



## Government, Higher Education and Private Non-Profit institutions sectors

"Survey of the National Statistical System (Law n. º 22/2008 of 13 May) compulsory, registered in the INE under n. º 10379, valid until December 31 of 2022."

The Directorate-General for Education and Science Statistics (DGEEC) is the Statistical Authority responsible for collecting and processing data from the National Scientific and Technological Potential Survey (IPCTN), through a delegation of competences from the National Statistics Institute (INE).

IPCTN is the official instrument for collecting information on the human and financial resources allocated to Research and Development (R&D) activities in Portugal.

This survey is addressed to all potential R&D performing Institutions, with 2021 as the reference year for this statistical operation

The results of this statistical operation enable the construction of indicators to characterise and develop the national scientific and technological system and integrate the national (MCTES and INE) and international (Eurostat, OECD, among others) official statistical series.

Before completing the survey please read the concepts and additional information associated with the various sections. Please fill these survey, with your credentials, in <https://ipctn.dgeec.mec.pt/ipctn21>. You can obtain a copy of the information you provide by

selecting the "Report" option, which is available in the bottom right corner of the platform.

For any clarification, contact us by phone (213 949 298/311/368/369/382) or e-mails:

..... Hospitals: [ipctnh@dgeec.medu.pt](mailto:ipctnh@dgeec.medu.pt)

..... Other institutions (Government, Higher Education and Private Non-Profit sectors): [ipctni@dgeec.medu.pt](mailto:ipctni@dgeec.medu.pt)

### Legislation

The DGEEC is the INE delegated agency for the statistical area of Science and Technology, integrating the National Statistical System (SEN). As such, it is subject to the legislation (Law n. º 22/2008, of 13 May 2008) which stipulates the functioning of the SEN.

### Mandatory response

It is mandatory to provide the information requested by DGEEC, as the SEN entity responsible for the direct collection of statistical information.

### Statistical confidentiality

The DGEEC is obliged to safeguard the individual statistical information of individual and collective persons collected by it. The collection, processing and dissemination of statistical data is made according to SEN Law, in particular article 6.º, which establishes the application of the principle of statistical confidentiality to all information that allows individualized statistical units, as well as the manuals for the application of this principle by the statistical authorities.

All data are kept in a secure technological environment, in a DGEEC server located in Portugal, with access restricted to DGEEC staff members responsible for data management and maintenance. The results of personal data processing are always disclosed in aggregated form, never revealing the identity of the data subjects. Breach of statistical confidentiality is punishable not only as a disciplinary offence, but also as a criminal offence, according to article 32 of the SEN Law.

### Privacy

For questions exclusively concerning the privacy of your personal data, please contact the Data Protection Officer in writing at: [dpo@dgeec.medu.pt](mailto:dpo@dgeec.medu.pt)

In situations of doubt or conflict, regarding the use of your personal data, not resolved by the respective Data Controller or Data Protection Officer, you may lodge a complaint or request clarification from the competent authority:

If you have any questions you should use the form accessible at: <https://www.cnpd.pt/cidadaos/pedidos-de-informacao/> and in case of conflict you should use the form accessible at: <https://www.cnpd.pt/cidadaos/participacoes/>

## Section I – Unit identification

### 1. Person responsible for completing the questionnaire:

1.1. Name

1.2. Function

1.3. Phone number

1.4. E-mail address

### 2. Name of the Unit in 2021

#### 2.1. Unit's organic framework in 2021

Units that have more than one organic framework must indicate them

#### 2.2. Fiscal Identification Number (NIPC) in 2021

If your Unit doesn't have fiscal identification number of its own you may indicate the one from the organic dependence/framework

### 3. Location

3.1. Address

3.2. Postcode

3.3. City

3.4. District - County

3.5. Phone number

3.6. E-mail address

3.7. Website (www)

## Section II – Research and Development (R&D) activities

[It is suggested to read the concepts and examples presented in Annex I]

### 1. Unit's R&D activities in 2021:

[This question can be multiple responses, for the first three options.]

Developed intramural R&D activities

[Required to answer Sections III, IV and VI and Individual form; must also fill Additional information and finish the survey please.]

Hired R&D services to other institutions or enterprises

[Required to answer Section V; must also fill Additional information and finish the survey please.]

Financed R&D activities of other institutions, enterprises and/or individuals

[Required to answer Section V; must also fill Additional information and finish the survey please.]

Did not develop, hire or finance R&D activities

[Required to answer Additional information and finish the survey please.]

## Section III – Human resources in R&D activities, without tertiary education level

### 1. Number of persons without tertiary education level who performed R&D or direct R&D support activities in the Unit in 2021, by function

All individuals, paid by the Unit or Framework Institution, with a level of education corresponding to basic education, secondary education and non-higher post-secondary education (eg CET) must be considered. You must distinguish between technicians or other R&D support personnel, between men and women, and consider the percentage of time spent on R&D activities, with reference to person/year (we suggest consulting the examples presented in Annex II) and distinguish between internal and external personnel of the Unit.]

Percentage of time in R&D activities during the year 2021	Technicians or equivalent (see inherent functions in Annex II)		Other support staff (see inherent functions in Annex II)		Total
	Men	Women	Men	Woman	

**1.1. Internal personnel:** number of persons without tertiary education level, who have an employment contract with the Unit for which you are reporting or with the Framework Institution (University/Faculty/School/Hospital, etc.).

[See concept in Annex II]

up 5%					
6 to 10%					
11 to 20%					
21 to 30%					
31 to 40%					
41 to 50%					
51 to 60%					
61 to 70%					
71 to 80%					
81 to 90%					
91 to 100%					
<b>Subtotal</b>					

**1.2. External personnel:** number of persons without tertiary education level with a service provision contract and/or grant holders, paid by the Unit or by the Framework Institution (University/Faculty/School/Hospital, etc.).

[See concept in Annex II]

up to 5%					
6 to 10%					
11 to 20%					
21 to 30%					
31 to 40%					
41 to 50%					
51 to 60%					
61 to 70%					
71 to 80%					
81 to 90%					
91 to 100%					
<b>Subtotal</b>					
<b>Total</b>					

## Section IV - Intramural R&D activities expenditures in 2021

[It is suggested to read the concepts and examples presented in Annexes I, II, III and IV.]

### 1. R&D expenditures, carried out in the Unit in 2021, regardless of the source of funds.

[Expenses incurred by the Unit or its framework institution must be reported. Monetary values must be expressed in euros without indicating cents. It should not be considered deductible VAT, nor VAT refunded.]

#### 1.1. Current expenditures on R&D activities in 2021

[For a better specification on "internal personnel" and "external personnel", it is suggested to consult Annex II.]

€	1.1.1. Expenses with internal personnel in R&D activities supported by the Unit or by the Institution of the same (University/Faculty/School/Hospital, etc.): people with an employment contract
€	1.1.2. Expenditure on external personnel in R&D activities supported by the Unit or by its Institution (University/Faculty/School/Hospital, etc.): people with a service contract, scholarship holders and other types of self-employed workers
€	1.1.3. Expenses with external personnel in R&D activities at the Unit supported by other institutions: includes FCT scholarship holders, teachers from other Higher Education establishments, workers from other public or private entities. [The answer to this item is optional as it can be calculated from the information on the individual sheets/form] Labour costs with external R&D personnel
€	1.1.4. <b>Other current expenditure on R&amp;D activities</b>
€	<b>Total (a)</b>

#### 1.2. Capital expenditures on R&D activities in 2021

€	1.2.1. Land, buildings and facilities
€	1.2.2. Machinery and equipment
€	<b>Total (b)</b>
€	<b>Total (a+b)</b>

### 2. Funding of intramural expenditure on R&D activities carried out by the unit in 2021, by source of funds

[Only the funds that were spent during the year 2021 should be considered, with reference to the expenses declared in the previous question. Revenues from the sale/provision of R&D services must be included in the respective headings listed below. When funds pass through several organisations, as in cases of R&D subcontracting, whenever possible, the original sources of R&D funds should be indicated. This can happen, for example, with funds coming from the EU, which are first transferred to a main contractor and subsequently distributed among the other participants (subcontractors).]

€	Government Funds: General revenue/income
€	Other government funds [Includes funds from FCT, Portugal 2020, funds managed by Compete and Regional Operational Programs, and other State funds for R&D.]
€	Income from national non-profit private institutions: provision of R&D services and/or other transfers to R&D

€	Income from national enterprises: provision of R&D services and/or other transfers to R&D
€	Income from national higher education institutions: provision of R&D services and/or other transfers to R&D
€	Funds from own revenue [Includes interest, rents and revenues from services rendered, with the exception of R&D services.]
€	Scientific patronage funds [under Decree-Law nº 74/99, of March 16.]
€	European Union Funds
€	Funds from other international organizations
€	Revenues from foreign government institutions: provision of R&D services and/or other transfers to R&D
€	Income from foreign non-profit private institutions: provision of R&D services and/or other transfers to R&D
€	Income from foreign enterprises: provision of R&D services and/or other transfers to R&D
€	Income from foreign higher education institutions: provision of R&D services and/or other transfers to R&D
€	Other funds. Specify: <span style="background-color: #e6e6fa; display: inline-block; width: 400px; height: 15px;"></span>
€	<b>Total</b> [Corresponds to the total (a+b) stated in question 1.]

