Strategy
for the
promotion
of

5G

technology

Contents

01

Executive summary

The world is in the middle of a digital transformation, as a result of the appearance and deployment of a wide range of technologies which are driving, and will drive, enormous changes in the productive activity of most economic sectors, helping to strengthen their competitiveness and development potential and, in turn, directly impacting on the economic and social progress of different countries.

5G, together with other disruptive technologies such as the internet of things, artificial intelligence, advanced data analysis, process automation, robotics, cloud computing, virtual and augmented reality, 3D printing and drones, among others, are the cornerstone of this digitalisation, which is characterised by increasingly dynamic and constant technological change.

To make the coexistence of a huge number of new technologies and multiple electronic devices viable and efficient, the key element is the hyperconnectivity provided by 5G: permanent, ubiquitous, high-capacity, high-speed connections between people and between machines, without delays, safe and reliable.

5G and the digital transformation

In the economic and business sphere, **5G will have a positive impact on aspects such as the improvement of competitiveness, productivity, efficiency in the use of productive resources, or in terms of greater quality or performance of the products or services** generated in different economic sectors.

On the other hand, **the impact of 5G will also be visible and easily perceived by citizens and the daily life of people,** not only because of the access to new and better products or services generated by the different economic agents, but also in terms of access to digital public services. Furthermore, in the field of personal communication, 5G will also provide new services or substantially improved services, adapted to the digital consumption patterns increasingly present in personal relations and communication.

In the area of economic and environmental impact, 5G networks are called upon to be **a key element in advancing the digital and ecological transformation of companies, individuals, households and society as a whole.** These transformations will have a direct impact on the creation of wealth and the economic development of the different States and regions, and on the transition towards a decarbonised economy.

In 2016, the "5G for Europe: an Action Plan", pointed out that global revenues from 5G should reach the equivalent of €247 billion by 2025[1] and that the benefits of introducing 5G in four key industry sectors for the EU - automotive, health, transport, and energy - could reach 114 billion per year.

5G and its socio-economic impact

[1]https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=-CE-LEX%3A52016DC0588

Moreover, according to the "5G Readiness Report", published by Nokia[2] in autumn 2020, fifth-generation mobile technology has the potential to contribute eight trillion dollars to the world economy by 2030.

Finally, in the case of Spain, the "Digital Spain 2025" strategy points out that, according to data from the European Commission, the 5G Economic Deal will involve **investments worth more than 5 billion euros and the creation of more than 300,000 jobs in our country.**

A priority of the European Union and the Government of Spain

The development of 5G technologies is therefore a priority for the European Union and the Spanish Government, as demonstrated by the decisions they have been taking for some years now.

In the EU's strategic context, **in 2016 the European Commission approved the "5G Action Plan for Europe",** which promoted appropriate coordination between countries and generated an environment conducive to investment in 5G networks and the creation of new innovative ecosystems, to improve European competitiveness and offer concrete benefits to society.

The European Commission has identified the development of a Europe adapted to the digital age as a strategic priority for the period 2021-27. February 2020, the European Commission adopted **the 2020-25 strategy, "Shaping Europe's digital future".** Pillar 1, Technology at the service of people, includes a set of key actions including accelerating investments in connectivity for the Gigabit

[2]5G Business Readiness Report: https://www.nokia. com/networks/5g/readiness-report/

Society. One of the main goals identified by 2025 is to achieve uninterrupted 5G coverage in large urban areas and on the main communication routes: motorways, highways, and railways.

Finally, as part of the **"Annual Strategy for Sustainable Growth 2021"**[3], the European Commission provides guidance to Member States on how best to present their recovery and resilience plans under the "Recovery and Resilience Mechanism". This includes a series of flagship projects to be incorporated into the national plans, such as the Connection- Fast Deployment of Fast Broadband Services to all regions and households, including 5G and fibre networks.

As far as the **strategic context of 5G in Spain** is concerned, a first turning point was the approval of the **"5G National Plan (2018-20)"**[4], which had as its main goal to place our country among the most advanced in the development of this new technology so that when 5G reaches technological and commercial maturity, Spain will be prepared to take full advantage of the opportunities of this technological paradigm.

Furthermore, in July 2020, the **"Digital Spain 2025"**[5], strategy was presented, which includes a set of 50 measures, reforms and investments, organised into ten strategic areas, in line with the European Union's digital policies for the new period. One of the strategic pillars is the promotion of 5G technology.

[3]https://eur-lex.europa.eu/legal-content/es/TXT/?qi-d=1600708827568&uri=CELEX:52020DC0575

[4]https://avancedigital.gob.es/5G/Documents/plan_na-cional_5g.pdf

[5]https://www.mineco.gob.es/stfls/mineco/prensa/ficheros/noticias/2018/Agenda_Digital_2025.pdf

Objectives of the Strategy

Against the backdrop of "Digital Spain 2025" and the "Recovery, Transformation and Resilience Plan", "España Puede", the following **Action Objectives of the "Strategy for the promotion of 5G technology" have been established:**

1.
To support economic recovery and job creation

2.
To strengthen economic, social, and territorial cohesion, by social, economic or gender digital divides

3.
To contribute to the transformation of the productive sectors and the transition towards a new economic, ecological and social model

Objectives of the Strategy

4.
To promote sustainable development

5.
To provide the country with the connectivity needed to increase its resilience to future crises

6.
Favour the consolidation of Spain as one of the leading countries in technological deployment and R&D&I in the development of applications on new digital technologies in Europe, especially 5G

Axes, Action Lines and Measures

To achieve the afore mentioned objectives, the Strategy includes a series of actions encompassed in different Lines of Action, based on three main lines of action:

Axis 1: | **A radio spectrum for 5G services**

Axis 2: | **Effective support for the deployment of 5G networks and services**

Axis 3: | **A regulatory and administrative framework to boost the deployment of 5G technology**

The framework of Axes, Lines of Action and Measures included in this Strategy are summarised below:

STRATEGIC AXIS	ACTION LINE	MEASURES
AXIS 1. A radio spectrum for 5G services	1. 5G spectrum allocation	1. Provision of the 700 MHZ band 2. Provision of the 26 GHZ band
	2. 5G spectrum management	3. Rearrangement of the 3.5 GHZ band 4. Enabling the Harmonized Bands for your 5G
AXIS 2. Effective support to the deployment of 5G networks and services	1. Incentives for the deployment of 5G networks	5. 5G deployment in population centres 6. 5G deployment in transport corridors 7. Deployment of the mobile transmission network in 5G 8. Good Practices Guide and support to local authorities for deployment
	2. Demand-side and 5G ecosystem promotion	9. 5G on sectoral digitisation tractor projects 10. Promoting innovation in 5G technology 11. 5G Cybersecurity Ecosystems
AXIS 3. A regulatory and administrative framework to boost the deployment of 5G technology	1. Reduction of administrative barriers for the promotion of 5G technology	12. Simplification of administrative procedures 13. Reduction of deployment burdens
	2. Legislative developments for the promotion of 5G technology	14. Tools for the facilitation of network deployment 15. Cybersecurity Act 5G

In order to meet the targets set out in this strategy and to develop its measures, **an initial budget estimate** of the actions of the "Strategy for the promotion of 5G technology" over the period 2021-2025 is planned. The budget include public investment, both the Kingdom of Spain's own resources and European Union funds (economic resources from the Community budget, where the use of funds from the Connecting Europe Facility (CEF2) and the Recovery and Resilience Mechanism, among others, is envisaged) and private funding. **The public resources planned for the Strategy for the promotion of 5G Technology over five years amount to 2 billion.** The diagnosis of the situation presented in this Strategy, as well as the sum of proposals, measures and actions considered as courses of action, have been shared with the Advisory Council for Digital Transformation and the Permanent Commission on Telecommunications, Digital Infrastructures, Digital Connectivity and the Audiovisual Sector, whose opinions and considerations have been gathered and incorporated. The main agents and companies in the sector and other interested partners have also been consulted and considered, to make this Strategy a participative instrument for public-private collaboration that will contribute to Spain's Digital Transformation.

Budget allocation

02

5G, The network of the future and its socio-economic impact

Industrial revolutions have been characterised by the transformation of the physical infrastructure of networks, with consequences for both business and society. Electricity drove the Second Industrial Revolution, as the networks achieved the implementation and development of economies of scale by connecting large electricity production plants to the local distribution grid with a massive arrival to users, through high voltage transmission grids.

The Third Industrial Revolution, also known as the Scientific and Technical Revolution, was based on the advances of microelectronics, the extensive deployment of telecom networks and the development of information and communication technologies as instruments for the transformation of industry and society.

The world is immersed in the Fourth Industrial Revolution, driven by the presence of a set of technologies that make radical changes possible in multiple sectors and that can contribute to improving its competitiveness and that of national economies, while at the same time contribe to the achievement of the United Nations Sustainable Development Goals and generating changes in social uses, behaviour and modes. This industrial and social revolution is supported by disruptive technologies such as the Internet of Things, artificial intelligence, advanced data analysis, process automation, robotics, cloud computing, virtual and augmented reality, 3D printing and drones, among others.

The key enabler that in turn allows these technologies to achieve their full potential is hyperconnectivity: permanent, ubiquitous, high-capacity, high-speed connections between people and between machines, without delays, secure and reliable.

5G technology (fifth generation of mobile technologies) is seen as a key factor in this change, enabling industrial transformations through wireless broadband services at gigabit speeds, support for new types of applications that connect objects and devices (Internet of Things), and versatility through software virtualisation, enabling innovative business models.

The large-scale deployment of 5G[6] communication networks is set to unleash the full potential of the Fourth Industrial Revolution through such ubiquitous high-capacity, low-latency, high-density device connectivity.

According to the European Union's 5G Observatory[7], 5G applications can be classified into 16 vertical groups, which are listed below:

Agriculture	Automobiles and road transport	Drones	Education
Health	Energy	Fixed wireless access	4.0 Industry
Media and entertainment	Public safety	Smart buildings	Smart Cities
Smart public services	Tourism	Transport	Virtual Reality
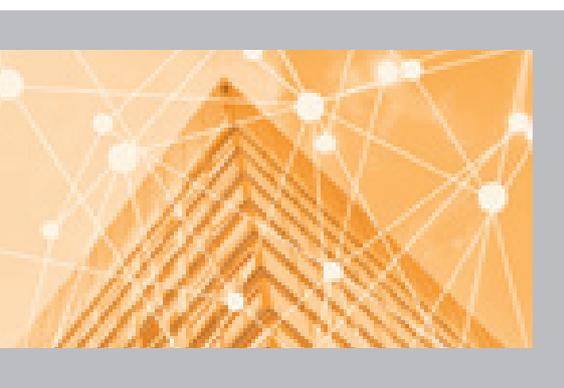
Each of these corresponds to a sector of activity or socio-economic sphere which, thanks to access to 5G services and technologies, will **undergo real transformative changes.** In these sectors, 5G will have a positive impact on aspects such as the improvement of competitiveness, productivity, efficiency in the use of productive resources, or in terms of greater quality or performance of the products or services generated in these sectors and areas. Among these verticals, this strategy will promote the application of 5G within the vertical sectors in which "Digital Spain 2025" promotes sectorial digitalisation projects (agri-food, mobility, health, tourism and trade).

Thus, in the industrial field, 5G will be the main enabler of the digital transformation and a **key enabler in the ecological transition**, in branches such as, for example, mobility, manufacturing, health, energy, agroindustry, tourism or entertainment.

Some of the transformations that 5G will promote in the area of economic sectors are included in the report published by the

[6]See appendix with the characteristics of 5G technology

[7]https://5gobservatory.eu/5g-trial/major-european-5g-trials-and-pilots/

World Economic Forum and PwC, "The Impact of 5G: Creating New Value across Industries and Society"[8], through a series of cases that illustrate the value of 5G in different industrial sectors, and also the impact that these use cases can have in favour of some of the Sustainable Development Goals (SDG) of Agenda 2030 defined by the United Nations.

Taking as a basis the analysis carried out by the World Economic Forum and PwC, cited above, and linking it to the areas with the greatest potential for transformation proposed by the Digital Spain 2025 Strategy, some use cases that may represent an opportunity for Spain are identified:

2.1. Applications and benefits of 5G for citizens and companies

Scope	Key industry trends	Examples of use cases	SDG	Enabled transformation
A digital food industry	⊕ Progress in smart processes due to the evolution of the internet of things and automation ⊕ Increasing consumer demand for organic products ⊕ The demand for greater transparency on agri-food processes and products by consumers	⊕ 4.0 Industry ⊕ Human-Robot Collaboration ⊕ Predictive maintenance ⊕ Digital Twins ⊕ Augmented reality ⊕ Virtual reality ⊕ Drones for ground monitoring	SDG 7 SDG 8 SDG 9 SDG 12 SDG 13 SDG 14 SDG 15	⊕ The use of connected devices allows the productivity of the sector to be improved. ⊕ The sale of products directly to the end consumer through location-based platforms allows the competitiveness of companies in the sector to be increased. ⊕ Advanced predictive maintenance can lead to an improvement in the availability and performance of machinery ⊕ Digital performance and process management leading to improved operational efficiency Factories of the future with smart automated manufacturing

Scope	Key industry trends	Examples of use cases	SDG	Enabled transformation
Sustainable, innovative, and efficient mobility	⊕ Autonomous driving and connected passengers ⊕ Changing passenger patterns and car sharing ⊕ Electric mobility - green agenda ⊕ Digital Vehicle Ecosystem ⊕ Info-entertainment on the move ⊕ Urbanization and inter-modality ⊕ Environmental awareness and public spaces ⊕ Urban lifestyle and increasing expectations of public transport	⊕ Digital twin for predictive maintenance ⊕ High density in deployment and automation (C-V2X) ⊕ Intelligent traffic control ⊕ Health monitoring through remote vehicles ⊕ Entertainment in vehicles with mass media ⊕ Air taxis	SDG 3 SDG 7 SDG 9 SDG 11 SDG 13	⊕ nomous mobility as a reality; it will lead to higher individual productivity (less time spent driving) ⊕ Reduction of environmental impacts
Digital Health: towards prediction, personalisation and efficiency	⊕ Increased consumer interest in their well-being ⊕ Increasing costs to achieve socio demographic changes ⊕ Growing demand for quality, patient safety and data storage ⊕ Change in consumer behaviour, freedom of choice and different alternatives of service providers	⊕ Remote patient surveillance ⊕ Internet of skills medical/remote surgery Image transfer ⊕ Transferencia de imágenes ⊕ AR/VR for health care ⊕ Disease management ⊕ Clothing and medicine ⊕ ical Drone for service provision	SDG 3 SDG 4 SDG 5 SDG 8 SDG 9	⊕ e-Health and remote medicine leading to increased accessibility to quality health care ⊕ Preventive health care ⊕ Measures leading to a long-term decrease in health expenditure

Scope	Key industry trends	Examples of use cases	SDG	Enabled transformation
Digitisation as a lever for trade modernisation	⊕ Omnichannel retail strategies ⊕ Personalised retail experience ⊕ Growth of the culture of immediacy ⊕ Increased relevance of mobile digital wallets ⊕ Online trading at greater speed ⊕ Growth in e-commerce subscriptions	⊕ 3D calls and holograms ⊕ AR/MR for the consumer ⊕ Automated purchasing ⊕ Design optimizations ⊕ Intelligent customer relationship management ⊕ Tailored in-store promotions ⊕ Reduction of reserve inventories	SDG 2 SDG 3 SDG 8 SDG 12 SDG 13	⊕ Test before you buy ⊕ EExperience of AR/VR use for the consumer ⊕ Customization of in-store advertising leading to increased sales
Smart tourism	⊕ Development of immersive tourism ⊕ Proliferation of virtual tickets ⊕ Tourist demand for customized services	⊕ 3D calls and holograms ⊕ AR/MR for the consumer ⊕ Smart management of relations with tourists ⊕ Proactivity towards the tourist ⊕ Tourism offer through autonomous vehicles	SDG 7 SDG 8 SDG 9 SDG 11 SDG 12	⊕ Through augmented reality and data management, a higher value offer can be provided to the tourist, thus affecting the productivity of the sector ⊕ Integration of the entire value chain of the sector ⊕ Optimisation of the relationship with the tourist through data management ⊕ Customized tourism offer, thus improving the experience

On the other hand, **at the level of citizens and the day-to-day life of the people, the impact of 5G will also be visible and easily perceived** by them, not only thanks to access to new and better products or services generated by the industrial sector, but also in terms of access to digital public services. The benefits of 5G technology will enable to transform the access to and enjoyment of the different public services currently available, in terms of, for example, the customization of services, the proactivity of public authorities, the possibility of accessing them via mobile devices, or the automation of citizen care and information.

