

Research and Experimental Development (R&D) 2023 in the Higher Education Sector

Guidelines for the questionnaire with definitions and classifications

Part 1 R&D Activity

1.1 Type of R&D activity

Please specify the percentage breakdown of the unit's R&D in 2023 by type of R&D activity. The percentages should add up to 100%.

[OECD's definition of R&D \(Frascati Manual\)](#). For description of the sector consult chapter 9.

Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.

Which R&D activities are covered?

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

Experimental development is systematic work drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

What is and is not R&D?

It can be difficult to distinguish between R&D and other related activities. In the higher education sector, it is particularly demanding to differentiate R&D from education, training, and specialized health care. There are several important criteria that must be satisfied in order to classify an activity as R&D. The activity must be **novel, creative, uncertain, systematic, transferable** and/or **reproducible**.

Examples of R&D activities:

- research training and special R&D scholarships
- supervision as a part of a specific R&D project
- PhD projects
- collection and processing of data/statistics for scientific purposes
- indirect support activities in R&D-performing units, e.g., management and administration
- theoretical studies of factors determining regional variations in economic growth and development of a model to improve public regional policy
- special programmes of blood tests for patients taking a new drug

These activities are not R&D:

- education and continuing education
- routine collection of general data, e.g., quarterly registration of unemployment or market surveys
- general purpose statistics, collection of material for museums and geological, geophysical, hydrological and oceanographic data
- studies of public policy, planning, etc. which investigate phenomena, relationships, structures, etc. that were researched previously
- routine testing performed by healthcare professionals, e.g., blood samples or bacteriological samples
- ordinary medical therapy that does not involve the development of new treatment methods

These activities may be R&D: Pedagogical or artistic experimental development, writing proposals, supervising, participating in conferences, and other similar activities may be considered as R&D if they follow the definition and meet the five above-mentioned criteria.

In the survey we ask the heads of the units to estimate the R&D percentage of the activities, because we believe them to possess the best knowledge of the unit's activities. This information is not available in other data sources.

1.2 Field of research and experimental development (FORD)

Please specify the unit's field of research and experimental development in 2023. Choose field(s) from the drop-down list and enter the percentage of R&D in the table below. The percentages should add up to 100%.

Fields of research and experimental development in the drop-down list:

Humanities and the arts

Languages
Literature
Cultural studies
History
Archaeology
Folklore studies, ethnology
Musicology
Art history
Architecture and design
Religion and theology
Philosophy and ethics
Film studies
Theatre science
Visual arts
Performing arts and film
Music performance and composition
Not elsewhere classified – humanities and the arts

Social sciences

Economics
Sociology
Urbanism and planning
Political science and organizational theory
Social anthropology
Psychology
Education
Human geography
Demography
Media studies and journalism
Library and information science
Social science of sport
Law and criminology
Social work
Gender studies
Not elsewhere classified - social sciences

Natural Sciences

Mathematics
Informatics
Physics
Earth sciences
Chemistry
Biological sciences
Not elsewhere classified - natural sciences

Engineering and technology

Mining and petroleum sciences
Materials science and engineering
Construction technology
Electrical engineering
Information and communication technology
Chemical engineering
Machine engineering
Marine technology
Biotechnology
Food technology
Environmental technology
Medical technology
Nanotechnology
Industrial and product design
Not elsewhere classified – engineering and technology

Medical and health sciences

Basic medical/dental studies
Clinical medical subjects
Health sciences
Clinical dentistry
Sports medicine
Not elsewhere classified - medical and health sciences

Agricultural and veterinary sciences

Agricultural science
Fishery
Veterinary medicine
Not elsewhere classified – agricultural and veterinary sciences

1.3 Internationalisation

The respondent is asked to estimate the percentage of the unit's total R&D activity that is related to international project cooperation.

What is international project cooperation?

International project cooperation includes project cooperation with researchers from foreign research institutions or companies; cooperation that supports inbound or outbound mobility; international incentives, or specific measures to make Norway an attractive host country for international research cooperation.

1.4 Industry relevance

The respondent is asked to estimate the percentage of the unit's total R&D activity that is relevant for industry. R&D activities are relevant for industry if their results are expected to have an immediate or future value for industry.

