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COMMUNICATION
ON RESEARCH AND DEVELOPMENT STATISTICS FOR 2019

As the official producer of research and development (R&D) statistics in Montenegro, the Ministry of Education, Science, Culture and Sports is publishing key R&D statistics for 2019. The data collected provide all mandatory indicators with breakdowns defined in the EU Commission Implementing Regulation for statistics on science and technology (995/2012), in line with the methodological guidelines defined in the Guidelines for collecting and reporting data on research and experimental development (Frascati Manual, OECD, 2015). Data are produced within 18 months following the end of the year observed, and are published nationally and submitted to Eurostat.

R&D statistics provide internationally comparable data on total R&D spending and R&D staff. Data are collected from reporting units – entities conducting R&D activities based on their financial and staff records. Data have been collected from units within four sectors of implementation: higher education, government, business-entrepreneurial and private non-profit sector.

The results of this survey indicate that total domestic spending on research and development in 2019 amounted to 0.36% of GDP[1], i.e. gross expenditures for R&D amounted to EUR 17,984,722. In 2019, 2330 persons were engaged in research and development activities in organisations, institutions and companies active in this field, including 1586 researchers, 495 technicians and 249 supporting staff members.

Given that R&D activities represent only part of the work engagement of most employees, actual engagement is shown through the full-time equivalent, which is the ratio of hours devoted by one employee to R&D and the total number of working hours. In 2019, total FTE was 685, and FTE for researchers was 469.

[1] GDP (at current prices) of Montenegro in 2019 amounted to EUR 4,951,000,000 (Monstat)

