ANNEX 4 - CLUSTER 4: DIGITAL, INDUSTRY AND SPACE

1. Global Challenges and their Drivers

Digitisation and technological progress, including Space, shape all sectors of the economy and society. They transform the way industry develops and produces new products and services, as well as the way we live, travel, work and learn, and are central to any sustainable future. To succeed in this transition, research and innovation needs to target global leadership and autonomy in strategic value chains;[85] enable production and consumption to respect the boundaries of our planet; and maximise the benefits for all parts of society in the varied social, economic and territorial contexts in Europe.

Sufficient positive changes on these fronts can only happen by facilitating technological progress and steering digital and industrial transformation. EU industry, including both SMEs and large companies, needs continued EU support for the development and uptake of smart and clean technologies. However, the EU cannot do this alone. Partnership initiatives will help leverage the necessary additional private and public funding and align research and innovation priorities across Europe. There are **three main challenges**:

(i) Although Europe has been a leading player in research and innovation across a number of industrial sectors, this position is more than ever at stake and eroding. Reliance on imported key technologies and raw materials is compromising Europe's autonomy. Europe's industry faces fierce global competition, combined with difficulties in financing high-risk investments in complex technological areas, including digitisation and circularity. It is also hampered by ageing infrastructures, including machinery that is not ready for digitisation and plants not fit for a fully circular and climate neutral industry; and by a lack of scale-up and technology diffusion capacities. Long investment cycles are needed in key EU industries, notably the energy-intensive industries.

Key facts and figures:

- Europe's industry and companies provide a livelihood for millions of Europeans and play a central role in the EU's prosperity, economic leadership, and social cohesion. After a long decline, industry's share of the economy has increased in the last five years and currently contributes around 17.5% of the European Union's GDP (22% including construction) and directly provides work to close to 24% of Europe's (manufacturing including construction)[86].
- While Europe is one of the world largest markets for **digital products and services**, the contribution of European industry and businesses to the worldwide digital supply chain has shrunk gradually over the past 20 years.[87] Most recently (2017-18), EU companies reduced their global R&D share in ICT industries by more than 8%.[88]
- Space technologies, data and services have become indispensable in the daily lives of European citizens: when travelling, using mobile phones and car navigation systems, watching satellite TV, enhancing weather forecasts, improving emergency services and responding to other global challenges. The value generated from **space related activities** is estimated between EUR 46 to 54 billion representing a share of 21% of the worldwide business. In

[85] The Commission unveiled preliminary recommendations of the expert group on strategic value chains, the Strategic Forum for Important Projects of Common European Interest, to prepare coordinated action and investment to strengthen key strategic value chains. For instance, low-carbon Industry and Industrial Internet of Things have their centre of gravity in this cluster. https://ec.europa.eu/growth/content/stronger-and-more-competitive-eu-industry-president-juncker-open-2019-eu-industry-days_en

[86] The contribution of industry for employment and growth is likely to be even higher as these figures do not account for the importance of industry-related services and the trend of servitisation, which are not visible in the sectoral statistics.

[87] *Etude sur l'écosystème électronique: Vue d'ensemble, développements futurs et position de l'Europe dans le Monde*, 2018 DECISION Etudes & Conseil

[88] 2018 EU Industrial R&I Investment Scoreboard http://iri.jrc.ec.europa.eu/scoreboard18.html

addition, the capacity to access and use space is a strategic asset for Europe and its Member States, which impacts many other sectors,[89] and opens up many business opportunities for early-stage and high-tech companies, especially in combination with digital technologies, other sensors and sources of data. The EU must make the most of these opportunities by fully developping and exploiting the potential of European Space Programmes and its components Copernicus, EGNOS and Galileo, SSA and GOVSATCOM. The emergence of 'New Space' since 2010, can be seized to open up new business possibilities in Europe, by enlarging the number of players involved. The potential of the downstream segment of the space sector can be better exploited, in particular Galileo and Copernicus. Such applications can help tackle global challenges, create high-skilled jobs and open up new market opportunities for businesses.

- Research and innovation is recognised as an important source of economic growth and competitiveness, but there is an **urgent need for more investments** in Europe, in particular in industry. Industry accounts for 64% of private sector R&D expenditure and for 49% of innovation expenditure.[90] The R&Dconducted within the business enterprise sector in the EU was equivalent to 1.36 % of the EU-28 GDP in 2017, significantly below the EU's 2% target for the private sector and lower than in South Korea (3.27%), Japan (2.57%), Switzerland (2.39%) and the United States (1.97%).[91] In digital for example research and innovation intensity is about 5% as opposed to 12% in the US and 11% in Japan.[92]
- The EU shows higher shares of research and innovation in medium-tech sectors (circa 40%) as compared to USA and China (circa 20 and 30%), while lower shares of R&D in high-tech sectors are seen with respect to USA and China (circa 75 and 43%). There is a need to integrate horizontal industrial and innovation policies with sector/technology specific ones, to promote the industrial transformation towards the knowledge economy by reinforcing the presence of high-tech sectors, while fostering the modernisation of low- and medium-tech sectors and their capacity to absorb new technologies.
- EU public investment in R&D in digital technologies is 40% less than in the US; and in critical areas, such as Artificial Intelligence (AI), public and private investments in the EU are 4 times less than in the US. China set up a strategy plan[93] to support an AI industry worth 150 b$ including the development of AI chips. This complements the 2025 plan, which strives to secure its position as a global powerhouse in high-tech industries, and focuses heavily on intelligent manufacturing in ten strategic sectors. The strategy seeks to raise the domestic content of core components and materials to 40% by 2020 and 70% by 2025.[94] In Space, the EU governments' investments of EUR 8.2 billion in upstream space programmes are well under half of the NASA budget, and probably under one third of the total US space budget. . If we consider that investment in Space systems has a well-tested multiplier effect that trickles down 3-4 times into the economy, we identify a source of the US advantage in other high-tech sectors.
- SMEs tend to implement new technologies at slower rates than larger companies. For instance, 36% of companies with 50-249 employees use industrial robots, compared to 74% of companies with over 1000 employees. Only a fifth of EU companies are highly digitised.

(ii) Europe's industry can adapt to planetary boundaries, through a transformation that will allow it to cope with a scarcity of resources, including energy; and to reduce its large share of

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[89] Space-based services provide immediate information in support of numerous Union policies and industry sectors; it is calculated for example that more than 10% of EU GDP is enabled by GNSS.

