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NATIONAL SURVEY OF RESEARCH, INNOVATION AND ENTERPRISE IN SINGAPORE 2023

NATIONAL RESEARCH FOUNDATION
PRIME MINISTER'S OFFICE
SINGAPORE

Agency for Science, Technology and Research
SINGAPORE

NATIONAL SURVEY OF RESEARCH, INNOVATION AND ENTERPRISE 2023

Expenditure on R&D rose in 2023

All types of R&D expenditure increased for private and public sector in 2023

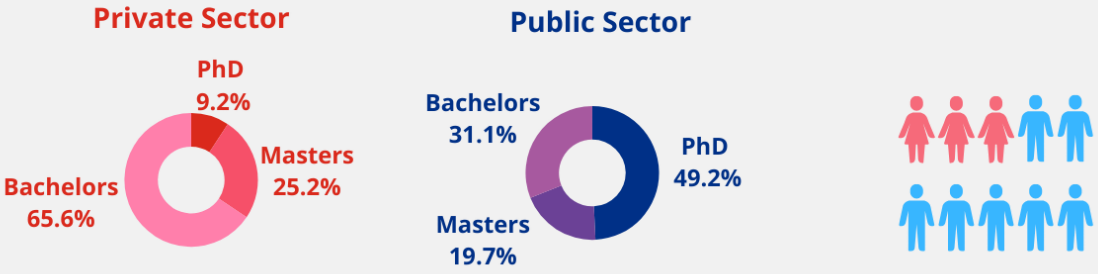
R&D-related Employment up in 2023

61,693 jobs* associated with R&D in 2023, up from 59,609 in 2022

	Private Sector					Public Sector				
	2021	2022	2023	% Change 2021 - 2022	% Change 2022 - 2023	2021	2022	2023	% Change 2021 - 2022	% Change 2022 - 2023
Researchers [1]	23,786	27,141	**28,283**	+14.1%	**+4.2%**	23,719	24,584	**25,034**	+3.6%	**+1.8%**
• Researcher Scientists and Engineers (RSE) [2]	21,778	24,760	**25,624**	+13.7%	**+3.5%**	18,144	18,617	**18,744**	+2.6%	**+0.7%**

Bachelor degree holders made up the highest share of RSEs in Private Sector while PhD degrees was the most prevalent qualification type among Public Sector in 2023

32.1% of all RSEs were females in 2023



* Includes researchers, technicians and other supporting staff.
[1] Comprises Research Scientists and Engineers, non-degree researchers and full-time postgraduate students.
[2] Refers to those who hold formal qualifications at university degree level, and excludes full-time postgraduate students.

CONTENTS

Introduction

Singapore's sustained investments in Research, Innovation and Enterprise (RIE) over the past three decades have cultivated an increasingly vibrant RIE ecosystem. Our institutes of higher learning, industry partners, public sector agencies and research institutes collaborate closely on R&D, helping to generate innovative products, services, and solutions. The Government has supported these RIE efforts strongly through various RIE Plans, with the latest being the RIE 2030 Plan[1]. Collectively, these efforts will continue to build a strong base of capabilities and talent, enhance Singapore's competitiveness as a knowledge-based and innovation-driven economy, and help address key national challenges.

In 2023, Singapore's Gross Expenditure on R&D (GERD) increased by 8.4% to reach $13,746.9 million from $12,676.2 million in 2022, registering a CAGR of 6.4% between 2013 to 2023. Singapore's GERD as a percentage of GDP was 2.0% in 2023. The increase in GERD was due to the increase in both Business Expenditure on R&D (BERD), by 10.2% between 2022 and 2023, and the increase in Public Expenditure on R&D (PUBERD) by 5.4% over the same period. The BERD/PUBERD ratio in 2023 increased to 1.87, from 1.79 in 2022.

R&D investments enable job creation. In 2023, a total of 61,693 jobs were associated with R&D activities. Among these, Research Scientists and Engineers (RSEs) accounted for the majority at 71.9%, or 44,368 jobs. The bulk of RSEs were Bachelor's degree holders (51.0%), followed by PhD (26.1%) and Master's degree holders (22.9%). The number of RSEs in the private sector increased by 3.5% between 2022 and 2023. Among the public sector, the number of RSEs grew by 0.7% between 2022 and 2023. Overall, the total number of RSEs grew by 2.3% in 2023.

The RIE survey data provides insights about Singapore's R&D ecosystem, from the expenditure of organisations to the impact on manpower. This survey would not be possible without the support of participating organisations in both the public and private sectors. We thank all participant organisations for their important contributions.

National Research Foundation,
Agency for Science, Technology and Research

[1] The Research, Innovation and Enterprise (RIE) 2030 Plan was announced in Dec 2025, with a Government commitment of $37 billion for RIE efforts from 2026 to 2030.

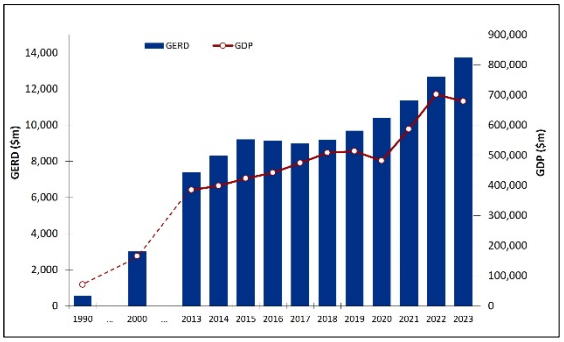
1. OVERVIEW OF R&D IN SINGAPORE

1.1. Gross Expenditure on R&D (GERD)

GERD in Singapore increased by 8.4% from $12,676.2 million in 2022 to $13,746.9 million in 2023. Singapore's GDP[2] (at current market prices) decreased by 3.3% from $701.8 billion to $678.7 billion over the same period.

In 2013, GERD was $7,393.5 million, and GDP was $384.9 billion. The Compound Annual Growth Rate (CAGR) of GERD from 2013 to 2023 was 6.4%.

Fig.1.1 Gross Expenditure on R&D and GDP (1990-2023)

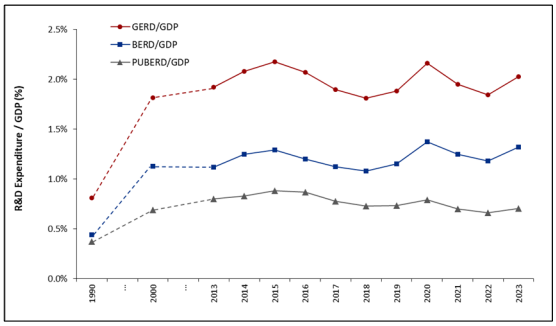


1.2. Public Expenditure on R&D (PUBERD) and Business Expenditure on R&D (BERD)

GERD as a percentage of GDP increased from 1.8% in 2022 to 2.0% in 2023, due to an increase in GERD and a decrease in GDP in 2023. Of this, Business Expenditure on R&D (BERD) and Public Expenditure on R&D (PUBERD) as a percentage of GDP were at 1.3% and 0.7% respectively in 2023.

For every $1 spent on research in the public sector, $1.87 was spent by businesses in 2023.