1. DATA ON STAFF

Chart 1 - The number of persons in R&D and overall FTE

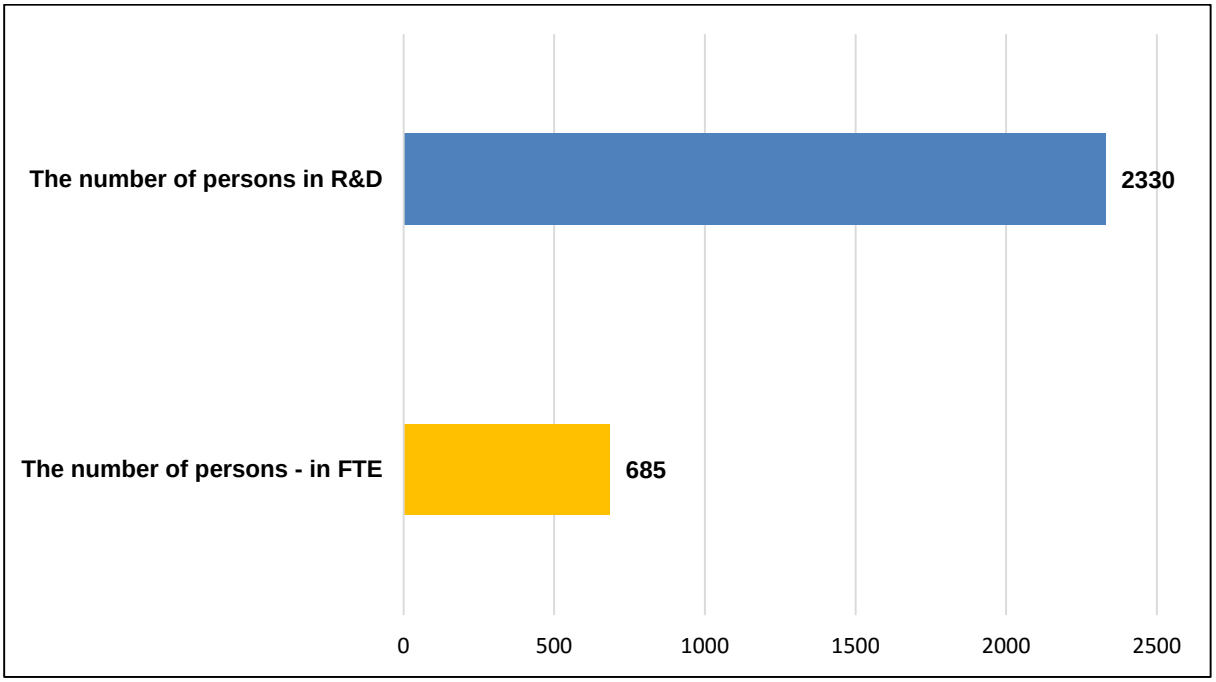


Chart 2 - The number of researchers in R&D and FTE for researchers

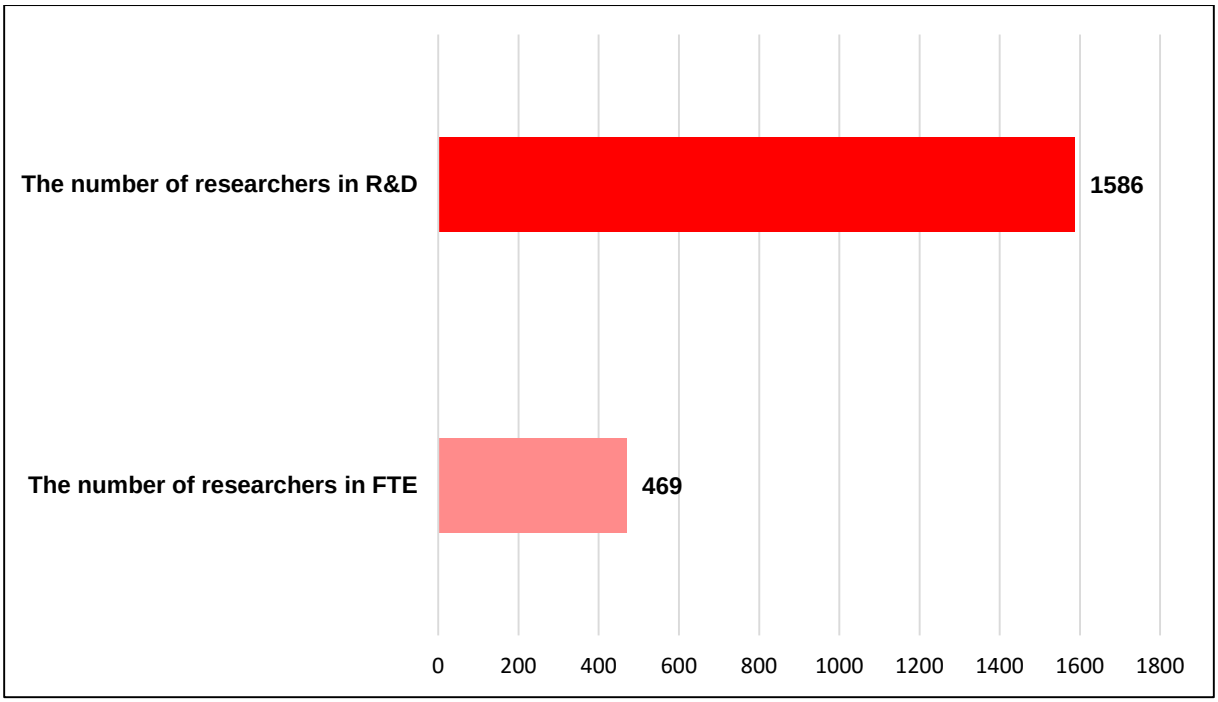


Chart 3 - Staff by sector, overall and in FTE

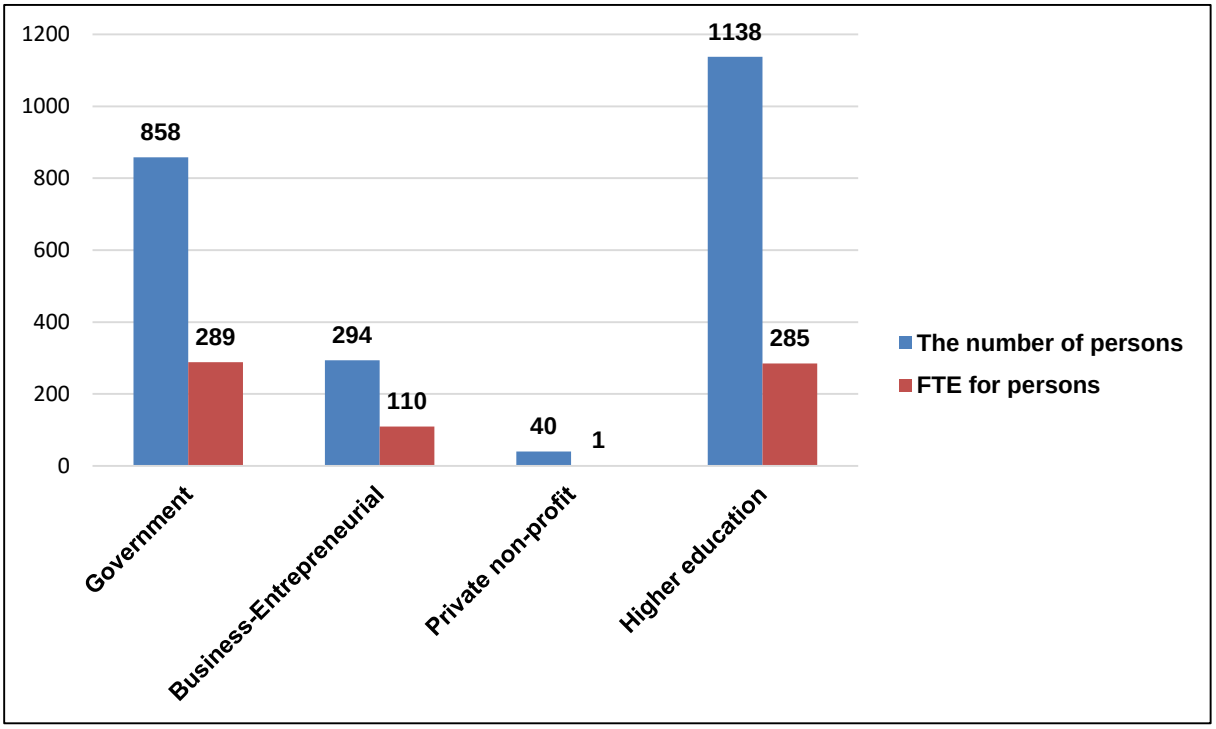


Chart 4 - The number of researchers by sector, overall and in FTE

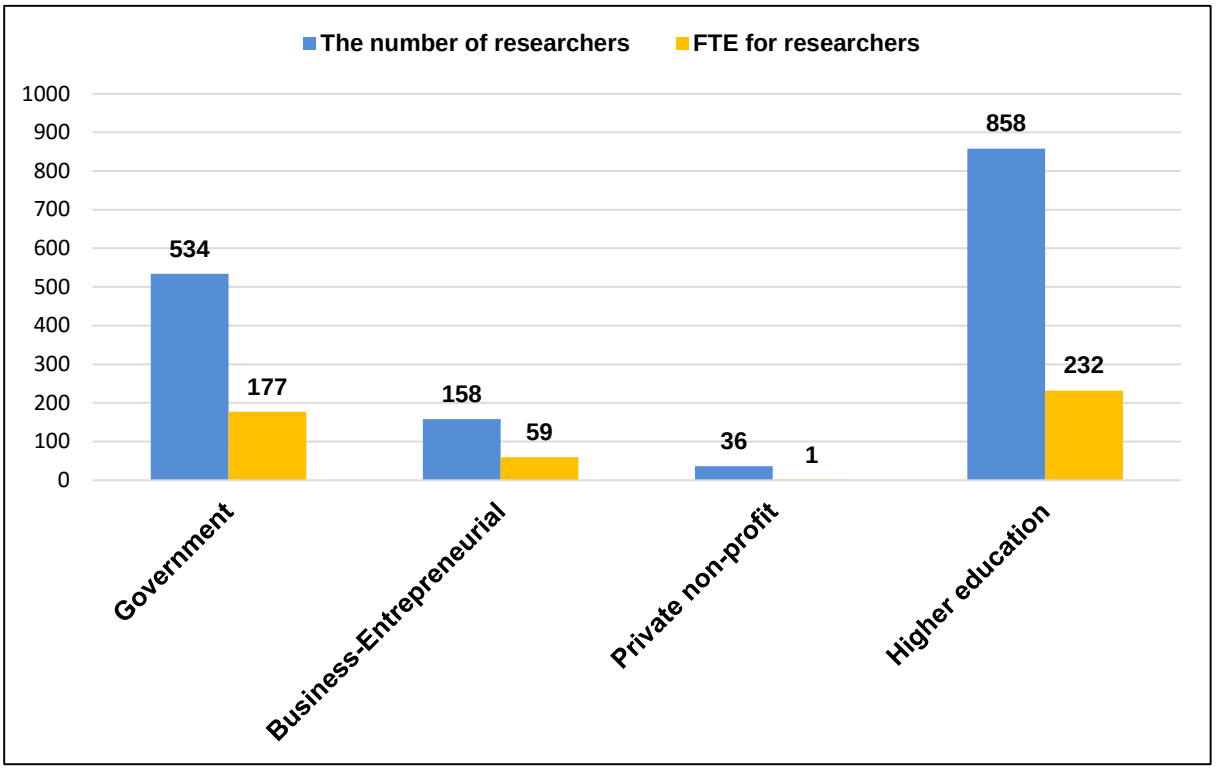


Chart 5 - The number of researchers by sector and gender

