EECTI

Spanish Science, Technology and Innovation Strategy 2021-2027

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SPANISH SCIENCE, TECHNOLOGY AND INNOVATION STRATEGY 2021-2027

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SPANISH SCIENCE, TECHNOLOGY AND INNOVATION STRATEGY 2021-2027

Spain has a joint, immediate and supportive responsibility towards the next generations: investing in science and innovation. There is no other alternative if we aspire for the intellectual enrichment of society, the improvement of people's life expectancy and quality of life, competitiveness of the industrial and business sector, maintenance and increase of qualified employment, the working future of our children and sustainability of our welfare state.

To illustrate how necessary it is to support research activity in a sustained manner, the simile of plants is often used, in order to bear fruit: there is no use flooding a plant if it has not been watered every day beforehand. The Spanish Science Strategy, Technology and Innovation, for the next seven years, envisages precisely that we will sufficiently and judiciously water the tree of science in the mid and long term, and thus close the gap with the most advanced countries with the highest standard of living.

This Strategy, which is the result of the consensus and joint work of the Government, the Autonomous Communities, economic and social agents, universities, scientific societies, technology centres and other actors, must serve as an impetus for Spain to finally consolidate itself as a country of knowledge and innovation.

During the preparation of this Spanish Strategy for Science, Technology and Innovation, Spain and the world have suffered a pandemic that has profoundly affected our way of life and has demanded the maximum effort from everyone, including the science and innovation system. The European Union, aware of the need to provide a swift and forceful response, has decided to recover activity with far-reaching reforms and an unprecedented initial investment.

The Strategy, in line with these plans, has been designed in two phases: a first phase, from 2021 to 2023, in which the efforts made will be focused on guaranteeing the strengths of the system, strengthening infrastructures and designing a well-defined research career, and a second phase in which the consolidation of a system that is the backbone of the State and the basis for future growth will be addressed. In the first phase, it will be essential to clearly and forcefully support RDI in the health field, as well as investment in ecological transition and digitalization, starting from the science of excellence, through specific programmes, strategic actions in the priority sectors and large driving projects that will allow us to face the social, economic, industrial and environmental challenges necessary to achieve sustainable welfare and inclusive growth in our country.

Pedro Duque
Minister of Science and Innovation

EXECUTIVE SUMMARY

The **Spanish Science, Technology and Innovation 2021-2027** 2027 Strategy (EECTI 2021-2027) is the basic instrument for consolidating and strengthening the Science, Technology and Innovation System (SECTI) over the next seven years.

The ECCTI 2021-2027 is specifically designed to facilitate the articulation of our RDI policy with the **policies of the European Union**, taking into account the regulations approved or in progress, in order to make the best use of the synergies between the programmes. In this aspect, the strategy adds elements that also aim to promote maximum coordination between **State and Autonomous Community planning and programming**.

EECTI 2021-2027 has been in the making for months, but its final drafting was completed during the **COVID-19 pandemic**. It therefore includes activities specifically aimed at solving the problems caused by it, and at consolidating and promoting science and innovation as a tool for the social, economic, and industrial reconstruction of our country.

Overcoming the global crisis suffered by COVID-19 and re-establishing a strong national RDI system after the last decade of difficulties are urgent actions that need to be addressed. To this end, the Strategy will be implemented in **two phases**.

- In a first phase, **2021-2023**, the efforts made will be focused on guaranteeing the strengths of the system, strengthening the current programming, infrastructures and human resources that will benefit from the design of a well-defined research career, which will allow the necessary generational change. In this phase it will be essential to clearly and forcefully support RDI in the health field, as well as investment in ecological transition and digitalization, starting from the science of excellence, through specific programmes, strategic actions in priority sectors, and large tractor projects, which will allow us to face the social, economic, industrial and environmental challenges, necessary to achieve sustainable welfare and inclusive growth in our country

- The second phase of the EECTI, corresponding to 2024-2027, will make possible RDI to be placed among the fundamental pillars of our National Government and consolidate its value as a tool for the development of a knowledge-based economy.

RDI and industry must be at the heart of the initiatives and approaches proposed by the national public and private sectors, and it is in this aspect that the EECTI places particular emphasis on the need to bring science closer to economic and social progress, in order to be at the service of Agenda 2030 and the EU's political priorities. To achieve this Target, the Strategy will prioritise and

respond to challenges in strategic national sectors in specific areas that will be key to the transfer of knowledge and the promotion of RDI in the Spanish business fabric. The capillarity of the system will contribute to mitigate the challenge in our country, promoting the distribution of its agents and infrastructures throughout the national geography.

The national strategic sectors are detailed in the body of the Strategy and in Annex II. Broadly speaking, the map is as follows:

1. **Health:** new therapies, precise diagnosis, cancer and ageing, and special emphasis on infectious diseases.

2. **Culture, Creativity and Inclusive Society:** the genesis of the human being, cognition and language.

3. **Security for Society:** Inequality and Migration; the Market and its Tensions; Protection of Society and Cybersecurity.

4. **Digital world, Industry, Space and Defence:** AI, next generation internet, robotics, physics, mathematics, communication networks.

5. **Climate, energy, and mobility:** climate change, decarbonisation, mobility and sustainability.

6. **Food, Bioeconomy, Natural Resources and Environment:** from biodiversity to food use of land and sea.

It is essential to increase the investment effort in RDI policies until it reaches levels more in line with the country's capacity: in essence, doubling the sum of public and private investment, until it reaches the European average. The strategy is therefore designed for a phase of resource expansion, with a gradual orientation that will allow the consolidation of a larger and more powerful Science, Technology, and Innovation System in the long term.

The larget is to generate, based on a solid system for generating new knowledge, a more innovative and dynamic productive fabric, based on current strengths. This will make it possible to increase competitiveness and, with it, the generation of quality employment and to ensure the sustainability of our social system in the long term, investing in the quality of life of future generations.

1 Introduction

i. Background and exposition of the strategic motivation

Spain

The elaboration of the Spanish Science, Technology and Innovation Strategy 2021-2027 (EECTI) represents an opportunity to reflect what Spain seeks to be and do in Science, Technology and Innovation during this period. The EECTI is being defined at a time when national and international actors are discussing the assumptions concerning the role of science and innovation in society, as well as the policies that we must address in order to face and respond to the conditions of the new economic and technological geopolitical context.

The decline in RDI over the last 15 years, together with the devastating effect of the **COVID-19** pandemic on the economy, requires the introduction of strong measures, promoted by the government, to rebuild and strengthen the science and innovation system. The health crisis has put science in a pre-eminent position in Spanish society and in the governments of **Spain and the Autonomous Communities** (ACs) for decision-making, and has highlighted the role of science and access to knowledge as essential levers in the reconstruction plans of Spain and the EU. However, the crisis has also brought to light the inadequacy of the science and innovation system in key strategic sectors, and the need to develop an open and solid pan-European research model, in which Spain must play a more important role. Society demands that the State and the Government give the necessary support to the public administrations (PAs), with competences in the area of promoting scientific and technical research, and to all their public and private agents in order to strengthen our SECTI.

The EECTI is the necessary instrument to strengthen the SECTI in an integrated way and to respond to the current national and European crisis. The EECTI is conceived as the multiannual reference framework that will make it possible to reach a set of targets shared by all the Public Administrations with competences in the field of promotion of scientific and technical research and innovation. This instrument will serve as a reference for the preparation of the National Scientific and Technical Research and Innovation Plans (PEICTI), which will include the criteria and mechanisms for linking the Plan to the sectoral policies of the Government, the Autonomous Regions and the various public authorities.

With the present EECTI and its PEICTI, Spain has the opportunity to face up to the challenges of society, favouring economic growth through the generation of knowledge. To do this, we must provide our system with resources that increase its resilience and international presence, emphasising the consolidation and expansion of our strengths. In this sense, a **National Agreement** is necessary, equivalent to others being carried out by the European and international community, providing stability and translating immediately into a forceful action of **investment in science and innovation** that undertakes the necessary administrative and legislative reforms to facilitate the implementation of the measures adopted.

This **effort** requires the identification of our strengths and weaknesses and must be executed in a coordinated and efficient way. In this sense, it is essential to align our interests with those of our partners in the EU, following a common path that will undoubtedly strengthen our strategic model and allow us to maintain and exceed the levels of welfare achieved in our country. In this context, the EECTI 2021-2027 reaffirms the **integrating vision** of RDI throughout the value chain, as well as its impact on the Spanish economy, companies, industry and society, thus justifying the economic efforts and structural reforms that need to be carried out.

Europe

In order to overcome the current situation, our country will take advantage of the European recovery plan which will put in place the necessary measures to put Spain and Europe on a resilient, sustainable and fair path to recovery. To ensure the success of this response, recovery at a European level will be articulated through the **Multiannual Financial Framework** (MFP), which will be backed by [1,074,300]

million euros, to which we must add the [750,000] million euros of the ***Next Generation EU***, the European Recovery Instrument whose funds will provide an extraordinary boost to investment aimed at financing Europe's recovery.

The *Next Generation EU* proposal covers a range of instruments whose lines of action are geared towards the recovery and economic transformation of the EU. For Spain, and for the rest of the EU countries, the acquisition of these funds is subject to the presentation of an **Investment and Reforms Plan**. This effort will allow the necessary measures to be taken to modernise our economy, a process in which RDI will act as a driving force for productivity and competitiveness.

The EU's response to the coronavirus crisis rests on **three pillars**:

- **Measures to repair, recover and emerge stronger from the crisis**, supporting the reforms and investments needed to achieve a lasting recovery, improving and making the Cohesion Policy more flexible, and influencing a Just Transition in which specific measures are taken to support young people and fight child poverty.
- **Measures to increase public and private investment, and to support businesses**, to improve their solvency, to strengthen the Invest EU programme and to facilitate strategic investment.
- **Learning from the lessons of the crisis and addressing the EU's strategic challenges**, including strengthening the research and innovation activities of Horizon Europe, the EU Health programme, civil protection mechanisms and external action.

In this context, in October 2020 the European Council[1] agreed its position on the Horizon Europe package with an envelope of 85,543 million euros from the MFF pending the conclusion of negotiations with the European Parliament. The Next Generation Europe program, for its part, includes 5 billion euros also aimed at research and innovation actions to address the consequences of the COVID-19 crisis, in particular, its economic and social impact.

The EECTI and its State and Regional Plans will have to take into account this increase which is aimed at specific clusters in the areas of Health, Climate, Energy and Mobility, Digital World and Industry and Space. In addition, the Digital Europe Programme (DEP), the European Defence Fund (EDF), and the future European Defence Research Programme (EDRP) are going to constitute one of the main ways of enabling the national technological fabric over the next decade, through RDI activities prioritised in the Technology and Innovation Strategy for Defence 2020 (ETID 2020). The prioritisation of these clusters will make it possible to promote a resilient recovery, consistent with the targets of the **European Green Deal**[2], and will provide the European Innovation Council with additional means to consolidate the progress towards innovation of small and medium-sized enterprises, start-ups and midcaps.

In addition to taking advantage of the European Recovery Plan, the EECTI will take into consideration the **Council's recommendations on Spain's 2019 and 2020 Stability Programme**, which coincides with the taking of measures (in the years 2020 and 2021) to improve the effectiveness of RDI support policies, to focus economic investment policy on promoting innovation and the ecological and digital transition, and, in general, to boost research and innovation through its planning instruments

1 On 29 September 2020, the Council adopted the general approach on the proposal for a regulation establishing «Horizon Europe», and the draft decision establishing the specific program implementing «Horizon Europe».
https://www.consilium.europa.eu/media/45766/st11251-re01-en20.pdf
2 https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0004.02/DOC_1&format=PDF

The EECTI has to be identified as the State Smart Specialisation Strategy that will act as a key element for the articulation of the RDI policies of our country with the policies of the European Union (EU), including the aforementioned EU recovery instrument and the Structural Funds, especially the European Regional Development Fund (ERDF), which will have an impact on the implementation of RDI through the regional Smart Specialisation Strategies (S3), which are of unquestionable incentive value.

In order to address the Strategy, it is essential to stress that the promotion of RDI must be coordinated and that the regions will have a key role to play in reducing the EU's innovation deficit, which will be considered an essential task in order to promote cohesion policies. In this context, the EECTI, as a **national S3**, will be an essential element of the **regional S3** and has therefore been designed according to the following principles:

- Using the assets and resources available in each of the Autonomous Regions, and in our country as a whole, to face the challenges and opportunities that will contribute to strengthening growth, maintaining national coordination.
- Limiting investment priorities in RDI to those with critical mass and strong business resources.
- Incorporating a process of identifying priorities and needs in which, in addition to the National Government, the Autonomous Regions or the SECTI itself, attention is paid to the interests of the market and the private sector.
- Broadening the vision of the strategy to support technological and social innovation.
- Including a solid monitoring and evaluation system, as well as a review mechanism to update the strategic and programmatic options considered necessary in each case.

Global Environment

The socio-economic situation in Spain and in the surrounding countries also highlights the need to frame the design of the EETCI within an **overall strategic framework**. The targets of the EECTI take into consideration the contribution of RDI to the achievement of the Sustainable Development Goals (SDA) of the **United Nations Agenda 2030** and the **Paris Agreement**. Spain, in line with the European Horizon Europe programme, defends the inclusion of the SDAs in the RDI priorities and targets that will be key in the strategic direction of state and regional financing plans and programmes.

The **Addis Ababa Action Agenda** provides the basis for implementing Agenda 2030, providing the framework for financing sustainable development, and establishing the financing instruments for the ODS. In the Addis Agenda, with a chapter dedicated to Science, Technology, and Innovation, the ODS take on special relevance as they are considered fundamental tools for improving efficiency in the economic, social and environmental dimensions.

International Strategic Motivation

The political orientation of the EU, which is reflected in the ***European Green Deal*** and the ***Strategy to shape Europe's digital future***, is also identified with the economic impact expected to be achieved through the ***A new model of industry for Europe strategy***, which ensures the importance of RDI to improve and boost the competitiveness of European industry. The competitiveness generated will cover all areas which, while respecting climate neutrality, will contribute to shaping the digital future in a circular economy that guarantees its innovative capacity. To this end, a large part of the Union's programmes (the Horizon Europe programme, the Digital Europe programme, the Single Market programme, the Innovation Fund, InvestEU, the European Social Fund, the European Defence Fund, the future European Defence Research Programme, the Union's Space Programme and the European Structural and Investment Funds) will be used and the competitiveness of the industry will be promoted by reinforcing its strategic autonomy.

In this sense, the **European Commission defined and included in the European programmes the political guidelines** previously identified by the international scientific community, in whose selection the Spanish community made a significant contribution. These policy guidelines are:

- the demographic change,
- the globalisation of the economy,
- digitisation,
- industry and society,
- controlling climate change through a fair and social ecological transition

It is also important to highlight the European Commission's effort to show the need to improve investment in RDI in the area of Artificial Intelligence (AI). Thus, in its **Coordinated AI Plan**, this discipline is considered a pillar of Europe that will allow it to boost its competitiveness and support the progress of the digitisation and green transition areas.

Spain has made the priorities defined by the European Commission its own. On the one hand, by approving the "**Action Plan for the Implementation of Agenda 2030: Towards a Spanish Sustainable Development Strategy[3]"** and, on the other, by including the **Ecological Transition and the demographic challenge, health care, connectivity and digitisation, the rural environment, the circular economy** and **Artificial Intelligence** as fundamental areas of State policy. Together with these areas, Spain has made its own national strategic priority, which, in addition to converging with the European strategy, focuses on specific areas and on the guiding and incentivising role of RD.

In a global strategic field, the alignment of EECTI with EU priorities will favour synergies between Spanish RDI policies and the programmes of the EU and other countries around us, thus contributing to improve the effectiveness of the National Government and the regional and local administration to strengthen their RDI policies.

3 www.agenda2030.gob.es/sites/default/files/recursos/Plan%20de%20Acci%C3%B3n%20para%20la%20Implementacion%20de%20la%20Agenda%202030.pdf

ii. Process of elaboration of the EECTI 2021-2027

The development of the EECTI has followed an open and inclusive process of the SECTI's main agents, not only "**from top to bottom**" through the very governance established in the Science, Technology and Innovation Law 14/2011 of 1 June, but also "**from bottom to top**" through the constitution of interest groups that respond to a fourfold model (Companies, Research and Public Administration, Civil Society and Users of Innovation).

The work with the various agents has contributed to drawing up the priorities and strategic lines defined in the current document and has enabled the Ministry of Science and Innovation (MCIN), in collaboration with the **Science, Technology and Innovation Policy Council** (CPCTI), to complete the preparation of the EECTI which, after receiving the reports from the CPCTI itself, the **Science, Technology and Innovation Advisory Council** (CACTI) and the National Government's economic planning bodies, has been submitted to the Government for approval and referral to the **Spanish Parliament**.

The process of drawing up EECTI 2021-2027 began in February 2019, in response to the mandate of the Government's Delegate Commission for Science, Technology and Innovation Policy, issued in December 2018. Since then, the MCIN, in collaboration with the CPCTI, has prepared the EECTI during 2019 and 2020, with the collaboration of commissions and working groups, such as the Executive Commission of the CPCTI, made up of regional government officials who have contributed to collecting and coordinating the needs of regional RDI policies. In addition, the contribution and guidance of the CACTI, a body which involves the scientific and technological community, as well as economic, trade union and social agents, has been taken into account.

In addition, an **Advisory Group** was organised, comprising representatives of the Ministry of Science, Innovation and Universities (in accordance with the structure of Royal Decree 865/2018 of 13 July) and its funding agencies: the State Research Agency (AEI), the Centre for Technological and Industrial Development (CDTI), the Carlos III Health Institute (ISCIII) and the Spanish Foundation for Science and Technology (FECYT). This Advisory Group has been punctually assisted by representatives of the Directorate General for Research and Innovation of the European Commission, the Permanent Representation of Spain to the EU, and the High Commissioner for the Agenda 2030.

Prior to the preparation of the EECTI, **bilateral meetings** were held with the ministerial departments with sectorial actions in RDI: Ministry of Universities (MUNI), Ministry of Foreign Affairs, European Union and Cooperation (MAEUEC), Ministry of Agriculture, Fisheries and Food (MAPA), Ministry of Culture, Ministry of Defence, Ministry of Economic Affairs and Digital Transformation (MINECO), Ministry of Transport, Mobility and Urban Agenda (MITMA), Ministry of Industry, Trade and Tourism (MINCOTUR), Ministry of the Interior, Ministry of Health (MINSAN), Ministry of Finance (MINHA) and Ministry for the Ecological Transition and the Demographic Challenge (MITERD). In addition, face-to-face meetings were held with the directors general of the Autonomous Regions and with the different ministerial departments with responsibility in the area, and the fundamental aspects of EECTI were presented for debate and discussion.

At the same time, EECTI principles were presented in **external commissions**: a first one made up of representatives from the scientific field - Public Research Bodies, the Scientific Committee of the AEI, the Confederation of Scientific Societies of Spain (COSCE), the Alliance of Severo Ochoa Centres and Maria de Maeztu Units (SOMMA) and the Conference of Rectors of Spanish Universities (CRUE), and a second committee made up of representatives from the scientific, technological, innovative and business fields and associations from different sectors - Technology Centres, Business Associations and Federations, Technology Platforms, Science and Technology Parks, Spanish Confederation of Business Organisations (CEOE) and the Forum of Innovative Companies.

2

Conceptual framework and key elements of the EECTI

The **definition of a conceptual framework** for EECTI is carried out with the aim of reaching a national consensus on a set of elements and their interactions from which the targets and priorities will be derived and which, subsequently, through state and regional planning, will allow for the development of specific programmes and sub-programmes. This framework should ensure the functioning of an **SECTI action model** that will allow national and European public and private investments in these areas to materialize into benefits for society. To this end, a model has been

proposed that combines excellent science and innovation, based on inter- and multi-disciplinarity that offers future solutions to the problems and challenges of Spanish society.

The key elements on which EECTI is based are:

i. To establish a **global vision that will enable Spanish science, technology, and innovation, in the period 2021-2027**, to play a leading role in the European context. The EECTI must achieve the maximum consensus and national commitment through a State Pact. For this reason, efforts must be maximised so that the EECTI takes into account the interests and targets of all RDI agents (national, regional and local public authorities, universities, public and private research centres, technology centres, science and technology parks, health research institutes, scientific and technical infrastructures and companies) and of society as a whole.

ii. To configure the EECTI and the **State Plans as the State Smart Specialisation Strategy** that responds to the Enabling Condition required for the receipt of ERDF aid during the period 2021-2027.

iii. To develop an **integrated structure that is fully interrelated** with the sectoral policies, to which EECTI can offer its support in order to favour the fulfilment of its targets, allowing for the coordination and synergy of the instruments and actions at the different levels of national and regional administration. In this way, depending on its field of action, EECTI will facilitate cooperation with the sectoral policies and other programmes and actions of the National Government and the Autonomous Regions, trying to make efficient use of the available resources.

iv. To establish a **set of strategic options** that respond to the desired intelligent specialisation and that have sufficient flexibility for their implementation and the appropriate evaluation mechanisms to develop, at a later stage, the PICTIS and the Autonomous Regions' RDI Plans, with the capacity to adapt to the possible changes that may occur during the implementation period.

v. To have **effective governance mechanisms** based on those described in the LCTI, which contribute to improving the use of resources, establishing, through the State Plans, measures and programming mechanisms that are adapted to the targets set by the Strategy.

vi. To serve as a **guide for the SECTI's public executing agents** so that, within the framework of their competencies, they can prepare their own institutional strategies that help increase their competitiveness in a globalised context. The institutional strategies will serve to establish synergies between different actors (e.g. public and private, national, regional and international) over which the National Government and, if applicable, the Autonomous Regions cannot exercise the same type of influence.

vii. The conceptual framework has a key element at the international level, which refers to the strategic alignment with programmes such as Agenda 2030 and, in general, with European programmes. Therefore, it is essential that EECTI addresses and develops the programmes derived from research and innovation, cohesion, and sustainable development policies with a global vision, coordinated with the EU[4].

The measures developed in the RDI plans and programmes during this period should take advantage of the new opportunities governed by EU competition rules and facilitate the path of our innovative companies and industry towards rebuilding in accordance with the principles of the digital, green and circular economy. This will allow the development of innovation-intensive companies generating higher quality, more stable and better paid jobs, which will act as key players for the stability of our economy.

The coordination in the definition of the EECTI, as well as the development of the PEICTI for the years 2021-2023 and 2024-2027, will be closely related to the priorities defined in the **Strategic Planning of the Horizon Europe Programme**, for which the scheme shown in Chart 1 has been proposed.

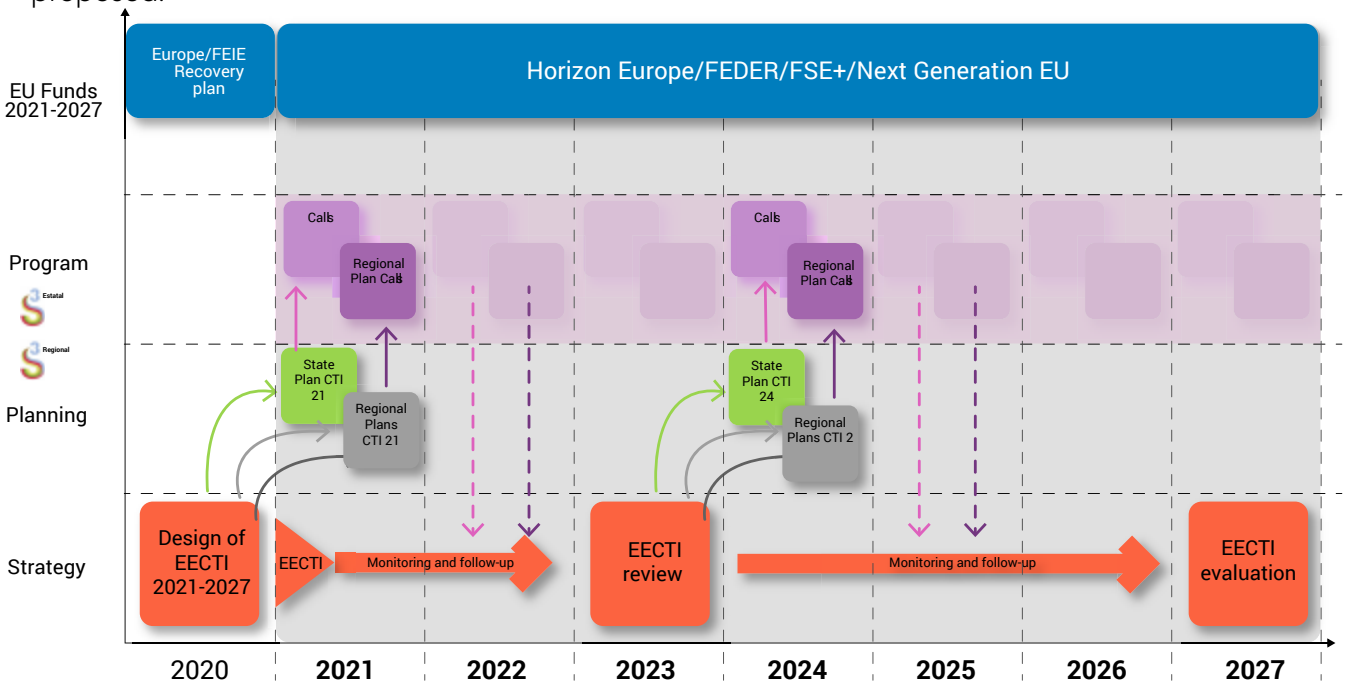

Chart 1. Strategies and Plans; coordination with Horizon Europe

4 Coinciding in time with the elaboration of this Strategy, a set of programs and regulations are being prepared in the EU, with Spanish participation, which will have a direct impact on EECTI, namely: i) The new research and innovation framework program 2021-2027, Horizon Europe (HE), with which EECTI will endeavour to possible synergy and complementarity, encouraging the involvement of SECTI; (ii) The new Regulation on Common Provisions 2021-2027 for the European Funds which regulates, inter alia, the ERDF program and the European Social Fund Plus, with which part of the public aid for R&D&I is co-financed; (iii) The modification of the framework for state aid for the period 2021-2027, which will affect the way in which Member States can implement certain actions to support research and innovation.

The Smart State Specialisation Strategy

EECTI will have to meet the conditions laid down in the regulations governing the ERDF and European Social Fund (ESF+) programmes during the years 2021-2027, due to the fact that part of EECTI's actions will be financed by these funds, the allocation and co-financing of which is regional and varies according to the category of the region in which each Autonomous Community is located.

The EECTI 2021-2027, together with the State Scientific, Technical and Innovation Research Plans, is configured as the **State Smart Specialization Strategy (S3)** which must include the necessary elements to comply with the **Enabling Condition**[5]. Furthermore, the EECTI will provide coverage for the Regional Smart Specialisation Strategies S3 developed in the Autonomous Regions (Chart 2). The interaction of these strategies will be coordinated through the CPCTI and the RDI Public Policy Network and will be directed by the **Directorate General for European Funds of the MINHA and the Directorate General for Research Planning of the MCIN**.

In accordance with the Royal Decree 404/2020 of 25 February, which develops the basic organic structure of the MCIN, the exercise of the functions in the actions co-financed by the European Social Fund and by the European Regional Development Fund will correspond to the **Directorate General for Research Planning (DGPI)**. The DGPI will monitor and evaluate the State S3 by collecting and analysing data through the Science, Technology and Innovation Information System (SICTI), which will also be responsible for generating indicators in those areas that affect the EECTI.

Chart 2. Regional and state smart specialization (S3): the role of the EECTI 2021-2027

5 The new Regulation on Common Provisions for 2021-2027 lays down the obligation to comply with conditions for receiving ERDF aid, known as the Enabling Conditions. In the case of Political Objective 1 "A more intelligent Europe", which includes R&D&I, the condition defined is "Good governance of the national or regional strategy for intelligent specialisation", and compliance with this condition is determined on the basis of seven criteria: 1. Monitoring and evaluation tools to measure results against the objectives of the strategy; 4. The functioning of the cooperation between partners (entrepreneurial discovery process); 5. Actions needed to improve regional or national research and innovation systems where relevant; 6. Where relevant, actions to support industrial transition; 7. Measures to improve collaboration with partners outside the Member State in the priority areas supported by the smart Specialisation Strategy.

3

SECTI and environment analysis

For the elaboration of the EECTI, an analysis of the most relevant indicators of the SECTI has been carried out, the evolution of which is shown in Annex I of this document. From this analysis, the **SWOT** (Strengths, Weaknesses, Opportunities, Threats) presented at the end of this section was derived, which has contributed to identify the targets and priority axes of the EECTI 2021-2027.

The following aspects are highlighted in this analysis:

- **SECTI's leadership** in the international sphere, as well as its capacity for cooperation in the European environment through participation in European programmes and projects, mainly the EU's Horizon 2020 Framework Programme, and in international organisations and infrastructures.

- The distribution of **RDI aid** at national and regional level

- The levels of **investment and expenditure** by the public and private sector.

- **Scientific production** and its quality and international impact.

- The situation of **human resources** in the public and private sector, and the mobility capacity of research personnel.

- SECTI's **inventive and innovative** activity.

- Significant progress towards **gender balance** in all of SECTI's areas and levels.

- The **social perception** of science.

DAFO analysis of the SECTI

Strengths

1. Experience and leadership position in the EU Framework Program: Horizon 2020.

2. Knowledge of the scientific, technological and productive capacities of our country, as a result of the process of elaboration and monitoring of the regional smart specialization strategies (RIS3).

3. Investment in Centres of Excellence, Health Research Centres, Singular Scientific-Technical Infrastructures (ICTS) and participation in international facilities.

4. Common behaviour of the regions in prioritizing aid for human resources and projects, thus expanding the scope for coordination and cooperation.

5. Continued increase in employment in RDI of personnel with doctorates.

6. Percentage of the population with higher education and potential critical mass.

7. Development of a strong and coordinated information system to carry out the monitoring and evaluation of SECTI.

8. Growth of investment in RDI by certain groups of companies, particularly innovative medium-sized companies.

9. Growing trend in society's interest in science and technology and the consequent improvement in its assessment.

10. Excellent international positioning regarding the deployment of broadband in relation to the European average; 5th place for Spain in DESI 2020.

11. The percentage of female researchers is above the EU average and is one of the highest in Europe.

12. Institutional repositories in research centres and universities with technological maturity for the development of Open Science.

Opportunities

1. The global crisis of COVID19 has shown the importance of science and innovation for the well-being and development of society.

2. Key role of science and innovation in achieving the SDGs.

3. The weight of Spanish SMEs in RDI activity is higher than that of other neighbouring countries, which could lead to greater flexibility and adaptation of innovative activities.

4. A Multiannual Financial Framework in the EU which, together with the Next Generation EU funds, has increased the resources to finance the RDI activities of the new European Framework Program.

5. The regulation of the ERDF program prioritizes the financing of RDI.

6. The enabling conditions required by the EC for 2021-2027, together with a stronger governance by the Autonomous Communities and an organization responsible for S3, will encourage the coordination of RDI policies between the General Government and the ACs.

7. European convergence in policies that support RDI capacity in technological and scientific fields, which are key to relevant sectoral policies.

8. A firm commitment to disruptive digital technologies including AI.

9. The European objective of achieving greater industrial self-sufficiency, with its corresponding reflection in Spain.

10. An increase in private investment in RDI through an incentive plan and a state regulatory framework appropriate to the environment.

11. Continuous improvement of bibliometric production indicators.

12. Movement towards Open Science, which will improve quality, transparency, impact, reproducibility, and citizens' access to knowledge.

13. The Green Pact and the Strategic Framework for Energy and Climate.

DAFO analysis of the SECTI

Weaknesses

1. The absence of a State Pact that gives stability, continuity and directionality to the country's strategy in RDI

2. Inadequate legal and administrative framework for the efficient and competitive execution of RDI

3. The lack of public and private funding in RDI in the form of direct investment (subsidies) with respect to neighbouring countries

4. Important territorial inequality of the investment effort in RDI

5. Excessive fragmentation of aid in RDI, both regionally and sectorally (especially technological).

6. A disincentive effect due to the bureaucratization of public aid and the rigid annual budget framework.

7. Inefficiency of the budgetary effort in financial credits (chapter 8) destined to RDI (PG 46), decoupled from the current needs of the private agents of the SECTI.

8. Greater weight of current spending on investment in RDI and the consequent decapitalization of spending, especially in the business sphere.

9. The flight of talent and the low percentage of personnel employed in RDI, compared to the employed population.

10. A low presence of international students in national doctoral programs.

11. Low innovative capacity of Spanish institutions and companies despite the existing critical mass of inventors.

12. Low intensity in the protection of inventions.

13. Low public-private collaboration, both in terms of co-financing and execution.

14. Low level of knowledge transfer to the productive sector and society.

15. The fragmentation of the Spanish market makes innovative impact difficult.

16. A lack of training in new technologies in companies, especially in SMEs, and ignorance of the opportunities offered by digitization.

17. The shortage of great industrial champions.

18. Despite the fact that the majority of Spaniards have a positive vision of innovation associated with science and creativity, there is the opinion that in Spain there is little culture of innovation.

Threats

1. The impact of the health, social and economic crisis linked to the COVID-19 pandemic and the risk of a decrease in investment in RDI.

2. Sustaining or minorising investment in public and private RDI with respect to GDP, compared to the EU average.

3. A lack of strategic vision of investment in RDI and less weight of the business sector in internal spending, compared to the European average.

4. Barriers, mainly legislative, to the mobility of personnel between the public and business sectors, including between public institutions.

5. Aging of research staff and precarious conditions, with discontinuities, in access to the system for young people.

6. Stagnation and weakness in innovative activity in SMEs compared to the European average.

7. Low capacity to value the results of RDI in patents, placing us among the countries with the lowest level of knowledge transfer in the EU.

4

Principles, targets and lines of action

The evolution of the SECTI during the **2008-2020 crisis period** experienced a decline in investment that was more pronounced in 2010, 2011 and 2012. Even in this situation, SECTI has shown a certain resilience due, to a large extent, to the financing effort carried out in previous years, in which the implementation of scientific research infrastructures was strongly supported and financed, human resources (HR) in the public sector were increased, funding for RDI projects was increased and participation in EU RDI programmes was encouraged.

The consequences of the economic crisis were much harder for RDI companies which, although they were able to sustain the level of investment, suffered a 50% drop in numbers. In this sense, we must ensure that the agents responsible for technological and industrial transformation are based on a real and firm **public-private partnership**, reinforced through the mechanisms and actions included

in this strategy and identified in the General Guidelines of the New Spanish Industrial Policy 2030 and in the regional S3.

The **coronavirus** has dealt an unprecedented blow to Spain, Europe and the whole world, testing its health, economic and social system. As we know no borders, only a global action, with more Europe, more science and more innovation can prepare us to solve the effects of this pandemic, protecting the lives and work of citizens and contributing to the creation of a new model of society more committed to the environment.

On the basis of the lessons learned and the desire to establish a new economic and social model, the reconstruction of RDI in our country will require the addition of the necessary budgetary efforts which will be distributed in **two phases** in accordance with the priorities of **this EECTI**:

A **first phase, 2021-2023**, which guarantees the stability of the SECTI, strengthening the current programming, infrastructures and human resources. The health area will be a priority in this phase and will receive clear and strong support. Likewise, investment in ecological and digital transition will be favoured by articulating, for this purpose, specific programmes and actions that allow us to face the challenges of our society to achieve sustainable welfare and inclusive growth.

