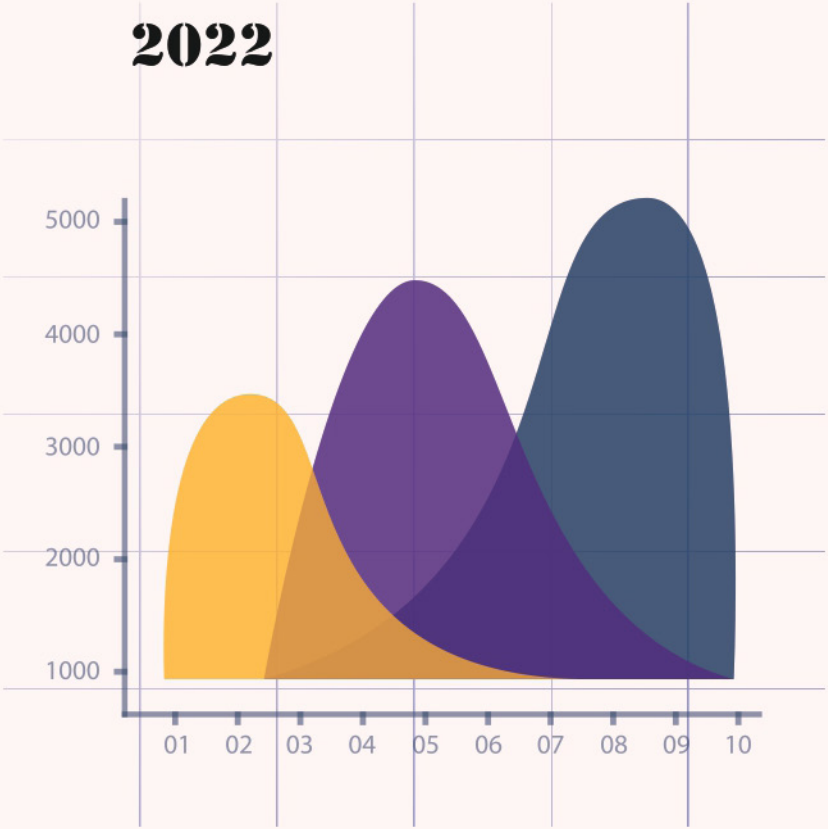
STATISTICAL HANDBOOK ON RESEARCH AND DEVELOPMENT OF SRI LANKA

2022



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National Science Foundation
47/5, Maitland Place
Colombo 07
Sri Lanka
www.nsf.gov.lk

Statistical Handbook on Research and Development of Sri Lanka 2022

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For a copy of the publication or suggestions for improvements, please write to:

Head
Science and Technology Policy Research Division
National Science Foundation
47/5, Maitland Place
Colombo 07
Sri Lanka

Tel/Fax: 011 2675841
E-mail: info@nsf.gov.lk
Website: www.nsf.gov.lk

PREFACE

The National Research and Development Survey 2022 was designed to measure the status of research and development in the country pertaining to the surveyed year 2022. The statistical handbook encompasses financial and human resources devoted to Research & Development (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 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 the OECD and the 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 providing them with a comprehensive overview of R&D activities of the country.

The Statistical Handbook on Research and Development of Sri Lanka 2022 was produced by the Science and Technology Policy Research Division (STPRD) of the NSF. The valuable comments and editorial changes made by the external reviewer Dr R.D. Guneratne are highly acknowledged.

All the institutions under the scope of the survey provided information for the success of this survey. Further, the MIS Unit of the University Grants Commission (UGC) and the Department of Census and Statistics (DCS) assisted in providing data and information on the Higher Education and Business Enterprises Sectors respectively.

The guidance and support extended by the Board of Management of the NSF, the Chairman and the Director General of the NSF are immensely acknowledged.

Mr Wasantha Anuruddha
The Head/ STPRD
National Science foundation
47/5,MaitlandPlace,
Colombo 07, Sri Lanka

October 2024

HIGHLIGHTS - 2022

- Sri Lanka spent a total of Rs. 25,280.70 million on R&D in 2022. This corresponds to 0.10% of the GDP of the country.
- The highest gross expenditure on Research and Development (GERD) was incurred by the Business Enterprises (41.59%) followed by the Higher Education Sector (28.26%), the Government Research Institutes (27.22%), and Private Non-Profit Organizations (2.93%).
- The highest proportion of funds for R&D was devoted for Applied Research, 55.33% of GERD, while Experimental Developments and Basic accounted for 30.33% and 14.34% of GERD respectively.
- The top three fields of sciences which have the highest GERD are Engineering and Technology (34.09%), Agricultural Sciences (27.89%) and Natural Sciences (17.09%).
- 6,269 Researchers (Head Count) were employed in domestic R&D activities and their Full-Time Equivalent (FTE) value was 2151.
- The total number of FTE researchers were 96.97 per million of population.
- 190 patent registrations were reported in 2022 and out of them 110 patents were Non-Resident registrations.
- 1,482 of articles of Sri Lankan scientists were published in SCI Journals in 2022 and 71% of them have a foreign co-authorship.

CONTENTS

FINANCIAL RESOURCES
FOR
RESEARCH AND DEVELOPMENT

1.1. Gross Domestic Expenditure on Research and Development (GERD) 2022

Description		
a)	GERD at Current Market Price (Rs. Million)	25,280.70
b)	GERD as a percentage of GDP (%)[1]	0.10%
c)	GERD per Million Population (Rs. Million)[2]	1,139.75
d)	GERD (USD Million)	82.55

1- GDP of 2022 at current market price is Rs. 24,148 billion (Anual Report 2022, Central Bank of Sri Lanka)

2- Mid-year population of 2022 is 22,181,000 (Anual Report 2022, Central Bank of Sri Lanka)

