

Innovation for inclusive Green and Digital Transition



European
Investment
Bank

The EIB bank 

Innovation for inclusive Green and Digital Transition

Innovation, Digital & Human Capital (IDHC)
Orientation 2021-2027

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Innovation for inclusive Green and Digital Transition

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Introduction

The EIB's **Innovation, Digital and Human Capital (IDHC) lending programme**¹ has been in place since 2000 (prior to 2021 under the name of "Innovation & Skills" and before 2014 as "Knowledge Economy"). It has aimed to support education, research and innovation policies at EU and Member State level by promoting their objectives and complementing their instruments.

The experience gained by the EIB over these two decades — supported by EU policy and market developments — has confirmed the relevance and soundness of this lending programme. As is well known from the economic literature, innovation is the ultimate driver of economic growth and international competitiveness, and is **a cornerstone of Europe's ability to survive and thrive in a global, competitive landscape propelled by cutting-edge technology**. In Europe much remains to be done, while there is also evidence of progress. Important gaps remain between the European Union and other innovative regions of the world, as well as between regions within Europe. The long-standing objective of elevating the European Union's average R&D intensity to 3% of GDP remains unattained, although it has edged up over the years. The European Union hosts many excellent universities, world-leading innovative companies and industrial clusters, as well as best-in-class telecommunication infrastructure.

At the same time, the green and digital transitions are game changers. The EIB lending programme under IDHC needs to embrace the opportunities that these create, as well as its responsibility in providing targeted and effective support for their accelerated deployment. The European Union cannot continue to depend only on industries where it has been a global leader in the past but needs to invest massively and develop cutting-edge innovative clusters in these industries and technologies. This is needed not only to ensure the success of these transitions per se, but also must serve as a strategic imperative for Europe so as not to fall behind global competition in these growth areas of the future. A purposeful and broad-based innovation policy in the European Union thus remains justified, as is the Bank's continued backing of this policy with a clear sense of directionality and purpose.

Against this background, this Orientation draws on lessons learned and stakes out a new direction for the EIB's IDHC lending for the coming years, strongly anchored in EU policy priorities under the 2021-2027 Multiannual Financial Framework (MFF)².

Specifically, in support of the **green transition**, the Orientation outlines areas of priority for the Bank's financing of innovation in support of its commitments under the Climate Bank Roadmap (CBR), including both the financing of R&D, the demonstration and first commercial deployment of innovative technologies, infrastructure and business models that will drive decarbonisation of the economy.

Of equal importance, the Orientation sets the course for the Bank's support for the **digital transition**. Digitalisation is a key enabling technology not only for business innovation and the transformation of public services. Because of its role as a facilitator of smart power grids, required for the shift towards renewable energy and as an enabler of electric mobility, digitalisation is also a key driver of the green transition. However, the European Union still suffers from a digitalisation gap vis-à-vis its key global competitors. Closing this gap will require bigger efforts to boost digital investment across the economy, and tailored EIB support for such investment.

¹ Innovation, Digital and Human Capital (IDHC) is one of the EIB's four *Public Policy Goals* (PPGs). For details on the revised PPGs, please see the [EIB Group Operational Plan 2021](#).

² This Strategy focuses on the lending activities of the EIB and does not cover EIF activities. The EIB and the EIF maintain dialogue and knowledge exchange on innovation policies and objectives.

1. Executive summary: Innovation for inclusive green and digital transition³

While the IDHC lending programme maintains eligibilities currently in place, the green and digital transitions, as well as the lessons learned from the COVID-19 pandemic, require that the course is set such that the Bank remains an effective champion of EU competitiveness and sustainable and equitable growth. In order to enhance the economic impact of EIB lending, appraisal methodologies also continue to evolve⁴. In light of this, EIB lending will see a greater focus on:

- Supporting transformative green and digital technologies.
- Directing EIB resources towards areas of market failure and corresponding underinvestment.
- Enhanced support for innovation in cohesion regions.
- Improved resilience to global health crises.
- Supporting innovative SMEs and mid-caps.
- Using upstream technical and financial advisory services in support of EIB lending.

The EIB does not set this course in isolation. EIB priorities under the IDHC lending programme will deliver on EU policy priorities by continuing to **align closely with EU innovation policy**. Horizon Europe, the European Union's new research and innovation framework programme under the 2021-2027 Multiannual Financial Framework will focus on (i) strengthening the European Union's scientific and technological bases and the European Research Area (ERA), (ii) boosting Europe's innovation capacity, competitiveness and jobs, and (iii) delivering on citizens' priorities and sustaining our socioeconomic model and values. Similarly, the EIB's digital economy priorities are being developed in alignment with the new Connecting Europe Facility (CEF2) Digital Programme, aiming to support and catalyse investments in digital connectivity infrastructure of common interest over the period 2021-2027; and with Digital Europe — a complementary EU programme focused on building the European Union's strategic digital capacities and facilitating wide deployment of digital technologies. Also of importance for EIB prioritisation are the objectives of the European Regional Development Fund (ERDF), in particular the objectives (i) Smarter Europe — through innovation, digitalisation, economic transformation and support to small and medium-sized businesses — and (ii) a greener, carbon-free Europe, implementing the Paris Agreement and investing in energy transition, renewables and the fight against climate change.

Recent economic research and the empirical evidence collected from EIB financing and advisory services support the conclusion that, while crucial in its own right, focusing solely on **boosting R&D investment** (whether public or private) will not on its own suffice in enhancing Europe's competitiveness, economic growth, and quality of life. While innovative European regional clusters play host to world-leading research and highly innovative global companies, regional disparities in productivity and competitiveness have lingered. Many European innovative companies continue to encounter **difficulties in bridging the gap between technology development and market deployment and adoption** (see the well-known Valleys of Death) and often leave the European Union for US and Asian markets with deeper risk capital markets. This reduces the European Union's strategic autonomy and creates greater dependencies in critical components across the technology value chain. Laggard companies and regions — along with many innovative technologies — need a different approach for catching up than just by increasing R&D investments. Investment in skills, digital infrastructure, and the **scaling-up of and market creation for very innovative and breakthrough technologies**, along with better economic governance, are crucial components.

While the objectives and eligibilities of the IDHC lending programme are well adapted also for future lending, increasing emphasis will be given to the **acceleration of the green and digital transformation** of European industry (as prioritised in the European Industrial Strategy) and the public sector. Emphasis will be on the development, demonstration and first commercial deployment of cutting-

³ Additional details on IDHC lending priorities going forward are provided in chapter 5.

⁴ The priorities discussed in this Orientation are in line with and do not impact the categorisation of market failures introduced with the [Additionality and Impact Measurement framework \(AIM\)](#).

edge innovations and breakthrough technologies, solutions for the deep decarbonisation of Europe's economy in line with the EU Green Deal, the development and early deployment of strategic digital technologies, the roll-out of digital infrastructure, the development of vaccines, novel treatment options and medical technology needed to tackle global health crises, and the acquisition of the skills necessary to sustain and improve the employability of the workforce in the midst of structural transformation.

As in its other lending areas, the EIB Group's priorities under IDHC will in coming years shift towards **supporting the objectives of the Climate Bank Roadmap (CBR)**. This includes innovation towards deep decarbonisation and environmental sustainability in the energy, industry and transport sectors, in the nexus of climate and digital, and support for training and re-skilling of the workforce for the requirements of a climate-neutral economy. The EIB Group continues to advise and finance research and development programmes for the development of green breakthrough technologies, as well as in terms of supporting their demonstration and first full-scale deployment, in close cooperation with the European Commission and the EU Innovation Fund.

The International Energy Agency has estimated that around two-thirds of CO₂ emission reductions in its "sustainable development scenario" (which implies global net-zero emissions by 2070) stem from technologies that are either at a mature (25%) or early-adoption (41%) stage of development. The remaining one-third of cumulative CO₂ reductions would stem from technologies that have not yet passed the demonstration stage⁵. Under innovation, EIB support focuses on the latter two. In terms of main sectors, key green innovation priority areas include development, demonstration and first commercial production of breakthrough technologies related to equipment and solutions for:

- Renewable/low-carbon energy generation, transmission and storage:
 - Electrolysers, fuel cells and other equipment for the conversion of electricity into hydrogen and back; for the conversion of hydrogen into synthetic fuels; for hydrogen transport and storage.
 - Heating and cooling with electricity or renewables.
 - Innovative carbon capture, usage or storage (carbon sequestration techniques).
 - Efficient electricity transmission.
 - Efficient electricity storage (e.g. batteries, fly wheels etc.).
 - Smart energy systems.
 - Novel renewable energy technologies.
- Sustainable and smart transport and mobility:
 - Next generation lithium-ion batteries and other potentially disruptive battery technologies.
 - Development of electric, hydrogen and fuel-cell or other carbon-free emission vehicle technologies.
 - Powertrain-neutral vehicle component and system technologies for safety and sustainability (active/passive safety, automation, connectivity, telematics, light-weighting of interiors/exterior/structure and advanced materials).
 - User-oriented innovation for inclusive, cooperative, connected, safe and automated mobility.
 - Carbon-free technologies for aviation.
- Green/sustainable/digital industry:
 - Electrification of heat and power in energy-intensive industries.
 - Green or low-carbon steel production.
 - Efficient carbon capture, usage and storage.
 - Industrial processes based on low-carbon hydrogen and other alternative low-carbon fuels and feedstocks.
 - Development of lightweight and reusable/recyclable materials, improved material efficiency in production processes.

⁵ International Energy Agency: Energy Technology Perspectives 2020

- Digitally enabled circular business models and production models for increased energy and material efficiency and reduced reliance on virgin materials.
- Semiconductor devices, in particular power semiconductors, leading to significant energy savings in hosting equipment and related services.
- Circular bio-based technologies and innovations.
- Development and deployment of energy-efficient digital infrastructure.

Beyond support for mitigation, the EIB will continue to explore the potential of innovation for adaptation, e.g. climate data, modelling and analytics, resilient agricultural systems, water-saving technologies, satellites for earth observation, and vulnerabilities to new health risks.

Of equal importance is the **digital transition** and the European Union's digital strategy. The development and widespread deployment of breakthrough digital technology is a key driver of innovation and productivity growth throughout the economy, and an enabler of the green transition in industry, transport and infrastructure. Building on a foundation of broadbased and equitable Very High Capacity (VHC) communications infrastructure, digital technologies drive transformative changes in the public and private sectors alike. In alignment with the European Commission's digital targets for 2030 (Digital Compass), the EIB will continue to support **highly additional digital investments and space-based communication infrastructure and services**. The roll-out of VHC fixed and mobile networks across Europe is a critical complement to business sector innovation, but the speed of this roll-out is being held back by market failures linked to their public good characteristics. 5G networks serve as the foundation for new digital services, digital innovation, and the digital transformation of the business and public sectors, including the health and education sectors. The digital transition entails much more than infrastructure, however. ICT is an innovation-enabling general purpose technology that will drive productivity, global competitiveness and growth across the EU economy. For instance, the collection and processing of big data based on artificial intelligence (AI) can enable faster scientific discovery and more accurate research. It can boost productivity and transform business models in industry through applications such as improved human-robot collaboration, customised products on demand, predictive maintenance, faster and more reliable design and quality control and improved supply chain management. In the health sector, the collection of big data and the application of AI can improve early diagnosis and preventive healthcare, facilitate remote patient monitoring, champion precision medicine, support physician decision-making, and improve productivity and accuracy in drug research/discovery as well as treatment/disease management.

