



**NATIONAL
SCIENCE
FOUNDATION**

Statistical Handbook on Research and Development of Sri Lanka 2020

**National Science Foundation
47/5, Maitland Place
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Sri Lanka
www.nsf.gov.lk**

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ISBN 978-624-5896-02-8

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PREFACE

The Statistical Handbook on Research and Development of Sri Lanka 2020 comprises the findings of the National Research and Development Survey 2020 conducted by the National Science Foundation (NSF), Sri Lanka. This showcases the performance of the R&D sector in the country during the year 2020. The statistical brief encompasses financial and human resources devoted to R&D and also some output indicators of the R&D sector. This statistical brief covers the whole R&D sector of the country namely, State Sector R&D institutes, Higher Education Institutes, Business Enterprises and Private Non-Profit organizations.

The National R&D Survey is conducted biennially since 2018. This Survey is conducted according to the standards stipulated by the Organization for Economic Co-operation and Development (OECD) and UNESCO Institute of Statistics (UIS) and therefore the statistics are internationally comparable. The Frascati manual (2015) of OECD and Guide to Conducting an R&D Survey: For countries starting to measure research and experimental development (2014) of UIS are the two major guidelines followed in the survey. The statistics depicting here can be used by policy makers, planners, researchers, scientists and technologists by having a comprehensive overview of R&D activities of the country.

The Statistical Handbook on Research and Development of Sri Lanka 2020 was produced by the Science and Technology Policy Research Division (STPRD) of the NSF. Mrs Dilushi Munasinghe coordinated the survey while Mrs Chandima Samarasinghe and Mrs Madhumali Wickramasinghe assisted in the survey in many ways. Mrs Chandima Samarasinghe designed the handbook as well.

The NSF extends its great appreciation to the Heads and staff members of all responding institutes, the MIS Unit of the University Grants Commissions and the Department of Census and Statistics for their invaluable cooperation extended to complete this survey. Comments and editorial changes given by the external reviewer Dr R.D. Guneratne are highly acknowledged. Finally, we wish to record our sincere thanks to the Management of the NSF for their directives and encouragement given to complete this survey.

Science and Technology Policy Research Division

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January 2023

HIGHLIGHTS - 2020

- Sri Lanka had spent a total of Rs. 18,174.60 million on R&D in 2020. This corresponds to 0.12% of the GDP of the country.
- The highest gross expenditure on Research and Development (GERD) was incurred by Business Enterprises (37.94%) followed by Government Research Institutes (34.12%), Higher Education Sector (26.7%), and Private Non-Profit Organizations (1.25%).
- The highest proportion of funds for R&D was devoted for Applied Research 47.45% of GERD while Basic and Experimental Developments accounted 29.30% and 23.25% of GERD respectively.
- The top three fields of Science which have the highest GERD are Engineering and Technology (27.65%), Agricultural sciences (24.20%) and Natural sciences (22.46%).
- 6,064 Researchers (Head Count) were employed in domestic R&D activities and their Full-Time Equivalent value was 2267
- Researchers per million of population were 103.43 in full-time equvalued (FTE)
- 272 patent registrations were reported in 2020 and out of them 223 patents were Non-Resident registrations.
- 1,139 articles were published in SCI Journals in 2020 by the Sri Lankan scientists and 71% of them have a foreign co-authorship

CONTENTS

Preface	iii
Highlights	iv
1. Financial Resources for Research and Development	01-11
1.1. Gross Domestic Expenditure on Research and Development (GERD) 2020	
1.2. Source of Funds - Sector-wise Disaggregation	
1.3. R&D Expenditure - Sector-wise Disaggregation	
1.4. Time Trend - Capital and Recurrent Expenditure on R&D	
1.5. Time Trend - GERD by Research Activities	
1.6. Time Trend - GERD by Field of Science	
2. Human Resources in Research and Development	13-28
2.1. Researchers and Technicians Employed in Research and Development 2020	
2.2. Researchers by Different Disciplines	
2.3. Researchers by Educational Qualifications	
2.4. Researchers by (Head Count) Age and Gender	
2.5. R&D Persons - Sector-wise Disaggregation	

- 2.6. R&D Persons - Sector-wise Disaggregation
- 2.7. Researchers by Different Disciplines (2014-2020)
- 2.8. Time Trend of Researchers by Educational Qualifications
- 2.9. Time Trend of Researchers by Age
- 2.10. Number of Research Students in Universities 2018 & 2020
- 2.11. Research Students by Different Disciplines

3. Performance & Output Indicators of Research and Development

29-41

- 3.1. Patents, Industrial Designs and SCI Journal Publications in 2020
- 3.2. Patent Registrations according to International Patent Classification (IPC)
- 3.3. Industrial Designs according to Locarno Classification
- 3.4. Sector-wise Innovations
- 3.5. Commercialization of Innovations by Sectors
- 3.6. Publications of Sri Lankan Scientists in SCI Journals
- 3.7. Publications of Sri Lankan Scientists in SCI Journals by Field of Science (2014-2020)

Definitions and Technical Notes & References

42-44



FINANCIAL RESOURCES
FOR
RESEARCH AND DEVELOPMENT

1.1. Gross Domestic Expenditure on Research and Development (GERD) 2020

Description		
a)	GERD at Current Market Price (Rs. Million)	18,174.60
b)	GERD as a percentage of GDP (%) ¹	0.12%
c)	GERD per Million Population (Rs. Million) ²	829.13
d)	GERD (USD Million)	97.2

1- GDP of 2020 at current market price is Rs. 15,027 billion (Annual Report 2021, Central Bank of Sri Lanka)

2- Mid-year population of 2020 is 21,919,000 (Annual Report 2021, Central Bank of Sri Lanka)

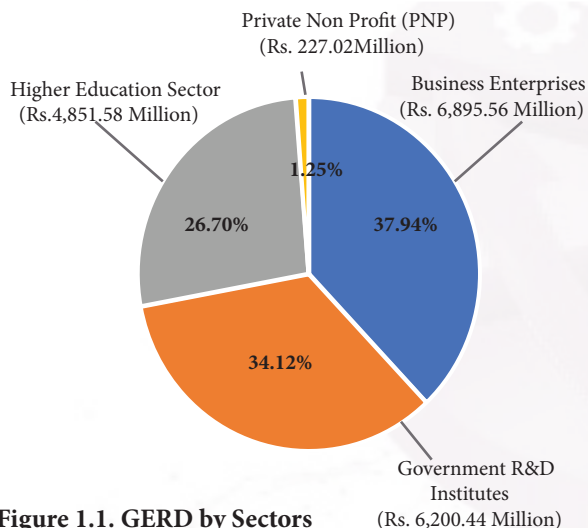


Figure 1.1. GERD by Sectors

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

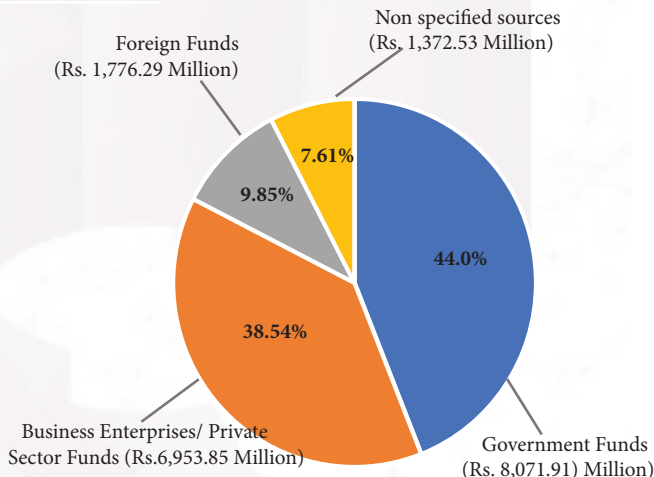
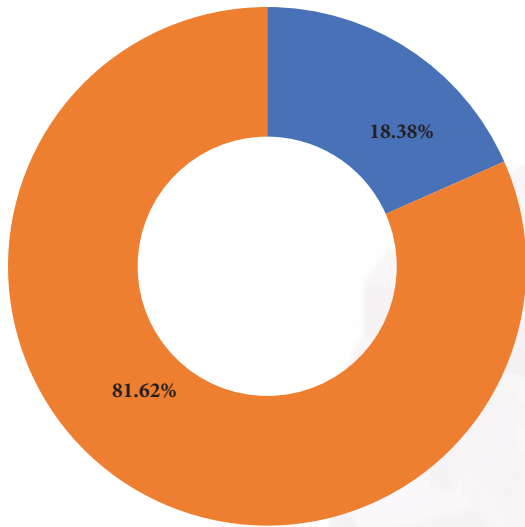


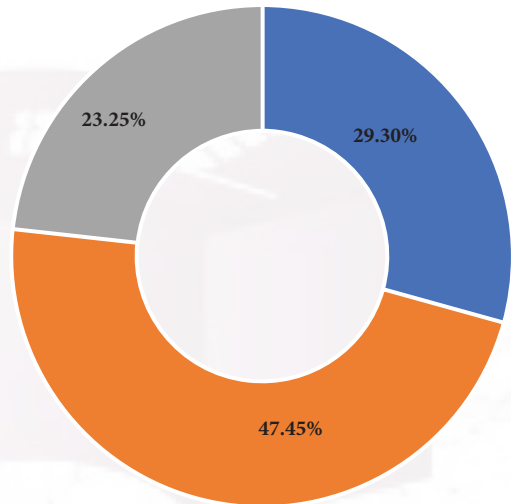
Figure 1.2 R&D Expenditure by Source of Funds



