RD&I activities

At **Isdefe**, innovation pursues objectives inherent to its nature as the in-house provider of General State Administration (AGE), such as the generation of knowledge, anticipation of needs and the improvement of engineering and consulting services in strategic areas of the Administration. That is why we are committed to RD&I activities as a tool for identifying and knowing what technologies await us in the future, which allows us to anticipate the impact that these technologies could have, especially in the field of Defence. and Security.

RD&I Management Model

Isdefe, as in-house technical service provider for the General State Administration (AGE), promotes different RD&I activities with the aim of generating knowledge, anticipating the needs of the administration and improving engineering and consulting services in strategic areas of the AGE.

We are committed to RD&I activities as a tool to identify and learn what technologies await us in the future, especially in the field of Defence and Security.

In terms of sustainability, investment in RD&I allows Isdefe to be more innovative through the development of proofs of concept, prototypes and methodologies, among others. This investment returns in improving the quality of the consulting and engineering service that Isdefe provides to the public administration, as well as to society in general.

The use of the results of RD&I activities provides first-hand knowledge that allows us to anticipate future challenges and needs of the Administration.

The Business Development Department and, within it, the **Innovation, Processes and Transformation Department**, is in charge of preparing, supervising and coordinating the execution of RD&I activities.

The management model is structured around two axes:
- Innovation activities.
- Research and development activities.

Innovation activities

Horizons Network

The Horizons Network is the vehicle around which innovation is articulated in Isdefe and acquires the capacity to anticipate the opportunities and challenges that the Public Administration will have to face, developing ideas and proposing innovative solutions.

The Horizons Network:

- It identifies and takes advantage of the existing sources of knowledge in the innovation ecosystem, establishes a range of lines of activity focused on both the staff and General State Administration (AGE) bodies, and makes tools available to the organisation to promote an innovative corporate culture.

- It carries out technological and methodological surveillance and prospective activities in Isdefe's areas of strategic interest, mainly using the University-Isdefe collaboration framework articulated in technological observatories.

red**horizontes**

Observatories of the Horizons Network

Defence and Security

Air Traffic Management

Cybersecurity

ICT and Digital Advancement

Space

Management and Economics of the Public Sector

Systems Engineering, Logistics and Programme Management

The Network is nourished by the academic knowledge of its employees, of the organisations for which it works and of national and international partners and collaborators. The Network also exploits information from open sources.

It also supports the internal knowledge management system through its **knowledge communities**, heterogeneous groups made up of Isdefe personnel who share their experiences and knowledge in a collaborative framework.

In 2020, two new communities were created: **Artificial Intelligence and Blockchain and Big Data**.

In order to make the objectives and results of the Red Horizons public, multiple activities have been carried out in 2020 that disseminate and make use of the results:

- Virtual participation as speakers in national and international technological and professional conferences.
- Publications in scientific journals.
- Knowledge transfer sessions, among others.

Network Nodes

The Isdefe Horizons Network has developed a University – Company collaboration model and configures a network of experts at the national and international level that allows for the dynamisation of the existing knowledge in the organisation, the University and the Administration.

In 2020 the Horizons Network is made up of a set of observatories:

Defence and Security Observatory

POLYTECHNIC UNIVERSITY OF MADRID (UPM)

This observatory is the result of the work carried out under the Isdefe-UPM Chair in Defence and Security with the Higher Technical School of Telecommunications Engineers (ETSIS). The observatory carries out prospective exercises in detection and neutralisation of drones, in embedded sensors and in collaborative autonomous platforms.

The Defence and Security Observatory's main lines of research in 2020 were the characterisation of cameras embedded in UAVs with movement modelling and the evaluation of digital algorithms for blurring images captured by UAVs.

Air Traffic Management Observatory

POLYTECHNIC UNIVERSITY OF MADRID (UPM)

This observatory is the result of the work carried out under the Isdefe-UPM Chair in Air Traffic Management with the Higher Technical School of Aeronautical Engineers (ETSIA). The observatory carries out prospective exercises in influence parameters on 4D routes, in the minimum separation between manned and unmanned aircraft, in the integration of drones in airspaces and in aircraft approaches to airports under the time-spaced concept.

The main lines of research of the Air Traffic Management Observatory in 2020 were the generation of scenarios of interest with the ATC SkySim simulation platform (validation tests of concepts, means, techniques and procedures related to the operation) and the integration of RPAS in airport air control.