Digitalisation is also a key enabler of the greening of the energy and transport sectors and of the shift towards more circular and less carbon-intensive industrial resource flows, all of which rely critically on the ability to — in real time — collect, analyse, and optimise processes using large amounts of information. In conjunction, the Bank will continue to support the space sector infrastructure and related communication services, which are crucial for the resilience of digital infrastructure (and thus for public safety), while also enabling specific critical applications such as environmental monitoring and disaster recovery. The COVID-19 pandemic has demonstrated the critical importance of widespread digitalisation for economic resilience. Digitalisation in industry, education, health and other sectors allowed for a high level of production, efficiency and functionality to be maintained during the pandemic, which otherwise would have proven substantially more disruptive and economically damaging. Digitalised businesses also performed better than non-digitalised ones during the pandemic.

Yet, the European Union suffers from a lingering digitalisation gap: it underinvests in ICT in comparison with other major economies such as the United States and Japan. In 2017, the European Union invested around 2% of its GDP in ICT compared to almost 3.5% in the United States and 3% in Japan. A digitalisation gap also appears in the European Union's average R&D intensity in the ICT sector itself, relative to its key international competitors. Importantly, the European Union is also characterised by substantial variation in digitalisation intensity within the Union, across regions, sectors and individual firms. On a regional level, digitalisation is on average lower among companies in Eastern and Southern Europe. Similarly, at the firm level, digital competitiveness is higher among

the European Union's 'innovation leaders', which is suggestive of the importance of developing a country's digital capacity to achieve innovation-led growth. Without intervention, there is the risk that the "winner-takes-all" nature of digitalisation may further widen this digitalisation gap, as the companies driving digital change continue to digitalise at a faster rate, while others fall even further behind and risk losing their overall competitiveness. Because of this, broad-based support for digitalisation across EU countries and regions is not only essential to boost innovation-led growth and competitiveness at the EU level, but also to foster equitable and socially sustainable growth across all EU regions.

Despite the investment gaps, **Europe need not have a permanent disadvantage as a global digitalisation leader.** Its large size, stable regulatory environment, well-developed infrastructure, skilled work force and world-class research and technology institutes are all elements in favour of widespread deployment of digital technology in Europe. Its industry is strong in digital sectors such as electronics for automotive, security and energy markets, telecoms equipment, business software, and laser and sensor technologies. Nevertheless, as a producer, Europe's high-tech sectors do face severe competition from other parts of the world, while in terms of deployment many traditional sectors and small and medium enterprises (SMEs) are lagging behind.

There is an opportunity to close the digitalisation gaps through broad-based investment, which is not only a question of investing in digital technologies per se, but in the convergence of digital with traditional 'physical' technologies. Digital technology cannot prosper in isolation, in particular because of large complementarities between, on the one hand, digital deployment, and on the other, digital competencies, skills, and inclusive access to infrastructure across sectors, firms and individuals.

Effectively, embracing this opportunity also requires striking the right balance between technology development and diffusion, which both vie for scarce economic and human resources. It has been observed that, while the United States is a global leader as an ICT producer, this sector makes use of economic and human resources to an extent that may starve the ICT-using sectors of the economy of resources needed to reap the full benefits from digitalisation. Europe's ICT-producing economy is notably smaller, allowing for greater diffusion of scarce human and other resources across ICT-using sectors, broadening the productivity gains from digitalisation throughout the EU ecosystem.

Digitalisation is already a prominent feature in all areas of IDHC lending. With a foundation in digital infrastructure and the deployment of digital technology in industry and services, digitalisation can facilitate the revolutionary transformation of R&D methodology and the provision of health services and education. But the transversal nature of digitalisation also goes beyond the areas covered by the IDHC PPG (public policy goal), including transport and energy infrastructure. The transversal nature of digitalisation means that such project components are often not explicitly reported when contained under another primary lending objective and are, as a result, likely to be underrepresented in the EIB's aggregate lending statistics. In parallel with the priorities set out in this Orientation, efforts are under way to better define, identify and record the digitalisation components in EIB lending across all lending areas, as well as the economic impact of digitalisation⁶.

The economic impact of investing in innovation and digital transformation would be stunted without the complementarity of human capital, in the form of a healthy and relevantly educated and trained working population. A healthy and better educated population not only contributes to innovation and growth; it is also more resilient in the wake of technological transformation and global health crises. Carefully considering social inclusion is also essential in this context, for building up human capital across socioeconomic groups and characteristics (e.g. gender, age, ethnicity) or geographical location (regional cohesion). The EIB will continue to finance innovation in life science

⁶ Exploring these issues in greater depth, the [EIB Investment Report](#) 2021/2022 includes the results of the 2021 EIB Investment Survey and a comprehensive study on investing in digital transformation in the European Union.

(pharmaceuticals, vaccines, medical technology, diagnostics), health infrastructure⁷ and education projects in accordance with the objectives of the European Education Area, the Digital Education Action Plan, Horizon Europe and the EU4Health programme launched in the wake of the COVID-19 pandemic. Increased emphasis will also be given to gender equality and the economic empowerment of women⁸, recognising that gender equality and equal access to financing is essential to maximising the effective use of human capital and to inclusive economic growth.

EIB support under the heading “Innovation” includes the development, demonstration and first commercial deployment of a new or significantly improved technology. Plant replication and the further rolling out of an established manufacturing technique would normally not be eligible for financing by the EIB (except when located in and beneficial to a cohesion region, under specific conditions). Importantly, however, innovation is about more than just technology. It also involves the development of new, innovative business models, not least those based on circular principles and digitally-enabled innovation.

Exceptions to the financing restrictions in the previous paragraph are certain operations that contribute to the **resilience of the Union** and strategic autonomy. These include specifically the scale-up of semiconductor manufacturing and the critical raw materials for digitalisation. Support for the **manufacturing of semiconductors** is warranted as long as there are insufficient existing or planned manufacturing facilities in the European Union based on that technology (in keeping with the forthcoming European Chips Act⁹) and when the support to such state-of-the-art technology in the European Union is necessary to protect the security of supplies, enable the development of new industrial ecosystems or markets, or support future research, development or innovation activities building upon that technology. Additionally, for the benefit of strategic autonomy, the Bank will support the **sustainable supply of critical raw materials (CRMs) for digital applications**, integrating resource efficiency aspects (including those based on circular principles) in production and the product life cycle. This lending area is complementary to the financing of CRMs for green transition under the EIB’s [Energy Lending Policy](#).

These areas are particularly exposed to market failures related to production externalities in the rest of the economy. Enhanced global production-sharing is efficient when global trade operates within normal parameters, but it also makes the economy vulnerable to disruptions in global supply chains. The high dependence of the wider economy on these specific activities incurs economic costs on society far beyond their direct costs in times of major trade disruption, caused for example by a pandemic or a geopolitical threat. The current COVID-19 pandemic has clearly illustrated the systemic vulnerabilities associated with predominantly non-EU semiconductor supply.

The EIB is continuously adapting its lending for enhanced effectiveness, **strengthening the focus on additionality and providing financial and technical advisory support to improve the bankability of innovative projects**. Lending to the business sector has increasingly focused on supporting the growth of younger and riskier innovative companies, a shift made possible thanks to several risk-sharing arrangements (EFSI, InnovFin), co-financed with EU budget funds. As a result, EIB loans to the private sector have also over time become increasingly focused on projects that directly address **growth-hampering market failures**, which on balance generate greater economic impact. Complementing its direct lending, the EIB Group has also stepped up its support for innovative SMEs and mid-caps through its intermediated lending and guarantees, and targeted advisory support, thus accelerating the growth of smaller and younger innovative companies on a scale that would not nearly be attainable through direct lending alone. Innovative SMEs and mid-caps play a prominent role in IDHC lending and this has grown over time. “Special Activities” operations, which are dominated (though

⁷ The historical lending statistics used for this Strategy include R&D projects related to life sciences (pharmaceuticals and medical technology) but do not include health infrastructure lending. Until the end of 2020, health infrastructure was recorded separately under the “Sustainable Infrastructure” PPG. The revised “Innovation, Digital and Human Capital” PPG also incorporates health infrastructure lending from 2021 onwards.

⁸ See [EIB Group Strategy for Gender Equality and Women’s Economic Empowerment](#)

⁹ As announced by European Commission President von der Leyen in her [State of Union address](#) on 15 September 2021.

not exclusively) by smaller and riskier companies, increased to 38% of total IDHC lending over the period 2014-2016, up from 23% in the preceding three years. Intermediated lending to innovative SMEs and mid-caps account for another 12% of IDHC lending. Taken together, SMEs and mid-caps thus account for a very substantial share of the bank's lending under this PPG. Because of their smaller loan size on average, SMEs and mid-caps account for well over half of the number of firms financed.

An important evolution in how the EIB will select projects in coming years is through an **enhanced focus on identifying and prioritising activities of societal benefit where levels of investment are adversely affected by market failures**, whether in the form of knowledge or environmental externalities, coordination failures, imperfect competition or incomplete markets. The introduction, this year, of the Bank's new market failure-driven **Additionality and Impact Measurement (AIM) framework** will guide the EIB's lending towards projects where its economic, social and environmental impact will be maximised.

Complementing this framework, to ensure that the EIB prioritises research, development and innovation projects where market failures are particularly prominent, project selection adheres to stringent definitions of R&D and innovation as set out in the Bank's **internal project appraisal guidelines**, which are closely aligned with the recommendations of the OECD's manuals for R&D and innovation. Specifically, the latter defines innovation as "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)". The Bank's project selection methodology for R&D and innovation is discussed in greater detail in Chapter 3.

Many EIB projects related to breakthrough technologies that transcend the state of the art — including low-carbon technologies, digital transformation and biotechnologies — are **indeed hampered by significant market failures**, reflected in longer implementation and market adoption periods or significant market, technology and implementation risk. These elements insert a wedge between social and private risk-adjusted rates of return, which in turn generates suboptimal investment situations not only during the R&D phase, but also during their early deployment and scale-up phases. The EIB Group's experience informs the need to **support investments with advisory and financing support all the way from early-stage R&D through pilot plant experimentation and up to first complete scale-up**. In breakthrough technologies, this scale-up often entails the establishment of new markets not in existence at the time first investment decisions are made. Such situations often concern industrial transformations (e.g. vehicle electrification, hydrogen) that require continued investments, a complete technology scale-up, non-reversible market deployment and the establishment of the necessary supply chains and collaborations to demonstrate the technology's viability and benefits to ensure its permanent adoption. Technologies for the decarbonisation of industry will require very high levels of investment in order to reach critical scale where complete and competitive markets become self-sustaining.

Support for **innovation in less-developed EU regions** (with a GDP per inhabitant below 75% of the EU average) was enhanced in 2021 with the EIB Board of Directors' approval of the EIB Cohesion Orientation 2021-2027¹⁰. In contrast with the Bank's eligibilities in non-cohesion regions, the EIB will henceforth be able to directly finance the deployment of proven technologies by mid-caps (up to 3 000 employees) in less-developed regions under the IDHC PPG when these projects demonstrate clear economic spillovers at the local level. This targeted lending enhances the diffusion of innovation in these regions by supporting first-time application of proven technologies in high-tech sectors, thus reinforcing innovation performance. To ensure that this extended support remains focused on technology deployment, one of the criteria is that it is the first time that the promoter deploys this technology in a given country. The second main criterion is that the main activity of the final

¹⁰ [EIB Cohesion Orientation 2021-2027](#).

beneficiary is in an innovative economic activity sector (by NACE code, as agreed under the [European Guarantee Fund](#)).