Furthermore, in the field of personal communication, 5G will also provide new services or substantially improved services, adapted to the digital consumption patterns increasingly present in personal relations and communications. Thus, the potential development of a new concept of interpersonal communications stands out, based on both the highest quality of existing facilities such as calls and video calls, videoconference applications, download of images and high-resolution videos, or the enrichment of the digital user experience with functionalities such as virtual reality, holograms or remote presence.
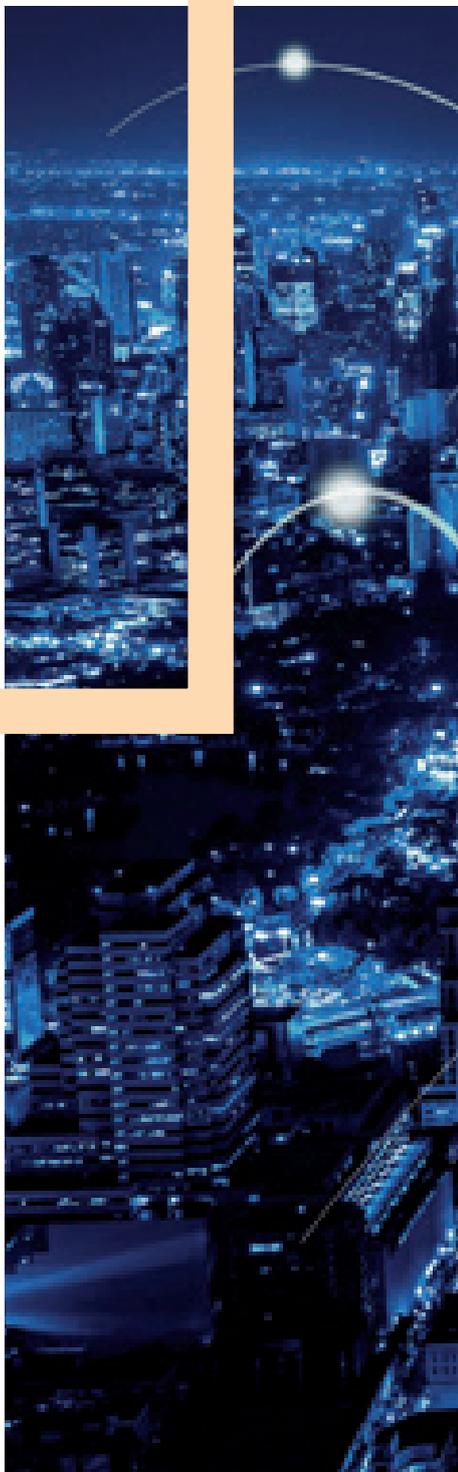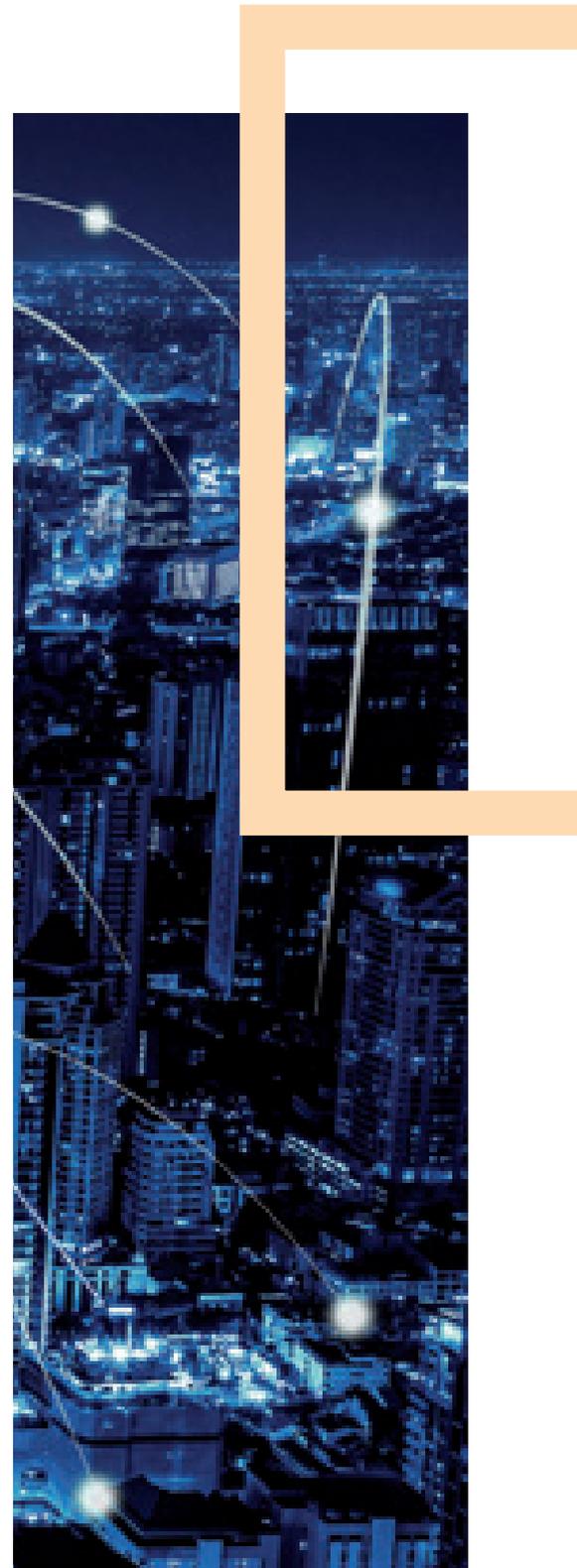
Benefits	Smart Cities	Environment
Social benefits	⊕ Great access to information and interconnection between cities ⊕ Reducing traffic congestion and reducing accidents Improved management of natural resources	⊕ Increased educational opportunities through mass distribution of open online courses ⊕ Improved health care through faster access to remote health care ⊕ Increased access to information through improved connectivity
Environmental benefits	⊕ Improved management of natural resources	⊕ Reduction of pollution and CO_2 emissions

For citizens, the benefits of other 5G applications will also be visible, in areas such as connected, automated and electrified mobility, or home automation[9], facilitated by the increased density of connected devices.

In addition, the new features deployed with 5G will also favour the development of cities and territories that are smarter, with more humane, sustainable and decarbonised environments focused on people, and with highly improved remote access to public services.

In this sense, the afore mentioned report by the World Economic Forum and PwC, presents some examples of the socio-economic value of some of the applications of 5G technology in everyday areas or environments of citizenship such as the following:

| Smart Homes	Smart Workplaces
⊕ Improving medicine through live support/assistance ⊕ Improved privacy and security ⊕ Superior access control	⊕ Increased assistance to ageing and disabled populations ⊕ General improvement of quality of life
⊕ Waste reduction ⊕ Reduction in consumption of energy and CO_2 emissions ⊕ Improved waste management	⊕ Cleaner environments

[9]Domotics is the name given to systems capable of automating a home or building of any kind, providing energy management, security, welfare and communication services, and which can be integrated by means of internal and external communication networks, wired or wireless, and whose control enjoys a certain ubiquity, from inside and outside the home.

2.2. Economic impact of 5G technology

In terms of economic impact, 5G networks, with their unprecedented increase in data transmission capacities, in the volume of connected devices and in real-time management capabilities thanks to their low latency, are set to be a key element in advancing the digital transformation of businesses, individuals, households and society. These transformations will have a direct impact on the creation of wealth and the economic development of the different states and regions.

In 2016, the "5G for Europe: an Action Plan", pointed out that global income from 5G should reach the equivalent of 247 billion by 2025[10] and that the benefits of introducing 5G in four key industrial sectors for the EU, namely: automotive, health, transport, and energy, could reach 114 billion per year.

[10]https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=CE-LEX%3A52016DC0588
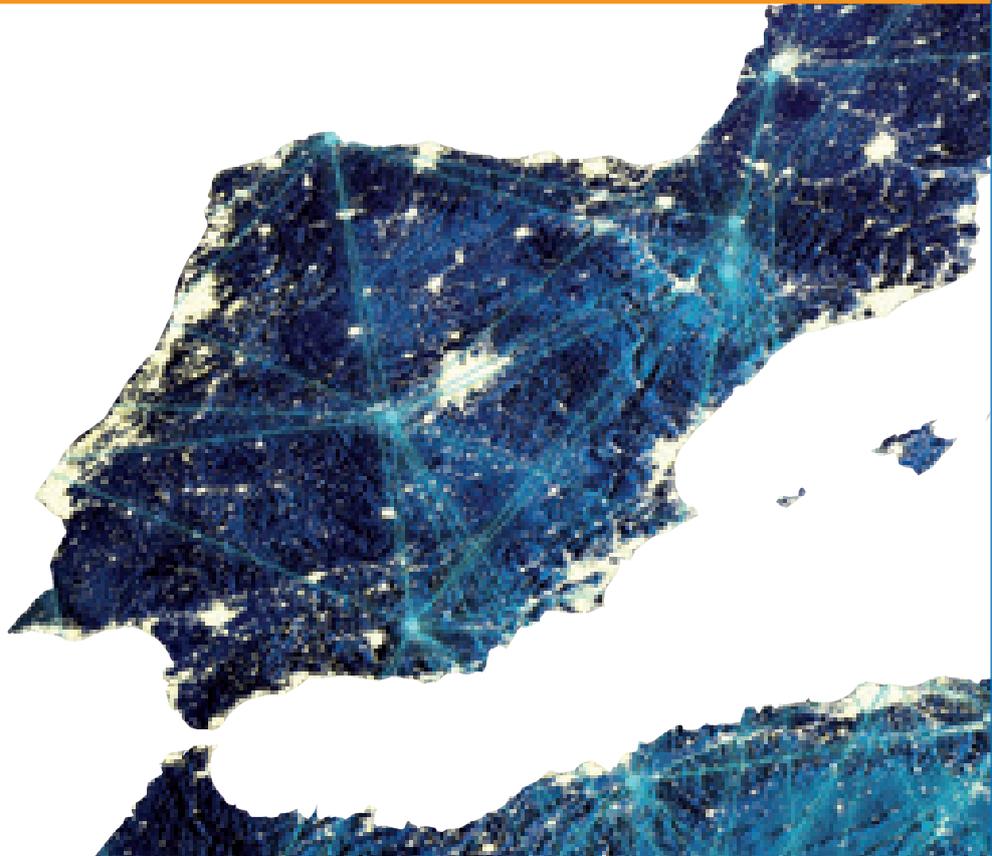
Moreover, according to the "5G Readiness Report", published by Nokia[11] in autumn 2020, fifth-generation mobile technology has the potential to contribute eight trillion dollars to the world economy by 2030.

The report also highlights the clear correlation between 5G implementation and business performance, finding that those companies with an advanced level of 5G adoption were the only group that experienced a net increase in productivity of more than 10% after the pandemic, and the only group able to maintain or increase customer loyalty during the health crisis. In addition, it is noted that 49% of companies in the most advanced phase of 5G grew at a significantly faster rate in 2019 than those in the earlier phases.
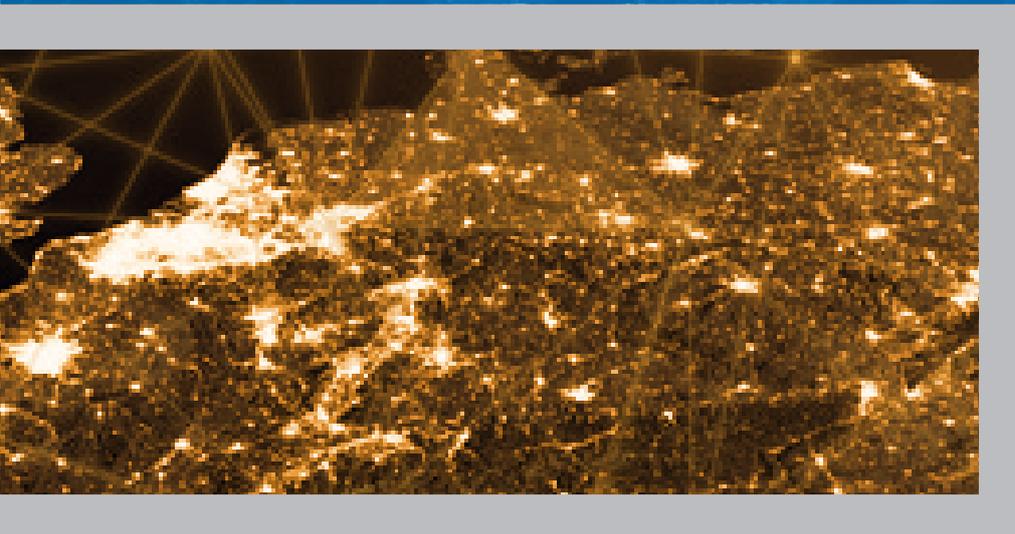
The report "The Impact of 5G: Creating New Value across Industries and Society"[12], published by the World Economic Forum, concludes that 55% of 5G use cases will have a direct impact on health and welfare objectives and 40% on innovation and infrastructure objectives. This will result in a global economic value of $13.2 trillion by 2035, and the generation of 22.3 million jobs in the global 5G value chain alone.

Finally, the case of Spain, the "Digital Spain 2025" strategy, points out that according to data from 2016 from the European Commission[13], the economic impact of 5G will mean **investments worth more than 5 billion euros and the creation of more than 300,000 jobs in our country.**

[11]5G Business Readiness Report: https://www.nokia. com/networks/5g/readiness-report/

[12]https://www.pwc.es/es/publicaciones/telecomunicaciones/impacto-5g-generando-valor-industrias-sociedad-ods.html

[13]Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe", https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17802
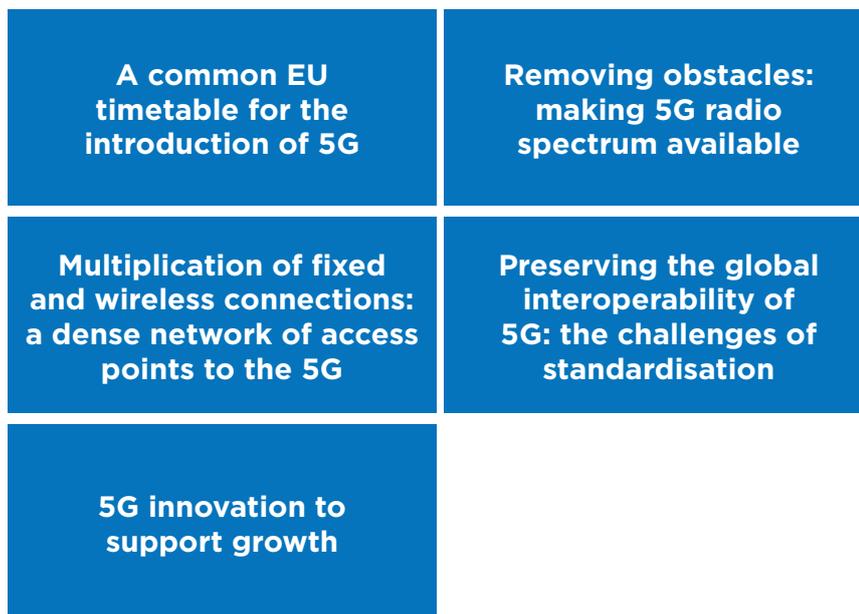
03

A priority for the
European Union
and Spain

In the **strategic context of the EU,** with the aim of exploiting the potential of 5G for the socio-economic development of the EU, in 2016, the European Commission adopted the **"5G Action Plan for Europe"**[14]**.** This plan promotes appropriate coordination between countries and creates an environment conducive to investment in 5G networks and the creation of new innovative ecosystems, to improve European competitiveness and offer concrete benefits to society.

To keep Europe at the forefront of the 5G race, the Plan emphasised the following key areas of action:

3.1.
5G as a priority for the European Union

A common EU timetable for the introduction of 5G	**Removing obstacles: making 5G radio spectrum available**
Multiplication of fixed and wireless connections: a dense network of access points to the 5G	**Preserving the global interoperability of 5G: the challenges of standardisation**
5G innovation to support growth	

At the end of 2019, the current European Commission established the **six strategic priorities** that will mark the way and the lines of action in the European Union for the period 2019-2024. These six priorities are summarised below:

A European Green Deal: to be the first climate-neutral continent

A Europe fit for the digital age: to empower people with a new generation of technologies

An economy that works for people: to work for social justice and prosperity

Promoting our European way of life: to protect our citizens and our values

A stronger Europe in the world: to strengthen our responsible global leadership

A new impetus for European democracy: to enhance, protect and consolidate our democracy.

[14]https://ec.europa.eu/transparency/regdoc/rep/1/2016/ES/1-2016-588-ES-F1-1.PDF

In relation to the strategic priority of a Europe adapted to the digital era, in February 2020, the European Commission launched the European digital strategy for the period 2020-25, **"Shaping Europe's digital future"**[15], based on three founding pillars described below:

#01

TECHNOLOGY AT THE SERVICE OF PEOPLE

The development, deployment and assimilation of technologies that make a real difference to people's daily lives
A strong and competitive economy that masters and shapes technology in a way that respects European values.

#02

FAIR AND COMPETITIVE ECONOMY OPEN, DEMOCRATIC AND SUSTAINABLE SOCIETY

A frictionless single market where businesses of all sizes and from all sectors can compete on a level playing field and develop, market, and use digital technologies, products and services on a scale that enhances their productivity and competitiveness at world level, and where consumers can have confidence that their rights are being respected.

#03

OPEN, DEMOCRATIC AND SUSTAINABLE SOCIETY

A trusted environment where citizens are empowered to act and interact, and are in control of the data they provide, both online and offline. A European path to the digital transformation that reinforces our democratic values, respects our fundamental rights, and contributes to a sustainable, climate neutral and resource-efficient economy.

The EU's digital strategy has as its goal the benefit of European citizens, businesses and the environment:
- **European citizens:** improving their quality of life through technology.
- **Businesses:** ensuring that companies can be born, grow, innovate and compete on fair terms.
- **Environment:** achieving climate neutrality using digital technologies.

Pillar 1, Technology at the service of people, includes a set of key actions for the period 20-25, including those aimed at accelerating investment in European Gigabit connectivity, with one of the main targets to be achieved by 2025 being uninterrupted 5G coverage in large urban areas, unique locations such as airports and on the main communication routes: motorways, highways and railway lines.

To this end, the European strategy sets out various measures such as: revising the Directive to reduce the cost of deploying high-speed electronic communications networks; updating the 5G Action Plan; and promoting 5G corridors for connected and automated mobility.

Finally, the importance that the European Commission attaches to 5G is also reflected in the **"Proposal for European Recovery"**[16]

presented by the European Commission in May 2020, with a comprehensive package of 1.8243 billion euros that brings together the multiannual financial framework (MFF) of 1.0743 billion euros and extraordinary recovery measures amounting to 750,000 million euros in the "Next Generation EU" instrument. Thus, the MFF, with the strengthening of the "Next Generation EU" instrument, are configured as the main instruments for the implementation of the recovery package to address the socio-economic consequences of the COVID-19 pandemic. Furthermore, it will also contribute to transforming the EU through its main policies, particularly the European Green Deal, the digital revolution and resilience.

The Recovery and Resilience Mechanism is the main instrument of recovery and the core of the Next Generation EU, as it will enable the EU to emerge from the current crisis stronger and more resilient.