- Capital (Rs. 3,320.01 Million)
- Recurrent (Rs. 14,854.59 Million)

Figure 1.3. Capital and Recurrent Expenditure on R&D

Source: National R&D Survey of Sri Lanka, 2020 (NSF)



- Basic (Rs. 5,325.76 Million)
- Applied (Rs. 8,624.09 Million)
- Experimental Development (Rs. 4,224.74 Million)

Figure 1.4. GERD by Research Activities

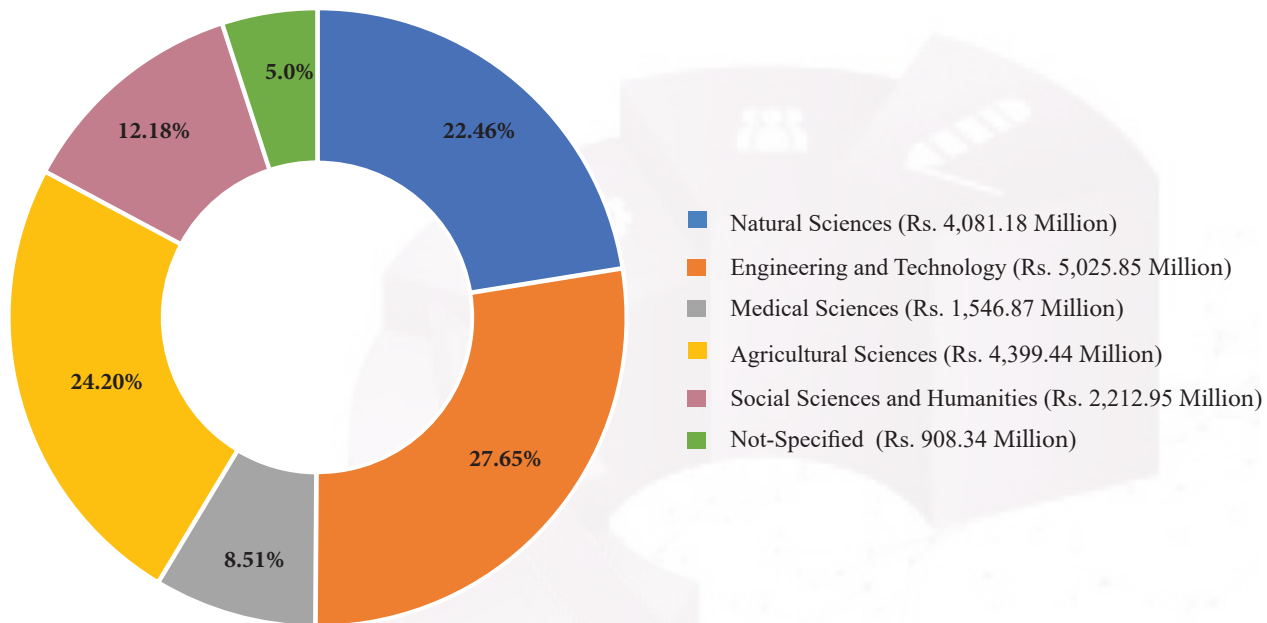


Figure 1.5. GERD by Field of Science

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

1.2. Source of Funds - Sector-wise Disaggregation

Source of Fund	Government R&D Institutes		Higher Education Sector		Business Enterprises		PNP		Total	
	Rs. Million	%	Rs. Million	%	Rs. Million	%	Rs. Million	%	Rs. Million	%
Government	5,118.67	82.55	2,822.76	58.18	126.43	1.83	4.05	1.78	8,071.91	44.41
Business Enterprises/ Private Sector	114.5	1.85	98.42	2.03	6,738.60	97.72	2.33	1.03	6,953.85	38.26
Foreign	93.56	1.51	1,463.74	30.17	0	0.00	218.99	96.46	1,776.29	9.77
Not-Specified	873.71	14.09	466.65	9.62	30.52	0.44	1.65	0.73	1,372.55	7.55
Total	6,200.44	100	4,851.57	100	6,895.55	100	227.02	100	18,174.60	100

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

1.3. R&D Expenditure - Sector-wise Disaggregation

Expenditure Description	Government R&D Institutes		Higher Education Sector		Business Enterprises		PNP	
	Rs. Million	%	Rs. Million	%	Rs. Million	%	Rs. Million	%
Capital	1,183.49	19.09	73.56	1.43	2,057.91	29.84	5.05	2.22
Recurrent	5,016.95	80.91	4778.02	98.57	4,837.65	70.16	221.97	97.78
Basic	1,197.92	19.32	1,684.61	34.99	2,320.46	33.65	122.77	54.08
Applied	4,137.51	66.73	2,686.26	55.95	1,696.33	24.60	103.99	45.81
Experimental Development	865.01	13.95	480.70	9.06	2,878.77	41.75	0.27	0.12
Natural Sciences	1,432.93	23.11	1,316.47	25.96	1,315.63	19.08	16.15	7.11
Engineering and Technology	1,033.62	16.67	871.14	17.99	3,121.09	45.26	0	0.00
Medical Sciences	209.87	3.38	870.87	18.43	460.03	6.67	6.1	2.69
Agricultural Sciences	2,601.38	41.95	513.69	10.86	1,202.84	17.44	81.53	35.91
Social Sciences and Humanities	780.94	12.59	905.22	19.17	411.69	5.97	115.1	50.70
Not-Specified	141.7	2.29	374.2	7.60	384.3	5.57	8.14	3.59

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

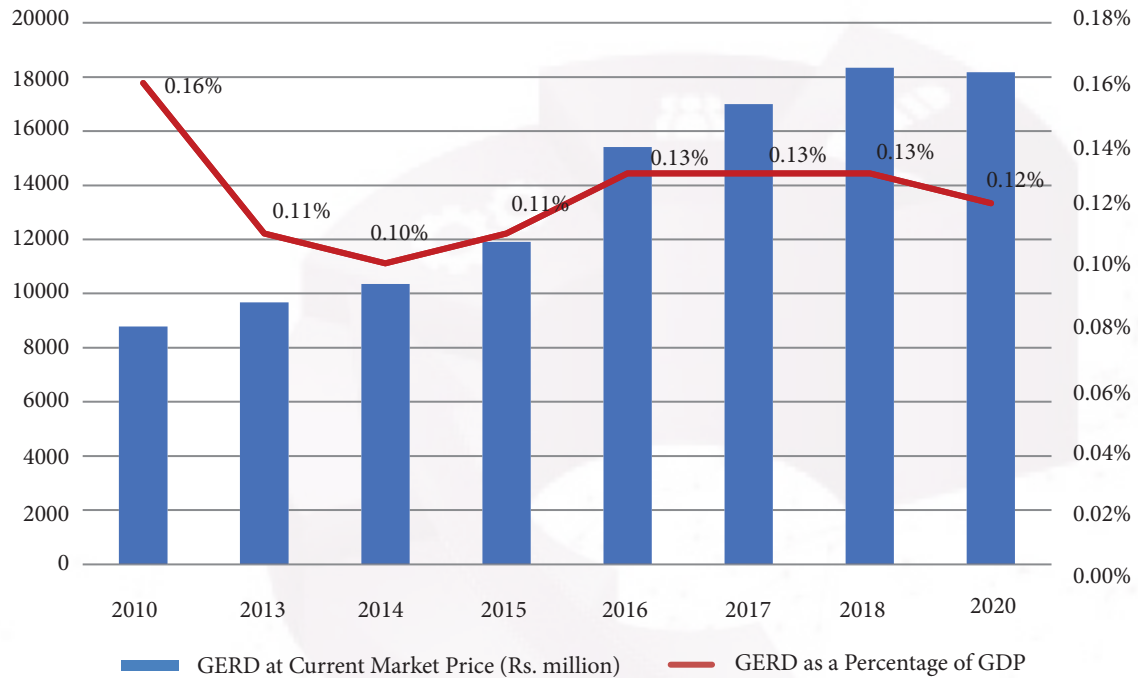


Figure 1.6. Time Trend of GERD (2010-2020)

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

1.4. Time Trend - Capital and Recurrent Expenditure on R&D

Rs. Million

Nature of Expenditure	2014	2015	2016	2017	2018	2020
Recurrent	8,851.04	10,453.60	13,290.64	13,854.42	14,191.12	14,854.59
Capital	1,499.04	1,450.50	2,128.66	3,148.92	4,152.81	3,320.01
Total	10,350.08	11,904.10	15,419.30	17,003.34	18,343.93	18,174.60

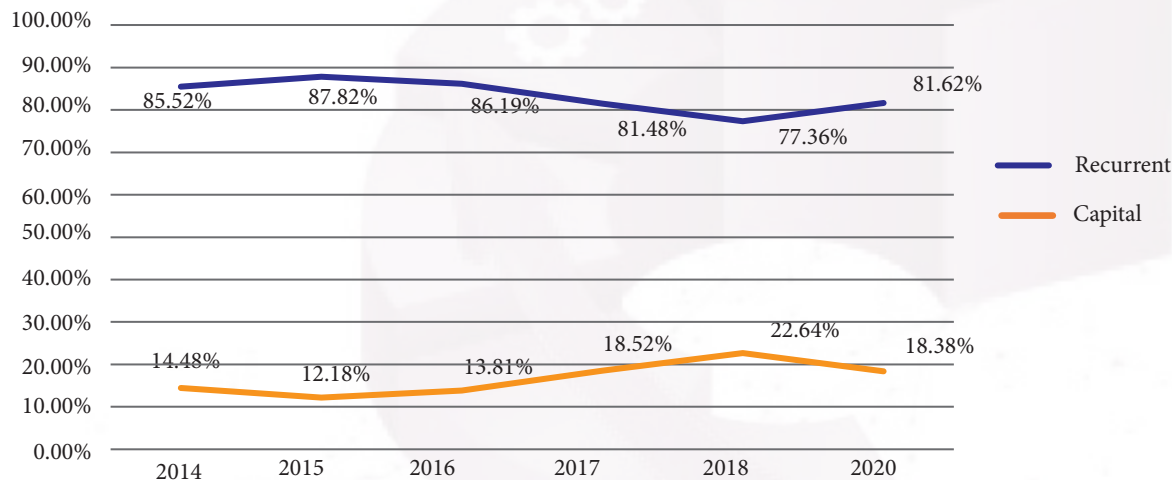


Figure 1.7. Time Trend of Capital and Recurrent R&D Expenditure

Source: National R&D Surveys of Sri Lanka, 2014, 2015, 2016, 2017, 2018 & 2020 (NSF)