[90] Re-finding Industry. Report of the independent HLG on Industrial Technologies, 2018.

[91] Non-EU28 countries figures are from 2015. EUROSTAT database

[92] 2012 PREDICT REPORT
http://is.jrc.ec.europa.eu/pages/ISG/documents/OnlineversionFINALPredict2012withnumbersv2.pdf

[93] New Generation of Artificial Intelligence Development Plan

[94] Made in China (MIC) 2025

greenhouse gas emissions, pollution and waste, as well as harness the opportunities emerging from this transition.

An accelarating global resource consumption has increased environmental pressures beyond sustainable levels. As a major user of natural resources, industry needs to reduce its carbon and materials footprint in order to ensure sustainability in the circular economy and to reach Paris Agreement targets. New technologies should notably reduce energy consumption and be part of a circular economy value chain which will contribute to Europe's competitiveness in a context of increased sustainability standards.

Key facts and figures:

- Industry is the third biggest contributor to greenhouse gas emissions. The latest increase of CO2 emissions is of particular concern, considering the efforts needed to comply with the Paris Agreement and a climate-neutral economy by 2050. Hence an overhaul of business models as well as disruptive technologies are needed.[95] [96]
- The global energy consumption by industry grew by an average of 1.3% each year between 2010 and 2016. In the EU28, between 2005 and 2016, final energy consumption decreased by 7.1% (0.7% annually) in all sectors, particularly in industry (16,4 %).[97]
- According to the International Energy Agency (IEA),[98] global industrial emissions in 2016 amounted to 8.3 GtCO2, or 24% of global emissions. Amongst the EU sectors, steel, cement and chemicals dominate industrial emissions. In a "business as usual" baseline scenario, EU emissions from these three sectors could amount to 546 MtCO2 per year by mid-century. Asprocess emissions account for a significant share of the emissions in these and other energy intensive industries, reshaping of whole process chains will be necessary. To achieve climate-neutrality in 2050, significantly larger investments in deep decarbonisation technologies are needed. These investments are estimated to be around an additional EUR 5.5 billion per year for the above mentioned sectors, an 88% increase compared to the baseline scenario.[99]
- The rapid expansion of the digital sector has environmental consequences, including considerable increases in the extraction of critical raw materials, in energy consumption (e.g. from digital infrastructure and other auxiliary equipment), as well as in Green House Gas emissions (4% of global annual increase[100]).

(iii) Developments in industry and in enabling technologies have the potential to enhance **social inclusion**; at the same time, there is a growing risk of digital divides. Workers, regions and societies are faced with extremely fast transformations, including the impact of digitisation and climate change.

The challenges in Europe are the rapid adoption of new technologies and their impact on the labour market and the nature of work; skills mismatches and increasing wealth concentration. Other **concerns regarding new technologies** include trust and ethical considerations. All the new approaches must engage citizens, workers and consumers, focusing on training and familiarity with technology. This is also necessary to make the new climate-neutral and circular economy approaches and products work.

Key facts and figures:

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[95] A Clean Planet for All, COM(2018)773 final

[96] The Club of Rome Climate Emergency Plan, December 2018, https://www.clubofrome.org/2018/12/03/the-club-of-rome-launches-the-first-climate-emergency-plan/, "…global carbon emissions must be cut by half by 2030, to zero by 2050. This is an unprecedented task, requiring a reduction rate of at least 7% annually; no country has to date achieved more than 1.5%."

[97] European Environment Agency database.

[98] https://www.iea.org/tcep/industry/

[99] Industrial Transformation 2050, Pathways to Net-Zero Emissions from EU Heavy Industry, Material Economics and ECF, 2019

[100] https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf

- There are substantial variations in the level of economic activity and labour market performance across Europe, including technological specialisation and research and innovation investment. Long-term economic and industrial decline, low levels of education and a lack of local employment opportunities emerge as key drivers of the anti-EU vote.[101]
- Evidence indicates a considerable accumulation of wealth by a small segment of society, as others face increasing hardship and a widening inequality gap. The Commission's Ethics Group warns that new forms of work bring unparalleled flexibility but also precariousness; and exposes the limitations of existing social models to guarantee decent livelihoods for many Europeans.[102]
- Due to the deployment of new technologies and automation, there is an increase in the number of high-skilled jobs. However, around 20% of European workers judged their current ICT skills insufficient. The highest skill mismatches are in occupations related to ICT, manufacturing and construction. A third of the EU labour force has an insufficient level in digital skills.[103] The lack of skilled individuals and talents risks slowing down investments. For instance, 9 out of 10 manufacturers are struggling to find the skilled workers they need. Similarly, more than half of companies looking for ICT specialists report difficulties in recruiting them. Hence, there is a need to reform the current educational system, and better anticipate and develop skills to equip the labour force with appropriate skillsets.
- New technologies such as digitisation and automation will reshape economies and societies in all the regions and will have differentiated impacts across the regions and also across the regions within one nation in Europe and globally.[104]

2. EU Policy Objectives

Against this background, the overarching vision behind the proposed investments is **a European industry with global leadership in key areas, fully respecting planetary boundaries, and resonant with societal needs** – in line with the renewed EU Industrial Policy Strategy.[105] Three objectives will be pursued across the cluster, in synergy with other EU instruments and initiatives:

Ensuring the **competitive edge and sovereignty of EU industry**: Key enabling technologies, including digital ones, and new services offered by digital and space technologies, will help revolutionise both industry and society and reinforce Europe's global industrial leadership. Developing and mastering these technologies will give EU industries the competitive edge they need for leadership in global markets; and promise innovation and market breakthroughs to achieve a circular, resource efficient and climate-neutral EU economy.
In a globalised world of heightened uncertainties and volatile geopolitical interests, it is essential to secure and assert European autonomy in a number of strategic technology areas and value chains, while continuing cooperation and exchanges with third countries.

To be less dependent, the EU must tackle missing segments in key strategic value chains. To begin with, it must ensure a secure, sustainable, responsibly-sourced supply of raw materials and increased autonomy in critical raw materials, maximising the value of its resources and materials. Examples are batteries, low-carbon industry, space critical components, smart connectivity platforms and microelectronics.