As part of the **"Annual Strategy for Sustainable Growth 2021"**[17], the European Commission provides guidance to Member States on how best to present their recovery and resilience plans under this Mechanism. This includes a series of flagship projects to be incorporated into national plans, such as the Connecting - Rapid Deployment of Fast Broadband Services to all regions and households, including 5G and fibre networks.
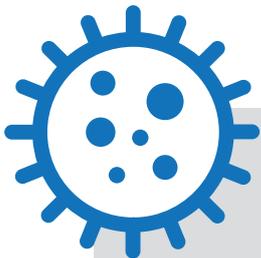
RECOVERY AND RESILIENCE FACILITY

FLAGSHIP AREAS FOR INVESTMENTS AND REFORMS

POWER UP
CLEAN TECHNOLOGIES AND RENEWABLES

MODERNISE
DIGITALISATION OF PUBLIC ADMINISTRATION

RENOVATE
ENERGY EFFICIENCY OF BUILDINGS

SCALE-UP
DATA CLOUD CAPACITIES AND SUSTAINABLE PROCESSORS

RECHARGE AND REFUEL
SUSTAINABLE TRANSPORT AND CHARGING STATIONS

RESKILL AND UPSKILL
EDUCATION AND TRAINING TO SUPPORT DIGITAL SKILLS

CONNECT
ROLL-OUT OF RAPID BROADBANDS SERVICES

European Commission

The need to give a strong impetus to the **deployment of 5G networks and services has been consistently underlined by the Community institutions, both by the European Commission and the European Council.** President Ursula von der Leyen encouraged the Member States in the European Union's September 2020 speech to use the funds of the "Next Generation EU" package to boost the safe and reliable deployment of 5G18[18].

[17]https://eur-lex.europa.eu/legal-content/es/TXT/?-qi-d=1600708827568&uri=CELEX:52020DC0575

[18]https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655

Finally, the conclusions of the European Council, held on October 1st and 2nd, 2020, urged Member States to submit their national 5G plans to the European Commission by the end of 2020.

To materialise this boost to 5G technology in the coming years, in addition to the use of the Reconstruction Mechanism, the MFF 2021-27[19] has other financing instruments at the service of the Member States. The most important of these are the **ERDF and the Connecting Europe Facility (CEF).**

Regarding the ERDF instrument 2021-2027, Policy Objective 3: "A more connected Europe, with strategic transport and digital networks", includes among its specific objectives the **promotion of digital connectivity,** which is addressed by the present Strategy.

The general objective of the Connecting Europe Mechanism is to develop and modernise the trans-European networks in the digital, transport and energy fields and to facilitate cross-border cooperation in the field of renewable energies, considering long-term decarbonisation commitments and emphasising synergies between sectors. In this respect, the specific objectives pursued include, in the digital sector, *contributing to the deployment of very high capacity digital networks and 5G systems, increasing the resilience and capacity of digital backbone networks on EU territories by linking them to neighbouring territories, as well as the digitisation of transport and energy networks.*

3.2.
5G as a priority for Spain

Regarding the **strategic context of 5G in Spain,** a first turning point was the approval of the "5G National Plan (2018-20)",[20] which had as its goal to place our country among the most advanced in the development of this new technology so that when 5G reaches technological and commercial maturity, Spain will be prepared to take full advantage of the opportunities of this technological paradigm.

The National Plan is structured around four strategic axes to be developed between 2018 and 2020:

Management and planning of the radioelectric spectrum.	**Promotion of 5G technology: Network and service pilots and R&D&I activities.**
Regulatory aspects.	**Coordination of the Plan and International Cooperation.**

Furthermore, in July 2020, the "Digital Spain 2025" strategy was presented[21], which includes a set of measures, reforms, and investments, articulated in ten strategic areas, in line with the digital policies established by the European Commission for the new period.

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2025

The Agenda's actions are aimed at promoting more sustainable and inclusive growth, driven by the synergies of digital and ecological transitions, which will reach society as a whole and reconcile the new opportunities offered by the digital world with respect for constitutional values and the protection of individual and collective rights.

"Digital Spain 2025", establishes 50 measures structured around ten strategic axes, one of which is specific to the promotion of 5G technology, and sets ten strategic objectives and corresponding targets:

#01

To ensure adequate digital connectivity for 100% of the population, promoting the disappearance of the digital divide between rural and urban areas (target 2025: 100% of the population with 100 Mbps coverage).

#02

To continue leading the deployment of 5G technology in Europe, encouraging its contribution to increase economic productivity, social progress and territorial structuring (target 2025: 100% of the radio spectrum prepared for 5G).

#03

To strengthen the digital skills of workers and the public (target 2025: 80% of people with basic digital skills, 50% of whom will be women).

#04

To strengthen Spain's capacity in cybersecurity, consolidating its position as one of the European poles of business capacity (target 2025: 20,000 new specialists in cybersecurity, AI and data).

#05

To promote the digitisation of public administrations (target 2025: 50% of public services available in mobile apps).

#06

To accelerate the digitisation of enterprises, with special attention to micro-SMEs and start-ups (target 2025: 25% contribution of e-commerce to SME turnover).

#07

To accelerate the digitisation of the production model by Sectoral transformation tractor projects generating structural effects (target 2025: 10% reduction of CO_2 emissions due to digitalisation).

#08

To improve the attractiveness of Spain as a European platform for business, work and investment in the audio-visual field (target 2025: 30% increase in audio-visual production in Spain).

#09

To favour the transition to a data economy, guaranteeing security and privacy and taking advantage of the opportunities offered by Artificial Intelligence (target 2025: 25% of companies using AI and Big Data).

#10

To guarantee citizens' rights in the new digital environment (target 2025: a national charter on digital rights).

Within Axis 2, **Promotion of 5G Technology,** it is pointed out that the need to facilitate the deployment of 5G without restrictions becomes a fundamental task for the economic development and the Digital Transformation of the country. Three specific objectives are set in this area:

> **To strengthen Spain's leading position in the development and deployment of 5G networks**

> **To support the early deployment of 5G by economic operators**

> **To develop a reliable environment for the deployment of 5G services**

This Strategy is therefore the backbone of the objectives and deploys the measures established by the "Digital Spain 2025" strategy to promote 5G technology.
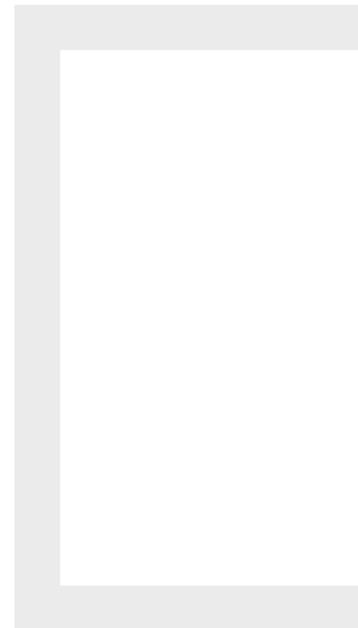
04

5G development in Europe and the rest of the world, and the steps taken in Spain

The development of this Strategy is in line with the advances that have been made in the development of 5G technology in the world, the EU and Spain as a whole.

Spain, as described below, has been one of the EU Member States making the greatest commitment to 5G, this progress has been highlighted by the 5G European Observatory, which aims to monitor market developments, including trials or pilots, and other actions taken by industry stakeholders and Member States in the context of 5G deployment in Europe and beyond.

4.1. Development of 5G beyond the EU

As far as other countries in the world are concerned, the deployment of 5G is progressing at a rapid pace. According to data from the European 5G Observatory, there are about 100 operators providing commercial 5G services worldwide by the end of September 2020.

In addition, and regarding the main non-European players, the following relevant milestones can be noted:
- In the US, the four main mobile operators will launch 5G services in 2018 and 2019.
- In South Korea, the deployment of 5G has been massive with over 115,000 5G base stations up and running by mid-2020.
- In China, all three mobile operators launched 5G services in November 2019.
- Japan is already very active in the 5G field, and four operators have launched commercial 5G services in 2020.
- In addition, there have already been other commercial 5G launches in many countries, mainly using the 3.5 GHz band: Australia, Bahrain, Brazil, Canada, Hong Kong, Kuwait, New Zealand, among many others.

4.2. Development of 5G in the European Union and Spain

For Europe, the 'Digital Economy and Society Index (DESI)' is a composite index that summarises five indicators of Europe's digital performance and allows monitoring of the evolution of the European Union Member States in digital competitiveness. This index establishes the score of the Member States in relation to the three preferential bands in Europe for the deployment of 5G, summarising progress in the following graphs:
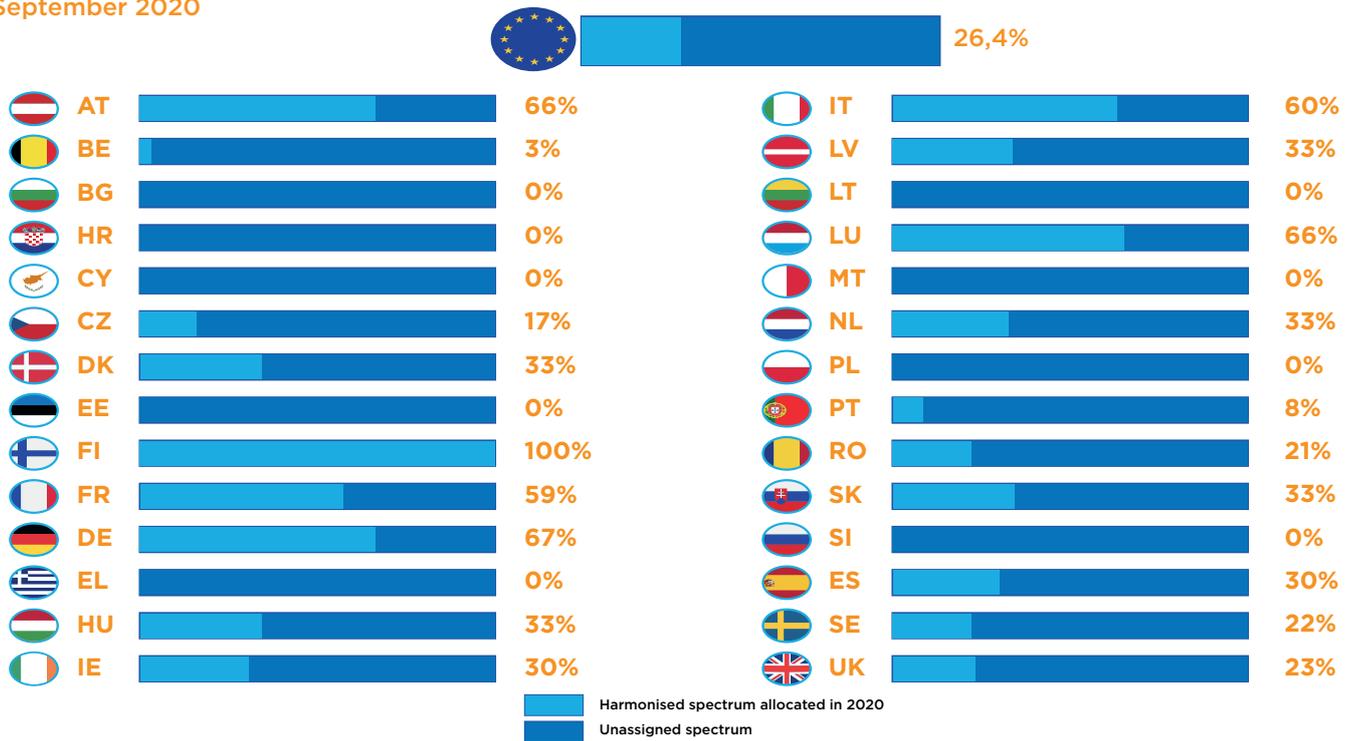
In the case of the three preferential bands, the state in the EU is summarised in the following graph:

Status of allocation of the preferential bands

September 2020

26,4%

AT	66%	IT	60%
BE	3%	LV	33%
BG	0%	LT	0%
HR	0%	LU	66%
CY	0%	MT	0%
CZ	17%	NL	33%
DK	33%	PL	0%
EE	0%	PT	8%
FI	100%	RO	21%
FR	59%	SK	33%
DE	67%	SI	0%
EL	0%	ES	30%
HU	33%	SE	22%
IE	30%	UK	23%

Harmonised spectrum allocated in 2020
Unassigned spectrum

With regard to the strategic commitment of the EU member states, in September 2020, 13 countries of the plus the United Kingdom had a National Plan and a roadmap to promote the deployment of 5G services in their territory.

In Europe, therefore, work is already underway to deploy and implement 5G services to achieve the objectives set by the European Union.

5G roadmaps and national plans

13 **Member States that have published national roadmaps for 5G and UK**

United Kingdom
Sweden
Finland
Denmark
Estonia
Netherlands
Germany
Luxembourg
France
Austria
Czechia
Portugal
Spain

These targets include that **at least one city in each Member State should be "5G enabled" by 2020 and that all urban areas and major land transport routes should have uninterrupted 5G coverage by 2025.**

**European telecoms companies have also been working on various pilots for more than two years** in order to verify the capabilities and to start the commercial phase of 5G services. By the end of September 2020, around 199 pilots had been implemented in the EU Member States and the United Kingdom.

According to the European 5G Observatory[22], by September 2020, **18 countries** of the EU member states plus the United Kingdom **already have commercial 5G services.**

In addition, as another example of progress in the EU, it has been found that in most of these 18 countries, there is already more than one commercial 5G service provider.

5G COUNTRIES

18 **countries with 5G commercial service**

5G Commercial
No commercial

Another key element in the development of 5G technology in Europe is the ability to establish cross-border digital corridors between Member States. In this regard, according to the European Observatory, 12 corridors have already been partially developed in the EU territory, and in the case of Spain there are 2, the one linking Spain and Portugal, and the one linking Spain and France.

Europe is therefore considered to be one of the advanced regions in the world in terms of 5G implementation, with 28 5G networks in operation** and 80 more networks expected to be operational by the end of 2020[23], bringing state-of-the-art wireless connectivity to millions of people.

12 Cross-border 5G corridors

5G Corridors

Cross-border
5G corridors
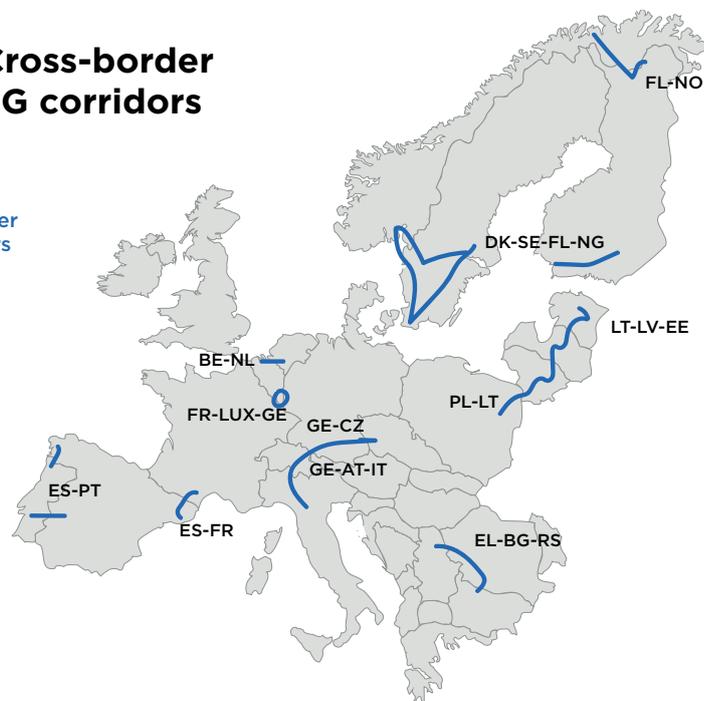
In the case of Spain, the "Digital Spain 2025"[24] strategy places the digital transformation as one of the fundamental levers for relaunching economic growth, reducing inequality, increasing productivity, and thus being able to take advantage of all the opportunities offered by new technologies. **Telecom infrastructures are key to the digital transformation,** as they are the basis for the digitisation of activities and processes. In response to this need, the "Digital Spain 2025" Agenda, as already mentioned, **includes the development of a "Connectivity Plan for people, companies and territories",** with the aim of guaranteeing adequate digital connectivity for the whole population, promoting the disappearance of the digital divide between rural and urban areas, **and this "Strategy for the promotion of 5G technology"** to promote the accelerated deployment of 5G networks and services.

Spain has already implemented a series of pilots which will allow it to explore and identify cases of use and applications of 5G technology in different industries. According to the latest assessment by the European Union's 5G Observatory, in September 2020, **Spain leads the ranking of 5G pilot experiences,** with 32 of the 245 pre-commercial pilot experiences underway throughout the European Union.

[23]https://etno.eu/library/reports/90-state-of-digi-2020.html
[24]https://www.mineco.gob.es/stfls/mineco/prensa/ficheros/noticias/2018/Agenda_Digital_2025.pdf

In the area of commercial experiences, **in June 2019, the first launch of 5G services by an operator took place,** reaching a coverage and offer available in 21 cities in Spain.

199 5G pilots in the 27 EM + Ru   **282** future cities with 5G

Number of pilots

More than 10
Between 5 and 10
Less than 5
Unknown

C Cities with 5G

5G pilots / 5G cities

According to the above-mentioned report, **Spain is the second European country in number of "5G cities",** with 39 stabilised cities, only behind the United Kingdom.

In September 2020, a new wave of operators launched their 5G services in an accelerated manner, so that the four operators with assigned radio spectrum have already begun commercial services.

A large part of the development of 5G in Spain is a consequence of the aforementioned **"National 5G Plan, 2018-2020",** as an instrument of the Ministry of Economic Affairs and Digital Transformation, which has been used to promote the development of 5G in Spain, developing different actions in the following areas:

⊕ **Radio spectrum:**
- Tendering and awarding of the 3.5 GHz band[25], one of the three preferential bands for the development of 5G.
- Second Digital Dividend, release of the 700 MHz band used by the Digital Terrestrial Television service to make it available for the provision of 5G services[26].