Examples of industry relevant R&D:

- A social science institute analyses teamwork during organizational changes.
- A unit within natural sciences participates in an EU project and develops effective calculation models for weather forecasts that can be commercialized later.
- Researchers at a veterinary unit develop a new vaccine for farmed cod.

Part 2 Sources of Funds

For most of the respondents, the questionnaire is already prefilled with accounting data that are reported by the central administrations of the educational institutions (the public educational institutions report to the Norwegian Directorate for Higher Education and Skills). The accounting data include both basic funding (question 2.1) and external funding (transfer and exchange funds, question 2.2). Please consult <https://www.ssb.no/innrapportering/uohsektor> (in Norwegian) for more information on accounting data in the R&D statistics.

2.1 Basic funding and share of R&D

How much of the basic funding from the Ministry of Education and Research or other granting Ministry did the unit spend on current expenditure and capital expenditure (i.e. expenditure on machinery and equipment) in 2023? Please fill in the expenditure or correct the prefilled accounting data.

Provide estimates for R&D percentage of expenditure

The R&D percentage of current expenditure reflects how much of the activity that classifies as R&D. The R&D percentage of expenditure on machinery and equipment depends on the use. The R&D share can be 100 per cent if the equipment is used for research purposes only, or lower if the equipment is also used in other activities (teaching, testing and quality control). Please consult section 1.1 for the definition of R&D.

Current expenditure/operating costs include account classes 6 and 7, except overhead costs such as electricity, rent and maintenance, account groups 60, 62, 63 and 66. Some institutions also include costs in series 9.

Examples: journal subscription fees, conference trips, own spending in external projects.

Capital expenditure/machinery and equipment cover the expenditure in the current accounting year (except depreciation). The post includes large instruments and equipment used in R&D activities.

Examples: medical devices, electron microscopes, chemical analysers, biobanks, computer software, licenses, purchase of large book collections, equipment in new research units.

Minor laboratory equipment and common PC software belong to current expenditure. Educational institutions may record machinery and equipment under different accounts. All the relevant accounts should be included in the total.

2.2 R&D expenditure funded by external sources

Please provide the correct amount of funding from external sources for each type of cost (NOK 1000 in 2023). Specify the R&D percentage.

The question covers external funding of R&D (exchange and transfer funds). Basic funding is to be reported in question 2.1.

Please check and make corrections to the accounting data by type of cost and source of funding. Please estimate R&D percentages of expenditure.

The prefilled accounting data should reflect the unit's spending in 2023 to the greatest possible extent. If the reporting unit hosts centres included in the unit's accounting, please include the expenditure of these centres. The expenditure financed by own sources from the basic funding is to be excluded. Please make corrections if necessary. Select source of funding from the drop-down lists.

According to the Norwegian Standard Accounts Specification for the higher education sector, the data are grouped by account group, source of funding and cost centre. Overhead expenditure (electricity, rent, etc.) is included in current expenditure. Internal transactions are included where applicable. Please note that it may be difficult to reconcile all the expenditures at the unit's level. Some values can be too high because the income (negative values) is excluded.

The funding from the Research Council of Norway (RCN) includes donation top-ups. Government sources include ministries and subordinate units, excl. the RCN. The category Abroad is prefilled only where the institution has provided data, as this is not a category in the institutions' standard accounting systems. Funds from foreign business enterprises are often listed under industrial sector/private in the institutions' accounts. Please transfer the sums to the category Foreign business enterprises in the questionnaire. Please choose the right category of foreign funds as accurately as possible. This is important when Statistics Norway reports R&D statistics to the OECD and Eurostat. "Own income" includes student fees and other sales income.

You are welcome to leave comments in the rightmost column of the table or in the comment box at the end of the questionnaire (e.g., "financed about 50/50 from private and public sources").

The R&D percentage of expenditure may vary from 0 % (e.g., continuing education, courses, etc.) up to 100 % (e.g., funding of PhD students and funding from the EU's Horizon Europe). For further information on the definition of R&D activity, check section 1.1 of these guidelines.