Another vital component of the EU's competitive edge is its technological sovereignty, to safeguard security of supply and European industry's ability to export its products as part of a global value chain. This is the case of digital technologies for instance, where fast development is creating new dependencies and vulnerabilities across the economy and society (e.g. cyberattacks, espionage,

[101] The Geography of EU Discontent
[102] Future of Work, Future of Society - European Group of Ethics in Science and New Technologies, December 2018
[103] Digital Economy and Society Index, https://ec.europa.eu/digital-single-market/en/desi
[104] OECD Regional Outlook 2019 - Leveraging Megatrends for Cities and Rural Areas, http://www.oecd.org/regional/oecd-regional-outlook-2019-9789264312838-en.htm
[105] Investing in a smart, innovative and sustainable Industry A renewed EU Industrial Policy Strategy, COM(2017)479.

hacking/sabotage, intellectual property theft, electoral interference) and leads to the emergence of new threats to strategic autonomy. For the EU Space industry for instance, non-dependence is key for a number of components used for satellites, space traffic management capabilities and launchers In addition, research supported by Cluster 3 on cybersecurity can ensure opportunities offered by emerging technologies are harnessed, while at the same time preventing the malicious use of such same technologies. Leveraging EU-controlled technologies (such as Gallileo) could also strengthen European industry's competitive advantage and society's resilience in safeguarding critical infrastructures.

To maximise impact, we must ensure that all European enterprises including small-and medium-sized enterprises and start-ups, have access to the technologies and data they need, by promoting an **ecosystem of technology infrastructures**, catering for industry, including SMEs and start-ups; and by establishing a European data ecosystem, in conjunction with the Digital Europe Programme.

A further factor for success is to combine the applied research with research in less mature and emerging technologies, through open research with a longer-term purpose.

Fostering **climate-neutral, circular and clean** industry: The pressing need to tackle a number of sustainability challenges, notably climate change, creates opportunities for developing new technologies allowing industry to reduce energy consumption, decarbonise production processes, protect the environment and enable a circular economy. Europe should take the lead in this approach.

The breakthrough technologies and solutions[106] to be developed in this cluster will, in conjunction with new business models, contribute to bring about climate-neutral and globally competitive EU industries by 2050, thereby delivering on theLong-term strategy, calling for a climate-neutral Europe by 2050;[107] and foster a circular economy.[108] Future factories will be climate-neutral, resource-efficient and fully integrated in the circular economy. The climate-neutral and circularity ambitions will reinforce one another.

Earth observation from space (i.e. Copernicus), combined with advances in computing, analytics and artificial intelligence, will bring invaluable information on the climate of our planet and its environment that will guide the development of mitigation measures.

A **major contribution to inclusiveness**: From the outset we must involve and empower workers, consumers and firms to make sure that they co-design, have access to, and take up, these technologies (reflecting age, gender and other diversity issues where appropriate). *In conjunction with other programmes and initiatives*, there must be adequate support for the development of skills, the involvement of the young (for example through living labs or learning factories), and the development of regions, cities and rural areas – ensuring a socially fair transition not leaving anyone behind. We must also pay due regard to safety, and to the impact of technologies and industrial transformation on people and societies, including changes in behaviour needed for sustainability.

A key aspect of the EU approach to technology development will be a **human-centred approach**, going hand in hand with European social and ethical values, social inclusiveness, and the creation of sustainable, high-quality jobs including through social innovation. For example in Artificial Intelligence developments will follow the key requirements[109] for trustworthy AI identified by the High-Level Experts Group established by the Commission.

[106] including low-power processors and computing architectures

[107] A Clean Planet for all – A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, COM(2018)773

[108] Closing the loop - An EU action plan for the Circular Economy, COM(2015)614

[109] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Building Trust in Human Centric Artificial Intelligence (COM(2019)168)

The interaction of science, technology, social sciences and humanities will be important in this respect, as will be the input of the creative sector and artists to sustainable inclusive innovation and to human-oriented technologies.[110]

Beyond this cluster, the other clusters will also develop and apply key enabling and emerging technologies, as part of a common strategy to promote the EU's industrial and social leadership.

3. Targeted impacts

In line with the priority of the Commission of **a Europe fit for the Digital Age**, EU sovereignty will be pursued within key strategic value chains,[111] by supporting digital, other key enabling and space technologies. This includes leadership in advanced materials, human-centric artificial intelligence,[112] block chain, high-performance / quantum computing, algorithms and tools supporting data sharing and data usage, and space technologies. Examples of key targeted impacts supporting this priority include:

- **Digitising and transforming industry**;
- **Increased sovereignty** in **key enabling technologies and digital technologies**, in strategic value chains, and a **secure and sustainable supply of raw materials**;
- **A European approach**, involving a human-centred and ethical development and use of new technologies;
- **Industrial leadership** in **key enabling, digital and space technologies and uptake of new technologies, and space services and data,** through technology infrastructures and increased autonomy in strategic value chains.

In line with the priority of the Commission of **a European Green Deal**, and with the strong support expressed by stakeholders in the public consultation (over 80%), EU industries will become climate-neutral, circular and clean. This can be done by, for instance, by developing the necessary breakthrough technologies and solutions for zero-emission and zero-waste factories, with plants in several regions contributing to the fight against climate change and the protection of the environment. The cluster will enhance Europe's position as a world leader in climate-neutral industry, the circular economy and clean technologies. Examples of key targeted impacts supporting this priority include:

- Achieving increased autonomy in **critical raw materials**, through substitution, resource efficiency and recycling and primary production;
- **Greening ICT**, for instance by developing low energy consumption components and combination of approaches, to enhance the efficiency of computing by several orders of magnitude;
- **Space services** will also contribute to climate mitigation and environmental protection, mobility and security.

In line with the priority of the Commission of **an economy that works for people**, industry will be providing one out of four jobs, having set the transition to climate-neutrality before 2050 on a solid ground. Input from the activities under this Cluster will inform up-skilling training programmes, and lead to attractive and creative jobs across Europe, while maintaining a two-way engagement with society with regard to developing technologies. One example of a key targeted impact supporting this priority is:

- **Increased inclusiveness**, by helping industry provide **attractive and creative jobs in Europe**; making a two-way engagement in the development of technologies a reality;

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[110] www.STARTS.eu

[111] https://ec.europa.eu/growth/content/stronger-and-more-competitive-eu-industry-president-juncker-open-2019-eu-industry-days_en

[112] https://ec.europa.eu/growth/content/stronger-and-more-competitive-eu-industry-president-juncker-open-2019-eu-industry-days_en

developing human-centred approaches; promoting social innovation; and helping foster skills and empower the young in, for instance, the digital and advanced manufacturing areas.