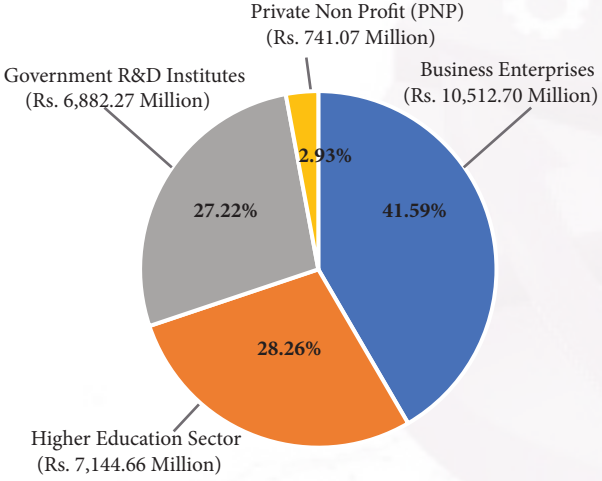


Figure 1.1. GERD by Sectors

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

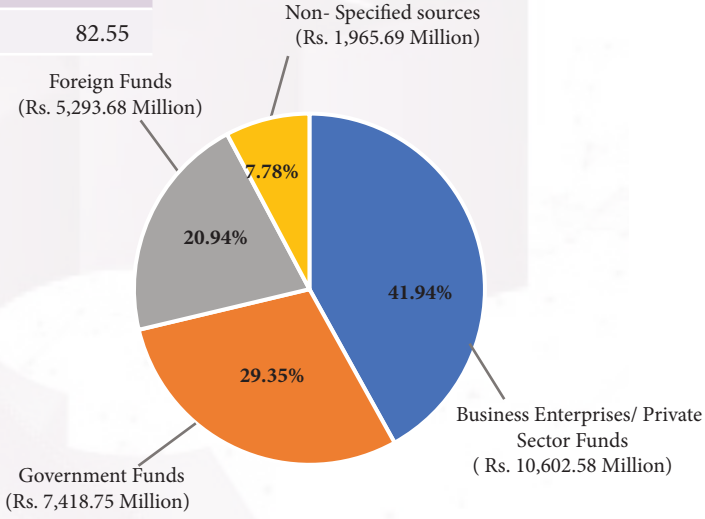


Figure 1.2 R&D Expenditure by Source of Funds

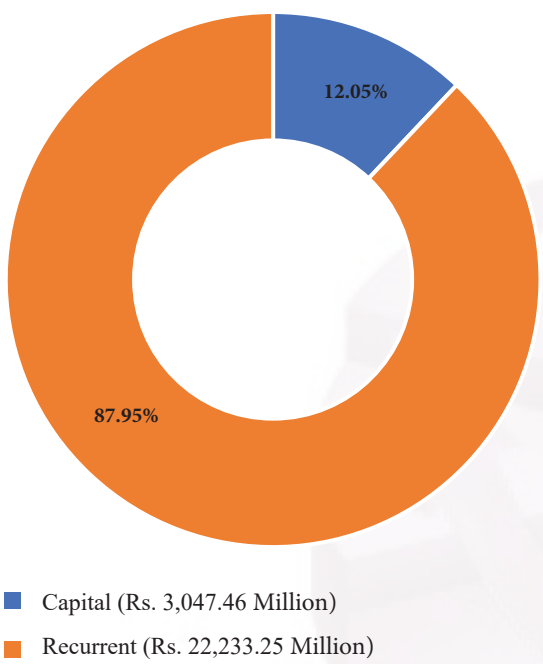


Figure 1.3. Capital and Recurrent Expenditure on R&D

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

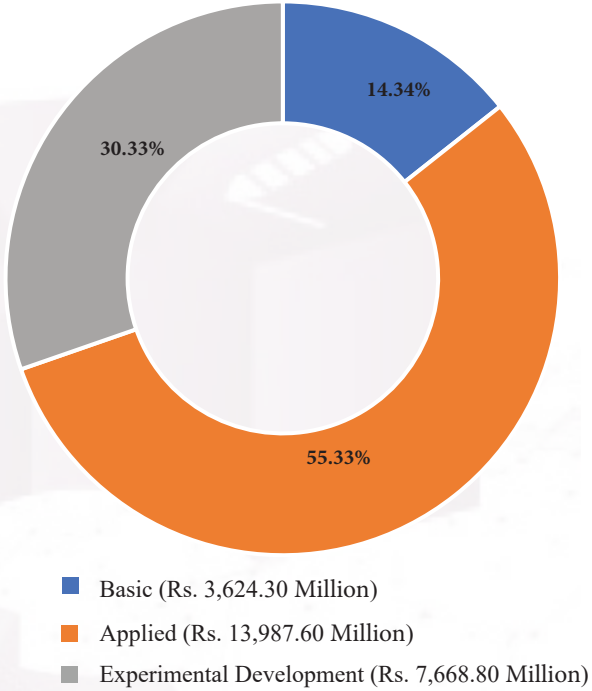


Figure 1.4. GERD by Research Activities

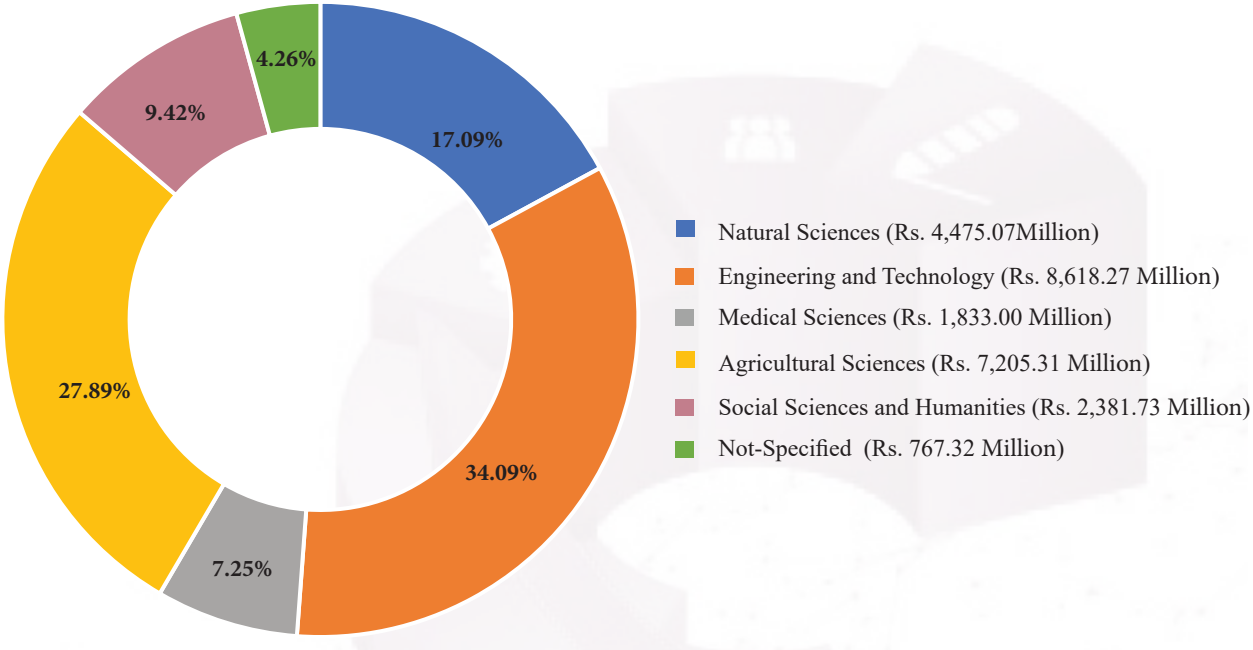


Figure 1.5. GERD by Field of Science

Source: National R&D Survey of Sri Lanka, 2022 (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	5,234.57	76.06	2,168.45	30.35	12.09	0.11	3.63	0.49	7,418.75	29.35
Business Enterprises/ Private Sector	84.12	1.22	156.72	2.19	10,355.56	98.51	6.18	0.83	10,602.58	41.94
Foreign	261.10	3.79	4,789.57	67.04	26.59	0.25	729.06	98.38	5,806.33	22.97
Not-Specified	1,302.47	18.93	29.92	0.42	118.46	1.13	2.20	0.30	1,453.05	5.75
Total	6,882.27	100.00	7,144.66	100	10,512.70	100	741.07	100.00	25,280.70	100.00