Cybersecurity Observatory

UNIVERSITY OF ALCALÁ DE HENARES (UAH)

This observatory is the result of the work carried out under the Isdefe-UAH Chair in Cybersecurity, ICT and Digital Advancement with the Department of Computer Science of the University of Alcalá de Henares' Higher Technical School of Computer Engineering. The observatory conducts foresight exercises in legal cybersecurity, cloud cybersecurity and data science, in the dark web and in cybersecurity on mobile devices.

The Cybersecurity Observatory's main lines of research in 2020 were blockchain and underlying technologies, continuous authentication for both military users and military devices, homomorphic cryptography and IoT security.

ICT and Digital Advancement Observatory

UNIVERSITY OF ALCALÁ DE HENARES (UAH)

This observatory is also part of the Isdefe-UAH Chair in Cybersecurity, ICT and Digital Advancement with the Department of Computer Science of the Technical School of Computer Engineering at the University of Alcalá de Henares. The observatory carries out foresight exercises in 5G Technologies and Artificial Intelligence.

The ICT and Digital Advancement Observatory's main lines of research in 2020 were Artificial Intelligence applied to Natural Language Processing (NLP), 5G propagation models and the impact of Massive MIMO 5G on the influence of EMF on health and in the certification protocols for new sites.

Space Observatory

CARLOS III UNIVERSITY OF MADRID (UC3M)

This observatory is the result of the work carried out under the Isdefe-UC3M Chair in Space with the Aerospace Bioengineering Department of the Escuela Politécnica Superior. The observatory carries out foresight exercises on various aspects (technologies, industry, policies...) in terms of space surveillance and earth observation.

The Space Observatory's main lines of research in 2020 were optical communications and quantum cryptography.

Observatory of Systems Engineering, Logistics and Programme Management

This observatory has a cross-sectional and methodological nature, which is why it carries out its activity with permanent or occasional collaborations with various universities and international organisations.

In the Systems Engineering field, the observatory is part of the INCOSE Advisory Board, the International Council on Systems Engineering, and its Spanish chapter AEIS.
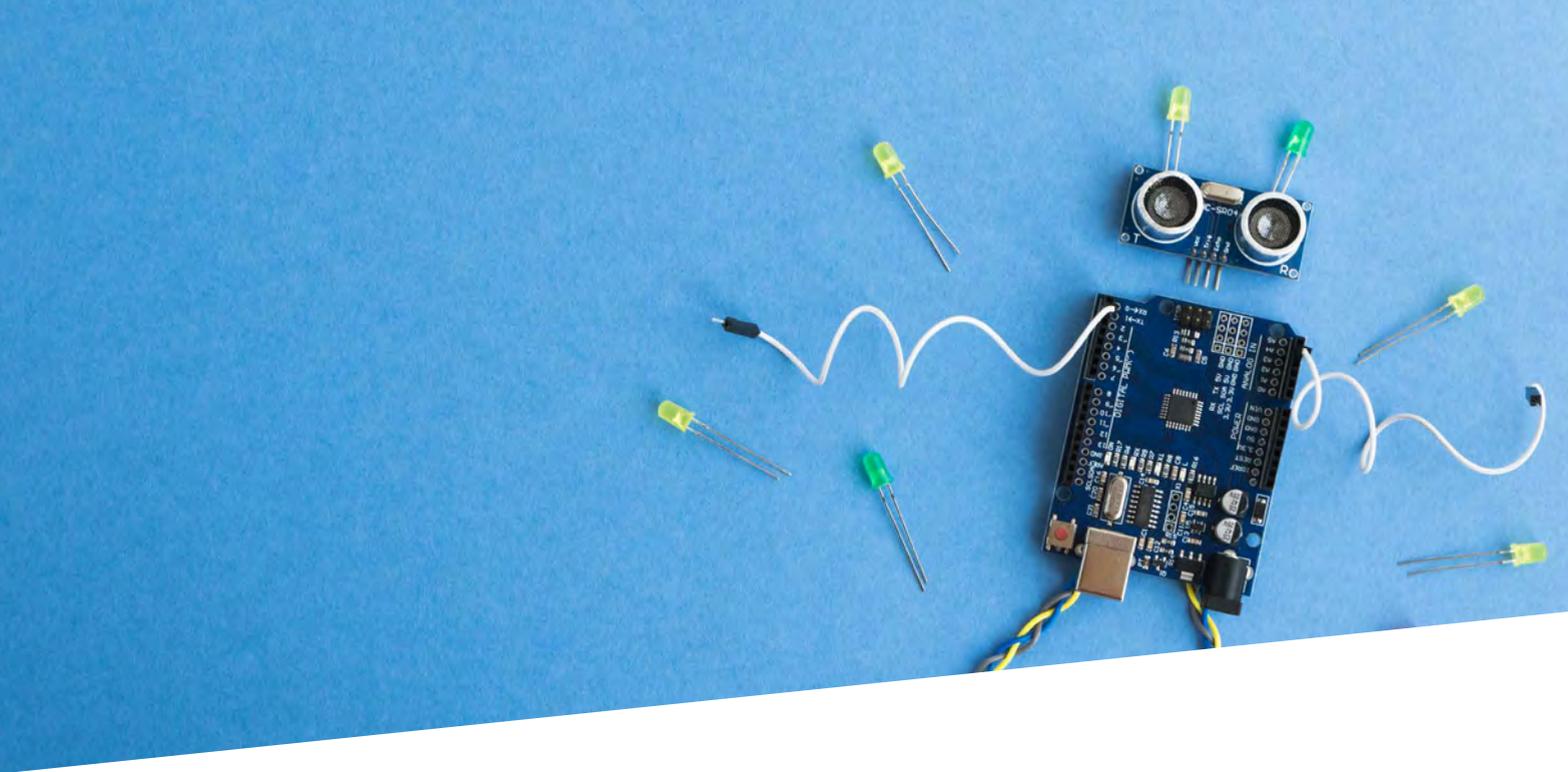
Research and development activities