In line with the priority of the Commission of **a stronger Europe in the world**, and with the strong support expressed by stakeholders in the public consultation (over 60%), the cluster will pursue increased autonomy in critical raw materials through substitution, efficiency and recycling and primary production; and world-leading European technologies for climate neutrality and circularity.

The research and innovation priorities that follow are associated with more specific impacts, while they all contribute in different ways to the three main policy objectives, as shown in the table below.

Key research and innovation orientations of Cluster 4	**Policy objectives**		
	Competitiveness and Autonomy	**Climate-neutral, Circular and Clean Industry**	**Inclusiveness**
1 Manufacturing Technologies	ALL PRIORITIES	Enabling circular and locally manufactured products	Skills, SME inclusion, localised manufacturing
2 Key Digital Technologies		Enabling sustainability in various applications	Skills, SME inclusion
3 Advanced Materials		Enabling sustainability in various applications	Skills, SME inclusion, Societal engagement
4 Emerging Enabling Technologies		Enabling sustainability in various applications	Societal engagement
5 Artificial Intelligence and Robotics		Enabling sustainability in various applications	Skills, Ethics, Societal engagement, SME inclusion
6 Next Generation Internet		Enabling sustainability in various applications	Skills, Societal engagement, SME inclusion
7 Advanced Computing and Big Data		Enabling sustainability in various applications	Skills, Societal engagement, SME inclusion
8 A globally competitive Space sector		Enabling sustainability in various applications	Skills, SME inclusion
9 Circular Industries		Circular Economy	Skills, SME inclusion

10 Low-carbon and Clean Industries		Carbon neutrality and clean environment	Skills, SME inclusion
11 New services from Space for the EU society and economy		Enabling sustainability in various applications and long term sustainability of the access to space	Skills, SME inclusion

4. Key Research and Innovation Orientations

Key research and innovation Priorities are grouped in two general categories: (I) Enabling technologies ensuring European leadership and autonomy; and (II) Accelerating economic and societal transitions (these will be complemented by priorities of other clusters).

I. Enabling technologies ensuring European leadership and autonomy

4.1 Manufacturing Technologies

Innovative manufacturing technologies will contribute to sustainable prosperity for all and reinforced strategic advantages in terms of increased productivity, enhanced job quality and reduced environmental footprints. They are also directly relevant for activities in clusters related to health, energy and mobility. Priorities include:

- Expanding the creation of new, value-added job creation through technology-driven innovations in design, engineering, logistics and end-of-life management; innovative business approaches, such as customisation and product-service systems; and applications of emerging technologies such as AI and human-robot collaboration that provide the basis for improving the quality of jobs.
- Strengthening and creating value chains based on digital industrial platforms, benefitting the production sectors from automotive and aerospace to health and food processing.
- Capitalising on the digital transformation to raise productivity and realise shorter innovation cycles, new business models, urban and distributed manufacturing, higher quality products and enhanced workplace skill-sets.
- More circular economy, with products reused in new value chains through "zero-waste" manufacturing, de- and re-manufacturing, including smart recycling, re-use of raw materials, repair and refurbishment.
- Developing bio-integrated manufacturing through the combination of disciplines including fundamental research in biology, medicine, engineering, machine learning and manufacturing and processes such as biomachining, biomimetics, biomechanics, and bio-inspired digital manufacturing.
- Enabling a "new way to build", for construction with lower environmental footprint, through modularisation, digital technologies, circularity and advanced materials, as well as standards and safety.

These investments should turn manufacturing into a human-centred, highly flexible and sustainable enterprise, providing attractive jobs, including in cities and in peri-urban and rural areas; supporting leadership in strategic value chains; and offering new products for new markets.

The Made in Europe co-programmed partnership could bring a concerted, broadly based, human-centric approach to these activities.

4.2 Key Digital Technologies

The opportunities from digitisation are immense and are driven by advances in technology, applications and services around a set of main tracks. The EU's current strong industrial value chains (e.g. automotive, aerospace, machinery and agri-food) are increasingly dependent for their

competitiveness and autonomy on access to cutting-edge key digital technologies. Mastering their development and integration in complex smart systems is vital to a sustainable, sovereign and competitive Europe.

At the heart of digital transformation is the continuous progress in key underlying electronics and photonics components and systems, software technologies and connectivity platforms. Further scaling in mainstream nanoelectronics raises physical and economic challenges, but progress in digital components and devices continues through disruptive innovations, thanks to new materials (such as graphene, flexible substrates), low-power electronics and alternative processing concepts, like neuromorphic, that map cognitive processes into electronic circuits, quantum information processing and open-source hardware. These innovative approaches unfold a new era of digital applications providing unprecedented levels of computing power, trust and security, as well as high precision sensing and low energy consumption.

Technologies supporting the concept of distributed intelligence will be essential to guarantee the required levels of energy efficiency, real-time operations and security. This includes advances on multisensor-based systems providing high levels of smartness and integrated in a wide range of application contexts (body, home, automotive etc.).

These developments will provide the basis for new computing and programming concepts such as edge computing, and for advances in modelling and simulation (e.g. digital twins). They are bringing the benefits of digital innovations, notably through Artificial Intelligence and big data analytics, to all types of products and services from connected and autonomous vehicles to health equipment, novel materials and drugs, and smart energy systems.

There are opportunities ahead for European players in innovative computing (neuromorphic or quantum) as well as in sensing (miniaturisation of photonic sensing with electronics co-integrated). For both future technologies photonic and electronic hardware play a significant role. Another aspect is the acquisition and aggregation of physical data for further processing with AI methods (e.g. used for machine vision in production processes). Therefore, stronger integration of software with electronic and photonic hardware in innovative computing architectures and their packaging into smart miniaturised multi-sensing systems should be addressed as priorities.

Emphasis will be put on trusted electronic components and systems. Embedded security, reliability and usability, as well as easier programmability, throughout products and services life-cycles, will contribute to citizens' confidence in digital technologies.

The development of low-energy computation solutions will also significantly contribute to higher levels of sustainability, while the increased use of photonics (light based technologies) will open up new possibilities for end user industry to innovate in new products and services.

Europe can capitalise on its recognised strengths in reliable cyber-physical systems, in embedded and stand-alone software and complex systems to seize the wide range of opportunities ahead.