Part 3 R&D personnel

3.1 Full-time equivalents financed by external sources

How many externally funded full-time equivalents (FTEs) were performed in the unit in 2023?

The FTEs cover the externally financed R&D and technical/administrative personnel who were employed at the unit as of October 1st, 2023. The institutions have reported these figures to DBH/Norwegian Directorate for Higher Education and Skills.

Please explain any corrections to the prefilled data so that we may update Statistics Norway's Register of Research Personnel. If you wish to receive the list of personnel which provided basis for the calculation of the unit's externally funded FTEs, please contact fou-statistikk@ssb.no.

3.2 Average salary per full-time equivalent

Please check the ratio between the total salary expenditure and FTEs funded by external sources in the table below. If the ratio is not reasonable, please explain in the comment box. Deviations may occur due to people having left before/started after October 1st 2023, or that tenured staff has received external funding ("frikjøp").

The average salary expenditure per FTE (including social security fees) will usually vary between NOK 800 000 and 1 650 000. The level depends on job position, salary and source of funds.

3.3 Doctoral degrees from abroad

During 2022 or 2023, did the unit recruit personnel with a doctoral degree (PhD) from abroad, or have any of the unit's employees obtained a doctoral degree abroad during 2022 or 2023?

Please enter the employee's name, in which country and which year the degree was awarded. Foreign visiting researchers are to be excluded.

Part 4 Thematic areas and technology areas

The Ministry of Education and Research has highlighted some areas as particularly important for Norway in their [Long-Term Plan for Research and Higher Education 2023-2032](#) (pdf). In 2023, questions regarding R&D in the prioritized thematic areas and technology areas are included as separate modules in the R&D survey, and will not be carried out as separate surveys, as in previous years.

4.1 Thematic areas

The thematic areas should have minimal overlap. The sub-areas within each main area should not overlap. The thematic areas can cover all fields of research and development.

Please tick the boxes for the thematic areas where the unit had R&D activity in 2023 and provide estimates for the percentage of the unit's R&D activity in 2023 within the selected thematic area, related to the total R&D activity.

4.2 Subclassification of the thematic areas

Please distribute the R&D activity of the unit by thematic areas and any sub-categories listed below.

4.2a Energy

The thematic area covers renewable energy production, maintenance, environmental impact and operations; energy efficiency and energy transition; exploration, extraction, development, production, transport and health/environment/safety in the petroleum and gas industry.

- Renewable energy:
 - Water power (production, maintenance, environmental consequences and operations)
 - Wind power (production, maintenance, environmental consequences and operations)
 - Bioenergy (production, maintenance, environmental consequences and operations)
 - Solar energy (production, maintenance, environmental consequences and operations)
 - Other renewable energy, such as geothermal energy, waves etc.
- Energy efficiency and change:
 - Construction and manufacturing (Energy efficiency- and restructuring within construction and manufacturing)
 - Transport (land/maritime) (Energy efficiency- and restructuring within transportation (e.g. energy carriers such as batteries, hydrogen, biofuel, charging and transport systems))
 - Petroleum (Energy efficiency- and restructuring within the petroleum sector)
 - Other industries (Energy efficiency- and conversion to low-emission technology within other industries)
 - Energy systems (grid, cables, transmissions, network systems and digitization etc.)
 - Economy, market, society (framework conditions and energy policy, market and consumer. Innovation processes and business development)
- Petroleum:
 - Search and increased extraction: Technology, geological models and knowledge about the extraction of petroleum resources on the Norwegian continental shelf. Development and operations of the reservoir to attain higher level of usage
 - Drilling, completion and intervention: Offshore drilling, completion and well intervention for extraction of petroleum resources
 - Production, processing and transportation: Transport of well streams from the well head to a platform, construction on land or underwater construction, including process technology, marine operations and platform technology
 - Big accidents and work environment. Preventing big accidents or improving the work environment in the petroleum industry on the Norwegian continental shelf or on land constructions in Norway
 - Other R&D related to petroleum
- Other energy:
 - Nuclear power and power generation from coal

4.2b Environment

Environmental technologies that directly or indirectly help improve the environment (except CO₂ management technologies, renewable energy, energy efficiency, and climate technology belonging to thematic area “climate”), and onshore environment and society covering biological diversity, ecosystems, pollution, waste and circular economy, land use, cultural heritage and cultural environments.