After an evaluation of the first phase, the **second phase of the EECTI, 2024-2027**, will be focused on tackling the strategic priorities, initiatives and actions established in the EECTI itself, the development of which will allow the consolidation of the SECTI and the promotion of RDI to constitute one of the pillars of our State.

i. EECTI principles

The basic principles of EECTI are focused on supporting national research and innovation and maintain the lines developed in EECTI 2013-2020. These principles, which form the criteria shared by all the agents, will guide the definition, planning and implementation of public RDI policies and are as follows:

- **The coordination** of the National Government's, the Autonomous Regions', the State's and the EU's **RDI policies**, through the SECTI's **governance** mechanisms (in particular, the Science, Technology and Innovation Policy Council) and those established in the EECTI. All of this is aimed at favouring the convergence towards co-creation and co-decision mechanisms of their respective plans and programmes, using joint programming and financing models that meet EECTI's targets.

• The **collaboration and agility of the administration** that will allow: i) progress in the improvement and flexibility of the regulatory and simplification mechanisms, avoiding redundancies in the programming instruments applied to RDI policies; ii) establishing synergies with the prioritised actions in the EU framework and the different EU funds.

• The **Gender Perspective** to ensure the application of the principle of real equality between women and men in RDI

• The **social and economic responsibility of RDI** through the incorporation of citizen science and the application of co-creation and open access policies, as well as the alignment of RDI with social values, needs and expectations.

ii. EECTI targets

The approach to the **Strategy's Targets** requires a cross-cutting approach, since it is from the priorities established by the RDI policy itself, as well as from the sectoral areas of public policy, that the development, use and implementation of scientific, technological and innovative knowledge must be promoted. To this end, each Target will be achieved through various lines of action that will make it possible to define and guide institutional initiatives to strengthen the SECTI and plan the programming of the National Government and the Autonomous Regions. **Table 1** shows the intensity of the contribution (in 3 different degrees) of each Line to the proposed Targets.

EECTI's targets are summarised in:

ADDRESSING THE PRIORITIES OF OUR ENVIRONMENT	
Tgt. 1	Placing science, technology and innovation as key axes in achieving the Sustainable Development Goals of the **2030 Agenda**.
Tgt. 2	**Contributing to the EU's political priorities** by aligning with its RDI programs, giving support to the actors responsible for the SECTI to achieve this target.
Tgt. 3	**Prioritizing and responding to the challenges of the national strategic sectors** through RDI, for the benefit of the social, economic, industrial and environmental development of our country.
PROMOTING RDI AND ITS TRANSFER	
Tgt. 4	**Generating scientific knowledge and leadership**, optimizing the position of research staff and institutions, as well as the quality of their infrastructures and equipment. Promoting quality and scientific excellence, favouring a systemic effect that reaches and benefits a greater number of groups. Applying scientific knowledge to the development of new technologies that can be used by companies and intensifying the **capacity to communicate** to our society **and to influence** the public and private sectors.

DEVELOPING, ATTRACTING AND RETAINING TALENT	
Tgt. 5	**Strengthening Spain's ability to attract, recover and retain talent**, facilitating professional advancement and mobility of research staff in the public and private sectors, and their ability to influence decision-making.
CATALYZING INNOVATION AND BUSINESS LEADERSHIP	
Tgt. 6	Favouring the **transfer of knowledge** and developing **two-way links between science and companies**, through mutual understanding of needs and objectives, especially in the case of SMEs.
Tgt.7	Promoting **research and innovation in the Spanish business fabric**, increasing its commitment to RDI and expanding the scope of innovative companies to make the business fabric more competitive.

iii. EECTI lines of action

These targets will be achieved through the deployment of a series of complementary and cross-cutting measures that are based on **lines of action**:

INSTITUTIONAL STRENGTHENING	
Line 1.	**Budgetary.** Increasing the budget dedicated to RDI during the period 2021-2027, and encouraging private investment, until it reaches the EU average, in particular through direct aid (subsidies), and favouring the establishment of adequate lines to facilitate the use of European funds, as well as compliance with the State Aid regulations.
Line 2.	**Instrumental. Developing the instruments and bodies depending** on the LCTI to increase expert advice to the different state and government bodies. **Simplifying and making the available instruments more flexible** and adapting them to the needs of the agents to improve the use of resources. **Strengthening SECTI** financing agents.
Line 3.	**Coordination. Coordinating and complementing national and sectoral RDI policies** with others at European, regional and local level, promoting support to other countries in the development of their policies in this area.
Line 4.	**Governance.** Addressing the development of a system of governance and indicators that facilitate the analysis, monitoring and evaluation of the results regarding the objectives set.
RESEARCH AND INNOVATIVE AGENTS	
Line 5.	**Capacities.** Encouraging and supporting the **generation of scientific and innovative capacities** in public and private SECTI agents to favour the aggregation and development of high-level RDI centres, and promote excellence in **scientific and technological infrastructures.**
Line 6.	**Itinerary.** Establishing a **scientific and technological pathway to enter the RDI system** to facilitate promotion and job security, which takes into account the needs of our country's personnel in research and innovation, in universities, public bodies, and health research institutes, public and private RDI centres and companies. This itinerary must consider the exit to the private sector, according to the needs of the productive and services sector.

Line 7.	**Talent.** Establishing mechanisms for attracting and developing **research, technological and innovative talent** for companies, industries and RDI centres, and facilitating the mobility of research, technological and innovative personnel, both in the public and private sectors. The principle of gender perspective in RDI will be respected, as well as equal treatment and opportunities between women and men.
Line 8.	**Promotion.** Promoting business innovation and the **dissemination of innovation** in all sectors, especially in small and medium-sized enterprises (SMEs), facilitating the incorporation of technologies and innovations, to achieve the country's political, social and economic priorities. Ensuring **adequate tax incentives** for RDI adapted to companies in the science and innovation system.
Line 9.	**Opportunities.** Strengthening national strategic sectors, transforming social challenges into **business development opportunities** and promoting entrepreneurship and investment in RDI in the private sector, as well as attracting venture capital for innovative companies.
RELATIONSHIPS BETWEEN AGENTS	
Line 10.	**Multidisciplinarity.** Encouraging inter- and **multi-disciplinarity**, promoting and supporting the transversal use of essential enabling technologies, disruptive digital technologies or deep technologies that allow business and social progress.
Line 11.	**Transfer.** Promoting the existence of **effective channels of knowledge transfer**, cooperation and exchange between the public and private sectors.
Line 12.	**Innovation.** Strengthening value chains around focused innovation systems.
Line 13.	**Internationalization.** Promoting the **internationalization of SECTI agents** by: i) promoting participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration with the support of scientific diplomacy; iii) international cooperation for sustainable development; iv) the promotion and participation in international scientific and technological facilities and infrastructures.
SCIENCE AND INNOVATION IN SOCIETY	
Line 14.	**Social.** Promoting the commitment **of Spanish society to RDI**, promoting **scientific dissemination and culture**, a reflection on the role of science and technology in today's society, and promoting **open and inclusive** science and innovation.

TARGETS\LINES		Institutional strengthening				Research and Innovative Agents					Relationships between the agents				Science and Innovation in society
		LINE 1	LINE 2	LINE 3	LINE 4	LINE 5	LINE 6	LINE 7	LINE 8	LINE 9	LINE 10	LINE 11	LINE 12	LINE 13	LINE 14
		Budget	Instrumental	Coordination	Governance	Capacities	Itinerary	Talent	Promotion	Opportunities	Multi-disciplinarity	Transfer	Innovation	Internationalization	Social
Addressing the priorities of our environment															
Tgt1	RDI at the service of the SDGs Agenda 2030														
Tgt2	Contributing to the political priorities of the EU														
Tgt3	Prioritising and responding to the challenges of the national strategic sectors														
Promoting RDI and its transfer															
Tgt4	Generation of knowledge and leadership of researchers, infrastructures and society														
Developing, attracting and retaining talent															
Tgt5	Strengthening Spain's ability to promote, attract and retain STEM talent														
Catalysing innovation and business leadership															
Tgt6	Favouring knowledge transfer														
Tgt7	Promoting research and innovation in the Spanish business fabric														

Table 1. Structure of the Spanish Strategy of Science, Technology and Innovation.

5 Action model

To achieve the above targets and facilitate the implementation of the EECTI 2021-2027, an action model is needed that allows the pieces that make it up to fit together and the coordination of the plans and strategies that depend on it. This model is articulated in different elements of a basal and transversal nature that conveniently cover the SECTI's needs. The implementation of the targets and lines of action proposed in the EECTI will require **programming instruments** which, through the PEICTI and other planning mechanisms, will allow ambitious RDI projects to be set up while maintaining European convergence, providing infrastructures and human resources and ensuring the transfer of results to the economy and society.

Description and action model of the EECTI 2021-2027

The **Action model** is articulated in accordance with the different elements summarised in the following chart:

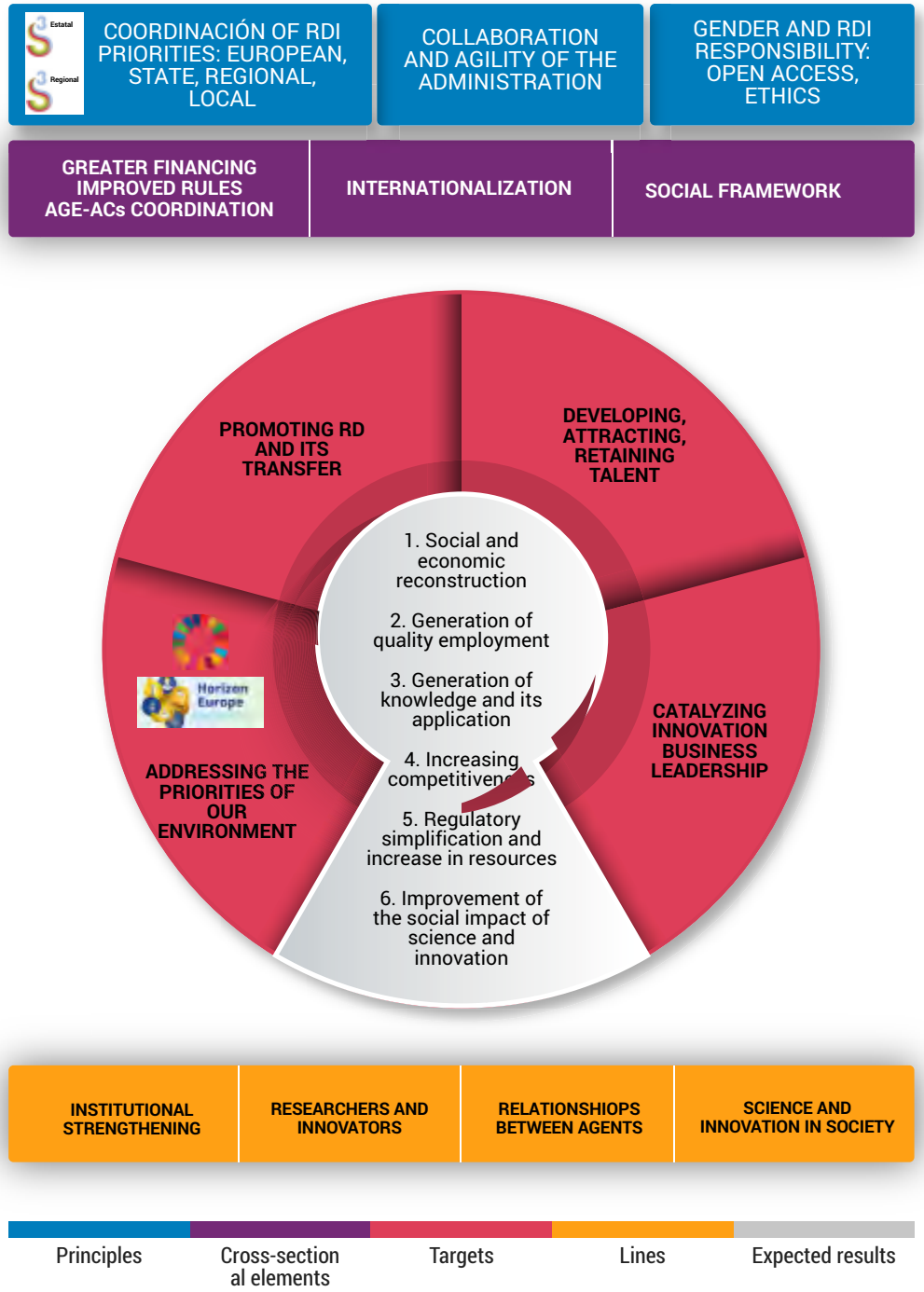

Chart 3. Action model of the EECTI 2021-2027

5.1. Addressing the targets

The targets represent the central element of the strategy and are articulated around **four large blocks** in which the tasks to be carried out are specified through lines of action. The proposed Targets and the approach designed to achieve them are described below:

i. Addressing the priorities of our environment

The actions set out in the EECTI will consider, directly or indirectly, the implementation of the **ODS of Agenda 2030** in Spain and will preferably be linked to ***Target 1***. In this sense, attention will be paid to the priorities and strategic areas of action defined in the Action Plan for the Implementation of Agenda 2030 in Spain, approved in 2018, and those defined in the future Sustainable Development Strategy 2030. In this sense, the ODS will serve as a driving force for RDI and will be used to define the scientific-technical priorities of our country.

Similarly, ***Target 2*** is aimed at integrating the interests reflected in the EU's RDI programmes. In this way, the EECTI directs the planning of its RDI programmes towards the **Global Challenges and Industrial Competitiveness pillars of the Horizon Europe Programme. Six thematic clusters** are defined within the Global Challenges pillar.

1. Health
2. Culture, Creativity and Inclusive Society
3. Security for Society
4. Digital world, Industry, Space and Defence
5. Climate, Energy and Mobility
6. Food, Bioeconomy, Natural Resources and Environment

At a national level, the strategic RDI lines have been identified to respond to ***Target 3***, whose prioritisation will cover Spain's needs in science and advanced technology, proposing progressive activities that will be supported by strong groups and institutions and a high level of visibility. These lines are not an academic catalogue but reflect SECTI's strengths in key areas to respond to the challenges of our society in which Spain has a clear international leadership. The selection of these lines is the result of a process led by the MCIN with the participation of the public and private sectors.

The national strategic lines are framed in the Horizon Europe thematic groups and allow the prioritisation described below and **detailed in Annex II**:

1. Health

- Precision medicine
- Infectious diseases
- Diagnostic and therapeutic techniques
- Cancer and Geroscience: Aging, degenerative diseases

2. Culture, Creativity and Inclusive Society

- Human evolution, anthropology and archaeology
- Cognition, linguistics and psychology
- Hispanic philology and literature

3. Civil Security for Society

- Spatial dimension of inequalities, migrations and multiculturalism
- Monopolies and market power: measurement, causes and consequences
- Cybersecurity
- Protection against new security threats

4. Digital world, Industry, Space and Defence

- Artificial Intelligence and Robotics
- Photonics and electronics
- Mathematical modelling and analysis and new mathematical solutions for science and technology
- Astronomy, Astrophysics and Space Sciences
- Next generation internet
- New materials and manufacturing techniques

5. Climate, energy and mobility

- Climate change Decarbonisation
- Sustainable mobility
- Sustainable cities and ecosystems

6. Food, Bioeconomy, Natural Resources and Environment

- Exploration, analysis and forecasting of biodiversity
- Smart and sustainable food chain

The set of clusters and national strategic lines will make it possible to address the full spectrum of our country's interests in RDI and will be reinforced through collaborative activities that break down the classic boundaries between disciplines.

The thematic prioritization described above will make it possible to develop basic research lines and will encourage **inter-disciplinarity** that generates high-impact science and knowledge. Similarly, **multi-disciplinarity** will be encouraged, which will allow scientific missions to be developed and ODS projects to be tackled. Interdisciplinary research will require promoting the interrelationship between different disciplines, maintaining an appropriate balance between them, while preserving the implementation of uni-disciplinary science. Because of the importance of this target, ***Action Line 10*** is designed, the implementation of which will require the search for mechanisms to evaluate and promote scientific activity appropriate to both types of approach. Similarly, enterprises must encourage multi-disciplinarity and intersectoral collaboration, which is the basis of the fourth industrial revolution.

The contribution of RDI to national policy priorities will be achieved through Action Line 2, which will promote the development of instruments and bodies depending on the LCTI to **increase expert scientific advice to the various state and government bodies**. In this way, RDI will be present in the decision-making process, contributing to the resolution of crisis situations based on knowledge.

In the current situation, and in order to contribute to the social and economic reconstruction of the country, the actions proposed at the EECTI will facilitate the transition of the Spanish economy

through innovation, both in those sectors in which our SMEs are most active and in new emerging sectors. To this end, the development of projects with a high social impact will be promoted and a **National Strategic Prioritisation** will be carried out which, by bringing together areas of interest, will provide a response to the challenges of the strategic sectors, as set out in ***Target 3***.

In its articulation, the EECTI 2021-2027 joins other National Strategies, both from the MCIN and from other ministerial departments, in which RDI plays a fundamental role:

- Spanish RDI strategy in AI[6].
- National Strategy for Connected Industry 4.0[7].
- Defence Technology and Innovation Strategy[8].
- Strategy for the Digitisation of the Agrifood and Forestry Sector and the Rural Environment[9].
- Fifth Master Plan for Spanish Cooperation[10].
- Strategic Framework for SME Policy 2030[11].
- National Security Strategy[12].
- General Guidelines of the New Spanish Industrial Policy 2030[13].
- Digital Spain 2025[14].
- Spanish Urban Agenda[15].
- Joint Spanish Cooperation Response Strategy to the COVID-19 Crisis[16].
- Spanish Circular Economy Strategy[17].
- Integrated National Energy and Climate Plan[18].
- Strategy for the adaptation of the coast to the effects of climate change[19].
- National Strategy to face the Demographic Challenge.

Likewise, EECTI will incorporate, through the mechanisms established in its governance, strategic areas contemplated in the future sectoral strategies currently under development[20].

These strategies focus on **priority areas** and on the need to exercise a guiding and incentive effect on RDI financing tools.

The **prioritisation of these Strategies requires** that the State Plans derived from EECTI establish **National Strategic Actions** that allow the sectoral objectives of EECTI to be implemented. These actions will be "programmatic actions", with different participation modalities and financing instruments, which will be articulated through the resources identified in the sectoral strategies. Furthermore, their management may correspond to different units, both from the MCIN and

6 http://www.ciencia.gob.es/stfls/MICINN/Ciencia/Ficheros/Estrategia_Inteligencia_Artificial_IDI.pdf
7 https://www.industriaconectada40.gob.es/estrategias-informes/estrategia-nacional-IC40/Paginas/descripcion-estrategia-IC40.aspx
8 https://www.tecnologiaeinnovacion.defensa.gob.es/es-es/Contenido/Paginas/detallepublicacion.aspx?publicacionID=205.
9 https://www.mapa.gob.es/es/ministerio/planes-estrategias/estrategia-digitalizacion-sector-agroalimentario/
10 https://www.cooperacionespanola.es/es/v-plan-director-2018-2021
11 https://plataformapyme.es/SiteCollectionDocuments/EstrategiaPyme/Marco_Estategico_Politica_Pyme_2030.pdf
12 https://www.dsn.gob.es/sites/dsn/files/Estrategia_de_Seguridad_Nacional_ESN%20Final.pdf
13 www.mincotur.gob.es/es-es/gabineteprensa/notasprensa/2019/documents/docu%20directrices%20generales%20de%20la%20pol%C3%ADtica%20industrial%20espa%C3%B1ola.pdf
14 https://www.mineco.gob.es/portal/site/mineco/menuitem.32ac44f94b634f76faf2b910026041a0/?vgnextoid=c3285b23f3083710VgnVCM1000001d04140aRCRD
15 https://www.aue.gob.es/
16 https://www.cooperacionespanola.es/sites/default/files/estrategia_de_respuesta_conjunta_de_la_cooperacion_espanola_covid19.pdf
17 https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/economia-circular/espanacircular2030_def1_tcm30-509532.PDF
18 https://www.miteco.gob.es/es/prensa/pniec.aspx
19 https://www.miteco.gob.es/es/costas/temas/proteccion-costa/estrategiaadaptacionccaprobada_tcm30-420088.pdf
20 The future Strategy of Technology and Innovation for Defence; the future RDI Strategy for the Health Sector; the future Sustainable Development Strategy 2030; the future Long-Term Strategy for a Modern, Competitive and Climate-Neutral Spanish Economy in 2050; the future Strategy for Safe, Sustainable and Connected Mobility; the future Strategy for Natural Heritage and Biodiversity; the future Second National Plan for Adaptation to Climate Change; the future Renewable Hydrogen Roadmap; the future Energy Storage Strategy; the future National Strategic Plan for the protection of the coastline; the future Innovation Strategy for the Blue Economy; the future State Strategy for Green Infrastructure and Ecological Connectivity and Restoration.

from other ministerial departments, and will allow the available resources to reach the maximum intersectoral penetration, favouring a rapid growth that improves competitiveness and the impact on strategic areas for the country.

The National Strategic Actions included in the PEICTI, together with the regional plans and strategies in sectors and territories identified in each Autonomous Community, will contribute to favouring **industrial transition by facilitating the training of HRs, the diversification of the economy, entrepreneurship and the technological improvement of SMEs interested in promoting technological change in areas such as: 4.0 Industry, society, the digital economy, low-carbon clean technologies, and services or products that reinforce the resilience of society and the national economy. All of this will be aimed at** contributing to the fulfilment of the S3 objectives and the European and international recommendations for progressing towards an economy based on low-carbon, digitized, sustainable and socially responsible technology.

ii. Promoting RDI and its transfer

Excellent and open science constitutes one of the pillars of Goal 4 (Generation of scientific knowledge and leadership). The promotion of an **Open Science** model will favour the generation of high-quality, high-impact knowledge, as well as its transmission to society, which is directly related to **Action Line 5** (promoting and supporting the generation of scientific and innovative capacities among SECTI agents). To ensure the level of excellence and its international presence, we have to provide Spanish science with **human and material resources**. In this way, we will also enhance the strategic capacities of our country, making it possible to apply scientific and innovative knowledge to the development of new technologies. **Generational renewal** will be favoured by promoting scientific and technological vocations, offering opportunities to young talents, and ensuring the budget allocation necessary for the development of RDI projects. Likewise, **technological leadership, inter- and multi-disciplinary** activity and the approach to **disruptive** areas and technologies will be promoted, while maintaining lines of work in areas that give solidity to SECTI and favour the industry as their end user. Interaction between public research organizations, universities, technology centres and innovative companies will be promoted to favour the transfer of knowledge and effective collaboration between agents.

Supporting **excellence in science**, a basic element of the EECTI model, will promote, in keeping with EU guidelines, open access to research results, making data findable, accessible, interoperable and reusable (FAIR). Dissemination in the scientific field, together with the effort carried out by open repositories, will facilitate accessibility to scientific advances and promote scientific dissemination and communication to society, the target pursued in **Action Line 14**.

The coordination of the financing agents will make it possible to improve the financing instruments and articulation mechanisms of the PEICTI, using, for this purpose, human resources with training in open access to data, microdata, publications, code (software) and, generally speaking, to all the results of publicly funded research. This aspect will be reinforced through the development of guidelines that allow the availability of data repositories for public use. To this end, the Spanish contribution to the **European Open Science Cloud** (EOSC), which will act as a driver for data-driven science, will also be promoted, and participation in the adaptation of digital repositories will be encouraged. This new scenario, in which scientific data acquires a relevant value, will be accompanied by other actions permitting, for example, the development of data infrastructures and

their services, thus supporting the production of FAIR data and their integration into the European Cloud, the training of managers and user communities of these infrastructures, and the development of new scientific career evaluation metrics.

Complementarily, the EECTI will promote the participation of the SECTI in the **European Partnerhips** of the Horizon Europe program, distributed into the different areas of the six thematic clusters described above and aimed at facilitating the achievement of the political objectives agreed by the EU. Spain has actively worked in the co-creation of these European Partnerhips, defined as "**initiatives where the EU, together with private and/or public partners, commit to support the development and implementation of a program of research and innovation activities**", and which will be prioritized on the basis of criteria of opportunity and the capacity of the stakeholders (the funding agencies of the MCIN and the sector ministries involved: MITERD, MINCOTUR, MINECO, MITMA, MINSAN, MAPA). Based on this effort, and in order to promote **and increase cooperation with our European partners** and with the entities of the European Research Area, the State Plans will establish in their programming specific, agile and flexible instruments, and financial contribution mechanisms that, in coordination with the AGE and the Autonomous Communities, consider the use of European Funds (ERDF, ESF +, EMFF, EAFRD). In this way, an adequate strategic prioritization will be carried out on the European Partnerhips, especially in those cases of institutionalized modality, or which require national co-financing, thus ensuring the level of participation in this key instrument of the new Framework Program.

The **Institutions**, including public research bodies, universities, clinical-care research centres, scientific foundations, technology centres, innovative companies and, of course, funding bodies and aid managers (agencies, ministries, ministries, etc.), **constitute one of the essential pillars of SECTI**. Its distribution throughout the national territory, together with that of the scientific-technical infrastructures, give RDI a relevant position in the face of the Demographic Challenge.

In order to facilitate the engagement of the SECTI, by means of **Action Line 5** the following initiatives will be prioritized: 1) the development of high-level RDI nuclei, 2) the strengthening of institutions by modernizing the systems management IT specialists, 3) the adaptation of the workforce and the establishment of guidelines that make it possible to align the Public Employment Offer with the tasks to be carried out, and 4) the provision and renovation of the necessary infrastructures and scientific equipment.

The **scientific-technical infrastructures** are central elements for carrying out research of excellence, which means that their financing, maintenance, updating and continuous improvement are basic aspects to strengthen the SECTI. In **Action Line 5**, it is planned to consolidate an advanced network of infrastructures and scientific-technical equipment that will, in turn, promote the work carried out in the research centres. Likewise, participation in new infrastructures in the field of innovation and citizen science will be encouraged, such as the "**living labs**", the **Digital Innovation Hubs** (DIHs) network and the **sandboxes** used in those cases where a measure of novel experimentation is required. In this way, the available infrastructures will be used to give access as users, to small research groups, technology centres, companies, etc.

From this perspective, and in coordination with the Autonomous Communities, the plan is to update and implement the **ICTS Map**, which will serve as a driving force for promoting excellence. The strengthening of the ICTS constitutes one of the fundamental elements of the Strategy and will favour the regional coordination and the cohesion of the SECTI with the EU. For this purpose, it will be necessary to increase investment in ICTS, establish agile mechanisms to attract RDI projects to these infrastructures, and favour access to **international infrastructures** (ESFRI, European Strategy Forum on Research Infrastructures).

Finally, in relation to the transfer of knowledge, it will be necessary to **ensure public-private cooperation** in the different stages of the value chain, from the initial phases of the development of technologies in which the application of knowledge will be favoured, to the arrival on the market of products of interest to society.

iii. Developing, attracting and retaining talent

Human resources are an essential element of SECTI. In this regard, it is essential to have the appropriate volume for the development of the necessary tasks and to ensure the qualification of the workforce.

Through **Action Line 7**, the **mobility** of human resources among the main public agents of the SECTI will be promoted, as well as the training and recovery of national talent, and the attraction of international talent. It will be equally important to incorporate personnel in the business and industrial sector, favouring mobility between company workers and the scientific and technological field and vice versa and promoting the absorption capacity of research staff in the business fabric. Through **Action Line 13**, mobility and international training will also be facilitated. Additionally, participation in international actions focused on training and research in areas of interest and technologies aligned with this strategy will be promoted.

In accordance with **Action Line 6**, a **scientific itinerary for access to the RDI system will be designed** and this, being adapted to the specificities of current legislation, is comparable to that of the neighbouring countries (Tenure Track). Likewise, a technological itinerary will be elaborated in which the figure of Technologist included in the LCTI will be developed.

In accordance with **Target 5**, it will be essential to establish a well-defined **Research Career** with effective selection, evaluation and promotion mechanisms, and in which mobility is contemplated and facilitated as an enriching element of the SECTI. The availability of a defined and structured scientific career will be an essential and necessary element to stimulate and retain scientific talent in our country. The designed itinerary will have to respect and guarantee the principles of occupational safety and equal treatment and opportunities between women and men.

In coordination with the competent authorities, **STEM** (Science, Technology, Engineering and Mathematics) education will be stimulated from the early educational stages with an inclusive approach that fosters diversity and, with it, quality science. In this sense, it seems essential to work in the different areas that provide opportunities to young people to interact with science: school, family, social environment and informal education through outreach programs, teacher training,

improvement of vocational guidance and contact between the different agents involved in training of young people (publishing houses, science museums and the media).

iv. Catalysing innovation and business leadership

The search for competitiveness through RDI is a fundamental pillar of this strategy, aimed at promoting the transfer of knowledge. In accordance with **Target 6,** Spain must stimulate **symbiosis between the scientific and business fields** and promote the development of their respective capacities. The generation of knowledge, both basic and of value, will serve to promote business development and the demand for knowledge in this sector. The development of this pillar implies promoting RDI in the Spanish business fabric, **Target 7**, and encouraging the group of innovative companies to generate ecosystems with greater capacity and critical mass. With this target, the responsibility of consolidated innovative companies and their commitment to RDI will be strengthened, which, thanks to technology, have become leaders in their respective sectors. These so-called "**champions**" must adopt a driving role that encourages other companies -typically SME suppliers and collaborators- to walk the path of innovation.

Spain faces important challenges in aspects related to the dissemination of technological innovation, as well as the role of Technology Centres, Science and Technology Parks, Technology Platforms and Associations of Innovative Companies in the transfer, to the innovation system, of knowledge based on the investigation. To promote the transmission of knowledge, actions such as the **six-year transfer and innovation period**, the reform of the registry of **Research Results Transfer Offices** (OTRIs), or the **Cervera Program** have been implemented. The validity of these policies and the main bottlenecks that limit the diffusion of innovation will be analysed in a project by the Directorate General for Structural Reform Support of the EU and the Organization for Economic Cooperation and Development (OECD), "Roadmap to foster co-operation between universities, research and business in Spain".

In relation to SMEs, the objectives described are aligned with the priorities set out for these types of companies in the **European SME Strategy for a Sustainable and Digital Europe**[21]. Likewise, the aforementioned objectives are aligned at the national level with those set out in the 2020 Strategic Framework for SMEs Policy, which defines as lines of action, among others, support for Entrepreneurship and Innovation.

In a complementary way, the administrations will stimulate the development of other RDI activities, such as:

1. The **MCIN's Science and Innovation Missions are an instrument of state innovation**, which will be defined by broad consensus and reviewed according to Spanish strategic priorities. This instrument is directly linked to Line of Action 11 (promoting the existence of effective channels of transfer, cooperation and sharing of knowledge between the public and private sectors), Line of Action 12 (promoting value chains around focused innovation systems), and Line of Action 9 (strengthening national strategic sectors by transforming social challenges into **business development opportunities**, promoting entrepreneurship and attracting investment). Given its relevance, and in line with the objectives of the 2030 Agenda, Spain will promote, through the

21 An SME Strategy for a sustainable and digital Europe. COM(2020) 103 final. 10.03.2020

Missions in Science and Innovation, the participation of companies and the most qualified public and private entities in the resolution of socioeconomic challenges.

At the national level, the Science and Innovation Missions financed by the CDTI will contribute to integrating the work of companies, researchers and institutions, public and private, and to having the necessary financial resources to achieve the desired impact. The type of actions contemplated in the proposed missions must cover **all the links of the value chain** such as: fundamental research oriented towards the action considered, the development and integration of advanced and emerging technologies, and support for the technological innovation process that will have an impact on new products and advanced services. All this, respecting the thematic alignment, the definition of the success indicators, the time horizons, the effort made in the EU in this regard, and the specific challenges of our country.

A key element for the success of the Science and Innovation Missions at the national level will be the creation of a governance structure, coordinated and integrated, that facilitates the definition, execution and obtaining of results, ensuring the interaction between the participating agents and institutions (public and private), and guaranteeing the achievement of the proposed objectives.

The Science and Innovation Missions will serve to start up **Tractor Projects** in areas such as the **"green challenge", health and social welfare, and the digitization of society**. These projects will be carried out in collaboration between various actors, and will favour the transfer, exchange of knowledge and the impact of science and innovation in society.

2. **Systemic and systematic innovation**, which will allow innovation to be present in all areas of society, public and private, and in all sectors, in particular, in the major objectives of the country, in strategic Spanish missions, in purchases of the administration, etc. This element is linked, among others, to **Action Line 8** (promoting business innovation and the diffusion of innovation in all sectors, especially in SMEs), facilitating the incorporation of technologies and innovations, internationalization, **industrial transition, digitization and migration to a low carbon economy**. Systemic innovation will bring society closer and participate in the results of innovation and its processes. In this sense, it should be noted that the **Public Procurement of Innovation (PPI)** will be promoted from the public sphere (AGE, ACs, local entities, public companies, universities, etc.) that will turn the Public Administrations into driving elements of innovative activity. For this, specific PPI lines will be launched in areas such as **health, mobility or the smart and sustainable agri-food chain.**

The main target of this activity is to ensure that **business RDI acts as a recurring investment** for companies, and not as a mere adaptive reflection to market situations or an activity that is abandoned in the face of the first attacks of an economic crisis. This requires continuous support based on the needs and innovative status of the company (intensive with RDI, occasional innovator, new entrant ...), as well as a **policy of awareness** of the need and benefit of innovation that allows expanding the scope of innovative companies in the Spanish industrial fabric.

3. **Innovation ecosystems** that take advantage of the disruption in traditional value chains. **Action Line 12** contemplates carrying out actions to promote the generation of new value chains that

enhance existing ones, taking into account three aspects: 1) the incorporation, to a pre-existing value chain, of actors from other value chains that provoke deep transformations; 2) the emergence of new executing actors, financers and intermediaries that position themselves in the value chains causing the breakdown of traditional chains; and 3) the implementation of sustainability criteria to facilitate the development of advanced products and services.

Beyond identifying the main players in an ecosystem, its innovation value lies in its ability to interact with other ecosystems. The assumption of open innovation models has allowed us to recognize the importance of "relational capital" versus "physical capital", and the need, on the part of the PAs, to provide spaces for interaction that cover the entire value chain. In this regard, the role of science-technology parks will be relevant, providing the appropriate collaboration spaces.

4. **Entrepreneurship**, as a key element that will complement the previous ones, should reach the national strategic lines, also contributing to the training of human resources, both at the most elementary educational levels, as well as in university postgraduate courses. It is necessary to continue supporting and promoting the creation of start-ups, or more specifically of spin-offs, which favour specialization and the exploitation of the results derived from research. For this, support programs for the creation of companies and training of entrepreneurs must be articulated. Likewise, it will be necessary to promote the creation and capture of early investment funds (e.g. seed capital) that favour the development of intra-entrepreneurship programs and the progressive internationalization of new innovative companies that will be supported by fiscal aid measures for promoting growth. The venture capital sector must expand the volume of its activities and favour specialization in emerging technological areas and geographic diversification.

5.2. Cross-sectional elements

RDI will benefit from those changes that make it possible to improve the management of the SECTI, through the development of adequate regulations that affect both the financing agencies and their executing agents. These changes will have to have the necessary **funding and adequate instruments** to improve **coordination** between the AGE and the ACs.