4.3 Advanced Materials

New material development has historically been closely linked to significant industrial and societal advances and remains a key technology for responding to virtually every global challenge. Material science and technology will also be essential to the "European Green Deal", and in particular its challenges of climate neutrality, transition to a circular economy, and a zero pollution Europe".

Europe should aim to develop advanced and sustainable materials, designed to meet specific needs (societal or industrial) so that they benefit the widest possible community of users. These materials shall be safe, sustainable and competitive within the circular economy and respect regulatory standards.

To reach climate neutrality in Europe, it is necessary to promote disruptive materials science that provides solutions at the industrial scale, e.g. in the form of catalytic systems that will overcome challenges in current renewable energy systems (generation, conversion and storage). Such new production concepts will combine high efficiency with changing and more variable feedstock (CO_2 and waste) and as such will support the decarbonisation of energy and the material needs of EU industries.

Energy efficiency is also a contributor to climate neutrality and therefore lightweight, functional and smart materials are of importance. In addition, materials that are able to mimic biological functions will be desirable for a wide range of commercial product applications.

Developing new sustainable materials will further reduce Europe's dependency on critical raw materials, and research and innovation on the circularity of materials and recycling systems will contribute to achieve this goal.

The development of advanced materials for innovative medical products and devices directly contributes to the well-being of European citizens. In addition, advanced materials will provide solutions for challenges related to health, fire performance and sustainability of building materials contributing to the safety of Europe's citizens.

Product design and development will benefit from the involvement of creative professionals, curators, restorers etc. who support an "innovative materials by design" approach, and which will be an efficient way to answer the growing consumer demand for innovative products combining functionality with aesthetics, as well as the need to protecting artefacts of cultural heritage.

The materials development cycle is long and entails several steps such as characterisation, modelling, processing, upscaling and engineering, including a lengthy assessment in industrial environments. To enable uptake by industry, especially SMEs and start-ups, there is a need for an innovation ecosystem of materials technology infrastructures, including open innovation testbeds and pilot lines. These will cover all relevant enablers and services needed for innovation based on new materials, including risk assessment. They will reduce the technological risk associated with the development of innovative materials and products, thus attracting more investors, and cutting the time to market.

A coherent approach to risk assessment and life-cycle methodologies will ensure the development and monitoring of a cradle-to-cradle approach, and will also further support the principle of the European eco-label. Advanced sustainable materials will also need to be taken up in industrial value chains.

Regulation, corresponding testing methodologies and risk assessment standards must be improved and updated to keep pace with innovation as well as conform to the circular economy.

These investments should lead to multifunctional and safe new materials embedded in strategic value chains, radically reducing environmental footprint, and moving towards a new economic cycle, characterised by a seamless integration of materials science which will enhance the competitiveness of European industries.

4.4 Emerging Enabling Technologies

Fascinating technologies that we could not imagine even a few years ago hold the potential to revolutionise the way in which we live and work. New enabling technologies will be needed as current ones become obsolete or clash with planetary boundaries. By exploring the potential of such technologies at an early stage, Europe can secure leadership in key enabling technologies of the future.

The objective of these activities will be to facilitate the early development (at low TRLs) of a limited number of new enabling technologies and feed the innovation pipeline. This will be done by scouting for transformative research themes, building also on the results of Pillars I and III; by exploring their potential for society, the environment and industry and be driven by the relevant SDGs. This purpose-driven exploration will not target specific applications but will focus on the possible effect on the three broad objectives described above.

Success depends on the combination of disciplines, from fundamental research in natural sciences to engineering, manufacturing and computer learning. Furthermore, radically new ideas sometimes emerge through interaction of creative people from very different background, including the civil society. This research and innovation priority will facilitate and stimulate these interactions by providing opportunities to meet, mutually inspire, cooperate and develop together innovative ideas. Social sciences and humanities will also play a role in envisaging the transformation pathways.

Examples of technologies include:

Future and emerging materials by design: A wide range of global challenges call for new materials by design, which are functional, safe, recyclable and sustainable (e.g. new plastics and polymers, catalysts, coatings and membranes). This entails a merging of new characterisation methodologies with modelling, to facilitate the use of artificial intelligence for the efficient design of new materials.

Enhanced information-based technologies inspired by the laws of nature and biology: an improved fundamental knowledge of how living beings function will enable new applications of biotechnology supporting sustainability.

The convergence of the "digital" and the "physical" and entirely new forms of digital technologies, like computational modelling of processes such as metabolisms, or the dynamics of cell differentiation. They will bring long-term benefits for citizens while transforming industrial processes for a circular and sustainable economy (e.g. progression of neuro-degenerative diseases, the chemistry of photosynthesis, climate change and environmental impacts, or the dynamics of social behaviour).

These activities will not only finance collaborative research and innovation projects, but also create fora for networking creative people from different backgrounds to inspire innovative ideas, including with citizens. They will also help stakeholders to navigate rapidly changing environments, for instance by actively transferring ideas and technologies between players that would not normally interact, or by combinations of different foresight activities (short-term, long-term, sectorial) to prioritise strategic directions while avoiding narrow visions for the future.

These activities are complementary to Pillar III activities under the EIC. The focus in this cluster is on renewal and transformative potential for business and industry sectors addressed by this cluster; and on fostering new ecosystems of innovation and new value chains. The activities will combine in an agile way the heavy long-term investment on industry-driven priorities with the exploration of new and potentially disruptive technologies.

4.5 Artificial Intelligence and Robotics

Driven by increased computing power, the availability of large amounts of data (the essential raw material for innovation, competiveness and growth) and progress in algorithms, smart devices and smart robots, Artificial Intelligence (AI) is shaping up as one of the most strategic technologies of the 21st century. The way we approach AI will define the world we live in.

Amid fierce global competition, a collective and decisive EU Research and Innovation agenda for AI will be instrumental in bringing its benefits to all our citizens and businesses whilst ensuring high ethical standards and inclusive approach.[113] Europe should strive for a technology leadership position in AI. The EU must also promote the adoption of principles and global standards, as well as actively participate in their development, e.g. through standardisation bodies, which will ensure an ethical approach to the development and use of technologies at both EU and international level.