**3. Distribution of R&D activities of the unit in 2021, by type of R&D**

[It is suggested to read the concepts and examples presented in Annex I.]

%	Basic research
%	Applied research
%	Experimental development
100%	<b>Total</b>

**4. Distribution of R&D activities of the unit in 2021, by socio-economic objective**

[According to the nomenclature for the analysis and comparison of scientific programs and programs - NABS2007, Eurostat. For a breakdown of each socio-economic objective see Annex III]

%	1. Exploration and exploitation of the earth
%	2. Environment
%	3. Exploration and exploitation of space
%	4. Transport, telecommunication and other infrastructures
%	5.1. Energy - Energy efficiency
%	5.2. Energy - Fossil fuels: oil, gas and coal
%	5.3. Energy - Renewable energy sources
%	5.4. Energy - Nuclear fission and fusion
%	5.5. Energy - Hydrogen and fuel cells
%	5.6. Energy -Other power and storage technologies

%	5.7. Energy - Other cross-cutting technologies or research
%	5.8. Energy - Other energy domains
%	6. Industrial production and technology
%	7. Health
%	8. Agriculture
%	9. Education
%	10. Culture, recreation, religion and mass media
%	11. Political and social systems, structures and processes
%	12. General advancement of knowledge
%	13. Defense
100%	<b>Total</b>

**5. Distribution of R&D activities of the unit in 2021, by national strategic priority:**

[As defined in the National Strategy for Research & Innovation for Intelligent Specialization (EI&I), 2014-2021. For further information see Annex IV]

%	1. Energy
%	2. Information and communication technologies
%	3. Materials and raw materials
%	4. Production technologies and process industries
%	5. Production technologies and product industries
%	6. Automotive, Aeronautics and Space
%	7. Transport, mobility and logistics
%	8. Food industry
%	9. Forest
%	10.1. Sea economics - marine food resources (fisheries and aquaculture)
%	10.2. Sea economics - natural systems and renewable energy resources
%	10.3. Sea economics - deep sea resources
%	10.4. Sea economics - ports, logistics, transport, shipbuilding and maritime works
%	10.5. Sea economics - culture, tourism, sport and leisure
%	11. Water and environment
%	12. Health
%	13. Tourism
%	14. Cultural and creative industries
%	15. Habitat
%	16. Other priorities. Specify: <span style="background-color: #cccccc; display: inline-block; width: 300px; height: 15px;"></span>
100%	<b>Total</b>

## Section V – Extramural R&D expenditures in 2021

[It is suggested to read the concepts in Annex I.]

### 1. Extramural expenditure on R&D activities, in 2021, by type of contracted and/or financed institution.

#### 1.1. Contracting

[Amount spent by the Unit on the acquisition of R&D services from external entities.]

In Portugal	Abroad	
€	€	Government institutions
€	€	Higher education institutions
€	€	Private non-profit institutions. Specify
€	€	Enterprises, technological centers/interface institutions with enterprises. Specify
€	€	Other institutions. Specify
€	€	<b>Total</b>

#### 1.2. Financing

[Transfer of R&D funds to external entities or individuals, through subsidies, grants or otherwise.]

In Portugal	Abroad	
€	€	Government institutions
€	€	Higher education institutions
€	€	Private non-profit institutions. Specify
€	€	Enterprises, technological centers/interface institutions with enterprises. Specify
€	€	Other institutions. Specify
€	€	<b>Total</b>

## Section VI - Biotechnology R&D activities in 2021

### 1. Has the unit developed biotechnology R&D activities in 2021?

- No [Required to answer Additional information and finish the survey please.]
- Yes

### 2. Techniques used in biotechnology R&D activities in 2021:

- |  |   |
|--|---|
| <input type="checkbox"/> DNA/RNA                                 | Genomics, pharmacogenomic testing, genetic probes, genetic engineering, DNA/RNA sequencing/synthesis/amplification, gene expression profiling, and use of antisense technology.   |
| <input type="checkbox"/> Proteins and other molecules            | Sequencing/synthesis/engineering of proteins and peptides, including large molecule hormones; improved delivery methods for large molecule drugs; proteomics, protein isolation and purification, signaling and cell receptor's identification. |
| <input type="checkbox"/> Cell and tissue culture and engineering | Cell/tissue culture, tissue engineering including <i>scaffolds</i> and biomedical engineering; cellular fusion; vaccine/immune stimulants, embryo manipulation.   |
| <input type="checkbox"/> Process biotechnology techniques        | Fermentation using bioreactors, bioprocessing, bioleaching, biopulping, biobleaching, biodesulphurisation, bioremediation, biofiltration and phytoremediation.  |
| <input type="checkbox"/> Gene and RNA vectors                    | Gene therapy and viral vectors.   |
| <input type="checkbox"/> Bioinformatics                          | Database construction of genomes, protein sequences; modelling of complex biological processes, including systems biology.  |
| <input type="checkbox"/> Nanobiotechnology                       | Application of nano/microfabrication tools and processes to build devices to study biosystems and applications for drug delivery, diagnostics, etc.   |
| <input type="checkbox"/> Other techniques                        | Specify: <input style="width: 400px;" type="text"/>   |

### 3. Application areas of the Unit's biotechnology R&D activities in 2021:

- |  |   |
|--|---|
| <input type="checkbox"/> Human health      | <ul style="list-style-type: none"> <li>- Large molecule therapeutics and monoclonal antibodies (MABs) produced using recombinant DNA (rDNA) technology.</li> <li>- Other therapeutics, artificial substrates, diagnostics and drug delivery technologies, gene therapy, etc.</li> </ul> |
| <input type="checkbox"/> Veterinary health | Animal health applications.   |

<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Agriculture	<p>- New varieties of genetically modified (GM) plants (including fruit trees, flowers, horticultural crops, grains, etc.), animals and micro-organisms for use in agriculture (including bio pest control), aquaculture (fish) and silviculture (tree varieties for forestry)</p> <p>- New varieties of non-GM plants (including fruit trees, flowers , horticultural crops, grains, etc.), animals and microorganisms for use in agriculture, aquaculture (fish) and forestry (tree varieties for forestry); bio pest control and diagnostics developed using biotechnology techniques (DNA markers, tissue culture, etc.).</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Food and beverages processing	<p>Use of bioprocessing techniques or improved crop varieties to improve food quality and characteristics.</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Natural resources	<p>Use of micro-organisms and other applications for mining, petroleum and energy extration.</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Environment	<p>Diagnostics, soil bioremediation (including phytoremediation), water, air and industrial effluent treatment using microorganisms, clean production processes.</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Industrial processing	<p>Bioreactors to produce new products (chemicals, food, ethanol, plastics, etc.), biotechnologies to transform inputs (bioleaching, biopulping, etc.).</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Bioinformatics	<p>DNA/RNA/protein synthesis and databases for humans, plants, animals and microorganisms. Gene identification, gene constructs, etc.</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Non-specific applications	<p>Research tools, etc.</p>
<div style="background-color: #d9e1f2; width: 20px; height: 15px; margin-bottom: 10px;"></div> Other applications	<p>Specify: <span style="background-color: #d9e1f2; display: inline-block; width: 400px; height: 15px; vertical-align: middle;"></span></p>

**4. Percentage assumed by biotechnology in the Unit's R&D activities in 2021:**

%

## Additional information

**1. Time spent on completing the questionnaire:**

[You should account for the time spent gathering the information needed to answer the survey].

Hours      Minutes

 

**2. Comments / Suggestions:**

## Individual form

[Individual forms should be completed and/or updated for all individuals with a higher education degree who performed or supported R&D activities in the Unit in 2021, all or part of the year, regardless of their affiliation with the institution, including grant holders and other individuals whose salary was paid by another institution. If they performed R&D activities in more than one institution, the respective individual form should also be filled in in those other units.]

**1. Unit name in 2021:**

**2. Full name:**

**3.1. Identification type:**

**3.2. Identification number:**

[Check digit(s). Eg: 1ZY2]

**4.1. Ciência ID:** [Ex.: D71F-EA08-B2B5]

**4.2. ORCID ID:** [Ex.: 0000-0002-1825-0097]

**5. Date of birth:**

YYYY - MM - DD

**6. Gender:**

Female

Male

**7. Country of nationality:**

**8. E-mail adress:**

**9. Level of education:**

[Please indicate your highest level of education, and its scientific area, at the end of 2021.]

<input type="checkbox"/> Doctoral or equivalent level	Scientific area [See Annex V]
<input type="checkbox"/> Master's or equivalent level	<input type="text"/>
<input type="checkbox"/> Bachelor's or equivalent level	<input type="text"/>
<input type="checkbox"/> Short-cycle tertiary education (TeSP)	<input type="text"/>

**10. Situation regarding R&D activities at this Unit in 2021:**

Did not perform R&D activities or direct R&D support

Only performed other activities in this unit

Permanently left the Unit

Other reason. Specify:

Perform R&D activities or direct R&D support

**10.1. Percentage of time in R&D activities or direct support in this Unit during 2021:**

[You should estimate the percentage of time spent on R&D activities in this Unit, using person/year as a reference. If you were assigned to R&D or other activities in another Unit, you should take these situations into account when estimating your time in R&D (we suggest consulting the examples presented in Annex II).]