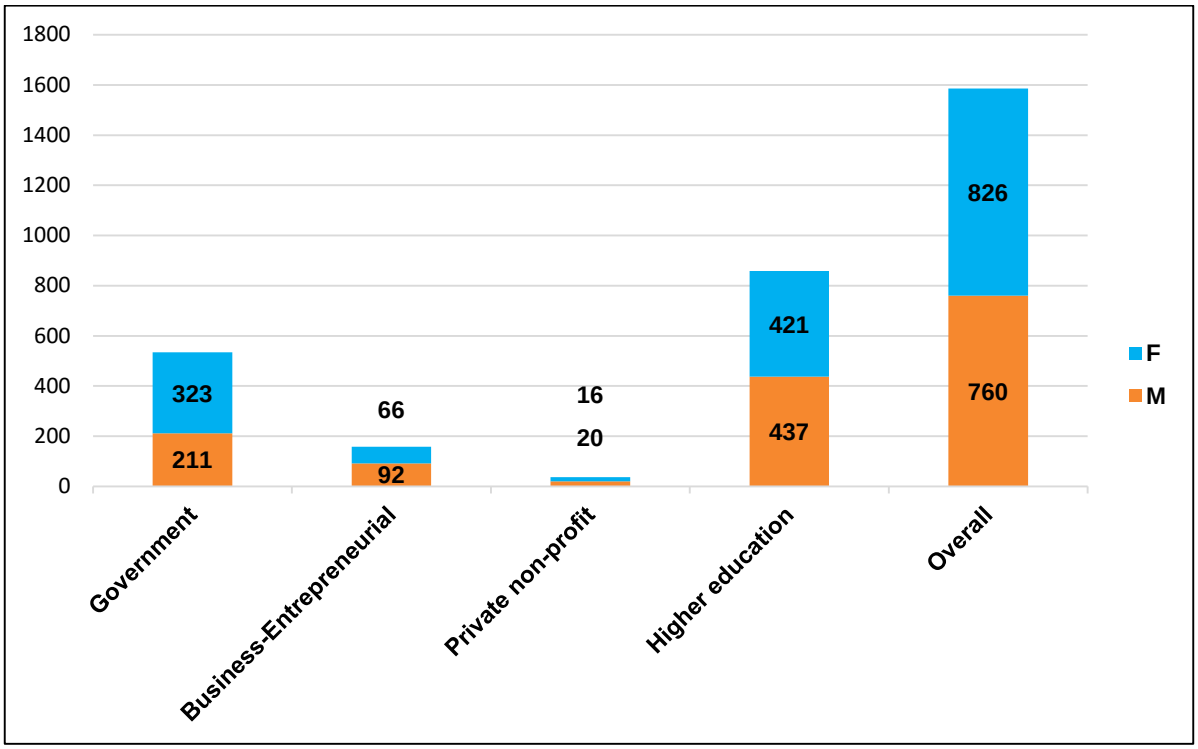
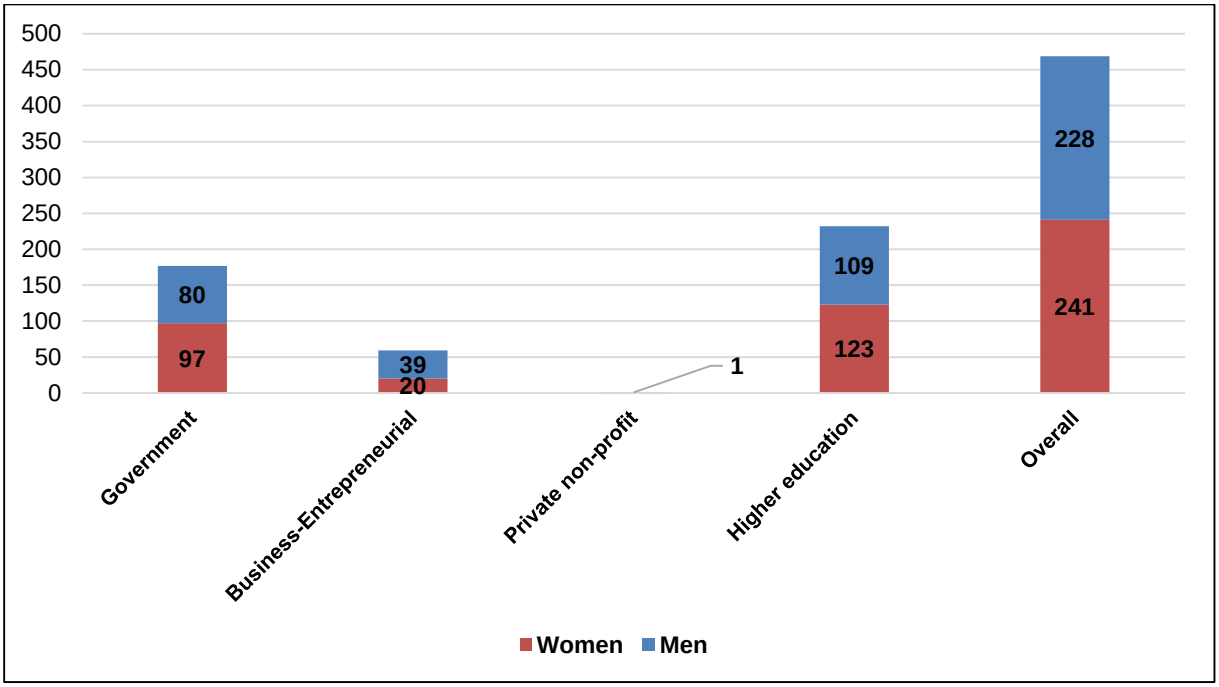


Chart 6 - Full-time equivalent for researchers by sector and gender



The following chart shows the comparative ratio of the number of researchers by the field of science and full-time equivalent (FTE), from which we can conclude that the largest number of researchers is in the field of social sciences. Researchers from the field of engineering are mostly involved in research and development.