The objective is to ensure that all citizens will experience the advantages of AI in daily life, such as traffic optimization and autonomous driving to reduce citizens everyday stress and drastically reduce the number of road accidents, to truly intuitive AI-based systems adapting to human needs, to support them in specific tasks, improving their working conditions, and making the technology easy to use by all, even the non-experts in AI. Also society as a whole will benefit from AI-based solutions to optimise the lifecycle of resources (energy, food, etc.), and make it more environmentally and economically sustainable, from production to distribution and use. Medical doctors will be able to ask for the support of powerful data-intensive machine learning to assist their diagnostic and therapy decisions. Firefighters will get the support of robots to approach hazardous intervention zones. Overall, progress in AI and robotics should be fully exploited to continue supporting European industrial competitiveness; and to bring all its potential benefits to the other clusters, to address global challenges, with direct impacts in sectors such as healthcare, agriculture, manufacturing, energy, transport. Its potential for the reduction of environmental footprints should also be fully exploited.

The introduction of AI and autonomous behaviour in complex, safety- and time-critical systems, such as those used in large transport networks, avionics, health or industrial applications, is a technological challenge but also a significant business opportunity for which Europe has a competitive advantage. Europe also needs to deploy a human-centric, ethical and trustworthy AI, which will be crucial for its acceptance, and a trademark for AI developed in Europe.

[113] Communication 'Artificial Intelligence for Europe' & Coordinated Plan on Artificial Intelligence (COM(2018) 795 final)

The challenges in AI and Robotics (embodied AI, which is one of European strength in AI) include foundational research improving hardware (chips for AI, but also mechatronics, and advanced sensing and actuation for safer, faster, more precise, and more energy efficient robots), algorithms, achieving explainable AI (transparent decision making), adaptive learning, and improving smart, collaborative, safe and efficient robots and autonomous systems. Adaptation to user-requirements to produce user-friendly, robust and effective solutions for their application domains, will also play an important role in acceptance of the technology. Applied research is also needed to advance and demonstrate technological progress, meeting the requirements of applications/sectors needs, but also important to drive longer-term research in identifying new scientific/technological challenges. Common AI platforms, sharing tools and resources for research and innovation in AI, and reinforced collaboration among researchers are expected to combat fragmentation and foster progress more efficiently, strengthening European's position. The support to excellence centres and their networking will structure the community, foster scientific excellence and make Europe attractive for the best scientists in AI. Synergies with Digital Innovation Hubs in robotics and AI will support applied research and help disseminate these technologies.

These investments should lead to significant European advances in AI, characterised by increased societal engagement, human-centred and ethical approaches, fostering acceptance with multidisciplinary approaches and awareness raising through dissemination activities.

4.6 Next Generation Internet

The Internet has become the critical infrastructure for Europe as many social and economic activities depend on it.

The Internet of today has significant limitations. The risk of breaches of security or privacy, lack of accessibility for users with disabilities, lack of user control of their data, and manipulation or disinformation are some of the major challenges to be tackled. Furthermore, the internet economy is vulnerable to concentration of market positions from devices to networks. Concentration in few powerful providers generates potential threats of user lock-in and consumer harm.

Europe has no choice but to invest further in research and innovation to be a leading force in shaping the internet technological and market development in full respect of people's fundamental needs, including trust, security and inclusion.

The next generation Internet (NGI) initiative aims to develop the key technologies and the infrastructures for the Internet of tomorrow. It will develop a human-centric trustworthy internet enabling full connectivity and accessibility, transparent recommendations and collective intelligence (involving people, processes, data, content and things) and promoting core European values.

NGI aims at supporting a competitive European Internet value chain, which can meet the future industrial and societal needs establishing Smart Networks and Services (including Internet of Things and edge computing infrastructures) and Content platforms. The initiative addresses the innovative vertical applications supported by such platforms including through large-scale pilots. It also fosters the use of artificial intelligence along a continuum of novel data infrastructures and services, from cognitive clouds to edge applications.

NGI builds on a comprehensive strategy including a technology push and an application/ market/ end-user pull, and composed of technological layers with different time to market cycles. It relies on an agile eco-system of top European innovators who develop trustworthy internet technologies, including open source components and Universal Design.

Interactive Technologies, including immersive technologies and language technologies, combined with AI, for example in virtual agents or accessibility automation tools, will support the human centric aspects of the Next Generation Internet and allow for a more inclusive, user-oriented/driven and innovative use of computers, machines and the Internet, bringing opportunities in many industrial and societal sectors, helping tackle sustainability challenges and ensuring that benefits of research and innovation are reaped equally by all members of society.

Distributed ledger technologies, being cross-cutting enabling technologies which support efficiency and trust in organising workflows, validation of transactions and operating autonomous systems, can enable the development of EU data spaces while empowering citizens, public services and businesses to control and share access to data.

4.7 Advanced Computing and Big Data

Today, Europe critically depends on foreign supercomputing technologies that are essential for scientific and industrial innovation; and its supercomputing supply industry provides only around 5% of supercomputing resources worldwide, whereas Europe consumes around 30% of these resources.

As transistor-based computers are reaching physical limits, the next generation of computing capabilities will be developed based on disruptive concepts, technologies and paradigms, keeping in mind environmental standards (e.g. 'Green ICT').

Europe has to be in the forefront of inventing the next generation low power processors and accelerators, integrate them in novel computing architectures and hybrid/modular systems to address future general purpose and/or specific applications.

Examples include research and innovation into novel neuromorphic architectures, quantum computing components, 3D and interposer/chiplet computing architectures, aiming to deliver the significant improvements of computational capability, performance and energy efficiencies required.

Combined with those advances, research and innovation will be also required for co-designing software, algorithms, programming models, simulations and tools for their integration in novel computing systems. These could be used for supporting the development of large-scale and industry-led pilot applications targeting key industry sectors, but also for public services like weather forecasting and climate modelling.

Further research and innovation efforts will also be required for advancing the state-of-the-art of extreme performance data analytics and prediction methods that enable the processing of Big Data - increasing volumes and streams of data that arrive from numerous sources at rates that are growing too fast for traditional computing methods.

While the abundance of data is a core element for computing complex problems and solutions, it may conversely create problems, in particular as regards the protection of personal and sensitive data (e.g. commercial data, trade secrets, health data etc.) that need to be protected by privacy-preserving technologies respecting the rights of data subjects and content creators.

In the same vein, some complex problems can only be computed and solved with a sufficient critical mass of data that may only exist in isolated silos that need to be connected. To ensure that diverse data from different sectors and of different types can be seamlessly combined and exploited across sectorial and national borders, methodologies and tools are needed to ensure interoperability and to keep track of the provenance, quality and completeness of data sets. Federation of data, especially while processing sensitive categories of data, such as health data, can contribute to overcoming some of the challenges, thus contributing to the creation of a European Health Data Space.