Source: National R&D Survey of Sri Lanka, 2022 (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	934.58	13.58	221.82	3.10	1,886.02	17.94	5.04	0.68
Recurrent	5,947.69	86.42	6,922.85	96.90	8,626.68	82.06	736.03	99.32
Basic	1,071.22	15.56	528.68	7.40	1,900.56	18.08	123.84	16.71
Applied	4,936.42	71.73	6,204.51	86.84	2,232.52	21.24	614.16	82.87
Experimental Development	874.64	12.71	411.47	5.76	6,379.62	60.68	3.08	0.42
Natural Sciences	850.81	12.36	1,272.50	12.36	2,088.70	19.87	263.06	35.50
Engineering and Technology	1,215.04	17.65	1,610.44	17.65	5,792.79	55.10	0.00	0.00
Medical Sciences	183.93	2.67	1,270.32	2.67	372.59	3.54	6.16	0.83
Agricultural Sciences	3,586.79	52.12	1,971.97	52.12	1,411.48	13.43	235.07	31.72
Social Sciences and Humanities	825.10	11.99	833.76	11.99	497.60	4.73	225.27	30.40
Not-Specified	220.60	3.21	185.67	3.21	349.53	3.32	11.52	1.55

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

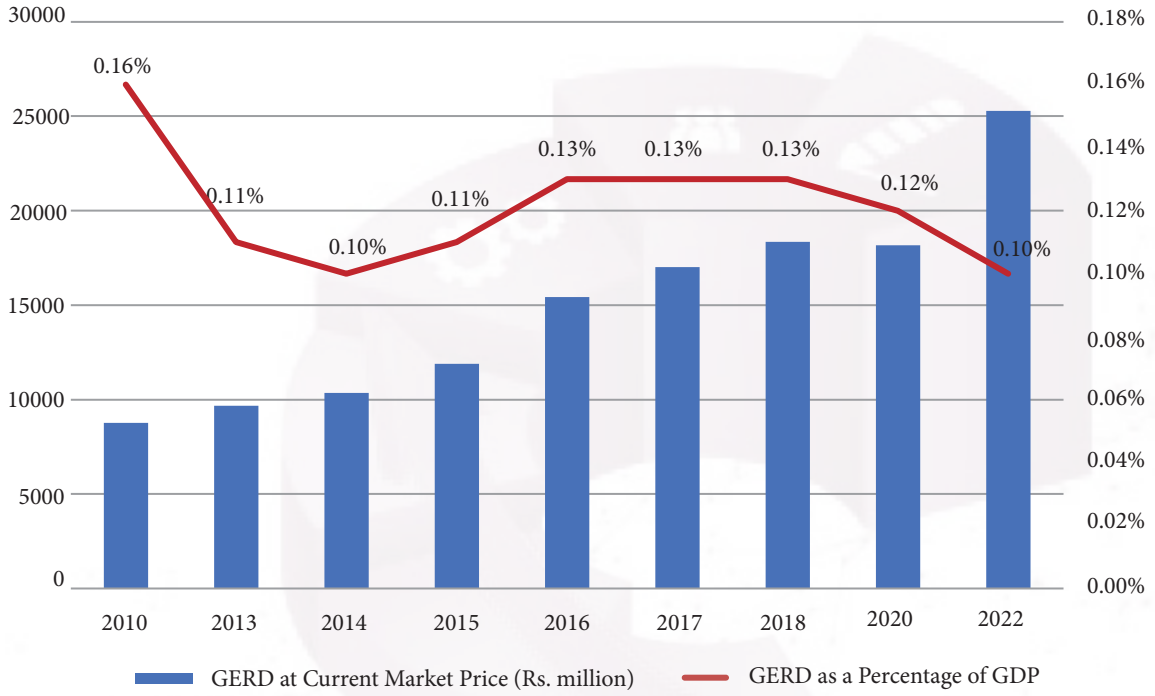


Figure 1.6. Time Trend of GERD (2010-2022)

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

1.4. Time Trend - GERD by Sectors

Sector	2015	2016	2017	2018	2020	2022
Government R&D Institutes	4,062.50	5,391.80	6,310.74	6,497.77	6,200.44	6,882.27
Higher Education Sector	3,795.30	3,147.20	3,774.10	4,302.92	4,851.58	7,144.66
Business Enterprises	4,004.20	6,784.00	6,809.20	7,295.28	6,895.56	10,512.70
Private Non Profit (PNP)	42.10	96.30	109.30	247.95	227.02	741.07
Total	11,904.10	15,419.30	17,003.34	18,343.92	18,174.60	25,280.70

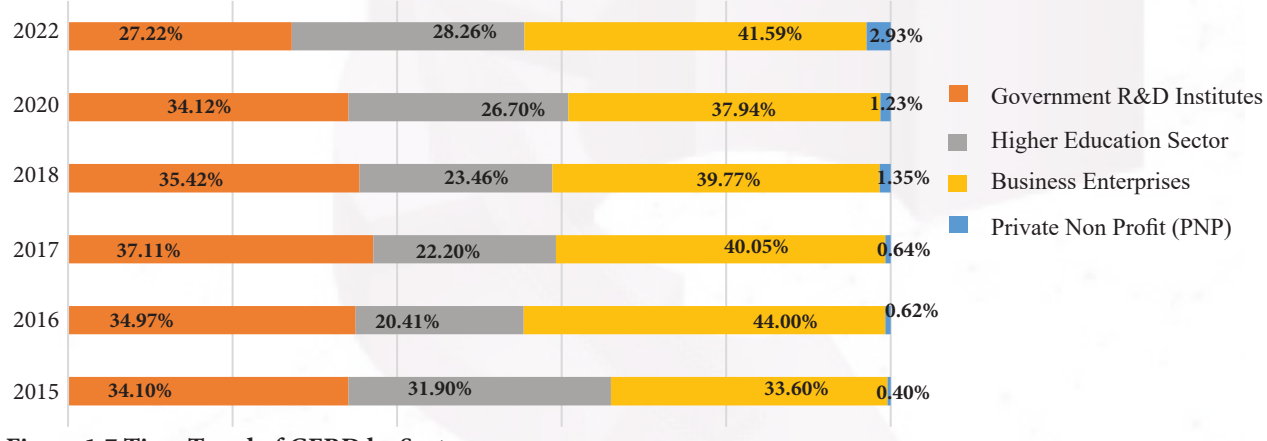


Figure 1.7 Time Trend of GERD by Sectors

Source: National R&D Survey of Sri Lanka, 2015, 2016,2017, 2018, 2020 & 2022 (NSF)

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

Rs. Million

Nature of Expenditure	2014	2015	2016	2017	2018	2020	2022
Recurrent	8,851.04	10,453.6	13,290.64	13,854.42	14,191.12	14,854.59	22,233.25
Capital	1,499.04	1,450.5	2,128.66	3,148.92	4,152.81	3,320.01	3,047.45
Total	10,350.08	11,904.1	15,419.3	17,003.34	18,343.93	18,174.60	25,280.70