⊕ **Promotion and dissemination of 5G networks and services**
- Promotion and support of the Mobile World Congress as a meeting point for mobile communication services and the advancement of new 5G technology.
- Establishment of the National 5G Observatory, with the aim of analysing the 5G ecosystem in Spain and identifying its main actors, as well as the initiatives under development at national and international level.

⊕ **Development of the 5G ecosystem:**
- Call for two waves of pilot projects to carry out tests and trials of 5G applications. A total of 10 projects have been financed, covering more than 120 cases of use with a budget of more than 80 million, managed by the Red.es entity and co-financed by the European Regional Development Fund (ERDF), which contributed more than 22 million euros in 2018-2020.

[25]Frequency band 3400-3800 MHz

[26]The three preferential bands of 5G in Europe were identified by RSPG in the document "Opinion on spectrum related aspects for next-generation wireless systems (5G)" https://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf

⊕ **Regulation of 5G networks and infrastructures:**

- The cybersecurity requirements that 5G networks and infrastructures have to meet in order to promote connectivity are particularly relevant as a cornerstone for the digital transformation throughout the country. The European Union is moving towards a common approach in this aspect, which is necessary to maintain the Digital Single Market without fractures. The most important milestone in this coordinated action has been the agreement on a 5G Network Cybersecurity Toolkit, reached in January 2020, which each country urged the European Council to take advantage of and transpose into its legal framework at its meeting in October 2020.

  Spain, like the other Member States, is making progress in this line of action, and its development is included in the form of a Draft General Telecommunications Law in this strategy.

[27]https://www.consilium.europa.eu/media/45932/021020-euco-final-conclusions-es.pdf

05

The starting point of the strategy: strengths and weaknesses

The European Union is immersed in the revolution of the new 5G technology, which is necessary to meet its major challenges scheduled for the coming years.

According to a report by the GSM Association[28] (GSMA), an organisation of more than a thousand mobile operators and related companies dedicated to supporting the standardisation, implementation and promotion of the GSM mobile phone system, **Europe has a series of aspects that could provide an opportunity to boost 5G services.**

Some of these positive aspects that GSMA highlights are, for example, the presence of 5G in 18 markets, the offer of numerous 5G smartphones, the knowledge of 5G technology or the increasing willingness of consumers to have this service.

However, **the GSMA also points out weaknesses in Europe in improving the implementation of 5G,** such as the belief, on the part of consumers and businesses, that 4G is still good enough, as a result of the lack of knowledge about the benefits that such technology can offer them.

In addition, GSMA believes that the stringent requirements for the provision of 5G services may also be a barrier or weakness for European telecom operators preparing to implement 5G networks. Some of the challenges[29] that it mentions are:

- Important regulatory barriers and long lead times for obtaining permits for the implementation of small cells.
- Excessive tax burdens and high investment costs associated with fibre, which prevent the implementation of 5G networks.
- Lack of globally harmonised spectrum in a certain frequency range to ensure effective implementation of 5G networks.

In Spain, the strengths and weaknesses identified in "Digital Spain 2025" for the digital transformation of our society and economy are perfectly transferable and applicable to the area of promoting 5G[30] technology.

Among the most important strengths Spain has, we should highlight its position to strengthen itself as an international connectivity hub, good connectivity and technological infrastructures, and the resilience and security of the grids.

In addition, Spain has the presence of relevant universities specialising in the technological field and at the forefront of some specialities, with a dynamic and talented society capable of adapting to changes and new developments, or, with various important productive sectors (tourism, agri-food, mobility, finance, digital content), for which the development of specific projects for digital transformation may mean an improvement in their productivity.

5.1. Challenges in Spain

[28]https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/03/GSMA_MobileEconomy2020_Global.pdf

[29]https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-BB.5G_01-2018-PDF-S.pdf

[30]See the analysis of the strengths and weaknesses of the digital transformation in Spain in "Digital Spain 2025". https:// www.mineco.gob.es/stfls/mineco/prensa/ficheros/noticias/2018/Agenda_Digital_2025.pdf

5G technology opens up new opportunities for economic, social and territorial development that will reinforce other policies essential for economic recovery and progress, such as ecological transition, the fight against the demographic challenge or the strengthening of the welfare state.

In terms of weaknesses, from a national perspective, Spain is relatively behind in terms of digital capacity and, furthermore, there is heterogeneity in business digitalisation, since alongside large, highly digitalised companies in sectors such as banking or the information sector, there are many SMEs and micro-SMEs, which make up the majority of our business fabric, and which are still far from optimum levels of digitalisation.

On the other hand, despite Spain's advanced position in the deployment of high-speed broadband networks, in particular fibre optics, and the incipient transfer of the Spanish success model of fibre deployment to 5G infrastructures and services, enabling a highly favourable scenario for the creation of digital ecosystems, some weaknesses can also be seen, derived from the territorial dimension and its orographic profile, and other existing gaps (social, economic or gender) which may slow down the development of 5G technology.

To draw up this Strategy, and in a similar way to the diagnosis included in Digital Spain 2025, the main strengths and weaknesses of our country have been identified **specifically in the area of promoting the deployment of 5G networks and services.**
A summary of these is given below:

Weaknesses
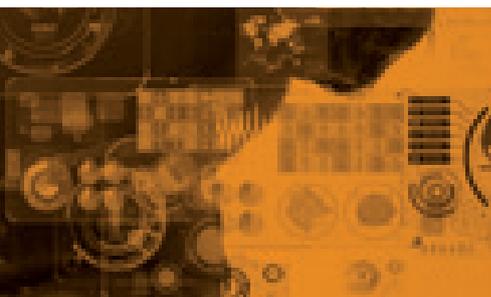
⊕ The size of the territory, the orographic difficulties, and the dispersion of the population, which implies very high costs to bring new infrastructure to areas outside the urban area.

⊕ The areas with the worst coverage are sparsely populated areas, generally with an older population (low working-age population) and a floating population.

⊕ Telecom operators with a downward revenue curve and difficulties in addressing new network infrastructure investments.

⊕ Delayed 700 MHz auction because of the pandemic.

⊕ Immature business model and profitability for 5G investments for their applications in the business environment.

⊕ Limited variety of 5G terminals. Prices are too high. The combination of high prices and no differential service to consumers compared to 4G leads to low user inclination to change the terminal.
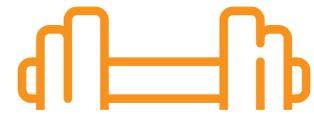
Strengths

⊕ Spain is one of the ten EU countries that have deployed 5G commercially.

⊕ Spain is the country with the highest number of 5G pilots deployed: 24 are underway, to which the new 8 projects approved in the second call for pilots in July 2020 must be added.

⊕ 5G transport corridors: two of the 11 corridors defined in the EU converge in Spain, on which pilot applications are already being developed.

⊕ Spain is the country in the Union with the most cities with 5G availability: 21 of 138 in the whole of the EU. By the end of 2020, the four most important operators in the country have announced that they will launch a commercial 5G offer in the 3.5 GHz band.

⊕ Fibre deployment: the most extensive coverage in the EU area, with a penetration of 80% reaching 46% in rural areas, it is expected that 93.1% of the population will have access to 100 Mbps by the end of 2022.

⊕ Availability of specific 5G R&D&I laboratories.

⊕ Use of 5G as a lever economic reconstruction: laying of networks and ducts, construction of sites, manufacture, marketing and distribution of equipment and terminals, etc.

⊕ Use of 5G as a digitisation lever: industry 4.0, connected vehicle, digital transformation of small and medium enterprises, sensorisation and intelligent territories, intelligent and sustainable mobility.

⊕ Use of 5G as a lever for territorial, social and gender cohesion: promotion of the emergence of new companies in any part of the territory, industrial development poles, and therefore jobs for everyone in the rural area: agri-food, tourism, traditional online trade...

⊕ Use of 5G as a lever for a change in the social model: connectivity and essential services for a better quality of life in less densely populated areas (home office working, remote assistance, remote training, etc).
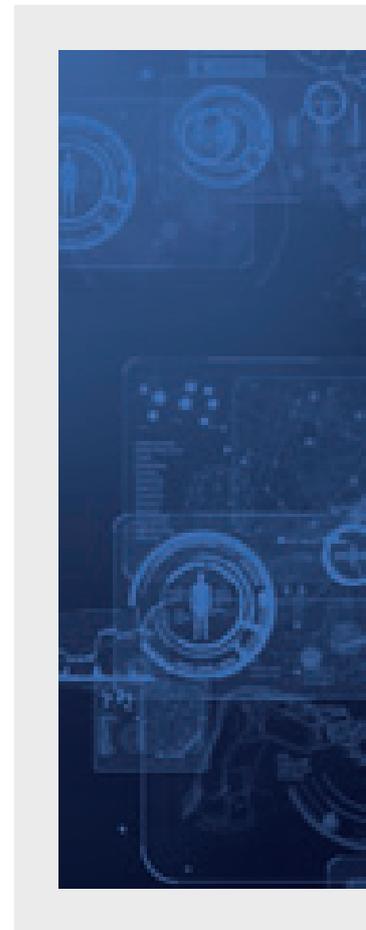
06

Vision and objectives

The Strategy is based on a vision of what it aims to achieve, and a series of strategic objectives to guide action in the coming years.

The "Strategy for the promotion of 5G technology" aims to make a decisive contribution to the economic, ecological, and social transformation of Spain, making it a richer, more fair and egalitarian society. To this end, we now have the chance to take advantage of the birth of a 5G technology with great potential for innovative change that will affect all areas: personnel, means of production, services, health, leisure, and entertainment. Moreover, this opportunity is **favourable position for the deployment,** thanks the extensive deployment of fibre optic networks throughout the territory, a basic issue for feeding the large volumes of data that will be processed with 5G.

The disruptive characteristics of 5G technology make **innovation and talent a key element for the leadership and exploitation of this technology.** 5G networks and infrastructures have the necessary characteristics to be open innovation platforms, where digital ecosystems focused on providing disruptive solutions for the driving sectors of the economy (mobility, manufacturing, health, energy, agro-industry, or entertainment) flourish, creating a virtuous circle between adoption and deployment that accelerates its extension throughout the territory and to all economic and social sectors. This opportunity can be exploited by Spain by strengthening the connection between the R&D&I laboratories and test fields dedicated to 5G technology already existing in Spain[31] and the productive sectors.

The development of **5G will also act as a lever for economic recovery,** with the capacity **to create jobs and consumption,** and will also have **favourable effects on the fulfilment of the Sustainable Development Goals of Agenda 2030,** given its direct and induced effects.

On the other hand, in the field of the technology sector itself, the architecture of 5G networks and systems, with less vertical integration and their future evolution towards 6G, provide an opportunity for the development of a globally competitive industry of its own, of which Spain wishes to form part within the European concert.
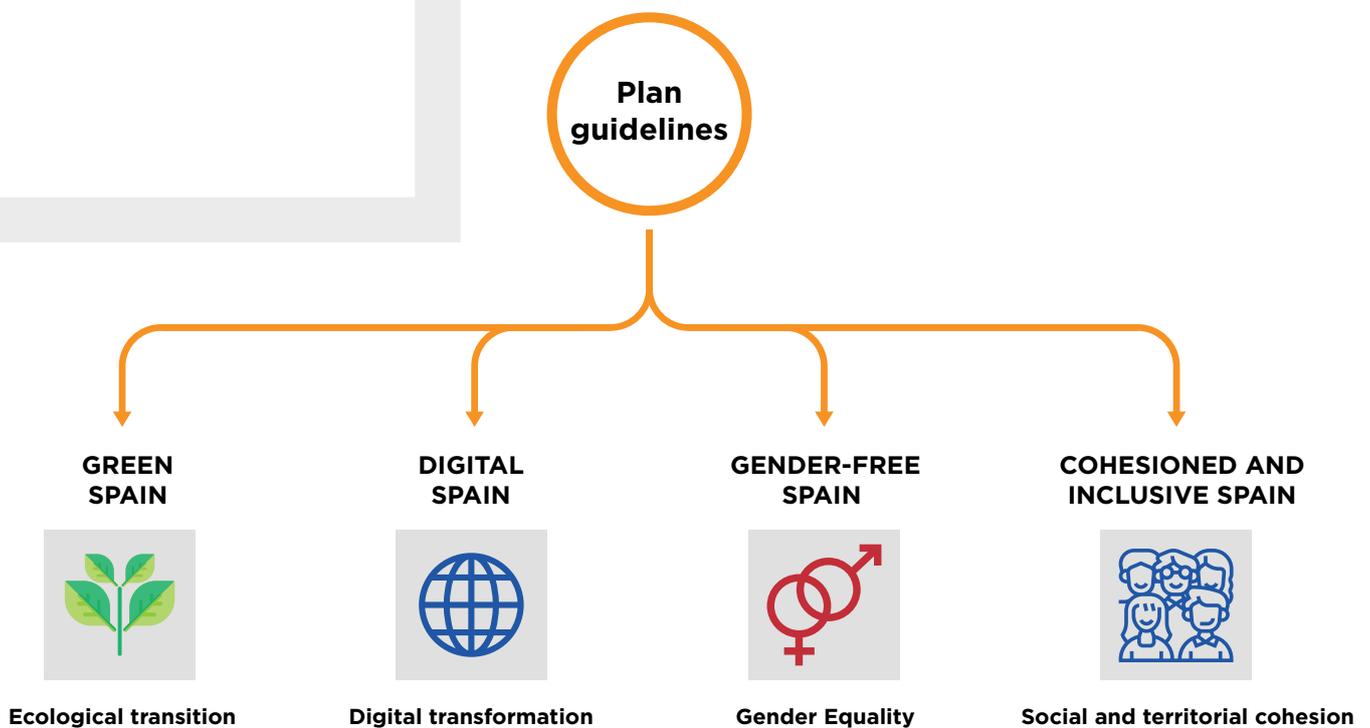
In short, **Spain must continue to consolidate its strength in 5G and contribute to European leadership.** The development of a country that is cohesive in its social, economic, and territorial dimensions requires making even greater efforts to extend connectivity without leaving anyone behind, facing up to the demographic challenge and depopulation, and attending to the specific needs of the most vulnerable, while at the same time developing projects that transform the economy.

6.1.
Vision

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[31]5Tonic, Barcelona 5G

6.2. Strategic objectives

As previously mentioned, the "Strategy for the promotion of 5G technology" is being developed under the **"Digital Spain 2025"** umbrella, which, within the scope of promoting the deployment of 5G networks and services, establishes the specific objectives mentioned above.

One of the objectives of the "Strategy for the promotion of 5G technology" is to directly and indirectly contribute to the four guidelines of the **"Recovery, Transformation and Resilience Plan, España puede",** presented by the Spanish government in October 2020, to tackle the challenges posed by the COVID-19 crisis, and which will guide the implementation of European funds available to Spain through the 'Next Generation EU' instrument. The guidelines set out in the plan are

Plan guidelines

GREEN SPAIN	DIGITAL SPAIN	GENDER-FREE SPAIN	COHESIONED AND INCLUSIVE SPAIN
Ecological transition	Digital transformation	Gender Equality	Social and territorial cohesion

The priorities of the Recovery, Transformation and Resilience Plan are fully aligned with the seven European Flagship Initiatives presented by the Commission in the Annual Sustainable Growth Strategy 2021, one of which is "increasing 5G coverage of the different regions". Thus, the Plan is structured around ten driving policies, one of which relates to the modernisation and digitalisation of the industrial and SME fabric, the recovery of tourism and the promotion of an enterprising Spain, which includes, as one of its projects, *"Digital connectivity, promoting cybersecurity and the deployment of 5G",* with an estimated budget of four billion euros for the period 2021-23.

As far as other countries in the world are concerned, the deployment of 5G is progressing at a rapid pace. According to data from the European 5G Observatory, there are about 100 operators providing commercial 5G services worldwide by the end of September 2020.

Against the backdrop of all these factors, the following **Action Objectives of the "Strategy for the promotion of 5G technology"** have been established for this Strategy.


1.
To support economic recovery and job creation

2.
To strengthen economic, social, and territorial cohesion, by social, economic or gender digital divides

3.
To contribute to the transformation of the productive sectors and the transition towards a new economic, ecological and social model

4.
To promote sustainable development

5.
To provide the country with the connectivity needed to increase its resilience to future crises

6.
Favour the consolidation of Spain as one of the leading countries in technological deployment and R&D&I in the development of applications on new digital technologies in Europe, especially 5G

Objectives of the Strategy

The six Strategic Objectives are described below:

1) **To support economic recovery and job creation.** The European Commission places the drive to deploy 5G within the digital transition as one of the priorities for using the European Union's Recovery and Resilience Mechanism. The economic and social value of 5G can be more than significant. It is estimated that the deployment of 5G will generate $13.2 trillion of global economic value by 2035 and will also generate 22.3 million jobs across the global value chain[32]. According to data from the European Commission[33], it is estimated that its economic impact will involve investments worth more than 5 billion euros and the creation of 330,000 jobs in Spain.

2) **To strengthen economic, social, and territorial cohesion, closing social, economic or gender digital gaps.** 5G is above all communication between people and between machines. But 5G must also be a tool to support social cohesion, helping to break the gender gap in the technological field and the inequality of access to digital skills and professions between men and women; reinforcing a structuring territorial model, promoting, and developing actions that allow 5G to be extended from an early stage in both urban and rural areas; and limiting the territorial gap effect that usually accompanies the deployment of emerging technologies.