Chart 7 - The number of researchers and FTE for researchers by field of science

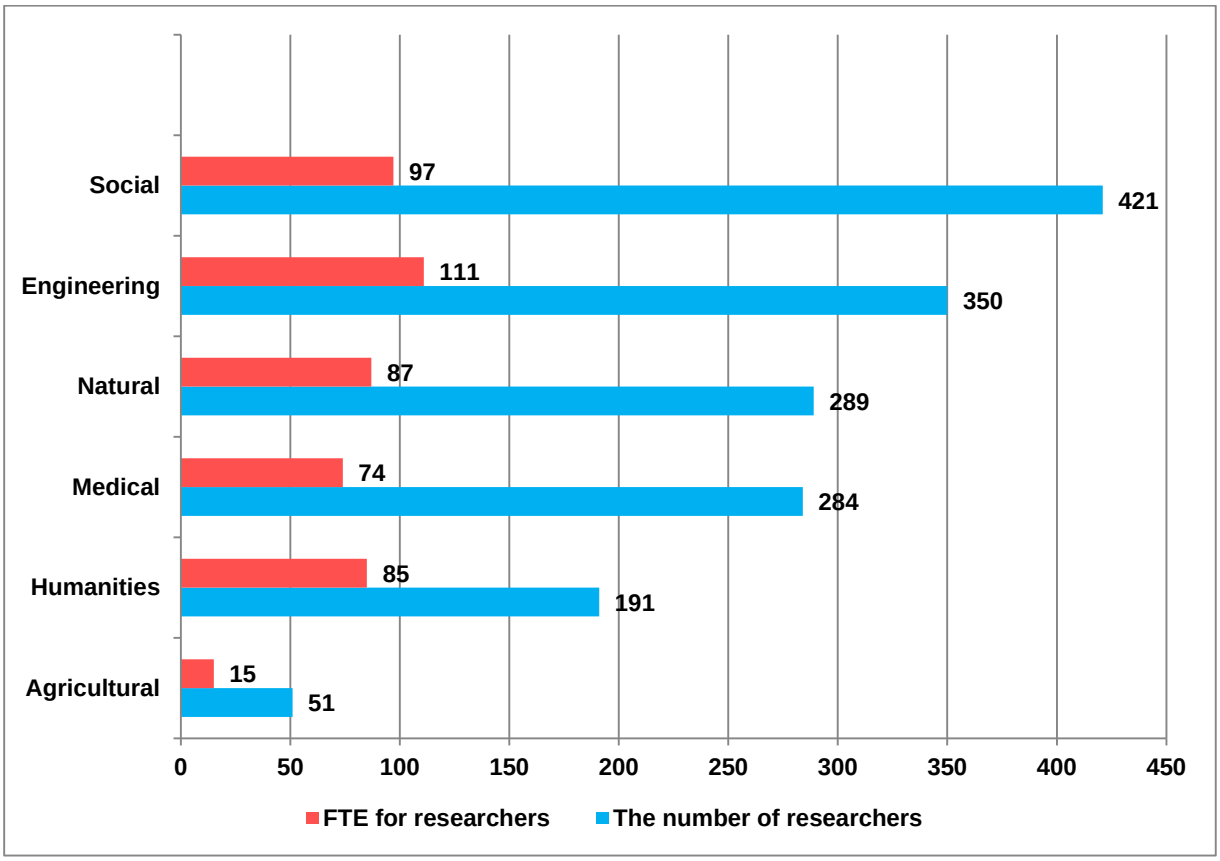


Chart 8 - The number of researchers by field of science and gender

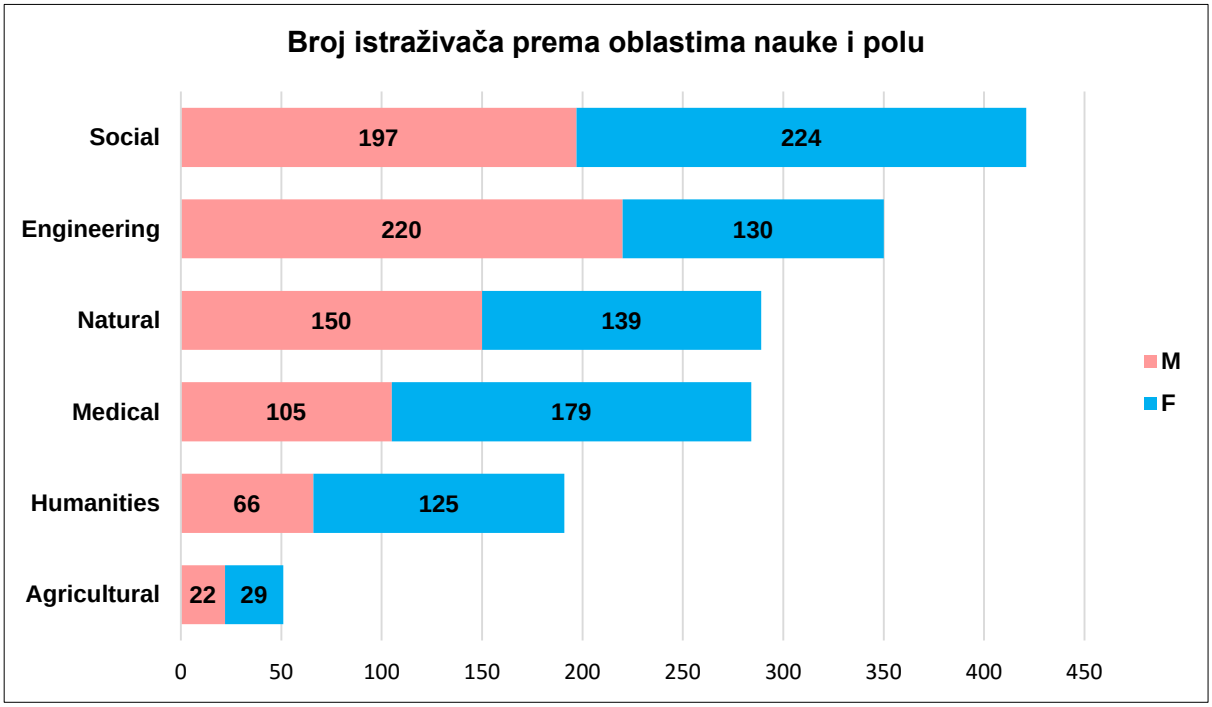


Chart 9 - Researchers by field of science and gender, in full time equivalent (FTE)