Fig.1.2 Gross Expenditure, Business Expenditure and Public Expenditure on R&D as a percentage of GDP (1990-2023)

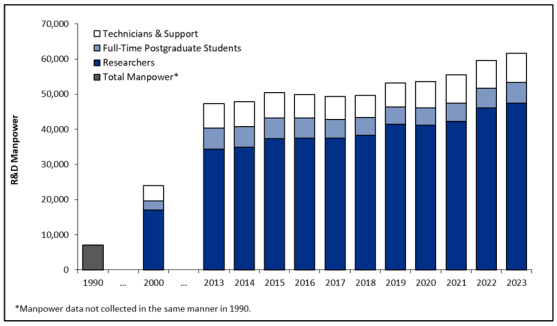


1.3. R&D Manpower

Total R&D Manpower (including researchers, full-time postgraduate students, technicians and support staff) increased by 3.5% from 59,609 persons in 2022 to 61,693 persons in 2023. This represents a CAGR of 2.7% from a base of 47,246 persons in 2013.

The number of researchers (excluding full-time postgraduate students) increased by 2.9% from 46,123 in 2022 to 47,443 in 2023. The CAGR from 2013, with 34,346 researchers, to 2023 was 3.3%. The total number of researchers (including full-time postgraduate students) was 53,317 in 2023.

Fig.1.3 R&D Manpower (1990-2023)



[2] GDP figures were extracted from Singapore Department of Statistics in Dec 2025.

2. BUSINESS EXPENDITURE ON R&D (BERD)

2.1 Overview

In 2023, 1,030 private sector companies indicated that they performed R&D in Singapore. The total BERD of these companies amounted to $8,956.0 million, corresponding to 1.3% of Singapore's GDP in 2023. This represents an increase of 10.2% compared to the BERD in 2022 at $8,130.1 million. The CAGR from 2013 to 2023 was 7.6%, from a base of $4,315.4 million in 2013.

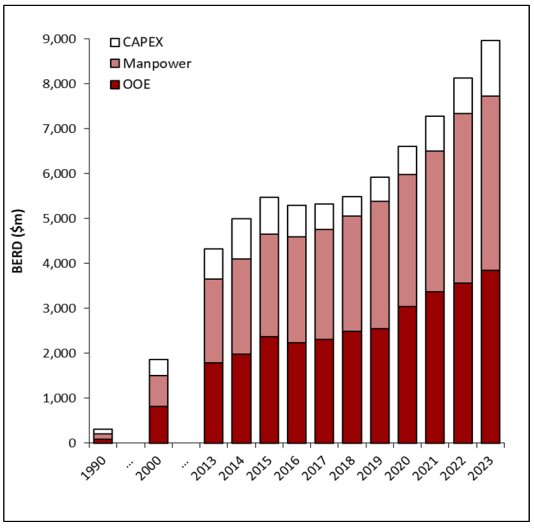
2.2 Type of Expenditure

Capital expenditure (CAPEX) increased by 54.8% from $796.2 million in 2022 to $1,232.8 million in 2023. From a base of $658.8 million in 2013, the CAGR for 2013 to 2023 was 6.5%.

Manpower expenditure increased by 2.6% to $3,874.6 million in 2023 from $3,775.7 million in 2022. From a base of $1,877.3 million in 2013, the CAGR for 2013 to 2023 was 7.5%.

Other operating expenditure (OOE) rose by 8.2% to $3,848.6 million in 2023 from $3,558.2 million in 2022. From a base of $1,779.3 million in 2013, the CAGR for 2013 to 2023 for OOE was 8.0%.

Fig.2.1 Business Expenditure on R&D by type of cost (1990-2023)



2.3 Type of R&D

The types of R&D conducted in private sector companies are classified into 3 categories.

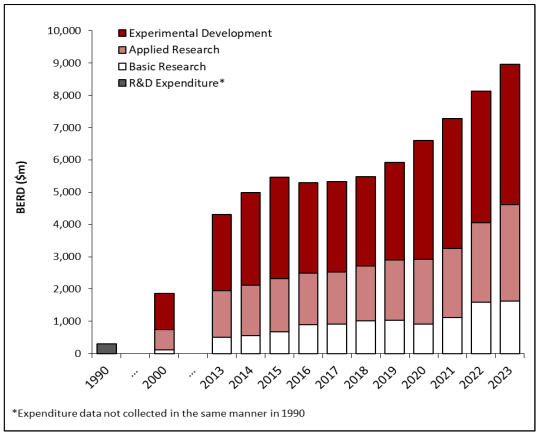
a) **Basic research** (both experimental or theoretical work undertaken without any particular application or use in view);
b) **Applied research** (original investigation directed primarily towards a specific practical aim or objective); and
c) **Experimental development** (systematic work directed to producing or substantially improving materials, products and devices; or installing new processes, systems and services).

Basic research expenditure in the private sector increased by 2.0% from $1,584.8 million in 2022 to $1,616.9 million in 2023. From a base of $503.8 million in 2013, the CAGR for 2013 to 2023 was 12.4%.

Applied research by private sector companies increased by 21.5% from $2,460.1 million in 2022 to $2,988.5 million in 2023. This represents a CAGR of 7.5% from 2013 when it was $1,451.1 million.

In 2023, business expenditure on experimental development rose by 6.5% from $4,081.6 million in 2022 to $4,346.9 million in 2023. This represents a CAGR of 6.3% from 2013 when it was $2,360.5 million.

Fig.2.2 Type of Business Expenditure on R&D (1990-2023)



2.4 Fields of Science and Technology

In the private sector, R&D expenditure in Info-communication & Media Technology decreased slightly by 0.8% from $1,221.2 million in 2022 to $1,211.2 million in 2023. This represents a CAGR of 15.5% from 2013 when it was $287.2 million.

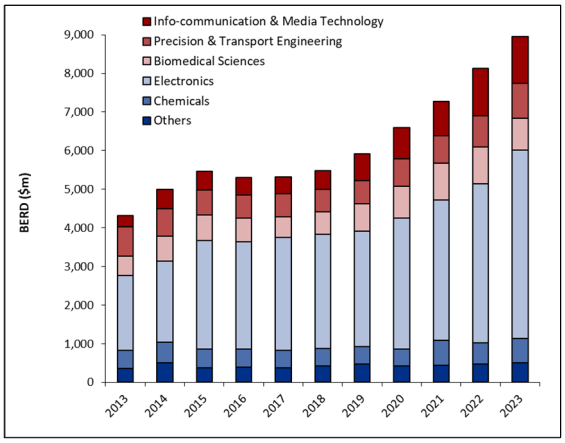
Expenditure in Precision and Transport Engineering research increased by 10.9% from $819.7 million in 2022 to $908.8 million in 2023. Between 2013 and 2023, the CAGR was 1.8%, from a base of $757.5 million in 2013.

R&D expenditure on Biomedical Sciences decreased by 12.1% from $942.3 million in 2022 to $828.5 million in 2023. Nevertheless, the CAGR was still positive at 5.0% from 2013 when it was $510.2 million.