3) **To contribute to the transformation of the productive sectors and the transition towards a new economic and social model.** Global deployment will continue in the following years in a gradual manner: if at present approximately 1% of all mobile subscriptions are 5G, this is expected to rise to 55% by 2025[34]. As 5G is implemented, users will be able
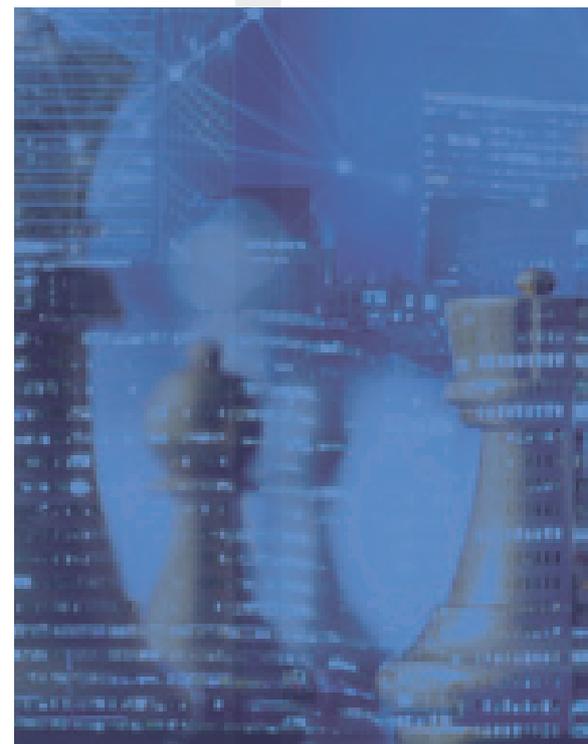
[32]IHS Markit Report https://www.qualcomm.com/media/documents/files/ihs-5g-economic-impact-study-2019. pdf

[33]Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe, https://op.europa.eu/en/publication-detail/-/publication/2baf523f-edcc-11e6-ad7c-01aa75ed71a1/language-en

[34]https://www.ericsson.com/es-es/mobility-report/reports/june-2020

to enjoy faster speeds and lower latencies, even if not all 5G features are immediately available. As the new standards become available over the next two years and the 5G deployment is extended and completed, more new services will become available to all, creating a momentum and innovative transformation that will affect many areas of our society, from smart cities and territories to health, smart mobility, manufacturing, automotive, agriculture, leisure, tourism, and commerce.

4) **To promote sustainable development.** There is a correlation between the deployment of 5G networks and the Sustainable Development Goals (SDG) set by the United Nations in its "Agenda 2030". According to a report by the World Economic Forum[35] based on the analysis of forty cases of use of this technology, it is concluded that 5G can provide social value in 11 key areas that correspond to 11 of the 17 Sustainable Development Goals (SDGs). This value is mainly derived from 5G's contribution to strengthening health and well-being (55% of its uses), improving infrastructure, and encouraging innovation (40% of its uses), and promoting sustainable industrialisation. Of critical relevance is the role and contribution of 5G networks to the decarbonisation of the economy and the fight against climate change (SDG 13). Other key areas where social value is created through 5G include the contribution to responsible consumption, the role of 5G as an enabler for the development of sustainable cities and communities, and the promotion of economic growth and decent work.

5) **To provide the country with the connectivity needed to increase its resilience to future crises.** The situation caused by COVID-19 has made the need to improve connectivity even more evident to cope with exceptional circumstances such as those experienced during the health crisis. Video-conferencing without delay; remote medical care; fluid connectivity even in large agglomerations such as concerts or sporting events; high resolution video games; higher quality and safer domotic[36] and industrial systems. 5G will bring to society and the economy the ability to keep the world going in the event of a new pandemic.

6) **To favour the consolidation of Spain as one of the leading countries in technological deployment, and in R&D&I in the development of applications on new digital technologies in Europe, especially 5G.** At the beginning of 2020, Spain had consolidated its leading position in the development and promotion of 5G networks and services in Europe. This effort has enabled the development of an ecosystem in which digital and vertical companies collaborate with operators by exploring new services and technologies and which now deserves to be strengthened with R&D&I programmes dedicated to the development of capacities both in the wireless electronic communications segment itself and in its applications to other sectors.

[36]Domotics is the name given to systems capable of automating a house or building of any kind, providing energy management, security, welfare and communication services, and which can be integrated by means of internal and external communication networks, wired or wireless, and whose control enjoys a certain ubiquity, from inside and outside the home.

07

Axes, goals, and strategy map

Spain's commitment to 5G has to be decided, because of its triple potential as:

- ⊕ **Reconstruction lever and investment driver;**
- ⊕ **Business model disruption capacity** due to its ultralow latency and high-density device connectivity facilities;
- ⊕ **Territorial structuring axis,** acting as a new vector to extend the coverage of high-speed networks capable of offering new development opportunities in low population density environments.

In this scenario and by actively collaborating in plans for the development of future technologies such as 6G, the Spanish Government aims to make our country one of the most developed ecosystems of 5G and a testing and development platform of the highest quality in Europe.

To this end, this Strategy aims to give renewed impetus to the deployment of 5G in Spain by means of actions in three areas of action:

7.1.
Action lines

Axis 1:	A radio spectrum enabled for 5G services
Axis 2:	Effective support for the deployment of 5G networks and services
Axis 3:	A regulatory and administrative framework to boost the deployment of 5G technology

⊕ **Axis 1:** A radioelectric spectrum for 5G services, which is essential to keep Spain among the leading countries in Europe.

⊕ **Axis 2:** Effective support for the deployment of 5G networks and services, favouring the availability of the necessary infrastructure for the development of an ecosystem of 5G services both in the business sphere and at different territorial levels of government and promoting innovation and R&D&I in the field of the fifth generation of mobile telephony.

⊕ **Axis 3:** A regulatory and administrative framework to boost the deployment of 5G technology that promotes an investment climate and provides legal certainty for agents.

In designing this Strategy, account has also been taken of the report "Report on the exchange of Best Practices concerning national broadband strategies and 5G path-to-deployment", drawn up by the Communications Committee (COCOM[37]), which summarises and details the most common strategic elements being considered by the Member States when establishing their 5G plans.

[37] The Communications Committee (COCOM) is a committee composed of representatives of the EU Member States whose main role is to give an opinion on the draft measures that the Commission intends to adopt.

7.2.
Goals

As a result of the development of the "5G Technology Impulse Strategy", the following goals are expected to be achieved in 2025 for each of the strategic axes:

AXIS	ASSOCIATED GOAL	DESCRIPTION OF THE GOAL
Axis 1: A radio spectrum enabled for 5G services	100% allocated[38].	Spectrum prepared for 5G in the bands designated as preferential in the European Union[39].
Axis 2: Effective support for the deployment of 5G networks and services	75% of the Spanish population covered in the bands designated as preferential.	5G population coverage using the bands designated as preferential for 5G in the European Union.
	Uninterrupted 5G coverage on the main roads and railways, as well as at singular points such as airports.	Coverage in communication paths.
Axis 3: A regulatory and administrative framework to boost the deployment of 5G technology	Availability of a regulatory framework and instruments for certification, innovation and improvement.	5G Cybersecurity.

[38]As described in the methodology of the DESI report, "Spectrum allocated as a % of the total harmonised 5G spectrum"

[39]The bands designated as preferential by RPSG are 694-790 MHz, 3,400-3800 MHz and 24.25-27.5 GHz

The Strategy also consists of **15 measures**, which are structured around the 3 Strategic Axes and 6 Lines of Action, with which it is intended to promote 5G Technology in Spain.

7.3.
Strategy Map

STRATEGIC AXIS	ACTION LINE	MEASURES
AXIS 1. A radio spectrum enabled for 5G services	1. 5G spectrum allocation	1. Provision of the 700 MHZ band 2. Provision of the 26 GHZ band
	2. 5G spectrum management	3. Rearrangement of the 3.5 GHZ band 4. Enabling the Harmonized Bands for use in 5G
AXIS 2. Effective support for the deployment of 5G networks and services	1. Incentives for the deployment of 5G networks	5. 5G deployment in town centres 6. 5G deployment in transport corridors 7. Deployment of 5G mobile networks 8. Good practices guide and support to local authorities for deployment
	2. Demand-side and 5G ecosystem promotion	9. 5G in sectoral digitisation tractor projects 10. Promoting innovation in 5G technology 11. 5G Cybersecurity Ecosystems
AXIS 3. A regulatory and administrative framework to boost the deployment of 5G technology	1. Reduction of administrative barriers to the promotion of 5G technology	12. Simplification of administrative procedures 13. Reducing deployment burdens
	2. Legislation to boost 5G technology deployment	14. Legal instruments for speeding up network deployment 15. Cybersecurity Act 5G
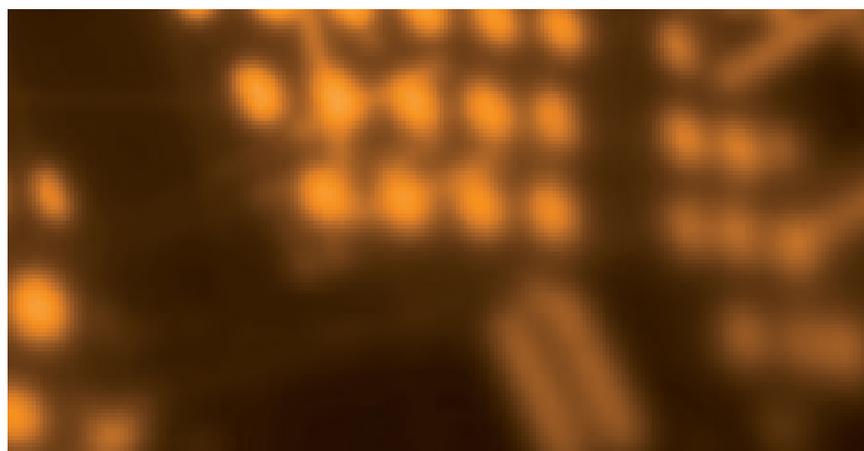
08

Action lines

This chapter details the measures of the Strategy, according to the Axes and Action Lines

| **RADIO SPECTRUM AVAILABLE FOR 5G SERVICES** |

8.1.
Strategic Axis 1: radio spectrum for 5G services

A fundamental aspect for the development and implementation of 5G is the availability of frequencies. On 16 September 2016, the European Commission published the 5G Action Plan for Europe, with the aim of boosting and coordinating efforts in the European Union for the deployment of 5G networks and services. One of the key elements, identified in this Plan, is the availability, at the right time, of the frequency bands identified by the European Union's Spectrum Policy Group (RSPG) as priorities for the implementation of the technology (694-790 MHz, 3,400-3800 MHz, and 24.25-27.5 GHz)[40], as well as enabling the use for 5G of those new frequency bands which are expected to be identified at the next World Radio-communications Conference in 2023.

Providing adequate access to the specified spectrum bands for 5G services within the appropriate time frame and with guarantees of contiguous spectrum are critical factors to allow the full development in Spain of the new generation of telephony. It is therefore essential to include in the Strategy actions to facilitate the availability of priority frequency bands, which requires planning actions and, in some cases, the release of occupied resources. The actions in this area are key to ensuring that the objective of 100% availability of the spectrum required for the deployment of 5G, as indicated in the "Digital Spain 2025" strategy, is achieved by 2025.

The measures envisaged in this area **will involve making the preferential frequency bands** (694-790 MHz, 3,400-3,800 MHz and 24.25-27.5 GHz) available to the sector and reorganising them, which will enable operators to have contiguous spectrum at their disposal and make more efficient use of it to offer their services.

[40]In November 2016, the RSPG adopted a first Opinion on 5G, in which it first identified the 3400-3800 MHz band, and also the 694-790 MHz and 24.25-27.5 GHz bands, as the priority bands for the launch of 5G services in Europe. In February 2018, the RSPG adopted a second Opinion addressing strategic issues, also highlighting that the availability of the 3400-3800 MHz band is key to the successful launch of 5G in Europe. In February 2019, the RSPG approved a third Opinion on some of the challenges for the implementation of 5G, such as the reorganisation of the 3400-3800 MHz band so that operators have contiguous spectrum in the band, and aspects related to the use of 5G for industrial applications.

8.1.1 ACTION LINE 1: ALLOCATION OF 5G SPECTRUM

This line of action line focusses on promoting, through appropriate public procurement and other administrative procedures, the availability of the 700 MHz and 26 GHz radio spectrum bands to the sector so that they can be used for the deployment of 5G technologies and services.

8.1.1.1. Measure 1: Availability of the 700 MHz band

The availability of the 700 MHz band for the deployment of 5G technology requires a previous step consisting of the release of this frequency band from its current uses in a process called the Second Digital Dividend (2DD).

The release of the second digital dividend in the 700 MHz band, which is currently used for Digital Terrestrial Television (DTT) and will be used for 5G mobile communications, is a process that is being carried out in a harmonised manner in the European Union in accordance with Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017 on the use of the 470-790 MHz frequency band in the Union. In the case of Spain, this process moves the DTT transmissions that are being made in this 700MHz band to other frequencies below this band, without any loss in the number of DTT channels that users receive. Public aid has been used to compensate users and broadcasters for the costs of releasing frequency bands (e.g. re-antennation, simulcast or simulcasts, etc.).

This process, which requires the adaptation of collective reception facilities in many buildings, has been slowed down because of the restrictions arising from the impact of COVID-19, making it impossible to complete it by the scheduled date of 30 June 2020, with 31 October 2020 being set as the new date for completion of the second dividend process, which has been communicated to the European Commission in the interests of coordinating this harmonised process at European level. The immediate consequence has been the postponement of the auction of **the 700 MHz frequency band** planned for the second quarter of 2020. **It will be carried out in the first quarter of 2021.**

8.1.1.2. Measure 2: Provision of the 26 GHz band

The 26 and 28 GHz (24.25-27.5 GHz) millimetre-wave bands are the most suitable for providing 5G wireless broadband electronic communications services requiring very high capacity. These bands will be made available in accordance with the views of RSPG(*) and the harmonised technical conditions adopted by the European Commission(**). Particularly, by adequately protecting the satellite systems operating in the band, and by ensuring that the continued deployment of earth stations is possible for the Earth exploration-satellite service (space-to-Earth) or in the space research service (space-to-Earth) in the frequency band 25.5-27.0 GHz, and for the fixed satellite service (Earth-to-space) in the frequency band 24.65-25.25 GHz.

The 26 GHz frequency band can play a very important role in vertical applications related to the industrial, logistics, trans-

port, or supply sectors[41]. The 'European Electronic Communications Code' provides that Member States should allow the use of at least 1 GHz of the 26 GHz frequency band to facilitate the deployment of 5G technology, provided there is clear market demand and no major constraints on the migration of existing users[42]. Among other uses of this spectrum band, the provision of 5G localised frequency use for internal use would be assessed. The present strategy envisages that **the allocation of frequencies in this band will be completed by 2021,** so that very high-capacity services can be started as soon as standards, equipment and deployments are available. To this end, a public consultation will be carried out to have an updated view of the demanding applications, the business authorisation models, the telecommunication operators and other possible stakeholders, the availability of equipment and the associated value chain.

8.1.2 ACTION LINE 2: MANAGEMENT OF THE 5G SPECTRUM

The second line of action, complementary to the first, focuses on achieving greater availability of spectrum for 5G technology and services, through the reordering of the use of certain bands, or through the enabling of 5G for those harmonised in Europe for electronic communications services.

8.1.2.1 Measure 3: Realignment of the 3.5 GHz band
Prior to the reordering (defragmentation) of this frequency band, **20 MHz should be tendered in the 3 400-3 600 MHz frequency band,** which is currently unallocated. In this way, the band can be reordered with the greatest guarantees and use, as no subsequent revisions are necessary.

The reordering of the band will allow operators with concessions in this band to have the spectrum available contiguously, which is the one that allows for the most efficient use and with which businesses and consumers can take full advantage of all the capacities provided by the 5G standard with full quality. **This process will start in the fourth quarter of 2020 and end in the first quarter of 2021.**

8.1.2.2 Measure 4: Enabling the Harmonised Bands for use in 5G
In application of the principle of technology and service neutrality, the different frequency bands harmonised in Europe for electronic communications services, including those on which current mobile phone services are provided (800 MHz, 900 MHz, 1800 MHz), may be used for the provision of 5G services, 2 GHz, 2.6 GHz), as well as those new frequency bands that will be identified at the next World Radiocommunication Conference in 2023. To this end, the **National Frequency Allocation Table (NFAC) will be modified to include the harmonised technical conditions, valid for 5G, of each of the frequency bands.** The synchronization or other conditions required at the national level will also be established, and the international coordination agreements with all neighbouring countries will be revised for each of the frequency bands so that they can be used with 5G technology. This measure
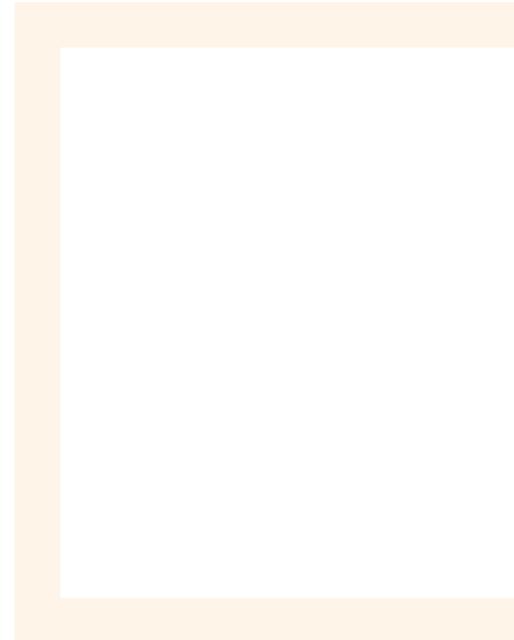
[41]The 24.25-27.5GHz band (26 GHz) is the 5G band identified to offer very high-capacity coverage in areas with a series of connected devices. It significantly increases data transmission capacity and favours the use of multi-antenna and multiple access technologies. This makes it very suitable for obtaining localised coverage by providing small cells with high capacity, providing ultra-reliable and low-latency communications, aspects that are particularly interesting in urban and industrial environments, by definition, with a high density of connected devices.

[42]See article 54, https://eur-lex.europa.eu/legal-content/es/TXT/?uri=CELEX%3A32018L1972

will enable the concessionary operators to make more efficient use of their frequency pool and will provide end users with more spectrum resources for better access to services such as telemedicine, tele-training, etc.