RD&I recruitment and management programme

During 2020, the **sixth edition of the RD&I Ideas Capture and Management Programme** was held, allowing the participation of all Isdefe employees in the process of generating ideas to be transformed into research, development and innovation projects with internal applications and for our customers.

The programme **fosters the corporate culture of RD&I** and is developed with the aim of engaging and raising awareness throughout the organisation about the importance of innovation and its leading role in the process when generating value for the company.

In the 2020 call, despite the situation caused by the pandemic, the number of proposals submitted has increased notably, reaching a total of **27 ideas in the fields of defence, security, public administration and energy.**

Winning projects in the 2020 call:

SIGUEN - National Energy Efficiency GIS Tool to define strategies in a just transition

- **Objective:** development of a Geographic Information System (GIS) capable of representing the current state of energy efficiency of certified buildings or their estimated efficiency based on their characteristics and energy consumption.
- **General State Administration (AGE) Interest:** Institute for Diversification and Energy Saving (IDAE), Ministry for Ecological Transition and the Demographic Challenge.

SEMODI - Money movement tracking

- **Objective:** the investigation of new technologies for the monitoring of money in the prevention of tax fraud, money laundering and other crimes related to the economic sphere.
- **General State Administration (AGE) Interest:** State Security Bodies and Forces, Prosecutor's Office, Ministry of Finance.

Special recognitions in the 2020 call:

GECO - Knowledge Management applied to Isdefe's Digital Transformation

- **Objective:** manage the knowledge related to the General State Administration's (AGE) Digital Transformation and apply the lessons learned to establish the foundations of good knowledge management.
- **General State Administration (AGE) Interest:** Isdefe.

OFINPRO - Observatory of International Project Financing

- **Objective:** analyse the viability of developing a tool for the Identification of International Projects financed by multilateral organisations, development banks and other agents in the field of international financing.
- **General State Administration (AGE) Interest:** Ministry of Industry, Commerce and Tourism (MINCOTUR).

European projects

Isdefe continues to consolidate its participation in European project programmes such as Horizon 2020, SESAR and GSA. During 2020, Isdefe has participated in the RD&I projects shown below:

Projects financed by *SESAR JOINT UNDERTAKING (SESA-JU)*

INVIRCAT - IFR RPAS Control in Airports and TMA

- **Start Date:** 2020.
- **Phase:** project in progress.
- **RD&I Scheme:** Transport - Traffic Management.
- **Financing Programme:** SESAR PJ.