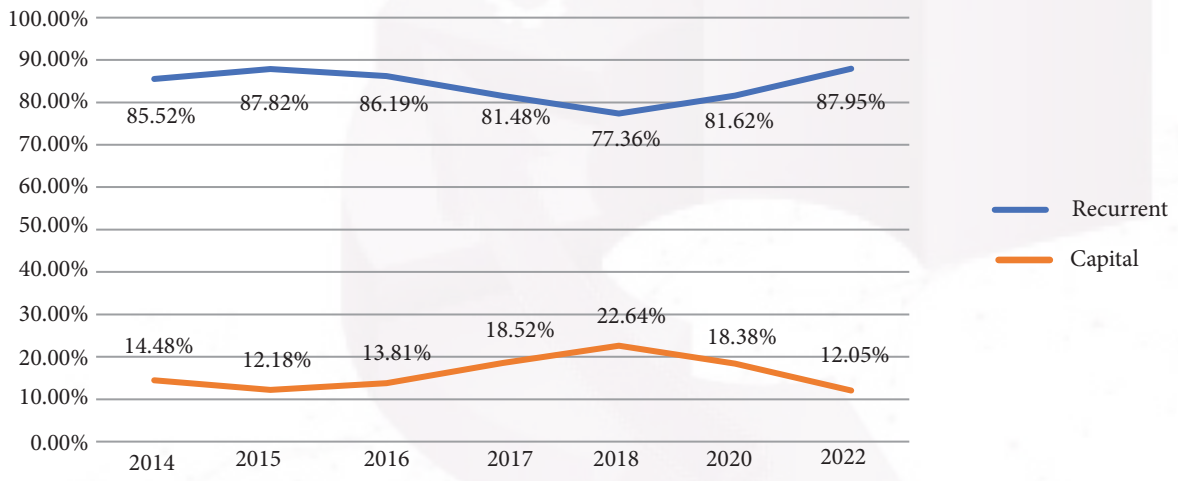


Figure 1.8. Time Trend of Capital and Recurrent R&D Expenditure

Source: National R&D Surveys of Sri Lanka, 2014, 2015, 2016, 2017, 2018, 2020 & 2022 (NSF)

1.6. Time Trend - GERD by Research Activities

Rs. Million

Research Type	2014	2015	2016	2017	2018	2020	2022
Basic	1,578.47	1,668.80	2,649.30	4,559.02	5,929.48	5,325.76	3,624.30
Applied	5,938.05	6,648.20	7,036.96	8,559.34	4,875.29	8,624.09	13,987.60
Experimental Development	2,833.56	3,587.10	5,733.04	3,884.98	7,539.15	4,224.74	7,668.80
Total	10,350.08	11,904.10	15,419.30	17,003.34	18,343.92	18,174.60	25,280.70

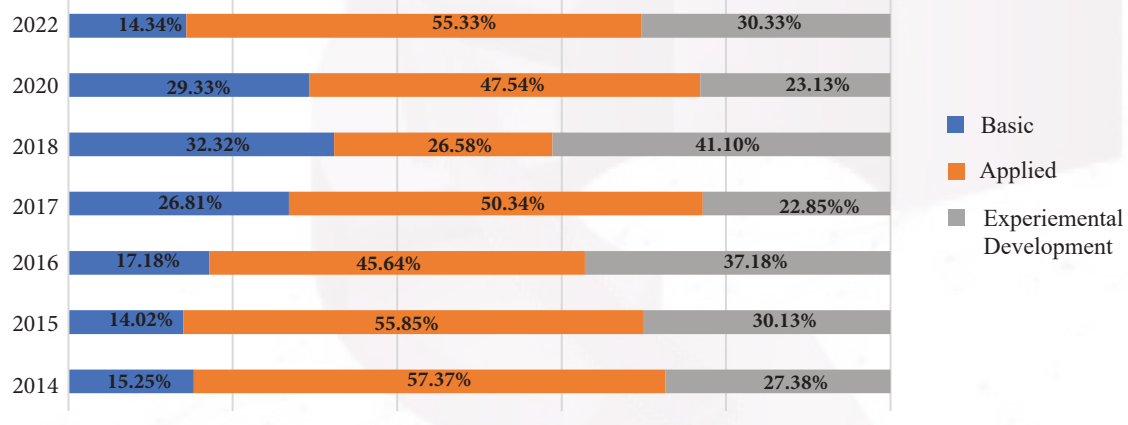


Figure 1.9. Time Trend - GERD by Research Activities

Source: National R&D Surveys of Sri Lanka, 2014, 2015, 2016, 2017, 2018, 2020 & 2022 (NSF)

1.7. Time Trend - GERD by Field of Science

Rs. Million

Discipline	2014	2015	2016	2017	2018	2020	2022
Natural Sciences	2,666.19	3,170.30	3,020.67	3,060.19	3,350.26	4081.18	4,475.07
Engineering and Technology	2,447.55	2,991.80	4,913.90	3,432.84	5,986.74	5,025.85	8,618.27
Medical Sciences	371.85	1,019.10	930.77	1,588.50	1,558.03	15,46.87	1,833.00
Agricultural Sciences	4,077.77	3,746.10	4,349.42	6,080.86	4,372.72	4,399.44	7,205.31
Social Sciences and Humanities	603.85	647.80	1,390.84	1,561.81	2,654.96	2,212.95	2,381.73
Not Specified	182.87	329	813.70	1279.14	421.23	908.34	767.32
Total	10,350.08	11,904.10	15,419.30	17,003.34	18,343.92	18,174.63	25,280.70

Source: National RDI Surveys Sri Lanka, 2014, 2015, 2016, 2017, 2018, 2020 & 2022 (NSF)