The **internationalization** of SECTI is defined as an intrinsic component of the promotion and coordination actions, which contributes to the strengthening of human and institutional capacities.

Another of the backbone elements of the EECTI, also included in the general objectives of the LCTI, consists of promoting open science and **citizen participation in research, development and innovation**. In this sense, so-called citizen science has had a great success in neighbouring countries and should be promoted in our country. Likewise, the social recognition of science and innovative business activity will benefit through the promotion of communication and **scientific and technological dissemination**.

i. Policy development, funding and coordination aspects

To achieve the objectives and expected results in this area, the Strategy will facilitate the development of the instruments and bodies established in the LCTI, such as the Spanish Research Ethics Committee, the consolidation of the SICTI, as well as suitable **regulations and financing instruments**. For this, it will be essential to strengthen SECTI's financing agents and face the new instruments with sufficient capacity and agility. These elements are linked to Action Line 1 (increasing the budget dedicated to RDI during the period 2021-2027, in a continuous and sustained manner, particularly in direct aid; subsidies), to Action Line 2 (achieving a normative framework and flexible instruments adapted to the needs of the agents of the RDI system, researchers and innovators) and to **Action Line 4** (addressing the development of a system of governance and indicators). The implementation of these lines of action will allow the establishment of a dynamic governance system, which will favour the coordination and implementation of the proposed actions, as well as the monitoring and evaluation of the EECTI. In accordance with article 11 of the LCTI, the SICTI will expedite the availability of statistical data, national and regional, to favour the decision-making of the AGE and the ACs.

Likewise, it is necessary to have **sufficient funding**, adequate IT management systems and agile and simple governance mechanisms, which make it possible to manage RDI funds, from the request for aid to its execution and justification. This will require **eliminating those bureaucratic obstacles** that make it difficult to carry out RDI actions. Finally, it is equally critical to simplify existing instruments, seeking a more versatile, flexible and functional update that adapts to a variety of purposes and operates under a common regulatory framework.

It is necessary to have a **regulatory framework that facilitates the coordination of alternative sources of financing** with other more traditional ones and that allows, in turn, to sustain the SECTI in a stable way, from incipient phases, until its final development. Likewise, it is necessary to find a way for the channelling of private funds that, together with public funds, allows the required actions[22] to be carried out. For this, a regulatory environment must be developed (patronage laws, crowdfunding, venture capital with attractive taxation) that **facilitates and stimulates private investment in research and innovation**, enabling public-private **co-financing and philanthropy. Multi-year budgets, based on political commitment**, will be the necessary tool to secure the funding required for projects. For all this, it will be essential to make an investment effort in RDI policies, both by the public and private sectors.

The coordination of the activities proposed will make it possible to make rational use of the available Resources, which is linked to **Action Line 3** (coordinating and complementing national and sectoral RDI policies, with others at a European, regional and local level). The alignment of the national RDI program and the regional programs, together with the coordination of the ministerial departments of the AGE and the ACs, local corporations and European institutions, will improve the functioning of the SECTI, which should, furthermore, strengthen its governance and carry out ad hoc technical level initiatives.

22 It will be a priority will be to coordinate the use of the various funds that will feed the actions (General State Budgets, ERDF, European Social Fund, EIB financing or future mechanisms such as InvestEU). The conditions imposed by each of these types of funds are different and not all of them are equally applicable to research or innovation activities. In this sense, the guiding principle will be that of greater aid (subsidy) at greater risk (in the image and similarity of those established by the General Regulation of Exemptions by Blocks), the funds with the lowest associated charges being those that are used for more "upstream" actions.

ii. Internationalization

The **internationalization** of the SECTI is a cross-cutting element in all the actions of the EECTI 2021-2027, and will be promoted through essential activities aimed at fostering collaboration with other Member States of the EU and with other neighbouring countries. These actions will be addressed by the MCIN itself and its agencies, in coordination with the MAEUEC, with the collaboration of the AGE and all its agents abroad. Internationalization is seen from a triple perspective:

Alignment with Horizon Europe

As described above, the implementation of the EECTI will promote **alignment** with **Horizon Europe**, the search for synergies with ERDF and ESF + funds, and support for participation in international projects and programs. A key aspect in this area will be the promotion of participation in joint programming actions of Horizon Europe and international facilities, favouring, for this purpose, the use of adequate, agile and efficient instruments, as well as the availability of specific financing in each case.

The promotion of Spanish participation in European and international programs requires carrying out a targeting exercise that makes it possible to optimize the use of available resources, according to the priorities, strengths and interests of our country. To this end, the MCIN will establish, through its agents, an **Incentive Plan** that includes a set of actions for promoting Spanish participation and leadership in European RDI programs (Horizon Europe). These actions will be structured in accordance with the objectives set in the corresponding state and regional plans. To this end, measures will be implemented such as: 1) the promotion of RDI management networks; 2) the promotion of scientific and technical research with the capacity to participate in European programs and in the European Research and Innovation Councils (ERC and EIC); 3) support for the presence of SECTI staff in European institutions and their participation in training programs in areas of interest; and 4) participation in the Communication Plans established at the state and regional level to connect science and society, valuing the capabilities of the SECTI at the international level.

In relation to the EU framework program, the MCIN will mark the levels of **return and participation** that we must achieve as a country in the calls of the European Commission financed exclusively with the Community budget. Likewise, it will be important to lead and participate in co-financed programs, in which Spain must allocate its own resources. In addition, Spain will promote the alignment of state and regional aid and its synergy with European funds, and the leadership and Spanish presence in the decision-making areas of the community structure.

Emerging science and technology opportunities and public-private collaboration

Emerging scientific and technological opportunities that arise in geographical areas outside the EU, especially in Latin America, constitute an essential aspect that must be taken into account when shaping the strategy.

In order to strengthen the SECTI, the need to create a **favourable environment for the detection of new disruptive technologies has been considered, as has the encouragement of innovative investment flows** to our country and the presence of Spanish entities in other countries. The financial resources devoted to RDI move from one region to another in search of more advanced ideas and more favourable ecosystems, especially in the case of private sector investments. It is necessary to adopt a proactive stance, involving the sectoral ministries, the MAEUEC and the Spanish diplomatic missions, in close collaboration with public and private entities. This will force Spain to launch initiatives that make it possible: a) to create the appropriate conditions for the location in our territory of research and innovation centres of foreign, public or business entities, and b) to support the presence of Spanish science and technology entities in other countries, through the reformulation of support for Spanish scientific-technological knowledge and capacities abroad.

Public-private cooperation will make it possible to maximize synergy and association with entities outside of Spain, which will favour participation in international tenders and the provision of components for large facilities.

Thus, the existence of globalized value chains and the need to participate in those that reinforce our influence capacity are assumed. This vision will be complemented by the adoption of open innovation models, in which large companies will proceed to identify stable partners, both public and private, in various countries around the world. Cooperation in open innovation is not limited to the local sphere, which means that the membership of a public entity or an SME in these international networks constitutes a key element to ensure their competitiveness and stability.

International cooperation and collaboration

In the field of **scientific cooperation and international collaboration**, which includes international cooperation for development and scientific diplomacy, **Spanish delegations in priority countries will be provided with specialized personnel** to detect strategic lines of interest and facilitate the attraction of talent to our country. In the same sense, the administrative processes that allow the creation of units in other countries will be promoted and the participation of outstanding personnel in the directive and management bodies of international, European and intergovernmental Partnerhips dedicated to RDI will be encouraged. Likewise, an attractive tax regime will be designed for foreign investment in RDI, especially, that coming from foundations and international funds.

The foregoing will favour the generation and **attraction of knowledge** of quality and social and economic relevance, something difficult to achieve by a single country from a unilateral perspective.

Work will be done to improve the use and impact of bilateral relations, determining scientific-technological areas of geostrategic interest and defining public policy decision structures. In this regard, it is worth highlighting the internalization activity of the MCIN with the CDTI and its external network, and that of MINECO in the ICT field carried out by Red.es in coordination with the ICEX in the US, Israel and China.

Finally, the SECTI will support other countries in the development of their RDI policies and actions through the action and cooperation mechanisms **established in the V Master Plan for Spanish Cooperation**. Thus, international activity in science and technology in developing countries will be reflected, both in the Country Association Frameworks (MAP), and in the Advanced Cooperation Agreements (ACA), through the participation of the MCIN. One should also remark on the need to maintain the Spanish contribution to international organizations and programs related to science and technology.

iii. Social Framework

Another element of a marked transversal nature of the EECTI is **citizen involvement in science and innovation**, which is included in **Action Line 14**.

The EECTI 2021-2027 stems from a conceptual framework in which **civil society** must be a central element of the SECTI. This conceptual framework is also contemplated in European science policies and in initiatives in favour of open science. Civil society also acts as a generator of knowledge and relevant practices of social innovation. The FECYT will work together with other agents of the system, to reinforce the communication and dissemination of results not only to specialized agents but also to a broad public, bringing science and innovation closer to society.

Citizen involvement in science and innovation requires promoting initiatives that promote interaction between scientists and society, taking the youngest element into account. To this end, it is essential to promote diversity and give access to scientific culture to interest groups that, traditionally, have not been involved in science communication activities.

Likewise, it is convenient to **reinforce Spanish society's knowledge** of the technological capabilities of our companies, which allow some of them to compete successfully in global markets, making the public able to associate science and innovation with Spanish companies.

Citizen involvement in science requires **analysing the context of public communication** in Spanish society. As is the case in neighbouring countries, new technologies and the democratization of access to information have led citizens to go from exercising a passive role, as recipients of information, to protagonists of the communication process, a circumstance that has generated new forms of participation that should be promoted by all types of digital and audiovisual media and forms.

Actions to protect people from **false information** related to science and technology will be promoted, as will critical thinking and **decision-making based on scientific evidence**. Citizen interest in science and innovation issues must be stimulated by all the agents that make up the SECTI, who must facilitate the dissemination of RDI, and support the professionalization of scientific dissemination.

5.3. Expected results

Reaching a State Pact that allows a change of model, with a regulatory framework that is appropriate to the needs of the SECTI, contemplating an ambitious budgetary expense until this reaches the

European average and favours its stability, reducing possible redundancies between State and Autonomous planning and programming. In this context, Spain will be able to achieve a position of European leadership, developing a system capable of entering new markets.

The way out of the global crisis caused by COVID-19. RDI is a fundamental element for the social and economic reconstruction of our country. Knowledge, innovation and industry must be at the heart of initiatives and approaches proposed by the public and private sectors. To achieve this target, all the axes of this strategy must be mobilized, promoting, for this purpose, investment in human resources to ensure generational renewal, a significant increase in investments in scientific and technological infrastructures, and the creation of conditions that facilitate business entrepreneurship.

The generation of knowledge and its application to solving the problems of society. This result will be achieved through the aspiration of the EECTI to place science, technology and innovation at the service of the achievement of the SDGs and of social, economic and environmental development, in accordance with EU priorities. To this end, it is necessary to prioritize and respond to the challenges of the national strategic sectors, and to enhance Spain's ability to attract and retain talent. It is important that the scientific and technological community maintain, and even improve, the excellent international position in which it currently is. This result is also linked to Spain's contribution to the international agenda in relation to scientific and technological knowledge, as well as its contribution to maintaining and improving the international position of Spanish research staff, infrastructures, companies and institutions.

Improving the social impact of research and innovation. This will be achieved by addressing the challenges of our society, favouring the recovery of the country based on the generation of knowledge and its transfer. In this sense, it will be essential that citizens perceive RDI as an essential element to improve their quality of life and that of the environment in which they live, actively getting involved in improving their knowledge of science and innovation.

Increased competitiveness. National RDI must prioritize and respond to the challenges of the national strategic sectors, which will, in turn, be key to promoting research and business innovation and the transfer of knowledge. The increase in competitiveness in the public and private sectors will ensure the existence in Spain of efficient and competitive institutions at an international level, capable of attracting human resources and investments, which also favour the foreign presence in our country. For this, it is necessary to energise and transform productive sector and public services that interact with value chains, as well as regional, national and global knowledge ecosystems. Research and technological innovation are essential for bringing competitive products and services to the market; among others, those that facilitate the digital transformation of society. In this sense, the EECTI 2021-2027 will promote the coordination and alignment of public policies that favour the digitization of our society and our industry in the field of RDI. Beyond RDI, it will be possible to improve the international balance of payments and rebalance the weight of technology exports and imports, facilitating the participation of Spanish entities in global markets.

The generation of quality employment. Spain's ability to attract and retain talent will be promoted through specific programs and a modern and appropriate scientific and technological itinerary, which will enhance research and innovation, both in research organizations and institutions, as well as in the Spanish business sector. The creation of quality jobs will ensure that the processes of globalization

and the development of disruptive technologies do not lead to job losses, but, on the contrary, offer better opportunities to a workforce that must be progressively and continuously trained to achieve the appropriate competencies for future needs. The generation of a solid innovative fabric will also make it possible for Spanish companies, both large and small, to offer quality, qualified and stable employment.

6

State-level operating model

As established by the LCTI, the implementation of the current EECTI will be carried out through the PEICTI, which will finance the actions and priorities established by the AGE over a multi-year period. For this, it will be necessary to define: i) the **objectives** to be achieved and their indicators, including those for productivity and results, proposed by the European Commission in Annex I of the ERDF Regulation for the period 2021-2027; ii) the **programming** to be developed in order to integrate the strategic actions proposed by the different ministerial departments and their financing agents; iii) the criteria and mechanisms for the **articulation and coordination** of the PEICTI; iv) the **foreseeable costs** of its implementation and the sources of financing.

The operational framework of the EECTI 2021-2027 will make it possible to include in the PEICTI the **specific programs** that will be developed by the financing agents attached to the MCIN and the units of the sector ministries involved and that will correspond to the areas shown in Figure 4.

Chart 4: Main areas of development of EECTI planning.

7 Governance of the EECTI

The LCTI provides for the following **governance areas of the SECTI**:

- The Spanish Strategy for Science, Technology and Innovation
- The Council for Scientific, Technological and Innovation Policy (CPCTI)
- The Advisory Council for Science, Technology and Innovation (CACTI)
- The Spanish Committee for Research Ethics (CEEI)
- The Information System on Science, Technology and Innovation (SICTI)

In this section it is important to emphasise the **instrumental nature of the EECTI** for achieving the objectives established in the field of RDI and the definition of the indicators for monitoring and evaluating the results obtained, the coordination instruments of the AGE and the ACs, and the RDI plans of the AGE and the ACs, as well as their articulation with the sectoral policies of the Government, the ACs, the EU and International Organizations.

Taking all the above into account, the Strategy is an umbrella that houses both the State RDI Plans, as well as the regional plans of the ACs. Therefore, it is necessary to develop the governance, as well as the monitoring and evaluation system of the EECTI, as defined in article 8.2.a) of the LCTI, in order to facilitate sectoral and territorial coordination with the different Ministries and with the ACs, respectively. This system will have **indicators and criteria for reviewing** the actual Strategy, which will make it possible to adapt the design of the State Plans, if necessary. The governance system will take into account the recommendations of:

- The **European Council on Spain's 2020 Stability Program**, where it is deemed necessary to strengthen governance in the field of research and innovation at all levels.
- The **Guide to research and Innovation Strategies for Smart Specialization** by means of a quadruple helix model (Companies, Research and Public Administration, civil society and users of innovation).

For all this, a **Monitoring Committee of the EECTI** will be created with the following composition and functions:

Composition

- Three representatives from the MCIN and one from MUNI, not counting the presidency and vice-presidency.
- Six representatives from the rest of the Ministerial departments that represent the six strategic lines of national RDI. To be determined by the Council of Ministers.
- Four representatives of the Autonomous Communities. To be determined in the CPCTI.
- Six renowned scientists, technologists or innovators who represent the six strategic lines of national RDI. To be appointed by the General Secretariat for Research at the proposal of CACTI.
- Two representatives of society, two union representatives and two representatives of the business sector who collect the demands of citizens, consumers and non-profit organizations. To be appointed by the General Secretariat for Research at the proposal of CACTI.
- A representative of the State Investigation Agency (AEI).
- A representative of the Centre for Industrial Technological Development (CDTI).
- A representative of the Carlos III Health Institute (ISCIII).
- A representative of the Spanish Foundation for Science and Technology (FECYT).

Functions

1. Carrying out the **annual monitoring** of the EECTI through the indicators included in the actual Strategy (see next section and Annex III), as well as those deemed necessary for incorporation.
2. Preparing a **public annual monitoring report** with improvement proposals (intermediate and final) to promote the coordination of RDI between the AGE and the Autonomous Communities, using the information contained in the SICTI and the Integrated University Information System (SIIU).
3. At the end of the period of validity of the EECTI, preparing a report that collects and allows the **evaluation of its results**.
4. If necessary, **areas with competitive strengths** will be identified for the process of entrepreneurial discovery and new actions to support industrial transition, which can be incorporated into state and regional planning

5. Gathering **information about the development and actions** of the PEICTI and the regional plans, as well as any revisions and updates that they may undergo.
6. Preparing **the reports** requested by the CPCTI in the framework of the evaluation and development of the EECTI.

Functioning

- The Committee will be renewed every three years. The members may extend their representation for a new period of two years.
- The Chairmanship of the Committee will be entrusted to the competent superior body of the MCIN (currently, the General Secretariat for Research) and the Vice-Presidency on the competent General Directorate (currently, the General Directorate for Research Planning). The Committee will have a secretariat whose functions will be entrusted to a body determined by the Committee's Presidency.
- The Committee will meet at least once a year in an ordinary session and as many times as convened extraordinarily by the Presidency, and working groups may be established if deemed appropriate.
- The Committee will submit the monitoring reports to the CPCTI, along with all the information related to the EECTI that it considers relevant.
- The creation, composition and operation of the Committee will be defined in a Regulation and in no case will it imply an increase in personnel costs.

8

Monitoring and evaluation of the EECTI

The LCTI provides, in its article 11, the function of the SICTI as a data collection instrument for the analysis and monitoring of the EECTI, developing the indicators to be used during the **monitoring and evaluation process of the EECTI**.

The SICTI will also take into consideration other macro indicators provided by official bodies such as the INE, Eurostat or the OECD, as well as incorporating information from other official sources such as SIIU, PATSTAT, CORDA, and other bibliometric sources. During this process, the SICTI will also take into account the indicators proposed by the European Commission in the field of **ERDF** and **ESF +** funds. Finally, SICTI may incorporate data from ad hoc surveys, as well as other official statistics.

Considering all of the above, **Table 2** lists the main indicators that will be used to monitor and evaluate the EECTI 2021-2027. Additionally, **Annex III** presents a complete selection of the indicators that can be used to accurately evaluate each of the objectives and axes of the EECTI. These indicators will be used in those working groups that the EECTI Monitoring Committee may establish. Likewise, this section may be expanded according to the specific needs of its analysis. On the other hand, as stated in **Action Line 4**, during the term of the ECCTI, new indicators that are deemed necessary may be defined and incorporated.

The EECTI, as a framework for the preparation of the PEICTIs and regional strategies, will be subject to annual monitoring and a double evaluation process:

On the one hand, as provided in the governance section, the **EECTI Monitoring Committee** will monitor the strategy on an annual basis. For this, it will have the support of the SICTI Committee, with representation from the ministerial departments, their financing agents and the Autonomous Communities.

On the other hand, the evaluation of the EECTI will be carried out in **two phases**: a mid-term evaluation in the middle of the term and a **final** evaluation one and a half years after its completion. The SICTI Committee will prepare the evaluation protocol and methodology, determining the quantitative and qualitative indicators used for it. This committee will assess the need for the opportunity/convenience of carrying out special information gathering operations that may be necessary for the evaluation. This evaluation will be submitted to the EECTI Monitoring Committee and the corresponding bodies.

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Table 2. Main indicators to be used to monitor and evaluate the EECTI 2021-2027.
The indicators against a dark background are considered key to evaluate the progress of the actions, public and private, proposed in the EECTI.

INDICATOR	AVAILABLE YEAR	DATUM MOST RECENT YEAR	EU DATUM	EECTI VALUE 2027	SOURCE
Percentage of national spending on RD s / GDP	2018	1,24%	2,12%	2,12%	INE (RD statistics)/Eurostat. Gross domestic expenditure on RD by sector [SDG_09_10]
% of internal RD expenditure financed by the business sector	2018	49,5%	58% (2017)	58%	EUROSTAT/INE
% of internal RD expenditure financed by the PA sector	2018	37,6%	29,3% (2017)	30,0%	EUROSTAT/INE
Percentage of RD expenditure carried out within the business sector with respect to GDP	2018	0,7%	1,4%	1,5%	Eurostat. Intramural RD expenditure (GERD) by sectors of performance and source of funds [rd_e_gerdfund]
Percentage of spending on RD by SMEs	2018	46,9%	-	50,0%	INE
Percentage of spending on RD of the Public Administrations financed by the business sector	2018	6,9%	8,3% (2016)	8,0%	EUROSTAT/INE
% of execution of chapter 7 of program 46 of the GSBs	2018	89,10%	-	95%	Estadística de Créditos Presupuestarios
% of execution of chapter 8 of the program 46 of the GSBs	2018	19,70%	-	45%	Estadística de Créditos Presupuestarios
Number of researchers (FTE) per million inhabitants	2018	3.003,10	4.066,27	4.000,00	Eurostat
Percentage of female researchers (in FTE)	2018	38,8%	33,8% (2017)	42,0%	INE. Estadística sobre actividades de I+D EUROSTAT (Head Count).
Percentage of personnel employed in RD (including researchers) with respect to the employed population (FTE)	2018	1,18%	1,46%	1,4%	Eurostat. Total R&D personnel and researchers as % of total employment [rd_p_perslf]
Percentage of personnel employed in RD (including researchers) with respect to the employed population (FTE)	2018	0,546%	0,851%	0,7%	Eurostat.Total R&D personnel and researchers by sectors of performance, as % of total labour force and total employment, and by sex (rd_p_perslf)
Personnel employed in RD with doctorates (%)	2017	28,6%	-	35%	Eurostat. Total R&D personnel and researchers by sectors of performance, educational attainment level (ISCED2011) and sex [rd_p_persqual11]
Percentage of total employment in manufacturing sectors of high and medium-high technology and in highly qualified services (knowledge-intensive)	2018	39,90%	46,10%	43%	Eurostat. Employment in high- and medium-high technology manufacturing and knowledge-intensive services [SDG_09_20]

INDICATOR	AVAILABLE YEAR	DATUM MOST RECENT YEAR	EU DATUM	EECTI VALUE 2027	SOURCE
Resolution time for calls for RDI grants (in months)	2018	6,3	-	5	SICTI
Number of actions of the EU Framework Program coordinated by Spanish institutions	2018	2.630	2.412	2.800,0	CDTI
Projects led (%)	2014-2018	15,8%	-	17%	CDTI H2020 (2014-2018)
Financing obtained (million euros)	2014-2018	3.639	-	5,000. HE final budget pending	CDTI H2020 (2014-2018)
Spanish rate of return of the EU Framework Program	2014-2018	10,0%	-	11%	CDTI H2020 (2014-2018)
Number of projects obtained from the ERC per million inhabitants	2019	1,2%	-	1,8%	FECYT
Number of publications per million inhabitants	2018	1.877	-	2.000	FECYT
Percentage of scientific production published in journals of the first quartile or Q1 (25% of most influential journals)	2018	56,8%	-	58%	FECYT
Percentage of publications among the 10% most quoted in the world	2018	14,6%	-	16%	FECYT
Percentage of publications in international collaboration	2018	50,2%	-	60,0%	FECYT
Number of licensed university and IPO patents per million inhabitants	2018	24,9	-	50	SICTI. TCI survey
Number of Spin-offs created by universities, IPOs and technology centres in the last 5 years	2017	549	-	800	SICTI. TCI survey
Direct annual financing from MICIN to ICTS (€ M)	2019	60,8	-	120	GENERAL SECRETRARIAT OF RESEARCH. MCIN.
ERDF financing granted by the MCIN to ICTS (€ M)	2019	34,2	-	70	GENERAL SECRETRARIAT OF RESEARCH. MCIN.
Financing of international quotas (M€)	2019	120,0	-	150	GENERAL SECRETRARIAT OF RESEARCH. MCIN.

9

Annexes

ANNEX I

Analysis of the Spanish System of Science, Technology and Innovation and of its environment

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

This annex contains a detailed analysis of the most relevant aspects of the SECTI. Its study serves as the basis for the elaboration of the EECTI 2021-2027. Throughout the different sections, each of these aspects are examined, and the objectives and lines of action proposed in the EECTI 2021-2027 are mentioned. Likewise, this analysis is the source of the SWOT (Weaknesses, Threats, Strengths, Opportunities) of the SECTI, presented in section 3 of the EECTI 2021-2027.

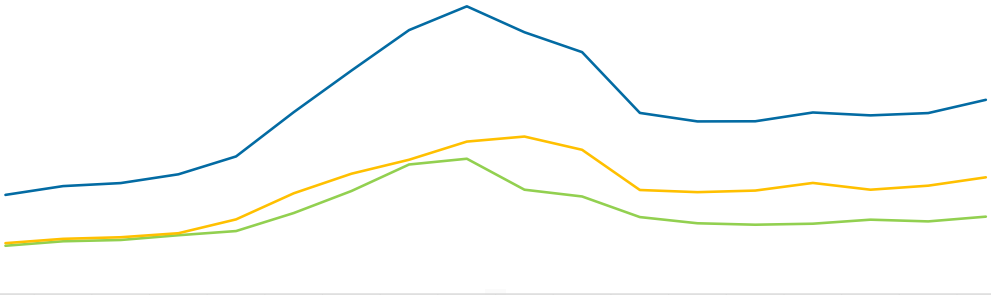
A

Economic and financial situation

A.1. Public financing of R+D+I. Budget credits

A.1.1. General State Administration

Most of the state financing of RDI is carried out through Expenditure Policy 46. The following graph (Graph 1) represents the series of total credits of Function 46 of the General State Budgets in the period 2001-2018, differentiating between financial and non-financial credits.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
TOTAL	3.577,8	3.892,0	4.000,5	4.317,4	4.965,8	6.556,9	8.057,2	9.516,9	10.375,4	9.442,0	8.723,5	6.531,9	6.225,1	6.233,0	6.545,0	6.445,2	6.525,0	7.002,7
NON-FINANCIAL TOTAL	1.742,8	1.902,2	1.951,9	2.123,7	2.271,0	2.921,6	3.716,3	4.671,5	4.877,7	3.763,4	3.518,9	2.777,7	2.552,3	2.499,9	2.536,2	2.682,9	2.618,0	2.791,2
FINANCIAL TOTAL	1.835,0	1.989,8	2.048,6	2.193,7	2.694,8	3.635,3	4.340,9	4.845,4	5.497,7	5.678,6	5.204,5	3.754,3	3.672,9	3.733,1	4.008,8	3.762,3	3.907,0	4.211,4

Graph 1. Evolution of total credits of Function 46 of the General State Budgets (million €)
Source: Ministry of Finance

The data shown show the dramatic effect that the economic crisis in Spain, starting in 2008, had on Policy 46, its impact being of such magnitude that the budget for 2016 fell back to the values of 2006. The most pronounced decrease occurred in 2010, 2011 and 2012, a period in which investment was reduced by one third with respect to the maximum value reached in 2009.

The following table (Table 1) shows the evolution of the percentage of the General State Budget that is initially allocated to investment in RDI (the well-known Function 46). In 2018, 1.57% of the total budget was specifically allocated to RDI. However, if only non-financial expenses are taken into account, the percentage is practically half (0.87%), which indicates that **less than 1% of the AGE's non-financial budget is allocated to spending on RDI. In this sense, one should take into account that in 2018, 39.9% of the budgetary expenditure in Function 46 is non-financial expenditure and that 60.1% is financial expenditure.**

Table 1. Evolution of the budgetary effort in RDI in the General State Budgets		
	% Function 46/Total GSBs	% Function 46/Total GSBs NON financial expenditure
2001	1,49%	0,82%
2002	1,59%	0,88%
2003	1,55%	0,92%
2004	1,67%	0,97%
2005	1,79%	0,98%
2006	2,17%	1,15%
2007	2,50%	1,40%
2008	2,70%	1,46%
2009	2,52%	1,37%
2010	2,40%	1,08%
2011	2,37%	1,14%
2012	1,76%	0,88%
2013	1,45%	0,73%
2014	1,45%	0,77%
2015	1,46%	0,76%
2016	1,47%	0,85%
2017	1,47%	0,82%
2018	1,57%	0,87%

Note: Relationship between the Initial Credits of the GSBs for RDI purposes (Function 46) and the total of the GSBs
Source: General Secretariat of Autonomous and Local Financing. Ministry of Finance.

A detailed analysis of chapters 7 and 8 of Function 46 over the last 10 years (2008-2018) (Table 2) shows a 57.7% decrease in the final credits of chapter 7, while that of chapter 8 is of only 13.1%. However, the average annual execution of this period has been of 88.3% in Chapter 7 and 44.2% in Chapter 8. The average execution of this chapter (Chapter 8) in the last three years (2016 -2018) is of 20.3%.

Table 2. Total Credit and Net Recognized Obligations of chapters 7 and 8 of Expenditure Policy 46 of the GSBs (€ M)

	Chapter 7		Chapter 8	
	Final credits	ORN	Final credits	ORN
2001	738,8	582,7	1.835,0	1.583,9
2002	822,2	718,2	1.989,8	1.911,8
2003	775,6	753,6	2.048,6	1.990,4
2004	893,1	855,5	2.193,7	2.124,1
2005	1.022,4	961,1	2.694,8	2.525,9
2006	1.429,7	1.400,0	3.635,3	3.478,8
2007	2.008,8	1.943,5	4.339,7	3.824,4
2008	2.815,6	2.230,4	4.830,1	3.859,7
2009	2.657,3	2.538,7	5.486,5	3.876,6
2010	1.718,5	1.640,7	5.674,6	3.406,5
2011	1.654,8	1.468,7	5.196,9	2.395,0
2012	1.098,7	951,9	3.754,3	1.627,8
2013	1.081,9	962,9	3.659,5	1.578,7
2014	1.000,5	915,8	3.726,9	1.528,7
2015	1.003,3	883,1	3.989,5	1.636,7
2016	1.147,7	946,6	3.749,9	863,7
2017	1.101,1	945,4	3.890,5	704,9
2018	1.190,0	1.060,2	4.198,8	827,0

Source: IGAE

One should take into account that, in general, Chapter 8 addresses the granting of loans to companies, a sector much affected by the economic crisis; in many cases they have abandoned their RDI activity (see the data on the private sector below), limiting their ability to absorb the available volume of Chapter 8.

Due to this circumstance, in 2018 the execution of chapter 8 was of 19.7% and that of chapter 7 was of 89.1%. The low execution of chapter 8 reduces the execution of the Expenditure Policy

46 in its entirety, so it is necessary to properly differentiate these chapters when carrying out an execution analysis.

A.1.2. Autonomous Communities

According to the data of the Ministry of Finance, collected in tables 3 and 4, the total calculation of the initial credits of the public policy for RDI in the budgets of the ACs in 2018 amounts to 2,277.5 million euros.

The expenditure with respect to the total budget is of 1.23%. If only the initial non-financial credits are taken into account, this rises to 1.31%, just the opposite of what happens in the AGE, in which it decreases if only non-financial expenditure is taken into account. This difference is due, as seen in the previous section, to the use that the AGE makes of chapter 8 to finance RDI. The autonomous communities, however, make less use of Chapter 8 to finance RDI, so that, as a whole, 90.2% is non-financial expenditure and only 9.8% is financial expenditure. These data show that the way of financing RDI is clearly different between the AGE and the ACs, with the exception of what happens on the Canary Islands and in Castile-Leon whose percentage of financial expenditure in RDI lies around 30% (Table 3).

The analysis of RDI expenditure by each Autonomous Community in non-financial expenditure (Table 4) indicates that La Rioja is the community in which a greater expenditure has been made (6.52%) (see footnote), followed by the Basque Country (3.01%) and Andalusia (1.79%). Madrid and Catalonia are, however, clearly below the average (Madrid 0.72% and Catalonia 0.98%)[1].

1 It must be considered that the criteria for distributing expenditure programs by functions is not always homogeneous in the different Autonomous Regions. Some Autonomous Regions. Some
include in the Function 46 expenditure programs related to the Information Society, Educational Innovation and Evaluation, Statistics or mapping among others. This is the case, for example, in La Rioja, which includes the Digital Society program in Function 46.

Table 3. Initial Credits for Expenditure Policy 46 in the AGE and the Autonomous Communities. Year 2018					
	Initial Credits. Expenditure Policy 46	**NON-financial Initial Credits. Expenditure Policy 46**	**Financial Initial Credits. Expenditure Policy 46**	**% NON**	**% C.I. financieros**
GEN. STATE ADMIN.	**7,061,951,720.00**	**2,844,353,900.00**	**4.217.597.820,00**	**40,3%**	**59,7%**
TOTAL		**2.053.776.935,84**	**223.731.904,97**	**90,2%**	**9,8%**
Andalusia	512.607.183,00	476.205.654,00	36.401.529,00	92,9%	7,1%
Aragon	75.687.559,29	68.377.881,29	7.309.678,00	90,3%	9,7%
Asturias (Principality of)	26.082.602,00	25.252.602,00	830.000,00	96,8%	3,2%
Balearic Islands	31.001.633,00	31.001.633,00	0	100,0%	0,0%
Canary Islands	55.206.777,00	36.556.777,00	18.650.000,00	66,2%	33,8%
Cantabria	8.261.360,00	8.261.360,00	0	100,0%	0,0%
Castile-Leon	149.191.361,00	103.170.608,00	46.020.753,00	69,2%	30,8%
Castile La Mancha	30.668.920,00	29.380.620,00	1.288.300,00	95,8%	4,2%
Catalonia	261.982.109,52	242.009.962,55	19.972.146,97	92,4%	7,6%
Valencian C.	219.628.470,00	212.193.160,00	7.435.310,00	96,6%	3,4%
Extremadura	61.125.417,00	61.125.417,00	0	100,0%	0,0%
Galicia	158.260.030,00	151.349.744,00	6.910.286,00	95,6%	4,4%
Madrid C.	136.423.372,00	135.787.321,00	636.051,00	99,5%	0,5%
Murcia (Region of)	29.990.840,00	28.090.808,00	1.900.032,00	93,7%	6,3%
Navarre	54.070.265,00	53.842.776,00	227.489,00	99,6%	0,4%
Basque Country	386.703.354,00	311.015.389,00	75.687.965,00	80,4%	19,6%
Rioja (La)	80.617.588,00	80.155.223,00	462.365,00	99,4%	0,6%

Source: General secretariat of Autonomous Local Financing. Ministry of Finance.