- Onshore environment and society:
 - Biological diversity, ecosystems and ecosystem services: biological diversity and ecosystems (state, use, impact, measures and policy instruments), including ecosystem processes and functions. Ecosystem services are defined as "the direct and indirect contribution of an ecosystem to human welfare" (providing, regulating, cultural and supporting services) including outdoor life and mental and physical health.
 - Pollution and environmental toxins: Pollution of air, earth and fresh water, coastal area and biological systems, including sources, dispersion, effects, measures and policy instruments to reduce pollution and the effects on the environment and the society. Noise and radioactive toxins are also included
 - Land use and land changes: Land use, land changes and areal conflicts related to land, also in the coastal zone
 - Cultural heritage and cultural environments: including knowledge about condition, use, impact, measures and policy instruments that affect use and conservation
 - Circular economy: R&D that contributes to effective use of resources, products and waste, ensuring that it remains in the economy in several stages to reduce damage to the environment and contribute to sustainability.
- Environmental technology:
 - Technologies that directly or indirectly help improve the environment: Covers pollution control technologies, purification, eco-friendly products and production processes, more efficient resource management, noise reduction and technological systems to reduce environmental consequences. Does not include CO₂ management technologies, renewable energy and climate technology for reduction of greenhouse gas emissions.

4.2c Climate

R&D within CO₂ management technologies, climate and climate change adaptation, climate technology and other technologies for reducing emissions (except those related to renewable energy and energy efficiency).

- Climate and climate change adaptation:
 - The climate system and climate changes: Processes in the atmosphere, ocean, ice on land etc. which contribute to climate variations and changes in the short and long term. Understanding climate change. Climate scenarios for global, regional and local scale.
 - Consequences of climate changes: Changes in nature and/or society caused by climate changes and climate measures
 - Climate change adaptation: Society's adaptations to the effects of climate change
- Climate technology and other emission restrictions:
 - Climate technology: technologies for reducing greenhouse gas emissions and other emissions leading to climate change, not related to use and production of energy
 - Social framework conditions and instruments to reduce emissions
- CO₂ management technologies:
 - Catch of CO₂
 - Transportation of CO₂
 - Storage of CO₂
 - Use of CO₂

4.2d Maritime

R&D within design, construction and operation of vessels in maritime transport, all types of maritime operations and related services.

- Sea transport: Design, construction and management of vehicles for sea transport.
- Maritime operations within petroleum: Design, construction and management of vehicles for offshore operations within petroleum.
- Other maritime operations: Design, construction and management of vehicles for offshore operations within fishery, aquaculture, renewable energy, etc.

4.2e Marine

R&D within marine ecosystems; monitoring, management and impact of the marine and coastal area resources and environment. Possibilities for new bioresources.

- Marine ecosystems: The ecosystem's structure, function, variation and change.
- Consequences for the Ecosystem: Pollution and other man-made impact factors on the marine environment, including the environmental effects of petroleum activities, mineral extraction and aquaculture.
- Monitoring and estimation: Technology for monitoring and estimating stocks of marine resources
- Mathematical and numerical models: Development of mathematical and numerical models for marine R&D.
- Marine biotechnology/bioprospecting: Development and exploitation of "new" biological resources.
- Other marine R&D

4.2f Fisheries

R&D within harvesting, catching, processing and marketing of marine organisms. Research related to resource management should be reported under thematic area "marine".

- Technology and equipment: Technology and knowledge pertaining to catching/harvesting.
- Food production industry: Technology and knowledge from harvesting to product.
- Economy, market, society: Profitability, market and embedding in society
- Other R&D related to fisheries

4.2g Aquaculture

R&D within production, processing and marketing of aquaculture products.

- Production biology: The biology of an organism at all stages of life.
- Feed resources, nutrition: Nutritional requirements, feed and feed resources.
- Health, diseases: Prevent diseases, fish welfare and development of vaccines.
- Breeding, genetics: Exploitation and development of the organisms' genetic potential.
- Technology and equipment: Sustainable and efficient production technology.
- Slaughtering, quality, refinement: Technology and knowledge from slaughtering to product.
- Economy, market, society: Profitability, market, management and embedding in society.
- Other R&D related to aquaculture

4.2h Agriculture

R&D within production, processing and marketing of agricultural products (agriculture, including livestock and forestry).

