



MINISTRY OF SCIENCE
MONTENEGRO

COMMUNICATION

Statistics on Research and Experimental Development R&D, 2015

Preliminary data

Data presented in this communication are the result of data processing from two sources:

1. Montenegrin Science Network, information system managed by the Ministry of Science, which gathers data about personnel, institutions and research projects, from the licensed research institutions (www.naucnamreza.me). The data are kept by individual researchers themselves (for personnel data) and accredited representatives of research institutions (for institutional data).
2. Annual reports collected from other subjects in the country active in the field of R&D, through the National survey on R&D, for units which don't keep their R&D records in the first source.

R&D Statistics enables internationally comparable data about expenditure on R&D and personnel in R&D, which are marked as input indicators on R&D. The data are collected according to the needs of the Government of Montenegro, and the EU requirements laid down in the regulation on statistics of science and technology (995/2012). Statistical process follows the methodological guidelines defined in Frascati Manual – Guidelines for collecting and reporting data on research and experimental development (OECD 2002 and 2015). By the Programme of statistical surveys for 2016 of the Government of Montenegro, Ministry of science was established as the official collector and producer of R&D statistics.

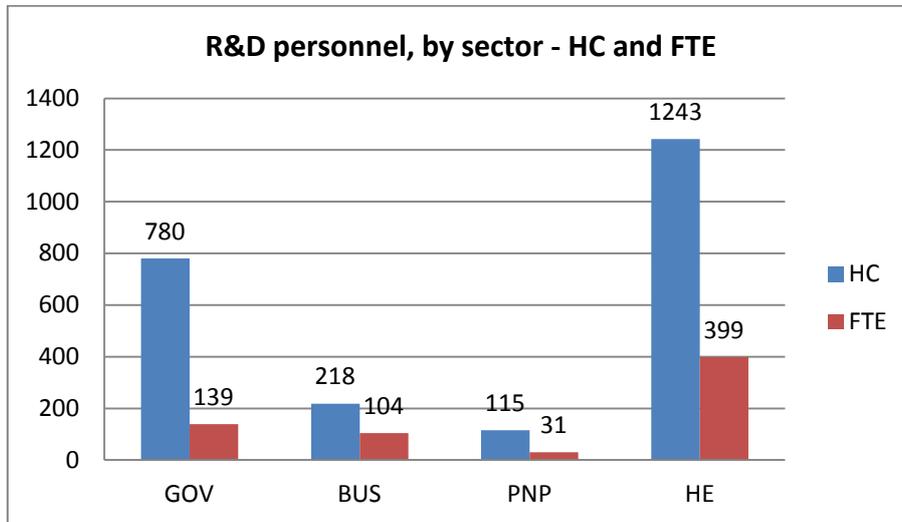
Data are collected from statistical – reporting units, performers of R&D, based on their financial and human resources evidence. Data were collected from 79 units from 4 sectors of performance: 44 from higher education, 11 government, 16 business and 8 private non-profit sector.

Key results of this survey show that:

- Gross domestic expenditure on R&D for 2015 is 0.38% of GDP¹, i.e. **13.667.834 EUR**.
- In 2015, **2356 people** in institutions, organizations and enterprises were engaged on R&D jobs, **among whom 1766 researchers, 386 technicians and equivalent staff and 204 other support staff**.
- Accounting that the R&D jobs among majority of personnel are only a part of their working engagement, full-time-equivalent is an important indicator of intensity of work on R&D. Accordingly, there was a **full-time-equivalent of 673 people** on R&D jobs in 2015.