Up 5%

51 to 60%

6 to 10%

61 to 70%

11 to 20%

71 to 80%

21 to 30%

81 to 90%

31 to 40%

91 to 100%

41 to 50%

**11. Please indicate your main field of R&D in this Unit in 2021:**

[See Annex V]

**12. Please indicate your professional situation in this unit in 2021:**

[If you had more than one professional situation in this unit, please select the most representative in 2021.]

Employment contract paid by this unit or its host institution ((University/ College/ School/ Hospital, etc.)

[E.g.: Permanently or temporarily employed worker; person who works for a fixed salary, wage or commission]

Contract for the Provision of Services to this unit or its host institution (University/ College/ School/ Hospital, etc.)

[E.g.: freelancers, contracts on a short-term basis, consultants, etc.]

Grant holder

[Individuals paid by this unit or its host institution, by the Foundation for Science and Technology or by another institution.]

Other situation

[Individuals paid by other institutions, such as teachers from other higher education establishments and workers from other public or private entities; pensioners; students and other unpaid individuals.]

**12.1. Indicate your professional activity in 2021 according to the situation reported in the previous question [See Annex VI]**

**Career or equivalent:**

- Teacher
- Researcher
- Physician
- Senior technician
- IT Personnel
- Armed Forces Military
- Nurse
- Senior Health Technician
- Technician of diagnosis and therapeutics
- Pharmacist
- Manager/Leadership position
- Grant holder
- Other situation. Specify:

**Category or equivalent:**

**12.2. Is your professional activity on an exclusive basis?**

Length of normal working hours

- Yes     up to 40h/week                       more than 40h/week  
 No

**12.3. If you selected "Other situation" in question 12.1., please indicate your gross wage or other type of financial compensation earned in 2021:**

- Gross wage (monthly average)                       €  
 Financial compensation                       Monthly amount €    or     Total amount €  
 No wage/salary or other financial compensation

**13. Institution responsible for your wage / scholarship:**

[You should answer to this question if you selected one of the following options in question 12: "Other situation" or "Grant holder".]

- This unit or its host institution (University/ College/ School/ Hospital, etc.)
- Foundation for Science and Technology (FCT)
- Other institution of the portuguese Government sector. Specify:
- Foreign institution of the Government sector. Specify:
- Portuguese Public Higher Education institution. Specify:
- Portuguese Private Higher Education institution. Specify:
- Foreign Higher Education institution. Specify:
- Portuguese Private Non-Profit institution. Specify:
- Foreign Private Non-Profit institution. Specify:
- Portuguese enterprise. Specify:
- Foreign enterprise. Specify:

**14. Indicate your main role in the R&D activities or supporting R&D activities of this unit, in 2021:**

**Researcher**

Professionals working in the conception/design or creation of new knowledge;  
 Research guidance, development and improvement of concepts, theories, models, instrumentation techniques, software or operational methods;  
 Collection, processing, evaluation, analysis and interpretation of research data ;  
 Evaluation of results of investigations and experiments; presentation of conclusions using different techniques and models;  
 Application of principles, techniques and processes to develop or improve practical applications;  
 Planning and management of the scientific and technical aspects of R&D activities;  
 Preparation of scientific articles and reports.

**Technician and equivalent staff**

Their main mission requires technical knowledge and experience;  
 Research and literature review or information gathering/collecting;  
 Execution of laboratory activity (experiments, tests and analysis) and equipment maintenance and repair;  
 Preparation of computer programs;  
 Assistance in collecting, recording, analysing data and preparing reports;  
 Application of questionnaires and interviews;  
 Other technical assistance tasks and support to R&D activities.

**Other supporting staff**

Administrative and secretarial tasks (including conferences and events organisation);  
 Provision of legal and related services at an intermediate level;  
 Law enforcement inspection and similar;  
 Technical assistance in galleries, libraries, archives and museums;  
 Performing skilled tasks in agriculture, forestry and fishing;  
 Carrying out of plant and machine operation tasks and assembly work;  
 Management of financial and human resources aspects and administration of general matters.

**15. Time spent completing this individual form:**

Minutes

## Annex I – Concepts and examples of R&D activities

### Research and Development (R&D):

Research and Development (R&D) activities are understood as all creative work carried out in a systematic way, with the aim of increasing knowledge - including knowledge of mankind, culture and society, and devising new applications resulting from that knowledge (Frascati Manual, 2015).

There are five cumulative basic criteria for identifying R&D activities:

- **Novelty/originality:**

- R&D projects/activities always imply new discoveries for the unit and for the sector;
- The potential novelty/originality of R&D projects results from comparison with the stock of knowledge existing in the sector;

- **Creativity:**

- R&D projects/activities must aim at new concepts or ideas that increase existing knowledge;
- Excludes routine process or product changes;

- **Uncertainty (multiple dimensions):**

- Regarding the results/outputs;
- Regarding the costs;
- Regarding the time to allocate from the human resources involved;

- **Systematics:**

- Activities have to be planned;
- They have to be accounted for in terms of human and financial resources (costs and funding);
- Procedures have to be defined and recorded;
- The results have to be recorded (reports);

- **The knowledge is/must be transferable and/or reproducible**

- The results of R&D projects/activities must be able to be reproduced by others;
  - Since the purpose is to increase the stock of knowledge, the results cannot remain “tacit knowledge” (i.e., remain only in the minds of researchers or other human resources involved);
  - Even if protected by means of Intellectual Property Protection, it is expected that processes and results will be registered for use by others.

Generally speaking, it is considered R&D if the resolution of a problem is not evident to any individual who is aware of the set of knowledge and basic techniques commonly used in the area in question. Activities of a routine nature must be included in R&D, if they are developed, exclusively or mainly, within the scope of R&D projects.

The R&D activities can be classified into three categories:

<b>Basic research</b>	consists of experimental or theoretical work, developed with the main purpose of obtaining new knowledge about the fundamentals of phenomena and observable facts, without any specific objective of practical application.
<b>Applied research</b>	consists of original research work, developed with the aim of creating new knowledge, directed towards a predetermined application or objective.
<b>Experimental development</b>	is the systematic use of existing knowledge obtained through research and/or practical experience in order to manufacture new materials, products or devices; to install new processes, systems or services; or to improve existing ones substantially.

## Examples of R&D activities:

### 1. Education, training and other activities

Teachers	<ul style="list-style-type: none"> <li>- Guidance of doctoral theses.</li> <li>- Guidance and implementation of R&amp;D projects.</li> </ul>
Doctoral/Master's students	- As long as they are integrated in the R&D activities of the responding unit
Other personnel	- Guidance and implementation of R&D projects.

### 2. Other Scientific and technical activities

Data collection	<ul style="list-style-type: none"> <li>- Research on new measurement methods (e.g. temperature).</li> <li>- Study and development of new systems and techniques for data collection, analysis and interpretation.</li> <li>- Data collection that is part of the R&amp;D process, exclusively or mainly, should be considered as R&amp;D activity (e.g. topographic mapping, geological, hydrological, oceanographic or meteorological surveys and astronomical observations). Similarly, in the social sciences, survey or other data collection undertaken for the purpose of serving R&amp;D projects should also be considered as R&amp;D activity. Routine data collection for purposes other than scientific research should not be considered as R&amp;D activity. Market research is also to be excluded from R&amp;D.</li> </ul>
Methodologies and statistics	<ul style="list-style-type: none"> <li>- Conceptual and methodological work related to the development of new or substantially modified surveys or statistical survey methods.</li> <li>- Work on sampling methodologies, estimation/forecasting techniques and data analysis.</li> </ul>
Feasibility studies and scientific articles	<ul style="list-style-type: none"> <li>- Feasibility studies for R&amp;D projects.</li> <li>- Scientific articles.</li> </ul>
Patents and licences	- Administrative and legal work performed for patent and licence registration should be excluded from R&D. However, work on patents directly related to R&D projects is considered as R&D activities.
Mining and prospecting activities	<ul style="list-style-type: none"> <li>- Development of new methods and techniques of geological surveys.</li> <li>- Geological surveys undertaken as an essential part of a research project concerning geological phenomena.</li> <li>- Research on geological phenomena per se undertaken as a subsidiary part of geological prospecting and surveying programmes.</li> </ul>
Specialised medical care	<ul style="list-style-type: none"> <li>- Research into the side-effects of particular therapies (e.g. in an autopsy, research into a particular death to establish the side-effects of a particular treatment).</li> <li>- Research into the effects of the use of new drugs (e.g. special blood collection and testing programmes).</li> </ul>
Clinical trials	<ul style="list-style-type: none"> <li>- Systematic trials on human volunteers to ensure the efficacy and safety of new drugs, vaccines or treatments before they are placed on the market (Phases 1, 2 and 3).</li> <li>- Activities related to the testing of medicinal products or treatments, after their production and placing on the market, if they bring scientific and technological advances (Phase 4).</li> </ul>