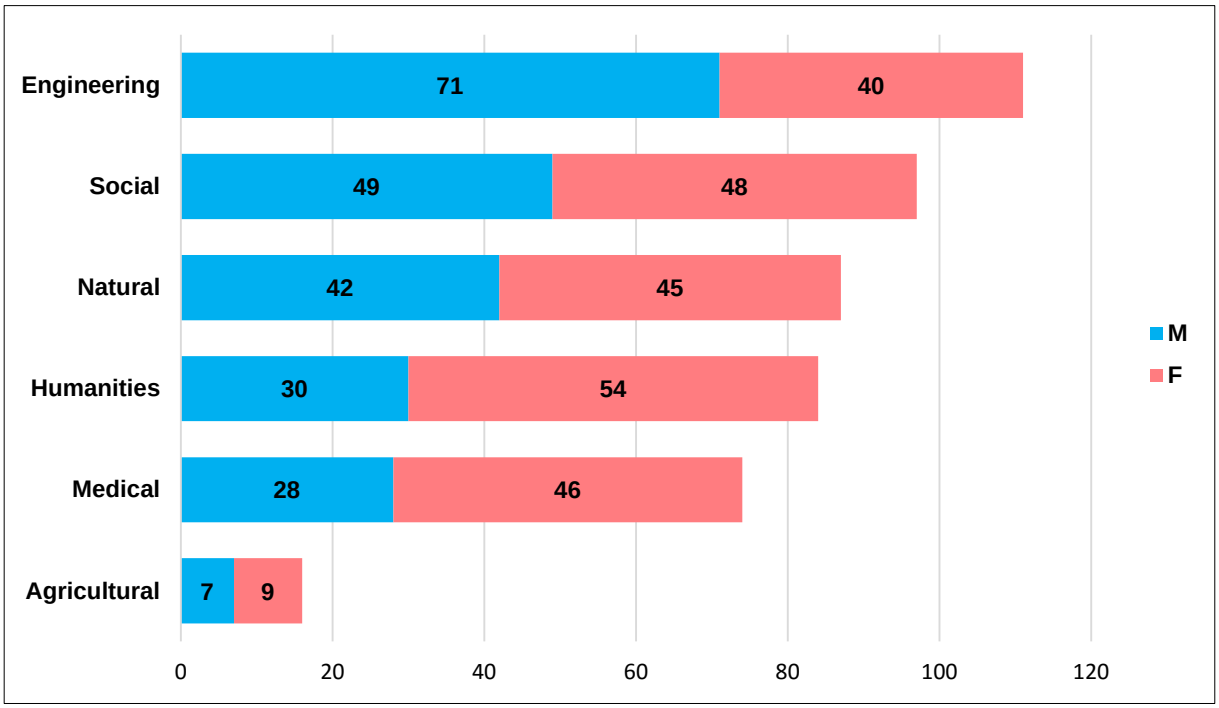
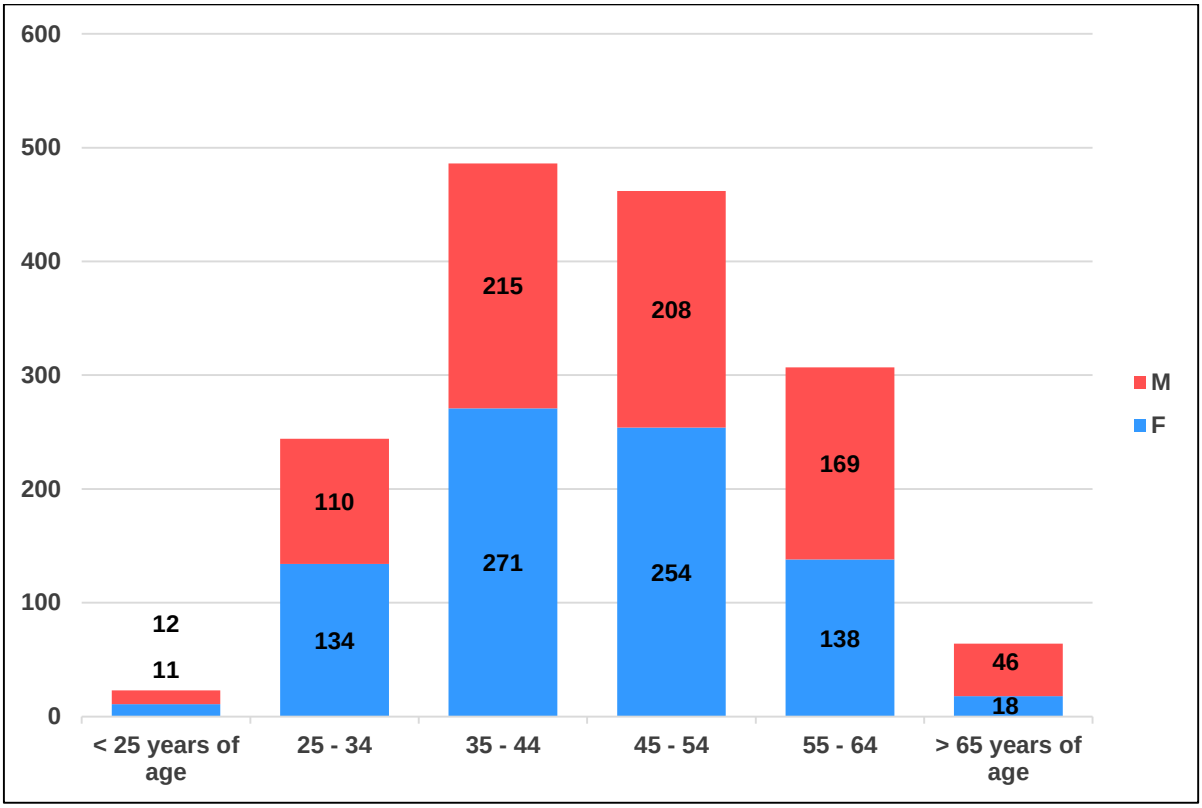


Chart 10 - The number of researchers by age and gender



The chart below shows the distribution of researchers by sector and ISCED level of education. Out of the total number of researchers, 779 researchers are with doctoral degree (ISCED 8), 634 with master's degree (ISCED 7), and 154 who completed the first higher education cycle (ISCED 6).