The use of remotely piloted aircraft is on the rise worldwide, raising safety issues related to their operation within airport manoeuvring areas. **Efficient and safe integration** of remotely piloted aircraft systems (RPAS) into existing air traffic control procedures and infrastructures is needed within terminal control areas under instrument flight rules (IFR).

The EU-funded project will develop an operations concept for RPAS in airport terminal control areas, based on simulation evaluations and recommendations, intended for legislators and standardisation bodies.

It will develop standardisation concepts for the full adaptation of RPAS in terminal control area environments, including automatic take-off and landing operations to establish a cooperative, heterogeneous and distributed simulation infrastructure that enables full RPAS IFR flight.

IMHOTEP - Integrated Multimodal Airport Operations for Efficient Passenger Flow Management

- **Start Date:** 2020.
- **Phase:** project in progress.
- **RD&I Scheme:** Transport - Traffic Management.
- **Financing Programme:** SESAR PJ.

One of the most important priorities of the European Union is to establish an integrated transport system that is sustainable, safer and smarter.

The EU-funded IMHOTEP project will go beyond collaborative decision-making to disseminate information on air transport systems over the public transport network for the benefit of passengers. **The objective is to develop a conceptual operations framework and a set of data analysis methods and tools** that allow information sharing, common situational awareness, and real-time collaborative decision-making between airports and ground transport stakeholders.

Case studies will be carried out at Palma de Mallorca and London City airports to test these newly developed methods and tools.

PJ04 W2 TAM - PJ04 W2 Total Airport Management

- **Start Date:** 2020.
- **Phase:** project in progress.
- **RD&I Scheme:** Transport - Transport Centres.
- **Financing Programme:** SESAR - Very Large Demonstrators (Wave 2).

The TAM project **aims to improve the integration of airports and networks of large and medium or regional airports**, improve the integration of airports in the area of operations and on the ground and carry out new research on how environmental aspects could be supervised and managed in the day-to-day operations of airports.

This project is a continuation of the SESAR PJ04 – Total Airport Management project that was developed within "wave 1" of the programme.

PJ13 W2 ERICA - Enable RPAS, Insertion In Controlled Airspace

- **Start Date:** 2019.
- **Phase:** project in progress.
- **RD&I Scheme:** Transport - Advanced Concepts.
- **Financing Programme:** SESAR - Very Large Demonstrators (Wave 2).

Remotely Piloted Aircraft Systems (RPAS) provide important services to civil and military aviation. If RPAS could access non-segregated airspaces, it would generate great economic benefits and opportunities in the market. However, for operational and safety reasons, this is not yet possible.

The EU-funded project PJ13 - W2 ERICA **looks at operational and technical opportunities that would allow RPAS to operate safely in controlled airspaces, both under nominal conditions and during emergencies**. You will also create test solutions without a negative impact on air traffic. The objective is to develop European operations to develop RPAS-accredited European operations in non-segregated airspaces, in order to enable civil and military RPAS to operate air traffic management systems within and outside of Europe.

2. OUR SECTORS

DOMUS - Demonstration of Multiple U-Space Suppliers

- **Start Date:** 2018.

- **Phase:** project in progress.

- **RD&I Scheme:** Transport - Advanced Concepts.

- **Financing Programme:** SESAR - Connecting Europe Facility.

The DOMUS project is the result of the offer submitted to the CEF-SESAR-2018-1 U-SPACE call, the objective of which is to prepare a rapid deployment of U-Space services for phase U2, including those deployed for phase U1, which will allow the operation of RPAS at low altitude in:

- Flights beyond line of sight (BVLOS).
- Flights in rural environments.
- Flights in urban environments.
- Flights in suburban environments.

The deployment of these services will facilitate the processes and authorisations for certain RPAS operations. To do this, DOMUS will carry out a series of real RPAS flights using a U-Space architecture developed by the Spanish industry and operated by several U-Space service providers and the Spanish air navigation service provider – ENAIRE.

Projects funded by the European Commission through the Horizon 2020 Programme

COPKIT - Technology, training and knowledge for Early-Warning / Early-Action led policing in fighting Organised Crime and Terrorism

- **Start Date:** 2018.

- **Phase:** project in progress.

- **RD&I Scheme:** Defence and Security - Intelligence and electronic warfare.