Space exploration	All activities except the routine activities of placing satellites in orbit or establishing tracking and communication stations.
Software development	<p><b>Include as R&amp;D activities:</b></p> <ul style="list-style-type: none"> <li>- Development of new operating systems or languages;</li> <li>- Design and implementation of new search engines based on original technologies;</li> <li>- Efforts to solve hardware or software conflicts based on re-engineering processes of a system or a network;</li> <li>- Creation of new or more efficient algorithms based on new techniques;</li> <li>- Creation of new and original encryption or security techniques.</li> </ul> <p><b>Routine activities not considered R&amp;D (exclude from IPCTN):</b></p> <ul style="list-style-type: none"> <li>- Improvements of already existing systems or specific programs;</li> <li>- Technical problems already solved in previous projects on the same operating systems and computer architecture;</li> <li>- The routine maintenance of computers and software.</li> </ul> <p><b>Other software-related activities that are not considered R&amp;D activities (exclude from IPCTN):</b></p> <ul style="list-style-type: none"> <li>- Development of application software and information systems using known methods and existing software tools;</li> <li>- Adding functionality to existing programs/applications (e.g. user-friendly features);</li> <li>- Creating websites or software using existing tools;</li> <li>- Use standard methods of encryption, security verification and data integrity testing;</li> <li>- The customisation of a product for a specific use, unless knowledge is added in the process that significantly improves the base program;</li> <li>- The routine analysis (debugging) of existing systems and programs.</li> </ul>
<p><b>3. R&amp;D management activities and other direct support activities</b></p>	
Direct management of R&D projects	- Planning activities and supervision of scientific and technical aspects carried out by the directors of the R&D projects.
Other direct or auxiliary support activities	<ul style="list-style-type: none"> <li>- Management, administration and secretarial activities that directly contribute to the R&amp;D projects.</li> <li>- Writing the progress reports and the final report of the R&amp;D projects.</li> </ul>

#### 4. Industrial activities

Studies and projects	- Studies of prototypes, models, pilot installations, special equipment, structures or tools necessary for the design and implementation of a new product, process or service.
Prototypes	- Designing, building and testing original models that have all the technical qualities and operating characteristics of a new product (includes all activities performed up to the last necessary modifications to prototypes and after tests are satisfactorily completed).
Pilot plants/installations	All activities of construction and use of pilot plants provided that their main purpose is to gain experience, gather data necessary for: <ul style="list-style-type: none"> <li>- verification of hypotheses;</li> <li>- elaboration of new product formulas;</li> <li>- establishing new specifications of finished products;</li> <li>- design of special structures and equipment necessary for the establishment of new processes;</li> <li>- writing operating instructions or process manuals.</li> </ul> When the pilot plant starts operating as a normal commercial production unit it can no longer be considered as R&D.
Experimental production	- Activities associated with new design and engineering work in the early pre-production phase.
R&D "feedback"	- Activities related to solving technical problems that need further R&D after a new product or process moves to production units.
Industrial design	- Drawing up plans and designs used to define the procedures, technical specifications and operational characteristics which constitute the documentation necessary for the design, development and production of new products and processes.
Machinery and industrial engineering	- Activities that in the process of preparing machinery and tools give rise to new R&D work, such as developments in machinery and production tools, changes in production processes and quality control procedures or the development of new methods and standards.
Testing, trials and standardisation	- Routine testing and trials to ascertain compliance with standards are not R&D activities. Conducting final tests and trials (before going into production) of new materials, components, products and processes and others, as a result of R&D projects, should be considered as ancillary R&D activities. Work consisting of the creation of new standards, requiring special effort of reflection and sometimes testing, and the development of new test methods or substantial improvement of existing ones are also R&D activities.

## 5. R&D activities in services

<p>Banking and insurance</p>	<ul style="list-style-type: none"> <li>- Mathematical research applied to financial risk analysis.</li> <li>- Development of risk models for credit policy.</li> <li>- Experimental development of new software for homebanking.</li> <li>- Development of techniques for investigating consumer behaviour with the aim of creating new types of accounts and banking services.</li> <li>- Research on new risks or new risk characteristics to be taken into account in insurance contracts.</li> <li>- Research on social phenomena having an effect on the creation of new types of insurance (e.g. non-smoking insurance).</li> <li>- Research and development on insurance and e-banking, Internet services and e-commerce applications.</li> <li>- Research and development on new or significantly improved financial services (e.g. new concepts for current accounts, loans, insurance and savings instruments).</li> <li>- Analysis of the effects of economic and social changes on consumption and leisure activities.</li> </ul>
<p>Other service activities</p>	<ul style="list-style-type: none"> <li>- Development of new methods for measuring consumer expectations and preferences.</li> <li>- Development of new methods of delivering and measuring social service outcomes that can be adapted to a variety of socio-economic or cultural settings.</li> <li>- Development of new survey methods and instruments.</li> <li>- Development of follow-up and recognition procedures, particularly in the area of logistics;</li> <li>- Research on new concepts of travel and holidays.</li> </ul>

## 6. R&D activities in arts

<p>New instruments and technologies</p>	<ul style="list-style-type: none"> <li>- The experimental development to produce new electronic musical instruments.</li> <li>- The exploration of new technologies for the performance art, e.g. improving audio/video quality.</li> </ul>
<p>Arts and artistic expression studies</p>	<ul style="list-style-type: none"> <li>- The basic and applied research that contributes to most arts studies in the areas of musicology, art history, theatre studies, communication and literature, among others.</li> <li>- Artistic performance is normally excluded from R&amp;D. However, higher education institutions that award doctoral degrees to artists as a result of their artistic performance can recognize artistic practice as an R&amp;D activity.</li> </ul>
<p>Preservation and restoration</p>	<p>Conservation and restoration activities may be considered as R&amp;D if they involve specialised technical staff linked to scientific research (e.g. researchers) or the publication of scientific work.</p>

## Intramural expenditure on R&D activities

<p>Intramural expenditures</p>	<p>All R&amp;D-related expenditure within the Unit, irrespective of the source of funds. The amounts to be declared must include the amounts incurred directly by the reporting unit and/or the amounts provided by its framework institution. Neither deductible VAT nor refunded VAT is taken into account. Within the scope of the National Scientific and Technological Potential Survey (IPCTN), the intra-mural expenditure is calculated according to the following types of expenditure</p> <p>a) Current expenditure on R&amp;D activities:</p> <ol style="list-style-type: none"> <li>1. Expenditure on internal personnel</li> <li>2. Expenditure on external personnel</li> <li>3. Other current expenditure</li> </ol> <p>b) Capital or investment expenditures with R&amp;D activities:</p> <ol style="list-style-type: none"> <li>1. land, buildings and facilities</li> <li>2. Instruments and equipment</li> </ol>
<p>a) Current expenses with R&amp;D activities</p>	<p>From the perspective of IPCTN, current expenditure on R&amp;D activities of the Unit when performed in experimental or similar laboratories of other units should be accounted as intra-mural expenditure of the reporting Unit. Depreciation/Amortisation is excluded. Current intramural expenditure includes the following types of expenditure:</p>
<p>a.1) Expenses with internal personnel in R&amp;D activities</p>	<p>It should include expenses with persons employed in the establishment plan of the Unit or its framework institution, who, in the reference period, were involved in the unit's R&amp;D activities, whatever the duration of that participation (e.g. contracts for an indefinite period; fixed-term contracts; service commissions). It should include their respective gross remuneration; the prizes/bonuses; social security costs for personnel, including legal, contractual or optional employer's social security costs; funds and other provident schemes, by way of pension, family allowances, accidents at work, insurance, etc., taking into account the time spent on these activities.</p>
<p>a.2) Expenses with external personnel in R&amp;D activities (supported by the Unit or by its Subsidiary Institution, or supported by other institutions)</p>	<p>This should include external personnel costs. External personnel are considered to be those individuals who work on the unit's R&amp;D activities as self-employed workers (service providers, also known as "green receipts", or Single Acts), such as, e.g. consultants hired on an individual basis; doctoral or master's students; scholarship holders; volunteers. External personnel costs may be borne by the unit for which you are reporting, by your framework institution (e.g. University/Faculty/School/Hospital, etc.), or be borne by other institutions.</p>