R&D expenditure in Electronics grew by 18.1% from $4,132.4 million in 2022 to $4,878.4 million in 2023. This represents a CAGR of 9.7% from 2013 when it was $1,928.4 million.

Spending in Chemicals research increased by 15.0% from $539.6 million in 2022 to $620.6 million in 2023. This represents a CAGR of 2.9% from 2013 when it was $465.6 million.

Fig.2.3 Business Expenditure on R&D by fields of science and technology (2013-2023)



The types of R&D conducted are classified by Fields of Science and Technology are as follows:

a) **Biomedical Sciences**; Comprising: Biomedical & Related Sciences, and Biomedical Engineering.
b) **Chemicals**; Comprising: Material Sciences & Chemical Engineering, and Chemical Sciences.
c) **Electronics**; Comprising: Electrical & Electronics Engineering, and Computer Engineering.
d) **Info-communication & Media Technology**; Comprising: Info-communication & Media Technology, and Computer & Related Sciences.
e) **Precision & Transport Engineering**; Comprising: Aeronautical Engineering, Civil & Architecture Engineering, Marine Engineering, Mechanical Engineering, and Metallurgy & Metal Engineering.
f) **Others**; Comprising: Agricultural Sciences, Food Sciences, Earth & Related Environmental Sciences, Environmental Engineering, Physical Sciences & Mathematics, Energy, and Other Areas.

3. PUBLIC EXPENDITURE ON R&D (PUBERD)

3.1 Overview

In 2023, 60 public institutions, including government agencies, public research institutes, institutes of higher learning, academic medical centres, hospitals and other publicly-funded research organisations, indicated that they performed R&D in Singapore.

These organisations reported a total R&D expenditure of $4,790.9 million in 2023, corresponding to 0.7% of Singapore's GDP. The total expenditure by public sector in 2023 was higher than the $4,546.1 million in 2022. From a base of $3,078.1 million in 2013, the CAGR for 2013 to 2023 was 4.5%.

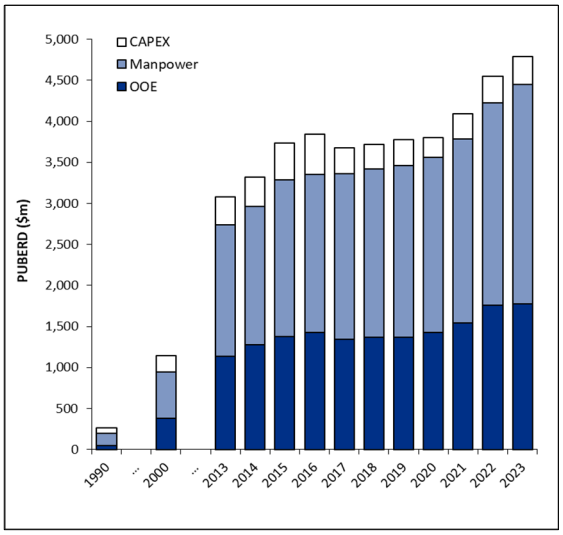
3.2 Type of Expenditure

Amongst public institutions, CAPEX increased by 5.3% from $321.8 million in 2022 to $338.8 million in 2023. This represents a negative CAGR of 0.1% from 2013, when the base was $342.1 million.

Manpower expenditure increased by 8.5% from $2,466.0 million in 2022 to $2,675.1 million in 2023. From a base of $1,598.0 million in 2013, the CAGR for 2013 to 2023 for manpower expenditure was 5.3%.

OOE increased by 1.1% from $1,758.3 million in 2022 to $1,777.1 million in 2023. From a base of $1,138.1 million in 2013, the CAGR for 2013 to 2023 for OOE was 4.6%.

Fig.3.1 Public Expenditure on R&D by type of cost (1990-2023)



3.3 Type of R&D

The types of R&D conducted in public sector research organisations are as follows:

a) **Pure basic research** (primarily focused on the advancement of knowledge, rather than to solve a specific problem or to seek long-term economic or social benefits);
b) **Strategic basic research** (carried out with the expectation that it will produce a broad base of knowledge likely to form the basis of the solution to current or future problems or possibilities);
c) **Applied research** (original investigation directed primarily towards a specific practical aim or objective); and
d) **Experimental development** (systematic work directed to producing or substantially improving materials, products and devices; or installing new processes, systems and services).

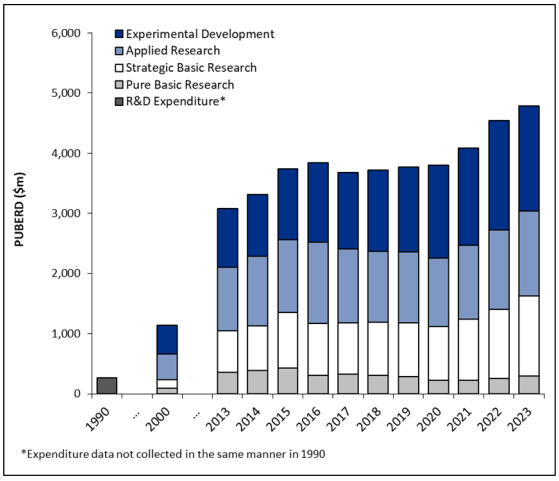
Pure basic research expenditure in public institutions increased by 17.4% from $253.2 million in 2022 to $297.3 million in 2023. This represents a negative CAGR of 1.8% from 2013 when it was $356.8 million.

Strategic basic research expenditure in public institutions increased by 15.3% from $1,154.9 million in 2022 to $1,331.6 million in 2023. This represents a CAGR of 6.8% from 2013 when it was $686.6 million. Together, pure basic research and strategic basic research registered a CAGR of 4.6% from 2013 to 2023.

Applied research expenditure in public institutions increased by 7.0% from $1,319.2 million in 2022 to $1,411.7 million in 2023. This represents a CAGR of 2.9% from 2013 when it was $1,056.2 million.

Experimental development expenditure in public institutions decreased by 3.8% from $1,818.8 million in 2022 to $1,750.3 million in 2023. This represents a CAGR of 6.0% from 2013 when it was $978.5 million.

Fig.3.2 Type of Public Expenditure on R&D (1990-2023)



3.4 Fields of Science & Technology

In public institutions, R&D expenditure on Info-communication & Media Technology increased by 7.4% from $444.5 million in 2022 to $477.4 million in 2023. This represents a CAGR of 5.1% from 2013 when it was $289.8 million.

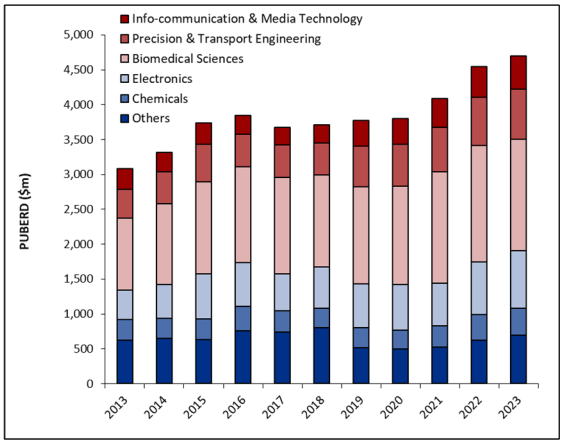
The expenditure for Precision and Transport Engineering research increased by 3.3% from $690.0 million in 2022 to $712.9 million in 2023. Between 2013 and 2023, the CAGR was 5.4%, from a base of $419.4 million in 2013.