Chart 11 - The number of researchers by sector and ISCED level of education

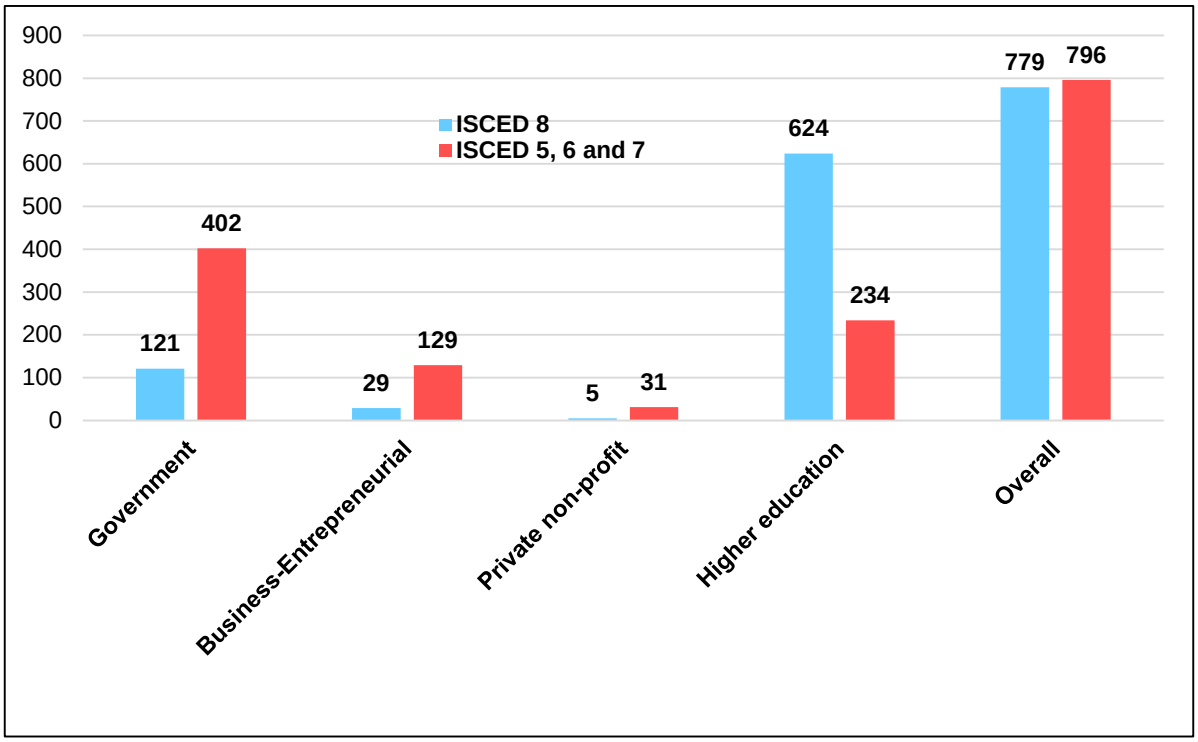
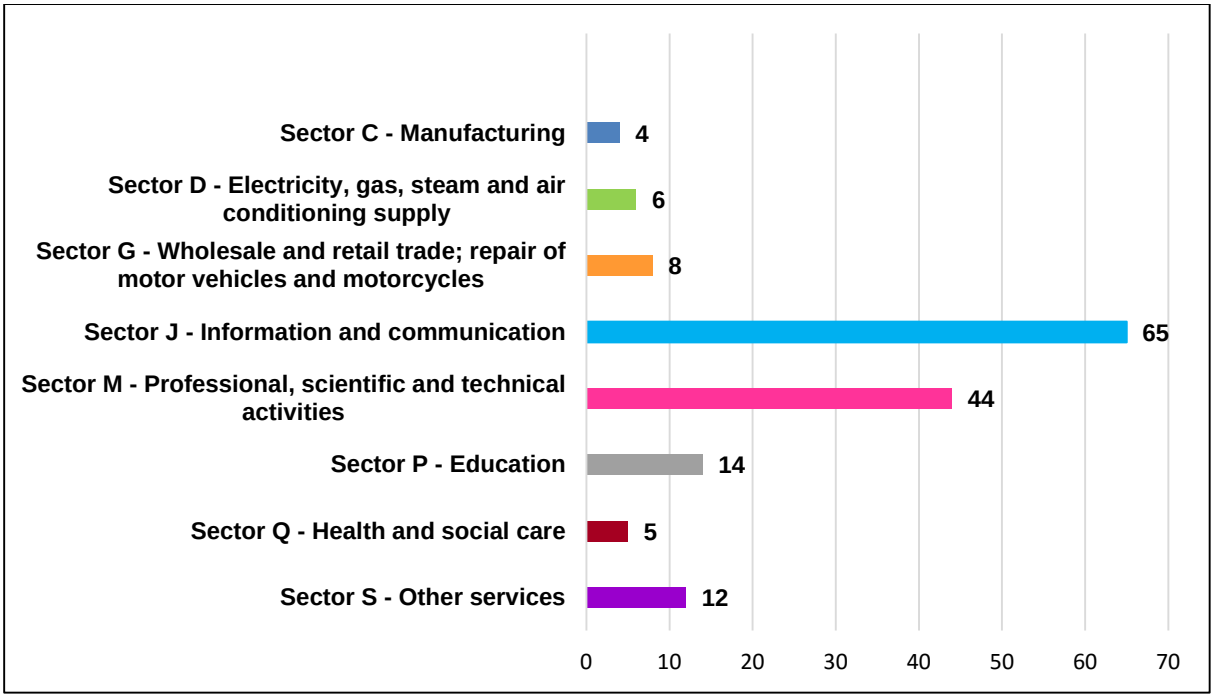


Chart 12 - The number of of researchers in the business-entrepreneurial sector by the field of economic activity

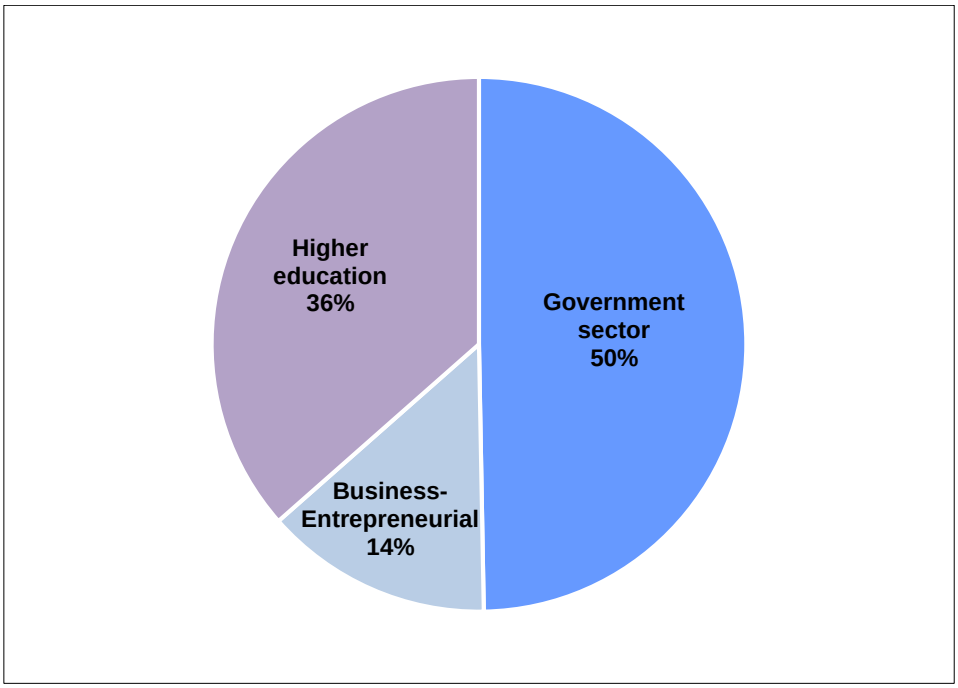


2. DATA ON SPENDING FOR RESEARCH AND DEVELOPMENT

Out of EUR 17,984,722 spent in total for research and development, EUR 13,810,584 accounted for current expenditures (77 %), while EUR 4,174,138 accounted for capital expenditures (23 %).