Furthermore, sustainability issues posed by digital technologies should be addressed through large scale research and innovation activities aiming to reduce the carbon footprint and substantially improve the energy efficiency of ICT processes and technologies, covering hardware, software, sensors, networks, storage and data centers; and to provide metrics and methodologies to measure in a standardised way the carbon footprint and energy efficiency of data processing and transmission chains.

These investments should allow Europe to rely on its own high-performance computing technologies.

4.8 A globally competitive space sector reinforcing EU sovereignty

Research and innovation actions will foster the competitiveness of space systems in particular for ultra-high throughput telecommunication, support the integration of satellites in 5G networks, advanced navigation signals and high-resolution earth observation, supporting in particular the EU space programme components. Digital and automated industrial processes will enable seamless manufacturing for the production of cost effective space systems including constellations. In the mid to long term, the future space ecosystem should include hybrid, smart and reconfigurable satellites, which can be assembled and serviced directly on-orbit, with a de-orbiting capacity.

EU autonomy in accessing and using space will be reinforced with new concepts for reducing the production and operation cost such as reusability of launcher components, low cost, high thrust and green propulsion, micro launchers, new types of payloads and space routes. Opportunities for

in-orbit validation ("IOV") and in-orbit demonstration ("IOD") will contribute to de-risk new technologies, concepts and applications. These will be operating from modern and flexible launch facilities. In the other hand the development of new space increases the risk of collision between satellites and debris and requires to develop new technologies enabling the development of space traffic management.

EU-funded research will also contribute to critical technologies, space science and missions and outreach and education activities. Development of downstream applications and synergies with non-space sectors, including with advanced enabling technologies such as manufacturing technologies, digital technologies, advanced materials, AI and Robotics, advanced Computing and Big data, will be promoted

The role of quantum technologies in space infrastructure and for space-based services will become more and more important, especially in terms of security, efficiency and reliability and shall therefore be further explored.

These investments should lead to globally flexible, reconfigurable and competitive space systems and services, which can be tailored to evolving customer needs. This will provide the EU space sector with a global competitive edge, contribute to space industry modernisation and foster the development of 'New Space' business eco-systems. This will also contribute to the EU Space Strategy, provide the necessary research and innovation to support the EU's Space Programme, enhance the autonomy of the sector and secure space-related data and services, as well as support the overall effort of the European Union in tackling global challenge through long term programming with measurable objectives and leading to ambitious demonstrations including through co-funded actions where appropriate.

II. Accelerating economic and societal transitions

4.9 Circular Industries

In a circular economy, the value of products, materials and resources is maintained for as long as possible and waste is minimised. The EU Circular Economy Action Plan[114] includes a wide range of initiatives for a sustainable, low-carbon, resource efficient and competitive economy. It also relies on research and innovation through the entire life-cycle to prevent new and larger waste streams and to tackle scarcity of resources, and price volatility. Also needed are solutions to increase material efficiency and recover the economic value of waste streams, while radically decreasing their environmental footprint. Priorities include:

- Design of circularity enabled products, implementation of circular supply chains and systematic cradle-to-cradle life cycle assessment both for new and existing products;
- Product life extension through predictive maintenance, repair, re-use, and refurbishment leading to value loops at European scale;
- Advanced solutions and conditions for the sustainable exploration, extraction and processing of raw materials; and also their substitution, recycling and recovery in industrial symbiosis settings;
- New automated technologies to sort, dismantle and remanufacture or recycle products; and efficient processes to handle mixed waste sources;
- Digital and industrial technologies like robotics, artificial intelligence, and digital platforms for energy-intensive industries leading e.g. to fully fledged cognitive plants

Circular approaches need to be systemic, connecting people, products and systems. The focus will be on sectors, products and materials that have the highest impacts and the greatest potential for enhanced circularity.

These investments should reinforce European autonomy, through access to a secure, sustainable, responsibly-sourced and affordable supply of raw materials, in particular critical raw materials (through substitution, resource efficiency, better recycling and a clean primary production) reduce the dependence on overseas handling and processing of municipal and industrial waste.

[114] COM(2015)0614

4.10 Low-carbon and Clean Industries

Energy-intensive industries have a central role in the EU's industrial value chains and the low-CO_2 Emissions industry has been identified as a strategic value chain[115]. Heavily reliant on energy and non-energy raw materials, they will need to supply products with zero net emissions for downstream manufacturing. Deep decarbonisation calls for breakthrough technologies in all major emitting industrial sectors, in terms of: the underlying production processes (e.g. for steel, cement and chemicals); substitutes for carbon-intensive products; and decarbonised energy and feedstock.

By 2030, Europe's regions should benefit from entirely new types of industrial plants producing sustainably with zero greenhouses gas and polluting emissions and zero waste while being globally competitive.

The required technologies include process and heat electrification, switch to decarbonised energy and feedstock, usage of hydrogen, CO2 capture and usage, catalysis and artificial photosynthesis, waste heat recovery, and materials for re-use and recycling, all of which need to be developed and demonstrated in industrially relevant or operational environments before the first market deployment in the EU. For a broad market diffusion in the medium and long-term, appropriate economic framework conditions allowing companies to deploy these technologies in an economically viable manner need to be created.

Industries will need to coordinate innovations and investments in clean energy systems, with a much higher share of renewables, far beyond what is already foreseen for 2030 (32.5%). A closer integration is needed across value chains, giving rise to new business models, processes and technologies in which waste and emissions would be either avoided or transformed into valuable resources for new innovative processes and industries. Co-located industrial plants, which can adapt their production to fluctuations in energy and resource flows, would ensure flexibility in energy and feedstock utilisation, including through industrial symbiosis amongst adjacent plants.

A closed-loop system, based on complex flows of resources, energy and information, would be supported, including through artificial intelligence-based technologies. Long-lasting arrangements are needed with renewable energy and storage providers to develop the necessary capacity, reduce security of supply risks and channel resources where they are most needed. These approaches also call for new business models, skills, and financial solutions; and need to be developed in conjunction with the priority 'support industrial facilities in the energy transition' under the Cluster 'Climate, Energy and Mobility'.

By 2030, these investments should lead to a large set of industrial plants in several regions, with zero net emissions of greenhouse gases, zero waste and zero polluting emissions - and by 2050, to factories that are climate-neutral, resource-efficient and fully integrated in the circular economy.