- **Financing Programme:** H2020 - Secure Societies.

The COPKIT project **addresses the challenge of analysing, preventing, investigating and mitigating the use of new information and communication technologies by organised crime and terrorist groups**. This is a key challenge for policy makers and for Spain's Law Enforcement, due to the complexity of the phenomenon and the number of factors and actors involved through the development of an early warning system, based on intelligence at both strategic as well as operational levels.

EUROPOL participates in COPKIT as head of its Advisory Board, and in the SOCTA 2017 report "Crime in the era of technology" states that "This is now, perhaps, the greatest challenge facing Spain's Law Enforcement in the entire world".

MEDEA - Mediterranean practitioners' network capacity building for effective response to emerging security challenges

- **Start Date:** 2018.
- **Phase:** project in progress.
- **RD&I Scheme:** Defence and Security - Crisis and Emergency Management Systems.
- **Financing Programme:** H2020 - Secure Societies.

The Mediterranean and Black Sea region is characterised by a highly volatile and dynamic security environment that presents severe threats and challenges to societies and prosperity. The MEDEA project, during its 60 months of implementation, provides funds for four interrelated actions:

1. Establish and operate the MEDEA network, a multidisciplinary network of security professionals.
2. Engaging participants in early governance on new security challenges.
3. Promote the "co-creation" of security technology innovations and capabilities between innovation professionals and providers.
4. Establish and update annually the Mediterranean Security Research and Innovation Agenda (MSRIA).

Projects funded by the European GNSS Agency (GSA)

PETRUS-PRS JTA-MS: PRS JOINT TEST ACTION

- **Start Date:** 2018.
- **Phase:** project in progress.
- **RD&I Scheme:** Space - Systems and Earth Observation.
- **Financing Programme:** *European GNSS Agency.*

The PETRUS project responds to the needs of the European Galileo Agency (GSA), in the areas of:

1. Provision of test data and results to the programme in support of the validation of the PRS service.
2. Provision of test and demonstration results, to assess the suitability of the ERP to meet the needs of potential users.
3. Provision of lessons learned about different characteristics of the PRS service: PRS service quality and safety, performance, operational concept and definition of use cases.
4. Carrying out awareness-raising activities on the actions and use of PRS.

A success story

Tele-iNNOVATION
Isdefe with open and collective innovation

The lockdown due to the COVID-19 pandemic in Spain that came into force on March 14, 2020 forced the vast majority of Isdefe employees to work remotely from one day to the next. The company made a great effort of coordination and cooperation to make this possible.

The Business Development Management, through its RD&I Area, launched the **Tele-iNNOVATION Express Contest** on March 23 with the purpose of collecting innovative ideas that mitigate the impact of the COVID-19 crisis in Isdefe.

The contest had the following **objectives:**

- To take advantage of the exceptional situation of massive teleworking.
- To help staff stay active and creative.
- To test an innovation management tool.

The Tele-iNNOVATION contest was developed over 4 weeks, collecting the innovative ideas of Isdefe employees through an innovation management tool, answering the question, **How do you see the Isdefe of the future?**

65 ideas were collected, which received a total of 437 comments and 850 likes from the 228 participants.

A classification of **4 categories** was proposed:

- **Technology**
- **Organisation**
- **Processes and Others**, being the finalist and winning ideas in each of these categories which are shown in the following table.

Technology

- **Innovative Company 5.0**
- Digital workplace

Organisation

- **Partial or temporary telework to reconcile, motivate and take care of health**
- Talent retention and motivation

Processes

- **Work by objectives**
- Forming relationships between different parts of the company. Knowledge management.

Others

- **Carsharing of Isdefe Electric Vehicles**
- The Headquarters of the Future. Nursery and gym at the Isdefe headquarters.