Outside the European Union, the EIB's lending under IDHC will be pursued in all areas, with a particular focus on investments that support regions' and countries' sustainable economic and social development, including private-sector job creation, youth employment and women's empowerment. Key lending areas include digital infrastructure, health infrastructure and services, education and financial support for SMEs and mid-caps. Of high priority (in all lending areas) will be to identify and support projects that help accelerate the transition to low-carbon pathways in production, transport, heating and cooling of buildings, and energy systems.

Market failures and capacity deficiencies in a number of innovation areas warrant mentioning the importance of **complementary technical and financial advisory support** to public administrations and private project promoters in preparing strategies, identifying and prioritising investments, developing bankable business and financial plans and, in particular, transferring relevant knowledge and skills. Asymmetric information and incomplete markets lead to a shortage of risk financing needed for speedy deployment and scale-up of breakthrough technologies. Integrated technical and financial advisory helps reduce such frictions and bridge the two "valleys of death" in innovation financing. Activities to support management capacity as well as prepare quality project pipelines of public authorities will help achieve the innovation objectives set in the Cohesion Policy 2021-2027, and build on a smarter Europe that promotes an innovative and smart transformation based on good governance requirements. Diffusion of innovation is key, and this relies on synergies between numerous programmes (including Horizon Europe, Digital Europe, InvestEU, the Single Market, ETS Innovation Fund and the ERDF). Capacity building via e.g. JASPERS can assist in bridging knowledge gaps and promoting innovation technology transfer as well as establishing links between different policies.

Lastly, **the EIB Group's support for innovation** draws on the high degree of complementarity between the EIB and the [European Investment Fund](#) (EIF) to ensure that the Group can cover the full range of innovation — from the very early stage right through to the deployment of mature technologies. In the context of the Group Alignment Implementation Plan (GAIP), the EIB and the EIF are also engaging in permanent formal consultation in several areas, including additionality and impact, sector policy matters and alignment of SDG methodologies. This includes a full mapping of the EIB's and the EIF's PPGs with the aim of EIB Group-level orientation of PPGs for the 2021-24 Operational Plan.

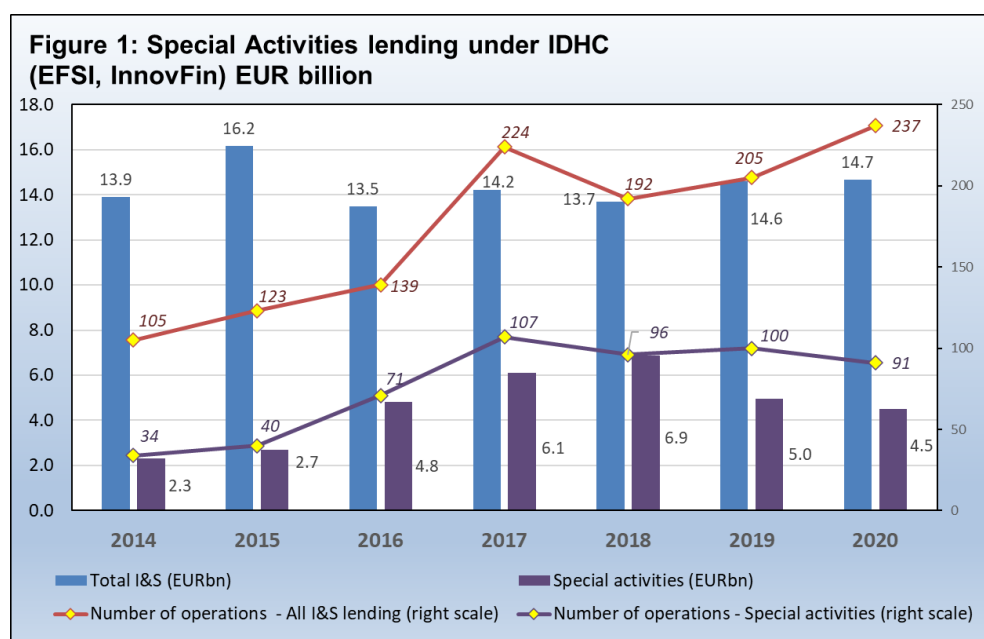
Through its unique role, **the EIF adds an important dimension to the EIB Group in supporting innovative SMEs**, with a strong element of support for the development of a wider, innovative green ecosystem, operating via venture capital funds, technology transfer funds, business angels and other private equity funds (e.g. infrastructure funds). Through the EIF, the EIB Group is the largest provider of venture capital in the European Union. The EIF has supported almost half of Europe's unicorns (young companies valued at over USD 1 billion) that have emerged in the past 15 years, mostly in the early stages of their development. Alongside the EIF's role in supporting all the EIB Group's four PPGs, innovation has historically been, and remains, one of the core dimensions of its business activity. In coming years, the EIF will seek to strengthen its focus on disruptive and cutting-edge technologies — in line with the priorities of InvestEU — such as artificial intelligence, blockchain, robotics and automation, space, etc.¹¹

¹¹ In December 2020, the EIB and the EIF launched the [AI Co-Investment Facility](#), a EUR 150 million joint equity instrument targeting companies in the field of artificial intelligence. It will be deployed over a period of four years, with the aim to support the European ecosystem of excellence and trust in AI and the European Digital Strategy of the European Commission, and to target the "second equity gap" that companies face when they move into the growth phase of their life cycle.

2. EIB lending under IDHC in 2014-2020: lessons learned

Between 2014 and the end of 2020, the EIB financed¹² a total of 1 226 projects under the IDHC lending objective (before 2021 under the name of “Innovation and Skills”¹³) with **financing volume of EUR 100.7 billion**. 97% of the Bank’s innovation lending was for projects in the European Union, with only EUR 2.9 billion lent for investments outside the European Union, in Turkey, Serbia, Tunisia, Morocco, Ukraine Israel, etc.

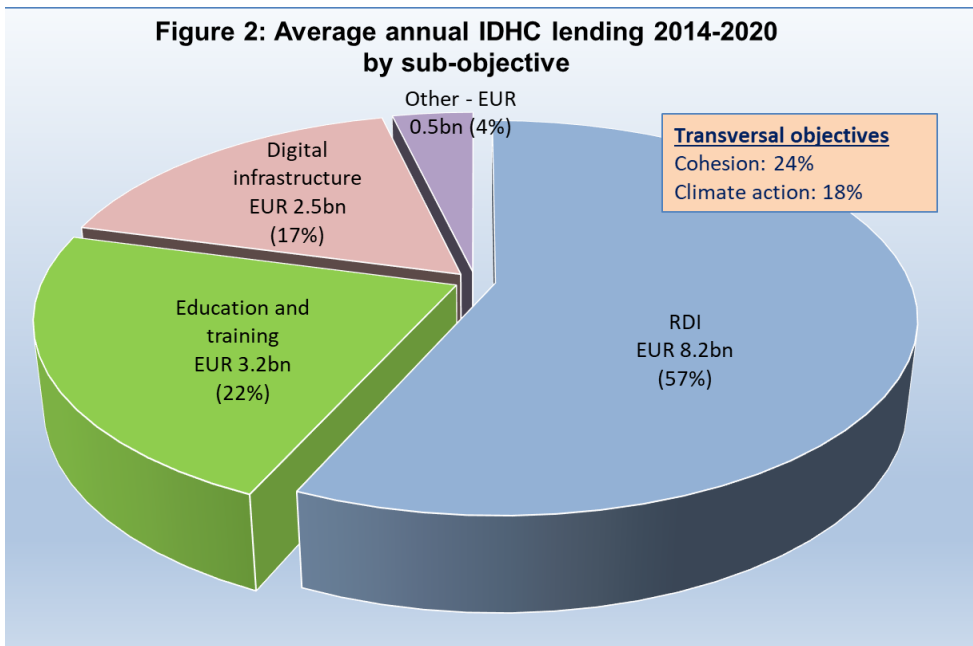
A stronger market orientation and financial instruments under InnovFin and EFSI risk-sharing mandates have been crucial in the transition towards smaller, higher-additionality loans as it allowed the Bank to broaden its activities under Special Activities. The share of **Special Activities operations thus increased** from just below 23% of total IDHC lending in 2014-2016 to 38% in 2018-2020. This is also reflected in the smaller average size of IDHC operations, which fell from EUR 132 million in 2014 to about EUR 62 million in 2020. At the same time, the **number of operations more than doubled** (Figure 1 below).



Lending by IDHC sub-objective: Well over half of IDHC lending between 2014 and 2020 was accounted for by the financing of R&D and innovation (RDI) projects, followed by education and training, totalling 22% (see Figure 2 below). Another 17% financed investments in digital infrastructure (mostly mobile and fixed broadband networks, but also space-related infrastructure). Whereas RDI and digital infrastructure investments financed by the EIB were primarily promoted by private-sector entities, financing of education and training projects was focused on public-sector promoters, in particular sub-sovereign and sovereign entities.

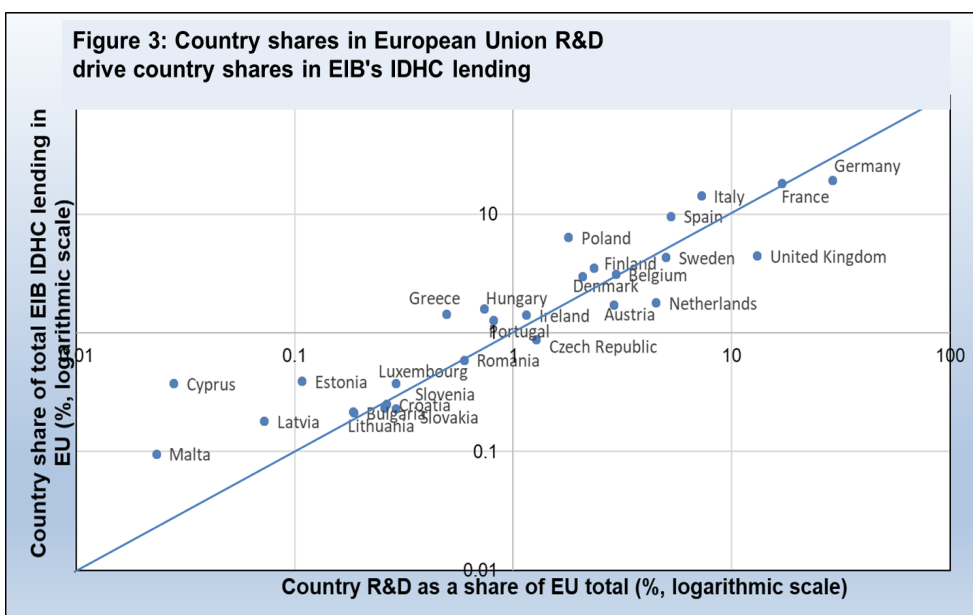
¹² By signatures, excluding the EIF. The statistics exclude health infrastructure, which until the end of 2020 were recorded under the “Sustainable Infrastructure” PPG. Health is included under the IDHC PPG from 2021 onwards.

¹³ For ease of reading, we consistently use in this £Orientation the new abbreviation IDHC also when discussing historical lending. The actual name of the programme has changed several times in the past, from its inauguration as i2i, through “Knowledge Economy”, “Innovation & Skills” (in 2014-2020), and finally IDHC from 2021 onwards.