8.2. Strategic Axis 2: Effective support for the deployment of 5G networks and services

EFFECTIVE SUPPORT FOR THE DEPLOYMENT OF 5G NETWORKS AND SERVICES

The support of the Administration has been key for Spain to reach the current level of development of 5G services and networks. Financial support has been provided and the use of the necessary frequencies has been facilitated for the development of pilot experiences that allow the identification and testing of cases of use of this technology. **In the new phase that is opening, the measures are concentrated on supporting the deployment of networks, reinforcing the actions of private initiative,** to accelerate investments in network infrastructure in the bands identified as preferential for 5G use in the European Union. In addition, the drive to promote ecosystems that develop 5G services for businesses and government will be continued with innovation support programmes.

Deployment support measures act on four key areas in the deployment of 5G:

- ⊕ Transport corridors.
- ⊕ Town centres.
- ⊕ Mobile network.
- ⊕ Support for 5G projects in social and economic activities: business and industrial solutions, and essential public services.

The different measures of this axis will be aligned with the objective of favouring **the extension of the coverage footprint in the fastest and most territorially inclusive way possible.** Given the enormous transformational potential of 5G technology, this strategy aims to boost deployments in those areas where operators would be slow to arrive with their conventional deployment models. A 5G deployment that delivers transformational benefits to all from the outset. This approach will mean that actions will be promoted that complement the operators' deployment plans, encouraging the acceleration of deployment and support in those areas, territories, and activities where 5G has a greater transformational effect and generates positive externalities.

8.2.1 ACTION LINE 1: INCENTIVES FOR THE DEPLOYMENT OF 5G NETWORKS

This line of action aims to make available to operators and other public and private actors involved in network deployment a set of incentives and support resources to stimulate and facilitate the deployment of 5G networks in population centres and on primary and secondary transport corridors.

8.2.1.1 Measure 5: 5G deployment in town centres

To encourage private investment and promote **the territorial expansion of the 5G network,** a series of actions will be carried out to speed up and increase the territorial coverage of these networks.

Firstly, a **deployment aid plan will be created. This aid to the sector will consist of a bonus associated with the installation of 5G networks and base stations** (provided they have not previously received other types of public aid). The costs of acquiring, installing, and upgrading equipment, among others, would be eligible for a subsidy. Operators will undertake to provide coverage in line with the percentage of the population covered and linked to the aid received. This commitment must go beyond any coverage obligations that may have been established in the tenders and agreements for granting operating frequencies.

To ensure that the extension of networks is not concentrated in urban environments, the intensity of aid will be gradual, being lower in large cities, and higher the lower the number of inhabitants of the population to be covered. Similarly, the definition of aid will consider aspects related to the temporal advance of network deployments in order to obtain the maximum early advantage of the opportunities that 5G offers for economic development.

To the same end and in order to maximize the performance and exploitation of the infrastructures in service in the territory, the use of existing telecom infrastructures or others such as electricity transport infrastructures will be considered. This will allow the acceleration of the establishment of networks and the deployment of 5G technology, mainly in the rural areas and in Empty Spain.

As a continuation of the first phase of this measure, from 2023, and according to the degree of development achieved of the 5G networks, the opportunity to design and implement specific programmes to continue with the extension of 5G coverage in rural areas by aligning it with secondary corridor deployments will be assessed.

Secondly, it must be considered that the deployment of 5G in urban environments requires the installation of numerous small size and range antennas, the so-called small cells. Small cells allow

for an optimised user experience in 5G services. In this sense, the "Implementing Regulation"[43] that the European Commission has adopted on wireless access points for small areas (small cells)[44] is of particular importance. To make these deployments effective, it is necessary to disseminate the scope and characteristics of these deployments and the regulations that govern them among the local authorities, so that they do not create barriers to them.

To this end, and as part of the actions aimed at speeding up 5G network deployments in population centres, a working group will be set up to coordinate and execute a series of tests for the experimental deployment of small cells in certain cities selected for this purpose. To this end, the Spanish Federation of Municipalities and Provinces (FEMP), the Spanish Network of Intelligent Cities (RECI) and the Spanish Association for Standardisation and Certification (AENOR), among others, will be invited and asked to participate in this Group. The objectives of this group are to establish the scope and characteristics of the tests and to propose the collaboration agreements for their development, as well as the necessary economic endowment for their execution within each selected city.

For each project, the appropriate streets or areas will be chosen to evaluate the impact of the deployment of small cells and the densification of the network in urban environments. These tests, in which operators, installers and government personnel will participate, will allow conclusions to be drawn to simplify deployments, as well as to evaluate a series of practices that anticipate and avoid future problems that may arise, through the coordinated action of all the agents involved.

8.2.1.2 Measure 6: 5G deployment in transport corridors

The 5G corridors will encourage increased competition in the telecommunications, transport, and logistics sectors. The importance of transport corridors for the development of 5G is recognised by the European Union: the European Commission set as a key objective for the Gigabit Society to achieve uninterrupted coverage of 5G on major roads and railways by 2025. This objective is reaffirmed in "Shaping Europe's digital future"[45], of February 19th, 2020. The corridors will also become a vector for the extension of coverage and territorial cohesion by favouring the extension of 5G networks to rural and sparsely populated environments. Finally, they are a central pillar in the development of an ecosystem of connected, automated and electrified mobility, which will jointly promote the digitalisation of transport and its decarbonisation.

With the aim of cohesive territorial development, the 5G Technology Promotion Strategy seeks to develop 5G infrastructure on primary and secondary corridors. **The investments required for the deployment in these corridors combine public and private efforts.** On the one hand, around the main rail and motorway corridors, it will be supported by Community programmes. On the

[43] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uri-serv:OJ.L_.2020.234.01.0011.01.ENG&toc=OJ:L:2020:234:-TOC

[44] The Regulation specifies the physical and technical characteristics of small cells for 5G networks. It aims to help simplify and speed up installations

[45] https://ec.europa.eu/info/sites/info/files/communication-shaping-europes-digital-future-feb2020_en_4.pdfRegulation specifies the physical and technical characteristics of small cells for 5G networks. It aims to help simplify and speed up 5G network installations, which

other hand, the start of the rural deployment of 5G around the secondary communication corridors will be encouraged. In both cases, the combined public-private investment effort is expected, which will require leveraging the contribution of the operators.

Investment efforts will be focused on two levels:

1. Primary corridors: These corridors include motorways, highways and high-speed rail lines, both national and cross-border. In short, the provision of 5G coverage on the country's main communication and passenger and goods transport routes, favouring the development of connected and automated mobility between large cities, enabling the digital transformation of logistics and passenger transport and the decarbonisation of these. The Connecting Europe Facility 2021-27 (CEF2) focuses on the development of cross-border primary corridors[46] , with the remaining national primary corridors being the object of investment, both public and private, directly by the operators. To promote the development of 5G in the cross-border corridors, Spain has signed agreements with France and Portugal.

2. Secondary corridors: The deployment of 5G cannot be limited to large infrastructure and large urban centres. The deployment of 5G infrastructure accompanies and is part of a policy of territorial structuring and economic and social cohesion. For this reason, an aid instrument will be set up to encourage the deployment of 5G infrastructure on national, provincial, and other secondary roads in rural areas, promoting the extension and continuity of 5G coverage beyond populated areas.

8.2.1.3 Measure 7: 5G mobile network[47]

Fibre optic networks have evolved to become the main means of transmission between network elements, both in access and transport networks. To enable the 5G network to adapt to future changes and to meet the high demand for bandwidth and the significantly higher density of base stations than in previous generations. In addition, it will need to respond to new service needs, where computing and storage resources will need to be located closer to the edge of the network, where data is generated or consumed, to meet the expected and required quality of service. Therefore, it will be necessary to face new investments to improve connectivity and capacities of the sites (both those that are updated and new deployments), as well as to replace existing radio links and other elements that imply bottlenecks and possible bottlenecks for 5G traffic.

To this end, as a complement to the "Connectivity of People, Companies and Territories Plan", also developed as part of the "Digital Spain 2025" strategy, an aid programme will be set up to update the transmission capacity of sites, make it scalable for the future and use its capillarity to improve the levels of coverage and service of mobile broadband communications in rural areas.

[46]The proposed Regulation Connecting Europe Facility 2021-27 defines the following cross-border corridors from Spain to Portugal and France:

• For automated driving on cross-border sections

- Vigo-Port

- Évora-Mérida

- Aveiro Salamanca

• For large-scale automated driving

- Metz - Paris - Bordeaux - Bilbao - Vigo - Porto - Lisbon

- Bilbao - Madrid - Lisbon

- Madrid - Mérida - Seville - Tarifa

- Montpellier - Narbonne - Perpignan - Barcelona - Valencia - Malaga - Tariff with extension Narbonne - Toulouse

[47]In telecommunications, a transmission network (or backhaul) is the portion of a hierarchical network comprising the intermediate links between the core (or backbone), and the subnetworks at its edges.

Eventually, among the elements that would support the deployment with this measure could be the components associated to the edge-computing facilities of the 5G standard.

The instrument to be used would be **calls for proposals where aid would be granted to the sector to update the connectivity of sites.** As in the case of other calls for proposals to support the deployment of broadband electronic communications services, the bases will follow the principle of technology and service neutrality, always considering and assessing both terrestrial and satellite technologies.

8.2.1.4 Measure 8: Good practice guide and support to local authorities for deployment

One of the main obstacles to overcome when it comes to speeding up network deployments in towns is the lack of knowledge or partial knowledge of the legal framework that covers network deployments in the urban area, the documentation that must be required from operators, and the deadlines and maximum response times to be observed. This situation occurs more frequently in smaller municipalities or those that do not have sufficient administrative support. To correct this situation, the following actions will be carried out, in coordination with similar actions in the "Connectivity Plan":

⊕ **A Guide to Good Deployment Practices will be drawn up describing the applicable Spanish and EU regulations and detailing the best practices observed.** This Guide will have the collaboration of the FEMP and the contribution of the Sector will be requested. To reach the maximum interested public, several dissemination and awareness actions will be carried out: publication of the Guide, presentation of the Guide in national and international forums, etc.

⊕ In collaboration with the FEMP[48] and the INAP[49], **a campaign will be carried out to train local public administration employees in town planning and telecom regulations:** knowledge of the legal framework and the future Guide to Good Deployment Practices, adaptation of local town planning regulations, clarification of procedures, administrative deadlines and response times, classification of responsible statements, etc.
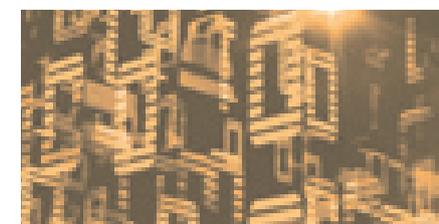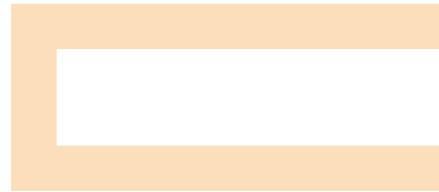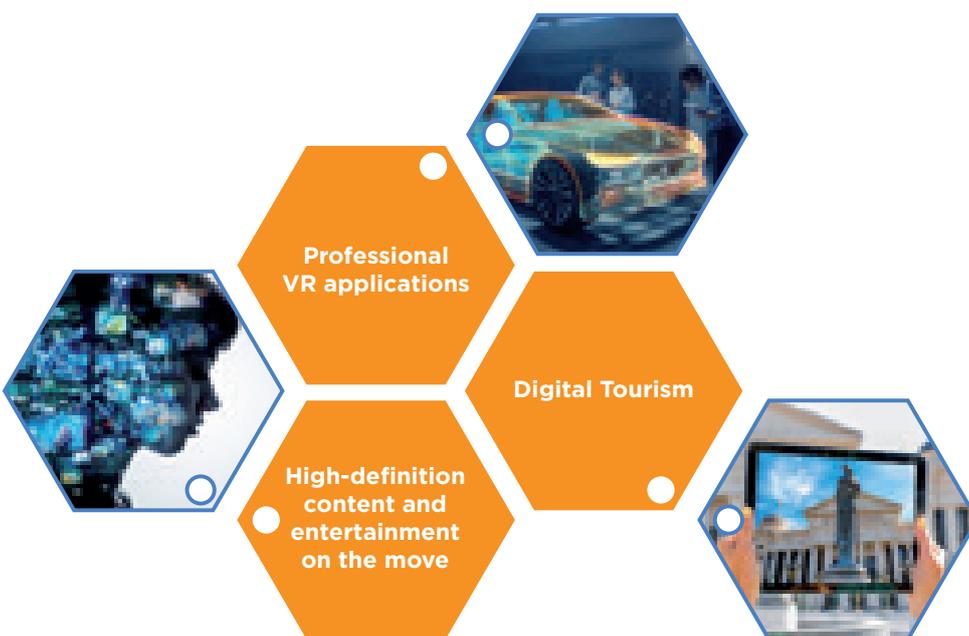

8.2.2 ACTION LINE 2: DEMAND-SIDE STIMULATION AND 5G ECOSYSTEMS

This action line seeks to encourage the demand for 5G services and technologies, through the support and promotion of large digitalisation projects in sectors that demand intensive use of 5G, as well as through the promotion of real public-private ecosystems that encourage innovation, entrepreneurship, cyber security and talent around 5G networks, technologies and services.

8.2.2.1 Measure 9: 5G in sectoral digitisation driving projects

5G connectivity will allow companies to move towards greater productivity, with the business sector being the one where the greatest innovations will occur. For economic activities of all kinds, the pandemic has shown that industry and business must be flexible in adapting their plants, services, and procedures to market circumstances. 5G technology will enable these companies to move towards the concept of the "wireless factory", where wireless technologies speed up changes in production chains in response to changes in the environment.

In other sectors such as the agri-food industry or tourism, and in general the service sector, 5G connectivity will allow substantial improvements in competitiveness and the generation of new business models. This effect also extends to the automotive sector, facilitating the deployment of connected, automated and electrified vehicles, and contributing to the change in the mobility paradigm in our country, in line with the "Safe, Sustainable and Connected Mobility Strategy" of the Ministry of Transport, Mobility and the Urban Agenda.

Professional VR applications

Digital Tourism

High-definition content and entertainment on the move

Cases of improved bandwidth use

Similarly, connectivity has been key to maintaining the activity of essential public services during the state of alarm and has served to enhance the value of innovative digital services that can be enhanced by 5G technology. Thus, for example, the development of teleassistance or distance learning has taken on an inclusive meaning following the COVID-19 health crisis.

Connected car and smart transport

Logistics innovation

Remote monitoring of critical machinery and infrastructure

Use cases of ultra-reliable real-time communications

To this end, a collaboration line will be opened with the bodies responsible for the sector in order to identify and **finance 5G use cases in tractor projects** of companies that occupy strategic positions within the productive fabric of each sector. Special focus will be placed on the successful experiences resulting from the two calls for 5G pilots carried out by Red.es within those high-impact productive areas that act as driving forces for the economy and, at the same time, act as demonstrators of the transformative power of 5G in the different industrial and application service verticals. Public-private collaboration is essential for the development and success of the model.

A parallel collaboration line will be developed with the aim of identifying and financing 5G uses for tractor projects in the education, health, care, and social welfare services that contribute to a more inclusive development.

5G use cases in traction projects for digitalisation

The transversal impact of 5G technology on the economy and society is reflected in various studies published in recent years and is derived from the ductility of its application in multiple industries, creating new business models, transforming the develo-

Smart farms and precision agriculture

Sporting events

Automated production lines

Cases of high-density use of devices

pment of activities and multiplying productivity. The Ministry of Economic Affairs and Digital Transformation, through the call for pilot projects from Red. es, promotes the development of illustrative cases of the potential of 5G technology.
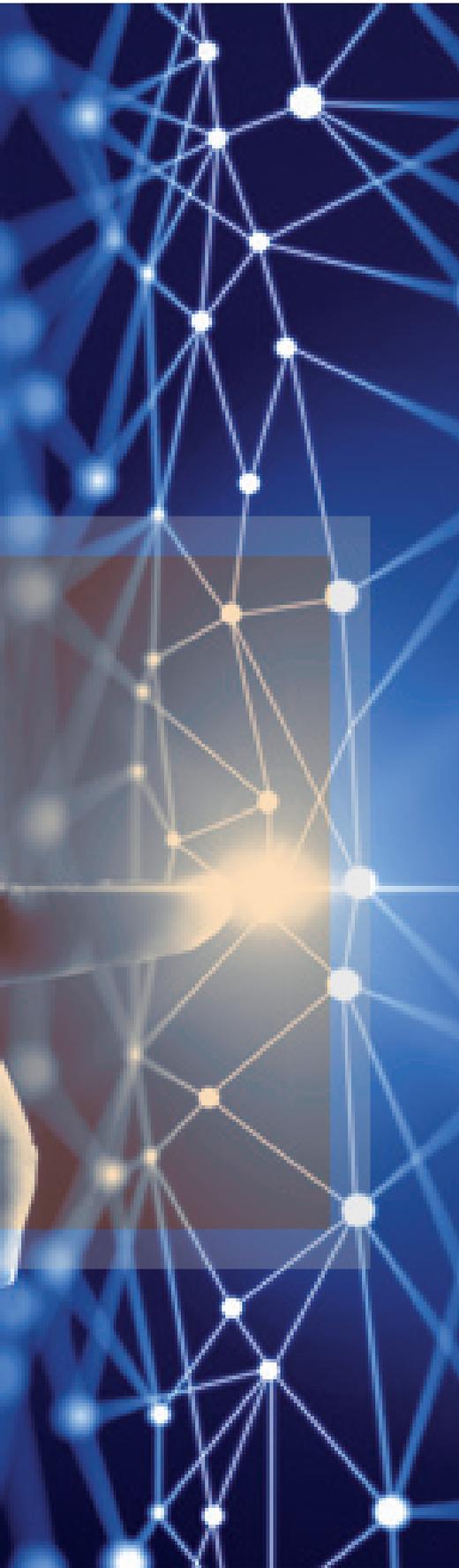
Connected and automated vehicles

Until now, automated vehicles have depended on sensors to assist with navigation and collision control. They usually operate on fixed routes or only have basic capabilities to optimise routes. 5G will massively enable the connectivity of automated vehicles, which trained with Artificial Intelligence applications and based on the data generated by them and the road infrastructure, will have automatic learning capabilities for decision making and new on-board multimedia services. 5G will also help next-generation automated and connected vehicles to run control software and process data in the perimeter cloud (edge computing), providing them with immense computing power at a lower cost than on-board processing.