- Primary production of food: Earth, plants and livestock. Plant health and animal health, as well as animal welfare.
- Food product industry: Processing, packing, logistics and storage.
- Economy, market, society: Broad conditions and industry- and trade politics. Market and consumer.
- Forest production and use of wood: Forest production (processing of wood plants, illnesses and pests, wood management, resource registration, felling and driving of timber). Use of wood (traits, logistics, processing, building with wood and markets).

4.2i Welfare

R&D in the interaction between the welfare policy, the education system and the labour standards and rights; interaction between the welfare state, market economy, the family and other social institutions. Welfare research includes such topics as labour standards and rights and labour market; inclusion and exclusion; living conditions; upbringing and health care; migration and integration policy; social inequality; citizen participation and democracy; the responsibility and role of the government, the non-governmental and private sectors in the welfare sectors. The area covers research on conditions in Norway and/or abroad if the conditions in Norway are a part of comparative studies.

- Working life and labour market: Research on working life, labour market, restructuring, management, working environment, cooperation and training in working life, including the collaborate partnership (parts-samarbeid). The importance of education for participation in working life.
- Income security and inclusion/exclusion from working life: Research on dropout and exclusion and inclusion in working life. Income security due to time-limited/permanent absence from work, including research into the retirement patterns of the elderly.
- Living conditions and demography: Research on differences in living conditions, social class, integration, social participation, inclusion and exclusion, housing and the importance of living environment for welfare. Research into the causes and consequences of changes regarding age, immigration and fertility in the population. Research concerning biological and social aspects in the differences between women and men, and where gender is a central dimension.
- Family and upbringing: Research on family relationships and organisation, children's upbringing conditions and framework conditions. Does not include research on kindergartens, schools and the education system.
- Welfare services - public and private: Research on public and private welfare services. Does not include research on kindergartens, schools and the education system.
- International migration and immigration: Research on international migration, immigration and emigration, integration, the relationship between minority and majority, asylum policy, refugees and global challenges.
- The cultural basis, sustainability and support of welfare society: Research on the cultural basis and fundamental prerequisite, including its sustainability, legitimacy and trust and social capital, of the welfare society. Including support for policy processes and institutions.

4.2j Education

R&D related to teaching and learning, education content and assessment methods, professional education and professional training, management, governance and organization of the education sector and the role of the education system in social and working life.

Research areas:

- Early childhood education and care (ISCED 0)
- Basic school 1-7 (ISCED 1)
- Basic school 8-10 (ISCED 2)
- Upper secondary school (ISCED 3)
- Higher education (ISCED 5-7)
- Research education (ISCED 8)
- Adult learning

Research topics:

- Policy and management systems
- Economics, organisation and management
- Teaching, learning and development
- The relation between education systems, home and working life

4.2k Health and health care

R&D within health care and health promotion, prevention, causal mechanisms of diseases, reduction and treatment of diseases and disabilities, organization and enhancement of services in health and health care.

4.2l Other public sector activities

R&D activities related to clarifying and/or improving the public sector's impact on the economy, operation, administration and organization of other sectors not included elsewhere in the questionnaire. Cross-disciplinary research, for example in environment and health, is also included here. The term "public sector" is used in a broad sense and may comprise companies from the business enterprise sector and other agencies carrying out public tasks.

4.2m Development research

R&D within poverty reduction, peace, democracy and human rights, and research activities that enhance research capacity in developing countries.

4.2n Tourism

R&D related to tourism and tourism industry.

4.3 Technology areas

Please tick the boxes for the technology areas where the unit had R&D activity in 2023 and provide estimates for the percentage of the unit's R&D activity in 2023 within the selected thematic area, related to the total R&D activity. The technology areas should not overlap. Please provide estimates.