Table 4. Budgetary expenditure in RDI in the General Budgets of the Autonomous Communities. Year 2018

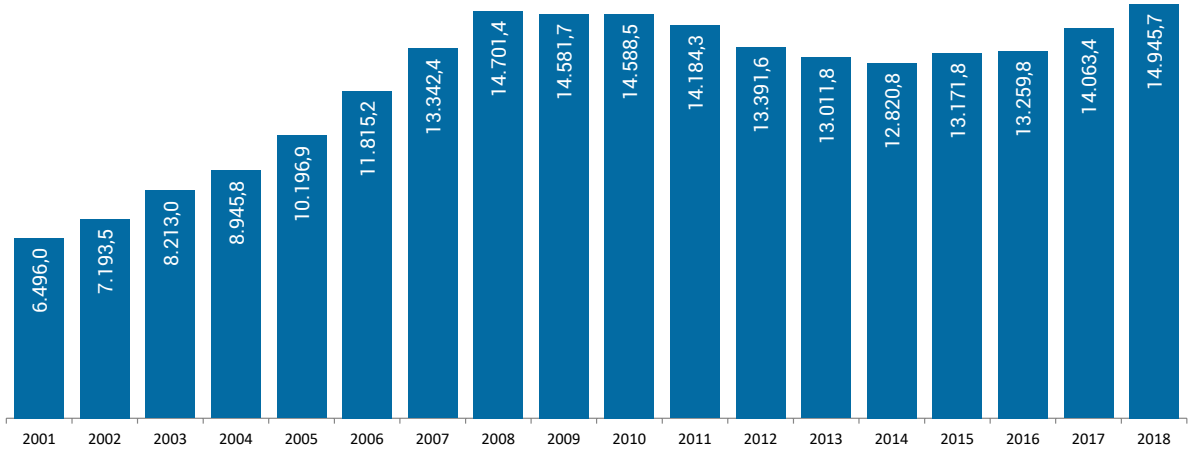
	% Expenditure Policy 46/Total GSBs	% Política de Gasto 46/Total PGE Gasto NO financiero
TOTAL	**1.23%**	**1,31%**
Andalusia	1.67%	1.79%
Aragon	1.32%	1,41%
Asturias (Principality of)	0.63%	0,68%
Balearic Islands	0,62%	0,76%
Canary Islands	0,67%	0,49%
Cantabria	0,30%	0,36%
Castile-Leon	1,52%	1,21%
Castilla La Mancha	0,37%	0,43%
Catalonia	0,86%	0,98%
Valencian C.	1,08%	1,37%
Extremadura	1,26%	1,35%
Galicia	1,48%	1,60%
Madrid C.	0,63%	0,72%
Murcia (Region of)	0,54%	0,62%
Navarre	1,30%	1,38%
Basque Country	3,35%	3,01%
Rioja (La)	5,34%	6,52%

Note: Relationship between the Initial Credits of the EB of the ACs destined to RDI (Function 46) and the total of the EB.
Source: General secretariat of Autonomous and Local Financing. Ministry of Finance.

A.2. Investment in RD. Financing sectors

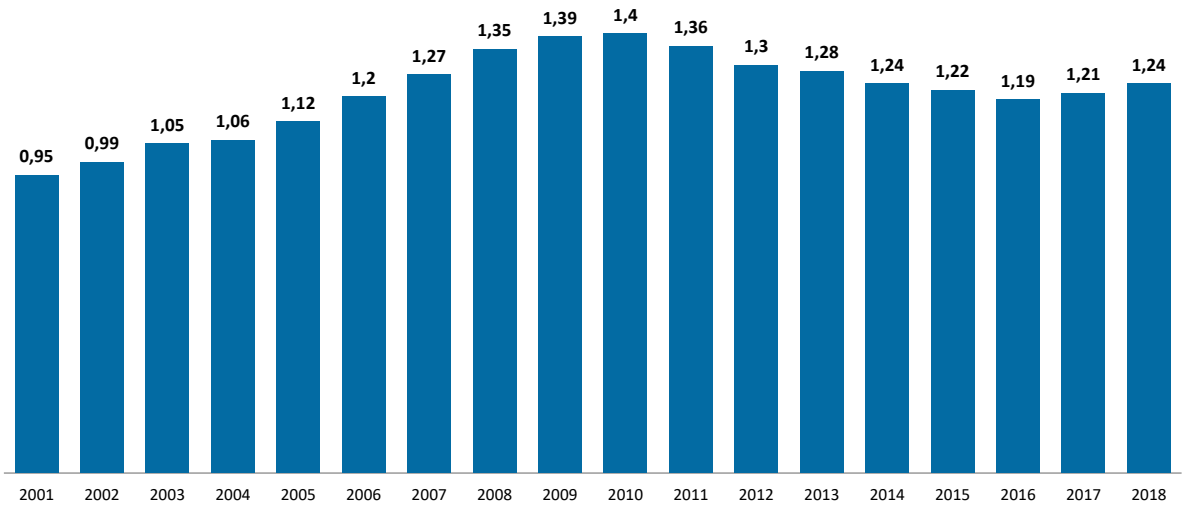
This section analyses the investment made by the different RD financing agents (Public Administrations, companies, Higher Education Institutions, Foreign Sector and IPSFL). It is therefore important to note that this is not budget data. In addition, it should be noted that this is investment in research and development and does not include investment in innovation.

Graph 2 shows the evolution of total investment since 2001. A growing trend is observed until 2008, at which time investment begins to decline until reaching the lowest level of the last decade in 2014 (€ 12,820.8 M). As of that year, investment begins to recover, especially in the last two years, in which it increased by 6.1% and 6.3% in 2017 and 2018, respectively.

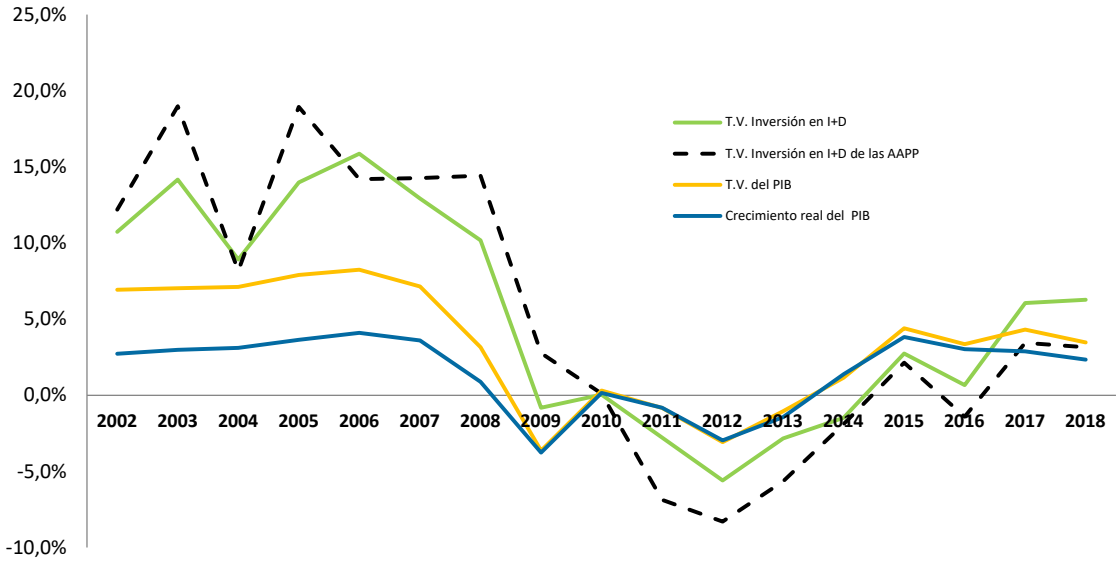


Graph 2. Internal investment in RD (€ M)
Source: RD statistics. INE

The analysis of investment in RD with respect to GDP shows (Graphs 3 and 4) that the maximum value reached corresponds to the year 2010 (1.4%). This increase is mainly explained by the weakness in GDP growth, which fell 3.8% in 2009 and grew only 0.2% in 2010, and entered recession again the following three years (2011-2013). Despite the significant drop in GDP during this period, investment in RD decreased at a more intense rate, which translated into decreases in the percentage of investment in RD relative to GDP. Therefore, as of 2010, the investment percentage began to decline year after year, reaching levels similar to those of 2006 in 2016 (1.19%). In the last two years, a recovery has been observed, placing the percentage of spending in relation to GDP in 2018 at 1.24, still far from the EU average, as will be seen later.



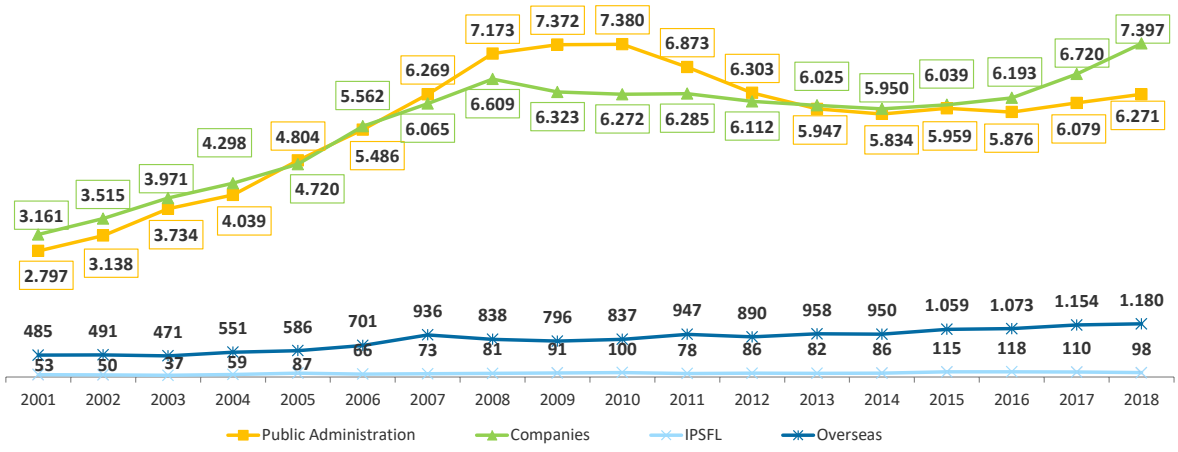
Graph 3. Internal investment in RD with respect to GDP (%)
Source: RD statistics. INE



Graph 4. Evolution of the annual variation rates of investment in RD and GDP
Source: INE

The following graph (Graph 5) shows, in absolute values, the evolution of investment in RD according to the financing agent.

One can observe that private investment is, in general terms, slightly higher than public investment. Likewise, the AAPP's reaction to the crisis starts late and lasts longer. The business sector acts faster in the face of the crisis, which creates a gap in the 2007-2012 period, in which public investment was clearly higher than that of the business sector. Since the beginning of the recovery from the crisis, and specifically since 2016, private investment has grown at a faster rate than public investment. In 2018, private investment reached € 7,397 million, with a growth of 10.1% compared to 2017, while public investment (including Higher Education) stood at € 6,271 million, with a growth of 3.2% compared to last year. **In short, the recovery of investment in RD is taking place mainly thanks to the business sector**.



Graph 5. Distribution of investment in RD by source of funds (M€)
Source: RD statistics. INE

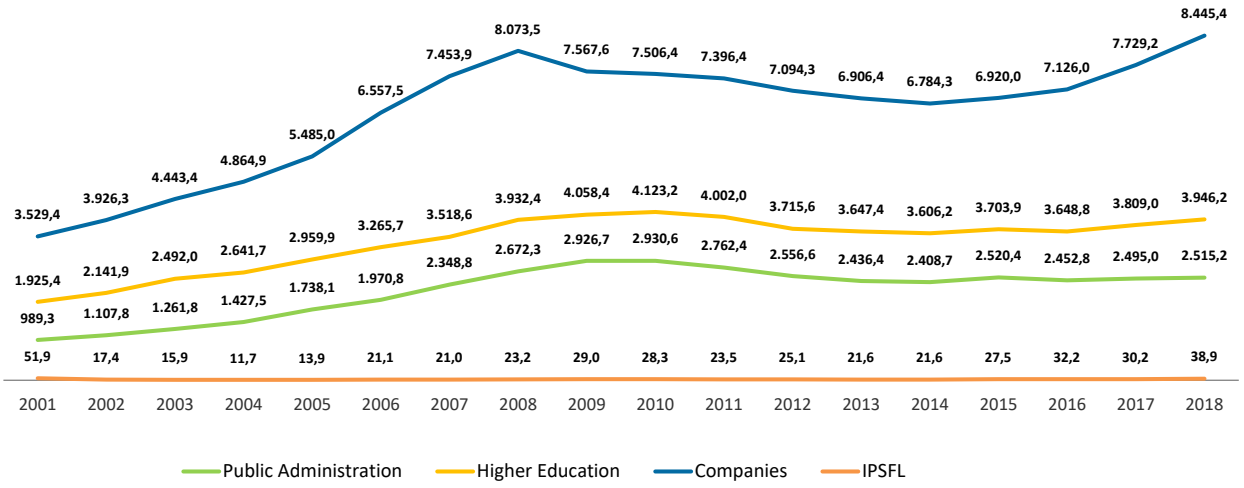
Ultimately, Spain is still far from reaching the 2% that was set as a target in the EECTI 2013-2020. If 2018 GDP is considered constant, in order to reach the stated target, spending on RD should increase by just over € 9 billion. Taking into account that the Public Administration (including Higher Education) financed 41.9% of spending in 2018, and seeing the financing quotas of each sector as constant, the increase in internal public financing should be around € 3,700 million and that of companies of € 4,500 million.

A.3. RD expenditure. Execution sectors

This section analyses the RD expenditure that is carried out from the perspective of execution, that is, taking into account the sectors and/or regions that execute it, for which reason we will use the concept "expenditure" instead of "investment".

The sectors in charge of RD execution are made up of four groups: the Public Administration (mainly through OPIs and the respective public RD bodies of the Autonomous Communities), Higher Education institutions, Companies and Private Non-Profit Institutions (IPSFL).

Graph 6 shows the evolution of RD execution in each of these sectors. One should note the drop in spending in the business sector in 2008, coinciding with the beginning of the economic crisis. However, in the last two years there has been a significant increase in executing activity in this sector. Specifically, in 2018, 56.5% of total investment in RD was carried out by the business sector, 26.4% by the higher education sector and 16.8% by the public administration sector.



Graph 6. RD investment by execution sector (M€)
Source: RD statistics. INE

The INE's RD Statistics allows one to determine the origin of the funds used by each execution sector. Thus, in 2018 the Public Administrations executed € 2,515.2 M (Graph 6): 68.4% came from the Public Administrations sector, 14% were internal funds, 6.9% came from the business sector and 9, 2% came from abroad (rest of the world) (7.2% from European programs).

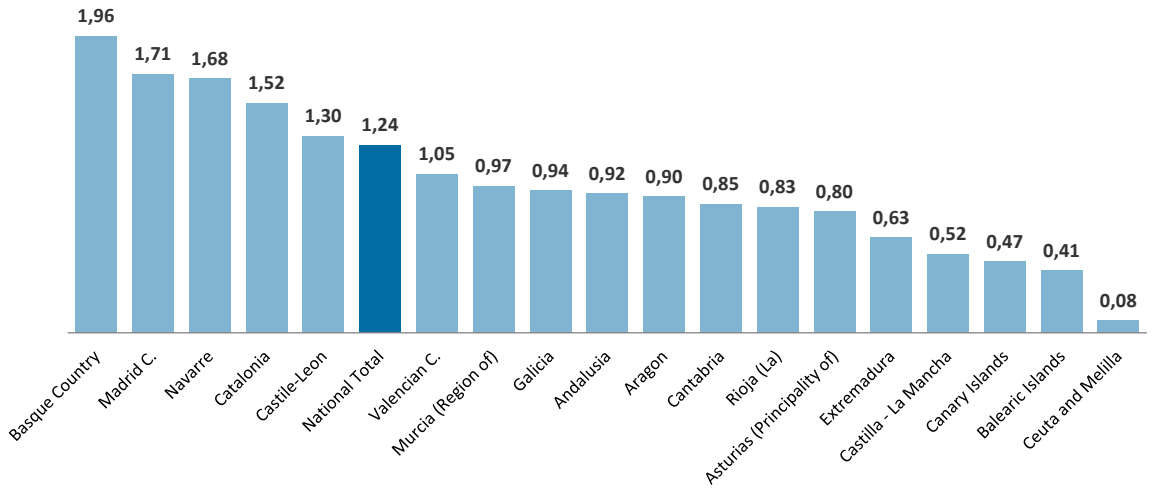
In 2018, companies executed € 8,445.4 M (Graph 6): 73.8% came from internal funds of the company itself, 9% from the Public Administration and 8% came from the rest of the world (3.8% from European programs).

Finally, of the total amount executed by the Higher Education sector (€ 3,946.2M), 70.4% came from the Public Administration, 5.5% from companies and 6.7% from the rest of the world (specifically, 5.3% from European programs).

These data show the low intensity of public-private collaboration in the field of RD and the need to improve these results. On the other hand, in relation to funds from European programs, one can observe that Spain has improved substantially in the last Framework Program of the European Union (H2020), as indicated in the internationalization data presented below.

Another aspect to take into account is the type of expenditure made by the RD executing entities. In 2008, when the maximum level of investment was reached (in absolute values), 81.7% was current expense - more specifically, 53.3% was compensation expense, and 18.3% was capital investment. Ten years later, current spending rose to 93.6%, (63.1% was remuneration), and capital investment was at only 6.4%. These data show the decapitalization that has occurred in the last decade, which will undoubtedly have a significant impact in the coming years, with the business sector being that which has suffered the most in this regard.

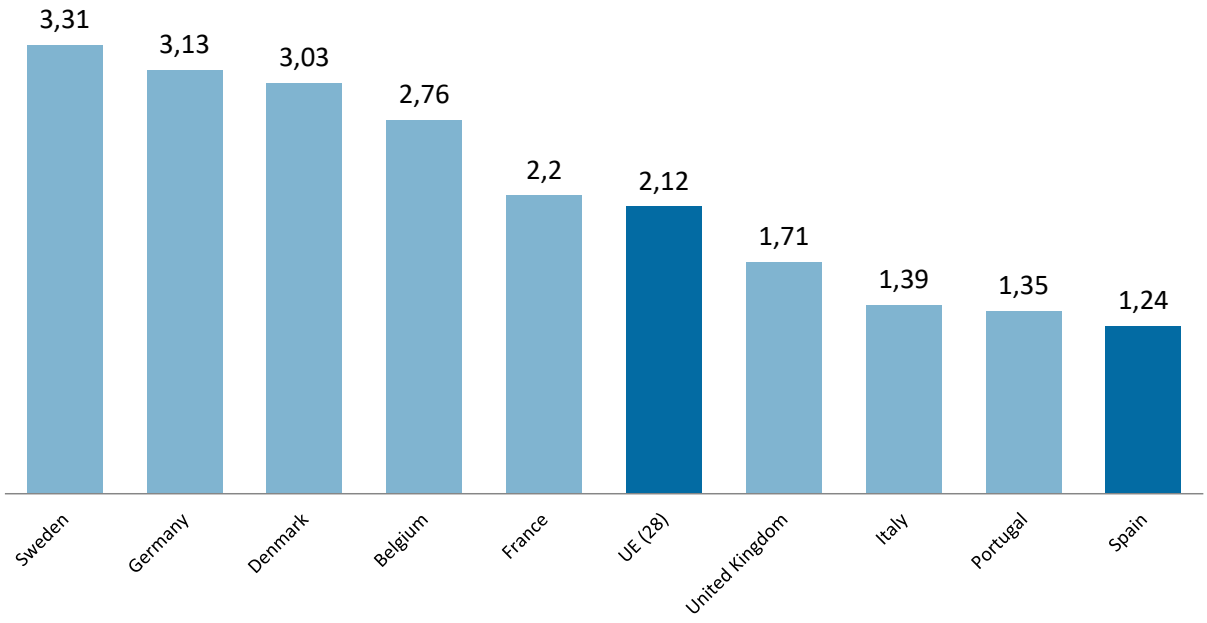
Finally, it is necessary to have a territorial vision in order to examine the distribution of RD spending with respect to GDP by Autonomous Community (Graph 7). Based on the 2018 data, five Autonomous Communities are above the national average (1.24%). The Basque Country is the community with the highest spending (1.96%), a figure close to the 2% established as a national target for 2020; it is followed by Madrid (1.71%), Navarre (1.68%), Catalonia (1.52%) and Castile and Leon (1.3%). The Autonomous Communities with the lowest spending relative to GDP are the Canary Islands, the Balearic Islands and Ceuta and Melilla.



Graph 7. RD expenditure on GDP by Autonomous Community (%). Year 2018
Source: RD statistics. INE

A.4. International economic perspective

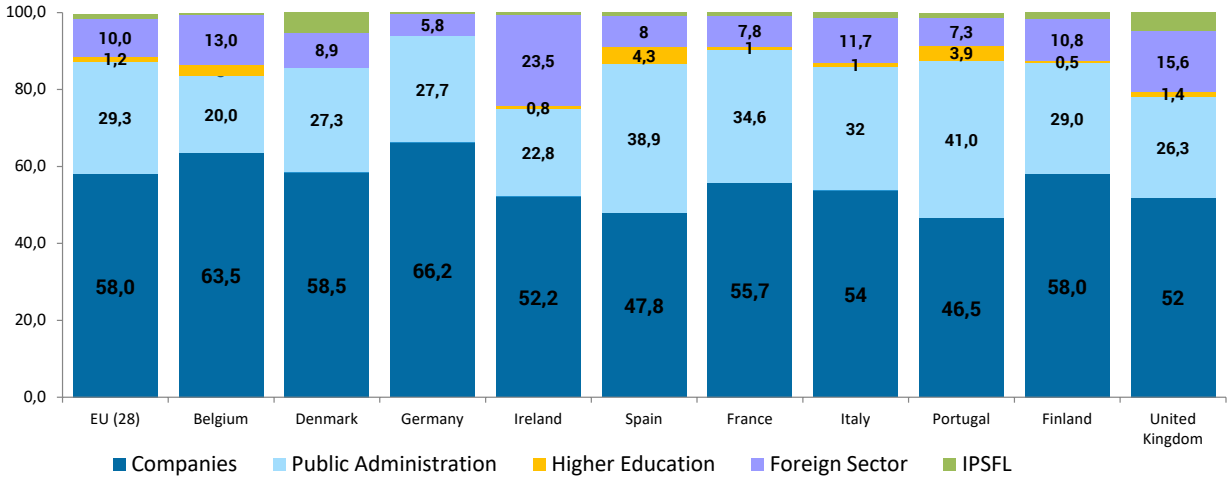
From an international perspective, Spain has certain characteristics that separate us from the EU. First, investment in RD with respect to GDP in Spain is clearly below the EU average (2.12 for the EU and 1.24 for Spain), in fact, Spain is at the bottom of the top economic powers of the EU (Graph 8).



Graph 8. RD expenditure with respect to GDP (%). Year 2018
Source: Eurostat

Note: The France datum corresponds to 2016

The second differentiating aspect between Spain and the rest of the EU countries refers to the role played by each RD financing sector in the total expenditure calculation. In Graph 9, with data from 2017, it is observed that, while in Spain 47.8% of spending comes from companies, in the EU the business contribution, as a financing agent, is ten points higher (58%). In fact, Spain and Portugal are the countries that make the least private effort in financing RD, since in practically all the countries in our environment, company spending exceeds 50% of the total computation of RD spending. For their part, the public administrations in Spain finance 38.9% of spending compared to 29.3% in the EU. It would be convenient for Spain, also in this indicator, to converge towards the average distribution of the EU.



Graph 9. Distribution of RD expenditure by sector of origin of funds Year 2017
Source: Eurostat

Note: The France datum corresponds to 2014

Based on the analysis of RD financing from the perspective of budgetary credits and investment in RD (sections 1.1 and 1.2), ***Line 1 has been established: Increasing the budget dedicated to RDI during the period 2021-2027, until reaching the EU average,*** *ein particular through direct aid (subsidies), and favouring, through Smart Specialization Strategies, the establishment of adequate lines to facilitate the use of Structural and Investment Funds of the EU, and the adaptation of national aid to the State aid regulations.* This line also seeks to shorten the distance that separates Spain from the EU average in terms of RD spending with respect to GDP (section 1.4).

Additionally, to reduce the distance from the EU as regards the role of private financing, ***Target 7 has been established in the EECTI: Promoting research and innovation in the Spanish business fabric****, increasing its commitment to RDI and expanding the perimeter of innovative companies to make the business fabric more competitive* and ***Line 7*** has been designed: *Establishing mechanisms for* ***attracting research, technological and innovative talent to companies, industries and RDI centres****, facilitating mobility of researchers, both in the public and private sectors.*

From the analysis from the perspective of RD expenditures by sectors (section 1.3) the following aspects stand out:

1) **Low intensity of public-private collaboration in the field of RD.** To improve this situation ***Line 11*** has been established: *Promoting the existence of effective* ***channels for knowledge transfer****, cooperation and exchange between the public and private sectors.*

2) Much room for improvement regarding funds from European programs. For this purpose, ***Target 2*** has been established: ***Contributing to the political priorities of the EU*** *by aligning with its RDI programs, giving support to the actors responsible for the SECTI to achieve this target,* and ***Line 13*** has been designed*: Promoting the* ***internationalization*** *of SECTI agents and scientific and technological infrastructures through: i) promotion and support to increase participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration; iii) international cooperation using science diplomacy; iv) promoting and participating in international facilities.*

3) The decapitalization of RD spending in the last decade, the business sector being the one that has suffered the most in this regard. For this purpose, ***Line 8*** has been designed: ***Promoting business innovation and the diffusion of innovation in all sectors***, *especially in small and medium-sized enterprises (SMEs), facilitating the incorporation of technologies and innovations that facilitate the achievement of priorities political, social and economic of the country. Ensuring tax incentives for RDI, adapted to companies in the science and innovation system.*

B

Human Resources Situation

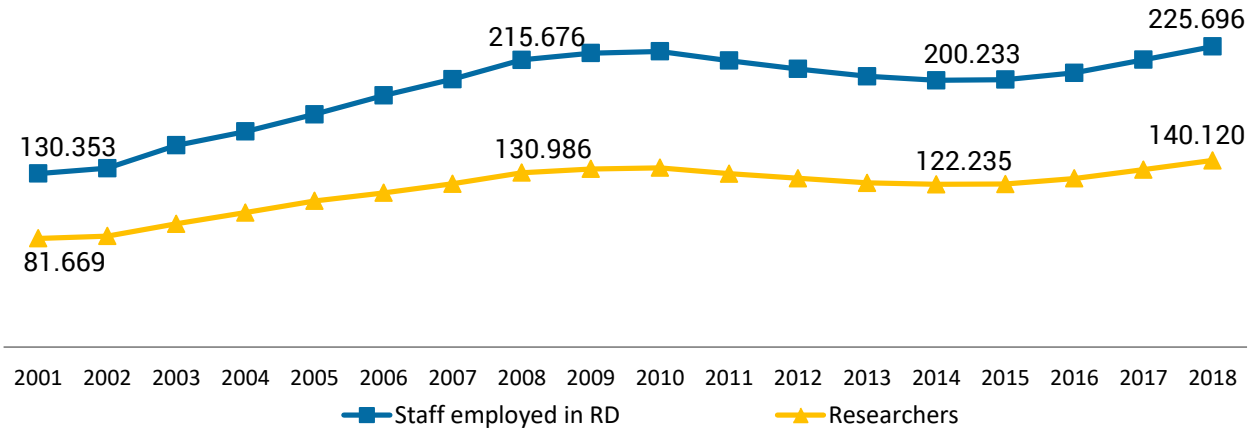
B.1. Personnel employed in RD and training

The key to having an excellent scientific and innovative system lies, to a large extent, in its human resources, the situation of which is analysed in this section.

First of all, it is necessary to assess the evolution of researchers and personnel employed in RD in recent years, these data are collected in Graph 10.

During the period 2001-2008, the increase in investment in RDI in Spain was inevitably accompanied by a significant growth in the number of researchers and personnel employed in R & D, which it practically doubled, going from 130,353 (in EJC) to 215,676 employees (in EJC).

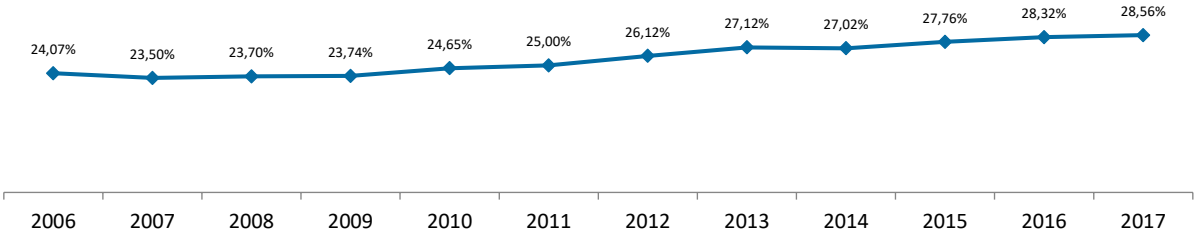
From 2008-2009, the effect of the crisis began to be perceived, affecting not only the budget and investment in RD, but also the total volume of human resources, which began to decline in 2010. The lowest value was reached in 2014, in which the volume of researchers decreased to 200,233 people (in FTE). From that moment on, there has been a growing trend.



Graph 10. Evolution of staff employed in RD and researchers (EJC)
Source: RD statistics. INE

The previous results show that the effect of the crisis on human resources has compromised the future prospects of two of the main strengths indicated in the EECTI 2013-2020: *"1) RD capacities available in Universities, OPIs, and RD centres, and 2) the increase in the number of researchers and RDI staff that allows a critical mass of scientists and technicians to be available."*

It is also interesting to examine the percentage of personnel employed in RD who have the title of Doctor. The following graph (Graph 11) shows the percentage of **Doctor personnel employed in RD**. One can see how the trend has been growing throughout the period. Either because during the crisis, non-doctor RD personnel were dispensed with to a greater extent, or because their qualification has improved. In any case, the year 2018 arrived with the highest percentage of doctor RD staff in the last years.

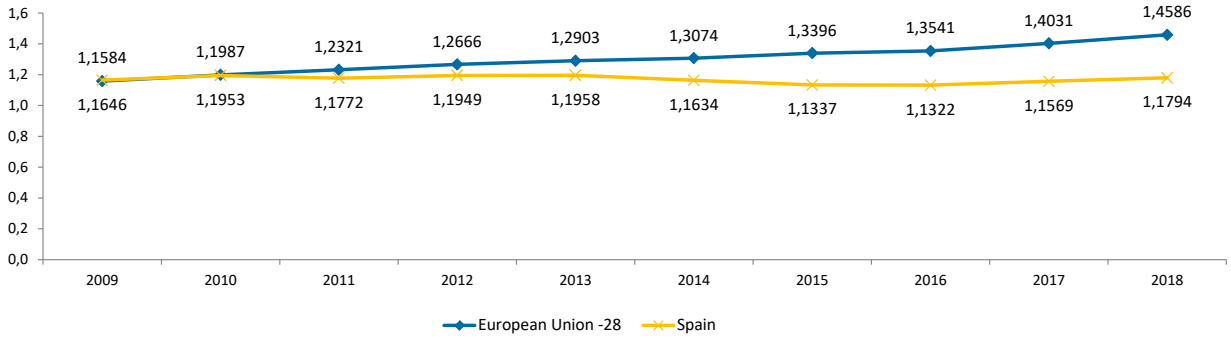


Graph 11. Percentage of personnel employed in RD with a doctorate
Source: Eurostat- own elaboration

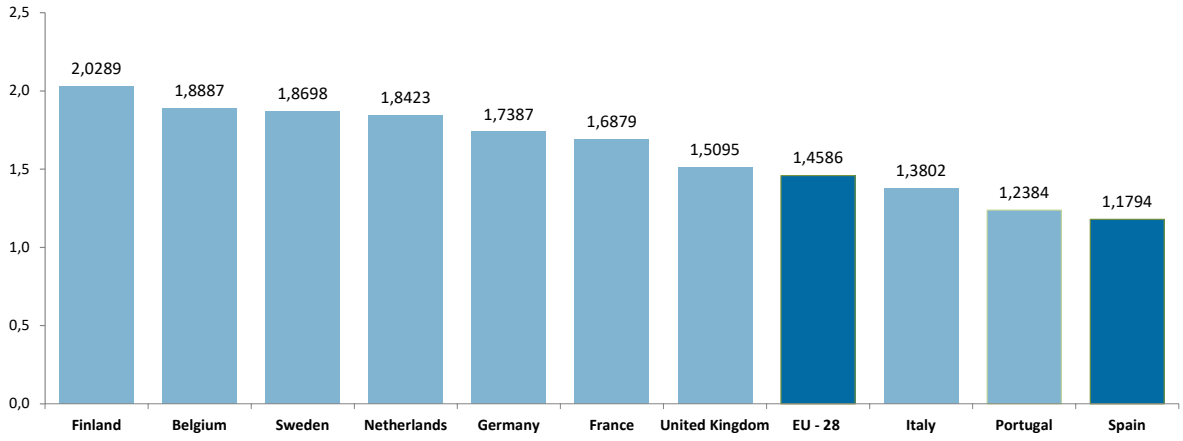
B.2. International perspective on Human Resources

What follows is the situation in Spain with respect to the EU and its surrounding countries in the field of human resources.

Graph 12 shows the evolution of the percentage of personnel employed in RD in Spain and in the EU with respect to the employed population. In 2010, the values in Spain and Europe were very similar, however, as of this date a gap opened and increased every year until reaching 1.18% in 2018, as compared to 1.46% in the EU. In the last two years, it has been observed that the population employed in RD in Spain has grown moderately in relation to the total employed population. However, this value grows more in Europe, increasing the gap between the two and placing Spain at the bottom of the neighbouring countries (Graph 13).

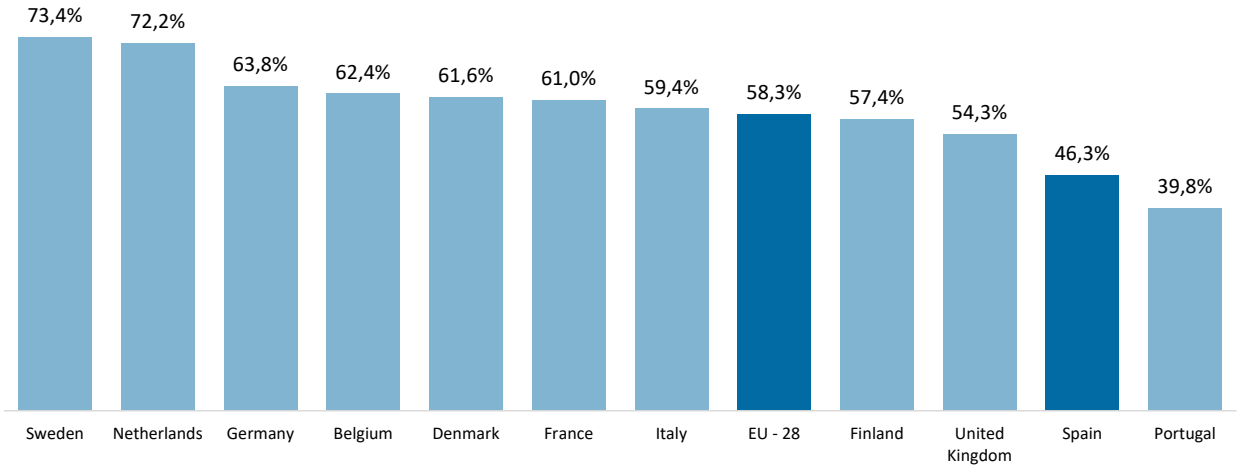


Graph 12. Percentage of employed RD staff in relation to the employed population (FTE)
Source: Eurostat (texts): European Union / Spain



Graph 13. Percentage of personnel employed in RD with respect to the employed population. Year 2018
Source: Eurostat

If performing an analysis of RD personnel by sector, one can verify that in Spain the percentage of personnel dedicated to RD in the business sector is one of the lowest in Europe, with twelve percentage points of difference with respect to the average (46.3% of RD personnel in Spain are in companies while in Europe the figure is 58.3%) (Graph 14).