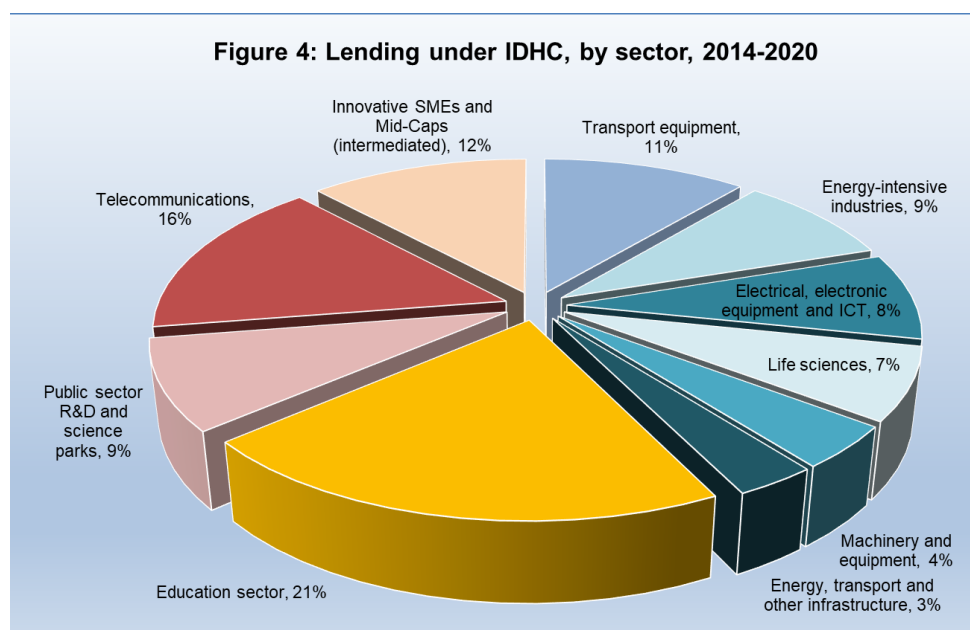


As regards **transversal objectives**, on average for the 2014-2020 period, 24% of the Bank’s IDHC lending contributed to the cohesion objective, and 18% to climate action. In 2020, the climate action ratio rose to 28%. Out of the Bank’s total IDHC lending in 2014-2020 of EUR 100.7 billion, EUR 27.9 billion (28%) benefited from the EFSI guarantee.

Lending by country: As illustrated by Figure 3 below, as can be expected, there is a very strong correlation between a country’s R&D share in the European Union and its share in EIB IDHC lending, reflecting a combination of economic size and R&D intensity, with a few notable outliers.



Lastly, **by ultimate beneficiary sector**¹⁴, lending to industry (including life sciences¹⁵) represents the largest share, at 42% (blue slices in Figure 4). The education sector and public sector research and science parks together make up another 30%, followed by the telecommunications sector (16%) and intermediated lending to innovative SMEs and mid-caps (12%)¹⁶.



The **impact** of EIB lending under IDHC during this period has been measured through a number of targeted output and outcome indicators. Examples of impact metrics for the 2015-2020 period include:

Innovation and digital

- Number of homes that have moved to FTTH/B (Fiber-to-the-Home/Building): 56.6 million.
- Employment directly supported by IDHC projects: 1.3 million.

Education

- New educational and ICT equipment supplied: EUR 836 million.
- New or rehabilitated education facilities: 10.4 million m².

Health

- Population covered by improved health services: 1.7 billion.
- Patients treated by supported facilities: 300 million.

¹⁴ While there is a positive correlation between sectors and lending eligibilities, these are two different dimensions of project reporting. For example, a project with a university (i.e. education sector) may include both R&D and education elements. Similarly, a corporate project may be focusing on its R&D but also have training elements, and so forth.

¹⁵ Reflecting their innovative and typically risky nature, life science operations are notably more prominent in the sub-category of quasi equity/venture debt lending, where they account for one-third of total lending.

¹⁶ It should be stressed here that this percentage pertains to dedicated lending to SMEs and mid-caps that qualify as innovative, while the bulk of the Bank's [lending to SMEs and mid-caps](#) is still counted under that separate PPG.

3. Prioritising IDHC lending within the new additionality and impact framework

Drawing on the successful implementation of its “Innovation and Skills” lending of recent years, the EIB will continue to support economic growth and cohesion under the IDHC PPG. The EIB’s IDHC lending programme also continues to reflect well the European Union’s reformulated policy agenda under the 2021-2027 MFF.

Within the current lending eligibilities, a reorientation of priorities is well under way. In its implementation, the EIB’s lending under IDHC will become notably more focused on projects that: (i) materially accelerate the development, deployment and scale-up of breakthrough technologies needed for the transition to a low-carbon/environmentally sustainable economy; (ii) deploy transformative digital technologies in the private and public sectors so as to enable the creation and growth of new innovative products, services and business models to enhance Europe’s global competitiveness; and (iii) strengthen human capital in the European Union through resilient and competitive health and education systems¹⁷.

The EIB’s adoption of the [Climate Bank Roadmap](#) (CBR) will be a key driver in the prioritisation of IDHC projects going forward. Meeting the climate targets of the Paris Agreement requires substantially boosting investment in green innovation from current levels. Crucial green technologies (i.e. low-carbon and environmentally sustainable) are in many industries not yet sufficiently mature to be competitively deployed at scale. Through increased investment in R&D and the deployment of early-stage breakthrough technologies, material progress can be made in improving energy efficiency in transport, industry and buildings, as well as in the efficiency of low-carbon power generation, power networks and transformation technologies. The transition to low-carbon modes of transport will depend on the development and scaling-up of production of high-energy-density batteries as well as green hydrogen. Low-carbon production of steel, chemicals, plastics, glass and cement will ultimately require deployment at scale of technologies that are not yet technically and commercially competitive. Getting there requires financial support and the creation of a supportive, forward-looking and predictable regulatory and policy environment.

Digitalisation is one of the key strategic enablers in the fight against climate change. In the energy sector, digitalisation of the whole value chain from generation to consumption is fundamental to improving overall energy system efficiency. Smart electricity grids are needed to integrate a greater share of renewable generation capacity and eventually shift away from carbon-intensive baseload power plants. Additionally, on a micro level, smart buildings can reduce energy costs through automated and optimised use of lighting, heating, cooling and other equipment. In transport, real-time information can help direct traffic in ways that decrease fuel consumption. Smart lighting of highways can regulate itself automatically based on traffic density and weather conditions. Smart logistics can reduce inefficiencies such as half-empty trucks and containers moving around or moving to suboptimal locations. In manufacturing, further automation can improve productivity and further reduce the energy intensity of production. Digitalisation can also facilitate tailored production (including additive manufacturing/3D-printing) with swifter responsiveness to changes in market demand, reducing waste from overproduction and bottlenecks from mismatches in supply and demand. Additive manufacturing also enables production closer to the customer, reducing the need for environmentally-costly logistics. Lastly, to achieve the above digitalisation objectives and reap the benefits for climate action requires well-performing, very high-capacity digital infrastructure.

¹⁷ For an in-depth analysis of the two major structural challenges for Europe — digitalisation and climate change — see the EIB’s [Investment Report 2020-2021: Building a smart and green Europe in the COVID-19 era](#).

The Bank's lending priorities under IDHC are directly determined by underlying market failures, which insert a wedge between private and social rates of return on investment and thus between actual and socially optimal levels of investment. The most prominent such market failures include:

- *Knowledge spillovers and environmental and safety externalities*, where societal benefits exceed private returns and where therefore a higher level of investment would be preferable than that typically generated on its own by private sector choices;
- *Imperfect competition*, which tends to hamper investment in early-stage and very innovative technologies. EIB projects in this area aim to expand the competitive space and market participation of a larger number of competitors in such technology fields;
- *Incomplete markets*, lack of know-how and skills, lack of coordination among market participants and the necessary supply chains, thus preventing the adoption and scale-up of innovative technologies.

Many EIB projects related to **breakthrough technologies** – including low-carbon technologies and digital transformation – have been found to be characterised by longer implementation and market adoption periods (requiring high upfront investments) or significant market and implementation risk. These elements tend to generate **suboptimal investment situations** not only during the R&D phase, but also during first deployment and scale-up. The Bank's experience points to the need to support investments with advisory and financing support all the way from early-stage R&D through pilot plant experimentation and up to complete scale-up and the establishment of new markets, which very often do not exist at the time first investment decisions are made. Such situations often concern industrial transformations (e.g. batteries for vehicles, hydrogen) that require continued investments, complete technology scale-up, non-reversible market deployment and the establishment of the necessary supply chains and collaborations to demonstrate technology viability and benefits and then contribute to permanent adoption, and often to further pull of innovation.

In order to identify research, development and innovation projects with a sufficient degree of additionality, the EIB adheres in its selection and appraisal of R&D and innovation projects to the Bank's **internal project appraisal guidelines**, which are closely aligned with the OECD guidelines for R&D (Frascati Manual) and innovation (Oslo Manual). The Bank's selection methodology for innovation and digitalisation projects is discussed in greater detail in Box 1 below.

The severity of market failures and a project's effectiveness in addressing the resulting suboptimal investment situation are at the core of the Bank's **Additionality and Impact Measurement (AIM) framework**, which will continue to guide the Bank's identification and prioritisation of high-additionality projects. In industry, examples of such projects include those discussed earlier. Other examples of projects with high AIM ratings under the IDHC PPG include investments in health infrastructure contributing to major access and quality improvement or with material innovative, cybersecurity and/or climate action components; investments materially enhancing the capacity and quality of medical research; innovation-enabling investments in digital and space infrastructure, renewable energy transformation and environmental monitoring; and investment in the education sector promoting innovative learning technologies, digital skills and innovative pedagogy.

Box 1: Technical and economic assessment criteria: innovation and digitalisation

As emphasised under AIM, the EIB will prioritise projects and activities where material market failures generate underinvestment situations relative to the social optimum. Such underinvestment arises in particular for beyond state-of-the-art research and development (R&D) and innovation, where knowledge externalities insert a wedge between the private and social returns on investment. In the context of innovation projects that include not only R&D but also tangible and non-tangible capital investment closer to the market, the presence of market failures needs to be established on a case-by-case basis. In the context of conventional fixed capital investment based on tried and tested technologies and conventional business models, economic theory and empirical evidence indicate that investment-impeding market failures are not necessarily substantial, at least for large corporates operating in competitive markets. Investment in structures, machinery and equipment provide the investor with collateral against which to borrow, limiting financial constraints. Similarly, conventional productive corporate fixed investment generates economic benefits that are largely excludable, limiting knowledge externalities and thus also the additional returns for society beyond those earned by the investing firm.

EIB support for innovation-enabling investments focuses on areas of market failure that insert a wedge between the private and social rates of return and thus lead to suboptimal investment situations from a social point of view. These market failures may derive not only from knowledge or environmental externalities, but also from imperfect competition or incomplete markets. Such innovation-enabling investments could, for example, include digital transformation, where fixed capital investments are accompanied by experimental organisational innovation and the introduction of risky new business models, drawing on new production processes and modes of operation to improve efficiency and productivity, or the collection and processing of information to create new and improved products and services.