Expenditure on R&D in Biomedical Sciences increased by 1.7% from $1,667.3 million in 2022 to $1,695.6 million in 2023. This represents a CAGR of 5.1% from 2013 when it was $1,030.3 million.

Expenditure on R&D in Electronics increased by 9.4% from $756.1 million in 2022 to $826.8 million in 2023. This represents a CAGR of 7.1% from 2013 when it was $416.4 million.

Expenditure on R&D in Chemicals increased by 4.4% from $363.7 million in 2022 to $379.8 million in 2023. Between 2013 and 2023, the CAGR was 2.4%, from a base of $298.4 million in 2013.

Fig.3.3 Public Expenditure on R&D by fields of science and technology (2013-2023)



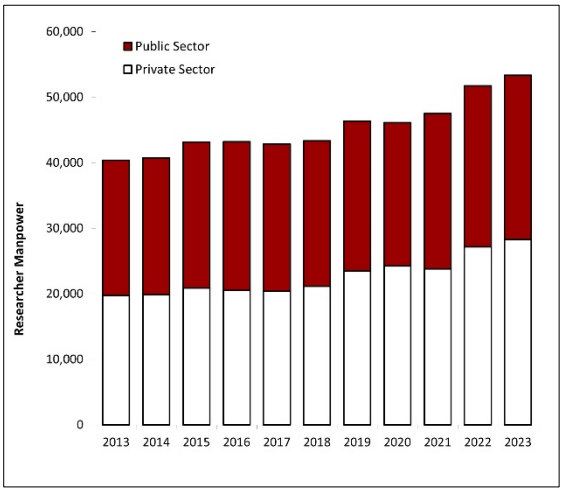
4. R&D TALENT

4.1 Researchers[3]

The total number of researchers (comprising Research Scientists and Engineers (RSEs), non-degree researchers and full-time postgraduate research students) increased by 3.1% from 51,725 in 2022 to 53,317 in 2023. This represents a CAGR of 2.8% from a base of 40,358 in 2013.

Researchers in the private sector grew by 4.2% from 27,141 in 2022 to 28,283 in 2023, while researchers in the public sector increased by 1.8% from 24,584 in 2022 to 25,034 in 2023. Between 2013 and 2023, both private and public sectors registered positive growth in researchers, with CAGR of 3.7% and 2.0% respectively.

Fig.4.1 Researcher Manpower (2013-2023)



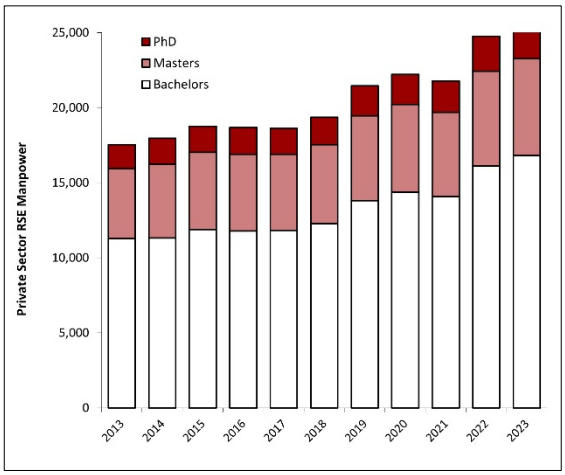
4.2 Research Scientists & Engineers

RSEs comprise researchers who hold formal qualifications at the university degree level, and exclude full-time postgraduate research students.

In 2023, the number of RSEs grew by 2.3% from 43,377 in 2022 to 44,368 in 2023. This represents a CAGR of 3.3% from a base of 31,924 in 2013.

In the private sector, the number of PhD RSEs increased by 1.4% from 2,331 in 2022 to 2,364 in 2023. This represents a CAGR of 4.1% from 1,584 in 2013. RSEs with a Master's degree grew by 2.2% from 6,312 in 2022 to 6,452 in 2023. This was a CAGR of 3.3% from 4,667 in 2013. The number of RSEs with a Bachelor's degree increased by 4.3% from 16,117 in 2022 to 16,808 in 2023. This represents a CAGR of 4.1% from 11,275 in 2013.

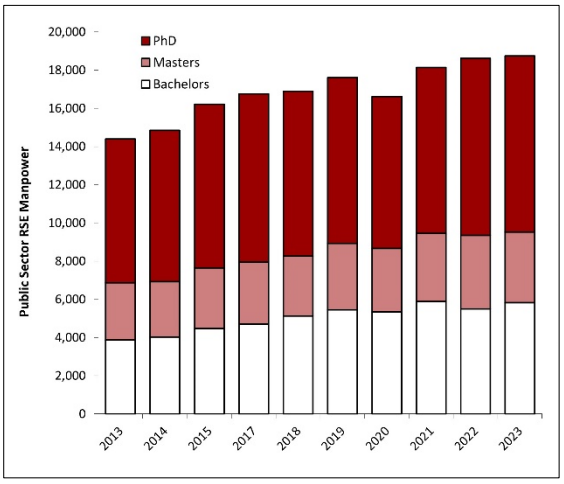
Fig.4.2 Private Sector Research Scientists & Engineers (2013-2023)



In the public sector, the number of PhD RSEs decreased by 0.4% from 9,270 in 2022 to 9,231 in 2023. This represents a CAGR of 2.1%, from a base of 7,525 in 2013. RSEs with a Master's degree similarly decreased by 3.9% from 3,840 in 2022 to 3,691 in 2023. There was a CAGR growth of 2.1% from a base of 2,999 in 2013. RSEs with a Bachelor's degree increased by 5.7% from 5,507 in 2022 to 5,822 in 2023. There was a positive CAGR of 4.2% from a base of 3,874 in 2013.

[3] Data on all R&D manpower (including non-researchers) can be found in the manpower tables under the List of Tables appended at the end of the report.

Fig.4.3 Public Sector Research Scientists & Engineers (2013-2023)

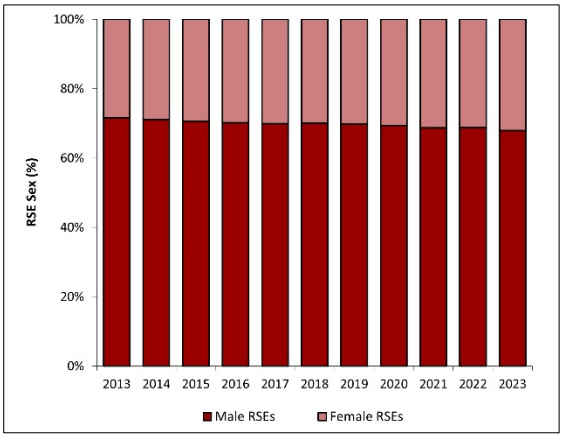


4.3 Profile of Research Scientists & Engineers

Sex

There were 14,222 female RSEs in 2023, making up 32.1% of all RSEs, slightly higher than the 31.2% in 2022. This represents a CAGR of 4.6% from 9,071 female RSEs in 2013.