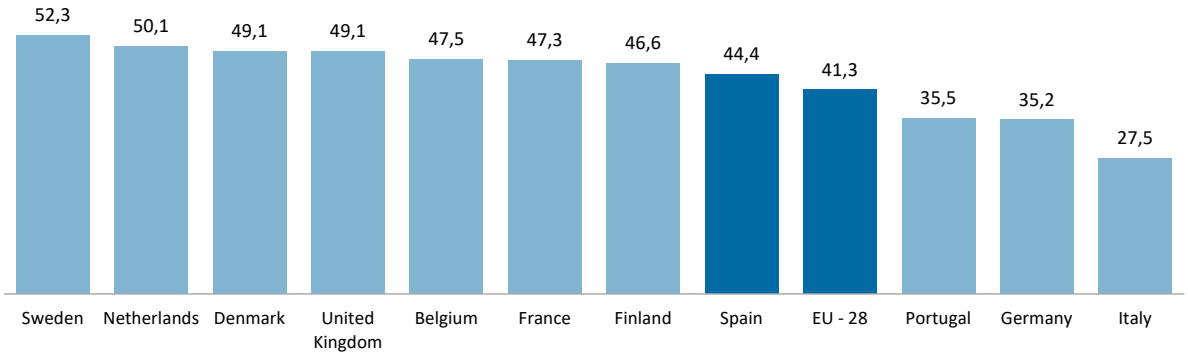


Graph 14. Percentage of personnel in RD in the business field (FTE). Year 2018
Source: Eurostat

One positive aspect to be taken into account, as shown in Graph 15, is the high potential that Spain has in terms of population with a higher educational level. Thus, in 2019, 44.4% of the Spanish population between 30 and 34 years of age reached the level of Higher Education

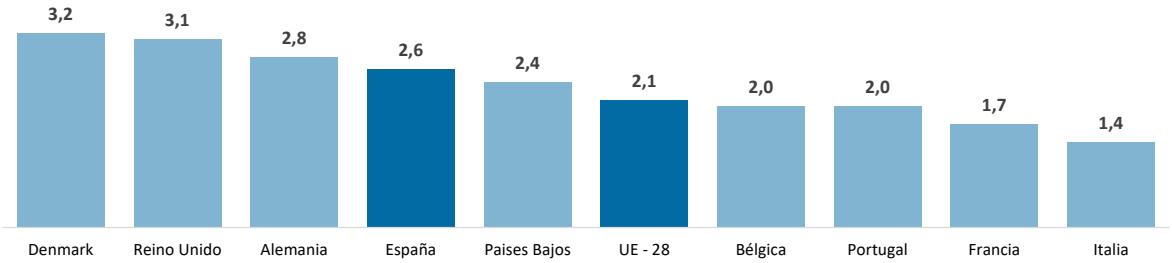
compared to the EU average of 41.3%. There is a potential for critical mass in Spain that is presented as a clear strength to face the future of research, development and innovation.

Graph 15. Population of between 30 and 34 with higher education. Year 2019
Source: Eurostat

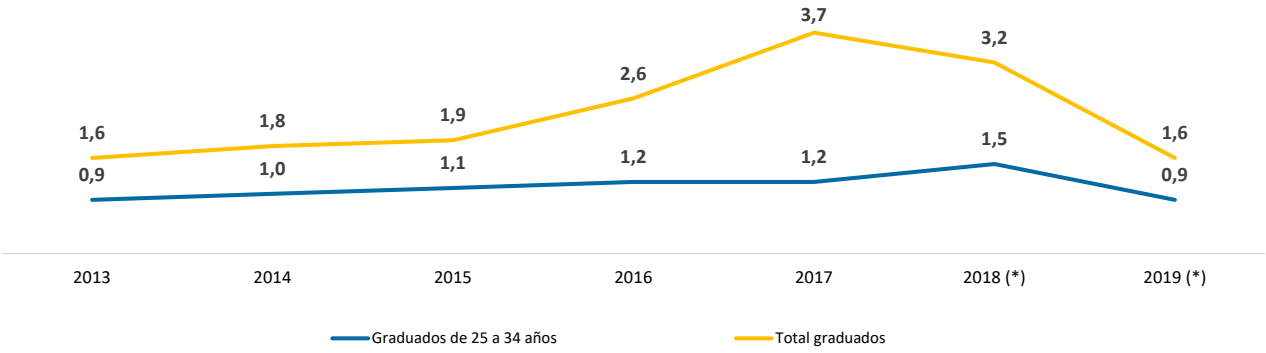


The data relating to doctoral graduates are analysed below (Graphs 16 and 17): the first graph shows the comparison of Spain with the rest of its neighbouring countries, while the second shows the evolution of the indicator in recent years.

In order to avoid misleading conclusions, it is necessary to examine both graphs together. Spain is clearly above the EU in terms of PhD graduates regarding the population between 25 and 34 years old, (for every 1000 people of between 25 and 34, 2.6 have a PhD, while in the EU the value is 2.1). However, these data, which refer to 2016, must be qualified by the results of Graph 17. In the period 2016-2018, an atypical pattern can be observed, corresponding to a strong growth of doctorates due to the change in regulatory regulations of the third cycle programs and the transition period that was opened so that those theses that had been initiated under the preceding regulation could be presented. At the end of this period, the figure returns to its usual level, with the values for 2019 at the levels reached in 2015: some 1.6 people per thousand, which is no longer as favourable as the situation shown in graph 16.



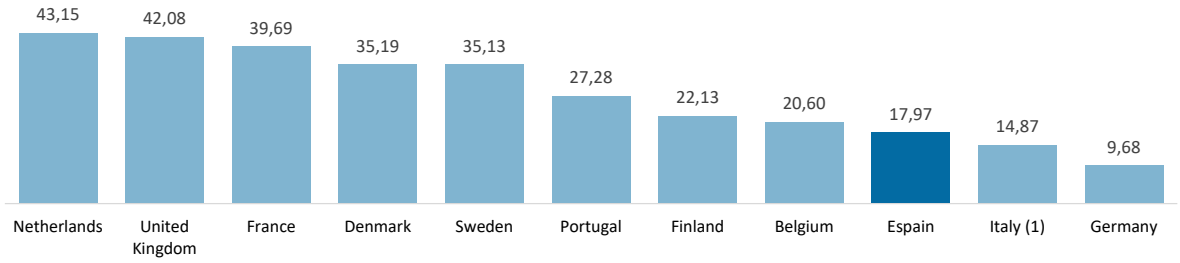
Graph 16. Graduados de doctorado respecto a la población de 25 a 34 años (‰).
Año 2016
Fuente: Eurostat



Graph 17. PhD graduates in relation to the population aged 25 to 34 (‰)
Source: Eurostat

In the coming years, it will be necessary to monitor this indicator and analyse its evolution.

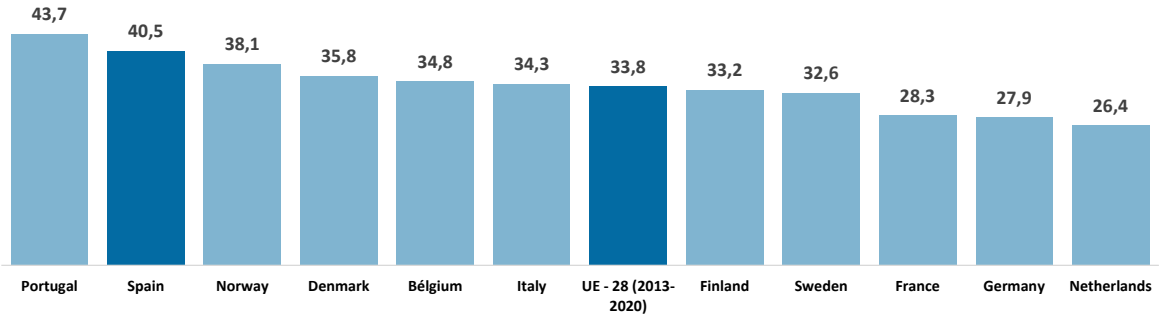
When analysing the percentage of international doctoral students in Spain, one observes that the level is clearly lower than that of the rest of neighbouring countries (Graph 18). The indicator used in the European Innovation Scoreboard (EIS), in the Attractive Research System section, highlights the poor assessment of Spain, which is situated, in terms of international doctoral students, among the most modest countries in innovation. This same section includes two bibliometric indicators that place Spain in a better position, making it rise to a moderately innovative category, but without improve it. Spain therefore shows a weak position in attracting talent.



Graph 18. Percentage of international doctoral students. Year 2017
Source: Eurostat

(1) Italy sends foreign students, not international ones

To finish this chapter, the following graph (Graph 19) presents the percentage of female researchers. Spain is in a very favourable position compared to the rest of the countries and clearly above the EU average (40.5% Spain and 33.8% the EU average). Without a doubt, this is a very favourable figure in terms of equality.



Graph 19. Percentage of female researchers. Year 2017
Source: Eurostat

The data presented in the analysis of human resources in Spain support **the need to carry out a double action: on the one hand, increase the number of personnel in RD and, on the other, maintain and continue increasing the scientific capacities of the resources human from SECTI.** In this sense, ***Target 5*** has been established, ***consisting in enhancing Spain's ability to retain and attract talent,*** *facilitating the professional advancement and mobility of its researchers in the public and private sectors, and their ability to influence decision-making, and* **Line 6** has been designed: *Establishing a* **scientific itinerary to enter the RDI system** *to facilitate promotion and job security, taking into account Spain's personnel needs, in terms of research and innovation, of universities, public bodies, health research institutes, public and private RDI centres and companies. This itinerary must consider the move to the private sector according to the needs of the productive and services sector.*

The following aspects stand out in the analysis from the international perspective:

1) The generation of a **gap between the percentage of personnel employed in RD in Spain and in the EU**, which increases every year. To address this situation, **Line 7** has been designed: Establishing **mechanisms for attracting research, technological and innovative talent to companies, industries and RDI centres, facilitating the mobility of researchers, both in the public and in the private sector.**

2) High **potential for critical mass**, with a percentage of the population reaching Higher Education level above the EU average. This potential must not only be maintained, but this critical mass must be allowed to enter the scientific and technological sphere, both public and private. It is for this purpose, along with ***Target 5***, that the above-mentioned **Lines 6** and **7** have been articulated.

3) Despite being well positioned with respect to the percentage of **personnel employed in RD PhD**, Spain is poorly valued in terms of **international doctoral students**. To overcome this weakness in attracting talent, ***Target 4*** has been designed: **Generating scientific knowledge and leadership**, optimizing the position of its researchers and the quality of its infrastructures and equipment, promoting the science industry. Applying scientific knowledge to the development of new technologies that can be used by companies, and intensifying the capacity to communicate to our society, and to influence the public and private sectors.

4) Spain is in a very favourable position in terms of equality, with a **percentage of female researchers clearly above the EU average**. To maintain this favourable position, **Line 14** includes the **promotion of gender balance in research and innovation** as a priority factor in SECTI.

C

Centres e Infrastructures

C.1. Excellent centres

In 2011, a specific call for the development and maintenance of centres of excellence was launched in Spain. This program has so far allowed the selection of 32 centres, which have received the Severo Ochoa centre accreditation. In 2014, a complementary call was launched, aimed at identifying units of excellence, which were smaller than the Severo Ochoa centres and designated the María de Maeztu units. To date, this program has allowed the selection of 24 María de Maeztu units. Since the beginning, € 248 M have been invested in 4-year accreditations in recognition of their excellence at an international level. Those accredited have been able to develop more ambitious lines of research, increase the training of researchers, attract and retain talent, improve their equipment and strengthen their international positioning, among other activities.

C.2. Singular Scientific-Technical Infrastructures

The Spanish Singular Scientific and Technical Infrastructures (ICTS) are essential facilities for the development of scientific research, technological development and innovation of the highest quality. The Map of Singular Scientific and Technical Infrastructures (ICTS) is the tool for long-term planning and development of these infrastructures, coordinated between the AGE and the Autonomous Communities. The ultimate goal of the ICTS Map is to place at the disposal of the national and international scientific, technological and industrial community cutting-edge scientific-technical infrastructures that are unique of their kind and have a very high investment and/or maintenance and operation cost with competitive open access for the entire RDI collective. ICTSs are infrastructures whose ownership corresponds to diverse institutions of diverse dependency, which is why a coordination between all the administrations involved is necessary.

The ICTS Map approved for the period 2017-2020 is made up of 29 ICTSs that bring together a total of 62 infrastructures, all of them operational, in the fields of Astronomy and Astrophysics; Marine, Life and Earth Sciences; Information and Communication Technologies; Health Sciences and Biotechnology; Energy; Engineering; Materials; and Socioeconomic Sciences and Humanities. Of the total ICTSs, 17 are located in a single location and 11 are geographically distributed into nodes located in different locations in different ACs and in Antarctica. There is also a core ICTS, the RedIRIS advanced academic communications network, which provides connectivity to all of them, as well as to practically all of the country's RDI centres and other related administrations.

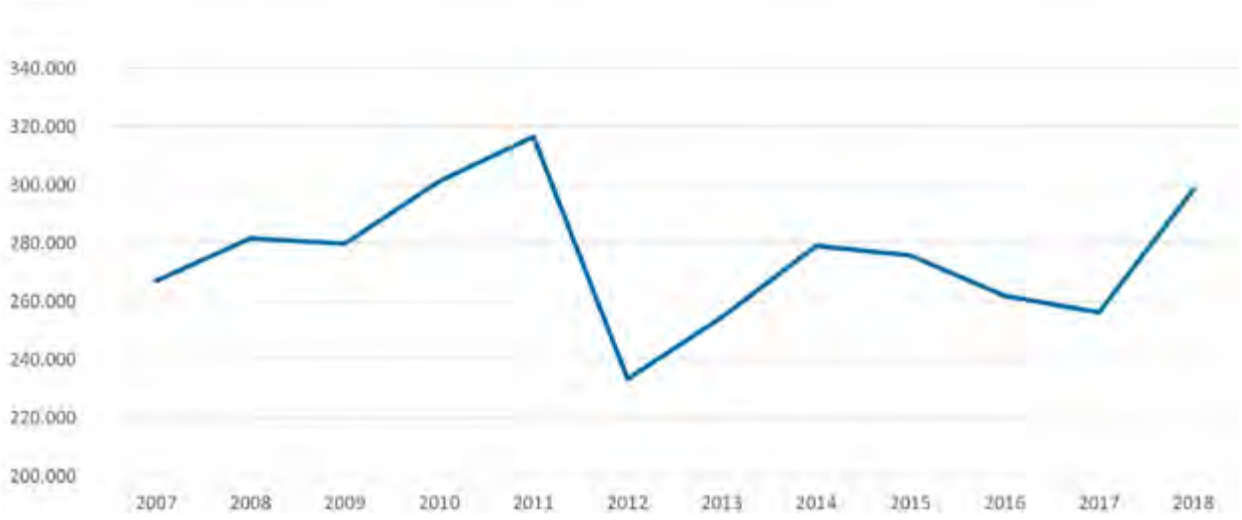
The ICTSs annually provide access to more than five thousand RDI projects, which make use of their facilities to carry out modelling, analysis, experimentation, observations of the environment and simulations of all kinds. ICTSs employ more than 2,000 people, of which about 80% are scientific and technical personnel.

C.3. Participation in international bodies and infrastructures

European research infrastructures are essential tools for the production of frontier science and a pillar of the European Research Area. They contribute to the promotion of European innovation through the so-called science industry

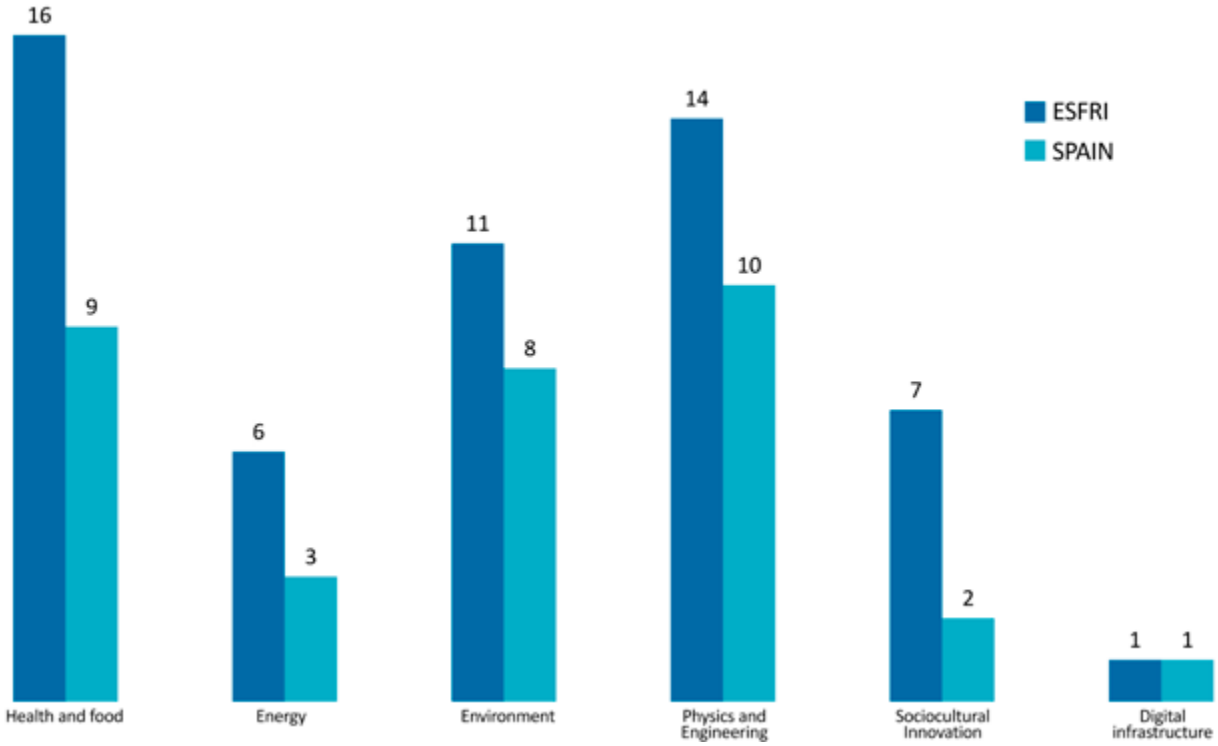
Spain has consolidated an important participation in the wide ecosystem of European research infrastructures that is governed by criteria of scientific excellence. Spain is a member of the eight International Research Organizations that are part of EIROFORUM, and a significant part

of the Research budget is dedicated to participation in these infrastructures. The following graph shows the evolution of the contributions to these Organizations in K €.



Graph 20. Spanish contribution to International Research Organizations. Source: Ministry of Science and Innovation

Furthermore, Spain actively contributes to ESFRI, the European Strategic Research Infrastructure Forum. Since its first edition in 2006, the inclusion of three infrastructures in its Roadmap has been promoted: EUSOLARIS, the infrastructure in the field of concentrated solar energy in 2010; the European Solar Telescope (EST) in 2016 and IFMIF-DONES, the material testing infrastructure for fusion reactors, in 2018. It is the statutory headquarters of LifeWatch, the e-infrastructure in the area of biodiversity and headquarters of main nodes of, among others, CTA (Cherenkov Telescope Array) whose northern observatory is built at the Roque de los Muchachos Observatory; PRACE, the BSC-CNS (Barcelona Supercomputing Centre-Centro Nacional de Supercomputación) being one of the TIER0 nodes of the computing infrastructure, or INSTRUCT, the European structural biology infrastructure that has its electron microscopy image processing node at the CNB-CSIC (National Centre of Biotechnology). Spain participates in 33 of the 55 infrastructures included in the update of the 2018 roadmap. Graph 21 shows their breakdown by subject area.



Graph 21. Spanish participation in ESFRI infrastructures
Source: Ministry of Science and Innovation

The participation in European research infrastructures also represents a path of internationalization of the ICTSs that favours the export activity of the companies of the so-called science industry; promotes the Spain brand; has a driving effect on economic activity, and promotes highly qualified employment. The industrial return obtained from participation in research infrastructures amounts to between € 100 and € 150 million per year. As an example, it should be noted that, in the last five years (2015-2019), the industrial return at CERN for Spanish companies is higher than 170 MCHF between supplies and services.

With the aim of ***strengthening excellence in research centres and scientific and technological infrastructures****,* ***Line 5*** *has been designed in EECTI 2021-2027: Encouraging and supporting the* ***generation of scientific and innovative capacities*** *in the System's agents (centres, groups, researchers, innovative companies) to favour the aggregation and development of high-level RDI nuclei, and promoting excellence in* ***scientific and technological infrastructures****.*

On the other hand, given the ***importance of Spanish participation in international infrastructures****,* ***Line 13*** *has been designed: Promoting the* ***internationalization of SECTI agents and scientific and technological infrastructures*** *through: i) promotion and support to increase participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration; iii) international cooperation using science diplomacy; iv) promoting and participating in international facilities.*

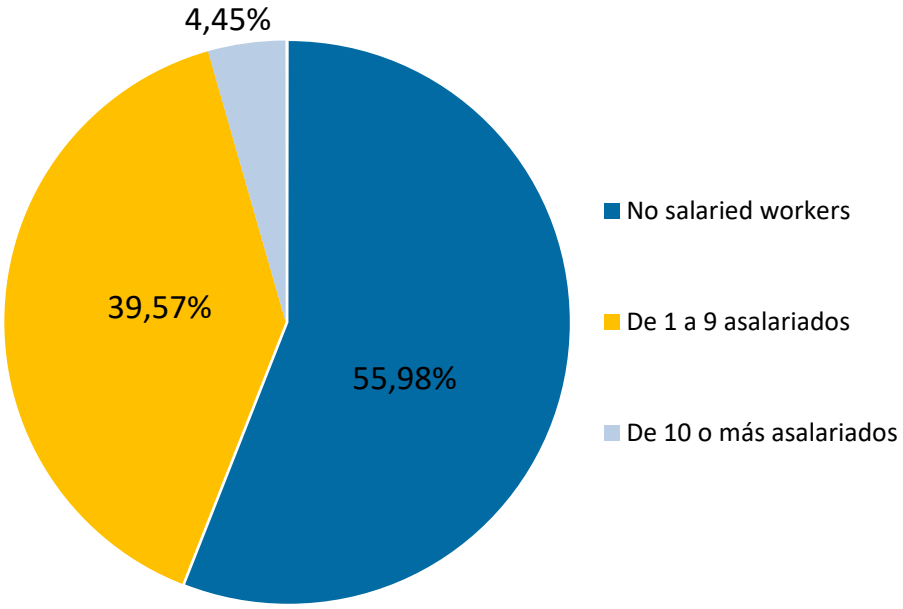
D

The business sector

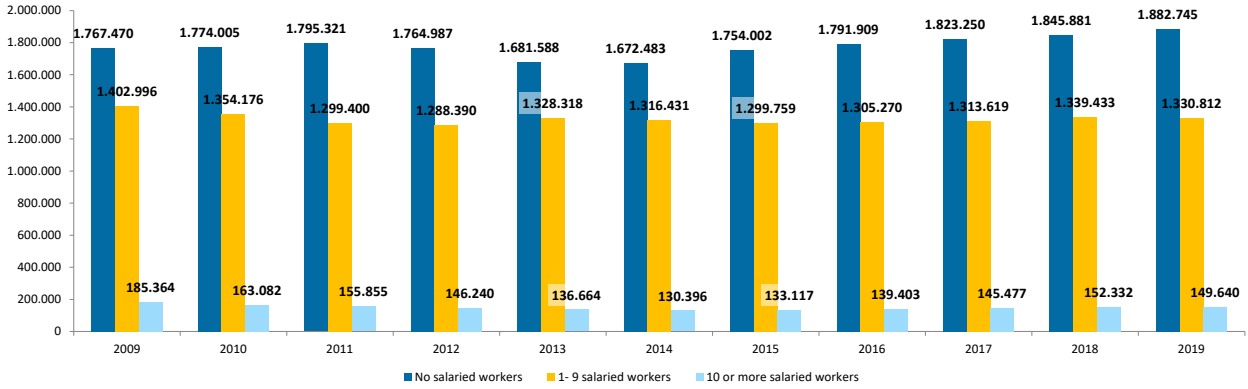
D.1. Characterization of the business sector

The RDI system of a country is conditioned by the very structure of its business fabric. The size of the companies is a determining factor in the investment effort that this sector makes in RD. Next, some characteristics of the Spanish business sector are analysed, which will make it possible to focus public policies and design the lines of action of this Strategy.

As shown in graphs 22 and 23, the business sector in Spain relies mainly on micro and small companies. Thus, it is observed that 56% of companies do not have employees and that around 40% have less than 10, which reduces the percentage of companies, with more than 10 employees to 4.5%. This distribution has remained relatively constant over the last decade (Graph 23).



Graph 22. Distribution of companies by number of salaried workers
Source: INE. Year 2019



Graph 23. Evolution of the number of companies by size
Source: INE

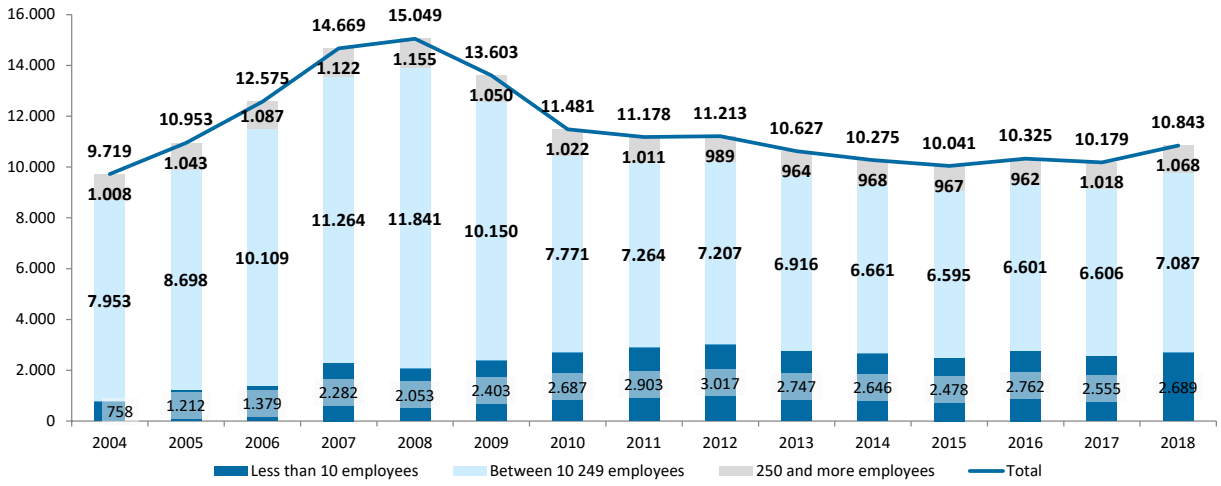
Table 5 presents a comparison of the business fabric in various neighbouring countries. Spain shows some weakness, in comparison with the EU, as regards the percentage of companies with more than 50 employees. This aspect is fundamental because, as has been said and can be seen in the data presented below, the largest companies are those with the greatest capacity for resources, human and physical, to invest in RDI.

Table 5. Comparison of the size of the companies with the European countries.				
	De 0 a 9	De 10 a 49	De 50 a 249	Más de 250
EU28	92,85%	5,98%	0,97%	0,20%
Italy	96,09%	3,37%	0,54%	:
France	95,53%	3,72%	0,61%	0,15%
Spain	94,40%	4,87%	0,60%	0,13%
Germany	82,06%	14,99%	2,46%	0,48%
United Kingdom	90,08%	8,30%	1,33%	0,29%
Netherlands	95,58%	3,54%	0,74%	0,14%
Portugal	95,26%	4,01%	0,63%	0,10%
Sweden	94,54%	4,54%	0,78%	0,14%
Belgium	94,77%	4,40%	0,68%	0,15%
Finland	91,13%	7,34%	1,28%	0,26%
Denmark	88,72%	9,28%	1,69%	0,31%

Source: Eurostat. Year 2017.

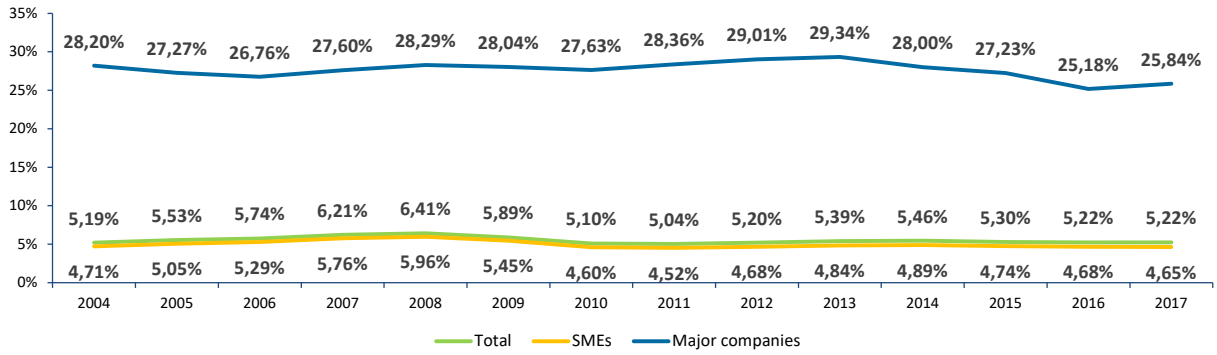
D.2. The business sector and its RD activity

The Graph 24 shows the evolution of the number of companies that have carried out RD activities by company size. The number of companies doing RD in Spain today is around 30% lower than in 2008. If this reduction in the number of companies and the evolution of business investment in RD in the period is taken into account, it can be said that the average investment of companies that have RD activity has grown considerably.



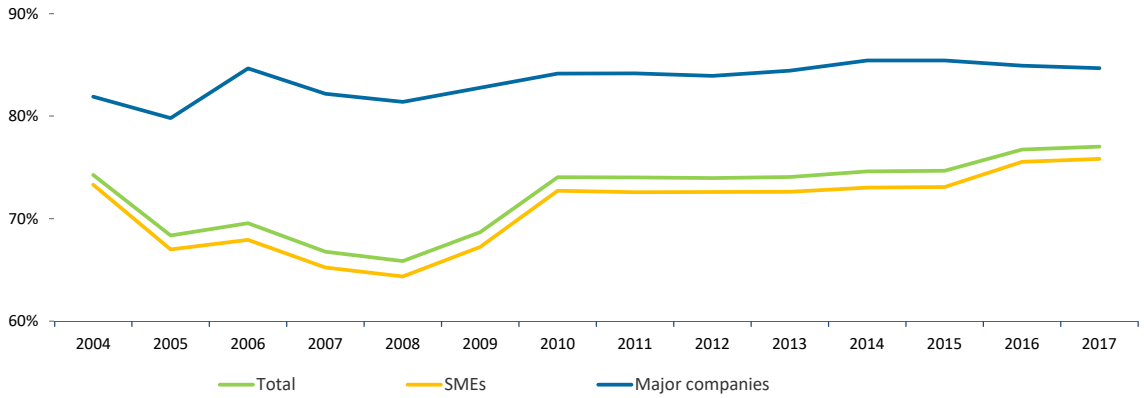
Graph 24. Number of companies that carry out RD according to company size.
Source: INE. Statistics on RD activities

As shown in graph 25, the percentage of SMEs that work in RD has been relatively stable throughout the entire period, although with a reduction of almost a point and a half between 2008 and 2010, coinciding with the economic recession. However, the percentage of large companies that carry out RD shows a more irregular trend, decreasing gently in the period 2008-2010 and declining more sharply in 2013-2016, when the economy begins to show signs of recovery (Graph 25). Therefore, there is a certain delay in the response of companies with RD activity to the economic crisis.



Graph 25. Evolution of the percentage of companies that carry out RD.
Source: INE. Survey on Innovation in companies

Another indicator to take into account is the percentage of companies that carry out their RD activity continuously (Graph 26). The behaviour during the 2006-2010 period is especially significant. From that year on, a stability phase begins until 2015, after which time, the percentage of SMEs that carry out RD continuously increases.



Graph 26. Percentage of companies that have carried out RD continuously.
Source: INE. Survey on Innovation in companies

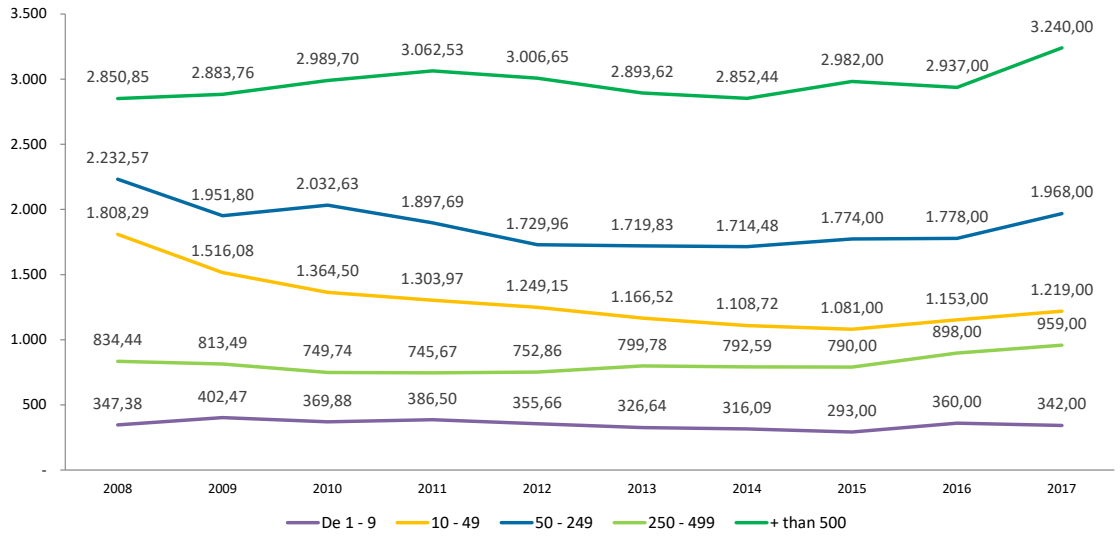
D.3. RD expenditure of the business sector

In the previous sections, it has been indicated that the business sector executed 56.5% of total RD spending in 2018. Graph 27 shows the evolution of investment in RD in the business sector in relation to the size of the companies, according to the data published by Eurostat. It can be seen that in 2017 the execution of business RD rose to € 7,728 million, of which 41.9% (€ 3,240 million) were executed by companies with more than 500 employees. However, the percentage of companies of this size in Spain is very small (clearly below 0.13%, see Table 5).

It is followed in investment volume by companies with between 50 and 249 employees that executed 25.5% (1,968 M €) and represent 0.6% of the business fabric, and those with between 10 and 49 employees (1,219 M €, 15.8% of business RD spending) and represent 4.87% of the business fabric in Spain.