4.4a ICT- Information and Communication Technology

ICT technology such as artificial intelligence, robotics and automation, smart components, hardware, communication technology, the internet of things, software and user interface. Digital security, e.g., encryption, biometrics and data protection. Digital transformation/implementation of ICT in the transfer between technology and humans, organizations and/or society; use of digital processes to simplify, streamline and optimize business models, organizations, products, services and processes.

- Artificial intelligence: Different approaches and techniques such as machine learning (e.g. deep learning and reinforcement learning) and machine reasoning (including planning, search and optimization).
- Robotics and automation: E.g. linked to industrial robots, autonomous vehicles such as drones, driverless cars, and vessels.
- Digital security: Technologies and knowledge to reduce digital vulnerabilities. E.g. encryption, biometry, privacy and security.
- Electronics, hardware, smart components and communication technology: The Internet of Things, including the hardware/process technology of the future, e.g. "Embedded Systems", photonics, lab-on-chip technologies, networks of sensors and communication infrastructure/network.
- Software, user interface and services: New methods of development, new programming languages, visualization, understanding user interface, usability, new models for delivery, ecosystems and business models.
- Digital transformations/digitalization: ICT on the crossroads between technology and humans, organizations and/or society. Juridical, ethical and organizational challenges pertaining to ICT.
- Other ICT

4.4b Biotechnology

Use of natural sciences and technology on living organisms and parts, as well as products and models of these, so that living and non-living material is altered to achieve knowledge, products and services. The definition of biotechnology covers several subject areas, including ethical, legal and societal aspects.

- Marine biotechnology: Technology and use in the area of seafood and new food products based on ocean resources, fish health and -welfare. Use of new knowledge from genomes to current farmed species and parasites. Growth and use of marine biomass and left-over raw material for different uses. Marine bioprospecting, genetic resources and infrastructure to marine research.
- Agricultural biotechnology: Breeding and development of species, including biobanks, bioprospecting, diagnostics and treatment of animal- and plant illnesses. Biodiversity, genetics resources and

environmental onshore biotechnology. Innovation in production of food, feedstuff and fertilizers. Use of biomass, such as wood, fiber and butchered waste.

- **Industrial biotechnology:** Development of tools to be used for industrial biotechnology, such as enzymes, microorganisms, microbial systems, system- and synthetic biology. Use of biomass through integrated biorefineries, as well as biological cleansing. Development of biotechnological process technology, such as biocatalysis, fermentation and cleansing, as well as infrastructure for demonstration and upscaling of biotechnological processes.
- **Medical biotechnology:** Development of diagnostics and different types of treatment for humans. Use against translation research, clinic research, prevention and innovation in the health sector. Infrastructure for health data and biobanks to support biotechnological research and development.
- **Generic development in methods:** Development of the biotechnological tool box with a potential use within all the areas. This category should only be used when it is impossible to link biotechnological R&D to any of the fields above.
- **Social aspects of biotechnology:** R&D related to how society contributes to and is affected by biotechnology. Includes ethical, legal and financial aspects of the use of biotechnology. Includes R&D related to "responsible research and technology", consumer issues and artistic research related to biotechnology.
- Other fields or cross-cutting fields

4.4c New materials, except nanotechnology

Functional materials (materials with certain chemical, physical or biological traits). Materials where the traits purposefully change when using nanotechnology should be reported under "nanotechnology".

4.4d Nanotechnology

New techniques developed for synthesis and processing for design of functional and structural materials, components and systems where dimensions and tolerance in the spectrum of 0.1 to 100 nanometres is of crucial importance. Ethical, juridical, societal and environment/health/safety aspects of nanotechnology.

Follow-up with respondents

Statistics Norway contacts the reporting units if there are errors or deficiencies in the answers. Most often it is about missing R&D percentages in question 2.2, or too low or too high average salary in question 3.2.

Statistics Norway processes the collected data confidentially.

Do you have questions about the survey?

The information about the survey Research and Experimental Development in the Higher Education Sector, including definitions and contact persons, is available on the webpage of Statistics Norway (in Norwegian): <https://www.ssb.no/teknologi-og-innovasjon/forskning-og-innovasjon-i-naeringslivet/statistikk/forskning-og-utvikling-i-universitets-og-hogskolesektoren>

Please contact us at fou-statistikk@ssb.no.