Successful deployment of innovation ultimately generates positive knowledge, environmental or safety externalities that enhance overall economic performance and productivity growth, either as a result of

- suppliers, customers and competitors imitating and learning from the experiences of the trailblazer; or
- benefits to society above and beyond those of the investor due to reduced environmental load, resource usage or safety improvements.

However, for the individual path-breaking investor, the risk-adjusted financial return on such innovation-enabling investment is lowered by several factors:

- Markets for new products and services may be underdeveloped, depending on the presence of multiple complementary players and supply chains not yet in place;
- Deployment of innovation-enabling equipment and business models depends on complementary skills of staff, which may only develop gradually through learning by doing;
- Finding the path to ultimate organisational and business success through experimental innovation may be preceded by several unsuccessful side tracks.

When assessing the innovation-enabling characteristics of business investment, the EIB project teams must therefore consider not only the direct investments in R&D and productive fixed capital, but equally the promoter's strategy for complementary organisational and business model innovation, staff training and the creation of external supply chains, markets and partnerships.

** This box draws on internal appraisal guidelines for research, development, and innovation, which in turn are closely aligned with the recommendations of the OECD's [Frascati Manual](#) for R&D and the [Oslo Manual](#) regarding innovation. The latter defines innovation as "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)".*

Lastly, in its support of green innovation, the EIB Group will also aim to expand its capabilities through **financial product innovation**. Work continues to develop green bonds and green loan products (supporting investments in conformity with the EU taxonomy for sustainable activities¹⁸), together

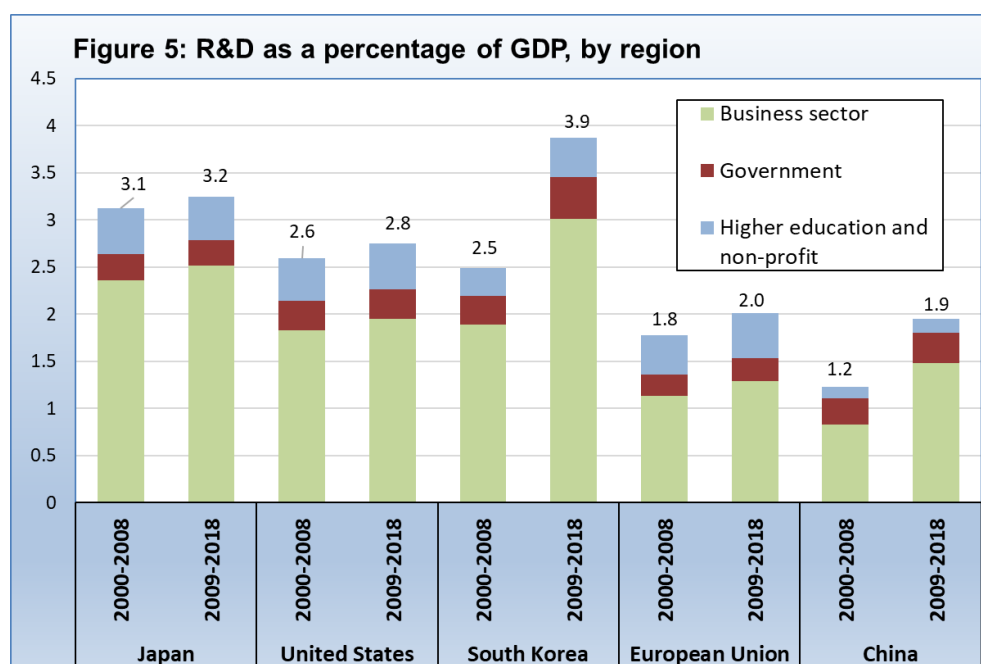
¹⁸ On 21 April 2021, the European Commission adopted an ambitious and comprehensive package of measures to help improve the flow of money towards sustainable activities across the European Union. The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. A first delegated act on sustainable activities for climate change adaptation and mitigation objectives [was published](#) on 21 April 2021. A second delegated act for the remaining objectives will be published in 2022.

with deployment of advisory services to support green investment through the provision of technical and financial expertise. Equity, funds and other innovative financial products will be utilised to support the development of higher-risk technologies and address specific investment gaps and policy priorities.

4. EU innovation policy and the EIB

Although important challenges remain, the European Union can record some progress towards its innovation and skills targets. In general, **educational attainment rates** have increased on a broad base, even if disparities between countries and social groups continue to exist. While still a far cry from its objective of attaining a **ratio of R&D spending to GDP** of 3%, it has edged up over time, from about 1.9% of GDP in 2014 to 2.1% in 2018 (Figure 5 below). Finally, the aims of the **Digital Agenda** (covering mostly the roll-out of broadband networks) seem to be within reach.

At the same time, new challenges have emerged, notably through the acceleration of technological change: the overarching trend of **digitalisation** and the dominance of the US economy in new high-tech, high-growth sectors, such as digital services, artificial intelligence, electric mobility, autonomous driving and robotics. A second challenge is posed by the need to achieve the **transition to a carbon-neutral economy by 2050**. Both areas attract significant global competition for technological and industrial leadership. Tackling these challenges head-on is a cornerstone of the new EU innovation policy post-2020. In view of the high investments in innovation made by the European Union’s competitors, the provision of tailor-made funding for innovation, digitalisation and skills will remain a highly relevant topic for the Union in the years to come, including from the point of view of safeguarding Europe’s strategic autonomy in these key technology areas. The EIB has aimed to closely align its lending priorities under IDHC with EU policy objectives and those of the European Commission, in particular objectives outlined first under Horizon 2020 and now under Horizon Europe.



This evolving policy landscape in turn reflects an improved understanding of the drivers of economic growth. In short, European Commission and EIB innovation policies have over time transitioned from

an earlier focus on supporting higher R&D intensity across the board (see first row of table below). The inherent market failure of knowledge externalities as a driver of **growth** remains. But experience has shown that this alone is not enough to produce the needed outcomes. The **systems-of-innovation perspective** (second row) has also increasingly informed EIB lending in its focus on synergies between public and private sector R&D, investment in skills to enhance the knowledge and innovation absorption capacity of all regions in Europe and an emphasis in industry innovation lending on projects that enhance vertical and horizontal linkages in innovative industrial clusters.

The most radical departure from broad-based innovation policy has come, however, with the realisation that these efforts alone will not be sufficiently directional in addressing the **grand challenges** facing the European Union in the years to come. Strategic autonomy in green, digital and health technologies is needed both to safeguard Europe’s supply of enabling technologies, necessary for speedy green and digital transitions, and to enhance its knowledge-driven growth potential. Reinforcing the global competitiveness of European industry in these areas is critical. A key reference going forward in this context is the [European Industrial Strategy](#), which calls for the further development of innovative European industrial ecosystems that bring together research institutions, suppliers, SMEs and larger companies.

Framing EU Innovation Policy

Framing	Key features	Policy rationale	Policy approaches
Science and technology for growth (since 1950s)	Linear innovation model, driven by R&D (research and development)	Addressing market failures (firms invest insufficiently in R&D because of public good character of innovation)	State financing of R&D; subsidies or tax incentives for business R&D
National and sectoral systems of innovation for improved competitiveness (since 1980s)	Focus on knowledge flows between upstream actors (universities, firms, agencies)	Responding to system failures, e.g. improving linkages between actors, addressing institutional problems (in laws, property rights, regulations)	Promoting science hubs and science-industry collaboration; education and training; cluster policies
Transformative change to address grand challenges (since 2010s)	Nurture radical innovation and new pathways; shape directionality of innovation	Promote system transformation, which incumbent actors are slow or reluctant to do.	Missions and goals (SDGs, climate targets), assisting new entrants, creating transformative coalitions, learning, experimentation.

Source: [Science, research and innovation performance of the EU 2020](#)¹⁹

On 15 March 2021, the European Commission adopted the first [strategic plan](#) for **Horizon Europe**, the new EU research and innovation programme worth €95.5 billion in current prices for the 2021-2027 MFF. Horizon Europe stands on three pillars, broadly mirroring the evolving thinking on innovation policy discussed above. It provides support for fundamental research infrastructure and innovation ecosystems and offers a clear directionality in identifying and tackling specific global challenges.

¹⁹ Adapted from Schot, J.W. and Steinmueller, W.E. (2018), *Three frames for innovation policy: R&D, systems of innovation and transformative change*, *Research Policy*, 47, 1554-1567.

EU innovation policy 2021-2027 — priority areas:



Providing guidance for the activities under the six clusters of Pillar 2, the strategic plan for the initial four years defines the following four **strategic orientations** for the programme:

- Promoting **open strategic autonomy** by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations.
- **Restoring Europe's ecosystems and biodiversity**, and managing sustainably natural resources to ensure food security and a clean and healthy environment.
- Making the European Union the first **digitally-enabled, circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems.
- Creating a more **resilient, inclusive and democratic European society**, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality healthcare, and empowering all citizens to act in the green and digital transitions.

Within these broader orientations, the European Commission has also identified five **EU missions** as an integral part of the Horizon Europe framework programme. These missions target some of the greatest challenges facing our world: fighting cancer, adapting to climate change, protecting our oceans, living in greener cities, and ensuring soil health and sustainable food production.

Under Horizon Europe Pillar 3, the European Commission has also introduced the European Innovation Council (EIC) Fund; a EUR 10 billion programme with grants and blended finance aiming to support early pre-commercial stage research as well as innovation and market deployment by private companies. In June 2020, the EIB signed an agreement with the European Commission as Investment Advisor for the [EIC Fund](#) for the provision of: (i) due diligence and investment advice, (ii) seek potential co-investors, (iii) propose the necessary procedures and policies for the Fund, (iv) sign, monitor and report individual operations, (v) carry out market assessments or other activities, as agreed between the parties, (vi) potentially represent the EIC Fund on the boards of investee companies, etc. The Bank's advisory services, under the InnovFin Advisory programme, also provided complementary advisory support to EIC beneficiaries and the European Commission under the EIC Pilot programme (predecessor of the fully-fledged EIC).

The 2021-2027 MFF also includes the updated **Connecting Europe Facility (CEF2) Digital Programme**, referring to a number of the objectives outlined in [Digital Compass 2030](#) (follow-up to the Gigabit Society). Reflecting a continuing shortfall in privately-financed broadband infrastructure, the CEF2 Digital Programme aims to provide financial support for investments in digital connectivity infrastructure of common interest during the period 2021-2027 (complemented by [Digital Europe](#) – an all-new EU programme focused on building the European Union’s strategic digital capacities and facilitating wide deployment of digital technologies). The European Union can only fully reap the benefits of the digital transformation if high-quality access to Gigabit networks is made available to all people, businesses and “socioeconomic drivers” such as schools, universities, hospitals, transport hubs and public administrations. An important complementary initiative, lastly, is the [EU Space Programme](#), which supports the development of advanced space technologies and services with the aim of increasing the European Union’s strategic autonomy.

In the previous MFF, over half of EU funding was channelled through the five **European structural and investment funds (ESIF)**, jointly managed by the European Commission and EU countries for job creation and a sustainable and healthy European economy and environment. This model will largely be maintained in the new MFF, where regional development and cohesion policy remain a substantial element among EU priorities. The focus is on the five objectives below:

- a **smarter Europe**, through innovation, digitisation, economic transformation, and support to small and medium-sized businesses.
- a **greener, carbon-free Europe**, implementing the Paris Agreement and investing in energy transition, renewables, alternative fuels like hydrogen, and the fight against climate change.
- a more **connected Europe**, with strategic transport and digital networks.
- a more **social Europe**, delivering on the European Pillar of Social Rights and supporting quality employment, education, skills, social inclusion, and equity of access to healthcare.
- a **Europe closer to citizens**, by supporting locally-led development strategies and sustainable urban development across the European Union.