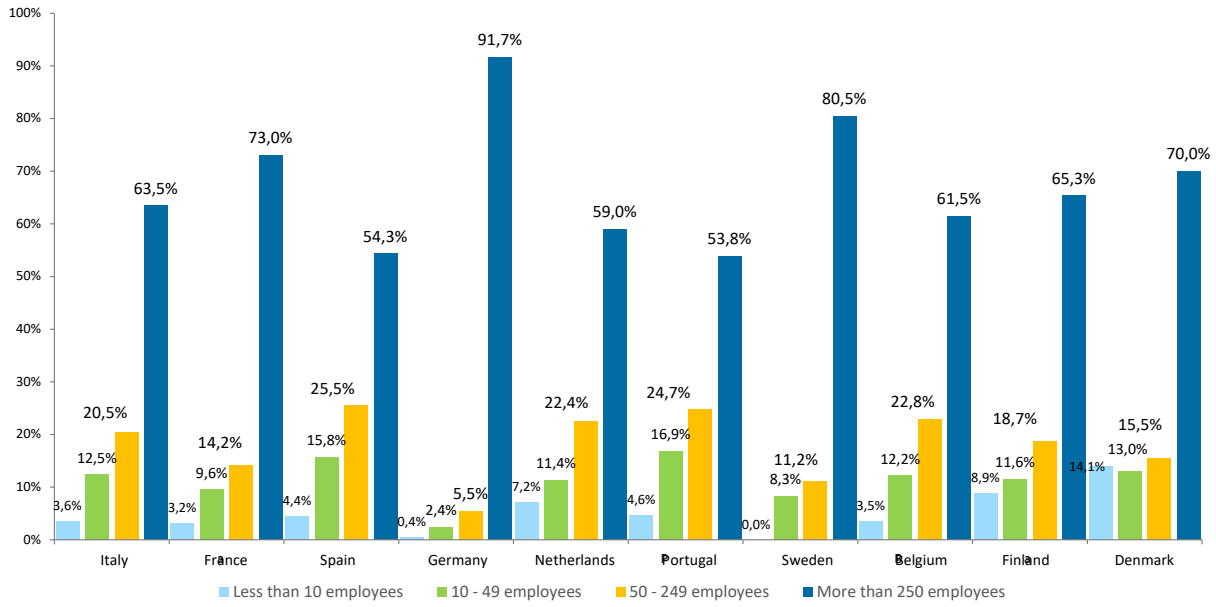
On the other hand, the lowest execution of expenditure has been made by companies with less than 10 employees (€ 342 M, 4.4%), which represent 94.4% of the Spanish business sector, followed by those with between 250 and 499 employees (€ 959 million, 12.4%). It should be taken into account that the percentage of companies of this size is less than 0.13% (this being the percentage of companies with more than 250 employees).

Although business spending has grown in recent years, until 2018 it had not managed to reach the 2008 spending level (€ 8,073 million). This recovery is mainly due to the higher investment of companies with more than 500 employees and from 50 to 249.



Graph 27. Execution of corporate R&D expenditure according to company size (in M euros). Source: Eurostat (2017)

Graph 28 compares the execution of RD spending in the business sector according to its size with that of other countries. Spain, together with Portugal, is the country in which the proportion of RD spending by companies with more than 250 employees is lowest (54.3% compared to 91.7% in Germany, 80.5% in Sweden , 73% in France, 63.5% in Italy or 61.5% Belgium). Clearly, as shown in table 5, the percentage of companies with more than 250 employees in Spain is lower than in Germany (0.13% compared to 0.48%), however, it is not with respect to other countries such as France, Belgium (0.15% in both cases) or Sweden (0.14%) and, despite this, the proportion of spending on RD by these companies is substantially higher in these countries. At the other extreme lie companies with less than 50 employees that reach a weight in RD spending in Spain that is higher than that observed in the rest of the countries. **These results show how the spending structure of the Spanish business sector by company size differs substantially from other countries and this affects other indicators, already analysed above**, such as the percentage of spending on RD in the business sector in Spain being almost 10 points below that of the EU (Graph 9). It seems, therefore, clear that it is necessary to articulate efficient instruments that help increase RD spending by large companies. In this sense, a clearer and more efficient tax incentive policy would undoubtedly contribute to achieving the European average.



Graph 28. Proportion of RD expenditure by company size

Source: Eurostat. Year 2017

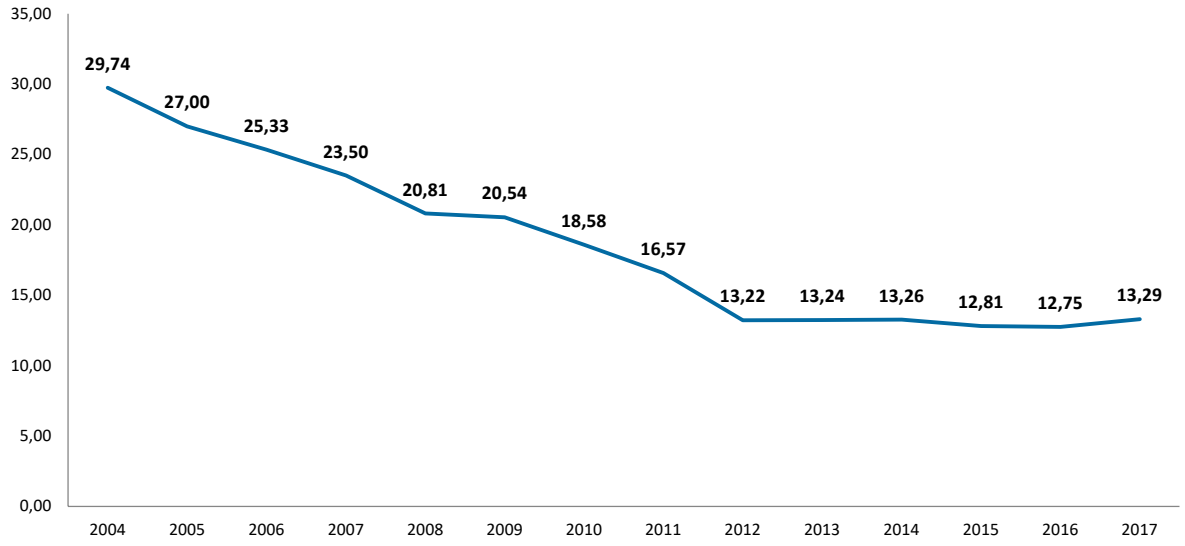
In short, on the basis of the results presented, it is observed that the characteristics of the Spanish business sector decisively affect RD. In particular, it should be noted that there

is a greater relative volume of micro-enterprises, less inclined to invest in RDI and more vulnerable to economic cycles, and that SMEs constitute the main muscle of RD activity.

D.4. Innovation in the business sector

According to the latest data from the INE, in the 2016-2018 period, one in five Spanish companies was innovative[2], reaching a total of 31,505 innovative companies in that period, of which 9.8% were product innovators and 17, 5% were innovative in business processes. Spending on innovative activities in 2018 stood at € 18,689 million.

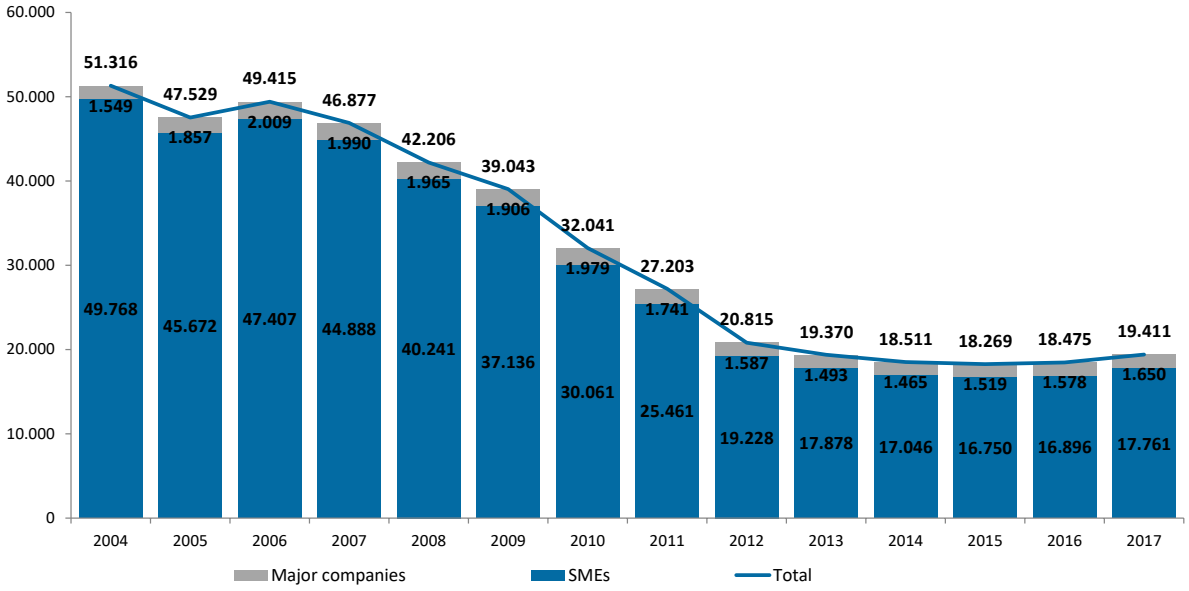
The following graph (Graph 29) shows the evolution of the percentage of technological innovative companies in Spain since 2004. The percentage has practically halved, from 29.74% in 2004 to 13.29% in 2017[3].



Graph 29. Evolution of the percentage of innovative technology companies.
Source: INE. Survey on Innovation in companies

When examining the situation taking into account the size of the companies and focusing the analysis on innovative technology companies (Graph 30), the reduction is found to have had a greater effect on smaller companies, which, as mentioned above, are more vulnerable.

2 INE press release: https://www.ine.es/prensa/eie_2018.pdf
3 The 2018 data are not included because there is a break in the series as a result of the revision of the Oslo Manual, which abandons the disaggregation of technological and non-technological innovative companies.



Graph 30. Number of innovative technology companies according to company size. Source: INE. Survey on Innovation in companies.

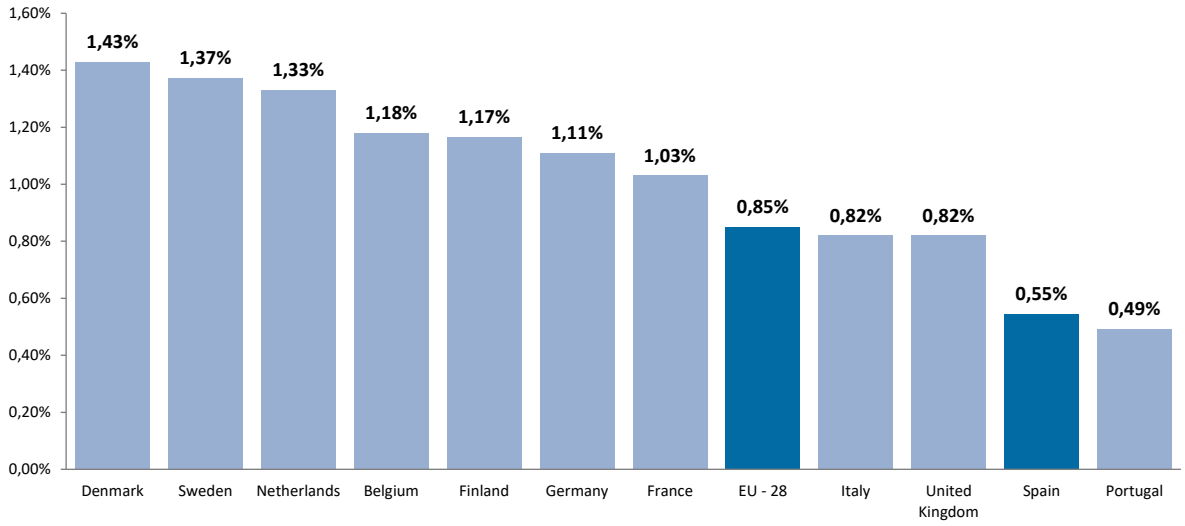
From the information available so far, it can be deduced that the crisis has had a more severe impact on the percentage of innovative companies than on the percentage of companies that carry out RD activities. It would be advisable to be able to return to pre-crisis levels, since **if the perimeter of companies that carry out RD activities is expanded, radical changes in the companies' RD results will be possible**.

D.5. Personnel employed in RD in the business sector

In terms of the labour market, Spain is in a critical situation in relation to the rest of the EU countries. It should be noted that, in the crisis period, the unemployment rate increased faster than in the rest of the European countries, reaching the highest rate in 2013 with a 26.1% unemployment rate compared to 10.9% in the EU. In 2019 this value fell in Spain to 14.1%, but it is still more than double the European average, whose rate is 6.4%.

If the unemployment rate of the population with higher education is analysed, it is observed that, although the levels are lower than the national total, the values are relatively high compared to the rest of the countries in our environment.

In Spain, the weight of personnel dedicated to RD compared to the population employed in the business field is lower than the European average, although it is true that this value has experienced a significant increase in comparison to the previous year (Graph 31).

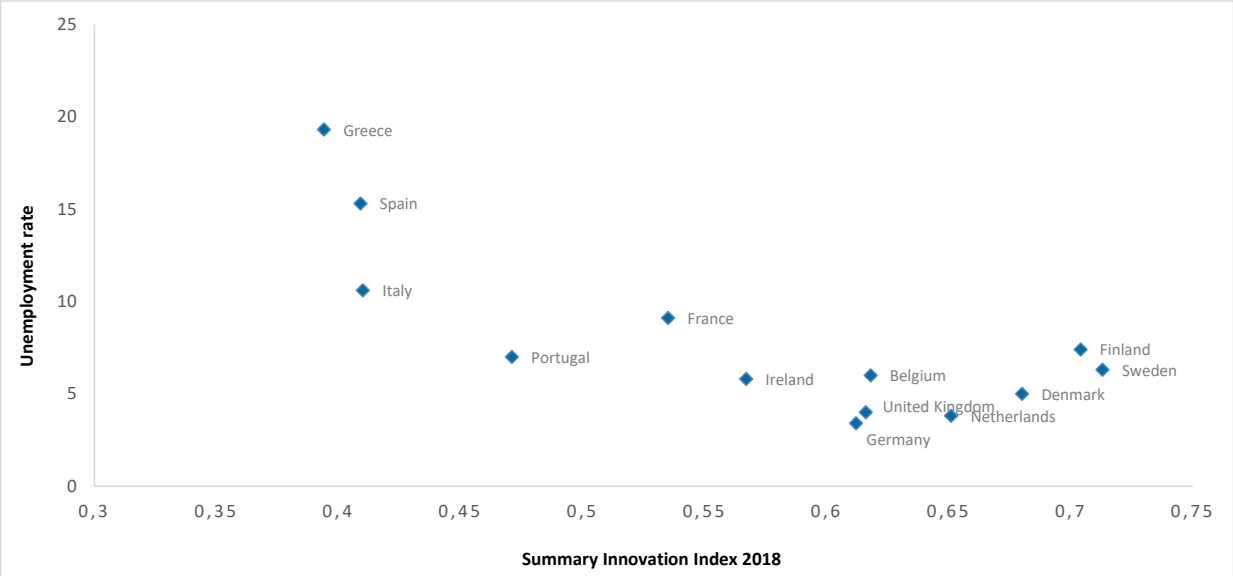


Graph 31. Comparison of personnel dedicated to RD (FTE) with respect to the emplo yed population in the business field.
Source: Eurostat. RD statistics. 2018 data (provisional data)

As a positive aspect, it should be noted that in the years with the highest unemployment rates (2011-2015), the personnel employed in RD have maintained a relatively better position than the rest of the population, staying in relation to the active population and improving their position when the employed population is taken into account.

In 2018, the personnel employed in RD in the business sector represented 46.3% of the total in all sectors. This percentage has increased in the last two years, while in previous years it had remained without great variations. However, it is still well below the European average, at 58.3%.

As shown in the following graph (Graph 32), it is interesting to observe the relationship that exists between a country's level of innovation and its unemployment rate. Using the *Summary Innovation Index* (SII) of the EIS as a measure of the innovative level of a country, it is observed that the greater the intensity of innovation, the lower the unemployment rate of a country.



Graph 32. Innovation vs. unemployment
Source: Eurostat. EIS (European Innovation Scoreboard)

Due to all the above, the following are regarded as priority targets of the EECTI 2021-2027: ***Target 6:*** Promoting ***the transfer of knowledge***, strengthening and developing ***two-way links between science and companies***, through a mutual understanding of needs and ***Target 7:*** Promoting ***research and innovation in the Spanish business fabric***, increasing its commitment to RDI and expanding the perimeter of innovative companies to make the business fabric more competitive. In addition, ***Line 8*** has been established: Promoting ***business innovation and the diffusion of innovation in all sectors***, especially in small and medium-sized enterprises (SMEs), facilitating the incorporation of technologies and innovations that facilitate the achievement of political priorities, social and economic aspects of the country. Ensuring tax incentives for RDI, adapted to companies in the science and innovation system. Likewise, the following lines of action are set: ***Line 9:*** Strengthening national strategic sectors, transforming social challenges into ***business development opportunities***, and promoting entrepreneurship and investment in RDI in the private sector, as well as attracting capital risk for innovative companies and ***Line 12: Strengthening value chains around focused innovation systems***. Finally, in relation to human resources, ***Line 7*** has been established: Establishing ***mechanisms for attracting research, technological and innovative talent to companies, industries and RDI centres***, facilitating the mobility of researchers, both in the public and the private sector.

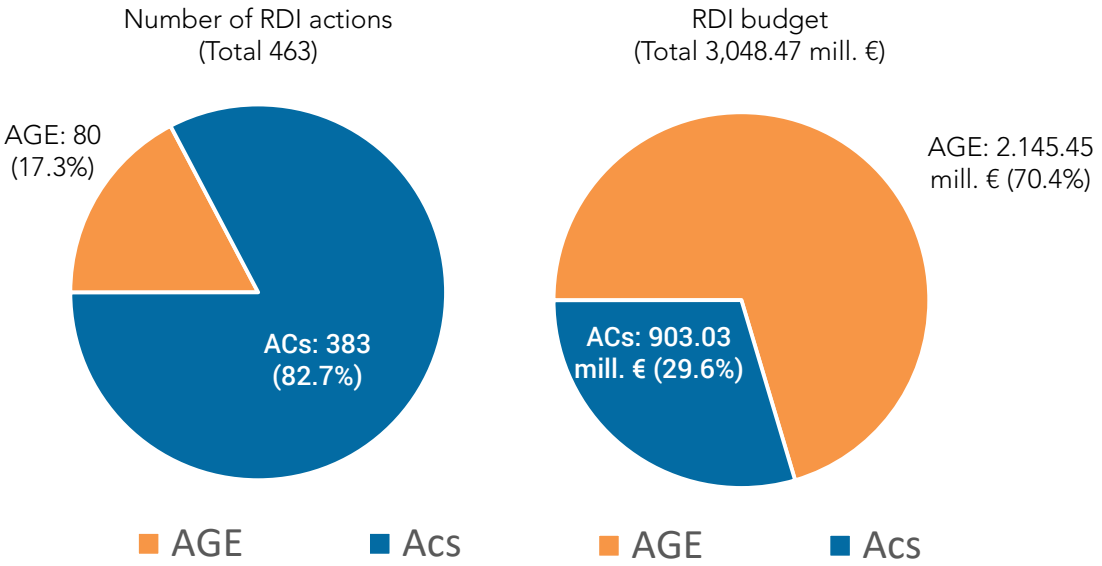
E

National, sectorial and regional aids

Coordination between RDI policies within the AGE and between the AGE and the ACs and the actual local corporations is presented as a vital element in terms of opportunity, rationality and efficiency. This section provides information on the aid granted by the AGE and the Autonomous Communities extracted from the SICTI.

The following graph (Graph 33) shows the distribution of RDI actions between AGE and ACs in 2018. These are grants in competitive competition, open lines and direct grants (grants from the Basque Country are not included). As can be seen, a total of 463 grants have been called; 17.3% are from the AGE and 82.7% from the Autonomous Communities.

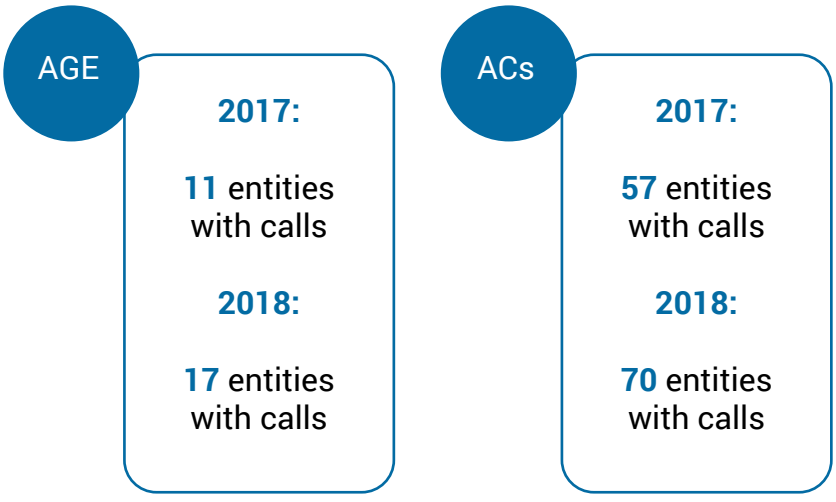
However, if the budgeted amount of these actions is evaluated (€ 3,048.47M), the data is invested in such a way that 70.4% represents the budget for actions of the AGE and 29.6% for those of the ACs. **These first results indicate that there is a very high volume of actions, and that some of them have a relatively low budgeted amount.**



Graph 33. Number of RDI actions and budgeted amount of the AGE and the ACs. Year 2018. Source: SICTI

Another interesting datum (Graph 34) refers to the number of convening bodies. In 2018, the AGE had 17 different bodies calling and therefore financing RDI actions. The three main institutions for financing RDI aid in the AGE are: the State Research Agency, the Centre for Industrial Technological Development (CDTI) and the Carlos III Health Institute.

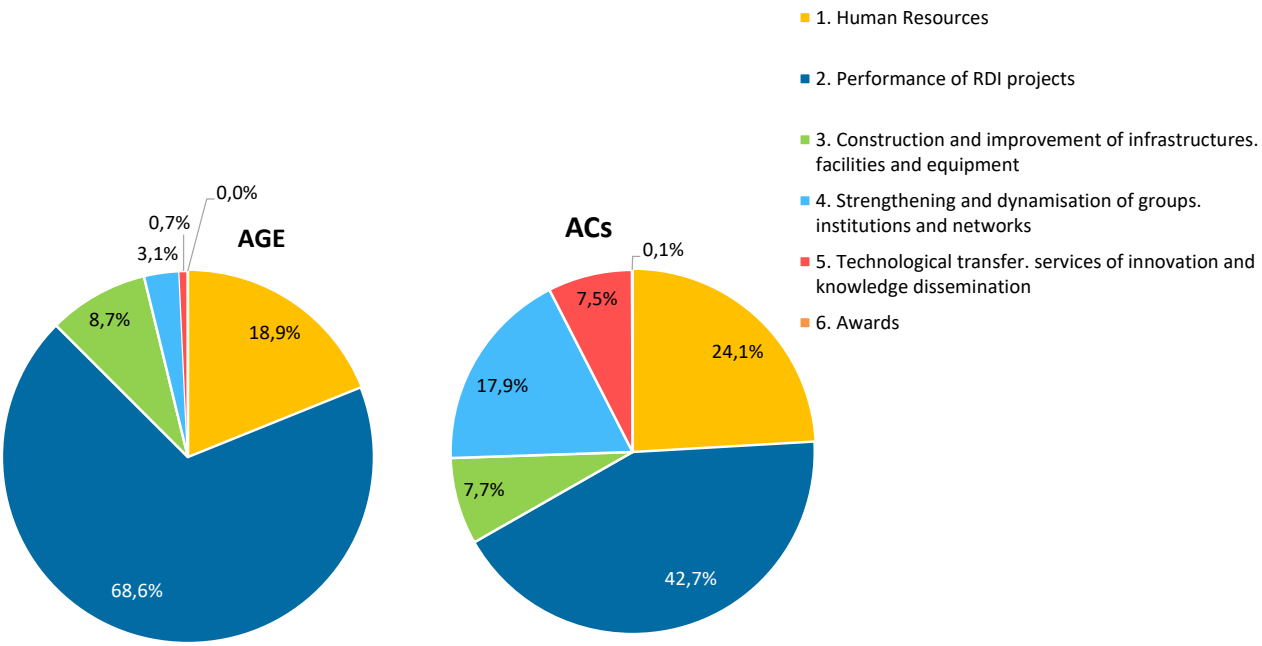
In the Autonomous Communities, the number of convening bodies rises to 70, which indicates that, on average, there are 4 different bodies that annually convene RDI actions. These results abound in the existing fragmentation in the granting of aid. Undoubtedly, the coordination of such actions with such a wide network of convening bodies is complicated, not only between the AGE and ACs, but also, and this aspect is really important, within the AGE itself and each one of the ACs. It is, therefore a priority to apply coordination policies for RDI, both in the sectoral spheres of the ministerial departments and in the territorial ones.



Graph 34. Number of bodies calling RDI actions in the AGE and the ACs. Year 2018 Source: SICTI

The following graph (Graph 35) shows the distribution of the budget dedicated to RDI aid in 2018 by type of action. It is verified that the main bulk of the budget, both in the AGE and in the Autonomous Communities, is allocated to aid for human resources and projects (87.5% in the AGE and 66.8% in the ACs), although in the AGE the percentage of the budget dedicated to research projects is 26 points higher than that of the ACs (68.6% and 42.7%). These results show the existence of an important margin for coordination and cooperation between the different institutions, mainly with regard to actions in human resources and research projects.

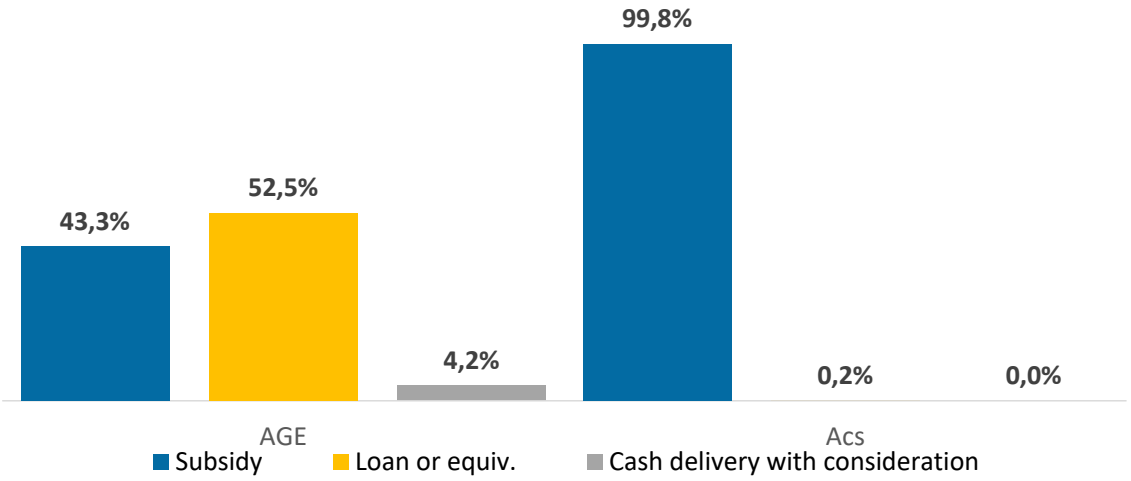
Regarding the rest of the aid, the Autonomous Communities allocated a greater percentage of their budget to strengthening and revitalizing groups, institutions and networks (18%), while the General Government allocated only 3.1% of its budget.



Graph 35. Distribution of the budget for RDI actions by type of action.

Year 2018
Source: SICTI

When the institutions' form of financing aid (Graph 36) is analysed, it is observed that the AGE allocates 43.2% of the budget to the subsidy modality and 52.5% to loans, while practically all the budget of the ACs follows a subsidy model.



Graph 36. Distribution of the aid budget by financing model. Year 2018
Source: SICTI

All these results show the existence of a wide margin to find areas of coordination between the different administrations. This aspect is included in ***Line 3: Coordinating and complementing national and sectoral RDI policies with others at a European, regional and local level***, *and* ***Line 4:*** *Addressing the development of a system of governance and indicators that facilitate the analysis, monitoring and evaluation of the results in relation to the objectives set.*

F

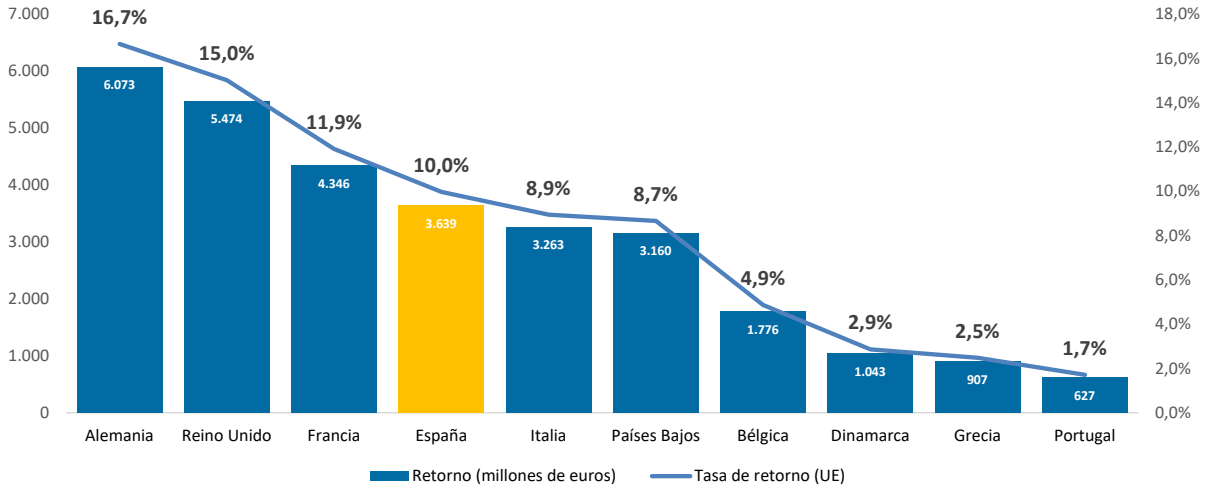
Internacionalization

F.1. Participation in the EU programs

During the years 2014-2018, Spanish participation in the European RDI framework programs has improved substantially compared to previous programs. According to data provided by the CDTI, in the VII Framework Program (2007-2013) Spain obtained € 3,397 million and a return of 8.3% compared to the EU28. However, in the H2020 program (considering only the 2014-2018 period) Spain has already exceeded these figures, placing the financing obtained at € 3,639 million, which represents a return of 10%, compared to the rest of the EU countries 28.

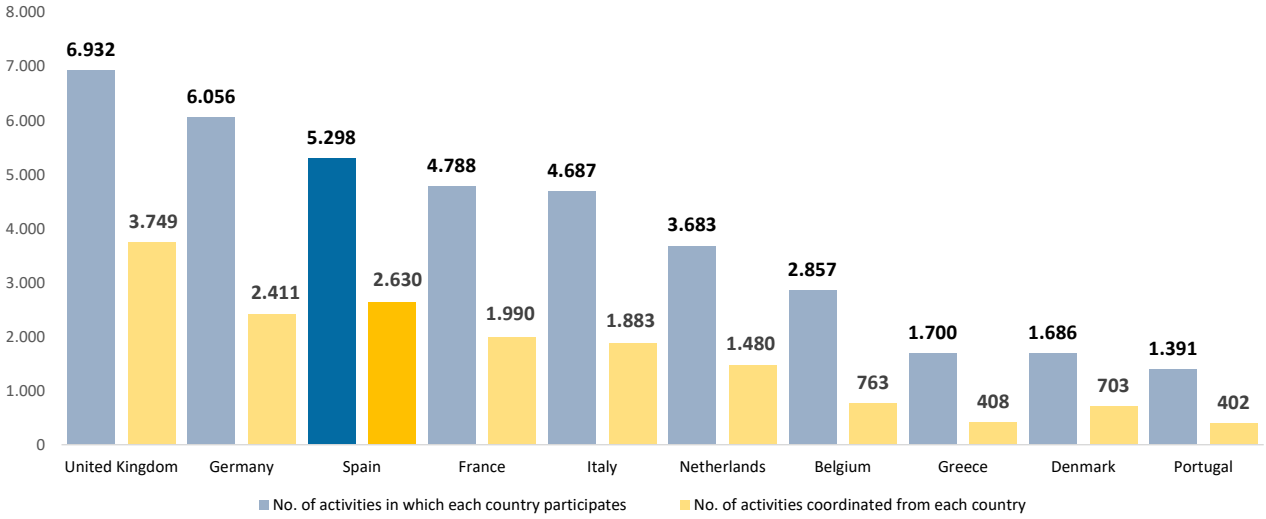
In the 2014-2018 period (H2020 program), there were 64,641 proposals with the participation of Spanish entities, of which 9,520 have been financed. In this period, 2,900 entities have participated in financed activities, compared to 2,642 in the previous program (2007-2013). Likewise, the percentage of projects led has improved, standing at 15.8% compared to 10.7% in the previous program.

The following graph (Graph 37) present comparative data with the rest of the EU countries, in which it is observed that Spain has improved two positions in terms of return.



Graph 37. Return and rate of return of participation in H2020 for the period 2014-2018
Source: CDTI

In terms of participation, it is verified that Spain occupies the third position. If the number of activities it coordinates is taken into account, Spain's position is second, as shown in the following graph (Graph 38).

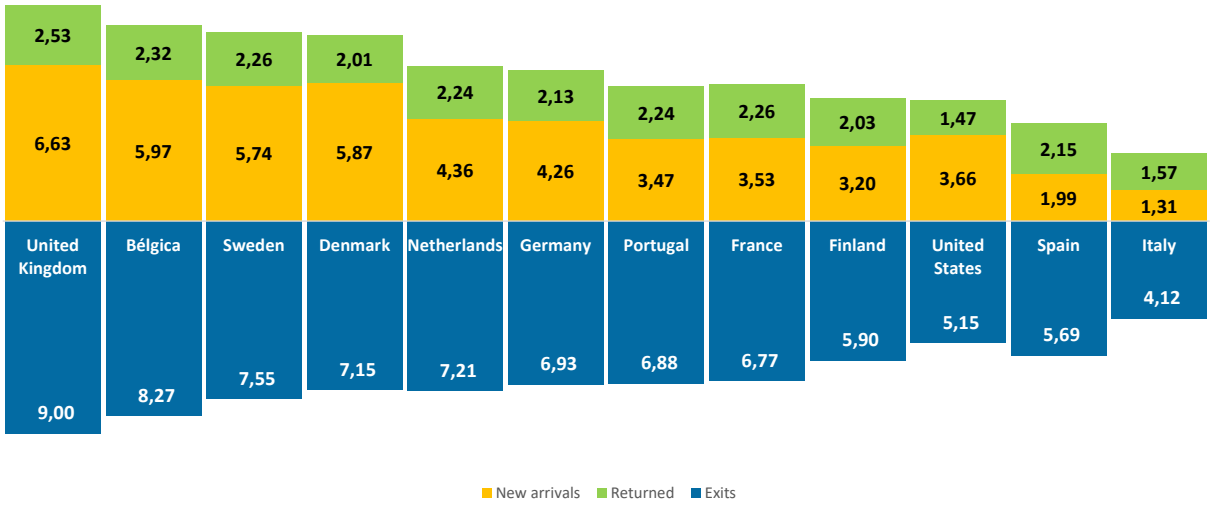


Graph 38. Number of activities in which each country participates and number of coordinated activities. Period 2014-2018
Source: CDTI

These results are very positive and show how the participation of Spanish institutions and groups in European programs has been progressively improving. Even so, it is necessary to continue promoting and encouraging the participation of Spanish groups in international programs, so it is important to favour the coordination of proposals and also support participation in international programs with the collaboration of other countries outside the EU. For this reason, ***Target 2*** proposes ***Contributing to the political priorities of the EU*** *by aligning with its RDI programs, giving support to the actors responsible for the SECTI to achieve this target,* and as an axis of action, ***Line 13: Promoting the internationalization*** *of SECTI agents and scientific and technological infrastructures through: i) promotion and support to increase participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration; iii) international cooperation using science diplomacy; iv) promoting and participating in international facilities.*

F.2. Staff mobility

The Graph 39 reflects the mobility of the authors considering their last affiliation and using the bibliometric data from 2016.