Fig.4.4 Sex of Research Scientists & Engineers (2013-2023)

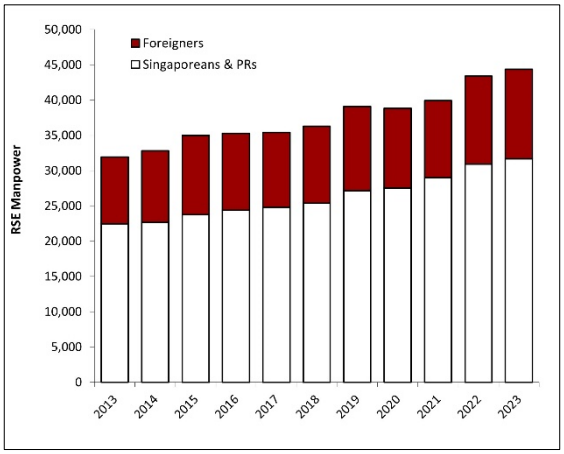


Citizenship

The number of Singaporean and Permanent Resident (PR) RSEs increased by 2.4% from 30,924 in 2022 to 31,674 in 2023. This represents a CAGR of 3.5% from a base of 22,459 RSEs in 2013.

The number of foreign RSEs saw an increase of 1.9% from 12,453 in 2022 to 12,694 in 2023. There was a CAGR of 3.0% from a base of 9,465 foreign RSEs in 2013.

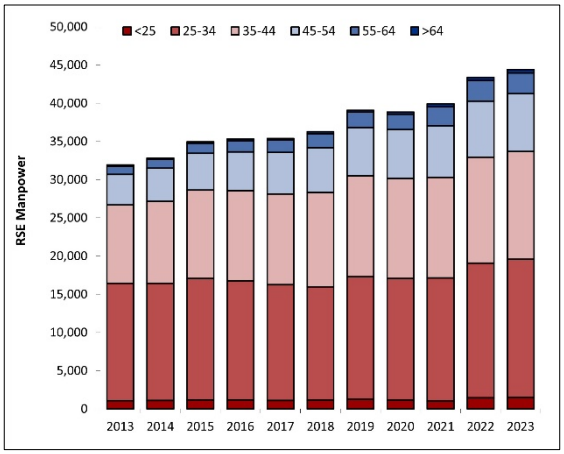
Fig.4.5 Citizenship of Research Scientists & Engineers (2013-2023)



Age-Bands

In 2023, 44.1% of all RSEs were under the age of 35 and 75.9% of all RSEs were under the age of 45. Compared to 2013, these proportions had fallen from 51.5% and 83.5% respectively, as there were more RSEs in the higher age-bands in 2023.

Fig.4.6 Age-Bands of Research Scientists & Engineers (2013-2023)



5. PATENTS

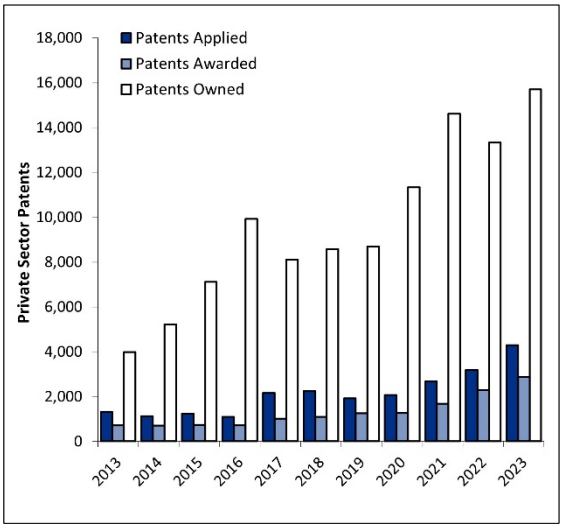
5.1 Patents Applied

In 2023, the total number of primary patent applications (first filings) as a result of R&D conducted in Singapore, stood at 5,139. This was an increase of 25.1% from the 4,107 patents filed in 2022, and a CAGR of 9.1% from the 2,144 patents filed in 2013.

In the private sector, 4,285 patents were filed in 2023, showing a 34.2% increase from the 3,192 patents filed in 2022, and a CAGR of 12.5% from the 1,323 patents filed in 2013.

In the public sector, the number of patent applications decreased by 6.7% from 915 in 2022 to 854 in 2023. Nevertheless, there was a positive CAGR of 0.4% from the 821 patents filed in 2013.

Fig.5.1 Patents Applied, Awarded and Owned in the Private Sector (2013-2023)

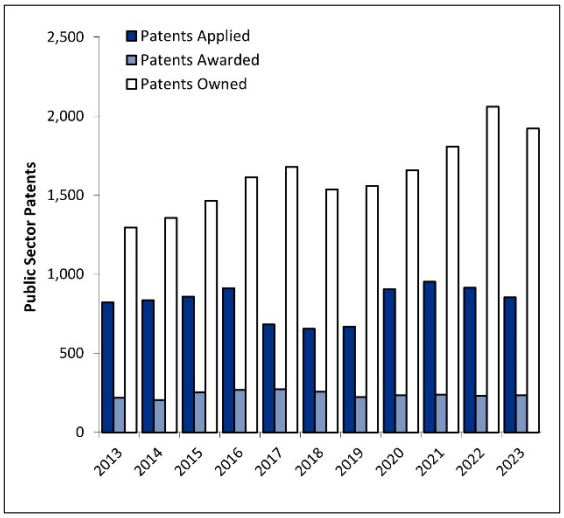


5.2 Patents Awarded

In 2023, the total number of patents awarded (first grants) as a result of R&D conducted in Singapore was 3,116. This represents an increase of 23.5% from 2,523 patents awarded in 2022 and a CAGR of 12.8% from the 934 patents awarded in 2013.

The number of patents awarded to private sector companies increased by 25.8% from 2,291 patents awarded in 2022 to 2,882 in 2023 and a CAGR of 14.9% from the 717 patents awarded in 2013. In the public sector, the number of patents awarded increased slightly by 0.9% from 232 in 2022 to 234 in 2023. There was a positive CAGR of 0.8% from the 217 patents awarded in 2013.

Fig.5.2 Patents Applied, Awarded and Owned in the Public Sector (2013-2023)



6. INTERNATIONAL COMPARISON OF R&D

6.1 Research Intensity in Selected Countries

According to OECD Main Science and Technology Indicators 2025/09, the United States of America remained the top R&D spender in 2023, with US$956 billion spent on research. China remained in second position, having spent US$915 billion, while Japan remained in third position having spent US$214 billion. Normalised as a percentage of GDP, GERD/GDP was 3.4% in the United States of America, 2.6% in China and 3.4% in Japan.

Singapore's GERD/GDP was 2.0% in 2023, an increase from 1.8% in 2022. The top research-intensive countries in the world, as measured by GERD/GDP, were Israel (6.3%) and the Republic of Korea (5.0%).

