

**RESEARCH  
AND  
DEVELOPMENT**



## 6 RESEARCH AND DEVELOPMENT

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### R&D IN SINGAPORE

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

To facilitate international comparability, data from the survey have been 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. Figures 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 is as reported by survey respondents. The patent number for the same invention is counted as one irrespective of the number of countries the patent is being applied or awarded.

## 6.1 ORGANISATIONS PERFORMING R&D BY SECTOR

Sector	Number						
	1997	2002	2003	2004	2005	2006	2007
Total	543	564	662	811	951	951	1,049
Private	508	519	617	765	900	897	992
Higher Education	6	7	9	9	9	9	9
Government	14	25	24	25	26	28	29
Public Research Institutes	15	13	12	12	16	17	19

Source : Agency for Science, Technology and Research

## 6.2 R&D MANPOWER BY OCCUPATION

Occupation	Number						
	1997	2002	2003	2004	2005	2006	2007
Total	17,219	26,824	28,825	31,006	34,522	36,191	38,255
Researchers							
RSE <sup>1</sup>	11,302	15,654	17,074	18,935	21,338	22,675	24,506
FPGRS <sup>2</sup>	-	3,723	4,065	3,705	3,718	3,761	4,094
Non-Degree	2,039	2,154	2,374	2,611	2,913	3,042	3,057
Technicians	2,297	2,398	2,549	2,823	3,265	3,291	3,224
Supporting Staff	1,581	2,895	2,763	2,932	3,288	3,422	3,374

Source : Agency for Science, Technology and Research

1 RSE denotes Research Scientists and Engineers.

Data exclude postgraduate students.

2 FPGRS denotes 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						
	1997	2002	2003	2004	2005	2006	2007
Total	2,104.6	3,404.7	3,424.5	4,061.9	4,582.2	5,009.7	6,339.1
Private	1,314.5	2,091.3	2,081.2	2,590.0	3,031.3	3,293.0	4,235.0
Higher Education	277.7	430.0	457.5	424.7	478.0	575.7	603.0
Government	216.1	449.1	435.8	442.2	442.8	518.3	770.8
Public Research Institutes	296.2	434.3	450.0	605.0	630.1	622.8	730.3

Source : Agency for Science, Technology and Research

## 6.4 R&D EXPENDITURE BY AREA OF RESEARCH, 2007

Million Dollars					
Area of Research	Total	Private Sector	Higher Education Sector	Government Sector	Public Research Institutes
Total	6,339.1	4,235.0	603.0	770.8	730.3
Agricultural & Food Sciences	70.1	61.9	0.9	7.3	-
Engineering & Technology	4,127.5	3,229.8	232.1	417.5	248.1
Biomedical & Related Sciences	1,057.6	387.4	172.1	124.1	373.9
Natural Sciences (excl Biological Sciences)	572.9	296.0	117.7	100.3	59.0
Others	511.1	259.9	80.2	121.6	49.4

Source : Agency for Science, Technology and Research

## 6.5 R&D EXPENDITURE BY TYPE OF COSTS, 2007

Million Dollars					
Type of Costs	Total	Private Sector	Higher Education Sector	Government Sector	Public Research Institutes
Total	6,339.1	4,235.0	603.0	770.8	730.3
Capital Costs	1,790.9	1,315.3	62.7	259.7	153.2
Land, Buildings & Other Structures	1,161.0	875.8	1.2	244.2	39.8
Vehicles, Plants, Machinery & Equipment	629.9	439.5	61.6	15.5	113.3
Manpower Costs	2,386.2	1,488.9	363.6	234.4	299.3
Researchers	2,075.1	1,334.0	337.5	169.6	234.0
RSE <sup>1</sup>	1,804.5	1,166.3	242.3	162.5	233.4
FPGRS <sup>2</sup>	50.7	-	50.7	-	-
Non-Degree	219.9	167.7	44.6	7.1	0.6
Technicians	136.9	59.8	14.5	26.7	36.0
Others	174.2	95.1	11.6	38.2	29.4
Other Operating Costs	2,162.0	1,430.8	176.7	276.7	277.8

Source : Agency for Science, Technology and Research

1 RSE denotes Research Scientists and Engineers.

2 FPGRS denotes Full-time Postgraduate Research Students.

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

	Million Dollars					
	2002	2003	2004	2005	2006	2007
Total	2,091.3	2,081.2	2,590.0	3,031.3	3,293.0	4,235.0
Manufacturing	1,514.7	1,548.8	1,649.1	1,974.3	2,213.3	2,986.7
Services	469.6	519.0	928.1	1,053.6	1,075.9	1,245.9
Others	107.0	13.4	12.8	3.4	3.7	2.4

Source : Agency for Science, Technology and Research

## 6.7 R&D OUTPUT

	Number						
	1997	2002	2003	2004	2005	2006	2007
Patents Owned <sup>1</sup>	831	1,739	2,314	2,570	3,475	4,717	5,786
Patents Applied	490	936	1,001	1,257	1,594	2,036	1,739
Patents Awarded	132	451	460	599	877	933	941

Source : Agency for Science, Technology and Research

<sup>1</sup> As at end of period.