Amongst the European Union’s five structural and investment funds, [the European Regional Development Fund \(ERDF\)](#) will remain most relevant to help the Union achieve its innovation policy targets. At least two-thirds of ERDF and Cohesion Fund resources will be allocated to the first two objectives.

5. Summary of IDHC priorities 2021-2027²⁰

Public sector R&D and research infrastructure

Public R&D and research infrastructure continue to be important catalysts both for European research excellence and for more equitable distribution of innovation-led growth across EU regions. Public R&D provides a foundation upon which competitive private sector R&D and innovation can grow.

Notable progress can be observed in some areas, while challenges remain in others. Poland, Slovenia, the Czech Republic and Portugal have for example seen visible progress in raising their economy-wide R&D intensities in recent years. The EIB's focus on poorly performing regions in terms of innovation capacity is reflected in the 46% transversal cohesion share of its public R&D projects. The European Union still lags behind some of its main competitors, however, with regard to the research intensity of its workforce, and a clear diversity in R&D and innovation performance across EU Member States persists.

Horizon Europe aims to continue giving these challenges priority, through support for widening participation and equitable spreading of research excellence, and a strengthening of the European Research Area. In support of these policy objectives, the EIB will continue focusing on the following key areas and priorities:

- **Public sector R&D facilities and activities**, including investments in university campuses and equipment, salaries of qualified research personnel for the time dedicated to research, and grants competitively awarded for research production.
- **Research infrastructure**: facilities used by the scientific community. Research infrastructure is often international in nature, which makes it essential for the EU research ecosystem, serving as a catalyst for common research programmes and allowing for resource sharing that also favours interaction between public and private players.
- **Science and technology parks and other technology transfer infrastructure**, including digital innovation hubs to support innovation and effective deployment of scientific research in the wider economy.

Priority will be given to (i) **support for excellent research** in order to make the Union's research and innovation system more competitive on a global scale, in particular as regards climate mitigation technologies, (ii) **alleviating territorial polarisation of R&D** and innovation, which limits the Union's overall innovation potential and innovation-led convergence; and (iii) public research related to **climate action**.

Business sector R&D, innovation and digitalisation

The Bank's lending for business sector R&D, innovation and digitalisation is widely distributed across industries, including transport equipment, other machinery and equipment, electronics and ICT, energy-intensive industries and life sciences (including pharmaceuticals and the manufacturing of

²⁰ IDHC retains the eligibilities of its *Innovation & Skills* predecessor with three material changes: the first is that IDHC reporting will include health infrastructure projects, already eligible but previously recorded under the Sustainable Infrastructure PPG. Health and education are important complementary drivers of innovation-driven sustainable growth. The economic impact of the COVID-19 pandemic reinforces this reasoning, while supporting the technology, structures and services needed to keep the population healthy is also a worthwhile cause in its own right. The second change is the inclusion under IDHC of direct financing of deployment of proven technologies (not justified by another PPG) by mid-caps in less developed regions when these projects demonstrate clear economic spillovers at the local level. The third change is to support manufacturing scale-up in targeted areas for the purpose of strategic autonomy, semiconductors, and critical raw materials for strategic digital technologies.

medical technology). In addition to upstream, early-stage corporate R&D, the Bank will continue to also support demonstration and first commercial deployment of socially beneficial breakthrough technologies and digital transformation of industry — that goes beyond the state of the art — when the aforementioned market failures result in suboptimal investment situations relative to what is optimal for society.

The following areas will be prioritised in the EIB's lending to business sector R&D, innovation and digitalisation:

- **Development and deployment of breakthrough low-carbon technologies:** In line with the Climate Bank Roadmap (CBR), the EIB will continue to focus on innovation supporting deep decarbonisation of the energy, industry and transport sectors, while also financing training and re-skilling of the workforce to be able to contribute to and function within a climate-neutral economy. The EIB Group will continue to finance R&D programmes with larger corporates and support the demonstration of low-carbon technologies for energy, mobility, industry and households. The Bank will also support investment in pilot and demonstration plants, or initial full-scale commercial production lines related to breakthrough low-carbon technologies. Similarly, in line with its [Energy Lending Policy](#), the Bank will continue to support projects developed under the EU Strategic Energy Technology Plan. Innovation goes beyond technology, however, and includes the development of innovative business models that support the green transition in the transport, energy and industry sectors, including business innovation based on circular economy principles.
- Experimental business innovation based on the development and deployment of **transformative digital technologies**, including industrial internet of things (IIoT), semiconductors, data collection and analysis, cloud computing, AI, blockchain technology, quantum technologies, digital manufacturing and simulations, actuators, robotics, predictive maintenance, cyber-physical systems, etc. Costs may include other (also non-digital) components required as part of any end-to-end system enabled by a digital solution. Eligible business sector digital transformation projects are, however, limited to those where digitalisation serves as an enabler of innovation as defined in the [OECD Oslo Manual](#).
- **Resilience of strategic industries — manufacturing of semiconductors:** Semiconductors are one critical technology where transferring state-of-the-art production technology to the European Union is essential to reduce strategic dependence on supply from outside the Union — a vulnerability highlighted by widespread economic disruptions from semiconductor shortages across a wide range of industries during the pandemic and as a result of geopolitical tension. Supporting EU manufacturing of semiconductors would enable the development of new industrial ecosystems and markets and support future research, development or innovation activities building upon the technology. R&D and manufacturing are highly symbiotic in the form of experimental innovation. Strategic autonomy in the sector therefore requires a broad strategy across the value chain. The [European Chips Act](#) about to be adopted includes a strategic ambition to reverse Europe's declining share in the global semiconductor market, increasing the region's production of cutting-edge and sustainable semiconductors and processors to at least 20% of world production in value by 2030. Given that the world market is expected to almost double in that timeframe, Europe would need to increase its current capacity by between four and six times to achieve this goal. This will clearly require the establishment of a fairly large number of new manufacturing plants in Europe within a very short time²¹.

²¹ In addition to very substantial financing requirements, the challenges of achieving these objectives suggest that cooperation with non-European producers will also be necessary. Although the European Union has well-developed R&D

- **Dual-use defence and security R&D and infrastructure** where there is a civilian commercial application for the developed technologies and projects²². The defence and security industry is facing a changing landscape, with focus partly shifting from physical to digital. Cyberdefence and cybersecurity involve several emerging disruptive technologies (EDTs) such as AI, blockchain, big data, quantum, robotics and autonomous systems, to name a few. **Space, cyber and EDTs are all characterised by dual-use potential**, with civilian and commercial customers often dominating demand and supply.
- **Development of new innovative drugs and innovative new medical technology** that are simultaneously safe, efficient, easy to use and affordable. Prioritised projects are those that: address global health challenges by providing novel insights into severe diseases; provide opportunities to fulfil unmet medical needs; have a significant impact on quality of life; support technology transfer from universities into new businesses; foster the creation of European intellectual property; and provide and disseminate novel scientific insights and knowledge.
- **Support for highly innovative SMEs**, in particular in life sciences, digital technology and transformation, and industries supporting the development and deployment of low-carbon technologies across all industry sectors. Whether through direct financing in the form of quasi-equity/venture debt (on the basis of EU budget-financed risk sharing arrangements), or through intermediated lending or funds, the EIB Group, has been able to — and will continue to — support an important category of players in the innovation chain: SMEs, and most notably start-ups. Such companies often take the lead in the development, validation and testing of trailblazing innovative technologies, which can then in a second stage be further developed and commercialised either on their own or in partnership with more established players. However, these typically young, small and innovative start-ups carry most of the risks (and investment burden) in the early stages of the innovation process, risks that larger incumbents are often either unwilling to bear or organisationally less well equipped to manage. Start-ups are typically well placed to develop radical innovations.
- **Intermediated lending support for the digitalisation of technology adopters among SMEs and mid-caps** to help meet the European Union’s target under Digital Compass 2030 of 90% companies in this segment attaining at least a basic level of digitalisation. This objective shall be pursued in alignment with the EIB’s support for the enabling environment, especially digital infrastructure, and for innovative SMEs and mid-caps, which tend to generate demonstration and spillover effects by encouraging technology adopters to accelerate the pace of their digital transformation. For this purpose, the EIB can leverage its intermediated financing in tandem with additional financial or non-financial incentives such as advisory services offered by digital hubs to financial intermediaries to build viable pipelines, especially in countries, which have identified SME/mid-cap digitalisation as a priority under their Recovery and Resilience Plans under Next Generation EU.

Following the Board’s approval of the Climate Bank Roadmap, there are some previously eligible R&D and innovation (RDI) activities that the Bank can no longer support. For example, the EIB Group will no longer support RDI motivated exclusively to support conventional high-emission technologies (e.g. internal combustion engine or fossil fuel-based propulsion systems in the maritime and aviation sectors). It will also not be able to support RDI activities related to products dedicated exclusively to the coal, oil and gas sectors including transport/exploration/use/storage.

capabilities and a sizeable equipment supply industry, EU-based semiconductor producers have become relatively small players and are unlikely to shoulder such a significant capacity increase on their own.

²² RDI activities for dual-use technologies can be included in EIB projects, where investments are motivated by the civilian applications of these technologies, i.e. insofar as at least 50% of expected revenues over the life of a project to be financed by the EIB derives from civilian applications.

Box 2: Mainstreaming digitalisation in EIB lending

There is growing awareness at the EIB that greater support for investments in digitalisation is needed in Europe to ensure that the European Union closes its digitalisation gap vis-à-vis leading global leaders in this field, and to maintain and reinforce competitiveness across a range of sectors transformed by disruptive digital technology.

As a transversal enabling technology, digitalisation appears as a component in virtually all the EIB's lending activities. This includes not only lending under the IDHC PPG, such as business innovation, health and education. Digitalisation also features in many projects related to transport and energy infrastructure, and in lending to small and medium-sized enterprises. With the notable exception of digital infrastructure, however, where digitalisation is indeed recorded as a primary lending objective, in many other lending areas digitalisation goes underreported and is consequently underrepresented in the Bank's aggregate lending statistics. Work is under way to change this.

The Bank's Innovation and Competitiveness Department has launched a pilot exercise to better define, identify and record digitalisation as a transversal component in projects. The pilot includes the creation of transversal indicators included in the Bank's project appraisal platform, both to estimate the digitalisation share in each project, and to assess its economic impact. The exercise also draws on a wider body of research and economic statistics to better understand the scope and scale of digitalisation across the different sectors of the economy and key areas of digital technology development and deployment and their economic impact. This pilot also aims to better understand the nature and scale of market failures and resulting underinvestment levels, which ultimately form the justification for policy intervention and EIB lending.

To facilitate the measurement of digitalisation in EIB lending, the proposed methodology under development distinguishes between three different types of digitalisation, depending on where they stand in the "digital technology value chain".

The first type is enabling digital technology. This includes the development and deployment of telecoms networks, data centres and other digital infrastructure. When calculating the digitalisation content of a project (and its percentage share of total project investment cost), all costs required for the implementation of the whole system are accounted for, including non-digital components such as civil works for network deployment, mobile tower masts, power systems, network/DC (direct current) buildings, etc. It would also include RDI expenditure to develop telecommunications equipment, semiconductors, hardware (HW), software (SW), etc.