1.5. Time Trend - GERD by Research Activities

Rs. Million

Research Type	2014	2015	2016	2017	2018	2020
Basic	1,578.47	1,668.80	2,649.30	4,559.02	5,929.48	5,325.76
Applied	5,938.05	6,648.20	7,036.96	8,559.34	4,875.29	8,624.09
Experimental Development	2,833.56	3,587.10	5,733.04	3,884.98	7,539.15	4,224.74
Total	10,350.08	11,904.10	15,419.30	17,003.34	18,343.92	18,174.60

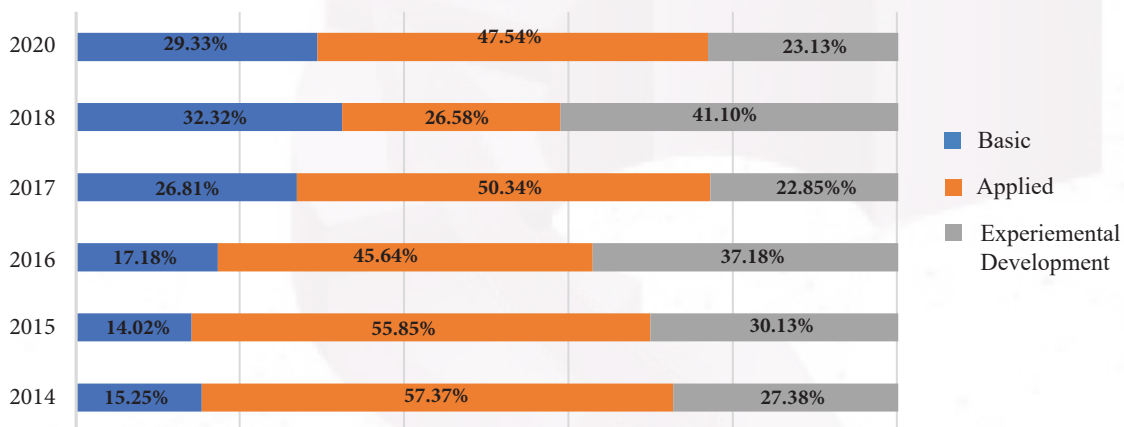


Figure 1.8. Time Trend - GERD by Research Activities

Source: National R&D Surveys of Sri Lanka, 2014, 2015, 2016, 2017, 2018 & 2020 (NSF)

1.6. Time Trend - GERD by Field of Science

Rs. Million

Discipline	2014	2015	2016	2017	2018	2020
Natural Sciences	2,666.19	3,170.30	3,020.67	3,060.19	3,350.26	4,081.18
Engineering and Technology	2,447.55	2,991.80	4,913.90	3,432.84	5,986.74	5,025.85
Medical Sciences	371.85	1,019.10	930.77	1,588.50	1,558.03	1,546.87
Agricultural Sciences	4,077.77	3,746.10	4,349.42	6,080.86	4,372.72	4,399.44
Social Sciences and Humanities	603.85	647.80	1,390.84	1,561.81	2,654.95	2,212.95
Not Specified	182.87	329.00	813.70	1,279.14	421.23	908.34
Total	10,350.08	11,904.10	15,419.30	17,003.34	18,343.92	18,174.63

Source: National RDI Surveys Sri Lanka, 2014, 2015, 2016, 2017, 2018 & 2020 (NSF)

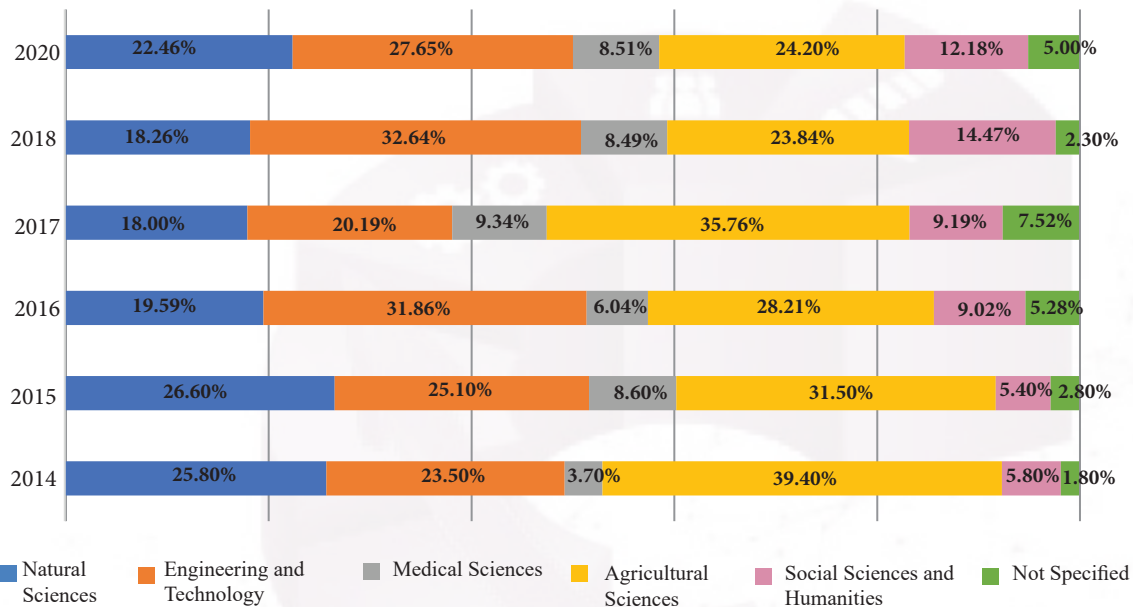


Figure 1.9. Time Trend - GERD by Field of Science

Source: National RDI Surveys Sri Lanka, 2014, 2015, 2016, 2017, 2018 & 2020 (NSF)



HUMAN RESOURCES
IN
RESEARCH AND DEVELOPMENT

2.1. Researchers and Technicians Employed in Research and Development 2020

Description		
a)	Head Count of Researchers (Number)	6,064
b)	Head Count of Technicians (Number)	3,583
c)	Human Resource for R&D (Researchers and Technicians)	9,647
d)	No of Technicians per Researcher	0.59
e)	Researchers per million population*	276.65
f)	Full time Equivalent of Researchers	2,267
g)	Researchers per million population (in full-time equivalent - FTE)*	103.43
h)	Number of Research Students	7,056

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

* Mid Year Population of 2020 is 21,919,000 (Annual Report 2021, Central Bank of Sri Lanka)