The chart below shows R&D spending by sector of implementation, indicating that the most of the funds marked for research and development in 2019 were spent in the government sector (50 %), follows sector of higher education (36 %) and business - entrepreneurial sector for 14 %.

Chart 13 - Spending on research and development by sector of implementation



The table and chart below show spending on research and development by the source of funding.

Table 1 - Expenditures on research and development by the source of funding (EUR)

Domestic funds by sector	**16,313,165.00**
Government	13,227,210.00
Business - entrepreneurial	2,119,448.00
Private - non profit	12,310.00
Higher education	954,197.00
Foreign funds	**1,671,557.00**
TOTAL EXPENDITURES FOR R&D	**17,984,722.00**

Chart 14 - Sources of funding for research and development

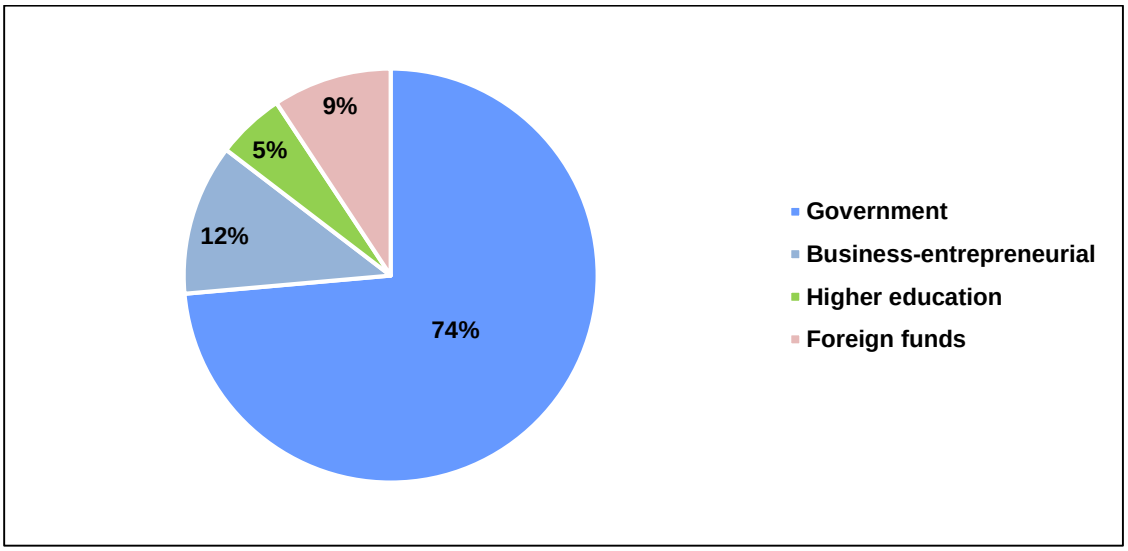


Chart 15 - Spent funds by type of research

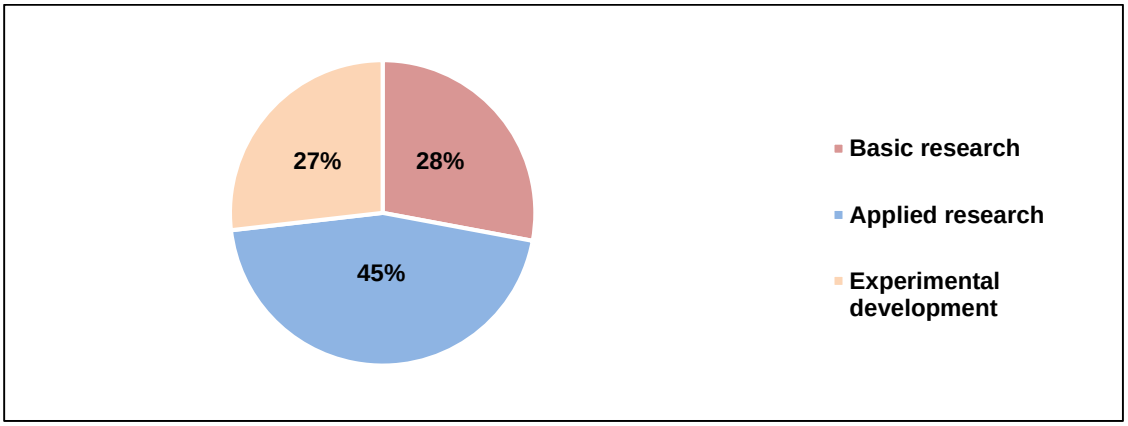
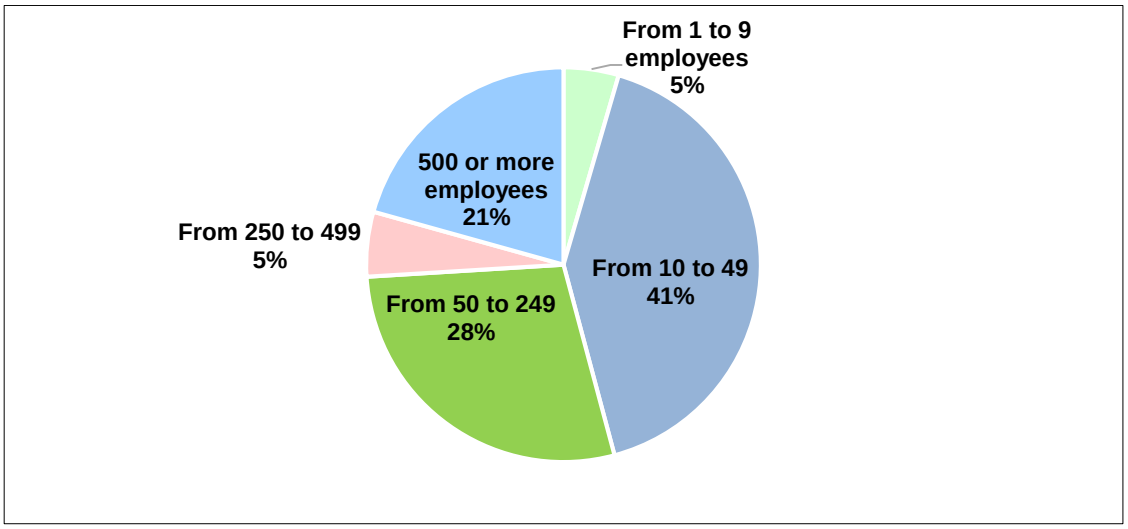


Chart 16 - Level of spending on R&D by the size of surveyed organisations



3. METHODOLOGICAL REMARKS

3.1 Legal basis

The legal basis for implementation of statistical surveys in the field of research and development in Montenegro has been established by the Law on official Statistics and official Statistical System (Official Gazette of Montenegro 018/12 and 047/19), the Five-Year Program on official statistics (2019 – 2023) and Annual Plan of official Statistics for 2020, which include the obligations arising from the process of accession of Montenegro to the European Union.