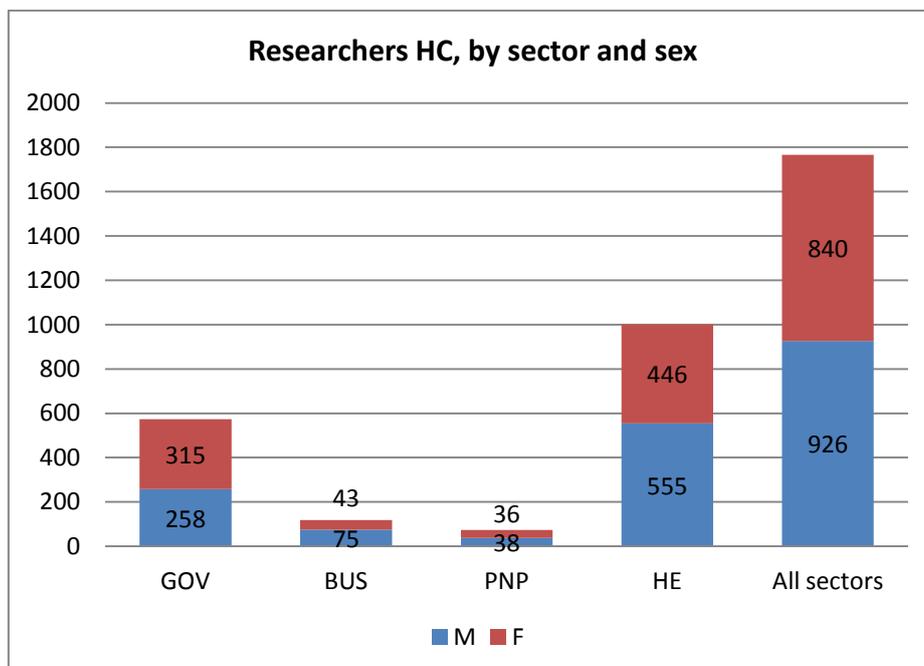
The lower graphic shows the ratio of R&D personnel as headcount and FTE.

¹ GDP (current prices) for Montenegro in 2015, amount to 3 624 734 000 EUR.



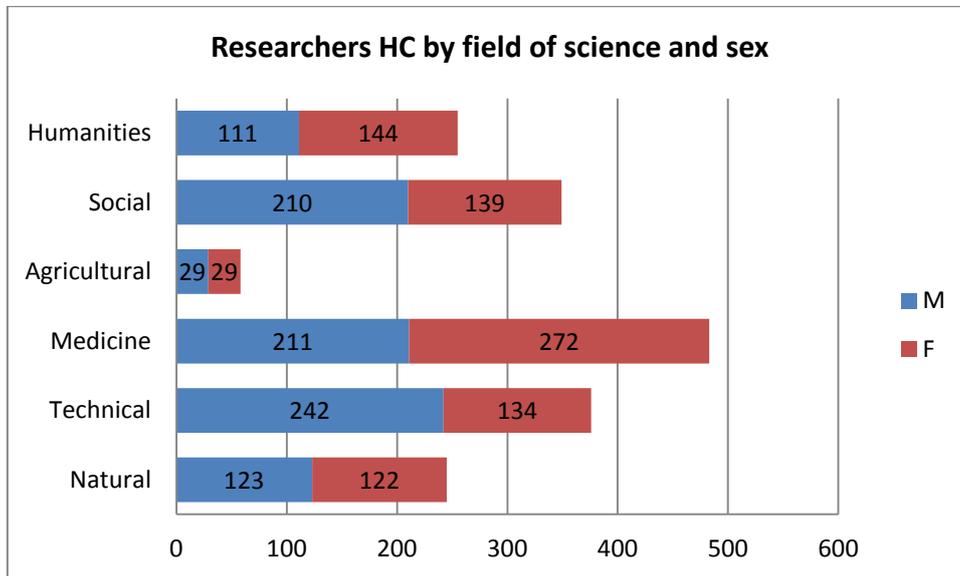
Personnel data

- There were 1766 key personnel, i.e. researchers, in 2015, among whom 849 researchers with PhD (ISCED 8), 745 with master degree (ISCED 7) including PhD students, and 172 researchers with completed first cycle of higher education.
- Of total number of researchers, 840 are women and 926 men. The graph below shows their distribution by sector of realisation.