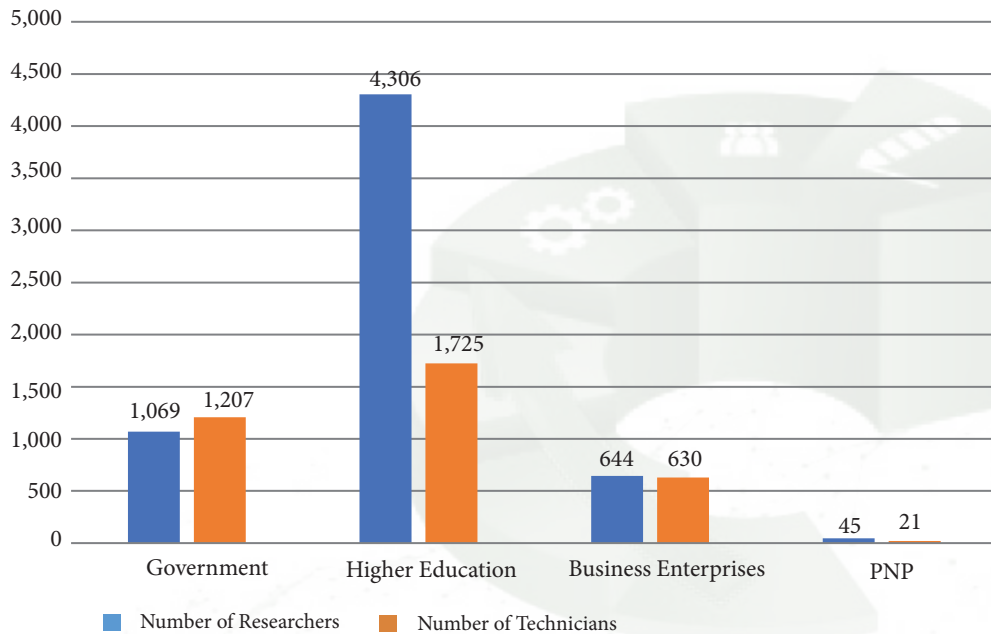


Figure 2.1. Distribution of R&D Persons by Sector

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

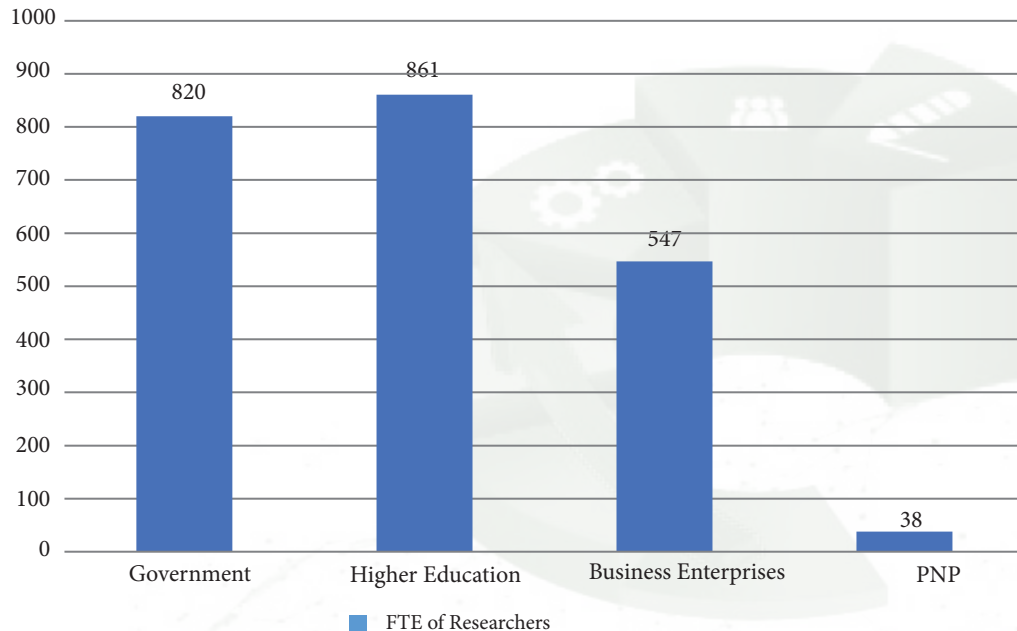


Figure 2.2. Full-time Equivalent (FTE) of Researchers by Sector

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.2. Researchers by Different Disciplines

Discipline	Male	Female	Total
Natural Sciences	678	772	1,450
Agricultural Sciences	457	453	910
Engineering and Technology	785	758	1,543
Medical Sciences	700	538	1,238
Social Sciences and Humanities	334	381	715
Not Specified	100	108	208
Total	3,054	3,010	6,064

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

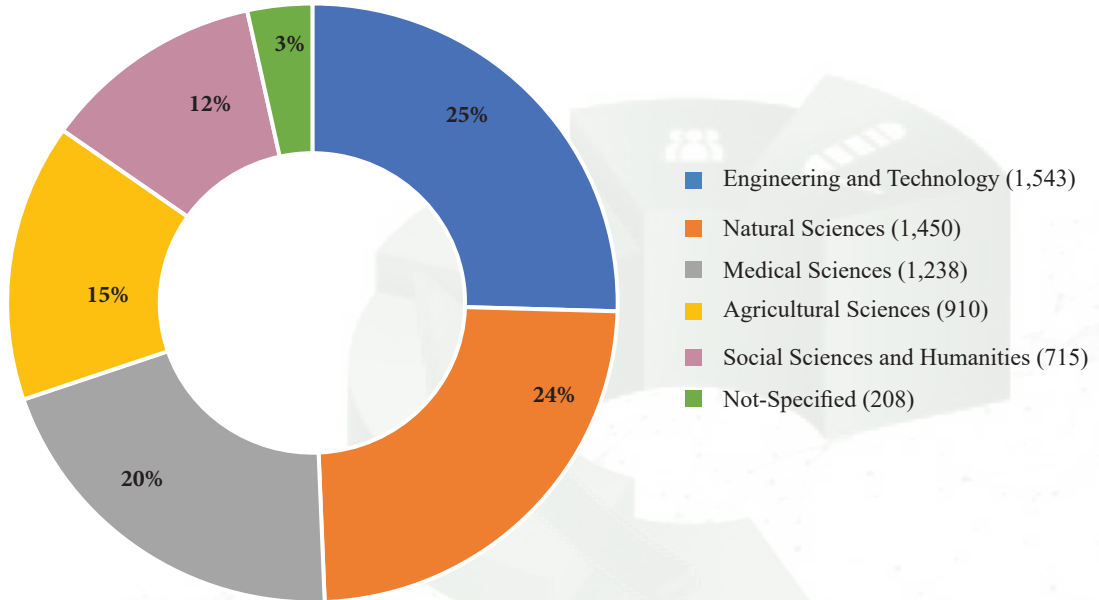


Figure 2.3. Distribution of Researchers by Different Disciplines

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.3. Researchers by Educational Qualifications

Educational Qualifications	Male	Female	Total
Doctoral or Equivalent	1,202	1,165	2,367
MPhil	237	224	461
Masters or Equivalent	847	869	1,716
Bachelors or Equivalent	745	734	1,479
Not Specified	23	18	41
Total	3,054	3,010	6,064

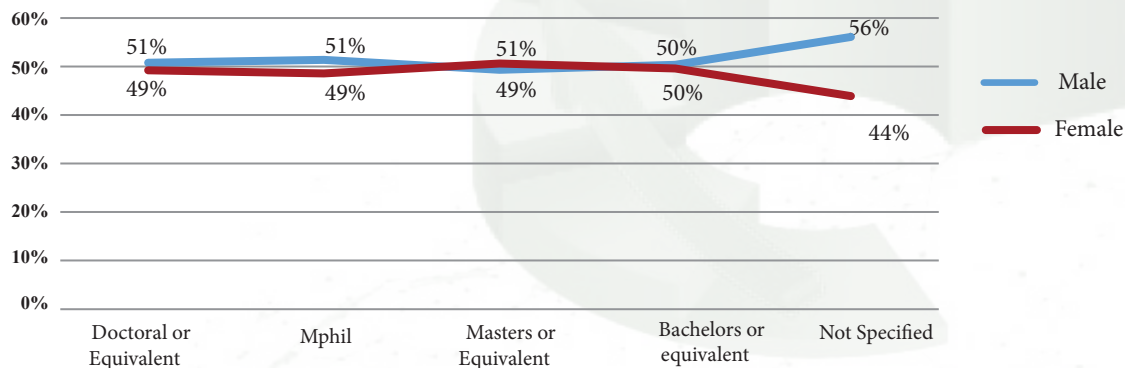


Figure 2.4. Researchers by Educational Qualiications and Gender

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.4. Researchers by (Head Count) Age and Gender

Age Group	Male	Female	Total
21 - 30	369	347	716
31 - 40	1,172	915	2,087
41 - 50	816	898	1,714
51 - 60	578	705	1,283
Above 60	119	145	264
Total	3,054	3,010	6,064

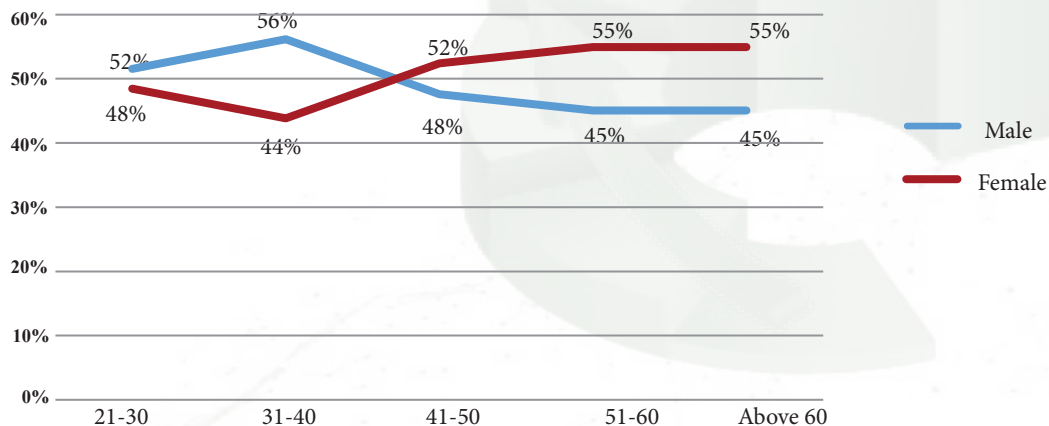


Figure 2.5. Age and Gender-wise Proportion of Researchers

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.5. R&D Persons - Sector-wise Disaggregation

Description	Government		Higher Education		Business Enterprises		PNP		Total		
	M	F	M	F	M	F	M	F	M	F	Total
Head Count of Researchers	527	542	2,075	2,231	434	210	18	27	3,054	3,010	6,064
Head Count of Technicians	679	528	1,264	461	480	150	2	19	2,425	1,158	3,583
Full-time Equivalent (FTE) of Researchers	404	416	415	446	369	179	15	23	1,203	1,063	2,267

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.6. R&D Persons - Sector-wise Disaggregation

Description	Government		Higher Education		Business Enterprises		PNP		Total		Total
	M	F	M	F	M	F	M	F	M	F	
Doctoral or Equivalent	112	103	1,058	1,034	28	24	4	4	1,202	1,165	2,367
M.Phil	36	44	195	179	5	0	1	1	237	224	461
Masters or Equivalent	212	257	528	563	98	37	9	12	847	869	1,716
Bachelors or Equivalent	159	134	294	455	288	137	4	8	745	734	1,479
Not Specified	8	4	0	0	15	12	0	2	23	18	41
Total	527	542	2,075	2,231	434	210	18	27	3,054	3,010	6,064
Researchers by Age											
21 - 30	60	55	204	171	102	113	3	8	369	347	716
31 - 40	184	229	805	600	178	78	5	8	1,172	915	2,087
41 - 50	140	150	569	723	103	16	4	9	816	898	1,714
51 - 60	134	107	403	594	37	3	4	1	578	705	1,283
Above 60	9	1	94	143	14	0	2	1	119	145	264
Total	527	542	2,075	2,231	434	210	18	27	3,054	3,010	6,064