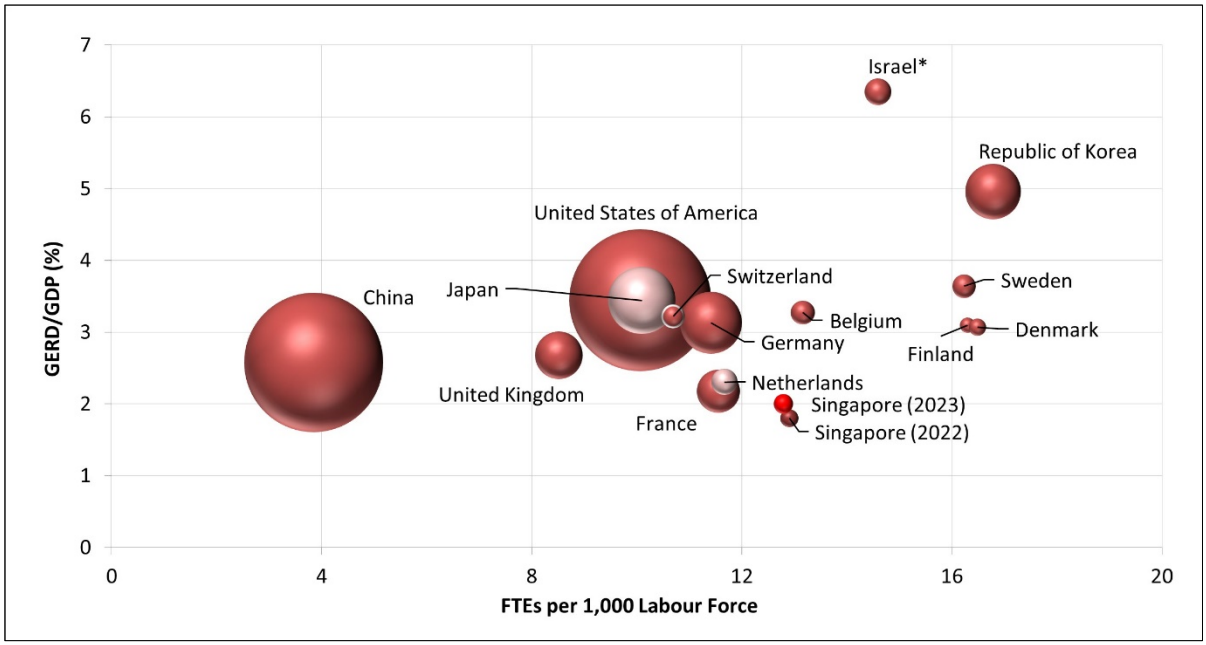
6.2 Researcher Intensity in Selected Countries

Researcher intensity is measured by Full-time Equivalence (FTEs) as a percentage of the labour force. Singapore's labour force increased by 4.9% from 3.75 million in 2022 to 3.94 million in 2023. Researcher FTEs rose by 3.6% from 48,599 in 2022 to 50,345 in 2023.

Singapore's researcher intensity (FTEs/1,000 Labour Force) was 12.9 in 2022 and 12.8 in 2023. This places Singapore within the ranks of countries such as Netherlands (11.7) and Belgium (13.2).

The top countries in terms of researcher intensity in 2023 are Republic of Korea (16.8), Denmark (16.5) and Finland (16.3).

Fig.6.1 Comparison of Selected Countries by Research & Researcher Intensity (2023)



Bubble size indicates GERD.
**Researcher intensity for Israel is of 2012.*
Source: OECD, Main Science and Technology Indicators Sep 2025.

7. EXPLANATORY NOTES AND DEFINITIONS

7.1 DEFINITION OF R&D

7.1.1 Research and development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge and the use of this stock of knowledge to devise new applications. R&D covers three activities: basic research, applied research and experimental development, which are defined and described in Section 7.5. The scope of the definition of R&D for this Survey extends to R&D in science and technology only and excludes the social sciences and humanities.

7.1.2 R&D is related to a number of other activities with a scientific and technological basis, which are often very closely linked to R&D through flows of information or in terms of operations, institutions and personnel. The basic criterion for distinguishing R&D from related activities is the presence of an appreciable element of novelty and the resolution of scientific 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.

7.2 R&D MANPOWER

7.2.1 R&D manpower comprises all persons directly employed on R&D and those providing direct services. It includes persons who are mainly or partially engaged in R&D. It comprises the three occupation groups defined and described below: researchers; technicians; and other supporting staff.

7.2.2 Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, or in the management of the projects concerned. Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work are categorised as researchers.

7.2.3 Researchers are further sub-classified as follows:

(a) **Research scientists and engineers (RSEs)** comprise the researchers, excluding the full-time postgraduate research students, who hold formal qualifications at the university degree level. RSEs are classified into three subcategories according to the highest level of the formal qualifications: PhD; Master's degree; and Bachelor's degree.

(b) **Non-degree researchers** comprise the researchers, excluding the full-time postgraduate research students, who hold formal qualifications below the university degree level.

(c) **Full-time postgraduate research students (FPGRSs)**.

7.2.4 **Technicians** are persons whose main tasks require technical knowledge and experience in one or more fields of science and technology. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. The tasks of technicians include: preparing computer programmes; carrying out experiments, tests and analyses; preparing materials and equipment for experiments, tests and analyses; and recording measurements, making calculations and preparing charts and graphs.

7.2.5 **Other supporting staff** comprise other persons who participate in or are directly associated with R&D projects. Managers and administrators dealing mainly with financial and personnel matters and general administration, skilled and unskilled craftsmen, and secretarial and clerical staff, are included in this heading, insofar as their activities are a direct service to R&D. Persons providing an indirect service should

be excluded (but their wages and salaries should be included as an overhead costs when measuring expenditure on R&D).

7.2.6 The Survey's reporting convention for the headcount of those engaged in R&D is the number of persons as at the last day of the one-year reporting period.

7.2.7 One full-time equivalence (FTE) unit may be thought of as one person-year. A person who spends 30% of his time on R&D and the rest on other activities during the one-year reporting period should be considered as 0.3 FTE. If a full-time R&D worker is employed for only six months during the one-year reporting period, this results in a 0.5 FTE.

7.2.8 R&D manpower is also classified by the following:

(a) **Nationality**, categorised by "Singapore citizens and Singapore permanent residents" as well as "non-PR foreign citizens".

(b) **Age group**, categorised by the following: (i) under 25 years; (ii) 25-34 years; (iii) 35-44 years; (iv) 45-54 years; (v) 55-64 years; and (vi) above 64 years.

(c) **Sex**.

7.3. R&D EXPENDITURE

7.3.1 The (intramural) R&D expenditures for an organisation comprise all expenditures on R&D performed *within the organisation* during the reporting period. They include non-R&D expenditures made outside the organisation but in support of the R&D performed within the organisation. It excludes extramural R&D expenditures, which are the sums an organisation paid or committed to pay to another organisation for the performance of R&D (e.g., acquisition of R&D performed by others and grants given to others for performing R&D).

7.3.2 Intramural R&D expenditures comprise current and capital expenditures.

(a) **Current expenditures** comprise manpower and other operating expenditures:

(i) **Manpower expenditures** comprise annual wages and salaries and all associated expenditures for R&D manpower. The expenditures on persons who provide an indirect service to R&D are included as other operating expenditures on R&D and not as manpower expenditures on R&D.