<p>a.3) Other current costs with R&amp;D activities</p>	<p>Includes expenditure on the purchase of small laboratory equipment (chemicals, animals, etc.), office supplies and miscellaneous equipment to support R&amp;D activities, not considered as capital expenditure; the share of expenses with water, gas and electricity; the use and/or rental of computers; the purchase of services of a technical-scientific nature; displacements/ travel; the purchase of books, magazines and other reference materials; subscriptions to libraries and scientific societies, etc.; costs with consulting firms; actual or imputed costs for small prototypes or models made outside the Unit; costs for patents, overheads, etc. It also includes all the costs of other indirect or ancillary support services, whether carried out in the Unit or contracted from external providers. Some examples are: transport services, storage, food, cleaning, security, use, repair or maintenance of buildings or equipment, computer services, printing costs of R&amp;D reports, etc..</p>
<p>b) Capital expenditure or of investment in R&amp;D activities</p>	<p>The sum of the actual gross expenditure incurred by the reporting statistical Unit on the acquisition of fixed capital goods or investment goods. If the acquired goods are also used for other activities of the statistical Unit, only the value related to use in R &amp; D activities is to be estimated and taken into account. All actual or imputed provisions for depreciation of real estate, plant and equipment should be excluded from the measurement of internal R&amp;D expenditure. Note: From the perspective of the IPCTN, this type of unit expenditure should relate to the share of use, for R&amp;D purposes, of the purchased equipment , or the share of use of other capital goods in use in the year of the statistical operation. Intramural capital expenditure includes the following types of expenditure:</p>
<p>b.1) Land, buildings and facilities</p>	<p>Includes expenditure on the purchase of land for R&amp;D (e.g. test plots, laboratory and pilot plant sites) and the construction or purchase of buildings, including expenditure on major building improvements, alterations or repairs.</p>
<p>b.2) Instruments and equipment</p>	<p>This includes expenditure on the purchase of major items of instrumentation and equipment used exclusively or not exclusively for R&amp;D; the purchase of books if this is for the installation/creation of a library or documentation centre with exclusive R&amp;D use; the purchase of software, including programme descriptions and documentation accompanying systems and applications software. Also included are the annual licence fees for the purchased software.</p>

### Extramural expenditure on R&D activities

Extramural expenses	<p>This refers to the amount spent by the research Unit (institution or enterprise) on contracting R&amp;D activities and funding/transfer of funds for R&amp;D activities performed by other units. Funds received by the research Unit (from foreign or national entities) that are transferred to other entities for external R&amp;D execution (subcontracting) should be considered as extramural expenditure.</p>
1. Contracting	<p><b>Contracting</b> presupposes the provision of an R&amp;D service by an external entity, the results of which revert to the contracting research Unit (institution or enterprise). The amounts to be declared should include the amounts paid directly by the reporting Unit and/or the amounts provided by its framework institution. Deductible VAT must not be taken into account.</p>
2. Financing	<p><b>Funding</b> refers to the transfer of funds for R&amp;D to be developed by third parties, such as other public or private institutions or individuals (e.g. R&amp;D scholarships or grants, prizes within the scope of R&amp;D projects, etc.) without there being counterpart for the funding institution.</p>

## Annex II - Human Resources performing R&D activities

All personnel directly involved in research and development activities, such as researchers and those providing services directly linked to R&D activities, such as R&D managers, technical R&D personnel and other R&D support personnel.

### Researcher

- Professionals working in the design or creation of new knowledge;
- Research guidance, development and improvement of concepts, theories, models, instrumentation techniques, software or operational methods;
- Collection, processing, evaluation, analysis and interpretation of research data;
- Evaluation of results of investigations and experiments; presentation of conclusions using different techniques and models;
- Application of principles, techniques and processes to develop or improve practical applications;
- Planning and management of the scientific and technical aspects of R&D activities;
- Preparation of scientific articles and reports.

### Technical or equivalent

- Their main mission requires technical knowledge and experience;
- Research and literature review or information gathering/collecting;
- Execution of laboratory activity (experiments, tests and analysis) and equipment maintenance and repair;
- Preparation of computer programs;
- Assistance in collecting, recording, analyzing data and preparing reports;
- Application of questionnaires and interviews;
- Other technical assistance tasks and support to R&D activities.

### Other support staff

- Administrative and secretarial tasks (including conferences and events organisation);
- Provision of legal and related services at an intermediate level;
- Law enforcement inspection and similar;
- Technical assistance in galleries, libraries, archives and museums;
- Performing skilled tasks in agriculture, forestry and fishing;
- Carrying out of plant and machine operation tasks and assembly work;
- Management of financial and human resources aspects and administration of general matters.

#### Notes:

a) Personnel in R&D activities that indirectly support R&D (computer services, library, finance, personnel, security, canteens, cleaning, maintenance, etc.) are not accounted for, although the charges for acquiring these services must be considered under current expenses as general expenses (overheads).

b) For the purposes of surveying the national scientific and technological potential, personnel are accounted for according to their function in the statistical unit surveyed, their qualifications and the length of time they have been engaged in R&D activities.

**Internal personnel** (individuals with an employment contract with the responding Unit or its framework institution)

Individuals who, during the reference period, participated in the unit's R&D activities, for whatever duration, under the following conditions:

- a) persons who have a contract of employment with the unit or its parent institution (e.g. University/College/School/Hospital, etc.) and receive remuneration in return for this;
- b) personnel connected to the unit or its framework institution, who, because they are not bound by an employment contract, do not receive regular remuneration for the time worked or work provided (e.g. owner-managers, unpaid family members, active members of cooperatives);
- c) personnel linked to other institutions who worked in the reporting unit or in their framework institution and were directly remunerated by it (eg: requested personnel);
- d) people in the conditions of the previous paragraphs, temporarily absent for a period of one month or less on holiday, due to labour disputes, vocational training, as well as illness and accident at work.

**External personnel** (individuals with a contract for services with the Unit or its framework institution, scholarship holders and individuals paid by other institutions)

External personnel are those individuals who work in the R&D activities of the unit as independent workers (service providers, also known as "green receipts", or Single Acts), for example, consultants employed on an individual basis; doctoral or master's students; scholarship holders; volunteers; retired professors/teachers. External staff expenses can be borne by the unit for which they are responsible, by the framework institution of that unit (e.g. University/Faculty/School/Hospital, etc.), or be borne by other institutions. Costs with external personnel may be borne by the unit for which you are reporting, by the same Institution for which it is responsible (eg University/Faculty/School/Hospital, etc.), or be borne by other institutions.

### Percentage of time dedicated to the R&D activities

**Personnel 100% dedicated to R&D** All personnel exclusively performing R&D activities throughout the year (12 months), during normal working hours.

**Personnel part-time dedicated to R&D** All personnel that has not only R D activities throughout the year (12 months) or during normal working hours.

It will be considered part-time all personnel in the period under review (year) that:

- (i) Does not exclusively perform R&D activities during normal working hours in a single unit;
- (ii) Performs exclusively R&D activities in more than one unit (and as such is considered part-time in each of them);
- (iii) Although exclusively providing R&D activities during normal working hours in one unit, was not in service for the whole year (12 months).

### Examples for calculating the percentage of time dedicated to R&D activities

Person A is 100% dedicated to R&D activities during the whole year (12 months) in the unit;

Person B is 100% dedicated to R&D activities for 6 months (1/2 year) in the unit;

Person C is 25% dedicated to R&D activities during the whole year in the unit;

Person D is 30% dedicated to R&D activities during 4 months (1/3 year) in the unit.

Person	Percentage of time in R&D	Percentage of time in R&D in the year
A	100%	100% x 1 year = 100%
B	100%	100% x 1/2 year = 50%
C	25%	25% x 1 year = 25%
D	30%	30% x 1/3 year = 10%

## Annex III - Socio-economic objectives, according to the EUROSTAT nomenclature for the analysis and comparison of scientific programmes and budgets (NABS 2007)

### 1. Exploration and exploitation of the Earth

Includes R&D relating to exploration and exploitation of the earth's environment - crust, mantle and seabed; seas and oceans; hydrology; atmosphere; climate, meteorological research and polar research; mining, oil and gas exploration; other general research relating to exploration and exploitation of Earth's environment. Does not include research related to pollution (consider under 2.); land use improvement (included in 4.); agricultural land-use and fisheries (included in 8.).

### 2. Environment

Includes R&D relating to pollution control; identification and analysis of the sources and causes of pollution and pollutants, including their dispersion in the environment and their effects on man, other species (fauna, flora and microorganisms) and the biosphere; research on the development of monitoring equipment for measuring all types of pollution and the elimination and prevention of all forms of pollution of all types of environment protection of the atmosphere and the climate; protection of ambient air; solid waste; protection of ambient water; protection of soil and groundwater; noise and vibration; protection of species and habitats; protection against natural disasters; radioactive pollution and other general research concerning the environment.

### 3. Exploration and exploitation of space

Includes civil space related R&D – aimed exclusively at increasing general knowledge (e.g. astronomy) or related to the development of specific applications (e.g. satellite telecommunications); scientific exploration of space; applied research programmes; launcher systems; space laboratories and space travel; and other general research related to aerospace exploration and exploitation.

### 4. Transport, telecommunication and other infrastructures

Includes R&D related to infrastructure and territorial development, including building construction and planning; general planning of the territory; transport and telecommunications systems; civil Engineering; water supply and other general infrastructure and land use planning research and pollution research related to the detrimental effects of unplanned land and cities.

### 5. Energy

Includes R&D relating to the production, storage, transport, distribution and efficient use of all forms of energy; processes designed to increase the efficiency of energy production and distribution; energy conservation studies; energy efficiency research; CO2 capture and storage; renewable energy sources; nuclear fission and fusion; hydrogen and fuel gas and other energy and energy storage technologies. Does not include exploration research (included in 1.) and vehicles and engine propulsion (included in 6.).