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

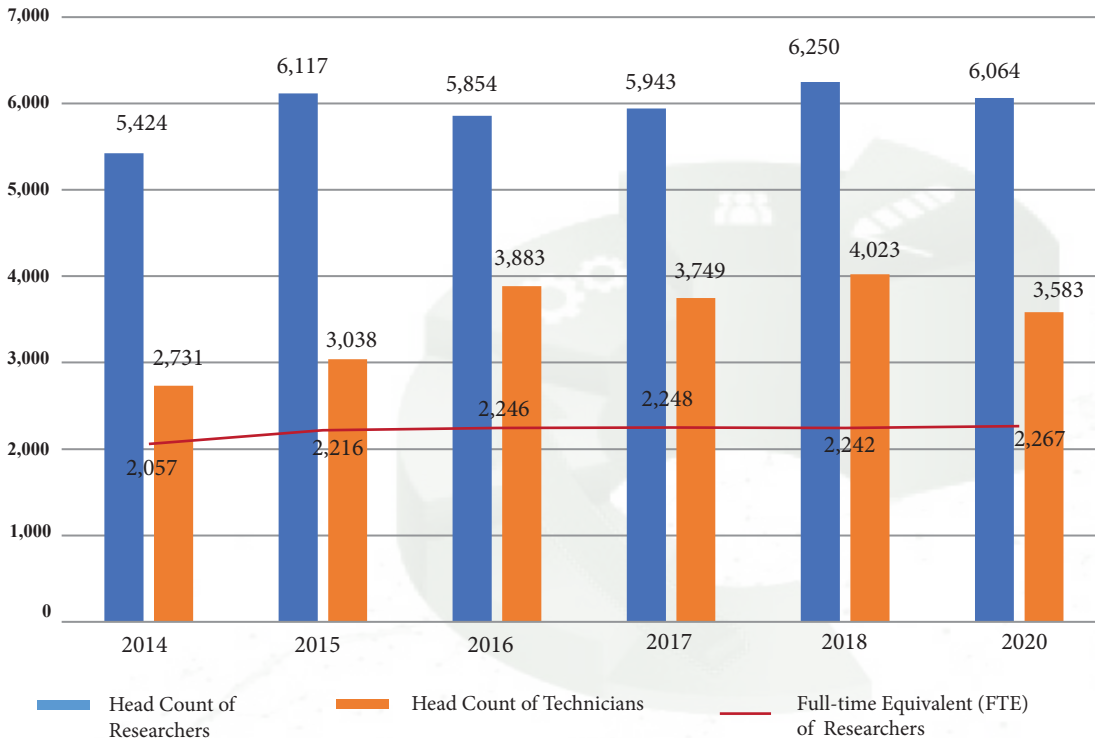


Figure 2.5. Time Trend of R&D Persons

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.7. Researchers by Different Disciplines (2014-2020)

Field of Science	Head Count of Researchers					
	2014	2015	2016	2017	2018	2020
Natural Sciences	1,629	1,897	1,399	1,385	1,462	1,450
Agricultural Sciences	1,289	1,423	1,387	1,239	1,170	910
Engineering and Technology	1,047	1,286	1,115	1,128	1,128	1,543
Medical Sciences	794	776	1,175	1,320	1,472	1,238
Social Sciences and Humanities	408	471	745	703	858	715
Not Specified	257	264	33	168	160	208
Total	5,424	6,117	5,854	5,943	6,250	6,064

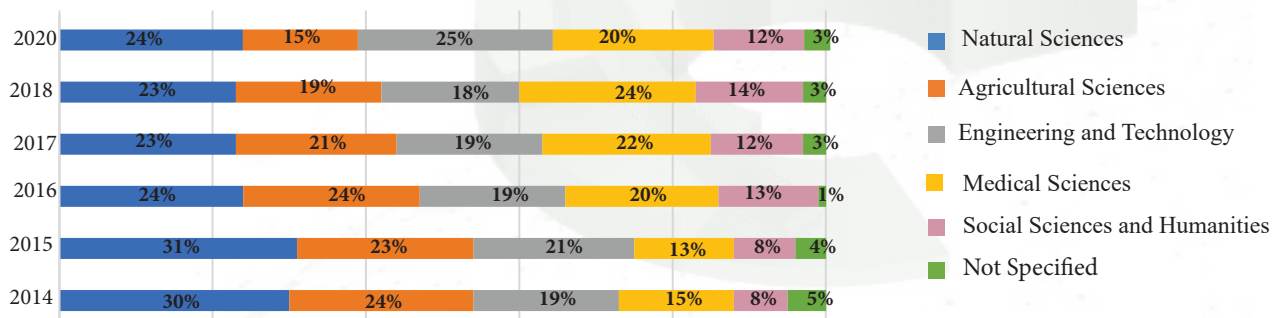


Figure 2.6. Researchers by Different Disciplines - Time Trend

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.8. Time Trend of Researchers by Educational Qualifications

Educational Qualifications	Number of Researchers					
	2014	2015	2016	2017	2018	2020
Doctoral or Equivalent	899	944	1,898	1,971	2,082	2,367
MPhil	237	266	409	426	470	461
Masters or Equivalent	863	1,249	1,842	1,955	1,992	1,716
Bachelors or Equivalent	3,310	3,383	1,583	1,480	1,556	1,479
Not Specified	115	275	122	111	150	41
Total	5,424	6,117	5,854	5,943	6,250	6,064

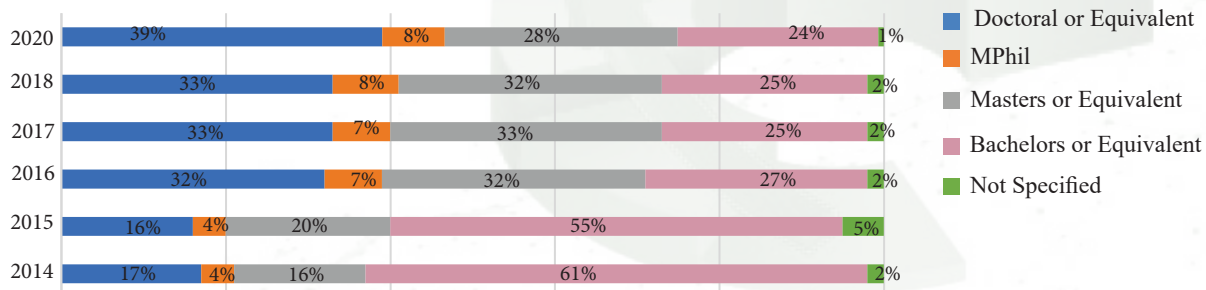


Figure 2.7. Researchers by Educational Qualifications - Time Trend

Source: National R&D Survey of Sri Lanka, 2020 (NSF)

2.9. Time Trend of Researchers by Age

Age Group	Number of Researchers					
	2014	2015	2016	2017	2018	2020
21 - 30	737	903	676	776	844	716
31 - 40	1,107	1,143	1,871	1,907	2,021	2,087
41 - 50	1,170	1,686	1,737	1,734	1,812	1,714
51 - 60	606	1,323	1,267	1,266	1,305	1,283
Above 60	163	755	303	260	268	264
Not Specified	1,641	307	0	0	0	0
Total	5,424	6,117	5,854	5,943	6,250	6,064

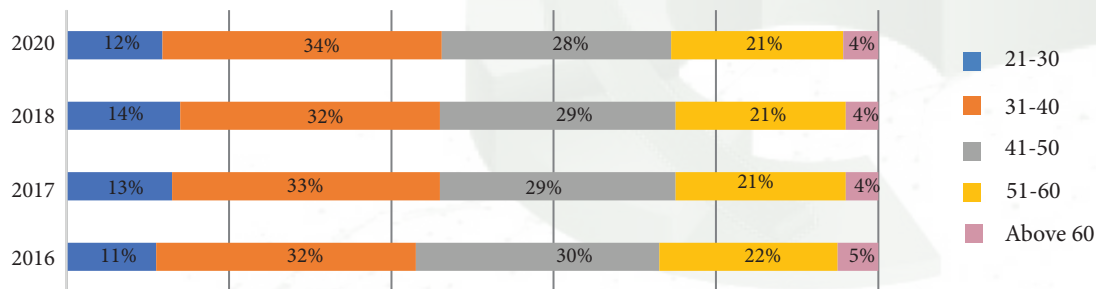


Figure 2.8. Time Trend of Researchers by Age

Source: National R&D Survey of Sri Lanka, 2014, 2015, 2016, 2017, 2018 & 2020 (NSF)

2.10. Number of Research Students in Universities 2018 & 2020

Student Category	2018			2020		
	Male	Female	Total	Male	Female	Total
PhD Research Students	658	456	1,114	662	501	1,163
MPhil Research Students	1,486	1,260	2,746	1,385	1,390	2,775
Total Research Students	2,144	1,716	3,860	2,047	1,891	3,938

