universities in financial difficulties – they should be supported by both Member States and the EU.

In addition, on the basis of 2017 figures, it is worth recalling that about 30 % of the EU's top 1 % publications [originate](#) in the United Kingdom (no longer a Member State), which remains the scientific powerhouse in Europe. Quality science performance in the EU-27 depends mainly on pockets of excellence in specific sub-fields. In addition, of the top 20 universities worldwide, the European ones are only British and Swiss. The EU-27 still do not have enough world-class universities that excel in a broad range of fields and are able to compete with, notably, the US, which accounts for 48 % of the top 100 universities in the world.

This may have been one of the reasons that, at the Gothenburg Summit in November 2017, the European Council created the [European Universities Initiative](#). The aim is to strengthen strategic partnerships across the EU between higher education institutions and to enhance the scientific quality and international competitiveness of European universities. To this end, it was decided to

create, by 2024, some 20 'European universities' – enhanced partnerships between existing universities. The new initiative would consist, amongst other things, of bottom-up networks of universities across the EU, which would enable students to obtain a degree by combining studies in several EU countries. The initiative is one of the flagship projects of the EU's objective to build a [European Education Area](#). Besides these strategic partnerships, the Union might think about setting-up a new university by bringing together world-class scholars and providing them with sufficient resources – to this end, the EU could better compete with other world-class universities.

Another major issue is the EU's [open access](#) and open science approach, which, inter alia, rewards science-business mobility and grants (cost-free) access to the (re-)use data of projects co-financed by the Union. The modernisation of universities and public research organisations should therefore be supported in this vein, through for example, promoting trans-national university partnerships and international networks.

## Potential initiatives

	Project	Likely lead actor	What should be done?	
<b>Funding and investments</b>				
1	Horizon Europe	Council, EP, Commission	The European Parliament (EP) should secure sufficient funding for Horizon Europe to support R&I activities across the EU	
2	European Structural Investment Funds	Council, EP, Commission	Secure the transformative R&I capacity and budget lines in EU funds other than Horizon Europe to promote R&I in other fields than science (e.g. agriculture, environment, social affairs) to ease the Union's transformation into a more competitive, inclusive, green and digital community	
3	Capital Markets Union	Council, EP	Access to capital beyond the traditional banking sector is urgently needed to increase private investments in R&I, in particular start-ups and SMEs would benefit	
4	Common Consolidated Corporate Tax Base (CCCTB)	Council	CCCTB could further increase R&I activities, in particular for SMEs. The Member States should progress in finding a compromise in the Council	
<b>Laws and guidelines</b>				
5	Directive on preventing restructuring frameworks (business insolvency)	Member States	Do not postpone the transposition of the directive into national law	
6	State aid rules	Commission	Further ease State aid rules in the field of R&I	
7	Regulatory sandboxes and policy labs	Member States	Member States should be more progressive and introduce regulatory sandboxes and policy labs to assess ex-ante to impact of (new) legislation at the micro level	
<b>Missions and market-creation</b>				
8	Horizon Europe missions	Commission, Council, EP, Civil Society	The EU institutions, together with civil society actors, should define common visionary goals and translate them into achievable missions	
9	European Innovation Council (EIC)	Commission, Council, EP	The EIC (pilot) supports high-risk and high-impact game-changing innovation with potential to shape the future. Therefore, its funding should be secured in the context of the MFF negotiations	
10	European Institute of Innovation and Technology (EIT)	Commission, Council, EP	As the EP has proposed, the EIT should be further strengthened in terms of funding	
<b>Digitalisation and skills</b>				
11	European cloud and data infrastructure	Council, EP, Commission	Foster the creation of an EU-wide cloud infrastructure in line with the data strategy	
12	EU data regulatory framework	Council, EP, Commission	Adopt a new set of measures to foster EU innovators' access to and use of personal and non-personal data (e.g. open access to government data)	
13	Digital Europe programme	Council, EP, Commission	The EP should secure sufficient funding for the Digital Europe programme to support investment in	

			frontier technologies such as AI, blockchain, high-performance computing and quantum technologies, advanced digital skills	
14	5G action plan	Commission	Foster definition of common EU standards for 5G networks and smart connectivity systems	
15	Cyber-security package	Council, EP, Commission	Set up a Joint Cybersecurity Unit to reinforce cooperation between Member States and organise mutual assistance. Establish European Cybersecurity Competence Centres to support the development and deployment of cybersecurity technologies	
16	European skills agenda	Commission, Member States	Implementation of the agenda is key to support the digital (and green) transition	
17	Digital education action plan	Commission, Member States	Finalise the implementation of the current Digital education action plan and adopt a new version swiftly. The plan provides important orientation for Member States in terms of benchmarks and best practices	
<b>Infrastructure and networks</b>				
18	European Research Area	Council, Commission	Proceed with the realisation of the ERA	
19	European Universities Initiative	Council, Commission	Create world-class universities and enhance scientific quality	
20	Open Access / Open Science	Commission	Further enhance the open access/science approach to support cross-border R&I projects and networks	

## REFERENCES AND FURTHER READING

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## ENDNOTES

<sup>1</sup> For more information, see C. Salm, [EU Research Policy: Tackling the major challenges facing European society](#), EPRS, European Parliament, March 2017, p.4.

<sup>2</sup> A *breakthrough innovation* leads to entirely new products, services or processes or to substantial improvements in the quality of existing ones (e.g. doubling the energy density in a battery for an electric car.) A *disruptive innovation* makes an existing product, service or industry obsolete (e.g. the smart phone, video streaming services). See: European Commission, [A renewed European Agenda for Research and Innovation - Europe's chance to shape its future](#), COM(2018) 306, p.11.

<sup>3</sup> Artificial intelligence can be understood as 'systems that display intelligent behaviour by analysing their environment and taking action – with some degree of autonomy – to achieve specific goals'. AI was enabled and enables itself through big data, supercomputers, complex algorithms and open source software. In addition, AI is increasingly blending with digital technologies such as blockchain. See: P. Boucher, [Artificial intelligence: How does it work, why does it matter, and what can we do about it?](#), EPRS, European Parliament, June 2020.

<sup>4</sup> For more information on the challenges and opportunities deriving from technical evolution and digitalisation, please see T. Madiaga, [Digital sovereignty for Europe](#), July 2020.

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