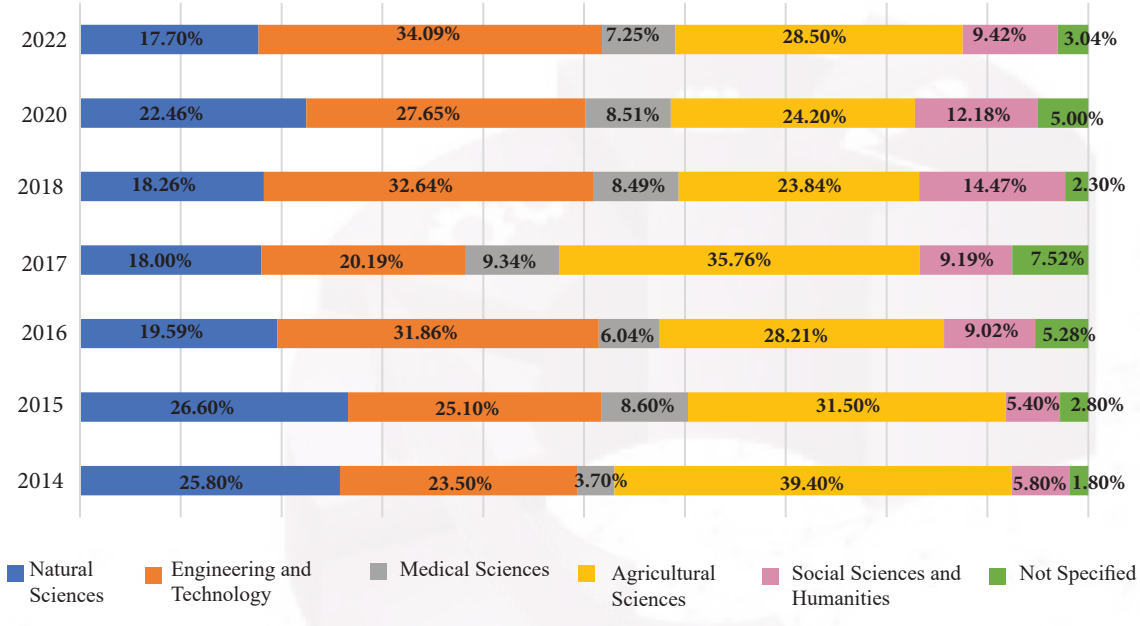


Figure 1.10. Time Trend - GERD by Field of Science

Source: National RDI Surveys Sri Lanka, 2014, 2015, 2016, 2017, 2018, 2020 & 2022 (NSF)

1.8. Time Trend- R&D Expenditure by Source of Funds

Source of Funding	2010	2013	2015	2018	2020	2022
Government Funds	4,907.16	5,209.97	7,099.60	9,735.57	8,071.91	7,418.75
Business Enterprises/ Private Sector Funds	3,592.58	3,934.04	4,099.90	7,259.64	6,953.85	10,602.58
Foreign Funds	239.13	486.17	176.40	931.33	1,776.29	5,293.68
Not- Specified sources	39.29	39.83	528.20	417.38	1,372.53	1,965.69
Total	8,778.16	9,670.01	11,904.10	18,343.92	18,174.58	25,280.70

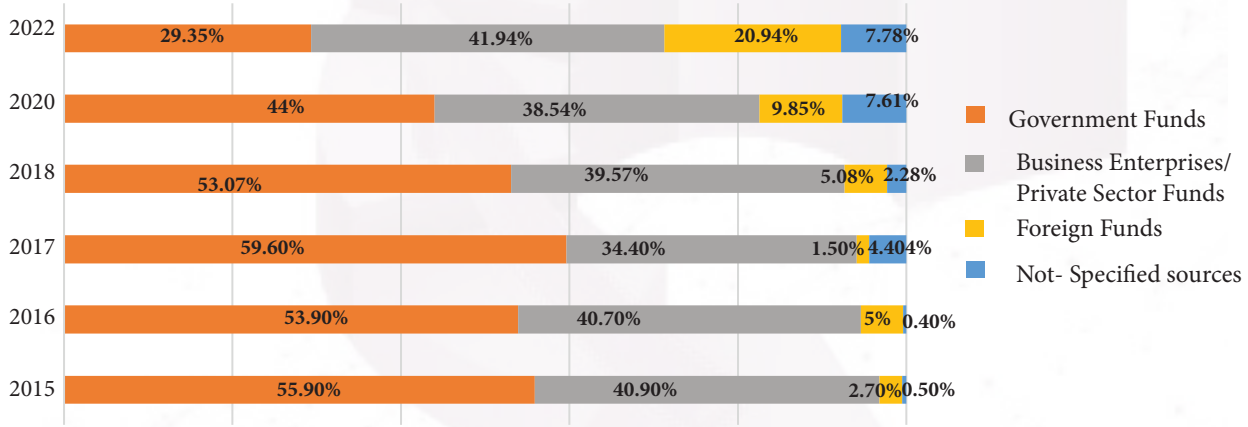


Figure 1.11 Time Trend of R&D Expenditure by Source of Funds

Source: National R&D Survey of Sri Lanka, 2010,2013,2015,2018, 2020 & 2022 (NSF)

HUMAN RESOURCES
IN
RESEARCH AND DEVELOPMENT

2.1. Researchers and Technicians Employed in Research and Development 2022

Description		
a)	Head Count of Researchers (Number)	6,269
b)	Head Count of Technicians (Number)	2,913
c)	Human Resource for R&D (Researchers and Technicians)	9,182
d)	No of Technicians per Researcher	0.46
e)	Researchers per million population*	282.63
f)	Full time Equivalent of Researchers	2151
g)	Researchers per million population (in full-time equivalent - FTE)*	96.97
h)	Number of Research Students	5,312

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

* Mid-year population of 2022 is 22,181,000 (Anual Report 2022, Central Bank of Sri Lanka)