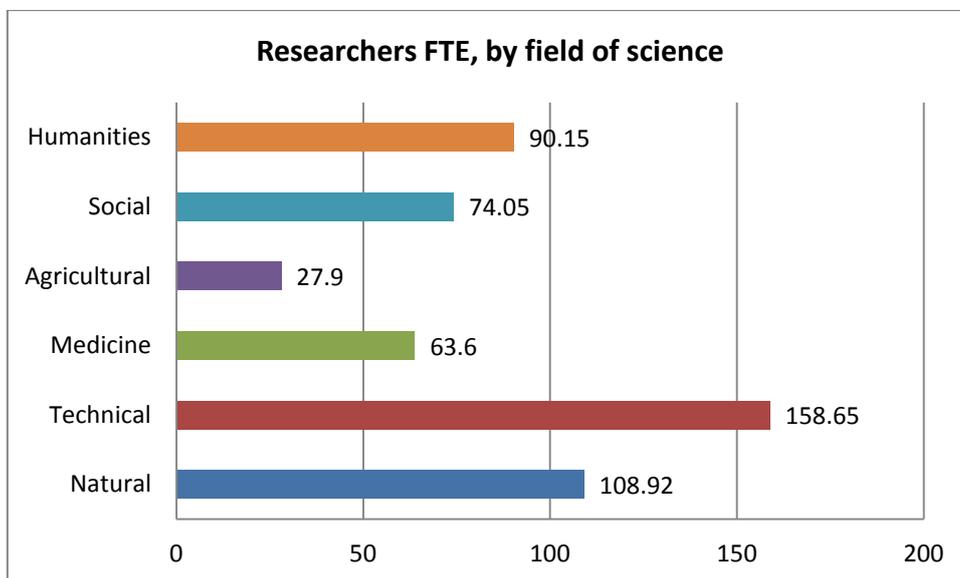




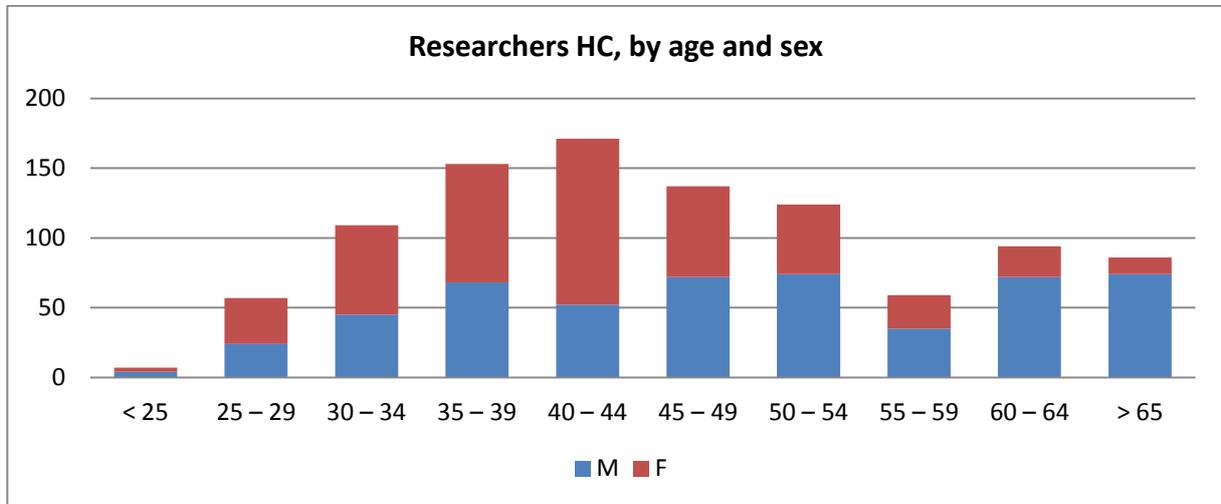
- The graph below shows the distribution of researchers by field of science and sex:



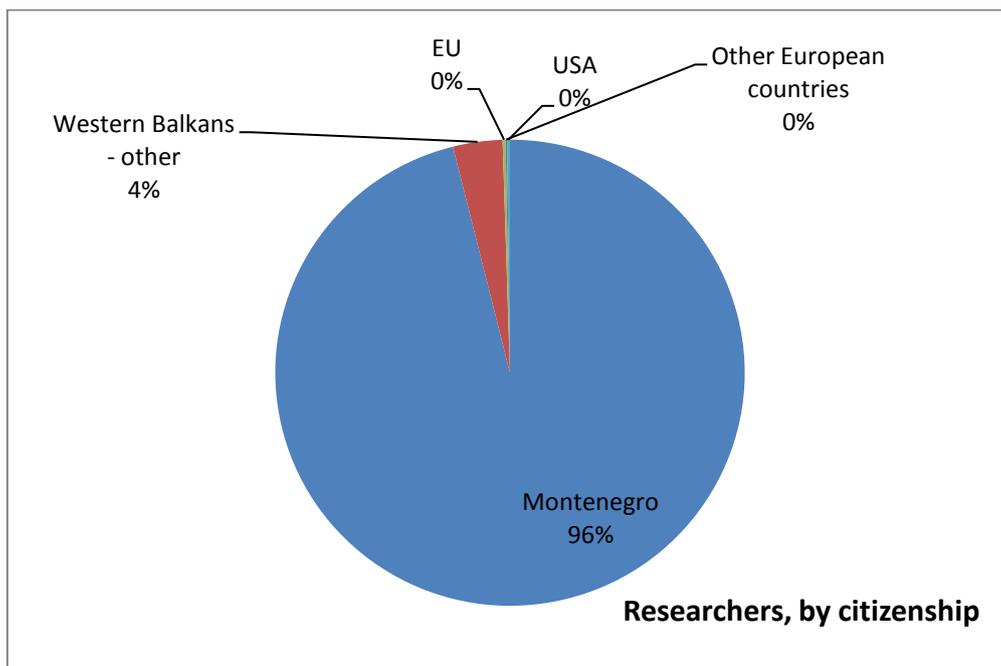
- The graph below shows the distribution of researchers as full-time-equivalent, by fields of science. Comparison among number of researchers HC (graph above) and FTE indicates the difference in intensity of research work, depending on the field of science.



- Based on the data from source Science Network (56% of statistical population) the distribution of researchers by age is shown in the graph below:



- Based on the source of data "Science Network", the distribution of researchers by citizenship is given in the graph below:



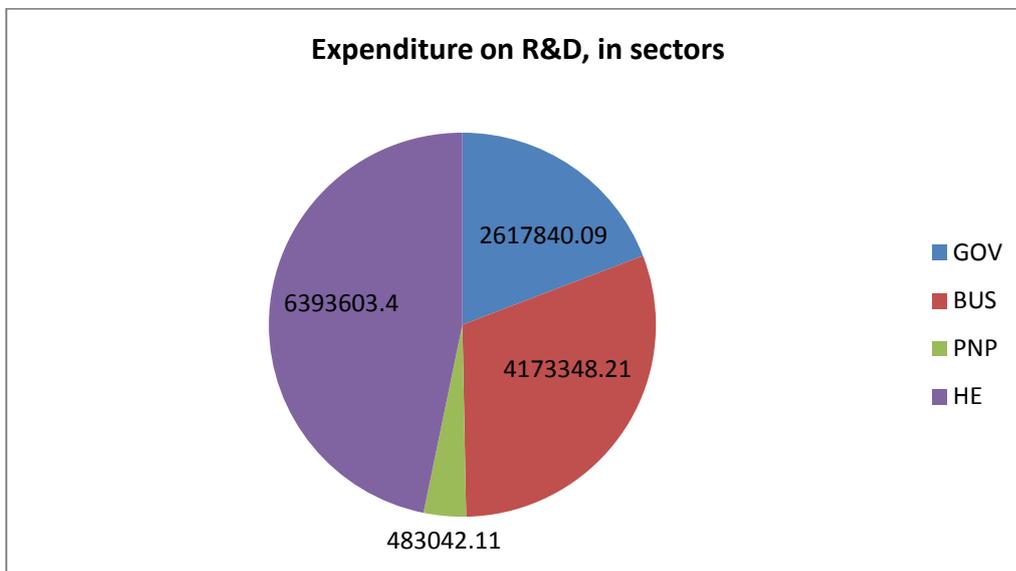


Data on expenditure

- From total expenditure of 13.667.834 €, we have 5.404.323 € marked as institutional R&D spending, 2.647.254 € as spending on projects, while for 5.616.257 € we don't have segregated data on those two categories.

- Total expenditure is split on 10.985.046 € for current costs (80%) and 2.682.788 € for capital costs (20%).