"Hubs for Circularity" should be created as points of industrial (large companies and SMEs) and public facilities within a particular region or a group of municipalities, achieving more circularity and carbon neutrality in their use of resources, while boosting the competitiveness of the EU industry in the global landscape.

The co-programmed partnerships Circular and Climate-neutral Industries and Clean Steel are expected to bring a broad-based approach to these activities, and those related to the circular industries, capturing in particular the full potential of industrial symbiosis.

4.11 New services from Space for the EU society and economy

Research and innovation activities will prepare for the next generation and applications of European Global Navigation Satellite Systems **(Galileo/ EGNOS)** which will provide precise positioning, navigation and timing This will contribute to intelligent mobility, lowering CO2

[115] Report on 'Strengthening Strategic Value Chains for a future-ready EU Industry' by the Strategic Forum on Important Projects of Common European Interest (IPCEI) high-level expert group set up by the European Commission in March 2018, available at: https://ec.europa.eu/docsroom/documents/37824

emissions, connectivity and infrastructures, whilst ensuring a non-dependent and sustainable supply chain, and integration with other technologies such as 5G.

Research and innovation activities should support core services of the European Union Earth Observation System **(Copernicus)** to enhance these and develop new service elements or products, thematic cross-cutting applications and high-quality, well-validated and easy-to-use products and information to respond to different user communities for a European and global uptake, in areas such as climate mitigation, monitoring GHG, environment, including Arctic regions, agriculture and urban planning, security. These will rely on innovative and evolutionary data and information infrastructures and services.

Further developments in sensors technologies and data processing will be supported as well as new services for Space Surveillance and Tracking (SST) and research on space traffic management, space weather and near Earth objects necessary to ensure the security of critical infrastructure both in space and on Earth for **Space Situational Awareness (SSA)**.

Research and innovation activities will support user equipment and system solutions for space and ground infrastructure for **Satellite communications for EU governmental actors (GOVSATCOM**) as well as applications for citizens and businesses.

The potential of the downstream segment of the space sector is not yet fully exploited, in particular with EGNSS and Copernicus. Key applications such as Galileo secure real-time high-accuracy positioning for automated transport, Copernicus earth observation on polar research and natural disasters, services for environmental monitoring systems, migration, agriculture can help tackle global challenges, create high-skilled jobs and open up new market opportunities for businesses. Synergies between Galileo/Copernicus will be reinforced and the availability of space assets and data from other organizations (e.g. EUMETSAT, ESA) better exploited.

These investments will provide EU citizens, companies and public authorities with a wealth of downstream applications benefitting from more accurate positioning &navigation services, higher resolution earth observations that will cater for digitalized mobility, climate and environment as well as more efficient and new emergency and security services.

The objectives stated under this section and under section 4.8 A globally competitive space sector reinforcing EU sovereignty will be pursued jointly with the European Agency for Space Programme (currently GSA), in close coordination with the European Space Agency and national space programmes, in mutually supportive and complementary approach. The development of Strategic Research and Innovation Agenda will be encouraged (e.g. on competitiveness of the space sector and access to space) together with the emergence of a coherent overall agenda that can answer the challenges of the future single Space Programme. Actions favouring openness and widening to new actors in space (e.g. New Space) will be considered, which have the potential to open up new possibilities in Europe. The framework to support space education and public engagement to attract young talents and provide appropriate skills will also be investigated.

5. International Cooperation

- Activities under this cluster will engage with international partners as appropriate to enhance exchange of know-how, access to international value chains, in areas of mutual benefit and EU interest, and with due consideration to the technological sovereignty/autonomy objective. Particular attention will be paid to Europe's strong position in sustainability, to promote EU climate-neutral, clean and circular technologies. Activities will also aim to pursue level playing fields, reciprocity and the development of technologies that put human rights and social values first, including through industrial and policy dialogues. Examples include: Materials safety methodologies and standards, aiming at harmonised approaches, e.g. for nanosafety and safe-by-design.
- Circular economy and climate-neutral technologies, to support global sustainability and European industry, including a harmonised approach to materials life cycle assessment ("circularity by design").
- Common standards and interoperability, including in the regulatory context of manufacturing technologies, digital technologies and Artificial Intelligence (focussed on ethics and data);
- On Space, dialogues are held on a regular basis with a number of countries. Copernicus has developed a number of agreements for mutual data exchange and promotes cooperation with Framework Programme Topics with these international cooperation partners.

6. European Partnerships

Considering that Europe's industry is investing less than its global competitors, in particular in high-tech areas, and taking into account the need to accelerate the industrial transformation to climate-neutral and circular industries, this cluster will be instrumental in mobilising industry and leveraging greater public and private investment towards common goals.

The following areas for possible future partnerships with a lead under this cluster have been identified:

- Made in Europe (co-programmed)
- Key Digital Technologies (possible institutionalised Partnership based on Article 187 TFEU)
- Photonics (co-programmed)
- Artificial Intelligence, data and robotics (co-programmed)
- Smart networks and Services (possible institutionalised Partnership based on Article 187 TFEU)
- HPC (possible institutionalised Partnership based on Article 187 TFEU)
- Circular and Climate-neutral industries (co-programmed)
- Clean Steel (co-programmed)
- Metrology (possible institutionalised Partnership based on Article 185 TFEU) – also relevant for clusters 1, 3, 5, and 6
- Globally Competitive Space Systems (co-programmed)

In addition, a candidate European Partnership on a Geological Service for Europe would contribute to this cluster in terms of improving the knowledge base and surface data on the availability of raw materials.

A partnership approach for the proposed priorities would be more effective compared to traditional calls because they would ensure industries working together across sectors and value chains, based on predefined targets. This is a pre-requisite for achieving, for instance, circular economy goals, where cross-sectoral cooperation along and across value-chain cooperation is vital. Partnerships, in particular those impacting climate change, should also be able to reach out at international level.

Activities within the Cluster "Digital, Industry and Space" will also be closely related and collaborate with relevant EIT KICs, notably EIT Raw materials, EIT Manufacturing and EIT Digital.

7. Missions

Depending on the scope of future specific Missions, activities within the Cluster Digital Industry and Space might be particularly relevant to the Mission(s) identified within the "Climate Adaptation including Societal Transformation", "Cancer" and the "Climate-Neutral and Smart Cities" mission areas, as well as other mission areas.