3.2 Aim and content of statistical survey

The aim of R&D statistics is to provide R&D data on the basis of input indicators – R&D staff, as well as R&D spending. The statistical data are collected through a national R&D survey, where all institutions active in the field of research and development submit data in the form of annual reports. The survey for 2019 was conducted by an electronic questionnaire fulfilled by surveyed organizations. The data are internationally comparable, and refer to human resources and gross expenditure on research and development (GERD).

3.3 Coverage

The survey covers statistical units that carry out research and development activities in the reporting year, within four sectors: government, business-entrepreneurial, private non-profit and higher education. The units are classified into sectors according to the legislation pursuant to which they have been established.

3.4 Statistical units

Statistical units are entities from the four sectors in which research and development activities are carried out. The 2015 Frascati Methodological Manual recommends that the statistical unit is the smallest homogeneous unit predominantly included in one of the six fields of science and for which a complete (or almost complete) set of input data can be provided. The examples of statistical units would include faculties, academies, medical clinics, research institutes, business development centres. A statistical unit is an organisation about which and for which R&D data are collected, which is engaged in research and development and has at least one researcher, permanently employed or as an external associate.

3.5 Directory of statistical units in research and development

The survey is based on the census principle, i.e. it includes all statistical units that have been identified as potential implementers of R&D activities in a given year. The directory of statistical units is created in the following manner:

a) All institutions from the register of licensed scientific research institutions (it includes units from all four sectors);
b) Units from the register of higher education institutions
c) Government sector units that have incurred R&D expenditures in the previous year. Examples of such statistical units are the Academy of Sciences, governmental agencies and offices, clinics, museums and other state authorities or local self-government bodies that are beneficiaries of the state or local budget;
d) Units in any sector that have used R&D government support programmes, or those that have participated in EU R&D programmes, or are otherwise known to engage in this activity.
e) Units that have participated in the statistical survey for the preceding year.

3.6 Basic concepts and definitions

For an activity to be an R&D activity, it must satisfy five core criteria, i.e. it must be:

1. novel
2. creative
3. uncertain
4. systematic
5. transferable and/or reproducible (Frascati Manual, OECD, 2015).

The main difference between R&D and non-R&D activities is the presence of novelty elements and the resolution of a certain scientific or technological ambiguity where the solution to a problem is not directly accessible to someone familiar with the basic corpus of knowledge and techniques in a particular field.

The results of scientific discoveries contain elements of authenticity and originality and are evaluated through publication in scientific publications or through testing in application. (Law on Scientific Research Activity).

Scientific research activity encompasses: basic research, applied research and experimental development.

Basic research consists of theoretical and experimental work performed primarily with a view to acquiring new knowledge or discovering new areas of research.

Applied research implies creative work performed for the sake of targeted application of the results of basic research in certain areas of science.

Experimental development means systematic work based on the application of results of research or practical experience and the creation of new knowledge aimed at design of new or improvement of existing products or processes.

3.7 R&D staff

R&D staff includes all persons employed directly on tasks of R&D, as well as those who provide services related directly to R&D. The staff engaged in R&D activities includes researchers, technicians and supporting staff.

Scientific research activities are performed by persons with research titles and persons with scientific titles, in accordance with the Law on Scientific Research Activity of Montenegro, as well as by persons who have been awarded academic and associate titles in a higher education institution. Scientific research activity may also be performed by a person holding a university degree, master's degree and doctoral degree who has not been awarded a research or scientific title within the meaning of the above Law, provided that he/she has references underpinned by published scientific papers that enable him/her to perform scientific research activity. Doctoral students are also included in the category of researchers. In the broadest sense (Frascati Manual 2015), researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software or operational methods.

Technicians cooperate directly with researchers, performing professional or technical tasks related to scientific research and development tasks (laboratory technicians, engineers and engineering technicians, drafters, librarians, curators, documentarians, IT professionals, proof-readers, etc.).

Supporting staff deals exclusively or mainly with organisational, administrative, legal, or financial affairs (managers, lawyers, treasurers, secretaries, etc.) in relation to R&D activities.

Headcount (HC) of R&D personnel – A variable that measures the total number of persons employed (mostly or partially) in R&D positions. The survey records all persons potentially involved in R&D, even if their activity in a given year amounted to zero. In this way, the stability in monitoring of the total R&D staff is achieved, while the following variable

indicates their actual activity within a year, which often depends on changeable circumstances (obtaining funds for a project, concluding a specific market contract, etc.).

Persons employed in R&D, full-time equivalent (FTE) – is a term that expresses the intensity of staff engagement in R&D. If a person is engaged on R&D 100 % of their working time, the corresponding full-time equivalent is 1 person-year. If a person usually spends 30% of his/her working time on R&D tasks and the rest on other duties (e.g. teaching, administration, consultations with students), the full-time equivalent is 0.3. Similarly, if an employee annually spends only six months on R&D tasks, with full-time engagement, the full-time equivalent is 0.5.

The survey proposes one of four ways to determine the intensity of engagement in R&D (i.e. FTE coefficient):

- definition in a specific legal act,
- staff self-assessment with records system in place,
- organisational unit management assessment,
- institution management assessment

The survey has established limits for recording staff activity coefficient at between 0.1 and 0.9 (i.e. values below 0.1 = 0; values above 0.9 = 1).

3.8. R&D activity expenditure

R&D expenditure includes all R&D expenditures incurred by the reporting unit in the reporting period, regardless of the source of funding. Both current and capital expenditures are included.

The aggregation of data on expenditures received from reporting units within all four sectors results in data on gross domestic expenditure on research and development – GERD, which is the basic data indicator for international comparisons of R&D spending.

Expenditures are also classified by source of funding, so it is possible to produce data on spending from domestic and foreign sources.