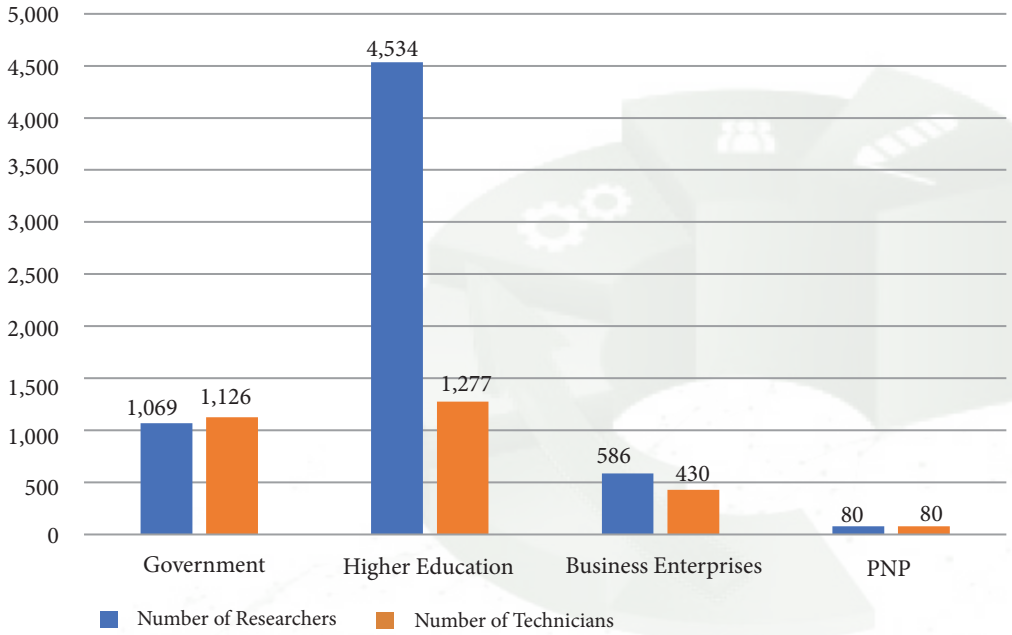


Figure 2.1. Distribution of R&D Persons by Sector

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

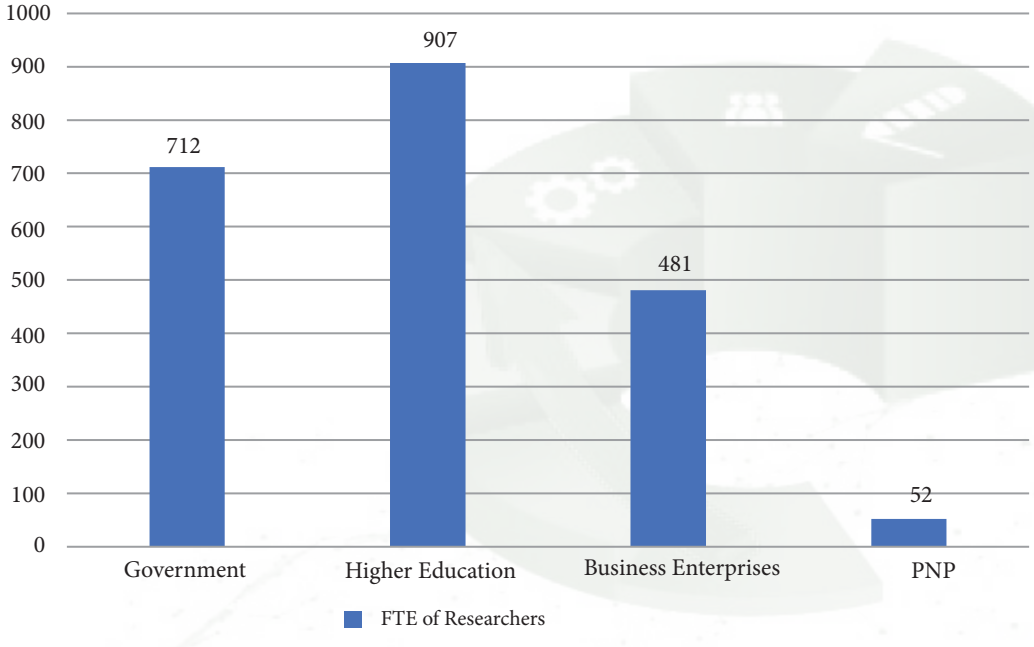


Figure 2.2. Full-time Equivalent (FTE) of Researchers by Sector

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

2.2. Researchers by Different Disciplines

Discipline	Male	Female	Total
Natural Sciences	813	790	1,603
Agricultural Sciences	403	500	903
Engineering and Technology	1,009	487	1,496
Medical Sciences	486	745	1,231
Social Sciences and Humanities	345	346	691
Not Specified	152	193	345
Total	3,208	3,061	6,269

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

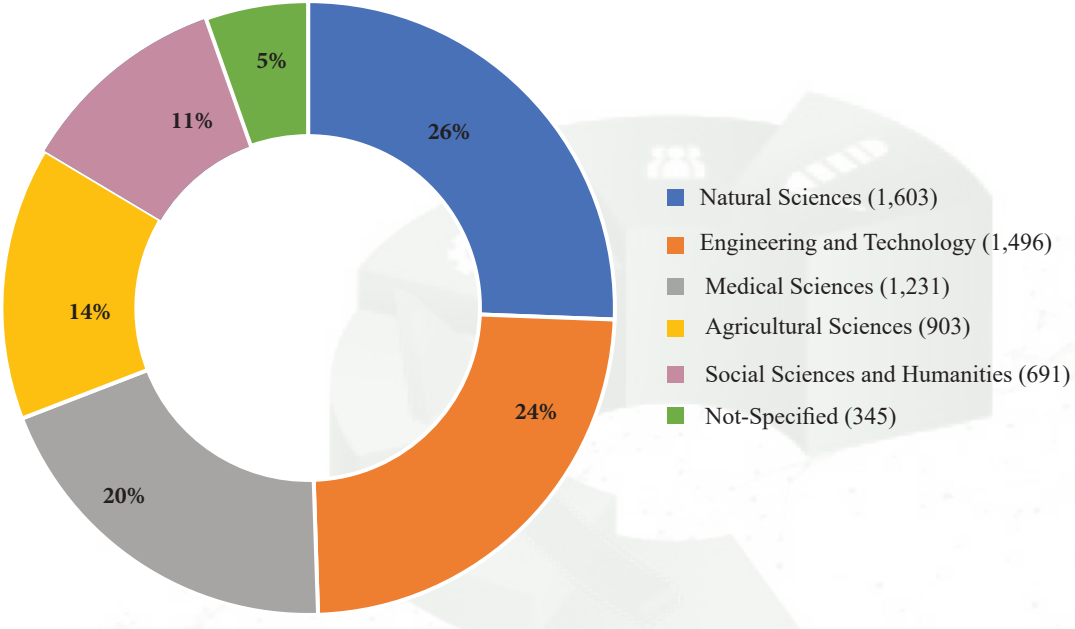


Figure 2.3. Distribution of Researchers by Different Disciplines

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

2.3. Researchers by Educational Qualifications

Educational Qualifications	Male	Female	Total
Doctoral or Equivalent	1,376	1,120	2,496
MPhil	239	241	480
Masters or Equivalent	826	886	1,712
Bachelors or Equivalent	687	786	1,473
Other Tertiary Level Diplomas (NVQ level 5&6)	70	28	98
Not Specified	10	0	10
Total	3,208	3,061	6,269

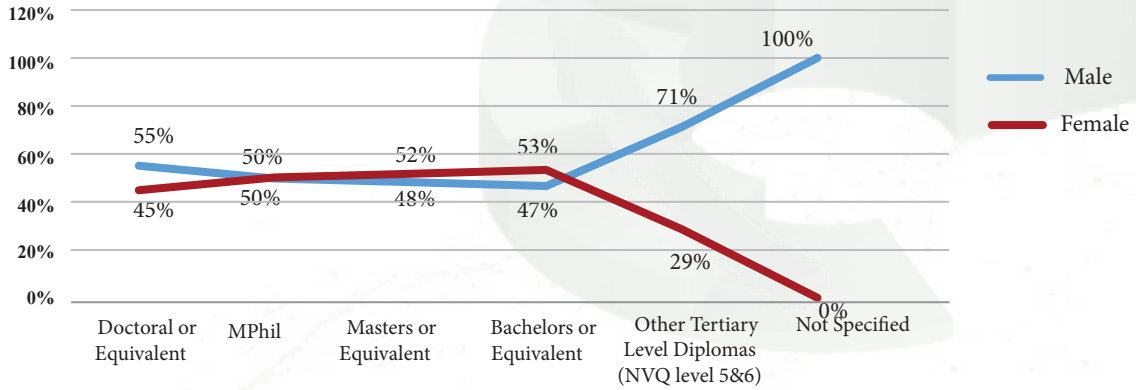
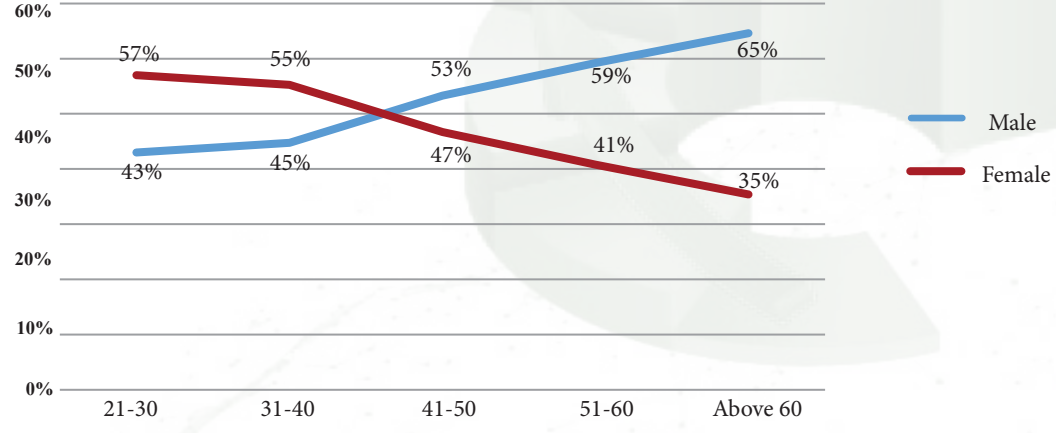