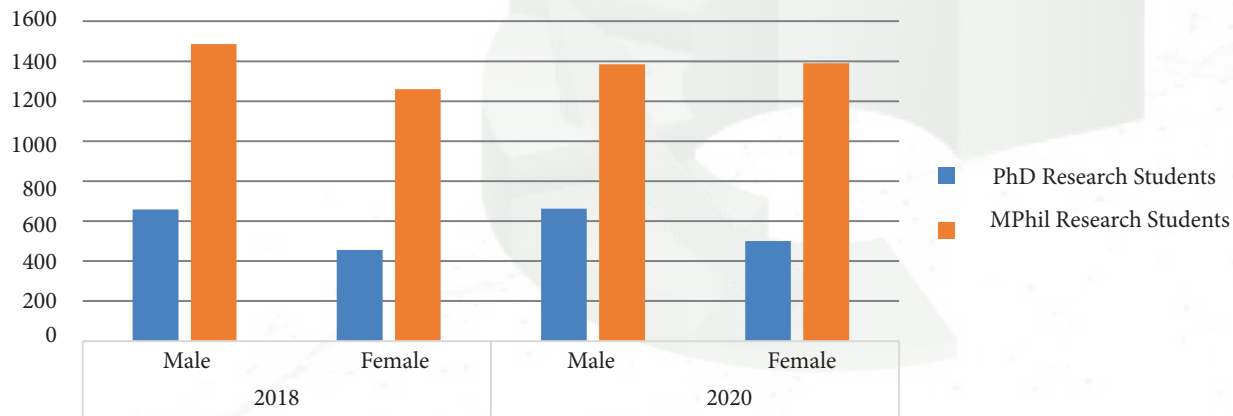
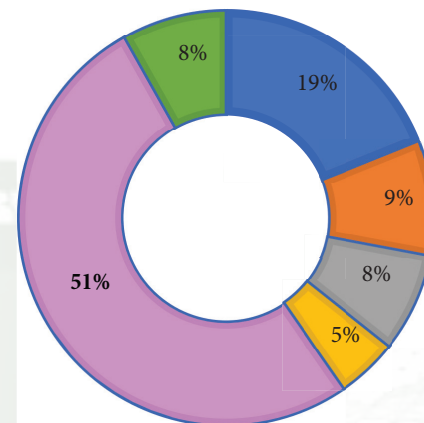


Figure 2.9. Types of Research Students

Source: National R&D Survey of Sri Lanka, 2018 & 2020 (NSF)

2.11. Research Students by Different Disciplines

Field of Science	Male	Female	Total
Natural Sciences	316	433	749
Agricultural Sciences	138	212	350
Engineering and Technology	184	119	303
Medical Sciences	63	125	188
Social Sciences and Humanities	1,142	884	2,026
Others	202	120	322
Total	2,045	1,893	3,938



- Natural Sciences
- Agricultural Sciences
- Engineering and Technology
- Medical Sciences
- Social Sciences and Humanities
- Others

Figure 2.10. Research Students by Different Disciplines

Source: National R&D Survey of Sri Lanka, 2020 (NSF)



PERFORMANCE & OUTPUT
INDICATORS OF
RESEARCH AND DEVELOPMENT

3.1. Patents, Industrial Designs and SCI Journal Publications in 2020

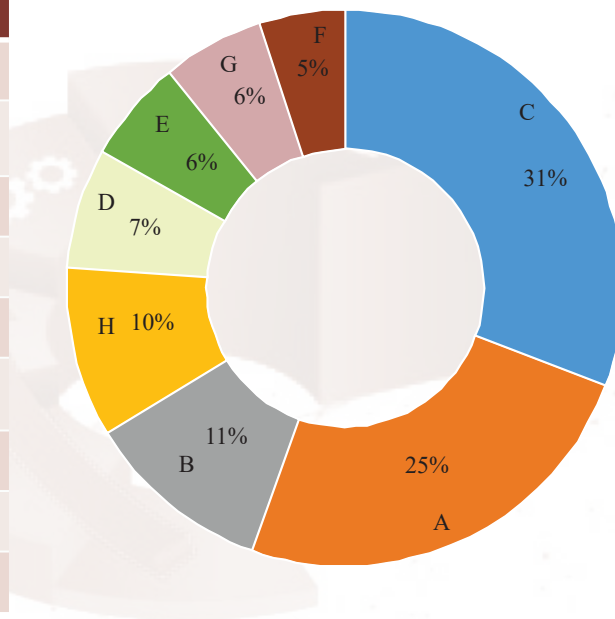
Description		
A)	Number of Patent Registrations (Resident)	49
B)	Number of Patent Registrations (Non-Resident)	223
C)	Total Number of Patent Registrations (a+b)	272
D)	Number of Industrial Designs Awarded (Resident)	122
E)	Number of Industrial Designs Awarded (Non-Resident)	29
F)	Total Number of Industrial Designs Awarded (d+e)	151
G)	Publications by Sri Lankan Scientists in SCI Journals**	1140

Source: National Intellectual Property Office (NIPO), Sri Lanka

**Adopted from the Scopus (Expanded) and Science Citation Index (SCI) Expanded

3.2. Patent Registrations according to International Patent Classification (IPC)

Description		Number
Section	IPC Category	
A	Human Necessities	67
B	Performing Operations, Transporting	29
C	Chemistry, Metallurgy	83
D	Textiles, Paper	19
E	Fixed Constructions	16
F	Mechanical Engineering, Lighting, Heating, Weapons	14
G	Physics	17
H	Electricity	27
Total		272



Source: National Intellectual Property Office (NIPO), Sri Lanka

Figure 3.1. Major Patent Types

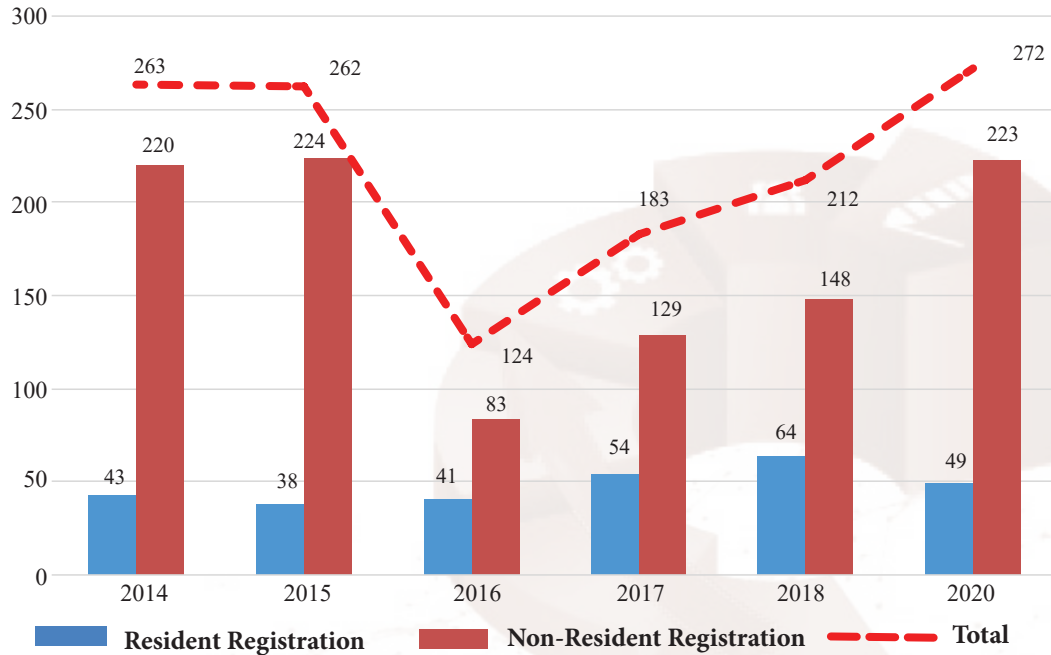


Figure 3.2. Time Trend of Patent Registrations

Source: National Intellectual Property Office (NIPO), Sri Lanka

3.3. Industrial Designs according to Locarno Classification

Description		Number of Industrial Designs
Class	Category of Locarno Classification	
1	Foodstuffs	1
2	Articles of clothing and haberdashery	17
6	Furnishing	4
7	Household goods, not elsewhere specified	1
8	Tools and hardware	7
9	Packages and containers for the transport or handling of goods	28
10	Clocks and watches and other measuring instruments, checking and signalling instruments	1
11	Articles of adornment	1
12	Means of transport or hoisting	17
13	Equipment for production, distribution or transformation of electricity	18
14	Recording, telecommunication or data processing equipment	4
19	Stationery and office equipment, artists' and teaching materials	22
20	Sales and advertising equipment, signs	2
21	Games, toys, tents and sports goods	12
23	Fluid distribution equipment, sanitary, heating, ventilation and air-conditioning equipment, solid fuel	5
25	Building units and construction elements	5
32	Graphic symbols and logos, surface patterns, ornamentation	6
Total		151