Smart health

5G can help save lives, as a basis for the digital transformation of the health service. The improved bandwidth of 5G connections enables high-resolution video consultations combined with virtual and augmented reality. Similarly, assistive robots will facilitate remote patient care by professionals without the need to travel, providing the most highly specialised care to any environment. Finally, intelligent portable devices will help increase the efficiency and effectiveness of treatments by constantly monitoring patients' vital signs wherever they are.

Digital transformation of manufacturing and operations

The Internet of Things, with the support of 5G, is going to be a fundamental part of optimising companies' manufacturing processes. Companies can capture significant value by using advanced analytical applications to optimise and adjust process parameters in real time, facilitated by the high density of connected devices and low latency characteristics of 5G. Other factors that will contribute to the optimisation of production processes are global connectivity between production centres, as well as with customers and suppliers, and improved distribution and logistics and 3D printer-based manufacturing.

Immersive leisure experiences

The high-capacity, anywhere bandwidth of 5G technology will ena-
ble the optimised development of applications in mobility such as
augmented or enhanced reality, virtual reality, high-definition 3D
with 4K/8K, broadcasting from drones, etc. All this will facilitate
360º broadcasting allowing you to experience live events or onli-
ne games from home with high user experience control facilities.

Airports

Airports are the stages that can host remarkable use cases. Due
to their particularity, they have great potential for use as a plat-
form for new technologies. For this reason, it will be interesting
to consider them as test and launch points for 5G. Some of these
possible use cases could be the use of drones with high-definition
images, the connected and autonomous vehicle, and the massive
application of the IOT to terminals and infrastructures.
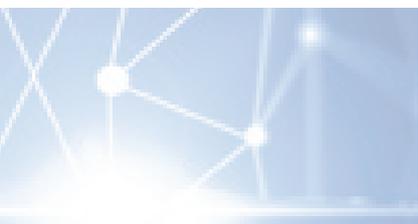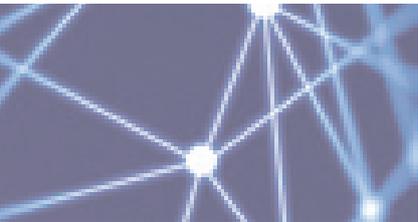
8.2.2.2 Measure 10: Promotion of innovation in 5G technology

To promote innovation and entrepreneurship to link human capital and talent to the development, implementation and marketing of products and services around 5G, and above all, to enable the establishment of an industrial base in Spain and linked to 5G and the future 6G, **annual calls for aid will be made to technology companies, research entities, universities, and consortia for the promotion of innovation in 5G.**

The target is **to support the creation of an ecosystem based in Spain that will attract investment, that will encourage the emergence of start-ups, and innovative companies for the development of equipment and services in 5G,** and as a result, lay the foundations that will make possible the technological, industrial and business development of the next decade in our country, which will **generate employment and stable, high-quality jobs, for which it is essential to imbue the productive sector with these.** The thematic focuses of future and interest identified in the development of 5G infrastructures and services, such as Open-RAN, 6G, Edge Computing, Network Slicing...

Analyses of the most relevant areas of interest in the field of European R&D&I programmes will be carried out to position Spanish companies and research and innovation centres among the leaders in future technological developments.

The development of 5G ecosystems will require training of people and companies. To this end, collaboration channels will be developed with universities and professional training organisations for employment in the field of the Digital Skills plan which forms part of the Digital Spain 2025 Strategy.

8.2.2.3 Measure 11: 5G Cybersecurity Ecosystems

Taking advantage of the traction effect of the 5G cybersecurity law that will be developed under this strategy, the development of ecosystems around 5G cybersecurity will be promoted by supporting the creation of working groups and generating synergies between telecoms operators, manufacturers, universities, and companies specialised in the field of 5G hardware and software security. 5G cybersecurity ecosystems are considered key to the implementation of the Commission's toolkit. Resources and investment will therefore be devoted to the creation of 5G cyber security infrastructures with the following tasks:

- To provide research and certification laboratories for in-depth security assessments, including source code reviews.
- Ability to perform security design audits, procedures, document reviews and penetration testing across the entire 5G commercial product line, with all supply chain partners, operators and suppliers working together.
- To facilitate synergies between start-ups, universities, and research, regulation, and standardisation bodies.

In this new digital society, it is crucial to ensure confidence, especially that of citizens, in technology to ensure its adoption. In addition to physical and digital security, it must also be a key instrument for protecting the digital rights of individuals and businesses.

Addressing these concerns is a collective task, and therefore work will be carried out in a coordinated manner with the various bodies involved in the field of security and particularly with INCIBE, and special attention will be paid to the applicable conclusions derived from the drafting of the Charter of Digital Rights included in the "Digital Spain 2025" strategy.

8.3.
Strategic axis 3: a regulatory and administrative framework to boost the deployment of 5G technology

A regulatory and administrative framework to boost the deployment of 5G technology

The development of 5G must be accompanied by regulatory measures that favour deployment while ensuring that services comply with requirements regarding security, reliability, privacy of individuals, businesses, and the Administration. This is intended to provide the necessary legal certainty to both the key players in the deployment and the adoption of the technology.

The development of 5G services will involve the massive deployment of new network elements in the territory, either in new locations or in locations used for other technologies and services. An agile and efficient deployment can be facilitated by reducing the number of network elements deployed and **limiting administrative and urban barriers** to the installation of equipment in urban territories.

As part of the "Digital Spain 2025" strategy, the transposition of the European Electronic Communications Code is planned. The consequent drafting of a new General Telecommunications Law, as well as its corresponding regulatory development, will facilitate the efficient deployment of 5G infrastructures, which will speed up this process and, consequently, progressively extend coverage.

On the other hand, taking advantage of the opportunities offered by 5G depends on the reliability of its infrastructures, encouraging its deployment to take the appropriate security measures to counteract the risks identified nationally and globally. This effort will be materialised through a **specific 5G cybersecurity regulatory framework.**

8.3.1 ACTION LINE 1: REDUCTION OF ADMINISTRATIVE BARRIERS FOR THE PROMOTION OF 5G TECHNOLOGY

With this action line, the Strategy aims to reduce costs and increase the speed of 5G deployment, through administrative simplification of those procedures and administrative formalities that generate higher economic and opportunity costs for the different private actors.

8.3.1.1 Measure 12: Simplification of administrative procedures

The transposition of Directive (EU) 2018/1972 of the European Parliament and of the Council, of December 11th, 2018, establishing the **European Electronic Communications Code will introduce into a new General Telecommunications Law actions favouring the deployment of 5G networks.** The implementation of these actions will require the establishment of channels of dialogue between the Ministry of Economic Affairs and Digital Transformation and the rest of the administrations.

As a general measure, the aim will be to simplify the existing administrative procedures so that they not only do not act as a barrier to the deployment of infrastructures, but also avoid slowing down and contribute to speeding up the implementation of the operators' plans. To this end, action will be taken in collaboration with town councils and other local entities to coordinate and speed up actions and deployments. One of the aspects which will have a significant impact in the medium term will be the densification of networks in urban areas (which will mean a significant deployment of small cells). Given the different approaches that can be adopted to achieve this, coordination will be sought with the FEMP and the Autonomous Regions to design generic procedures to facilitate this, in line with the conclusions obtained from the tests carried out for this purpose.

Similarly, this measure will be complemented and coordinated with similar measures included in the Plan for Connectivity. Similarly, work will be carried out jointly with the Ministry of Transport, Mobility, and the Urban Agenda to unify and homogenize the information concerning the granting of use and passage permits in transport corridors, with the aim of reducing the time required to respond to these requests.

In line with the above, Public Administrations will be encouraged to facilitate the use of their infrastructures (sites, ducts, towers, spaces for edge computing facilities...) for the deployment of 5G networks.

8.3.1.2 Measure 13: Reduction of deployment burdens

In order to accelerate and encourage network deployment by operators, by transferring immediate liquidity to the sector, a temporary reduction in the radio spectrum reservation fees associated with 5G deployment commitments will be made, **in proportion to the degree of 5G network deployment achieved** (the greater the deployment commitment, the greater the reduction factor to be applied). This temporary reduction will apply in the years 2021, 2022 and 2023.

8.3.2 LINE OF ACTION 2: LEGISLATIVE DEVELOPMENTS FOR THE PROMOTION OF 5G

This line of action focuses on providing a regulatory framework that will make the deployment of 5G more dynamic and generate a regulatory context that will reinforce the legal security of operators and users of 5G services.

8.3.2.1 Measure 14: Instruments to speed up network deployment

The COVID-19 crisis has shown that connectivity is essential for both citizens and businesses. Electronic communications networks, and particularly, very high-capacity networks, have played a crucial role. **The European Commission therefore notes that it is necessary to promote the deployment of fixed and wireless very high-capacity networks,** for example by removing unnecessary

administrative barriers and streamlining licensing procedures. To encourage the timely deployment of very high capacity networks, including fibre networks and next generation wireless networks, the Commission proposes the development of a "toolbox" based on best practice in Member State deployment.

Commission Recommendation (EU) 2020/1307[50] **of September 18th, 2020** on a common EU toolbox to reduce the cost of deploying very high-capacity networks and to ensure timely and investment friendly access to 5G radio spectrum identifies the need for

- ⊕ To reduce costs and increase the speed of deployment of electronic communications networks;
- ⊕ To provide, where appropriate, timely and pro-investment access to 5G radio spectrum through investment incentives

that promote spectrum use as well as through timely spectrum allocation procedures for the pioneering 5G bands;
- ⊕ To establish a more robust coordination process for spectrum allocation, which also facilitates provision.

To this end, it establishes that, by December 2020 20th, Member States and the European Commission must have cooperated to collect and agree on best practices for deployment instruments, and by 30 March 2021, they must have agreed on the set of instruments. Within the framework of this strategy, in coordination with the equivalent actions in the "Connectivity of People, Companies and Territories Plan", once this set of instruments is defined, the result of **the implementation of the Recommendation will be transferred to the national regulations in force.**

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[50]See https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=CELEX:32020H1307

8.3.2.2 Measure 15: 5G Cybersecurity Act

The range of threats to the 5G ecosystem includes traditional IP-based threats[51], to which must be added the vulnerabilities of the entire 5G network (core, access, and edge), of the legacy 2G/3G/4G networks, the threats introduced by virtualisation technologies (both IT infrastructure[52], network and network functions, SDN functions[53], etc.), fraud scenarios relating to roaming connections, manipulation, or interception of network traffic, etc. Given this complexity and the **exponential increase in the attack surface, it is to be expected many of these new vulnerabilities and critical assets will emerge that will need to be protected with new techniques and tools,** yet to be developed.

The European Union has committed itself to the reliable development of 5G technology. To this end, the European Commission

has adopted a Recommendation setting out a roadmap that has enabled Member States to jointly identify **a set of common tools and measures to mitigate security risks in 5G networks,** seeking to maintain a balance between cybersecurity measures and the maintenance of effective competition. Spain was an active party in promoting this roadmap and its development. Similarly, it will continue to contribute to the Community actions defined in the Communication "Secure deployment of 5G in the EU - Applying EU instruments"[54], adopted on January, 29th, 2020.

For the effective implementation of the risk mitigation measures in the national market, the Ministry of Economic Affairs and Digital Transformation has already conducted a prior public consultation in December 2019. **The input from the public consultation together with the European Union instruments will be the basis for a draft law already under preparation.**

[51]IP: Internet Protocol

[52]IT: Information Technology

[53]SDN: Software Defined Network

[54]Commission Recommendation (EU) 2019/534 of 26 March 2019 "5G Network Cybersecurity". See: https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=CE-LEX:32019H0534

5G

09

Accomplishing the goals set out in this Strategy implies having a **monitoring and governance mechanism that includes all the agents involved in the different measures planned,** thus enabling the appropriate cooperation and coordination necessary to achieve the success of the Strategy.

In this sense, the "Digital Spain 2025" strategy, which forms part of the Strategy for the promotion of 5G technology, establishes a governance mechanism based on transparency, participation, and collaboration, and provided with the appropriate leadership.

9.1 Governance Model

Advisory Council for Digital Transformation

Standing Committee on Telecommunications, Digital Infrastructures, Digital Connectivity, and the Audio-visual Sector

Artificial Intelligence Advisory Board

Working Group for the Promotion of Connectivity

Coordination committees
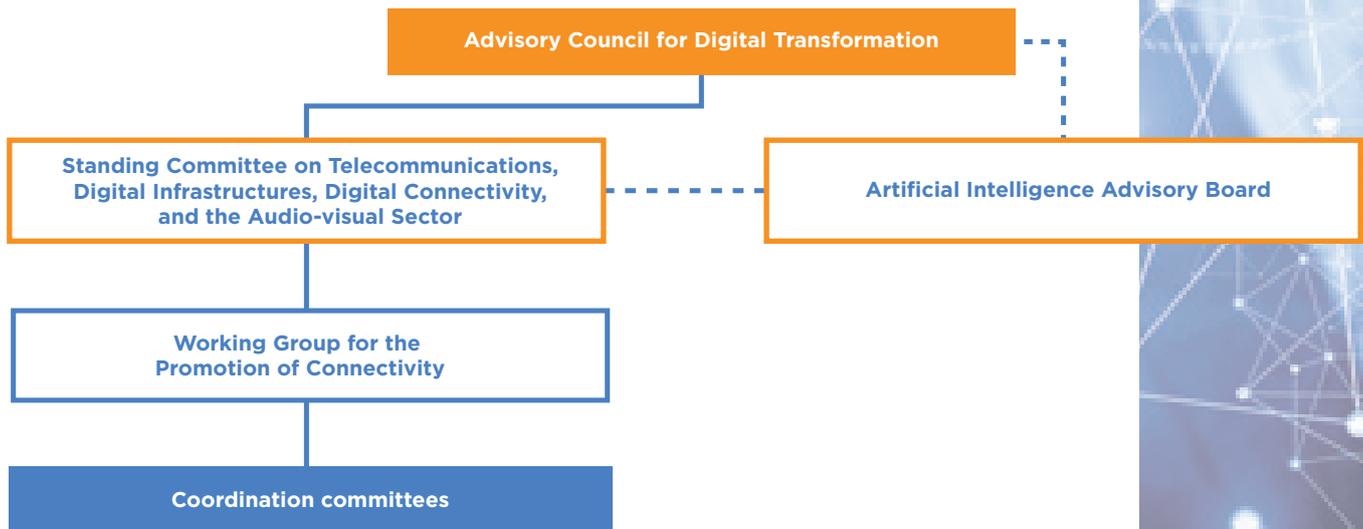
Within this framework, the Government of Spain will create a public-private council to facilitate the appropriate dialogue and multi-sector participation of the different relevant agents for the country's digital transition: the **Consultative Council for Digital Transformation,** resulting from the reactivation and updating of the previous Telecom and Information Society Advisory Council (CATSI) and which will provide an appropriate and renewed forum for the participation of the Economic and Social Agents linked to this matter. In coordination with the Advisory Council, the Advisory Council on Artificial Intelligence will act.

The Advisory Council will advise and contribute to the dissemination of the actions defined by Digital Spain 2025 and will be structured in Plenary and Commissions. Specifically, two Permanent Commissions will be created to address, in a more focused manner, the actions corresponding to the different axes and measures of the Agenda:

1. The Permanent Commission on Telecommunications, Digital Infrastructures, Digital Connectivity, and the Audio-Visual Sector; and

2. The Permanent Commission on the Digitalisation of the Economy, Administration and Citizenship.
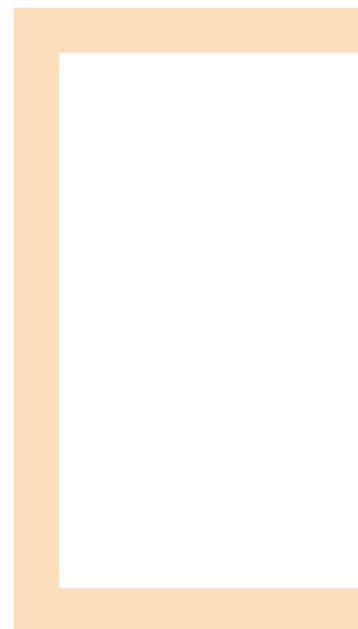
In this sense, the planning, control, and monitoring of the "5G Technology Promotion Strategy" will also be carried out jointly with that of the "Connectivity Plan". The governance mechanisms will therefore be enabled within the **Working Group for the Promotion of Connectivity that will be set up within the scope of the Advisory Council for Digital Transformation,** which depends on the Council's Standing Committee on Telecommunications, Digital Infrastructures, Digital Connectivity, and the Audiovisual Industry.

On the other hand, the Digital Spain 2025 Strategy establishes that in the case of sector strategies and plans, such as the 5G technology promotion strategy, the co-leadership will correspond to the **Ministry of Economic Affairs and Digital Transformation,** in cooperation with the different co-responsible agents: competent ministries, different levels of administration, business associations, trade unions and other economic and social agents, with the Ministry being responsible for calling the appropriate inter-ministerial coordination committees with other ministerial departments and public entities of the General State Administration.

As a basis for monitoring the development of the Strategy, the evolution of the targets set to be achieved by 2025 with the implementation of this strategy will be followed. In particular, the following developments are envisaged.