Figure 2.4. Researchers by Educational Qualiications and Gender

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

2.4. Researchers by (Head Count) Age and Gender

Age Group	Male	Female	Total
21 - 30	270	358	628
31 - 40	957	1,182	2,139
41 - 50	972	852	1,824
51 - 60	821	566	1,387
Above 60	188	103	291
Total	3,208	3,061	6,269



Fiure 2.5. Age and Gender-wise Proportion of Researchers

Source: National R&D Survey of Sri Lanka, 2022 (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	497	572	2,262	2,272	406	180	43	37	3,208	3,061	6,269
Head Count of Technicians	515	611	875	402	271	159	29	51	1,690	1,223	2,913
Full-time Equivalent (FTE) of Researchers	331	381	452	454	341	140	28	24	1,152	999	2,151

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

2.6. R&D Persons - Sector-wise Disaggregation by Educational Qualifications and age group

Researchers by Highest Educational Qualification	Government		Higher Education		Business Enterprises		PNP		Total		
	M	F	M	F	M	F	M	F	M	F	Total
Doctoral or Equivalent	93	101	1,245	1,002	17	7	21	10	1,376	1,120	2,496
M.Phil	26	51	198	187	11	0	4	3	239	241	480
Masters or Equivalent	187	256	538	567	93	47	8	16	826	886	1,712
Bachelors or Equivalent	151	158	281	516	246	105	9	7	687	786	1,473
Other Tertiary- Level Diplomas (NVQ level 5&6)	35	6	0	0	34	21	1	1	70	28	98
Not Specified	5	0	0	0	5	0	0	0	10	0	10
Total	497	572	2,262	2,272	406	180	43	37	3,208	3,061	6,269
Researchers by Age Group											
21 - 30	31	54	113	221	120	76	6	7	270	358	628
31 - 40	161	229	623	860	164	77	9	16	957	1,182	2,139
41 - 50	142	172	747	655	66	16	17	9	972	852	1,824
51 - 60	154	116	621	435	41	11	5	4	821	566	1,387
Above 60	9	1	158	101	15	0	6	1	188	103	291
Total	497	572	2,262	2,272	406	180	43	37	3,208	3,061	6,269

Source: National R&D Survey of Sri Lanka, 2022 (NSF)

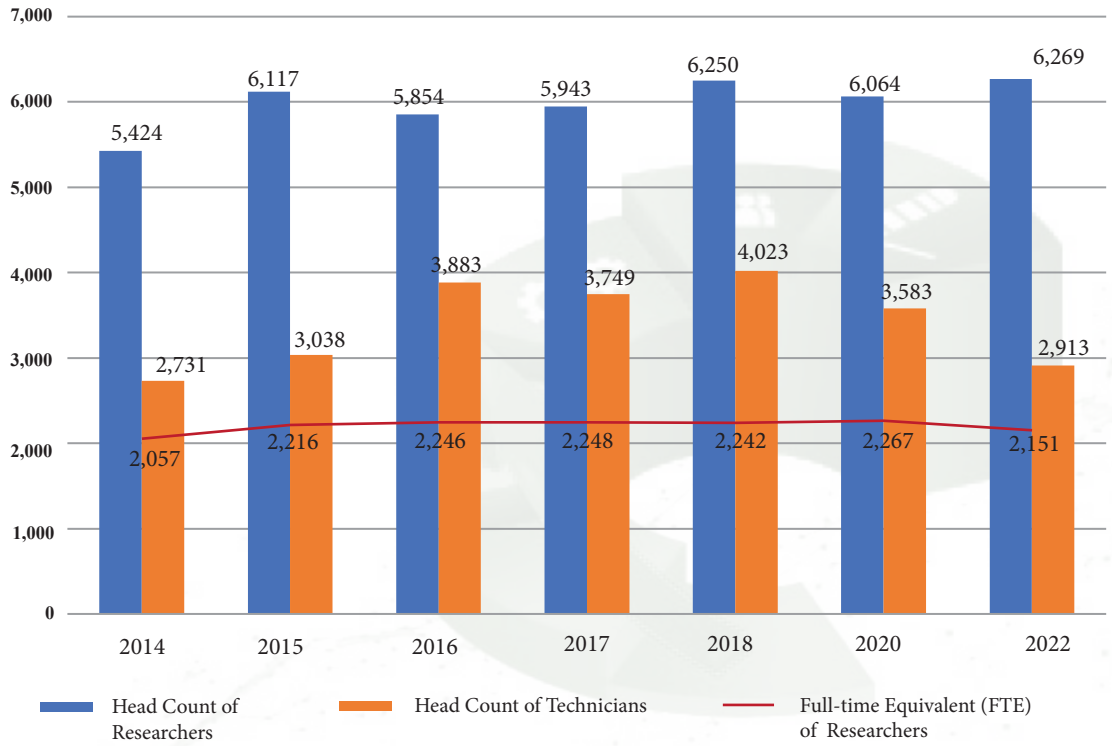


Figure 2.6. Time Trend of R&D Persons

Source: National R&D Survey of Sri Lanka, 2014,2015,2016,2017,2018, 2020 & 2022 (NSF)

2.7. Researchers by Different Disciplines (2014-2022)

Field of Science	Head Count of Researchers						
	2014	2015	2016	2017	2018	2020	2022
Natural Sciences	1,629	1,897	1,399	1,385	1,462	1,450	1,603
Agricultural Sciences	1,289	1,423	1,387	1,239	1,170	910	903
Engineering and Technology	1,047	1,286	1,115	1,128	1,128	1,543	1,496
Medical Sciences	794	776	1,175	1,320	1,472	1,238	1,231
Social Sciences and Humanities	408	471	745	703	858	715	691
Not Specified	257	264	33	168	160	208	345
Total	5,424	6,117	5,854	5,943	6,250	6,064	6,269