🏆 Winning idea 🎖 Finalist idea

Categories of the presented ideas

Open: 21
Technology: 18
Processes: 14
Organisation: 12

21 18 14 12

Participation by Isdefe Managers

DCPEG, 79 | DDS, 64 | DTTIC, 33 | DDN, 12 | DARRHH, 14 | DG, 8 | DECT, 11 | DPEF, 2

* DO (Robleado), 5
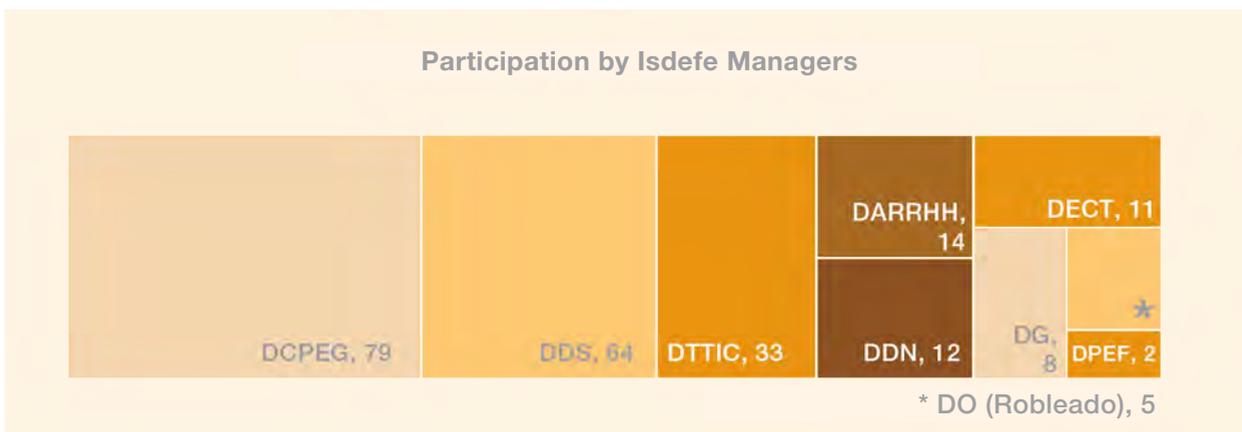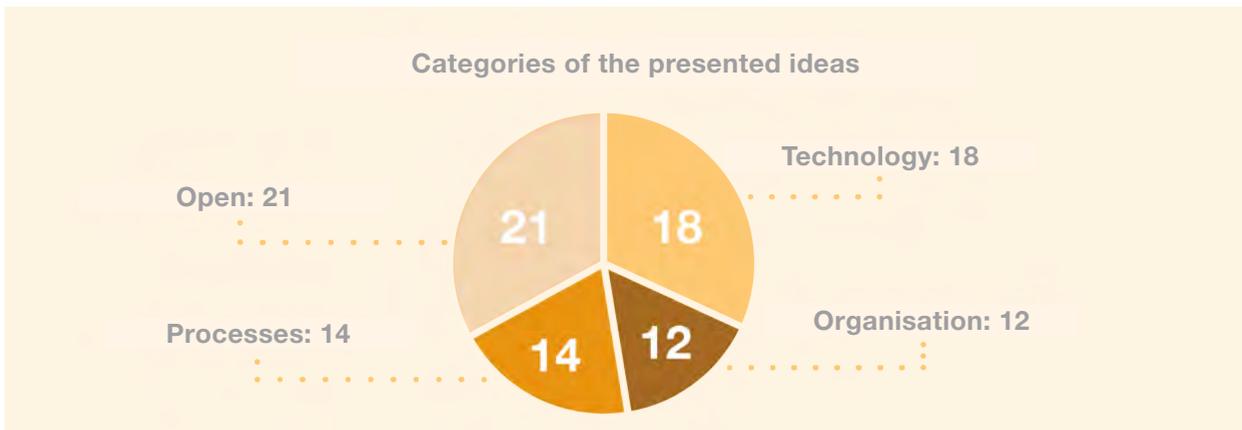
DDN (Dirección de Desarrollo de Negocio): Business Development Management; **DARRHH (Dirección de Recursos Humanos):** Human Resource Management; **DO (Dirección de Operaciones):** Operations Management; **DCPEG (Dirección de Consultoría y Procesos Estratégicos de Gestión):** Management of Consulting and Strategic Management Processes; **DDS (Dirección de Defensa y Seguridad):** Defence and Security Management; **DECT (Dirección de Espacio y Centros Tecnológicos):** Space and Technology Centres Management; **DPEF (Dirección de Planificación y Económico Financiera):** Planning and Financial Economics Management.