## 6. Industrial production and technology

includes R&D relating to the improvement of production and industrial technology; industrial products and their manufacturing processes; increasing economic efficiency and competitiveness and all manufacturing activities as classified by CAE, namely manufacture of food products, beverages and tobacco; textile, clothing and leather manufacturing; products from the wood, cork and furniture industries; pulp, paper and cardboard products; manufacture of products for the chemical and pharmaceutical industries; manufacture of rubber and plastic products; base metallurgical industry products; metal products; computer, communication, electronic and optical equipment; manufacture of electrical material and machinery and equipment, n.e., motor vehicles and their parts and other transport material; other manufacturing products and recycling (metal and non-metal products).

Does not include research relating to industrial products and their manufacturing processes which are integrated into other objectives such as, for example, defense (consider in 14.), aerospace exploration and exploitation (consider in 3.), energy (consider in 5.) and agriculture (consider 8.).

## 7. Health

Includes R&D concerned with the protection, promotion and recovery of human health, considered in the broad sense, including aspects of nutrition and food hygiene; preventive medicine, with all aspects relating to medical and surgical treatment - both for individuals and for groups - hospital structures and medical care at home, social medicine and pediatrics and geriatrics research; prevention, surveillance and control of communicable and non-communicable diseases; health status monitoring; health promotion; occupational health; public health legislation and regulations; public health organisation; specific public health services; health care for vulnerable and high risk groups and other general health-related research.

## 8. Agriculture

Includes R&D related to promotion of agriculture, forestry and fisheries; food production; chemical fertilisers, biocides, biological pest control and mechanisation of agriculture; impact of forestry activities on the environment; development of food productivity and technologies, animal and dairy science; veterinary science and other agricultural sciences.

Does not include: research on pollution abatement (included in 2.), development of rural areas, construction and planning of buildings, use of the countryside for recreation and leisure and water supply for agriculture (included in 4.), energy measures (included in 5.) and food industry (included in 6.).

## 9. Education

Includes R&D related to general education( teaching, pedagogy and didactics); special education (gifted persons and persons with learning disabilities); research related to pre-school and primary education, secondary and post-secondary education (technical and vocational training courses), higher education; services ancillary to education and other general research related to education.

## 10. Culture, recreation, religion and mass media

Includes R&D relating to the social phenomena of cultural, religious and leisure activities and their impact on life in society; racial and cultural integration and socio-cultural changes in these areas; recreational, sporting and cultural services; broadcasting and publishing services; religious and other community services and other general research relating to cultural, religious and communication phenomena.

### **11. Political and social systems, structures and processes**

Includes R&D on the political structure of society; issues of public administration and economic policy; regional studies and studies on decentralized governance; social change, social processes and social conflict; the development of social security and welfare systems; social aspects of work organization; gender studies, including gender discrimination and family problems; the development of anti-poverty strategies (local, national and international); the protection of certain classes of the population, at the social level (immigrants, delinquency, 'drop-outs', etc.) and at the sociological level (forms of life for young people, adults, pensioners, the disabled, etc.) and economic level (consumers, farmers, fishermen, miners, the unemployed, etc.); strategies for the provision of social security and social assistance, etc. ), at sociological level (ways of life of young people, adults, pensioners, disabled people, etc.) and at economic level (consumers, farmers, fishermen, miners, the unemployed, etc.); strategies for providing social assistance in situations of sudden changes in society (natural, technological or social) and other general research concerning political and social systems, structures and processes.

### **12. General advancement of knowledge**

Includes fundamental research with no discriminated socio-economic objective.

### **13. Defense**

Includes research for military purposes.

## Annex IV - National strategic priorities, as defined in the Research & Innovation Strategy for an Intelligent Specialization (EI&I), 2014-2020

### 1. Energy

- Optimization of energy production and transportation and complementarity in their management (renewable, non-renewable, new fuels and hydrogen, fuel cells, nuclear fusion, CO2 capture and storage, real-time energy system management, energy storage systems ).
- Energy efficiency and its impacts (Smart Cities, NZEB Net-Zero Energy Buildings, energy in transport, consumption patterns and consumer behavior, distribution of electricity and natural gas, climate change).
- Applications of new technologies and smart energy networks (ICTs).
- Integration of the European energy market (modeling, planning, new market models, regulation).

### 2. Information and communication technologies

- Promotion of the internet of the future (Internet of Things - IoT, wireless networks, communications and networks and optics, cybersecurity, impact of social networks).
- Electronic base infrastructures (electronics, hardware, files and digital collections).
- Software modeling and simulation.
- Component and sensor engineering.
- Robots - man / machine interaction.
- 'Cloud computing' and 'Parallel computing'.
- Digital agenda and e-Government.
- New digital business models.
- Nano and bio-electronics.
- Advanced and complex engineering systems.
- Mobile applications.
- Link to average.
- Connection to tourism and leisure.

### 3. Materials and raw materials

- Development of innovative technologies for sustainable mineral resources (use of new materials, processing of minerals and minerals, eco-innovative technologies, scarce mineral resources, materials for low carbon energy technologies).
- Sustainable production of raw materials and forest-derived materials (pulp, wood, cork, waste reduction and biomass utilization, environmental monitoring, waste reuse).
- Application of advanced technologies to raw materials and materials (resource efficiency through the application of ICT, new materials).
- Application of new materials to traditional industries.
- Efficient, safe and sustainable use of industrial resource production (alternatives to critical raw materials, efficient exploitation and use of raw materials, exploitation of raw materials in land and sea, rare earth exploration).

#### 4. Production technologies and process industries

- Increasing the competitiveness of process industries (cement, pulp, chemical, pharmaceutical and other industries, integration of the value chain, more efficient production processes, degradability of products, reduction of emissions and waste, energy efficiency).
- Green Chemistry (reuse of products and raw materials and energy efficiency; efficient chemical processes).
- Industrial biotechnology.
- Pharmaceutical industry.

#### 5. Production technologies and product industries

- Promotion of sustainable industrial growth based on products with high added value and technological content (incorporation of design, new materials and ICT, product-service integration, product customization).
- Factories of the Future (production and instrumentation technologies, flexible and reconfigurable production systems, intelligent and adaptive, collaborative and networked and mass customization, new production technologies, technologies for product lifecycle management, energy efficiency And minimization of environmental impacts in industrial production).

#### 6. Automotive, Aeronautics and Space

- Sustainability and innovation of automotive production and its components (new means of transport, low carbon and green, new fuels).
- Development of advanced technologies applied to automotive, aeronautics and space (ICT and electronics, optics and lasers, robotics, automation and control, advanced materials, design of automobile and aircraft modules).
- Development of the components industry (technical textiles, rubber, molds and plastics, glass, metal components, new materials, sensors, coatings).
- Intensive knowledge services (acquisition, pre-processing and access to data, telemetry, modeling for information production, design of modules).
- Development of subsystems for the aeronautics and space industry (navigation systems, space hardware, design of modules for the aeronautics industry).

#### 7. Transport, mobility and logistics

- Management of port infrastructures (management of aeronautical infrastructures, storage, software, infrastructures, flows of people, exploration of new businesses).
- Development of new sustainable means of transport of goods (via rail, sea, sustainability of road transport).
- Safe and sustainable transport (multi-modal and mobility, safety, construction of clean and quiet vehicles, mobility and urban space).
- Intelligent transport and logistics systems (communications, information and control systems, intelligent interfaces, flow management, payment system, operational research).
- Standardization and certification.
- New public transport policies (safety, modeling, public transport and urban areas).

## 8. Food industry

- Healthy food production based on sustainable agriculture (olive oil, honey, protein production, rural areas, water, wine, biodiversity, energy efficiency and waste reduction and reuse, safety / traceability).
- Ecosystem organization of the rural space (transport and distribution, forest and rural areas, land use and social organization, fires, impacts and combating desertification, waste treatment, biodiversity, intelligent packaging, customized food).
- Food engineering and advanced technologies (biotechnology, synthetic biology, technological engineering).
- Wine.
- Exploration of food links with health, economy of the sea, tourism.

## 9. Forest

- Forest eco-system development (forest species improvement, sustainable management and resource planning, land use, water, fire prevention and detection, monitoring and evaluation of environmental performance, pest and disease prevention and treatment of forest resources, energy efficiency And optimization of the processes of cutting, extraction, preparation or filling and optimization of manufacturing processes).
- Sustainable production of raw materials and materials products derived from the forest (paper pulp, wood, cork, other products: resin, pine nut, nut, carob, essential oils, waste reduction and biomass utilization, environmental monitoring, reuse of waste) .

### 10.1 Sea economics - marine food resources (fisheries and aquaculture)

- Sea economics - marine food resources: fisheries, aquaculture, in-land and off-shore, and fish industry; Salting and food security.
- Ability to predict and model and analyze population dynamics.
- Technological development of fishing gear.
- Analysis of socioeconomic aspects, importance of the sector in the development of regional and local economy, diversification to other economic activities in the community.
- Diversification technologies and processes of the species produced - new types of food; Use of robotics and biotechnology.
- Combating pathogens and diseases (aquaculture).
- Boosting the Green Economy (resource efficiency, appreciation of by-products and intelligent packaging).
- Increasing the value added of products in a market-oriented production (fish industry); Analysis of consumer preference and enhancement of the product image and the origin brand (aquaculture and fish industry); Food security.
- New technologies and services for product and process development.
- Demonstration of innovative business models and behavioral patterns.