(ii) **Other operating expenditures (OOE)** include non-capital purchases of materials, supplies and equipment to support R&D performed by the organisation. Administrative and other overhead expenditures are included and prorated if necessary. Expenditures on indirect services are included. Rents and fees associated with R&D are included.

(b) **Capital expenditures (CAPEX)** are the annual gross expenditures on fixed assets used in the R&D programmes of the organisation, i.e. on land, buildings and other structures, and on vehicles, plant, machinery and equipment. They are reported in full for the reporting period when they took place rather than registered as an element of depreciation.

7.3.3 Sources of R&D funds are reported by the performers of research. The surveyed organisation reports the sums which it received or will receive from various sources for the performance of (intramural) R&D during the one-year reporting period. Funds received for R&D performed during earlier periods or for R&D not yet started are excluded. The categories of sources of R&D funds are:

(a) Within Singapore:
  (i) Private sector;
  (ii) Government sector;
  (iii) Institutes of Higher Learning.

(b) Abroad:
(i) Foreign-based companies;
(ii) Foreign governments and international organisations.

7.3.4 All monetary amounts in this report are in Singapore dollars. Monetary amounts that are reported by survey respondents in foreign currency units are converted to Singapore dollars based on the average exchange rates for the relevant year, as published by the Monetary Authority of Singapore.

7.4. INSTITUTIONAL CLASSIFICATION

7.4.1 Sectors. The Survey classifies organisations into three sectors:

(a) **Private sector**. This comprises all business enterprises, excluding institutions of higher learning.

(b) **Government sector**. This comprises all government organisations, including all government ministries, statutory boards and public research institutes. It excludes institutions of higher learning, which are classified under a separate sector.

(c) **Institutes of Higher Learning**. This comprises institutions of higher learning, including the universities and polytechnics.

7.4.2 Industrial classification. The enterprises in the private sector are further sub-classified into industry groups and subgroups according to their classification by the Singapore Standard Industrial Classification (SSIC) 2020.

7.4.3 The enterprises in the private sector are also sub-classified by ownership and size:

(a) A company with at least 30% local equity is classified as a local company, and with less than 30% local equity a foreign company.

(b) A local company is classified as a small/medium-sized enterprise (SME) if it satisfies the following criteria (following Enterprise Singapore), and a large enterprise (LE) otherwise:

(i) Annual sales turnover of not more than $100 million; or
(ii) Employment size of not more than 200 workers.

7.5. FUNCTIONAL DISTRIBUTION

7.5.1 Type of R&D, referenced from the Frascati Manual 2015 by the Organisation for Economic Co-operation and Development (OECD).

Three types of R&D are distinguished:

(a) **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.

The performer of the research may not know about actual applications when doing the research, and therefore does not have them in view: such research is basic according to the definition. Research that is undertaken with the goal of a broad range of applications in the future, but which does not have a particular use in view, is basic according to the definition.

Thus, two types of basic research are distinguished:

(i) **Pure basic research** is carried out primarily for the advancement of knowledge, rather than to solve a specific problem or to seek long-term economic or social benefits or to transfer the results to sectors responsible for their application.

(ii) **Strategic (or oriented) basic research** is carried out with the expectation that it will produce a broad

base of knowledge likely to form the basis of the solution to recognised or expected, current or future problems or possibilities.

(b) **Applied research** is also original investigation undertaken in order to acquire new knowledge. However, it is directed primarily towards a specific practical aim or objective. Applied research is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving specific and predetermined objectives. It involves considering the available knowledge and its extension in order to solve particular problems. The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods or systems. Applied research gives operational form to ideas.

(c) **Experimental development** is systematic work, drawing on knowledge gained from research and practical experience, that is directed to producing new materials, products and devices; to installing new processes, systems and services; or to substantially improving those already produced or installed.

7.5.2 Fields of science and technology (S&T). The areas of R&D are classified by the following S&T fields:

Natural sciences (excluding biological sciences)

- Computer and related sciences [computer programming, computer studies, electronic data processing, information sciences, system analysis, and areas related to software development]
- Physical sciences and mathematics [astronomy and space sciences, physics and related sciences]
- Chemical sciences [chemistry and related sciences]
- Earth and related environmental sciences [geology, geophysics, mineralogy, meteorology, physical geography and other geosciences, other atmospheric sciences including climate research, oceanography, vulcanology, palaeoecology and related sciences]

Engineering and technology

- Civil and architecture engineering [architecture engineering, building sciences and engineering, construction engineering, municipal and structural engineering]
- Mechanical engineering
- Metallurgy and metal engineering
- Aeronautical engineering
- Marine engineering
- Electrical and electronics engineering [electrical engineering, electronics, communication engineering and systems]
- Computer engineering [hardware only]
- Info-communication and media technology
- Materials science and chemical engineering
- Environmental engineering
- Biomedical engineering

Biomedical and related sciences

- Basic medicine [anatomy, cytology, physiology, pharmacy, pharmacology, toxicology, immunology and immunohaematology, pathology, neuroscience]
- Clinical medicine [anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology, oncology, geriatrics, cardiovascular, dermatology, urology, infectious diseases]
- Health sciences [public health services, social medicine, hygiene, nursing, epidemiology]

- Pharmaceutical sciences and manufacturing
- Biological sciences [biochemistry, biology, biophysics, genetics, microbiology, molecular biology, bioengineering, bioinformatics]
- Other related biomedical sciences

Agricultural sciences, food sciences
[Agronomy, agrotechnology, animal husbandry, fisheries, forestry, horticulture, bacteriology related to animals, veterinary medicine, botany, zoology, food and other related sciences]

Energy
[Clean energy systems; solar energy; wind energy]

Other areas

7.6. OTHER DATA

7.6.1 The following R&D-related data are also collected by the Survey:

(a) **Patenting activities** arising from R&D performed in Singapore:
(i) Number of primary patent applications during the reporting period. Only first filings of patent applications are counted, and patent applications for the same invention in more than one country are entered as one.
(ii) Number of patent awards during the reporting period. Patent awards for the same invention in more than one country are entered as one.
(iii) Number of patents owned as at the last day of the calendar year.

(b) **Revenue data**:
(i) Licensing revenue from patents and new technologies developed in Singapore;
(ii) Sales revenue from commercialized products/processes attributed to R&D performed in Singapore.

7.6.2 (a) The following classification data are also collected in the Survey:
(i) Total number of employees;
(ii) Total sales revenue over the one-year reporting period;
(iii) Information on local and foreign equity in the company.
(b) The industrial classification of private sector enterprises by the SSIC 2020 is obtained from the Department of Statistics.

