

**RESEARCH
AND
DEVELOPMENT**



6 RESEARCH AND DEVELOPMENT

R&D IN SINGAPORE

Data on Research & Development (R&D) in Singapore are collected through the National Survey of R&D, conducted annually by the Agency for Science, Technology and Research (A*STAR). The scope of the survey covers R&D activities in the private, higher education, government and public research institutes sectors.

To facilitate international comparability, data from the survey are collected and presented based on guidelines provided in the Organisation for Economic Co-operation and Development (OECD) Proposed Standard Practice for Surveys on Research and Experimental Development, "Frascati Manual" (Sixth Edition).

Definitions

R&D Manpower

Researchers: Refers to professionals who are engaged in the conception or creation of new knowledge, products, processes, methods and systems, or 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 also fall into this category. Researchers are further sub-classified into:

- (a) Research scientists and engineers (RSEs)
- (b) Full-time postgraduate research students (FPGRS)
- (c) Non-degree researchers

Technicians: Refers to persons whose main tasks require more technical knowledge and experience in one or more fields of science and technology. They participate in R&D by performing scientific and technical tasks that involve the application of concepts and operational methods, normally under the supervision of researchers.

Other supporting staff: Includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

R&D Expenditure

Includes capital expenditure (acquisition of fixed tangible assets involved in R&D activities, excluding depreciation provisions), R&D manpower costs, and other R&D-related operating expenditures. Data for R&D expenditure in each current year are expressed in nominal terms and are not adjusted for inflation.

Patents

Refers to patents that are a result of R&D activities carried out in Singapore. Patent data published in the National Survey of R&D are as reported by survey respondents. Only one patent is awarded to an invention irrespective of the number of countries the patent is being applied or awarded.

6.1 ORGANISATIONS PERFORMING R&D BY SECTOR

Sector	Number						
	1999	2004	2005	2006	2007	2008	2009
Total	624	811	951	951	1,049	947	912
Private	593	765	900	897	992	888	854
Higher Education	6	9	9	9	9	10	11
Government	12	25	26	28	29	30	27
Public Research Institutes	13	12	16	17	19	19	20

Source : Agency for Science, Technology and Research

6.2 R&D MANPOWER BY OCCUPATION

Occupation	Number						
	1999	2004	2005	2006	2007	2008	2009
Total	20,612	31,006	34,522	36,191	38,255	40,504	41,388
Researchers							
RSE ¹	13,817	18,935	21,338	22,675	24,506	25,745	26,608
FPGRS ²	-	3,705	3,718	3,761	4,094	4,605	5,295
Non-Degree	2,465	2,611	2,913	3,042	3,057	3,015	2,484
Technicians	2,375	2,823	3,265	3,291	3,224	3,742	3,563
Supporting Staff	1,955	2,932	3,288	3,422	3,374	3,397	3,438

Source : Agency for Science, Technology and Research

1 RSE refers to Research Scientists and Engineers.

Data exclude postgraduate students.

2 FPGRS refers to Full-time Postgraduate Research Students.

Data for 2000 onwards include full-time postgraduate students only.

6.3 R&D EXPENDITURE BY SECTOR

Sector	Million Dollars						
	1999	2004	2005	2006	2007	2008	2009
Total	2,656.4	4,061.9	4,582.2	5,009.7	6,339.1	7,128.1	6,042.8
Private	1,670.9	2,590.0	3,031.3	3,293.0	4,235.0	5,120.0	3,724.5
Higher Education	310.0	424.7	478.0	575.7	603.0	709.8	854.3
Government	304.9	442.2	442.8	518.3	770.8	544.5	683.1
Public Research Institutes	370.6	605.0	630.1	622.8	730.3	753.8	780.9

Source : Agency for Science, Technology and Research

6.4 R&D EXPENDITURE BY AREA OF RESEARCH, 2009

Million Dollars

Area of Research	Total	Private Sector	Higher Education Sector	Government Sector	Public Research Institutes
Total	6,042.8	3,724.5	854.3	683.1	780.9
Agricultural & Food Sciences	92.9	79.5	2.4	11.1	-
Engineering & Technology	1,243.6	507.8	227.2	166.5	342.1
Biomedical & Related Sciences	3,699.3	2,735.7	337.7	330.7	295.3
Natural Sciences (excl Biological Sciences)	627.2	312.8	165.7	82.5	66.2
Others	379.8	88.8	121.3	92.4	77.3

Source : Agency for Science, Technology and Research

6.5 R&D EXPENDITURE BY TYPE OF COSTS, 2009

Million Dollars

Type of Costs	Total	Private Sector	Higher Education Sector	Government Sector	Public Research Institutes
Total	6,042.8	3,724.5	854.3	683.1	780.9
Capital Costs	1,034.0	712.5	123.4	76.9	121.2
Land, Buildings & Other Structures	134.1	81.0	7.8	37.1	8.2
Vehicles, Plants, Machinery & Equipment	899.9	631.5	115.6	39.8	113.0
Manpower Costs	2,619.7	1,512.2	500.7	269.7	337.1
Researchers	2,239.7	1,329.6	463.9	195.0	251.2
RSE ¹	1,979.1	1,205.7	335.1	188.8	249.5
FPGRS ²	127.1	-	127.1	-	-
Non-Degree	133.5	123.9	1.7	6.2	1.7
Technicians	174.4	67.9	14.0	30.0	62.4
Others	205.6	114.6	22.8	44.7	23.5
Other Operating Costs	2,389.1	1,499.8	230.2	336.5	322.7

Source : Agency for Science, Technology and Research

1 RSE refers to Research Scientists and Engineers.

2 FPGRS refers to Full-time Postgraduate Research Students.

6.6 R&D EXPENDITURE BY MAJOR INDUSTRY IN THE PRIVATE SECTOR

	Million Dollars						
	2003	2004	2005	2006	2007	2008	2009
Total	2,081.2	2,590.0	3,031.3	3,293.0	4,235.0	5,120.0	3,724.5
Manufacturing	1,548.8	1,649.1	1,974.3	2,213.3	2,986.7	3,749.4	2,316.3
Services	519.0	928.1	1,053.6	1,075.9	1,245.9	1,356.7	1,406.1
Others	13.4	12.8	3.4	3.7	2.4	13.8	2.1

Source : Agency for Science, Technology and Research

6.7 R&D OUTPUT

	Number						
	1999	2004	2005	2006	2007	2008	2009
Patents Owned ¹	1,077	2,570	3,475	4,717	5,785	5,455	6,067
Patents Applied	673	1,257	1,594	2,036	1,727	1,581	1,569
Patents Awarded	161	599	877	933	953	730	747

Source : Agency for Science, Technology and Research

¹ As at end of period.