## 10.2 Sea economics - natural systems and renewable energy resources

- Sea economics - natural systems and renewable energy resources: natural resources (biodiversity and climate, ocean - atmosphere, climate change) and renewable energy resources (wind, waves, salinity, tides, biomass).
- Ecosystem dynamics, modeling, marine biodiversity and Good Environmental Status indicators.
- Monitoring technologies, in-situ and remote sensing by satellite and by airborne platforms, and resource mapping.
- Decision support systems in the event of pollution accidents.
- Enhance the resilience of ecosystems.
- Mitigation and adaptation to climate change.
- New models of governance and designation of marine protected areas in the coastal zone and on the high seas.
- Maritime space planning.
- New socioeconomic models.
- Models of oceanographic prediction and ocean-atmosphere interaction.

## 10.3 Sea economics - deep sea resources

- Sea economy - deep sea resources: marine biotechnology; mining; Deep sea fishing; Non-renewable energy resources (hydrocarbons, natural gas).
- Mapping of biological and mineral resources (seabed mapping).
- Development of monitoring technologies (robotics, sensors, instrumentation, research platforms, nanotechnology).
- Exploration of resources (biomedicine, tissue engineering, pharmaceutical, enzyme production) and patents.
- Development of new services at sea, including ICT.
- Sustainability and resilience of ecosystems.
- Governance models and management tools.

## 10.4 Sea economics - ports, logistics, transport, shipbuilding and maritime works

- Sea economy - ports, logistics, transport, shipbuilding and maritime works: new means of transport; Low carbon transport; Intelligent transport; Ports; Shipbuilding and repair; Management of flows (transport, mobility and logistics); Maritime works.
- Motorways of the sea.
- Multipurpose platforms at sea and reduction of conflicts of use in the marine space.
- Adaptation of vessels to new environmental and other certification requirements.
- Diversification of shipbuilding and ship repair to support the renewable energy sector at sea, ship recycling and life cycle analysis.
- New boats for nautical and market niches.
- Transversal technological development for observation, evaluation, inspection and safety: ICT and robotics, platforms, instrumentation, automatic and autonomous systems.
- Synergies between technological areas, aeronautics and aerospace.
- Certified quality in the transportation and distribution of marine food resources.
- Development of hydraulic infrastructures (use of natural processes) and adaptation of infrastructures to climate change.
- Development of innovative technical solutions adapted to the economic, geophysical and ecological reality of the national coast.

## 10.5 Sea economics - culture, tourism, sport and leisure

- Sea economy - culture, tourism, sport and leisure: sport and leisure; Beach tourism; Health tourism; Cruises; Ecotourism.
- Evaluation of niche markets, development and technological innovation for nautical and marine centers and promotion of future motorizations.
- Networks and clusters - analysis of the enhancement of value added.
- Local and regional development of nautical, ecotourism and connection to endogenous resources.
- Marine protected areas and new management models.
- Literacy of the sea.

## 11. Water and environment

- Water resources (state of water bodies, planning, integrated management and governance, water uses, risks associated with extreme events, monitoring, modeling and information systems and decision support).
- Waste (reduction at source, planning, integrated management and governance, treatment and recovery systems and technologies, monitoring and information systems and decision support).
- Soils (systems and technologies for decontamination and recovery, planning, planning and governance, risks associated with use, monitoring and information systems and decision support).
- Ecosystems (evaluation of ecosystem services, restoration and recovery methodologies and technologies, planning, planning and governance, monitoring and information and support systems).

## 12. Health

- Aging and active life (dementia, health care, tourism).
- Diseases (neurodegenerative, autoimmune, rheumatic, infection and diabetes, cardiovascular, cancer, vision, epidemiology and socioeconomic research).
- Biomaterials and nanomedicine.
- Medical technologies (diagnosis and treatment, application of ICT to health).
- Biotechnology and health (microbiology; pharmaceuticals).
- Translational research.
- Health and well-being (food, sports, tourism).

## 13. Tourism

- Exploration of cultural heritage (material and immaterial heritage) (ethnological research and tourism, archaeological research and tourism, built heritage and tourism, Lusophony space and tourism, Portuguese diaspora and tourism, creative industries and media).
- Diversification of the offer of tourism and associated services (event tourism, cultural tourism, sports and religious tourism, health tourism, nature tourism: rural areas and biodiversity, housing tourism, tourism induced by scientific activities).
- Integration of the tourism value chain (agri-food, Portuguese Mediterranean cuisine, intelligent public transport systems, health and health policy, development of advanced ICT applications for tourism).

#### **14. Cultural and creative industries**

- Valuation of products and spaces (fashion: clothing, footwear, technical textiles, jewellery, leather, cork, product customization, architecture, design).
- Production, distribution and promotion of cultural and creative content (music, film and video, radio and TV, editing and literary creation, performing arts and visual arts).
- Preservation and enhancement of cultural heritage, tangible and intangible.
- Advertising.
- ICT: digital content and software services (games, new technologies for the arts and languages, educational software, applications of technology to the preservation and enhancement of cultural heritage, electronic technology and fashion).
- Cultural and creative industries, event and tourism promotion.

#### **15. Habitat**

- New methods of sustainable and efficient production (waste, reduction of environmental impacts, flexible production).
- Development of innovative materials and applications (cork, new materials / advanced materials, ceramics and glass, cutlery, wood and furniture, construction, paper, ICT, home textiles, paints and coatings, metal products).

## Annex V - Classification of Fields of Research and Development (FORD, 2015)

### 1. Natural sciences

**1.1. Mathematics:** Pure mathematics, Applied mathematics; Statistics and probability.

**1.2. Computer and information sciences:** Computer sciences, information science and bioinformatics (hardware development to be 2.2, social aspect to be 5.8).

**1.3. Physical sciences:** Atomic, molecular and chemical physics (physics of atoms and molecules including collision, interaction with radiation; magnetic resonances; Moessbauer effect); Condensed matter physics (including formerly solid state physics, superconductivity); Particles and fields physics; Nuclear physics; Fluids and plasma physics (including surface physics); Optics (including laser optics and quantum optics), Acoustics; Astronomy (including astrophysics, space science).

**1.4. Chemical sciences:** Organic chemistry; Inorganic and nuclear chemistry; Physical chemistry, Polymer science, Electrochemistry (dry cells, batteries, fuel cells, corrosion metals, electrolysis); Colloid chemistry; Analytical chemistry.

**1.5. Earth and related Environmental sciences:** Geosciences, multidisciplinary; Mineralogy; Palaeontology; Geochemistry and geophysics; Physical geography; Geology; Volcanology; Environmental sciences (social aspects to be 5.7); Meteorology and atmospheric sciences; climatic research; Oceanography, Hydrology, Water resources.

**1.6. Biological sciences:** Cell biology, Microbiology; Virology; Biochemistry and molecular biology; Biochemical research methods; Mycology; Biophysics; Genetics and heredity (medical genetics to be 3); reproductive biology (medical aspects to be 3); developmental biology; Plant sciences, botany; Zoology, Ornithology, Entomology, Behavioural sciences biology; Marine biology, freshwater biology, limnology; Ecology; Biodiversity conservation; Biology (theoretical, mathematical, thermal, cryobiology, biological rhythm), Evolutionary biology; other biological topics.

**1.7. Other natural sciences**

### 2. Engineering and technology

**2.1. Civil engineering:** Civil engineering; Architecture engineering; Construction engineering, Municipal and structural engineering; Transport engineering.

**2.2. Electrical engineering, Electronic engineering, Information engineering:** Electrical and electronic engineering; Robotics and automatic control; Automation and control systems; Communication engineering and systems; telecommunications; Computer hardware and architecture.

**2.3. Mechanical engineering:** Mechanical engineering; Applied mechanics; Thermodynamics; Aerospace engineering; Nuclear related engineering; (nuclear physics to be 1.3); Audio engineering, reliability analysis.

**2.4. Chemical engineering:** Chemical engineering (plants, products); Chemical process engineering

**2.5. Materials engineering:** Materials engineering; Ceramics; Coating and films; Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics; filled composites); Paper and wood; textiles; including synthetic dyes, colors, fibers; (nanoscale materials to be 2.10; biomaterials to be 2.9).

**2.6. Medical engineering:** Medical engineering; Medical laboratory technology (including laboratory samples analysis; diagnostic technologies); (Biomaterials to be 2.9 [physical characteristics of living material as related to medical implants, devices, sensors]).

**2.7. Environmental engineering:** Environmental and geological engineering, geotechnics; Petroleum engineering, (fuel, oils), Energy and fuels; Remote sensing; Mining and mineral processing; Marine engineering, sea vessels; Ocean engineering.

**2.8. Environmental biotechnology:** Environmental biotechnology; Bioremediation, diagnostic biotechnologies (DNA chips and biosensing devices) in environmental management; environmental biotechnology related ethics.

