



R&D DATA

INVESTING IN A BETTER FUTURE

Together, we must create sustainable conditions for seven to nine billion people in the near future to live a decent life without exhausting the Earth's natural resources. The challenge of sustainable development demands innovation and increased investment in research and development (R&D), which accounted for at least one-half of the growth in the gross domestic product (GDP) of industrialised countries over the past 50 years.



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TO MEET THE CHALLENGES of the 21st century, we cannot rely on market forces alone to ensure sufficient investment in R&D. Governments have a key role in stimulating and sustaining R&D in partnership with the private sector. The creation of knowledge is a rewarding but risky endeavor. It requires significant investment upfront with little guarantee of success, especially in terms of revenue. But the real value of R&D goes beyond patents and derivative products. The resulting knowledge can bring incalculable benefits for society as a whole in terms of education, health care and ecological conservation, to name but a few areas.

To provide a global perspective on investment in R&D, the UNESCO Institute for Statistics (UIS) conducts a biennial international survey for countries at all stages of development. In addition, the Institute helps countries develop their own national surveys to better measure the impact of their policies and investments by providing a range



of services, such as training workshops, methodological tools and survey instruments.

UIS data show that countries at all levels of development and private companies—large and small—are making tremendous investments in R&D. On average, industrialised countries devote the equivalent of 1.5% to 2.5% of GDP to R&D, although Israel and Korea, for example, surpass the average with more than 4%. In contrast, R&D investment in developing countries amounts to less than 1% of GDP on average. Yet despite these

UNESCO INSTITUTE FOR STATISTICS AT YOUR SERVICE

The UIS is the official source of data on science, technology and innovation (STI) for the United Nations. The UIS conducts two global surveys on R&D and innovation which involve more than 200 countries and territories and other statistical partners. The resulting data are freely available on the UIS website and widely disseminated.

For the UIS, the central goal is not just to publish STI data but to promote their use for effective policymaking. So the Institute works closely with countries to help in every stage of the process — from creating their own survey instruments based on international standards to analysis of the resulting data. To this end, the UIS has produced a comprehensive guide on how countries can start their own R&D surveys. The guide presents the relevant R&D indicators, a simple template for project management and governance, as well as model questionnaires for government, higher education, business and private non-profit organizations. The Institute also provides training and technical assistance on request, with a special focus on methodologies and instruments specifically designed to reflect the research structures and priorities of the individual country. Countries that are interested in starting or improving their measurement efforts are encouraged to contact the UIS.

BIG SPENDERS ON R&D

In general, universities and publicly-financed research institutes are active in basic research, while private businesses invest in applied research and experimental development with the aim of creating new or improved products and processes with a time-to-market period of four to five years. Investment in experimental development as a percentage of total R&D expenditure is highest in China (83%), followed by Israel (82%), the United States (63%), the Republic of Korea (62%), the Russian Federation (62%) and Japan (60%). These results highlight the fact that R&D activities in high-income countries are mainly undertaken by the business sector. In North America and Europe, more than 60% of R&D is carried out by private enterprises and industrial laboratories.

Yet in emerging economies such as Brazil, a large portion of R&D expenditure (60%) is allocated to the public sector. A similar situation is found in Asia, where universities and government research institutes predominantly perform R&D activities, although there is wide variation across countries. In Africa, R&D is mainly a matter for governments and universities, while the role of the private sector is marginal, with the exception of South Africa, where 60% of R&D is performed in the business sector.

figures, many countries are unable to accurately report on their R&D investments, even though this information is essential for policymaking.

R&D indicators provide a comprehensive perspective on the financial and human resources that a country devotes to R&D. There are two major groups of indicators: data on the people working in research and data on the money invested in it. These indicators can be broken down into different types of research (i.e. basic research, applied research and experimental development) in order to provide greater detail concerning the resources invested in the creation of knowledge. These are important parameters for evaluating a national innovation system.

R&D indicators are not 'just figures' — they tell a story, or rather, several stories. First, they tell you whether or not your country's strategic goals for R&D are being met or are at least within reach. The European Union (EU), for example, has set the goal of investing 3% of GDP in R&D, while the African Union (AU) is aiming for 1%. However, the data show that greater efforts are needed to reach these goals, with the EU investing the equivalent

of 1.97% of GDP (2012) and falling to 0.41% according to the most recent estimates for the AU.

Broken down into type of activity, field of science or region, R&D indicators can also be used to identify the strengths and weaknesses of a national innovation system. Do firms have the capacity to absorb and internalise knowledge from outside and transform it into new products and better processes? Are R&D investments directed to the specific economic priorities of a country or region? These are just some of the questions that can be addressed by analysing the data.

In terms of policy responses, R&D indicators can highlight the need for special support programmes for small and medium-sized enterprises, for example, or for R&D in the health sector. The data can also reveal the need to strengthen ties between universities and other non-profit research institutes, government and private companies, in order to create a 'golden triangle' for innovation. Finally, they can be used to help develop tax incentives to stimulate R&D and related policies, to strengthen the research capacities of the private sector and to outsource R&D to businesses in the medium or long term.

KICK-STARTING A NATIONAL SURVEY

National surveys are essential to provide an accurate perspective on R&D efforts and investments. Basically, questionnaires or interviews are used to gather information from all government research institutes, universities, private non-profit research organizations and companies engaged in research. The frequency of the survey may differ from sector to sector, but it is recommended to conduct one at least every two years. This helps to build up interest, trust and commitment among the survey respondents. It is also useful to identify a high-level 'champion', such as a government minister, who can help convince organizations to take part in the survey. The national bureau of statistics may be best suited to collect and process the data, in particular for the business sector, but in practice many countries rely on the ministry of science and technology to conduct the survey.



In summary, R&D indicators are useful in measuring the impact of R&D and related policy. By looking at historical data and combining them with other indicators—such as the number of publications, citations, patents and data on industrial output—you gain an accurate perspective on the real effects of R&D on economic and social development while putting policies in place for the future. But the first step lies in producing accurate and timely data—a challenge that can be met with the support of the UIS.



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UNESCO Institute for Statistics
C.P. 6128, Succursale Centre-ville
Montreal, Quebec, H3C 3J7
Canada

Tel: +1-514-343-6880
Fax: +1-514-343-6882
Email: uis.information@unesco.org
www.uis.unesco.org

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WOMEN IN SCIENCE

Women are under-represented in R&D. Worldwide they account for just 30% of all researchers, with the highest share in Latin America and the Caribbean (45%), followed by Oceania (39%), Africa (34%), Europe (34%) and Asia (19%). At the level of Bachelor's degree, men and women are on equal footing globally, while for Master's degrees the share of female graduates is rising to a majority of 54%. Beyond this level, the opposite is true, with men accounting for 56% of PhD holders and 70% of all researchers.