Source: National Intellectual Property Office (NIPO), Sri Lanka

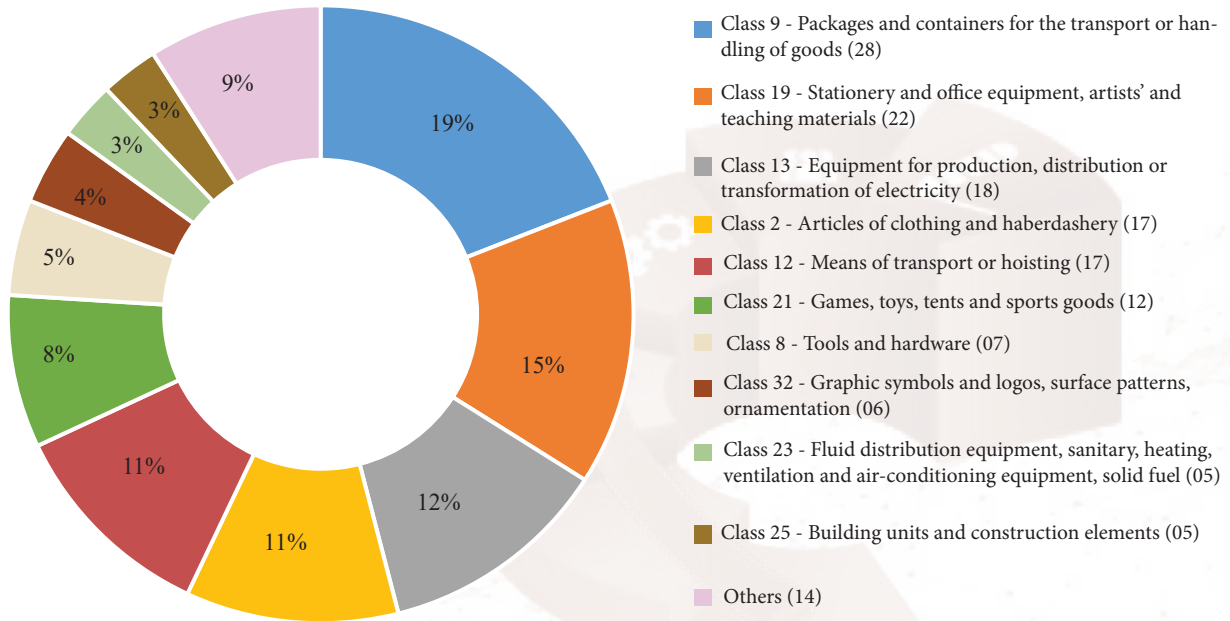


Figure 3.3. Major Industrial Design Types

Source: National Intellectual Property Office (NIPO), Sri Lanka

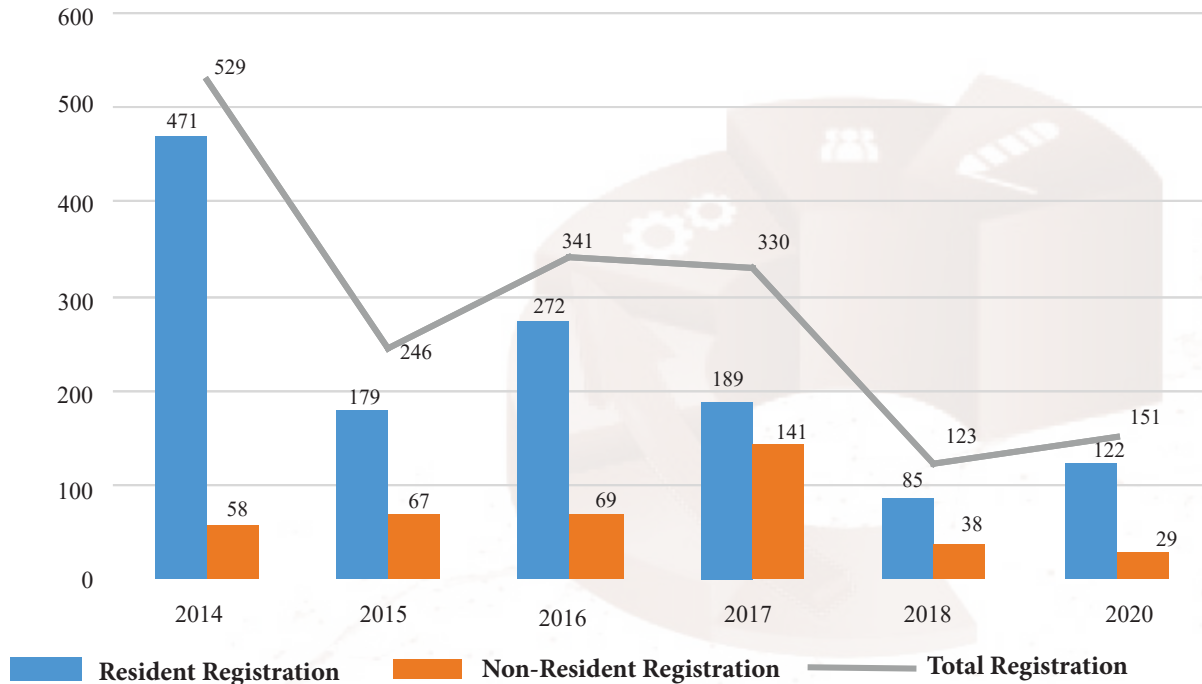


Figure 3.4. Time Trend of Industrial Designs Registration

Source: National Intellectual Property Office (NIPO), Sri Lanka

3.4. Sector-wise Innovations

Innovation Type		Government R&D Institutes	Business Enterprises	Higher Education Sector	Total
a	Development of New Products/Services/Processes	110	925	66	1,101
b	Existing Products/Services/Processes Significantly Improved	105	819	17	941
c	New Plant Varieties/Hybrids Developed	46	15	2	63
d	Import Substitutes Developed	3	50	2	55
e	Designs/Prototypes Developed	21	336	21	378

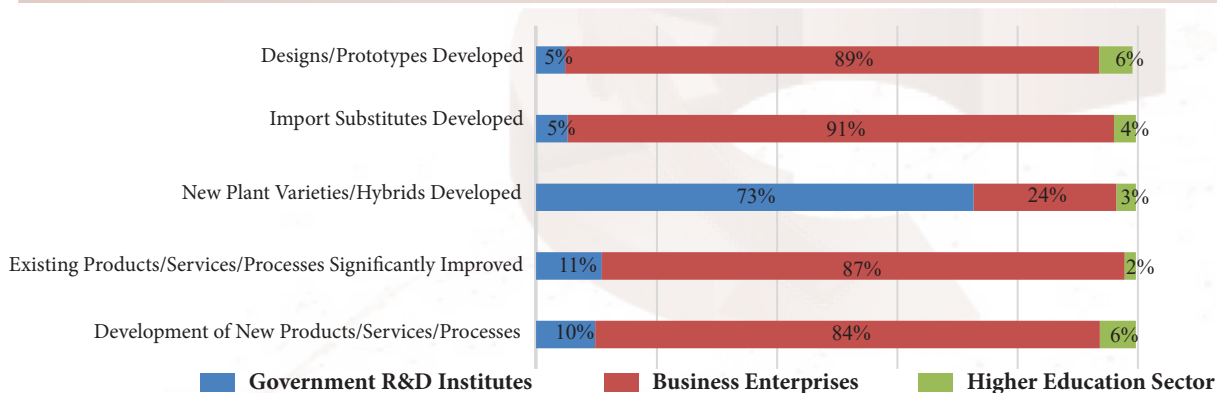


Figure 3.5. Sector-wise Contribution to Innovation

Source: National Research and Development Survey of Sri Lanka 2020

3.5. Commercialization of Innovations by Sectors

Innovation Type		Government R&D Institutes	Business Enterprises	Higher Education Sector	Total
a	Commercialization of New Products/Services/ Processes	17	755	29	801
b	Commercialization of Improved Existing Products/Services/Processes	15	575	4	594
c	Commercialization of New Plant Varieties/ Hybrids	38	12	0	50
d	Commercialization of Import Substitutes	0	6	0	6
e	Commercialization of Designs/Prototypes	1	197	0	198

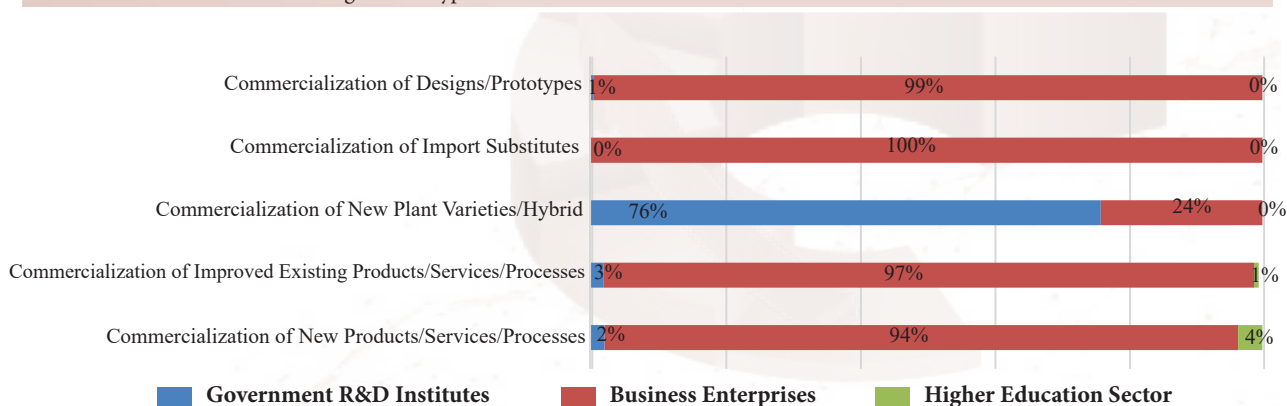


Figure 3.6. Sector-wise Innovation Commercialization

Source: National Research and Development Survey of Sri Lanka 2020 (NSF)

3.6. Publications of Sri Lankan Scientists in SCI Journals

Field of Science	Total Number of Publications	With Foreign Co-authorship	
		Number	%
Natural Sciences	462	347	75%
Engineering and Technology	150	107	71%
Medical Sciences	384	252	66%
Agricultural Sciences	115	81	70%
Social Sciences and Humanities	28	21	75%
Total	1,139	808	71%

