

Indicator 9.5.1

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Indicator Name, Target and Goal

Indicator 9.5.1: Research and development expenditure as a proportion of GDP

Target 9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Definition and Rationale

Definition:

This indicator is defined as the total intramural expenditure on research and experimental development (R&D) performed in the national territory during a specific reference period expressed as a percentage of national gross domestic product (GDP).

Concepts:

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.

The term *R&D* covers three types of activity: basic research, applied research and experimental development. *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.

R&D expenditure or in other words *Gross domestic expenditure on R&D (GERD)* is total intramural expenditure on R&D performed in the national territory during a specific reference period. It covers all expenditure for R&D performed in the economy, including both current costs and capital expenditures for R&D.

For further information on above definitions, see: OECD (2015). *Frascati Manual*. 7th Edition.

GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.

Rationale and Interpretation:

This indicator is a direct measure of the R&D spending, which is to be increased as per target 9.5.

Data Sources and Collection Method

Data for this indicator is primarily collected through nationally representative R&D surveys, which are conducted by the national statistical offices or relevant line ministries such as the ministry of science and technology. The direct collection of R&D data through dedicated surveys has a distinct advantage in that the concepts and definitions used can align completely with those contained in the *Frascati Manual*. Administrative data sources (which may include both financial data from revenue agencies as well as other types of administrative sources, such as company records) may be used as another source of information for compilation of R&D data, if the concepts, definitions and coverage used by administrative data sources are sufficiently close to those contained in the *Frascati Manual*.

The OECD *Frascati Manual* (please find the link in the reference section below) provides standard guidelines and recommendations for collecting and reporting internationally comparable statistics on the financial and human resources devoted to R&D. The information on the coverage and contents of the different chapters of the *Frascati Manual (2015)* are summarized below as a guide to readers. Chapter 1 introduces the manual and the twelve subsequent chapters provide guidance on specific topics. The five chapters (2-6) that follow contain general guidance on defining and measuring R&D in all sectors of R&D performance: concepts and definitions, institutional sectors, R&D expenditures, R&D personnel, and statistical methodologies and procedures. The next five chapters (7-11) address particular methodological and classification issues specific to each performing sector (Business enterprise, Government, Higher education and Private non-profit). The fifth sector, the Rest of the world (formerly referred to as Abroad) is discussed in Chapter 11 on R&D globalisation, which addresses the performance and funding of R&D in the Rest of the world. In addition, there is guidance on data collection on multinational enterprises (MNEs) and R&D services trade. The sector chapters are followed by two chapters (12-13) that approach the measurement of government support for R&D from a funder perspective: government budget allocations for R&D and measurements of tax relief for R&D.

The UNESCO Institute for Statistics (UIS) provides a guide to conducting an R&D survey for countries starting to measure R&D (please find the link in the reference section below). In addition to summarizing main concepts and definitions from the *Frascati Manual*, this guide presents the relevant R&D indicators, addresses common issues encountered in data collection, provides a simple project management template, and proposes generic model questionnaires for the Government, Higher education, Business enterprise and Private non-profit sectors.

Method of Computation and Other Methodological Considerations

Computation Method:

Research and development expenditure as a proportion of GDP ($R\&D_{Intensity}$) is calculated as:

$$R\&D_{Intensity} = \frac{\text{The total intramural expenditure on R\&D (GERD)}}{GDP} \times 100$$

Comments and limitations:

R&D data can be collected directly through surveys, through administrative data sources, or by combination of the two. The direct collection of R&D data has a distinct advantage in that the concepts and definitions used can align completely with those contained in the *Frascati Manual*, though this may have some cost implications. Furthermore, R&D data are not collected on a regular basis in many developing countries and that not all sectors of performance (Business enterprise, Government, Higher education, and Private non-profit) are covered. In particular, the Business enterprise sector often goes uncovered.

Proxy, alternative and additional indicators: N/A

Data Disaggregation

R&D expenditure can be disaggregated by sector of performance, source of funds, field of R&D, type of research and type of cost. The *Frascati Manual* provides more details related to these breakdowns (what these breakdowns/classifications are, the purposes, including user needs, the main criteria that are applied, etc).

References

Official SDG Metadata URL

<https://unstats.un.org/sdgs/metadata/files/Metadata-09-05-01.pdf>

Internationally agreed methodology and guideline URL

http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015_9789264239012-en

Other references

OECD (2015). *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, the Measurement of Scientific, Technological and Innovation Activities*. OECD Publishing, Paris. Available at: http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015_9789264239012-en

UNESCO-UIS. *UIS Data Centre – Science, Technology and Innovation*. Internet site: http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN_DS&popupcustomise=true&lang=en

UNESCO-UIS (2014). *Guide to Conducting an R&D Survey: For Countries Starting to Measure Research and Experimental Development, Technical Paper No. 11, UIS, Montreal*. Available at: <http://uis.unesco.org/sites/default/files/documents/guide-to-conducting-an-rd-survey-for-countries-starting-to-measure-research-and-experimental-development-2014-en.pdf>

Country examples

N/A

International Organization(s) for Global Monitoring

This document was prepared based on inputs from UNESCO Institute for Statistics (UIS).

For focal point information for this indicator, please visit <https://unstats.un.org/sdgs/dataContacts/>