Graph 39. Mobility of the authors (2016)
Source: OECD-SCOPUS

As can be seen, mobility levels in Spain, in percentage terms, are lower than in other countries. As a positive aspect, it should be noted that the rate of return stands at 2.15%, at the level of the countries with the greatest mobility. Undoubtedly, the increase in participation in international programs, together with the increase in the coordination of these programs, as well as the cooperation with international agents, will require, at the same time as it will promote, the two-way mobility of researchers.

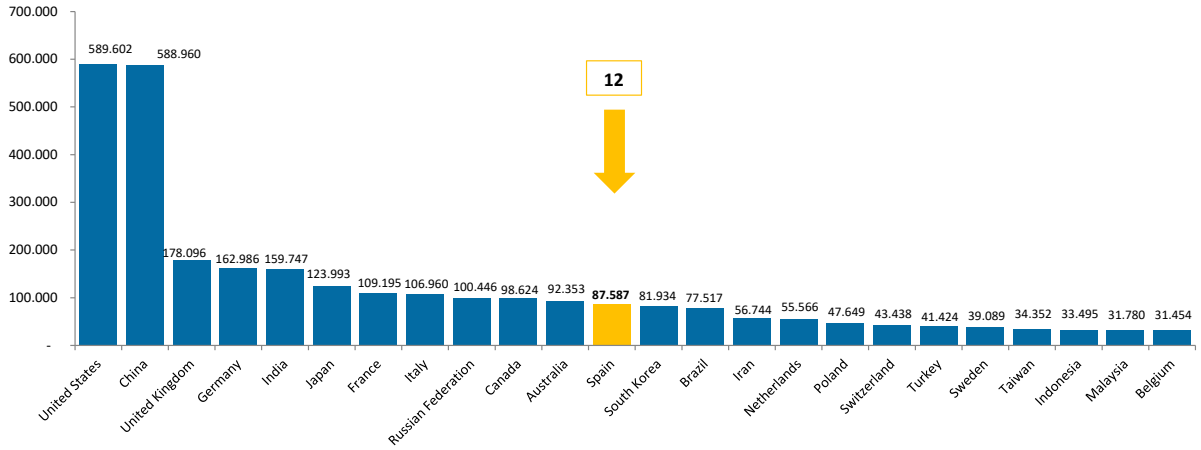
G

RDI results

G.1. Bibliometric indicators

This section analyses the situation in Spain in terms of scientific production as a result of research activity. All the indicators have been provided by FECYT from Scopus3 data[4].

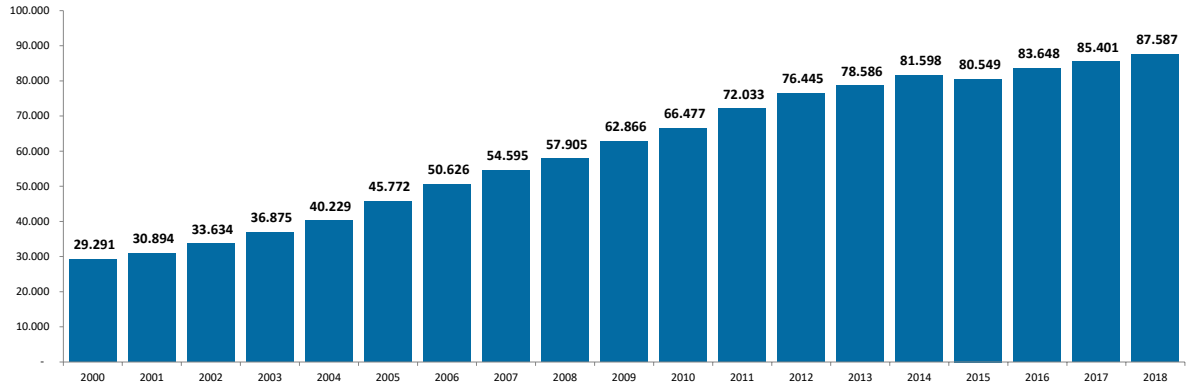
Spain, in terms of total volume of documents, ranks 12th within the group of 24 countries in the world, in which more than 30,000 documents are produced per year (Graph 40).



Graph 40. World scientific production. Year 2018.
Source: FECYT-SCOPUS

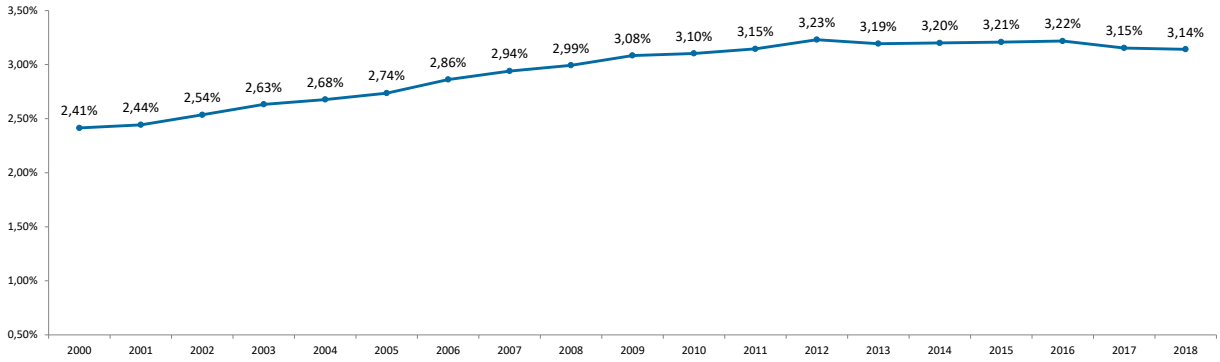
4 The consultation date for all bibliometric indicators shown in this section was March 9, 2020.

This parameter has increased progressively in Spain in recent years, meaning that in 2018 the total number of documents is three times higher than in 2000 (Graph 41).



Graph 41. Spanish scientific production
Source: FECYT-SCOPUS

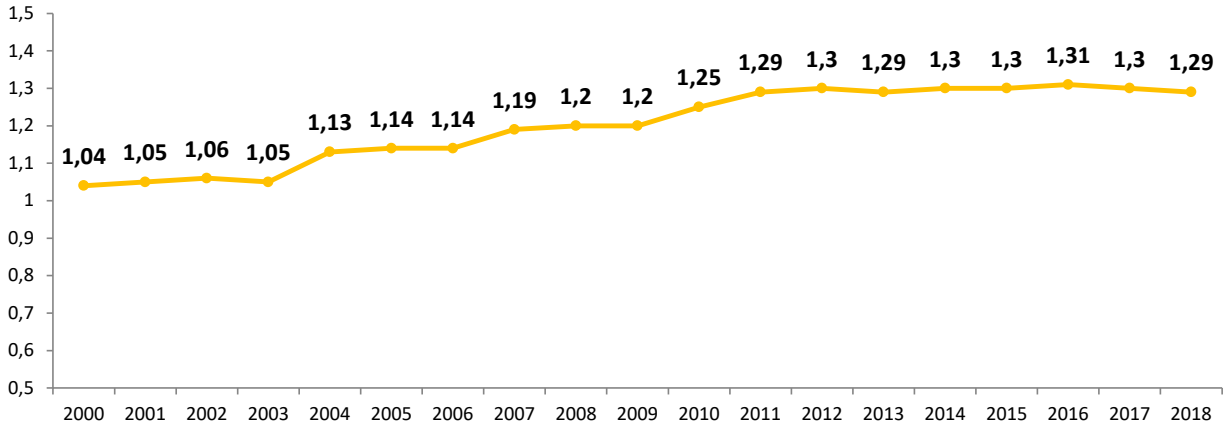
The following graph (Graph 42) shows the evolution of the percentage that Spain represents in world scientific production. The trend is growing, reaching a maximum in 2012. From that year on, it is considered a stage of stability, at around 3% of world production.



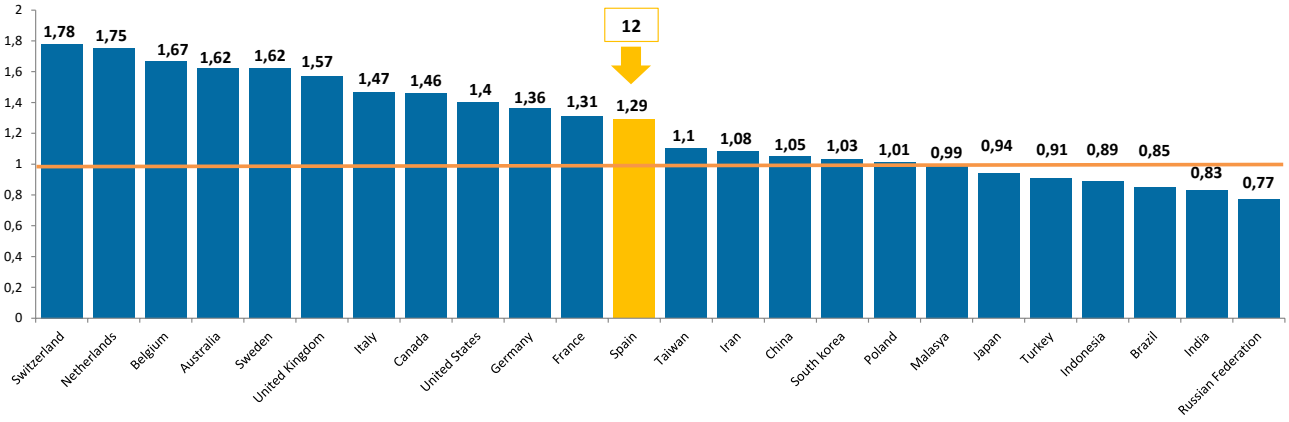
Graph 42. Percentage of Spanish scientific production in the world.
Source: FECYT-SCOPUS

Next, in the Graph 43 the **normalized impact** indicator of Spanish scientific production is presented, which compares the average number of citations of Spanish scientific production with world production. The value of the normalized impact of Spain in 2018 is 1.29, indicating that Spanish scientific production has been quoted 29% more than the world average (whose

value is 1). Spain occupies position 12 within the group of countries with the largest scientific production in the world (24 countries that produce more than 30,000 documents per year). (Graph 44).



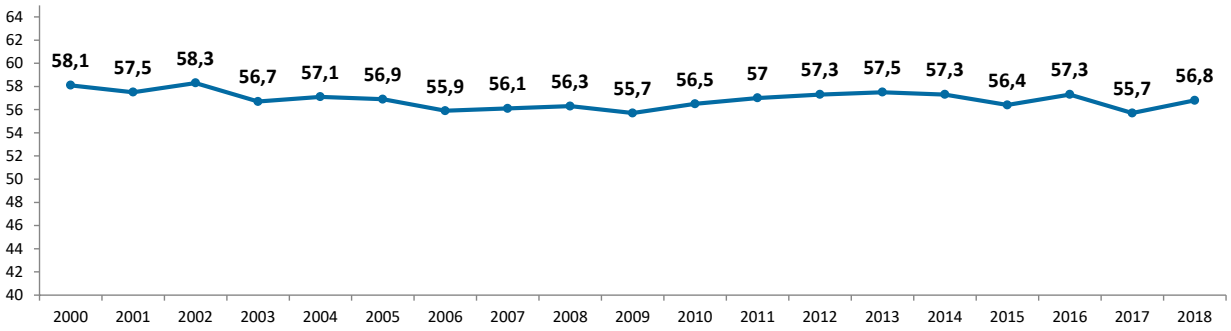
Graph 43. Normalized impact of Spanish scientific production.
Source: FECYT-SCOPUS



Graph 44. Normalized impact of world scientific production. Year 2018.
Source: FECYT-SCOPUS

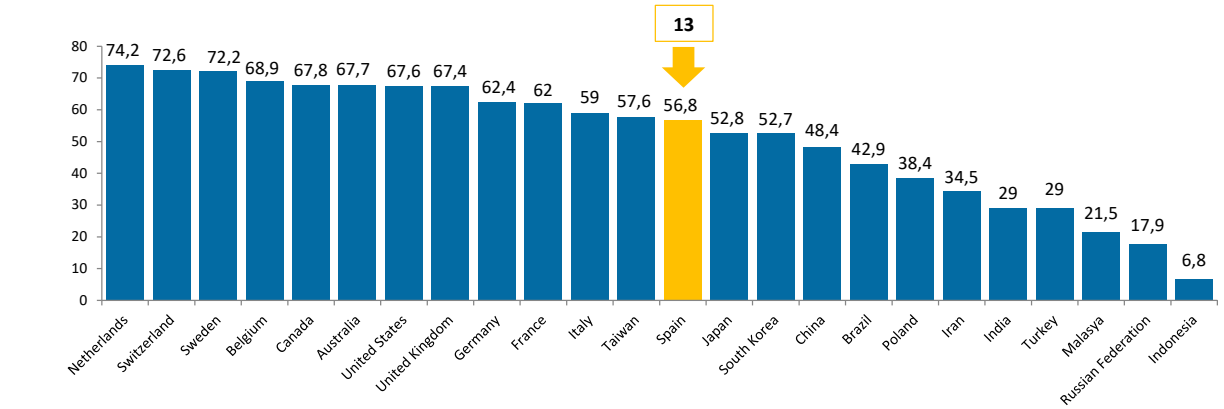
It is interesting to note that countries such as China and Japan, in which the volume of documents production is higher than that of Spain, however, present a lower average impact, which barely reaches the world average. In contrast, countries with a lower production volume than Spain, such as Switzerland, the Netherlands, Belgium and Sweden, are in the first positions in terms of the value of the normalized impact. Australia deserves a separate mention, as, having a similar production to that of Spain, is among the top 5 countries regarding the impact or international visibility of its publications.

Graph 45 analyses the evolution of the percentage of Spanish scientific production that is published in journals of the first quartile or Q1. It is an indicator that remains relatively stable during the time period examined (2000-2018); around 58% of Spanish scientific production is published in the most relevant journals in the world or in the first quartile.



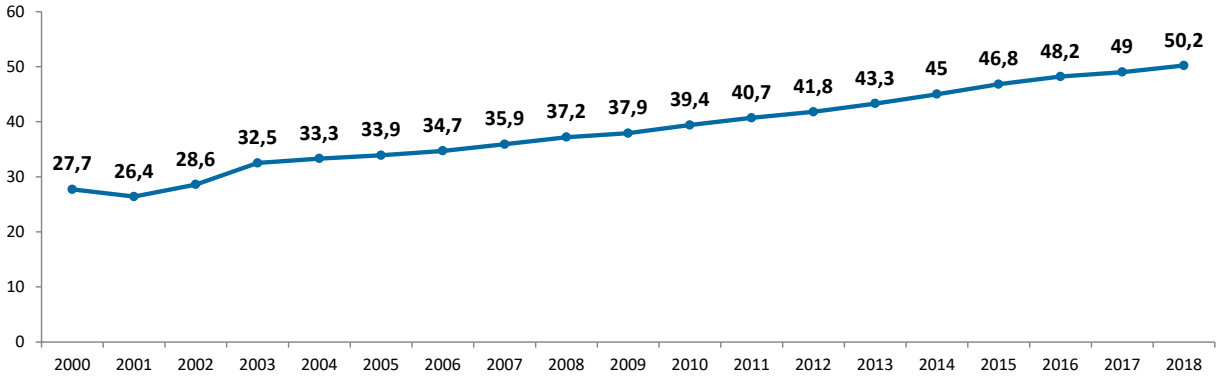
Graph 45. Percentage of Spanish scientific production published in first quartile or Q1 journals.
Source: FECYT-SCOPUS

Spain holds the 13th position with respect to the group of countries with the highest science production that is under analysis. Inevitably, one can observe a similar pattern to that of the rest of the indicators that measure the quality of scientific production: countries such as the Netherlands, Sweden, Switzerland and Belgium occupy the first positions, despite the fact that their level of scientific production is much lower than that of Spain. The presence of Australia also stands out, occupying the top positions in this group of countries.



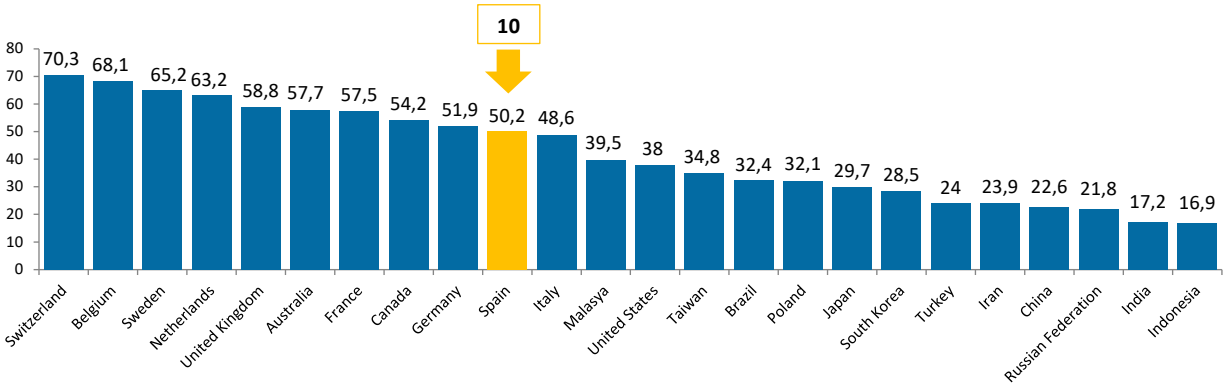
Graph 46. Percentage of world scientific production published in journals of the first quartile or Q1. Year 2018.
Source: FECYT-SCOPUS

Another bibliometric indicator that contributes to analysing the quality of Spanish scientific production is that of **international collaboration** (Graph 47), that is, the percentage of scientific publications in which Spanish institutions and institutions from other countries appear. The evolution of this indicator shows a clear improvement in the Spanish situation in the last decade. In 2000, only 27.7% of Spanish production was carried out in collaboration with other countries and in 2018 this indicator practically doubled to stand at 50.2% of production, which means that half of Spanish scientific production published in 2018 has been done in collaboration with other countries.



Graph 47. Percentage of Spanish scientific production in international collaboration. Source: FECYT-SCOPUS

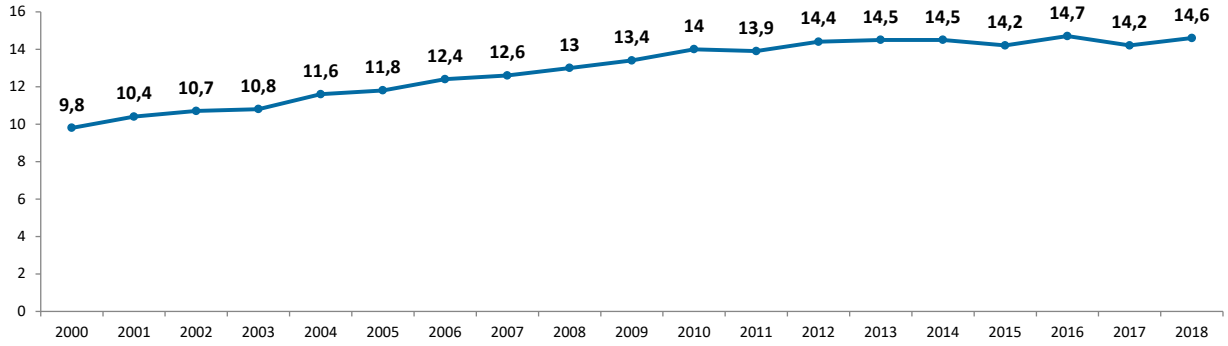
Spain has improved so much in terms of international collaboration that in the year 2018 it holds the 10th position of the group of countries with the most science producers. Of all indicators analysed, this is the one in which Spain holds the best position in the world.



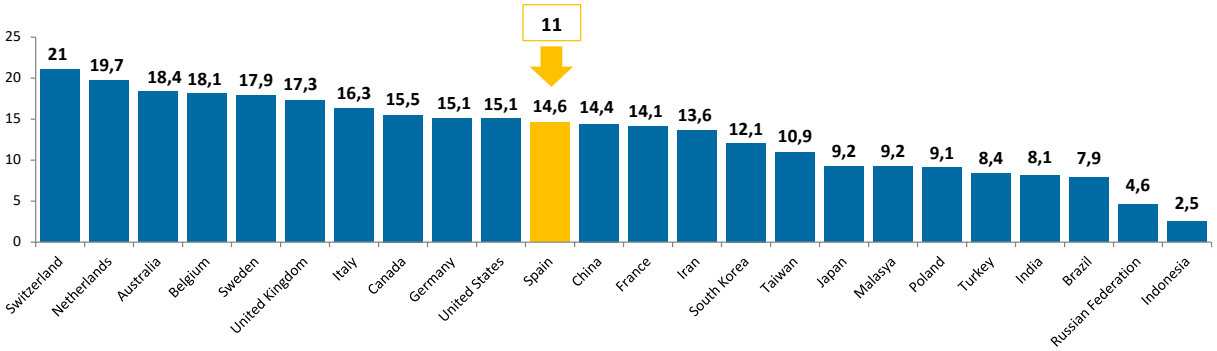
Graph 48. Percentage of world scientific production in international collaboration. Year 2018. Source: FECYT-SCOPUS

What follows is an analysis of the two indicators that make it possible to assess the level of excellence of publications: the number of publications that are among the 10% of the most quoted in the world and among the 1%[5].

Spain has improved in the first indicator, going from 9.8% in 2000 to 14.6% in 2018, although some stability has been perceived at around 14.5% since 2012. These results make it hold the 11th position in the world (Graph 49 and 50)



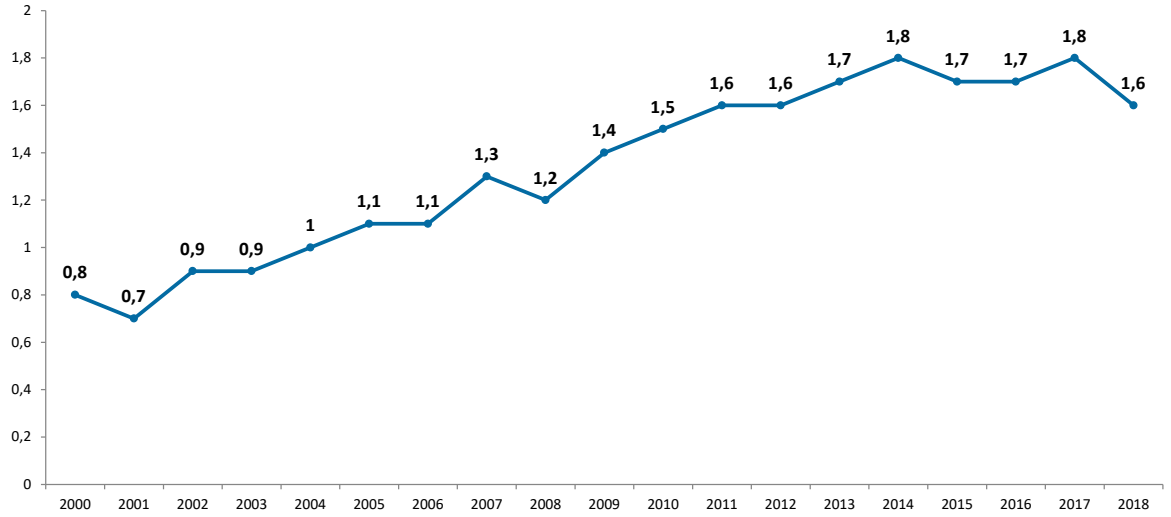
Graph 49. Percentage of Spanish publications among the 10% most quoted in the world
Source: FECYT-SCOPUS



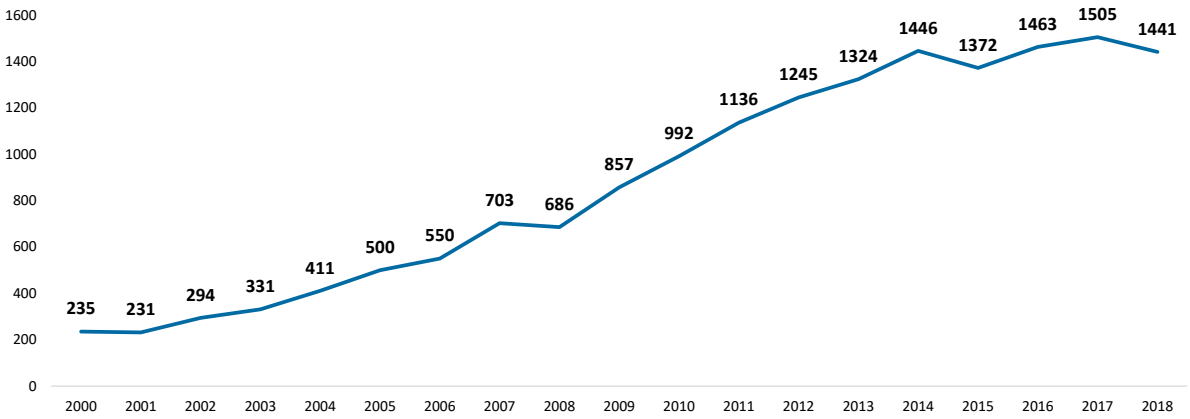
Graph 50. Percentage of publications among the 10% most quoted in the world. Year 2018.
Source: FECYT-SCOPUS

The second indicator analysed to measure excellence is the number of publications that are among the 1% of the most quoted. Spain has doubled its percentage in the period 2000-2018, going from 0.8% to 1.6%. In terms of volume of publications among the 1% most quoted, it has gone from 235 in 2000 to 1,241 in 2018. This good evolution allows Spain to position itself in the 13th position among the countries with the highest scientific production in 2018 (Graphs 51, 52 and 53).

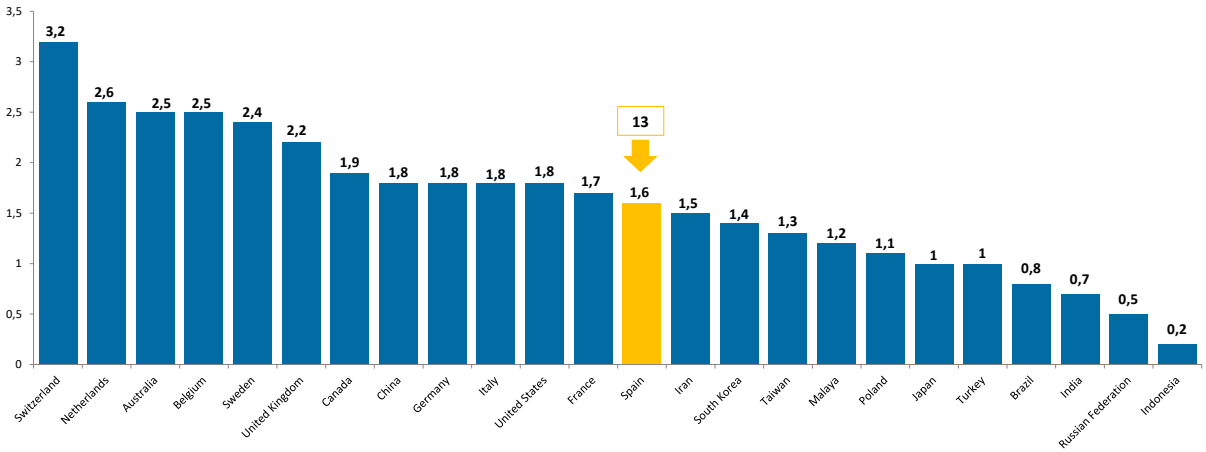
5 The data for 2018 should not be taken into account in terms of these indicators since the number of citations in the publications increases over time, so the data for 2018 is biased by temporal proximity.



Graph 51. Percentage of Spanish publications that are among the 1% most quoted in the world.
Source: FECYT-SCOPUS



Graph 52. Number of Spanish publications that are among the 1% most quoted in the world.
Source: FECYT-SCOPUS



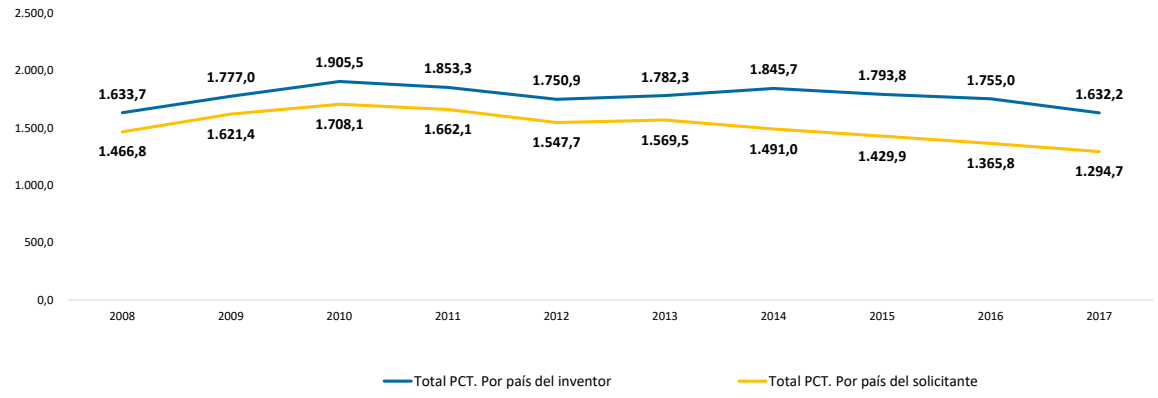
Graph 53. Percentage of publications among the 1% most quoted in the world.
Source: FECYT-SCOPUS

Considering the indicators of scientific production analysed, it can be concluded that, although Spain has worsened its global position in terms of the number of published documents, the percentage of publications with respect to world production has remained stable, representing 3% of world scientific production in the last 10 years. As strengths of the Spanish system, it is necessary to mention the increase in **international collaboration that currently reaches 50% of Spanish publications**, with the result, additionally, that about 15% of Spanish scientific production is among the most quoted in the world. It should also be said that, despite the benefit resulting from the increase in internationalization, the percentage of publications that are not published in world-renowned journals is significantly higher than that of neighbouring countries.

G.2. Patents

Patent applications and granted patents are indicators of the results of a country's inventive and innovative activity. It is necessary to attend to the nationality of the applicant and the inventor to determine a country's the inventive capacities, its critical mass in terms of human resources (inventor) and the capacity to value and market the results related to the business environment (applicant). This section includes data from PCT and European (EP) patent applications, which allow us to approach both aspects.

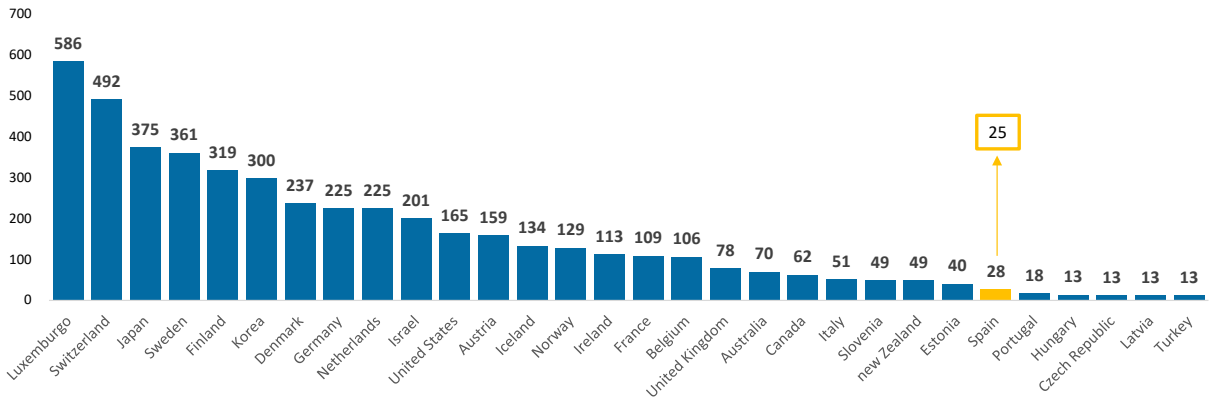
Firstly, the following graph (Graph 54) presents the evolution of PCT patent applications of Spanish origin, both from the perspective of the inventor's country of residence and the applicant's nationality. In both cases, there has been a clearly decreasing trend since 2014, possibly caused by the economic crisis experienced in Spain during the previous years (explained in section 1), which is making its effects felt in the mid-long term in terms of RDI results.



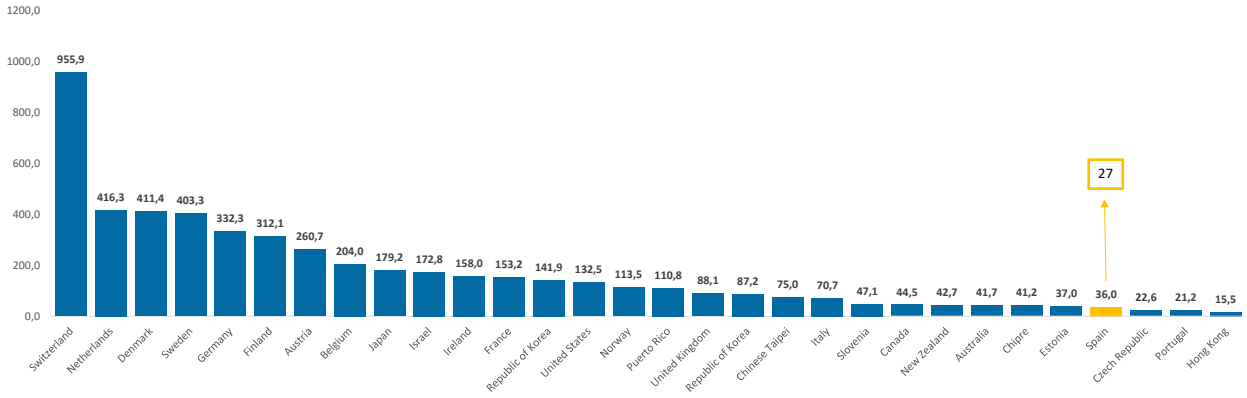
Graph 54. Evolution of PCT patent applications.
Source: Patstat

In the international comparison, Spain is among the top 20 countries in the world, both in number of applications and in European patent concessions. However, there is no Spanish entity among the top 100 patent applicants in the world, while 10 French and 16 German entities appear among those applicants.

As can be seen in the following (Graphs 55 and 56), both in relation to the number of PCT and European applications, Spain is at the bottom of the 30 countries that file the most applications per inhabitant. Specifically, it holds positions 25 and 27, respectively. These data show the low activity of knowledge transfer and innovation in Spain.