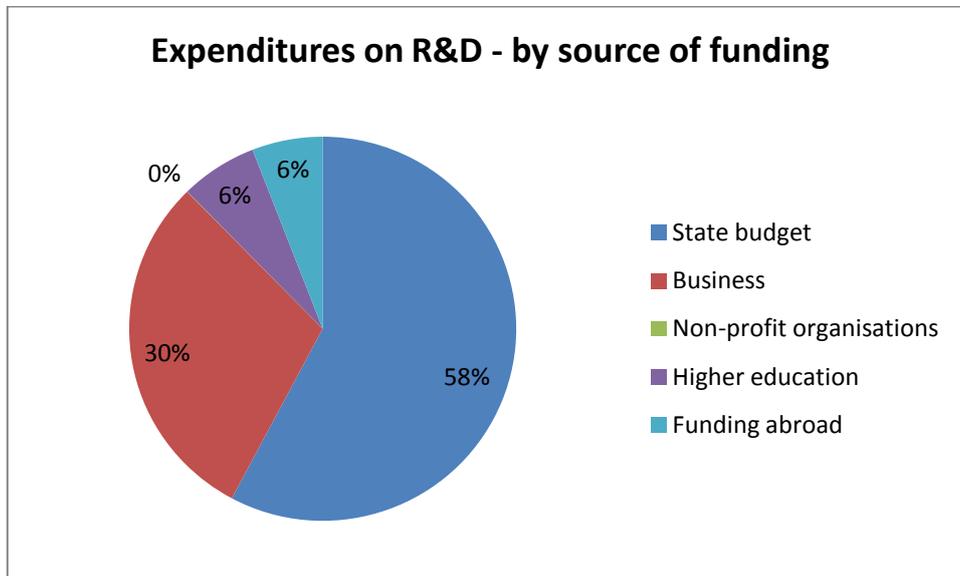
- The graph below shows R&D expenditure inside sectors of realization, and it indicates that almost half of R&D activity was carried out in the higher education sector (47%), followed by business sector (30%).



- As far as the sources of funding for R&D in 2015 are concerned, the majority of expenditures was covered from the state budget (58%). The table below shows the amounts financed from each group of sources, while the graph shows their distribution.

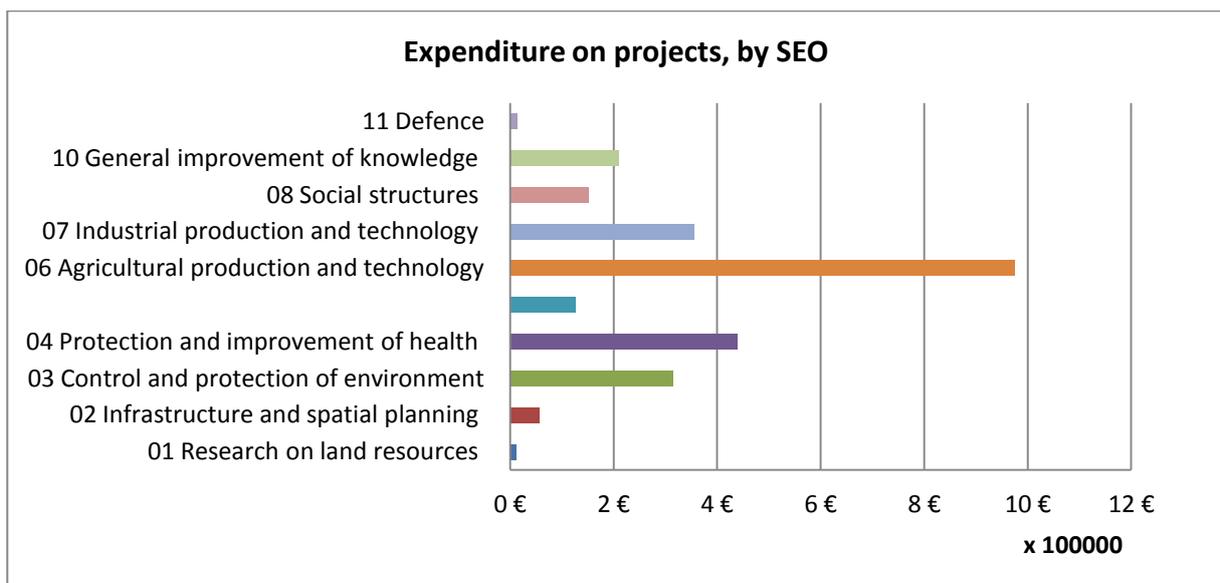
Expenditures on R&D - by source of funding (€)

Domestic funding	12860118.29
State budget	7897703.79
Business	4080570.05
Non-profit organisations	3125
Higher education	878719.45
Funding abroad	807715.72



- In 2015, there were 137 scientific-research projects going on in Montenegro, for which an amount of 2.647.254 € was spent during the year. 79% of expenditures was on projects of applied research, 12% basic and 9% experimental development.