**2.9. Industrial biotechnology:** Industrial biotechnology; Bioprocessing technologies (industrial processes relying on biological agents to drive the process) biocatalysis, fermentation; bioproducts (products that are manufactured using biological material as feedstock) biomaterials, bioplastics, biofuels, bio-derived milk and fine chemicals, bio-derived novel materials.

**2.10. Nano-technology:** Nano-materials [production and properties]; Nano-processes [applications on nano-scale]; (biomaterials to be 2.9).

**2.11. Other engineering and technologies:** Food and beverages; Other engineering and technologies.

### 3. Medical and Health sciences

**3.1. Basic medicine:** Anatomy and morphology (plant science to be 1.6); Human genetics; Immunology; Neurosciences (including psychophysiology); Pharmacology and pharmacy; Medicinal chemistry; Toxicology; Physiology (including cytology); Pathology.

**3.2. Clinical medicine:** Andrology; Obstetrics and gynecology; Pediatrics; Cardiac and Cardiovascular systems; Peripheral vascular disease; Hematology; Respiratory systems; Critical care medicine and Emergency medicine; Anesthesiology; Orthopedics; Surgery; Radiology, nuclear medicine and medical imaging; Transplantation; Dentistry, oral surgery and medicine; Dermatology and venereal diseases; Allergy; Rheumatology; Endocrinology and metabolism (including diabetes, hormones); Gastroenterology and hepatology; Urology and nephrology; Oncology; Ophthalmology; Otorhinolaryngology; Psychiatry; Clinical neurology; Geriatrics and gerontology; General and internal medicine; other clinical medicine subjects; Integrative and complementary medicine (alternative practice systems).

**3.3. Health sciences:** Health care sciences and services (including hospital administration, health care financing); Health policy and services; Nursing; Nutrition, Dietetics; Public and environmental health; Tropical medicine; Parasitology; Infectious diseases; epidemiology; Occupational health; Sport and fitness sciences; Social biomedical sciences (includes family planning, sexual health, psycho-oncology, political and social effects of biomedical research); Medical ethics; Substance abuse.

**3.4. Medical biotechnology:** Health-related biotechnology; Technologies involving the manipulation of cells, tissues, organs or the whole organism (assisted reproduction); Technologies involving identifying the functioning of DNA, proteins and enzymes and how they influence the onset of disease and maintenance of well-being (gene-based diagnostics and therapeutic interventions (pharmacogenomics, gene-based therapeutics); Biomaterials (as related to medical implants, devices, sensors); Medical biotechnology related ethics.

**3.5. Other medical sciences:** Forensic science; Other medical sciences

### 4. Agricultural and veterinary sciences

**4.1. Agriculture, Forestry, and Fisheries:** Agriculture; Forestry; Fishery; Soil science; Horticulture, viticulture; Agronomy, plant breeding and plant protection; (Agricultural biotechnology to be 4.4).

**4.2. Animal and Dairy science:** Animal and dairy science; (Animal biotechnology to be 4.4); Husbandry; Pets

#### 4.3. Ciências veterinárias

**4.4. Agricultural biotechnology:** Agricultural biotechnology and food biotechnology; GM technology (crops and livestock), livestock cloning, marker assisted selection, diagnostics (DNA chips and biosensing devices for the early/accurate detection of diseases) biomass feedstock production technologies, biopharming; agricultural biotechnology related ethics.

**4.5. Other agricultural sciences**

## 5. Social sciences

**5.1. Psychology and cognitive sciences:** Psychology (including human - machine relations); Psychology, special (including therapy for learning, speech, hearing, visual and other physical and mental disabilities).

**5.2. Economics and Business:** Economics, Econometrics; Industrial relations; Business and Management.

**5.3. Educational sciences:** Education, general; including training, pedagogy, didactics; Education, special (to gifted persons, those with learning disabilities).

**5.4. Sociology:** Sociology; Demography; Anthropology, ethnology, Social topics (women's and gender studies; Social issues; Family studies, Social work).

**5.5. Law:** Law, criminology, penology.

**5.6. Political science:** Political science; public administration; organization theory.

**5.7. Social and economic geography:** Environmental sciences (social aspects); Cultural and economic geography; Urban studies (Planning and development); Transport planning and social aspects of transport (transport engineering to be 2.1).

**5.8. Media and communications:** Journalism; Information science (social aspects); Library science; Media and socio-cultural communication.

**5.9. Other social sciences:** Social sciences, interdisciplinary; Other social sciences.

## 6. Humanities and arts

**6.1. History and Archaeology:** History (history of science and technology to be 6.3, history of specific sciences to be under the respective headings); Archaeology.

**6.2. Languages and Literature:** General language studies; Specific languages; General literature studies; Literary theory; Specific literatures; Linguistics.

**6.3. Philosophy, Ethics and Religion:** Philosophy, History and philosophy of science and technology; Ethics (except ethics related to specific subfields); Theology; Religious studies.

**6.4. Arts ( history of arts, performing arts, music):** Arts, Art history; Architectural design; Performing arts studies (musicology, theater science, dramaturgy); Folklore studies; Studies on Film, Radio and Television.

**6.5. Other humanities**

## Annex VI - Careers and categories

### University Teacher

Reitor | Vice-Reitor | Professor Catedrático | Professor Catedrático convidado | Professor Associado | Professor Associado convidado | Professor Auxiliar | Professor Auxiliar convidado | Assistente | Assistente convidado | Assistente Estagiário | Leitor | Professor visitante | Monitor

### Polytechnic Higher Education Teacher

Presidente | Vice-Presidente | Professor Coordenador | Professor Adjunto | Assistente | Professor Coordenador principal | Professor Coordenador convidado | Professor Adjunto convidado | Professor visitante | Assistente convidado | Monitor

### Teacher - Pre-School Education or Basic and Secondary Education

Professor | Docente - Outra

### Scientific researcher

Investigador-Coordenador | Investigador-Coordenador convidado | Investigador Principal | Investigador Principal convidado | Investigador Auxiliar | Investigador Auxiliar convidado | Assistente de Investigação | Estagiário de Investigação | Investigador Júnior | Investigador Especialista | Investigação Científica - Outra

### Physician

Assistente Graduado Sénior | Assistente Graduado | Assistente | Clínico Geral | Interno | Médica - Outra

### Senior Technician

Técnico Superior - posições remuneratórias da 1.ª à 5.ª | Técnico Superior - posições remuneratórias superiores à 5.ª até à 10.ª | Técnico Superior - posições remuneratórias superiores à 10.ª | Técnico Superior - Outra

### IT Personnel

Especialista de informática - Remuneração mensal bruta superior a 2800 Euro | Especialista de informática - Remuneração mensal bruta entre 2000 e 2800 Euro | Especialista de informática - Remuneração mensal bruta inferior a 2000 Euro | Especialista de informática - Estagiário | Técnico de informática | Pessoal de informática - Outra

### Armed Forces Military

Oficiais Gerais | Oficiais Superiores | Oficiais Subalternos | Sargentos | Praças | Militares das Forças Armadas - Outra

### Nurse

Enfermeiro-Gestor | Enfermeiro-Especialista | Enfermeiro | Enfermagem - Outra

### Senior Health Technician

Assessor Superior | Assessor | Assistente Principal | Assistente | Estagiário (3.º e 4.º Ano) | Estagiário (1.º e 2.º Ano) | Técnico Superior de Saúde - Outra

### Technician of diagnosis and therapeutics

Especialista Principal | Especialista | Técnico Superior de Diagnóstico e Terapêutica | Técnico Superior de Diagnóstico e Terapêutica - Outra

### Manager/Leadership position

Direção Superior de 1.º grau | Direção Superior de 2.º grau | Direção Superior de 3.º grau | Direção Intermédia de 1.º grau | Direção Intermédia de 2.º grau | Direção intermédia de 3.º grau, 4.º grau ou 5.º grau | Cargo Dirigente - Outra

**Pharmacist**

Farmacêutica - Assessor Sênior | Farmacêutica - Assessor | Farmacêutica - Assistente | Farmacêutica - Outra

**Grant holder**

Bolsa de Pós-Doutoramento (BPD) | Bolsa de Doutoramento (BD) | Bolsa de Doutoramento em Empresas (BDE) | Bolsa de Cientista Convidado (BCC) | Bolsa de Investigação (BI) | Bolsa de Iniciação Científica (BIC) | Bolsa de Técnicos de Investigação (BTI) | Bolsa de Gestão de Ciência e Tecnologia (BGCT) | Bolsa de Mobilidade entre Instituições de I&amp;D e Empresas ou Outras Entidades (BMOB) | Bolsa de Iniciação à Investigação (BII) | Bolsa de Investigação Pós-Doutoral (BIPD) | Bolseiro(a) - Outra Bolsa

**Other situation**

Aposentado(a) | Estudante de Doutoramento | Estudante de Mestrado | Consultor(a) | Outra Situação - Outra

DGEEC | Directorate-General for Education and Science Statistics

**R&D survey (2021)**  
**Inquérito ao Potencial Científico e Tecnológico Nacional (2021 )**  
**Government, Higher Education and Private Non-Profit sectors**

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