9.2
Map of monitoring indicators

Axis	Associated Target	2021	2023	2025
Axis 1: **A radio spectrum enabled for 5G services**	100% allocated[56]	60%	100%	100%
Axis 2: **Effective support for the deployment of 5G networks and services**	75% of the Spanish population covered in the bands designated as preferential	40%	65%	75%
	Uninterrupted 5G coverage on the country's main roads and railways	20%	50%	100%
Axis 3: **A regulatory and administrative framework to boost the deployment of 5G technology**	Availability of a regulatory framework and instruments for certification, innovation, and improvement	Approval of the Law	Full regulatory development	100%

10

Budgetary
allocation for
the implementation
of the strategy

In order to respond to the objectives set out in this Strategy and to develop its measures, a **first budgetary estimate of the actions of the "Strategy for the promotion of 5G technology"** is planned, which includes the investment required over the period 2021-2025, adding up the budgets for public investment (the Kingdom of Spain's own resources), EU funds (economic resources from the Community budget, where the use of EFC2 funds and funds from the Reform and Investment Plan, among others, is planned) and private financing.

Due to the importance given to the objectives of this Strategy both at European and national level, the **public resources that are expected to be mobilised for the 5G Technology Promotion in five years amount to 2,000 million euros.**

Furthermore, according to the 2020 global edition of the GSMA's **"Mobile Economy"** report, mobile operators are expected to invest US$ 1.1 billion in CAPEX between 2020 and 2025, of which approximately 80% will be in 5G networks. According to the latest data published by Analysys Mason in its report "5G action plan review for Europe"(*), in the case of Spain an average multiplier effect of 4.05 is expected from the investment. Therefore, without counting the investment of operators, the planned investment would bring a net profit for the country of 9,288 million euros. In this sense, in Spain and because of the implementation of the projects and measures defined in the 5G Technology Promotion Strategy, together with the Plan for Connectivity, it is planned to mobilise **private investment of 24,000 million euros** over its five years of validity.

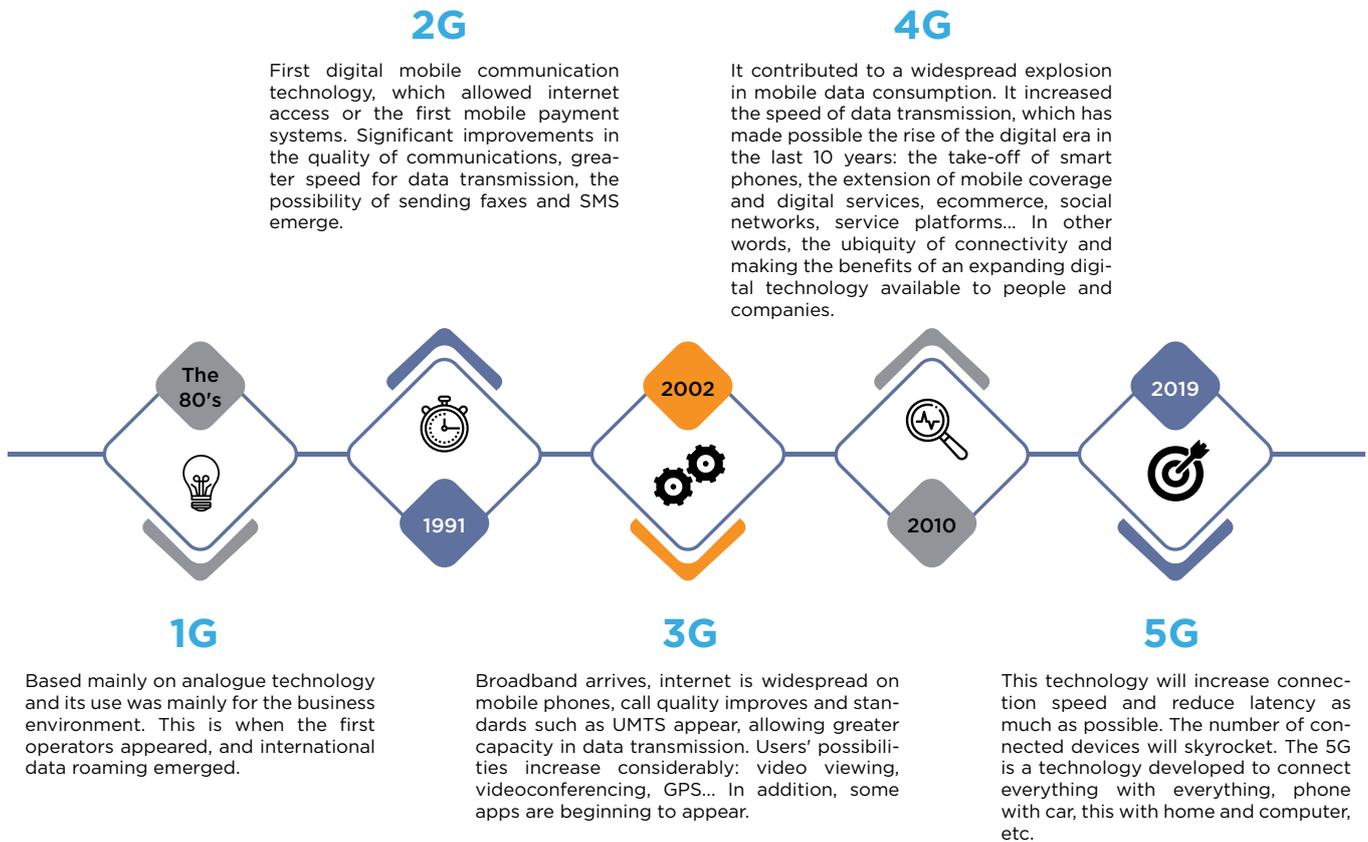# Budgetary allocation for the implementation of the strategy

Since the appearance of the first mobile generation in the 1980s, it has evolved to meet new needs in society. In this sense, each mobile generation has introduced important innovations.

The 5G standard in more detail

2G

First digital mobile communication technology, which allowed internet access or the first mobile payment systems. Significant improvements in the quality of communications, greater speed for data transmission, the possibility of sending faxes and SMS emerge.

4G

It contributed to a widespread explosion in mobile data consumption. It increased the speed of data transmission, which has made possible the rise of the digital era in the last 10 years: the take-off of smart phones, the extension of mobile coverage and digital services, ecommerce, social networks, service platforms... In other words, the ubiquity of connectivity and making the benefits of an expanding digital technology available to people and companies.

The 80's · 1991 · 2002 · 2010 · 2019

1G

Based mainly on analogue technology and its use was mainly for the business environment. This is when the first operators appeared, and international data roaming emerged.

3G

Broadband arrives, internet is widespread on mobile phones, call quality improves and standards such as UMTS appear, allowing greater capacity in data transmission. Users' possibilities increase considerably: video viewing, videoconferencing, GPS... In addition, some apps are beginning to appear.

5G

This technology will increase connection speed and reduce latency as much as possible. The number of connected devices will skyrocket. The 5G is a technology developed to connect everything with everything, phone with car, this with home and computer, etc.

Today, 4G is the dominant mobile technology in the world, with 4 billion connections representing more than half (52%) of global connections to mobile services. In addition, 4G is expected to continue to grow to 56% of global connections by 2025 (5 billion connections, 60% of the world total)[58].

In June 2018, the 3GPP (3rd Generation Partnership Project), the global organisation in charge of developing mobile standards, approved the final 5G standard. Thus, **5G is a global standard** that refers to the fifth generation of wireless communications networks, which are commonly used in mobile phones and other mobile devices with Internet connections.

[58]"The Mobile Economy 2020" (https://www.gsma.com/mobileeconomy/wpcontent/uploads/2020/03/GSMA_MobileEconomy2020_Global.pdf

5G systems bring about profound changes from previous generations that include:

⊕ Increased bandwidth,

⊕ Ability to manage higher density of devices,

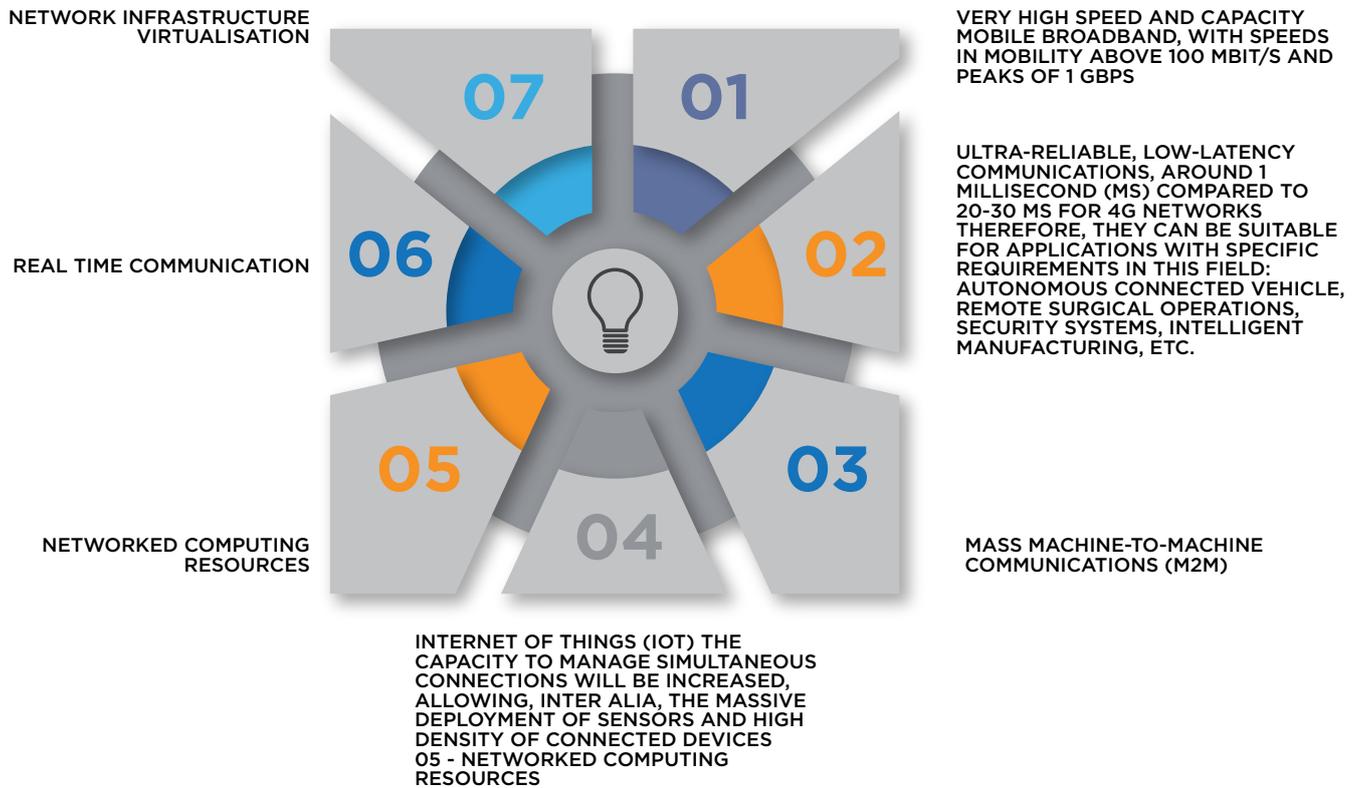⊕ Increased data transmission capacity and

⊕ Less waiting time or latency.

These new characteristics[59], as a whole, create new opportunities for wireless access for all types of users and different communication needs, and will generate a new cycle of development of applications, uses and services that will transform society, as was the case with the fourth generation.

Despite that the frequency bands used differ depending on the geographical area, the **specifications of the 5G technical standard** will be the same anywhere in the world. It is a global standard, and this is the guarantee of interoperability between services and networks in different countries, like 4G technology, thus ensuring compatibility between different manufacturers and between different versions of the technical standard, regardless of where in the world we are. Among other capabilities, 5G networks will facilitate:

[59]Highly reliable and low latency communications (URLLC), Enhanced Mobile Broadband Access (eMBB), as well as Massive Machine Type Communications (mMTC).

5G will mean an even greater leap compared to "Gs" or previous generations. Seen in comparison with 4G:

NETWORK INFRASTRUCTURE VIRTUALISATION

REAL TIME COMMUNICATION

NETWORKED COMPUTING RESOURCES

07

06

05

04

01

02

03

VERY HIGH SPEED AND CAPACITY MOBILE BROADBAND, WITH SPEEDS IN MOBILITY ABOVE 100 MBIT/S AND PEAKS OF 1 GBPS

ULTRA-RELIABLE, LOW-LATENCY COMMUNICATIONS, AROUND 1 MILLISECOND (MS) COMPARED TO 20-30 MS FOR 4G NETWORKS THEREFORE, THEY CAN BE SUITABLE FOR APPLICATIONS WITH SPECIFIC REQUIREMENTS IN THIS FIELD: AUTONOMOUS CONNECTED VEHICLE, REMOTE SURGICAL OPERATIONS, SECURITY SYSTEMS, INTELLIGENT MANUFACTURING, ETC.

MASS MACHINE-TO-MACHINE COMMUNICATIONS (M2M)

INTERNET OF THINGS (IOT) THE CAPACITY TO MANAGE SIMULTANEOUS CONNECTIONS WILL BE INCREASED, ALLOWING, INTER ALIA, THE MASSIVE DEPLOYMENT OF SENSORS AND HIGH DENSITY OF CONNECTED DEVICES 05 - NETWORKED COMPUTING RESOURCES

⊕ The new network **will be much faster** than the current one. It has been calculated that the speed will be between 10 and 100 times higher[60].

⊕ **It will improve traffic management,** by favouring the implementation of virtual networks, thus providing connectivity that is more in line with user needs.

⊕ SIt will be **more efficient,** so that the energy consumption of the chips will be reduced by 90%. This will benefit the battery autonomy of all types of network access equipment.

⊕ **It will multiply the number of devices connected for a given area by 100,** as indicated by the Word Economic Forum[61]. According to current specifications, the 5G could support about 20 thousand connected devices in just one area equivalent to a football field, about 100 times the current capacity.

⊕ 5G will have a **much lower latency.** Latency is the time it takes for the information to go to the server that processes it and return to the device to perform an action. It is the sum of the time it takes to travel to and from the device. Currently, 4G offers an average latency of 50 milliseconds. As mentioned above, with 5G this figure can drop to 1 millisecond, is a much greater leap forward than the leap from 3G to 4G. This drastic reduction in latency is precisely what will articulate many of the benefits of 5G.

New needs, new concepts: edge computing and 5G. Edge Computing consists of bringing processing power as close as possible to where the data is being generated. In other words, it consists of bringing the servers or the cloud closer to the user, to the very edge of the network to reduce the time it takes for the information to go to and from the server and to enable uses that would otherwise be unfeasible.

An example of this would be the connected pipeline. A single connected car is estimated to generate about 300 TB of data per year[62] (about 25 GB per hour). For the driving scenario to be viable, all this information and all this amount of data together with the information generated by the sensors that measure the speed of the surrounding cars, the cameras that identify traffic signs or obstacles on the road and a whole series of additional data need to be processed in real time.

The speed at which communication must take place between them and the server controlling that information must be kept to a minimum. It is a scenario where it is unthinkable that the information will travel to a remote server or in the cloud, be processed, and return. Therefore, processing needs to occur much closer to where the data is being generated, i.e., at the edge of the network.

[61]https://es.weforum.org/agenda/2019/08/que-es-la-5g-yque-beneficios-traera-al-mundo/

[62]https://www.tuxera.com/blog/autonomous-cars-300-tbof-data-per-year/)

The edge computing nodes that will make this computing possible at the edge will be digital infrastructures like data processing centres (but on a smaller scale) or other device hosting facilities with network connectivity, computing, and storage capacity (e.g., containers), and which can be located with a minimum installation next to a power substation or a telecommunications tower. These infrastructures are as critical as any data centre, and therefore must have configurations that provide security and resilience to the node's own physical facilities and the network itself.

In line with all the above, Cisco estimates that by 2030 **there will be 500 billion devices connected to a wireless network** - about 66 for every person on Earth today.

Therefore, the above benefits mean that the value that 5G will bring will **directly impact the global economy, creating millions of jobs.**

[63]https://www.cisco.com/c/en/us/products/collateral/se/internet-of-things/at-a-glance-c45-731471.pdf

5G

ANNEX 02

The following is a **summary of the Strategy for the promotion of 5G technology,** identifying for each one the type of measure it refers to, its implementation framework, the associated budget, and the goal it intends to achieve at the end of the Strategy's validity.

Summary of measures in the strategy

Investments and reforms	Type of measure	Implementation framework	Target
Axis 1. A radio spectrum available for 5G			
5G spectrum allocation and management	Regulatory	2021-2025	100 % of the spectrum available for 5G in 2025
Axis 2. Effective support for the deployment of 5G networks and services			
5G deployment in population centres (I): Deployment support	Annual call for proposals	2021-2025	75% of the Spanish population covered in 2025
5G deployment in population centres (II): Small Cells in urban environments	Experimental deployment test fund	2021-2025	75% of the Spanish population covered in 2025
5G deployment in transport corridors	Annual call for proposals	2021-2025	Uninterrupted 5G coverage on the country's major roads and railways by 2025
5G deployment in the mobile transmission network	Annual call for proposals	2021-2025	⊕ 75% of the Spanish population covered in 2025 ⊕ Uninterrupted 5G coverage of the country's main roads and railways in 2025
Good practices and deployment support	Documentation and campaign for education and training of local administrations employees	2021-2025	75% of the Spanish population covered in 2025
5G in sectorial digitisation tractor projects	Specific fund for sectorial digitalization projects	2021-2025	75% of the Spanish population covered in 2025
Promoting innovation in 5G technology	Annual calls for aid to promote innovation in 5G	2021-2025	Availability of a regulatory framework and instruments for certification, innovation, and improvement
Axis 3. A regulatory and administrative framework to boost 5G technology			
Reducing deployment burdens	Regulatory	2021-2025	Availability of a regulatory framework and instruments for certification, innovation, and improvement