The second type of digitalisation entails implementing digital technology for the purpose of improving business processes and facilitating innovation across different sectors, which may or may not themselves be related to digital products and services. Investment costs would include deployment of hardware and software, as well as necessary complementary costs such as training, data integration and change management.

The third category along the digital technology value chain are those activities that are enabled by digital technology or a digital solution. A project/component would qualify as digitalisation if (i) the digital solution is essential and drives the investment in the whole system, and (ii) the digital solution is based on technology that goes beyond the current industry standard. This category would also include RDI projects for which cutting-edge digital tools are essential in the process, such as drug discovery based on AI algorithms.

Digital infrastructure

The application of digital infrastructure and technologies has a strong impact across the economy and society, including in the field of e-health (telemedicine, electronic prescriptions and medical data exchange), and the use of advanced technologies to enhance public services (e.g. through big data or AI technologies). Yet the speed of rollout of digital infrastructure – relative to what would be socially

optimal – is hampered by market failures. This is in part linked to the inability of private investors to appropriate the positive economic externalities, where the wider economic returns typically far exceed those of the private investor. Moreover, the pandemic has increased the demand for digital reliance, but 5G rollouts have been delayed due to lockdowns, supply chain interruptions, 5G spectrum auction postponements, and reprioritisation of fixed line infrastructure investments. Europe is lagging behind South Korea, China and the United States in the speed of rolling out 5G mobile networks, in a sector with notable first-mover advantages²³. The need of closing the digital investment gap is further illustrated by the 2020 EIB Investment Survey, where one out of five surveyed firms cite access to digital infrastructure as a major obstacle to investment, around four times higher than the response of US firms²⁴.

Looking forward, the EIB will prioritise:

- Roll-out of very high-capacity (VHC) **fixed networks** in rural areas, where VHC coverage remains low or non-existent, as well as in urban areas to make sure that service competition will be available across all of society to stimulate the creation and adoption of productivity-enhancing digital services. Likewise, backbone infrastructure, including submarine cables, are important to make sure that growth in data traffic can be processed efficiently and, like all VHC networks, can under certain conditions contribute to climate action.
- Deployment of innovation-enabling 5G **mobile networks** across Europe. EIB support will continue focusing on support for R&D, tower densification, and network rollouts. 5G mobile networks are a key enabler for the deployment of IoT, AI, and the further digital transformation of industry, transport, energy and services, including in the health and education sectors.
- **Space-related infrastructures and services** (including launch services), with a particular focus on the deployment of new generation and innovative satellites and constellations; platforms and services of a public service nature (environmental monitoring, security, and strategic autonomy); the development of new launch platforms; and downstream applications and the use of all data generated by earth observation (EO) technologies.
- Enhancing the **security and resilience** of ICT networks and applications. Successful cyberattacks can lead to severe disruptions, potentially generating a cascading effect to other infrastructure and sectors throughout the economy. **Cybersecurity** is thus an economic enabler that guarantees the functioning of basically all critical societal infrastructure (given the increased role and deployment of digital technologies across the economy), ranging from health services to energy, transport, retail, etc. Prioritised investments would include those strengthening resilience through diversification of networks, for instance with high throughput satellites for secure broadband communication in remote areas.
- The adoption of **digital services** and practices in all sectors of the economy and supporting 5G-enabled digitally-driven business innovation in the wider economy, including smart cities, public administration, health, education and research, as well as specific internet-enabled technologies such as the deployment of industrial IoT networks.

These priorities are well aligned with the objectives under the [Digital Europe Programme](#) and [Horizon Europe](#) (of which around one-third is expected to support work for the digital transition).

EIB lending for digital infrastructure projects **outside the European Union** is, in addition to the above, justified as a key facilitator of **economic development**. One region of EIB focus is Africa, which has great potential to benefit from digital transformation that could generate much-needed jobs to the

²³ Telecommunications infrastructure, as all infrastructure, is inherently associated with large positive production externalities, which generate aggregate underinvestment in a competitive market setting. Increasing returns to scale create a negative relationship between average unit cost and the number of producers. Yet the inherently innovative nature of digital infrastructure requires competition. Hence, the need to find a balance between these two opposing elements through regulation, achieving sufficient oligopolistic profitability to encourage needed investment, while at the same time ensuring competition to foster innovation.

²⁴ <https://www.eib.org/en/publications-research/economics/surveys-data/eu-overview-2020.htm>.

millions of young people who enter the workforce each year, improve access to basic services, transform the delivery of public services, including healthcare, education and agriculture, and increase transparency and accountability in the public sector. The EIB will continue to build on its strong track record in supporting the digital sector in Africa, both through policy initiatives (notably participation in the EU-African Union Digital Economy Task Force) and financing, from investments in telecoms infrastructure to digital services. Its sector expertise is furthermore leveraged to provide advisory and technical assistance services at all stages of the project cycle and beyond, aiming to make investment projects bankable and ensure their sustainable implementation. Such activities include, for instance, supporting upstream project development, developing public authority personnel skills and improving access to finance, through market and sector studies to understand the needs of various industries and regions, business plan and strategy definition, risk mitigation and skills development.

Digitalisation and ICT infrastructure play an important role in the transition of several sectors to a low-carbon and climate-resilient economy. This is the essential infrastructure that enables the deployment of low-carbon and decarbonisation scenarios leading to significant sustainability benefits across the whole economy and fulfilment of the Paris Alignment criteria as set out in the EIB's Climate Bank Roadmap.

Following the Board's approval of the Climate Bank Roadmap, the Bank will no longer support non-VHC network technologies such as copper-based broadband networks or non state-of-the-art mobile telecommunication networks. Large data centres (so-called hyperscale data centres) outside the European Union would also not be further supported if power sourcing cannot meet the EIB Emission Performance Standard.

Education and training

Overall, Europe has a world-class educational system and has continued to make steady progress. EU-27 Member States have successfully met the ET2020 target to increase tertiary educational attainment to 40% of the population aged 30-34, which represents a material increase from the 33% ratio of a decade earlier. The ET2020 target of 95% participation in early (pre-school) childhood education has also been very nearly achieved at EU-27 level. However, important challenges still remain: participation rates vary considerably across countries, pointing to the continued need to support take-up and capacity building in laggard countries and regions²⁵. Considerable investments are also needed to address ageing school infrastructure and university campuses that were built during the great expansion of higher education in the 1970s. An important aspect of these modernisation efforts will also be to improve energy efficiency and thus reduce carbon emissions from school and university buildings.

In the context of education and training (but also in other areas), an important evolution is the increased focus by the EIB on gender equality and the economic empowerment of women, recognising that gender equality is essential to both maximising the effective use of human capital and to inclusive economic growth. The introduction of a gender tag enables the EIB to consider early on the potential impacts on gender equality of an operation, including those pertaining to IDHC.

²⁵ Against this backdrop, the European Commission in its Communication on achieving the European Education Area of September 2020 proposed new targets for 2030 (still to be confirmed), including an increase in tertiary educational attainment from 40% to 50% and the participation of three-year-olds in early childhood education and care from 95% to 98%, as well as reducing the share of low achievers in reading, maths, science and ICT literacy to below 15% among 15-year-olds, and increasing the share of people aged 20-24 with at least an upper secondary qualification to at least 90% ([COM \(2020\) 625 final](#)).

In line with EU policy goals, EIB lending under the education objective continues to prioritise the following key areas:

- **Educational infrastructure**, including pre-primary, to support equity in access to quality education and improvements in learning outcomes, including a focus on digital and highly energy-efficient educational infrastructure and means-tested affordable student accommodation.
- More and better **vocational education and training (VET)**, representing the interface between school-based education and on-the-job training, and investments facilitating upskilling and reskilling.
- Priority for projects in **poorly performing regions** in terms of learning outcomes or in EIB cohesion priority regions, which tend to exhibit the largest investment backlogs.
- Projects with a major technology/equipment component for **promoting digital skills** and innovative pedagogies, including skills needed to sustain and improve the employability of the workforce following the digital transformation.
- Projects including or being accompanied by **investments supporting the strengthening and transformation of education systems**, which may include investments in teachers' skills, to improve educational quality and make it more responsive to societal needs²⁶.

Through these different lending priorities, the Bank will focus on **improving Europe's competitiveness** vis-à-vis its main competitors by increasing the financial and human resources available for tertiary education, with a focus on excellence, in order to strengthen the position of European universities among the world's leading research universities.

The EIB will also pay particular attention to the **impact** of its education lending in terms of **reducing youth unemployment** through improved access to education, in all regions of the European Union and across all socioeconomic groups and characteristics. The Bank's continuing efforts to address youth unemployment includes an enhanced focus not only on access to education but also on its quality, to better accommodate needs for inclusion that reflects the diversity of the Union's population.

Outside the European Union, the financing of education and skills plays a crucial role in **supporting economic development**, especially in less developed countries with the largest remaining gaps. The COVID crisis has further worsened a situation of learning poverty and investment gaps that were already severe in many countries. Going forward, outside the European Union, the Bank will prioritise investments to strengthen public education systems, supporting efforts to ensure access to quality education for all, from early childhood and care to primary and secondary education, fostering the provision of infrastructure, equipment, and teaching skills. Another prioritised area is supporting vocational and technical education at secondary and tertiary level that is aligned with the needs of job markets and with regional sectoral dynamics and priorities.

Health

With the inclusion of health projects in the revised Innovation, Digital and Human Capital lending objective, the Bank will continue to support projects based on the following takeaways from lending in recent years:

- Foster the development of **effective, accessible and resilient health systems** in a way that also contributes to overall fiscal sustainability and economic growth, and promotes equal access

²⁶ For clarification, regular operational teaching expenditures such as salaries of teachers performing in their regular teaching capacity are not considered as an eligible investment cost.

regardless of socioeconomic characteristics or geographical location. Health projects will also focus on improving energy efficiency in hospital buildings.

- Speed up **medical innovation** through active participation in breakthrough projects in the health sector, including the deployment of digital technology, while paying due attention to equal access.
- Leverage the EIB's in-house expertise and **build on strong partnerships**, including with the European Commission, the World Health Organization and the Bill & Melinda Gates Foundation.

The Bank's experience in the health sector has put it in a unique position in the fight against the ongoing COVID-19 pandemic, focusing its current efforts on supporting health systems for pandemic preparedness and response as well as for R&D. The Bank is also learning important lessons from the upheavals of the past 18 months. The coronavirus pandemic has exposed systemic weaknesses in global health systems. It has also shown vulnerabilities in the global community's ability to prevent and respond to pandemic threats. Beating this pandemic — a task still in progress — has required an unprecedented level of international funding and cooperation, on multiple levels. The EIB is actively engaging with the European Union as well as with leading global players for maximum impact as quickly as possible. With its relevant presence in the sector and expertise in both healthcare infrastructure and R&D, the EIB is taking fast action and deploying both financing and advisory support aimed at providing immediate emergency support, speeding up the R&D required for vaccines, treatments and diagnostics, and strengthening the resilience of health systems in vulnerable countries.