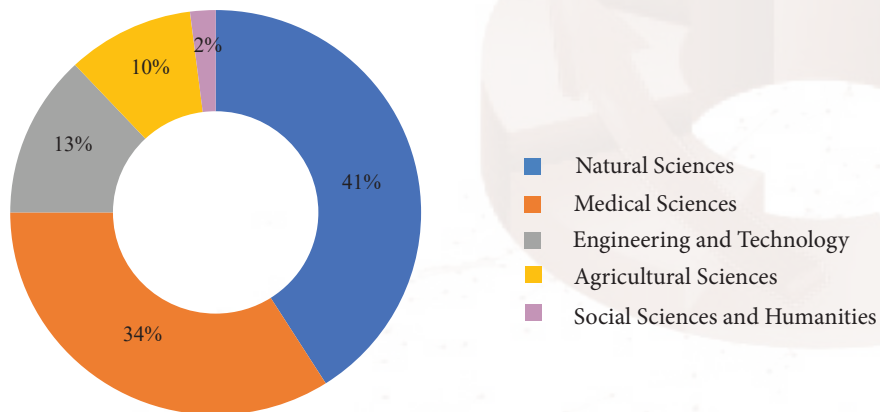


Figure 3.7. SCI Journal Publications of Sri Lankan Authors by Field of Science

Source: Adopted from the Scopus Expanded and Science Citation Index Expanded (SCIE)

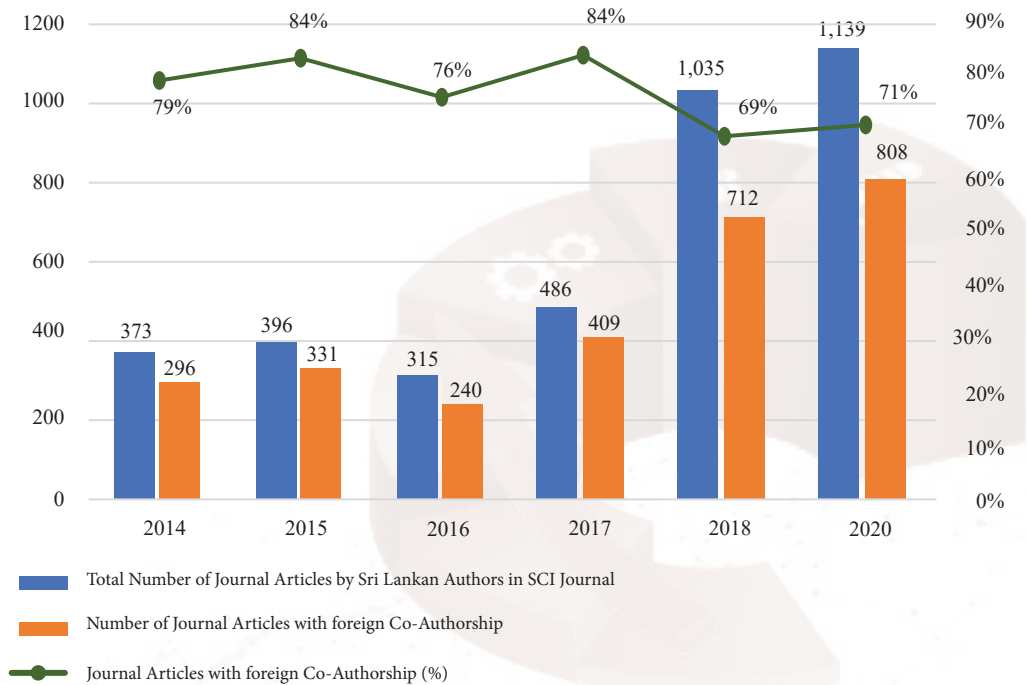


Figure 3.8. SCI Journal Publications - Time Trend

Source: Adopted from the Scopus and Science Citation Index

Figures of 2018 - Scopus expanded & SCI

Figures of 2020 - Scopus expanded & SCI expanded

3.7. Publications of Sri Lankan Scientists in SCI Journals by Field of Science (2014-2020)

Field of Science	2014		2015		2016		2017		2018		2020	
	Total Number	With foreign Co-authorship (%)	Total Number	With foreign Co-authorship (%)	Total Number	With foreign Co-authorship (%)	Total Number	With foreign Co-authorship (%)	Total Number	With foreign Co-authorship (%)	Total Number	With foreign Co-authorship (%)
Natural Sciences	95	79	102	84	120	88	167	92	319	68	462	75
Engineering and Technology	80	86	76	80	52	71	95	81	227	78	150	71
Medical Sciences	118	69	126	84	92	71	126	79	319	64	384	66
Agricultural Sciences	71	93	80	89	46	65	79	76	105	70	115	70
Social Sciences and Humanities	9	56	12	58	5	40	19	100	65	65	28	75
Total	373	79	396	84	315	76	486	84	1,035	69	1,139	71

Source: Adopted from the Scopus and Science Citation Index
 Figures of 2018 - Scopus expanded & SCI
 Figures of 2020 - Scopus expanded & SCI expanded

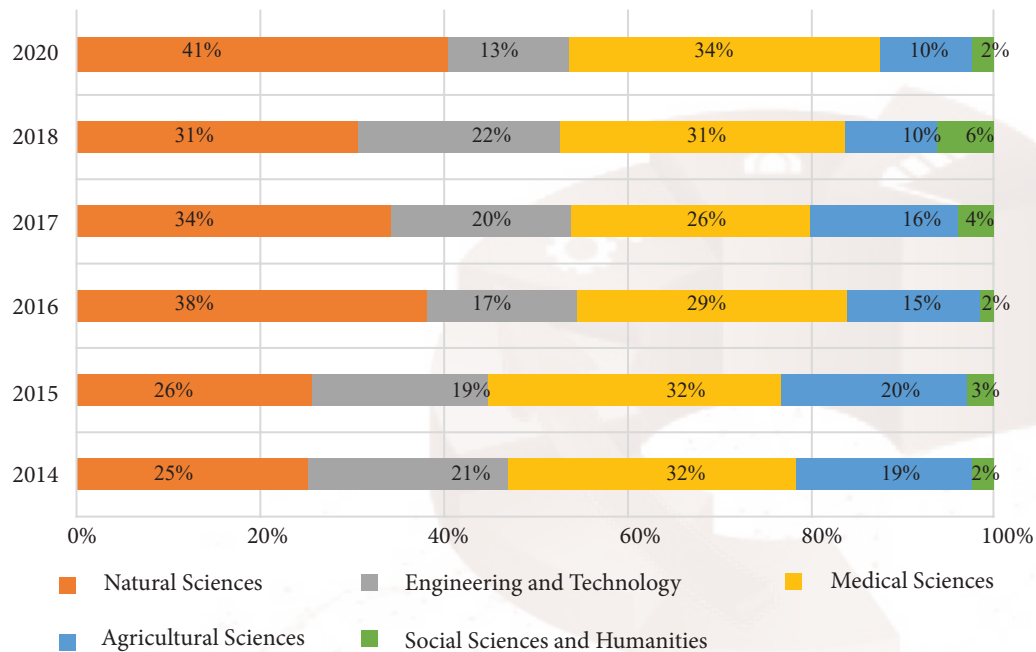


Figure 3.9. Articles in SCI Publications by Field of Science (2014-2020)

Source: Adopted from the Scopus and Science Citation Index

Figures of 2018 - Scopus expanded & SCI

Figures of 2020 - Scopus expanded & SCI expanded

DEFINITIONS AND TECHNICAL NOTES

The definitions and terminology used in the National R&D Survey 2020 and in this Statistical Hand Book are based on the guidelines provided by Technical paper No ii (UNESCO, UIS,2014) and Frascati manual (OECD,2015).

1. Research and Development (R&D)

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 activities:

- 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.
- b) Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- c) 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.

2. Sectors

This survey covers four major institutional categories that conduct Research & Development:

- i. Government Organizations that conduct R&D – Full coverage.
- ii. Higher Education Institutes - All higher education institutions/institutes established or deemed to be established under the University Act and major government universities.
- iii. Business Enterprises – 271 institutions were selected for the survey considering degree of their R&D activity and proportion of their contribution to national economy. All major industries that conduct R&D were included in the sample.
- iv. Private Non Profit Institutions (PNP) – All institutions that were involved in the activities related to R&D were covered in the survey.

3. R&D Expenditure

All expenditure for R&D performed within a sector of the economy, including:

- a) Recurrent expenditure (labour cost, non-capital purchases of materials, supplies for R&D equipment, water, fuel, gas, electricity, library materials etc.).
- b) Capital expenditure (reported in full for the period when they took place and should not be registered as an element of depreciation).

4. Human Resources in Research and Development

Researchers : Professionals engaged in the conception or creation of new knowledge or products. They conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software or operational methods (OECD, 2015).

Technicians and equivalent staff : Persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities and the Arts. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, and use of research equipment, normally under the supervision of researchers (OECD, 2015).

The headcount (HC) of R&D personnel is defined as the total number of individuals contributing to intramural R&D, at the level of statistical unit or at an aggregate level, during a specific reference period (usually a calendar year).

Full Time Equivalent (FTE) : One person per year. (E.g., if a person normally spends 30% of his/her time on R&D and the rest on other activities such as teaching, administration and counseling, the FTE is then counted as 0.3. Similarly, if a full time R&D worker is employed at an R&D unit for only a six month period, the FTE is calculated as 0.5).

Reference:

OECD. 2015. Frascati Manual 2015: guidelines for collections and reporting data on research and experimental development. Paris (France) : OECD publishing.

UNESCO. UIS. 2014. Technical paper no II. Guide to Conducting an R&D Survey: For countries starting to measure research and experimental development. Montreal, Quebec, Canada: UNESCO Institute for Statistics.