RD&I indicators

Cost distribution of RD&I projects by activity axis

Activity axis	2019	2020
Innovation Activities	220	210
Research and Development Activities	595	615
RD&I Recruitment and Management Programme	33	219
Collaborative Projects	562	396
Total	815	825

2019 2020

Distribution of RD&I projects by activity axis

	0	10	20	30	40	50
Innovation Activities						
Research and Development Activities						
RD&I Recruitment and Management Programme						
Collaborative Projects						
Total						

■ 2019   ■ 2020
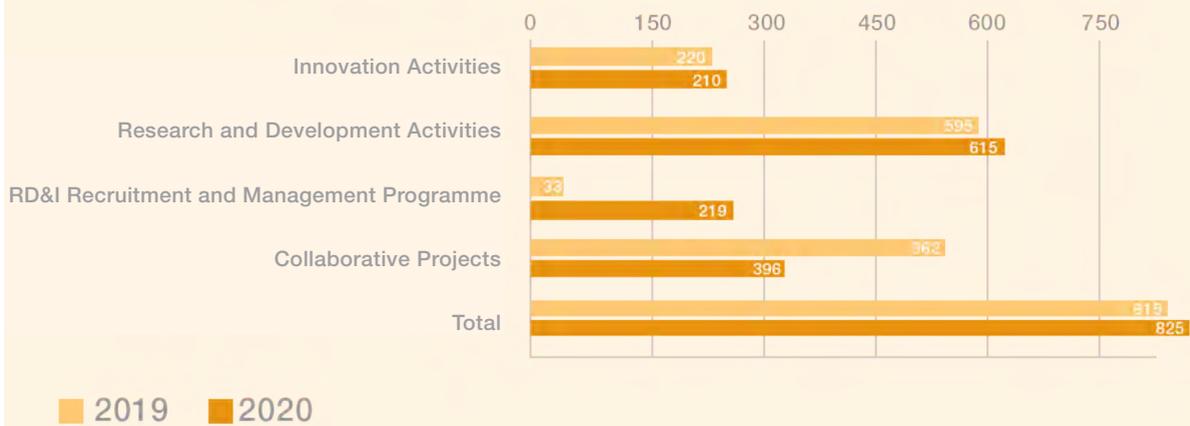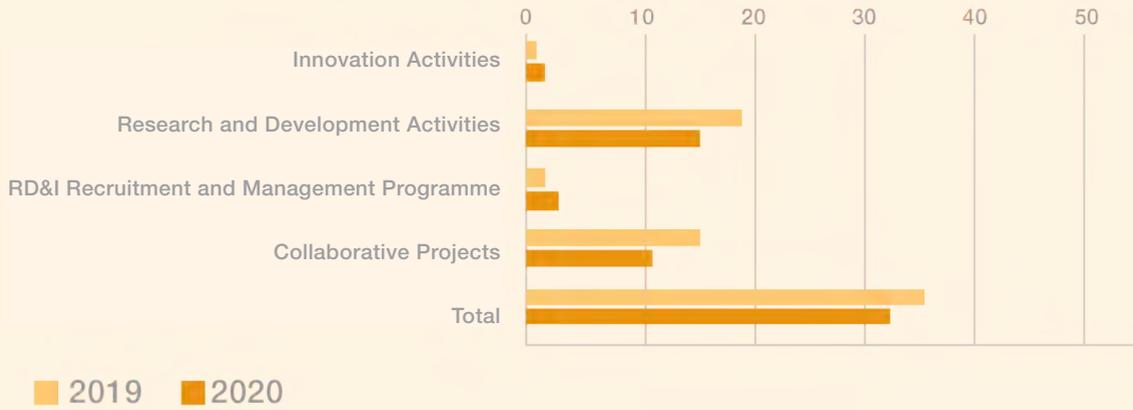
Financing obtained for R&D activities

2019

2020

400

340
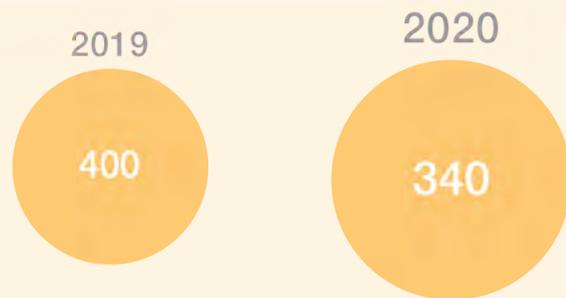
Financing received (thousands of €)