Outside the European Union, improved health is a fundamental determinant of economic growth and poverty reduction. With COVID-19, the health gap between developed and developing countries has widened further and a sense of urgency to address this imbalance has arisen. The Bank with its in-house health sector expertise and its private sector crowding-in capabilities is in a unique position to increase its developmental impact by stepping up support throughout the full health value chain, boosting healthcare resilience and improving access together with development partners. In particular, the Bank's engagement in private sector projects, which build local capacity to develop and manufacture vaccines or essential medicines, including supply chains support, is expected to be a priority in the medium term, facilitated through local and international partnerships. One new initiative is the EIB's partnering with European Commission and European development finance players for the new Sustainable Healthcare Industry for Resilience in Africa (SHIRA) financing platform, which will foster private sector investments as part of the Team Europe initiative to improve health security and resilience and boost local manufacturing of vaccines and treatments.

In both the education and health sectors, lastly, the Bank's commitments under the Climate Bank Roadmap would prevent it from financing previously eligible projects inside the European Union for the construction of buildings that are not compliant with national energy standards, as defined by the Energy Performance of Buildings Directive (EPBD). Outside the Union, eligible projects would similarly be restricted to those that meet international or best local construction standards. Using a [green building certification](#) (e.g. EDGE, LEED, BREEAM or equivalent) ensures that the buildings financed are amongst the best built in the country and are least likely to pose a risk of lock-in.

Annex 1: Activities covered under IDHC

Research, Innovation and Digital (RID):

- Research infrastructure.
- Private and public sector beyond-state-of-the-art R&D and innovation prioritised under EU programmes: Horizon Europe and relevant research and innovation objectives under other key EU policies priorities.
- Pilot, demonstration projects and first full-scale commercial production lines related to breakthrough technologies²⁷.
- Investments in innovation-enabling advanced manufacturing technologies, other key enabling technologies and digital transformation in the private and public sectors, including in dual-use defence and security industries.
- Manufacturing of semi-conductors — fostering strategic resilience through transfer of state-of-the-art critical technology in view of implementing the European Chips Act.
- Investments in innovative products and processes of SMEs and mid-caps.
- Development and expansion of broadband networks in line with the priorities of Digital Compass 2030 targets in support of, among others, the Connecting Europe Facility (CEF2) Digital Programme.
- Investments enhancing the security and resilience of ICT networks and applications.
- Support for 5G-enabled digitally-driven business innovation in the wider economy, including in public administration, health, education and research, as well as specific internet-enabled technologies such as the deployment of industrial internet of things (IoT) networks.
- Global navigation satellite services to facilitate environmental monitoring and autonomous vehicles in transport and agriculture, high throughput satellites for secure broadband communication in remote areas, and environmental monitoring.
- Other enabling infrastructure: supercomputers, submarine cables, satellites, backbones, quantum, AI.
- Sustainable supply of critical raw materials (CRMs) for digital applications, integrating resource efficiency aspects (including circular) in the production and product life cycle.
- Deployment of proven technologies (not justified by another PPG) by mid-caps in less developed regions if the project demonstrates clear economic spillovers at the local level.

Education and training:

- Educational infrastructure, from early childhood and care to adult training, and related equipment, to support equity in access to quality education and improvements in learning outcomes, including focus on highly energy-efficient educational infrastructure and means-tested affordable student accommodation.
- Investments related to vocational education and training (VET), the interface between school-based education and on-the-job training: investments facilitating upskilling, reskilling and reconversion.
- Projects with a major technology/equipment component for promoting digital skills and innovative pedagogies, including skills needed to sustain and improve the employability of the workforce following the digital transformation.
- Projects including or being accompanied by investments supporting the strengthening and transformation of education systems, which may include investments in teachers' skills, to improve educational quality and make it more responsive to societal needs.
- Projects that support and enhance students' access to quality education, such as student loan initiatives, giving priorities to students from disadvantaged backgrounds.

Health:

- Investment fostering the development of effective, accessible and resilient health systems in a way that also contributes to overall fiscal sustainability, economic growth and overcomes potential barriers to access by certain segments of the population or geographical locations.
- Medical innovation through active participation in breakthrough projects in the health sector, including the deployment of digital health technology, paying due attention to also reaching marginalised and vulnerable segments of the population and enhancing gender equality.
- Projects leveraging the EIB's in-house expertise and building on strong partnerships, including with the European Commission, the World Health Organization and the Bill & Melinda Gates Foundation.

²⁷ Outside of less developed regions, the EIB's finance for innovation projects adhere to the definition of innovation set out in the Oslo Manual (see Chapter 3 for a methodological discussion).

Annex 2: Appraisal and additionality of business sector digital transformation projects

Digitalisation has become a key enabler for innovation in the business sector, and similarly in EIB-financed projects across a wide range of industries. Nevertheless, not all deployment of information and communications technology (ICT) is innovative. The replacement of office computers or communications equipment that neither changes production processes nor introduces new products or services may be only weakly linked to business innovation. Indeed, economic research in the 1980s pointed to the seeming inability of even large ICT investments to transform business models. This caused the growth economist Robert Solow to draw the now famous conclusion in 1987 that “you can see the computer age everywhere but in the productivity statistics²⁸.”

Since the 1980s the “Solow ICT productivity paradox” no longer holds. Later research points to substantial positive productivity effects of investing in ICT in recent decades, particularly when combined with needed product and labour market deregulation and other complementary framework conditions. The expansion of the internet provided the necessary complement for computers to become enablers of transformative business innovation. Ever-faster processors and higher-capacity digital networks, together with digital innovations that include software, sensors, actuators, additive manufacturing and artificial intelligence, have also enhanced the ability of digitalisation to function as an enabler of innovation in the business sector.

These insights inform [EU policy](#) on digitalisation, which also guides EIB lending priorities. With its Digital Compass, the European Commission has set the course towards a digitally empowered Europe, centred on four key objectives to be attained by 2030. One of these specifically targets the digital transformation of the business sector, with the objective that by 2030:

- 75% of European enterprises will have adopted cloud computing services, big data, and AI.
- More than 90% of SMEs will have reached at least a basic level of digital intensity.
- The number of European unicorns will have doubled.

EIB priorities in the area of business sector digitalisation are fully aligned with these and other EU objectives (as outlined in greater detail in the main text). The Bank is, however, obliged to limit its financing to areas where material market failures are identified and which in turn result in underinvestment relative to the social optimum in the absence of policy support. As regards the commercial business sector, the most common (though not the only) such market failure are knowledge externalities. Specifically, innovation (whether based on R&D or other innovation-enabling investments) leads to the formation of new knowledge and know-how which is one of the key drivers of productivity growth. When a private firm undertakes innovation, some of this knowledge “spills over” to the rest of the economy. Spillovers to other firms occur through imitation and reverse engineering by competitors; the transmission of new ideas to suppliers and customers through normal business relationships; or through the movement of skilled labour that channels this knowledge across firms and sectors. Knowledge spillovers thus insert a wedge between the economic rates of return on innovation-enabling investments and those accruing to the investing firm. Private firms as a result invest less than would be economically optimal, which justifies policy intervention (including EIB support) to narrow this investment gap.

The Solow paradox illustrates well the point that it is not ICT investment per se that is associated with market failures justifying EIB intervention, but the productivity-enhancing innovation that these investments enable. Putting new computers on every desk does not drive innovation and productivity gains unless these investments foster new business processes, new market creation, or new or materially improved products and services.

As discussed in greater detail in the main text, the EIB supports digitalisation throughout the innovation value chain, including via the deployment of digital infrastructure; early-stage research and experimental development towards new digital products, processes and services.

An important element of the project appraisal process is thus to identify the presence and scope of innovation and the associated market failures. This is appraised on the same principles as any other innovation-enabling investments, such as R&D, or other key enabling technologies such as advanced manufacturing technology,

²⁸ Robert Solow, "[We'd better watch out](#)", New York Times Book Review, July 12, 1987.

advanced materials, or photonics. For all such investments, it is the innovation and associated knowledge spillovers and other market failures that justify EIB involvement.

The starting point for identifying whether a digitalisation investment entails innovation draws on the guidelines provided in the [OECD's Oslo Manual on Innovation](#). This defines innovation as “a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”.

This summary statement captures very well where digitalisation can also play an innovative role, to either enable

- New or improved products. Or
- New or improved processes.

Other types of innovation-enabling investments can of course also generate these results. What, however, makes digitalisation unique is its “general purpose technology” characteristics, specifically its ability to also enhance many of the other areas that the OECD manual identifies as innovation-enabling:

- R&D activities;
- engineering, design, and other creative work activities;
- marketing and brand equity activities;
- employee training activities;
- innovation management activities.

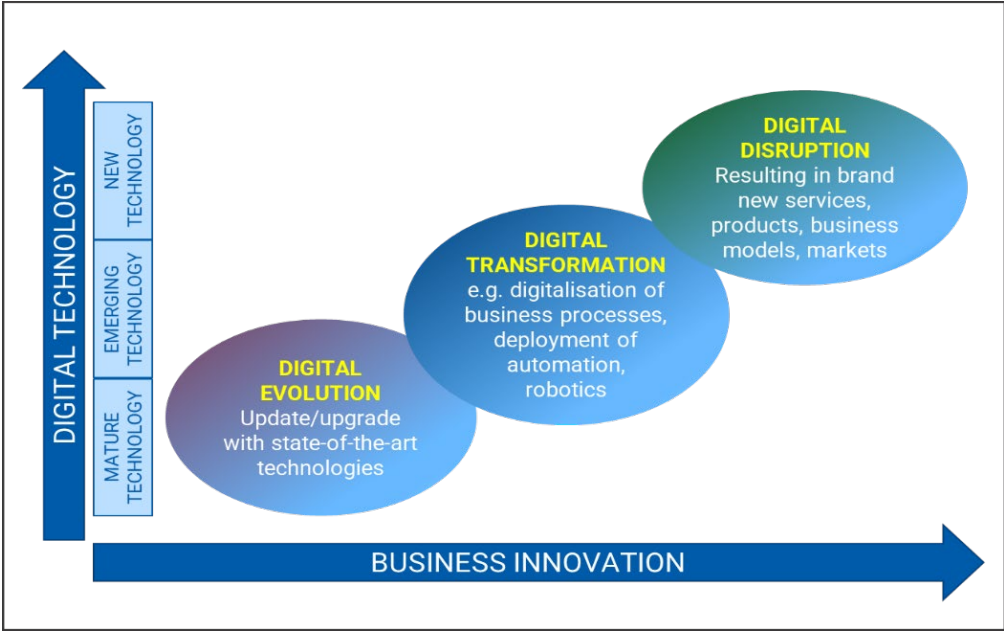
Digitalisation can thus play either a *direct role* in creating new products, services and processes, or *indirectly enable* these activities by enhancing the effectiveness of the other listed activities.

As discussed in Box 2, the EIB is in the process of improving the methodology of defining, measuring and reporting digitalisation activities included in projects primarily reported under different lending objectives. This evolving methodology centres on assessing digitalisation across the two dimensions shown in the figure below, the combined scale of which is closely associated with the size of market failure and hence the justification for EIB financing of the project:

- The maturity of the technology deployed.
- The scope of the business innovation enabled by the investments.

Once the aforementioned innovation criteria are established, the EIB-financed project can include the deployment of ICT hardware and software, personnel costs and necessary complementary costs such as training, data integration and change management. Under specific conditions, buildings directly linked to the digitalisation project can also be included (for instance for the purpose of ICT training).

Building on the innovation criterion, minor changes or improvements, routine upgrades or increases in production or service capabilities based on what is already in place do not constitute eligible expenditure. As a result, with the exception of innovative mid-caps in less developed regions, under this PPG the EIB will not support projects based on mature technologies solely focusing on an update of existing products, processes or business.



Innovation for inclusive Green and Digital Transition



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