7.6.3 The convention for reporting data such as sales revenue may differ across organisations.

7.7 LIST OF ABBREVIATIONS:

BERD	Business Expenditure on R&D
CAPEX	Capital Expenditure
CAGR	Compound Annual Growth Rate
EDB	Economic Development Board
FPGRS	Full-time Postgraduate Research Student
FTE	Full-time Equivalence
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
IPOS	Intellectual Property Office of Singapore
OOE	Other Operating Expenditure
PG	Post Graduate
PUBERD	Public Expenditure on R&D
RIE	Research, Innovation and Enterprise
R&D	Research & Development
RSE	Research Scientists and Engineers
SME	Small & Medium Enterprise
SSIC	Singapore Standard Industrial Classification
S&T	Science and Technology
UEN	Unique Entity Number

8. METHODOLOGY

8.1. METHODOLOGY

8.1.1 The National Survey of Research, Innovation and Enterprise (RIE) in Singapore is conducted under the Statistics Act 1973 (Chapter 317), which makes the submission of returns mandatory. Individual returns received are kept in confidence with the Statistics Act. The Act is available on the Singapore Department of Statistics' website (www.singstat.gov.sg).

8.1.2 The approach is to survey all organisations that are known to perform R&D. A register of R&D performing organisations is maintained. The Survey form is sent to the organisations on the register. The register comprises all organisations that had reported previously to the Survey that they performed R&D, after excluding those that subsequently reported that they did not perform R&D or ceased operations. The register is updated annually through a Preliminary Survey of organisations that are potentially performing R&D but are not on the register. The list of organisations surveyed in the Preliminary Survey is compiled annually from various sources, and includes all companies that are in receipt of government R&D grants.

8.1.3 From 2019, the register has expanded to include organisations that perform innovation activities (other than R&D). This is in line with the expansion of the survey to include returns on innovation activities performed by organisations in Singapore.

8.2. RESPONSES

8.2.1 The organisations that reported to the Survey that they performed innovation and/or R&D in 2023 comprised private sector enterprises, government organisations, institutions of higher learning and the public research institutes. A total of 1,030 private sector enterprises reported that they performed R&D in 2023.

8.2.2 Approximately 14,100 survey forms were sent out in the Preliminary Survey. Subsequently, close to 3,000 survey forms were sent out to private sector enterprises in the 2023 register of innovation and/or R&D-performing organisations. From these, nearly 2,100 private sector enterprises responded, out of which about 1,540 (73%) reported that they performed innovation (including R&D) in 2023, down from about 1,600 in the previous reference period. The remaining 27% reported that they did not perform innovation and/or R&D in 2023 or had ceased business operations.

8.2.3 In 2023, the top 150 private sector enterprises (by R&D expenditure in 2022) accounted for 85% ($7,799.6 million) of private sector R&D expenditure. 149 (99%) reported that they performed R&D in 2023 and their returns were either reported under their own name or under a parent or subsidiary while the last entity reported that it did not perform R&D in 2023.

8.2.4 88% of all the government organisations, institutions of higher learning and government research institutes that were surveyed in 2023 responded.

8.2.5 The 2023 National RIE Survey publication continues to report the aggregated findings of organisations that perform in-house R&D. Findings of innovation activities performed by organisations in Singapore may be included in future editions of the publication.

8.3. CONVENTIONS

8.3.1 The reporting period of the Survey is one year in length. The actual period may vary across Survey respondents but it would usually be the calendar or fiscal year.

8.4. HISTORICAL NOTES

8.4.1 The National Survey of R&D in Singapore was conducted by the Singapore Science Council on a triennial basis from 1978 to 1987. Since 1990, it has been conducted and published annually by the Agency for Science, Technology and Research (formerly the National Science and Technology Board). In 2019, the National Survey of R&D has been renamed the National Survey of Research, Innovation and Enterprise (RIE), which includes innovation as well.

8.4.2 Postgraduate research students (at the Master's degree and PhD levels) have been reported as R&D manpower only since the 2000 Survey. In the 2000 Survey, both full-time and part-time postgraduate research students were counted. Since the 2001 Survey, only full-time postgraduate research students (FPGRSs) have been included.

8.4.3 In 2000 and 2001, the Survey published data on patents applied and awarded that combined data from the Survey with data from the public databases of the Intellectual Property of Singapore (IPOS). Specifically, the published data combined the patenting data of the Survey respondents with the patenting data in the IPOS databases of locally-based companies (and individuals) that were not among the Survey's respondents. (The IPOS data contributed an additional 128 patents applied and 46 patents awarded in 2000, and an additional 193 patents applied and 51 patents awarded in 2001.) Since 2002, the Survey publishes only the patenting data of Survey respondents.

8.4.4 Since the 2002 Survey, (a) the industrial classification of enterprises in the private sector by industry groups was revised to ensure overall consistency of the classifications with SSIC 2000 and to align the definitions of the industry groups in the manufacturing industries with EDB's new definitions; (b) basic research in the private sector was not sub-classified into the subtypes of pure and strategic basic research; (c) "licensing revenue from acquired patents and new technologies" and "sales revenue from commercialised products and processes attributed to R&D performed in Singapore within the last 2 years" ceased to be published; (d) the Survey asked additionally for the age group and sex of R&D manpower to be reported; (e) the Survey included "computer engineering", "info-communication & media technology", "biological sciences", "basic medicine", "clinical medicine", "health sciences", "pharmaceutical sciences & manufacturing" and "other biomedical related sciences" as disaggregated options under the fields of science & technology category for both researchers and R&D expenditure; and (f) the Survey asked for the disaggregation of reported R&D expenditure in each field of science & technology by the type of R&D.

8.4.5 Prior to 2005, the classification of survey respondents from the private sector was based on the SSIC 2000. In 2005, it was updated to SSIC 2005, in 2010, to SSIC 2010, in 2015, to SSIC 2015, in 2017, to SSIC 2015 (version 2018), and in 2020, to SSIC 2020. In 2017, the aggregation of manufacturing activities into the EDB-defined manufacturing subsectors was also updated with EDB's revised classification. These revisions have some but limited impact on the comparability of the published R&D statistics in the 2017 survey report relative to those in the preceding survey reports.

8.4.6 Hitherto, organisations which were known to have performed R&D in the survey period, but which did not submit a survey return or submitted an incomplete survey return, have been excluded from the published survey results. With effect from the 2006 survey report, such organisations would be captured in the published survey results through a mechanism of imputation, where this is feasible. The imputed data would be based on the previous year's survey returns and/or the current year's

incomplete returns. The impact on the published statistics was marginal considering the survey already had a high response rate. Imputation was used for 7 (0.2%) of the 4,121 entities surveyed in 2021.

8.4.7 With effect from the 2007 Survey, an exercise would be undertaken on a yearly basis to update any changes made by the Department of Statistics to an organisation's Unique Entity Number (UEN) which could in turn impact its SSIC code. This is to capture any changes in the organisation's core activity so as to ensure that the organisation is placed in the correct industry classification.

8.4.8 With effect from the 2021 Survey, breakdowns for Capital Costs into the separate components "*Land, Building & Other Structures"*, and "*Vehicles, Plant, Machinery & Equipment"* are no longer collected to reduce respondent burden.

LIST OF TABLES

*Tables in this section will be published by 20 Feb 2026.

Data tables can be accessed at: https://www.a-star.edu.sg/News/national-survey-of-rie.

Data for full time series can be obtained at SingStat Table Builder (i.e. At SingStat Table Builder, choose Industry → Research and Development (R&D))