- The graph below shows the distribution of expenditures on projects, by socio-economic objective. The biggest portion of resources was directed towards projects with the objective of Agricultural production and technologies, followed by Protection and improvement of health, and Industrial production and technologies.





Methodological notes

1. Legal base

Legal base for conducting statistical surveys for the field of research and experimental development (R&D) in Montenegro is established in the Law on statistics and statistical system of Montenegro „Off. Gazette of MNE“ no 18/12, 5-year and Yearly plans of statistical surveys of the Statistical Office of Montenegro, which includes obligations deriving from the process of accession of Montenegro to the EU. By Yearly plan of statistical surveys for 2016, Ministry of Science was designated for the first time as the state administration body responsible for collecting, processing and production of statistical data on R&D. The task was taken over from the Statistical Office which produced statistics up until the data for year 2014.

Methodological solutions, standards (classifications, nomenclature, definitions etc.) and forms needed for the survey in 2015, were defined by the Ministry of Science, which harmonises them with the existing national and international standards..

2. Aim and content of statistical survey

The aim of R&D statistics is to provide data on the basis of input variables – personnel engaged on R&D jobs and expenditures on R&D activities. The statistics is collected through two sources: 1) information system “Montenegrin Science Network” (www.naucnamreza.me) in which the licensed research organizations are obliged to keep the R&D record, and 2) National survey on research and experimental development, which enables institutions active in the field of R&D to provide annual reports to the Ministry of Science. By aggregating the data from these two sources we are able to produce internationally comparable data (human resources and GERD).

Expenditure on R&D as % of GDP (R&D intensity) – GERD is one of the structural indicators to be analysed by the Ministry of Science and the Government of Montenegro, against the strategically set goals of expenditure on R&D.

3. Scope

The survey covers statistical units which performed R&D activity in the 4 sectors of economy: government, business, private non-profit and higher education. Units are placed to sectors based on the legislation by which they were established, and for units from business sector the check of their sources of income was carried out (budget / market).

4. Statistical units

Statistical units are made of entities from all 4 sectors, in which activities of R&D are performed. Methodological guidebook Frascati (§ 225, 2002.) recommends that statistical unit is "the smallest homogeneous unit predominantly involved in only one of the six fields (of science) and for which a complete (or almost complete) set of factor input data can be obtained". Faculties, academies, medical clinics, research institutes, development centres in enterprises are examples of statistical units. The statistical unit which is involved in R&D has at least one engaged researcher, be it fully employed or external contributor.



5. Adress book of statistical units in R&D

The survey is based on census, i.e. it covers all the units which are recognized in one year as possible performers of R&D activity. The address book is created in the following way:

- a. All units from the Register of licensed research institutions of the Ministry of Science (there are units from all 4 sectors here);
- b. Additional units from the Register of accredited higher education institutions kept by the Ministry of education (apart from those licensed at the Ministry of Science), so that the survey covers all the higher education institutions;
- c. Units from the government sector which had expenditures on research and development in the previous year, as recorded in the Ministry of Finance (apart from those licensed at the Ministry of Science). Examples of such statistical units are Academy of Sciences, agencies and bureaus of the Government, clinics, museums and other public or local governance bodies and institutions which are users of the state or local budgets;
- d. Additional units from the business sector which reported expenditure on research in the previous year to the Tax Administration Authority (apart from those licensed at the Ministry of Science). From the list provided by the Tax Administration, units which by their principal field of activity are not usual performers of R&D (e.g. trade, sports, entertainment, transport etc.) are removed, as well as the units which reported expenditures on research smaller than 2000 €.
- e. Units from any sector which used support programmes for R&D of the Ministry of Science, participated in EU programmes for R&D, or which are in any other way known to be R&D performers.
- f. Units which participated in statistical surveys for previous years.