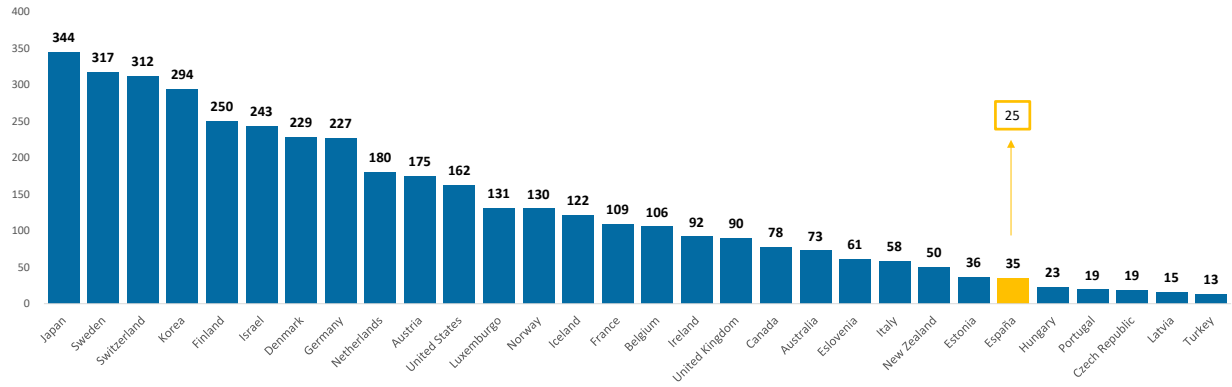


Graph 55. Number of PCT patent applications per million inhabitants, according to the applicants' country of residence. Priority year 2017.
Source: Patstat



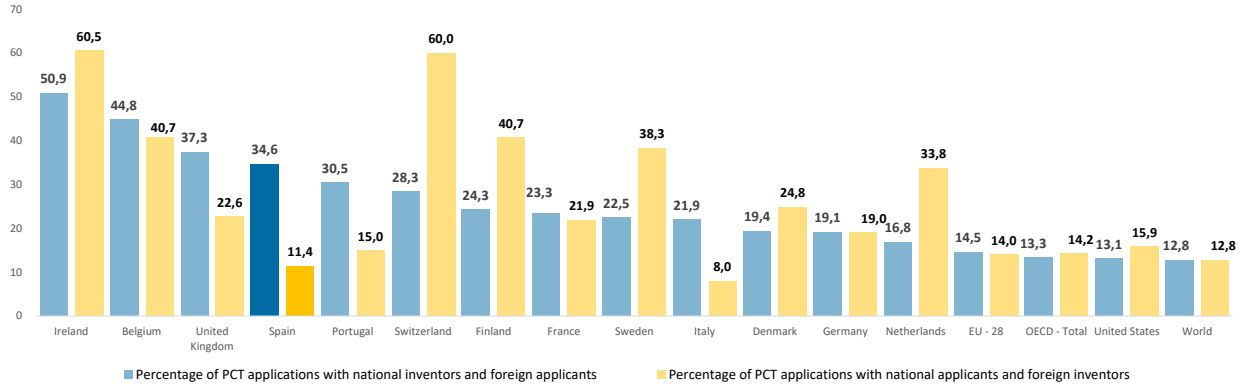
Graph 56. Number of European patent applications per million inhabitants. Year 2018.
Source: Patstat

If we look at the country of residence of the inventors (Graph 57), not of the applicants (previous graphs 55 and 56), it can be seen that Spain continues to hold a very low position



Graph 57. Number of PCT patent applications per million inhabitants, by the inventors' country of residence. Year 2017.
Source: Patstat

In the following graph (Graph 58), patent applications are analysed in terms of international cooperation. 34.6% of PCT applications, in which at least one of the inventors is Spanish, is of total or partial foreign ownership, a value that is above that of other countries. However, Spain holds one of the lowest positions when one takes into account the percentage of PCT applications of Spanish origin in which at least one foreign inventor appears (11.4%). This analysis shows that, although Spain has the inventor critical mass to collaborate with foreign institutions or companies that eventually seek international protection for their results, the ability to attract foreign inventor talent to Spanish institutions/companies is very limited.



Graph 58. PCT patent applications. Priority year 2017.
Source: Patstat

In short, the data presented reveal three important aspects: 1) The economic crisis in Spain has affected the number of patent applications and therefore the inventive and innovative capacity; 2) Spain has little capacity to attract foreign talent; 3) Spain, however, has a critical mass of researchers who collaborate with foreign institutions or companies that protect their research results.

To improve this situation, ***Target 4*** *has been established: Generating scientific knowledge and leadership, optimizing the position of researchers and the quality of infrastructures and equipment, promoting the science industry. Applying scientific knowledge to the development of new technologies that can be used by companies, and intensifying the capacity to communicate to our society, and to influence the public and private sectors and* ***Line 8*** *has been designed: Promoting business innovation and the* ***dissemination of innovation in all sectors****, especially in small and medium-sized enterprises (SMEs), facilitating the incorporation of technologies and innovations that facilitate the achievement of the country's political, social and economic priorities. Ensuring tax incentives for RDI, adapted to companies in the science and innovation system.*

On the other hand, it is worth mentioning that the first results of the Survey of Indicators of Knowledge Transfer and Innovation, which is carried out at the Ministry of Science and Innovation, for the year 2017 are available. This survey was aimed at universities (public and private), public research organizations (OPIs and AC bodies) and registered technology centres. Here are some preliminary results.

Considering the co-ownership of the patents, in 2017, 69.8% of patent applications were submitted by public universities, 24.6% by IPOs, 8.6% by technology centres and 1.6% came from private universities.

Of the total patents applied for, **48% were presented in joint ownership**; at public universities, the percentage of patents in joint ownership was 45%, at private universities it was 60%, and in IPOs 70%. These results are interesting when compared with those analysed in the previous paragraph.

Of the total number of co-owned patent applications, 28% were co-owned with companies and 23% with foreign institutions.

Regarding the Exploitation Agreements signed in 2017, it should be said that 77.5% had a private company as a licensee and 18.3% had their own spin-off.

In view of these results, it is observed that, in public universities, one out of every two patent applications are jointly owned, but only 25% are owned with companies. In the IPOs, three

out of four patents are applied for jointly (also 25% with companies). Once again, the clear weakness that the SECTI has in terms of public-private collaboration is revealed, and that has already been evident in other areas under analysis. For their part, it is private universities and technology centres that are most committed to the creation of spin-off companies for the exploitation of research results. For this reason, ***Target 6*** refers to *Favouring the transfer of knowledge, strengthening and developing two-way links between science and companies, through a mutual understanding of needs and objectives.* For this, ***Line 11*** focuses on *promoting the existence of* ***efficient channels of knowledge transfer****, cooperation and exchange between the public and private sectors.*

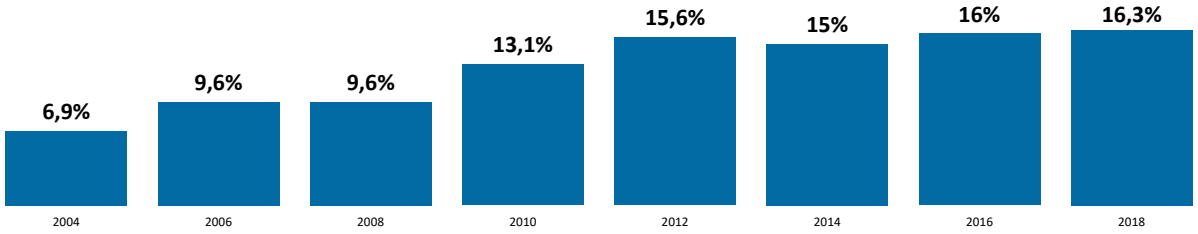
Finally, it should be noted that in public universities and IPOs, only one out of four patent applications is co-owned by a foreign institution. In this sense, ***Line 13*** has been proposed: ***Promoting the internationalization of SECTI agents*** *and scientific and technological infrastructures by: i) promoting and supporting participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration; iii) international cooperation using science diplomacy; iv) promoting and participating in international facilities.*

H

Social perception of science

Since 2002, on a biennial basis, the FECYT has been carrying out the Survey of Social Perception of Science and Technology in Spain. Interesting results emerge from this and they must be taken into account in the analysis of the involvement of citizens with science.

The following graph (Graph 59) shows the interest of society in science and technology. A growing trend is observed over time, although in recent years the evolution has been less intense than in previous years.



Graph 59. Evolution of social interest in science and technology.
Source: FECYT

Another important aspect is the percentage of citizens who think that science and technology provide more benefits than harm. As can be seen from the overall data in Table 6, this value has been increasing over the years to stand at 60.9% of the population in 2018. Only among the university population does this percentage rise to 75, 6%. However, there is still a long way to go, since approximately 40% of the population considers science to be more harmful than beneficial. This is a worrying fact for the development of science and, therefore, ***the first target*** of the EECTI 2021-2027 is that of *Placing science, technology and innovation as key lines in the achievement of the* ***Sustainable Development Goals of the Agenda 2030*** and the social, economic and environmental development of our country. **Target 3** has also been established: *Prioritizing and responding to the* ***challenges of the national strategic sectors through RDI, for the benefit of Spanish society and economy.***

Table 6. Percentage of citizens who think that science and technology provide more benefits than harm.

	2002	2004	2006	2008	2010	2012	2014	2016	2018
SEX									
Men	49,4%	49,5%	44,6%	54,6%	58,0%	56,8%	61,8%	57,0%	61,8%
Women	44,2%	44,4%	43,2%	52,1%	54,9%	49,4%	57,5%	52,1%	60,1%
AGE									
15 - 24 años	45,8%	44,1%	47,4%	50,0%	52,0%	50,0%	60,3%	54,5%	62,0%
25 - 34 años	49,3%	50,9%	48,2%	56,0%	56,5%	49,0%	59,4%	58,5%	63,0%
35 - 44 años	49,5%	48,4%	46,3%	56,7%	60,7%	56,6%	61,0%	58,3%	65,1%
45 - 54 años	46,4%	50,3%	47,5%	54,5%	59,1%	55,3%	65,9%	58,1%	62,8%
55 - 64 años	46,6%	45,1%	44,4%	51,3%	57,2%	56,8%	59,8%	54,7%	60,9%
65 and older	43,0%	42,5%	36,4%	50,0%	53,2%	51,9%	52,4%	40,2%	51,9%
EDUCATIONAL LEVEL									
Incomplete Primary School or less	39,5%	38,1%	31,2%	41,6%	45,3%	38,4%	41,9%	26,7%	39,2%
Primary School	42,9%	43,9%	35,2%	49,0%	48,2%	42,3%	47,9%	41,5%	47,1%
Secondary School 1st Cycle	46,1%	51,1%	41,6%	51,3%	51,9%	50,0%	55,4%	50,9%	56,1%
Secondary School 2nd Cycle	63,7%	52,6%	48,5%	57,9%	58,4%	56,2%	60,9%	58,2%	63,3%
University	60,0%	55,2%	64,8%	62,9%	69,5%	65,1%	73,3%	70,2%	75,6%
TOTAL	46,7%	47,9%	44,8%	53,4%	56,4%	53,0%	59,5%	54,4%	60,9%

Source: FECYT

Taking into account the data reflected above, ***Line 14*** proposes ***Promoting the critical spirit and commitment of Spanish society to RDI***, *promoting gender balance in research and innovation, scientific culture, reflection and decision, based on scientific evidence, the promotion of science and innovation, and implementing all of them in an open and inclusive way.*

ANNEX II

Strategic lines of national RDI

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

Strategic lines	Sub-lines and their areas of intervention
Health	
Precision medicine	Personalized medicine, beyond omic techniques; Integration of technologies of genomics, epigenomics, metabolomics, etc.); Sociological, psychological, economic, ethical aspects, artificial intelligence, digital health in personalized medicine; personalized nutrition and diet; personalized medicine in cancer, rare diseases, mental health and other pathologies.
Infectious diseases	Immune response; Emerging and re-emerging diseases caused by fungi, bacteria and viruses; Zoonosis; Immune response; Vaccines; Resistance to antibiotics; Environmental effects (climate change, migration, globalization) on the appearance and spread of infectious diseases; New methods of prophylaxis, detection and treatment; Health surveillance and epidemiology.
New diagnostic and therapeutic techniques	Biomedical engineering; New image-based diagnostic techniques; Pharmacology, pharmacogenomics, new drugs and therapies; gene diagnostics and therapies; regenerative medicine; new biomedical materials; sensors; nanotechnology applied to biomedicine; artificial implants and organs; new surgical techniques; digital health.
Cancer and Geroscience: ageing, degenerative diseases	Molecular profiles of healthy aging; Impact of aging on disease (neurodegenerative, cardiovascular, metabolic and cancer); Interaction of the environment, nutrition and psycho-sociological factors in healthy aging; Integrated development of multidisciplinary programs from cellular and molecular biology of aging to systems biology and medicine.
Culture, Creativity and Inclusive Society	
Human evolution, anthropology and archaeology	Origins and movements of the population and its evolution through physical human remains (linked to those of plants and animals) and material remains. A multidisciplinary approach that includes new archaeological techniques such as forensic science, genetic analysis, archaeobotany and new computer techniques.
Cognition, linguistics and psychology	Language acquisition and processing. Cognitive neuroscience and experimental psychology in bilingualism and multilingualism.
Hispanic philology and literature	Peninsular languages (Basque, Catalan, Galician, Portuguese, Spanish ...) and their contacts with each other, as well as their projection in the Latin-American world. Languages spoken in the peninsular past, such as Arabic are included. Evolution of languages and their uses. Dialectology and phonetics. Literature, written heritage and manuscript heritage. Oral, handwritten and printed literature and their circulation. New written communication media and its influence on the evolution of both spoken and written language. Evolution of languages and new identities. The creation and use of a new inclusive language.

Security for Society	
Spatial dimension of inequalities, migrations and multiculturalism	Spatial dimension of inequality (spatial and individual aspects). Integrated system of cities; Relations between cities; Disappearance of local markets; New spatial and geographic mobility data; Use of urban land; Migrations, multicultural societies, new identities, visible and invisible borders, integration, assimilation, marginalization and stigmatization.
Monopolies and market power: measurement, causes and consequences	Analysis of competition between companies in developed countries; Micro- and macro-economic, financial, innovation and technological change perspectives of market power; Relationship between market power, resource allocation, welfare, employment. Innovation, consumer protection strategies, macroeconomic and redistributive policies; Quantification of market power through big data on companies and new methods; Consequences of market power on inequality.
Cybersecurity	Cybersecurity Quantum Communications; Quantum cryptography; Post quantum encryption; New technologies for risk assessment and management; Biometrics; Privacy and ethical aspects in cybersecurity and digital control; Data governance; Zero Trust Models; Secure Software Engineering; Cybersecurity in industrial environments and in critical infrastructures and services. Systems for the detection, prediction and attribution against cyber-attacks.
Protection from new threats to security	Anti-drone systems and high-speed aerial vehicles, protection and fight against threats with explosives and CBRN, response to natural and man-made disasters, protection of infrastructures, surveillance, etc.
Digital world, Industry, Space and Defence	
Artificial and Robotic Intelligence	Multi-task Artificial Intelligence; Machine Learning; Hybrid Systems that combine Reasoning and Learning; Ethics and Artificial Intelligence; Causal and Common Sense Reasoning and Learning; Social Robotics; Development robotics; Language technologies; Deep understanding of the meaning of language; Computer Vision; Intelligent prediction and recommendation systems; Multi-agent systems; Cognitive assistants; Advanced navigation and guidance technologies; Applications of AI and Robotics to: Connected Industry 4.0, Natural Resources, Energy and Environment, Security and Defence, Tourism and cultural industries, Public Administrations, Education, Smart cities and territories, Health (Digital Health).
Photonics and electronics	Photonic communication technologies; Photonic sensor networks; Biophotonics; Portable photonic medical devices; Optical biosensors; Light-based precision medicine; Photonic biomarkers; New efficient lighting systems; Photonic metrology; Displays; Integrated photonic circuits; Photochemistry; Quantum technologies. New antennas, transmitting/ receiving modules, solid state amplifiers, metamaterials, nanoelectronics and heterogeneous integration embedded intelligent systems and their applications
Next generation internet	5G; 6G, spectrum sharing, "Advanced computing and big data" and "Key digital technologies" (IoT, blockchain, AI, identity, virtual and augmented reality…); Edge computing; Digitization of industry, health, education and public administrations and security and defence environments; "Service-oriented" architectures, Big data and the cloud; "Human-centric internet (preservation of privacy, dignity and security, transparency and reliability); Data control.
Modelling and mathematical analysis and new mathematical solutions for science and technology	New transversal tools (of analysis, statistics and data science, dynamical systems, computational geometry, ...) for the resolution of scientific and technological problems, frontier research in analysis of differential equations, biomathematics.

Astronomy, Astrophysics and Space Sciences	Observation of galaxies and exoplanets; asteroid observatory. Exploration of the Moon and Mars. Solar physics; Dark Energy and Dark Matter, X-Ray, Gravitational Waves, Ground and Space Instruments; Satellites; Astrophysical and space technology as a development engine (navigation, Earth observation, satellite communications, space surveillance,…).
Advanced materials and new manufacturing techniques	Composite materials, intelligent and multifunctional materials, multimaterial structures, metamaterials and auxetic structures, new coatings, etc. as well as development and application of additive manufacturing techniques and advanced methods. Cutting-edge technologies for the decarbonisation of the steel and cement industry. Application of hydrogen (renewable) in industry.
Climate, energy and mobility	
Climate change and decarbonisation	Hydrogen and renewable synthetic fuels; Renewable energy; Batteries; Recycling techniques; New materials for energy generation and storage systems; Sustainable energy conversion and CO2 storage systems; New methods for estimating the economic damage caused by climate change; Tipping points in the economics of climate change; Impact of natural disasters on local economies.
Sustainable mobility	Catalysis for more efficient fuels; Efficient vehicles (hybrids, electric, fuel cell, Hydrogen); Innovation in rail, air and maritime transport; Sensors (sensors and biosensors) with applications in mobility and transport.
Sustainable cities and ecosystems	Clean and smart cities and territories; Efficient weather systems and construction; Clean manufacturing techniques; Techniques for the preservation of the environment; Maritime engineering (coasts, coastlines, estuaries); New materials for construction compatible with the protection of the environment.
Food, Bioeconomy, Natural Resources and Environment	
Biodiversity exploration, analysis and prospects	Solutions to environmental problems adapted to the uniqueness, diversity and richness of Spain's natural heritage; Macro-ecology and biogeography; Ecological interactions and invasive species; Meta-genomics and environmental genomics; Climate change and impact on biosphere-atmosphere-ocean interactions and its impact on eco-physiology; Paleo-oceanography; Marine microbiology.
Smart and sustainable agri-food chain	Smart agriculture: From farm to table; Digital primary production; Digital technologies in an integrated vision of the food chain; Soil sustainability; Remote sensing; Forestry.
Water and oceans	Sustainability of the water cycle; climate-oceans nexus; pollution including emerging pollutants, marine litter and noise, land-sea interactions; sustainability of human activities at sea; marine energies.

ANNEX III

Indicators recommended for analysing targets and lines

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

Indicators by objectives
Facing the priorities of our environment

Tgt 1 Positioning science, technology and innovation as key axes in achieving the Sustainable Development Goals of the **2030 Agenda**.

Ind. 1.1. Percentage of RD spending on GDP. (RD statistics. INE) (ODS UN 9.5.1) and total expenditure on RD (INE)
Ind. 1.2. Percentage of total employment in high and medium-high technology manufacturing sectors and in highly qualified services (knowledge-intensive). (Eurostat)
Ind. 1.3. Percentage of personnel employed in RD with respect to the employed population (EJC). (Eurostat)

Tgt 2 **Contributing to the political priorities of the EU** by aligning it with its RDI programs, giving support to the actors responsible for the SECTI to achieve this target.

Ind. 2.1. Number of actions of the European Framework Program coordinated by Spanish institutions. (CDTI)
Ind. 2.2. Joint programming aid with the EU. (CDTI) Ind. 2.3. Percentage of projects led. (CDTI)
Ind. 2.4. Financing obtained (million euros). (CDTI)

Tgt 3 **Prioritizing and responding to the challenges of the national strategic sectors** through RDI, for the benefit of the social, economic, industrial and environmental development of our country.

Ind. 3.1. Esfuerzo presupuestario en I+D de los departamentos ministeriales. (SICTI)

Tgt 4 **Generating scientific knowledge and leadership**, optimizing the position of research staff and institutions, and the quality of their infrastructures and equipment. Promote quality and scientific excellence, favouring a systemic effect that reaches and benefits a greater number of groups. **Applying** scientific knowledge to the development of new technologies that can be used by companies. And intensifying the **capacity to communicate** to our society and to influence the public and private sectors.

Ind. 4.1. Número de publicaciones por millón de habitantes. (FECYT)
Ind. 4.2. Porcentaje de liderazgo en publicaciones. (FECYT)
Ind. 4.3. Número de proyectos obtenidos del ERC por millón de habitantes. (FECYT)
Ind. 4.4. Interés social por la ciencia. (FECYT)

Developing, attracting and retaining talent

Tgt 5 **Strengthening Spain's ability to attract, recover and retain talent**, facilitating professional advancement and mobility of research staff in the public and private sectors, and their ability to influence decision-making.

Ind. 5.1. Number of researchers (FTE) per million inhabitants. (INE)
Ind. 5.2. Percentage of staff employed in RD activities women. (INE)
Ind. 5.3. Percentage of college students enrolled in STEM degrees. (Eurostat)
Ind. 5.4. Percentage of doctoral theses referring to STEM topics. (Eurostat)

Catalizar la innovación y el liderazgo empresarial

Tgt 6 **Favouring the transfer of knowledge** and developing **two-way links between science and companies**, through mutual understanding of needs and objectives, especially in the case of SMEs.

Ind. 6.1. Number of PCT patent applications per million inhabitants. (SICTI/ PATSTAT)
Ind. 6.2. Number of PCT patents licensed per million inhabitants. (SICTI)
Ind. 6.3. Number of Spin-offs created in the last 5 years. (SICTI)
Ind. 6.4. Percentage of patents, utility models and plant varieties in joint ownership (according to the population framework of public institutions). (TCI/SICTI survey)

Tgt 7 Promoting **research and innovation in the Spanish business fabric**, increasing its commitment to RDI and expanding the scope of innovative companies to make the business fabric more competitive.

Ind. 7.1. Percentage of innovative Spanish companies. (INE) Ind. 7.2. Intensity in innovation. (INE)
Ind. 7.3. Percentage of innovative Spanish companies compared to potentially innovative Spanish companies. (INE)
Ind. 7.4. Expenditure on business RD with respect to GDP. (INE)
Ind. 7.5. Expenditure on internal business RD compared to Total RD expenditure. (INE)
Ind. 7.6. Purchase of business RD compared to Total RD expenditure. (INE)
Ind. 7.7. Percentage of personnel employed in RD with respect to the employed population in the business field (EJC). (Eurostat)
Ind. 7.8. PCT patent applications made by companies. (SICTI/ PATSTAT)
Ind. 7.9. Business volume of high and medium high technology manufacturing sectors with respect to Industry GDP. (INE)
Ind. 7.10. Value of exports of high technology products with respect to Value of exports of industrial products. (INE)

Indicators by lines

INSTITUTIONAL STRENGTHENING

Line 1. **Budgetary**. Increasing the budget dedicated to RDI during the 2021-2027 period, and encourage private investment, until it reaches the EU average, in particular through direct aid (subsidies), and favour, the establishment of lines adequate to facilitate the use of the EU Structural Funds, as well as compliance with State Aid regulations.

Ind. Line 1.1. Budgetary credits and net recognized obligations of the Expenditure Policy 46 (RDI) of the AGE and the ACs. (SICTI)
Ind. Line 1.2. Percentage of execution of chapter 7 of program 46 of the GSBs. (SICTI)
Ind. Line 1.3. Percentage of execution of chapter 8 of program 46 of the GSBs. (SICTI)
Ind. Line 1.4. Percentage of RD expenditure with respect to GDP. (INE)
Ind. Line 1.5. Percentage of RD spending financed by the business sector. (INE)
Ind. Line. 1.6 Percentage of expenditure on RD of the business sector with respect to GDP. (INE)

Line 2. **Instrumental. Developing the instruments and bodies dependent** on the LCTI, to increase expert advice to the different state and government bodies. Simplifying the available instruments **and making them more flexible** and adapt them to the needs of the different agents to improve the use of resources. **Strengthening** SECTI financing agents (AEI, ISCIII, CDTI).

Ind. Line 2.1. Rules that have been modified, adapted or created (new regulations) in the field of Science, Technology and Innovation with the aim of making the system more flexible. (MCIN)
Ind. Line 2.2. Number of organizations involved in the different phases of resolution of a call and average time. (AEI/CDTI)
Ind. Line 2.3. Decrease in the resolution time of calls for RDI aid. (SICTI)

Line 3. **Coordination. Coordinating and complementing national and sectoral RDI policies** with others at European, regional and local level, promoting support to other countries in the development of their policies in this area.

Ind. Line 3.1. Number of RDI actions co-financed between different administrations and planned and executed budget. (SICTI)
Ind. Line 3.2. Percentage of the PEICTI budget allocated to co-financed aid. (SICTI)
Ind. Line 3.3. Overlap of public aid according to beneficiaries (average number of aid by type of beneficiary). (SICTI)

Line 4. **Governance.** Addressing the development of a **system of governance and indicators** that facilitate the analysis, monitoring and evaluation of the results regarding the objectives set.

Ind. Line 4.1. Volume of information contained in SICTI: New reports. (SICTI)
Ind. Line 4.2. Number of new indicators available in SICTI. (SICTI)
Ind. Line. 4.3. Number of statistics in the National Statistical Plan on science, technology and innovation (MICIN)

RESEARCH AND INNOVATIVE AGENTS

Line 5. **Capacities.** Encouraging and supporting the **generation of scientific and innovative capacities** in public and private SECTI agents to favour the aggregation and development of high-level RDI centres, and promote excellence in **scientific and technological infrastructures**.

Ind. Line 5.1. Percentage of publications in journals of the first quartile (Q1) at the national level, by type of institution and by institution. (FECYT)
Ind. Line 5.2. Percentage of publications among the 10% most quoted in the world. (FECYT)
Ind. Line 5.3. Percentage of publications among the 1% most quoted in the world. (FECYT)
Ind. Line 5.4. Number of projects obtained from the ERC per million inhabitants. (FECYT)
Ind. Line 5.5. Annual investment in infrastructure of the AGE and the ACs. (SICTI)

Line 6. **Itinerary.** Establishing a **scientific and technological pathway to enter the RDI system** to facilitate promotion and job security, which takes into account the needs of our country's personnel in research and innovation, at universities, public bodies, and health research institutes, public and private RDI centres and companies. This itinerary must consider the move to the private sector, according to the needs of the productive and services sector.

Ind. Line 6.1. Population aged 25-34 that has obtained a doctorate in the reference year (Eurostat/SIIU)
Ind. Line 6.2. Percentage of personnel employed in RD with a doctorate. (Eurostat)
Ind. Line 6.3. Number of researchers (FTE) per million inhabitants. (INE)

Line 7. **Talent.** Establishing mechanisms for attracting and developing research, technological and innovative talent to companies, industries and RDI centres, and facilitate the mobility of research, technological and innovative personnel, both in the public and private sectors. Respecting the principle of gender perspective in RDI as well as equal treatment and opportunities between women and men.

Ind. Line 7.1. Mobility of the authors considering their last affiliation using the 2016 bibliometric data. (OECD)
Ind. Line 7.2. Percentage of researchers and personnel dedicated to RD in the business field (with respect to all sectors). (Eurostat)
Ind. Line 7.3. Percentage of doctors with respect to personnel in RD in companies. (Eurostat/INE)
Ind. Line. 7.4. Percentage of female researchers. (Eurostat/INE)
Ind. Line. 7.5. Percentage of women who are the first author of a publication. (FECYT)

Line 8. **Promotion.** Promoting business innovation and the **dissemination of innovation** in all sectors, especially in small and medium-sized enterprises (SMEs), facilitating the incorporation of technologies and innovations that facilitate the achievement of the country's political, social and economic priorities. Ensuring adequate tax incentives for RDI adapted to companies in the science and innovation system[1].

Ind. Line 8.1. Percentage of innovative SMEs over total SMEs. (INE)
Ind. Line 8.2. Percentage of spending on RD by SMEs. (INE/Eurostat)
Ind. Line 8.3. Number of Spin-offs created in the last five years. (SICTI) Ind. Line 8.4. PCT patent applications made by companies. (SICTI)

Line 9. **Opportunities.** Strengthening national strategic sectors, transforming social challenges into **business development opportunities**, and fostering entrepreneurship and investment in RDI in the private sector, as well as attracting venture capital for innovative companies.

Ind. Eje 9.1. Porcentaje de gasto en I+D del sector empresarial. (INE/ Eurostat)
Ind. Eje 9.2. Porcentaje del presupuesto del PEICTI destinado a Acciones Estratégicas. (SICTI)

1 Regarding the ICT aspects of this indicator, the ONTSI can be a source of origin.

RELATIONSHIPS BETWEEN AGENTS

Line 10. **Multidisciplinarity.** Encouraging **inter- and multi-disciplinarity**, promoting and supporting the transversal use of essential enabling technologies, disruptive digital technologies or deep technologies that allow business and social progress.

Ind. Line 10.1. Percentage of PEICTI projects that are evaluated in multidisciplinary commissions. (AEI/CDTI/ISCIII)

Line 11. **Transfer.** Promoting the existence of **effective channels for transferring** knowledge, cooperation and exchange between the public and private sectors.

Ind. Line 11.1. Percentage of public sector RD spending financed by the private sector. (INE/Eurostat)
Ind. Line 11.2. Percentage of patents, utility models and plant varieties in joint ownership (according to the population framework of public institutions). (TCI/SICTI survey)

Line 12. **Innovation.** Strengthening value chains around focused innovation systems.

Ind. Line 12.1. Percentage of innovative product or process companies that cooperate with universities or other higher education centres / with the AP or public research institutes. (INE)

Line 13. **Internationalization.** Promoting the **internationalization of SECTI** agents through: i) promotion and support to increase participation in international programs such as Horizon Europe and its joint programming initiatives; ii) international collaboration with the support of scientific diplomacy; iii) international cooperation for sustainable development; iv) the promotion and participation in international scientific and technological facilities and infrastructures.

Ind. Line 13.1. Percentage of international doctoral students in Spanish universities (SIIU)
Ind. Line 13.2. Spanish rate of return in the European Framework Program (CDTI) Ind. Line 13.3. Number of Spanish entities participating in activities financed by the European framework program (CDTI)
Ind. Line 13.4. Percentage of publications in international collaboration (FECYT)
Ind. Line 13.5. Percentage of companies that cooperated with foreign partners to carry out innovative activities (INE)
Ind. Line 13.6. Percentage of foreign researchers in Spain (INE) Ind. Line 13.7. Percentage of expenditure on RD financed by abroad (INE) Ind. AXIS 13.8. Number of international cooperation projects for development financed by Spanish cooperation actors for scientific and research activities (MAUC)

SCIENCE AND INNOVATION IN SOCIETY

Line14. **Social.** Promoting the commitment of **Spanish society to RDI**, promoting dissemination and scientific culture, reflection on the role of science and technology in modern society, and promoting **open and inclusive** science and innovation.

Ind. Line 14.1. Number of SECTI entities that have dissemination structures to the scientific knowledge society. (FECYT)

Ind. Line 14.2. Percentage of the population that believes that the benefits of science and technology are greater than its damages. (FECYT)

Ind. Line. 14.3. Number of advisory committees that include civil society. (MICIN)

ANNEX IV

Glosary of terms and acronyms

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

ACs Autonomous Communities

AEI Public Research Agency (from Spanish initials)

AGE General State Administration (from Spanish initials)

AI Artificial Intelligence

CACTI Advisory Council of Science, Technology and Innovation (from Spanish initials)

CDTI Centre for the Development of Industrial Technology (from Spanish initials)

CEEI Spanish Research Ethics Committee (from Spanish initials)

CEOE Spanish Confederation of Business Organisations (from Spanish initials)

COSCE Confederation of Scientific Societies of Spain (from Spanish initials)

COVID-19 Name given to the disease associated with the virus SARS-CoV-2

CPCTI Science, Technology and Innovation Policy Council (from Spanish initials)

CRUE Conference of Rectors of Spanish Universities (from Spanish initials)

DEP Digital Europe Program

DESI Digital Economy and Society Index

DGPI Directorate-General for Research Planning (from Spanish initials)

DIH Digital Innovation Hubs

EECTI Spanish Strategy of Science, Technology and Innovation (from Spanish initials)

EIC European Innovation Council

FTE full-time equivalent

EB Expense Budget

EOSC European Open Science Cloud

ERC European Research Council

EU European Union

ESFRI European Strategy Forum on Research Infrastructures

FECYT Spanish Foundation for Science and Technology (from Spanish initials)

ERDF European Regional Development Fund

EMFF European Maritime and Fisheries Fund

ESF+ European Social Fund

GDP Gross Domestic Product

GSBs General State Budgets

HE Framework Program for RDI of the EU. Horizon Europe.

HR Human Resources

ICTS Singular Scientific and Technical Infrastructures (from Spanish initials)

INE Nacional Institute of Statistics (from Spanish initials)

IoT Internet of Things

IPSFL Private non-profit institutions

ISCIII Carlos III Health Institute (from Spanish initials)

LCTI Law 14/2011, of 1 June, on Science, Technology and Innovation MAEUEC Ministry of Foreign Affairs, European Union and Cooperation (from Spanish initials)

MAPA Ministry of Agriculture, Fisheries and Food (from Spanish initials)

MCIN Ministry of Science and Innovation

MFF Multiannual Financial Framework

MINCOTUR Spanish Ministry of Industry, Commerce and Tourism (from Spanish initials)

MINCUL Spanish Ministry of Culture (from Spanish initials)

MINDEF Spanish Ministry of Defence (from Spanish initials)

MINECO Spanish Ministry of Economy and Business (from Spanish initials)

MINHA Spanish Ministry of Finance (from Spanish initials)

MINSAN Spanish Ministry of Health (from Spanish initials)

MITERD Spanish Ministry Ecological Transition and Demographic Challenge (from

Spanish initials)

MITMA Spanish Ministry of Transport, Mobility and Urban Agenda (from Spanish initials)

MUNI Spanish Ministry of Universities (from Spanish initials)

OECD Organization for Economic Co-Operation and Development

OTRI Office of Research Results Transfer (from Spanish initials)

PAs Public Administrations

PCT Patent Cooperation Treaty

PEICTI State Plans for Scientific, Technical and Innovation Research (from Spanish initials)

PPI Public Procurement of Innovation

RD/ RDI Research, development / and innovation

RIS3 Research and Innovation Smart Specialization Strategy

S3 Smart Specialization Strategy

SDGs Sustainable Development Goals

SECTI Spanish System of Science, Technology and Innovation (from Spanish initials)

SICTI Information System on Science, Technology and Innovation (from Spanish initials)

SIIU Integrated University Information System (from Spanish initials)

SME Small and medium sized-enterprises

SOMMA Alliance of Severo Ochoa Centres and María de Maeztu Units (from Spanish initials)

STEM Science, Technology, Engineering and Mathematics

UN United Nations

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