6. Basic definitions

Creative activity on scientific discoveries, application and exploitation of scientific results, training of researchers for scientific research work and career development of researchers are considered as scientific research activity. (Law on Scientific-research Activity, Offic. Gazz. of MNE 80/10, 40/11, 57/14)

Types of R&D

Scientific research activity encompasses: basic (fundamental), applied and developmental research. Scientific research activity enables training of researchers for scientific research work.

Basic research consists of theoretical and experimental work performed primarily with a view of gaining new knowledge or discovering new areas of research, with long term goals of application.

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

Developmental research is creative work based on the results of applied research, undertaken with a view of development of new technologies, production of new or improvement of existing materials, products and devices, or introduction of new or improvement of existing procedures, systems and services.



Results of scientific discoveries must contain elements of authenticity and originality and are valued by publication in scientific papers or testing in application. (Law on SRA).

The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty, i.e. when the solution to a problem is not readily apparent to someone familiar with the basic stock of common knowledge and techniques for the area concerned. (FM2002)

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

- novel
- creative
- uncertain
- systematic
- transferable and/or reproducible. (FM2015.)

7. Personnel in research and development

R&D personnel includes all the persons employed directly on R&D jobs, as well as those providing services directly connected to R&D. Personnel includes persons employed at the unit or external collaborators if they are engaged on R&D jobs.

RESEARCHERS –

Scientific research activity is performed by persons with research ranks and scientific ranks, in accordance with the Law on SRA, as well as persons elected in academic and associate ranks at the higher education institutions. Scientific research activity can be performed also by a person with higher education, master or doctoral degree, who is not elected in research or scientific rank, in the sense of the law, but has got references on the basis of publicized scientific works, which allow the performance of scientific research activity.

Students at the level of doctoral studies are included in the category of researchers.

In a wider sense, (Frascati 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 AND EQUIVALENT STAFF directly collaborate with researchers performing expert or technical tasks connected with research and development jobs (laboratory technicians, engineers or technicians from technical sciences, drawers, librarians, curators, IT experts, lectors etc.).

OTHER SUPPORTING STAFF is exclusively or dominantly involved in managerial, legal, administrative or financial jobs connected to R&D activities (managers, accountants, legal advisors etc.).

Personnel in R&D, Head count - HC – Variable which measures total number of persons employed (dominantly or partially) on R&D jobs. The survey makes evidence of all the persons potentially involved in R&D, even if their activity in a given year was 0. In this way we ensure stability in following the total number of personnel in R&D activity, while the next variable described indicates their actual engagement on R&D in one year, which often depends on highly fluctuating factors (provision of project funding, contracting on the market etc.).



Personnel in R&D, Full-time equivalent FTE – It is a construct which expresses the intensity of engagement of personnel on R&D jobs. If a person is 100% of his/her time engaged on R&D, the corresponding FTE is 1 person-year. Accordingly, if a person usually spends 30% of his/her working time on R&D tasks and the rest on other tasks (e.g. teaching, administration, student consultations), then FTE is 0.3 person-years. Similarly, if an employee has worked only 6 months in a year, full time on R&D, the FTE will be 0.5 person-years.

The survey suggests one of three ways of establishing the intensity of work on R&D (i.e. coefficient of FTE):

- Self assessment of personnel
- Estimation of the managers of the organizational unit
- Estimation of the management of the organization

The survey has established limits of registering coefficient of engagement of personnel, among 0.05 and 0.9 (i.e. below 0.05=0, above 0.9=1).

8. Expenditure on research and development activities

Expenditure on R&D are all expenditures on these activities made within the reporting unit, no matter the sources. Current and capital expenditures are included.

Based on the data on expenditures provided by the reporting units from all the four sectors, by aggregation we arrive to the indicator of Gross expenditure on research and development in the country. GERD is the fundamental indicator for international comparisons on R&D expenditure.

Data are segregated by sources of funding so that it is possible to distinguish among expenditure from domestic sources and from foreign sources.

In the present survey it was possible to produce analytical data on expenditure by types of research and socio-economic objective only from one source of data (Science Network).