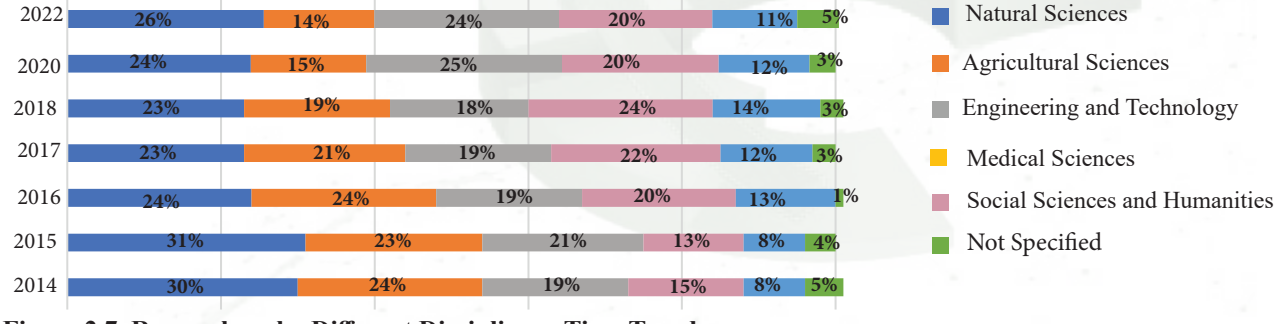


Figure 2.7. Researchers by Different Disciplines - Time Trend

Source: National R&D Survey of Sri Lanka, 2014,2015,2016,2017,2018, 2020 & 2022 (NSF)

2.8. Time Trend of Researchers by Educational Qualifications

Educational Qualifications	Number of Researchers						
	2014	2015	2016	2017	2018	2020	2022
Doctoral or Equivalent	899	944	1,898	1,971	2,082	2,367	2,496
MPhil	237	266	409	426	470	461	480
Masters or Equivalent	863	1,249	1,842	1,955	1,992	1,716	1,712
Bachelors or Equivalent	3,310	3,383	1,583	1,480	1,556	1,479	1,473
Not Specified	115	275	122	111	150	41	108
Total	5,424	6,117	5,854	5,943	6,250	6,064	6,269

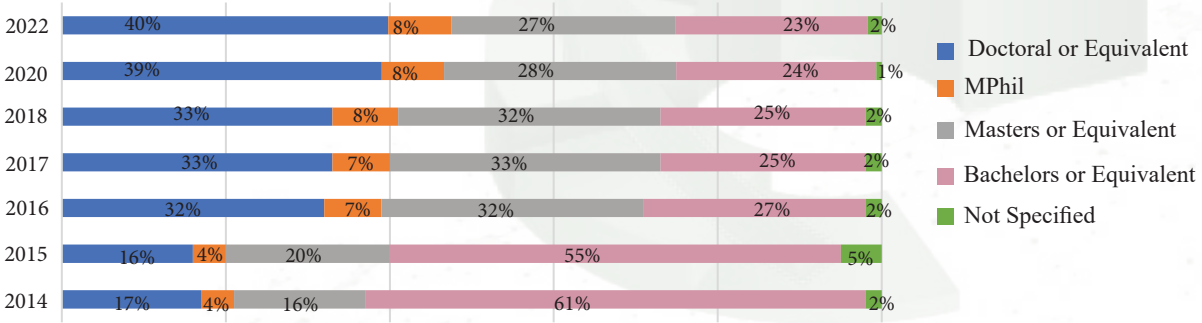


Figure 2.8. Researchers by Eduational Qualificatons - Time Trend

Source: National R&D Survey of Sri Lanka, 2014,2015,2016,2017,2018, 2020 & 2022 (NSF)

2.9. Time Trend of Researchers by Age Groups

Age Groups	Number of Researchers						
	2014	2015	2016	2017	2018	2020	2022
21 - 30	737	903	676	776	844	716	628
31 - 40	1,107	1,143	1,871	1,907	2,021	2,087	2,139
41 - 50	1,170	1,686	1,737	1,734	1,812	1,714	1,824
51 - 60	606	1,323	1,267	1,266	1,305	1,283	1,387
Above 60	163	755	303	260	268	264	291
Not Specified	1,641	307	0	0	0		
Total	5,424	6,117	5,854	5,943	6,250	6,064	6,269

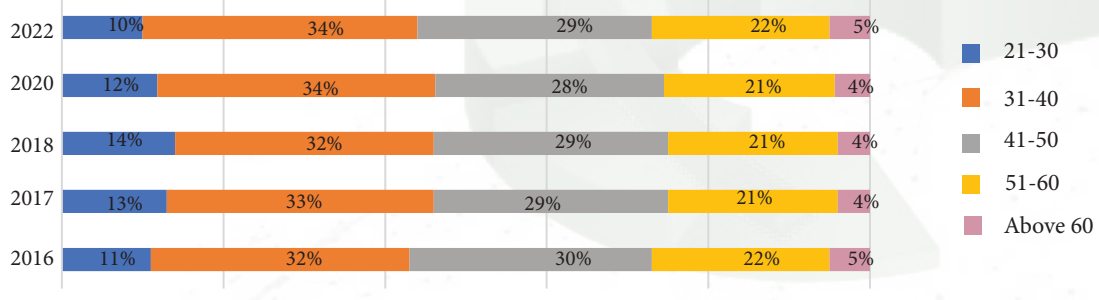


Figure 2.9. Time Trend of Researchers by Age Groups

Source: National R&D Survey of Sri Lanka, 2016,2017,2018, 2020 & 2022 (NSF)

2.10. Research Students by Different Disciplines

Field of Science	Male	Female	Total
Natural Sciences	407	569	976
Agricultural Sciences	150	246	396
Engineering and Technology	272	218	490
Medical Sciences	59	167	226
Social Sciences and Humanities	1,422	1,308	2,730
Others	293	201	494
Total	2,603	2,709	5,312

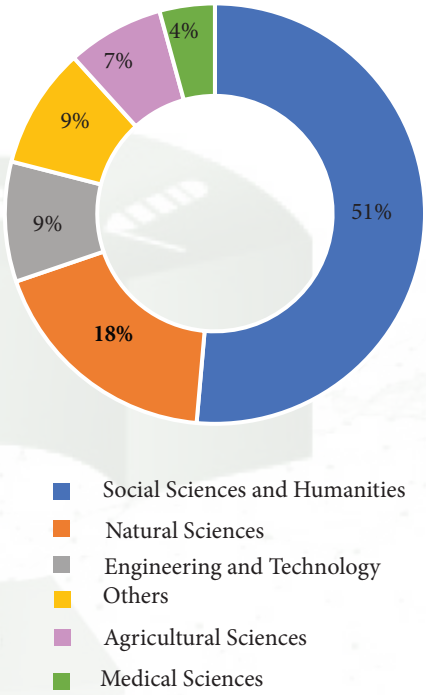


Figure 2.10. Research Students by Different Disciplines
Source: National R&D Survey of Sri Lanka, 2022 (NSF)

2.11. Number of Research Students in Universities 2018, 2020 & 2022

Student Category	2018			2020			2022		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
PhD Research Students	658	456	1,114	662	501	1,163	871	634	1,505
MPhil Research Students	1,486	1,260	2,746	1,385	1,390	2,775	1,732	2,075	3,807
Total Research Students	2,144	1,716	3,860	2,047	1,891	3,938	2,603	2,709	5,312

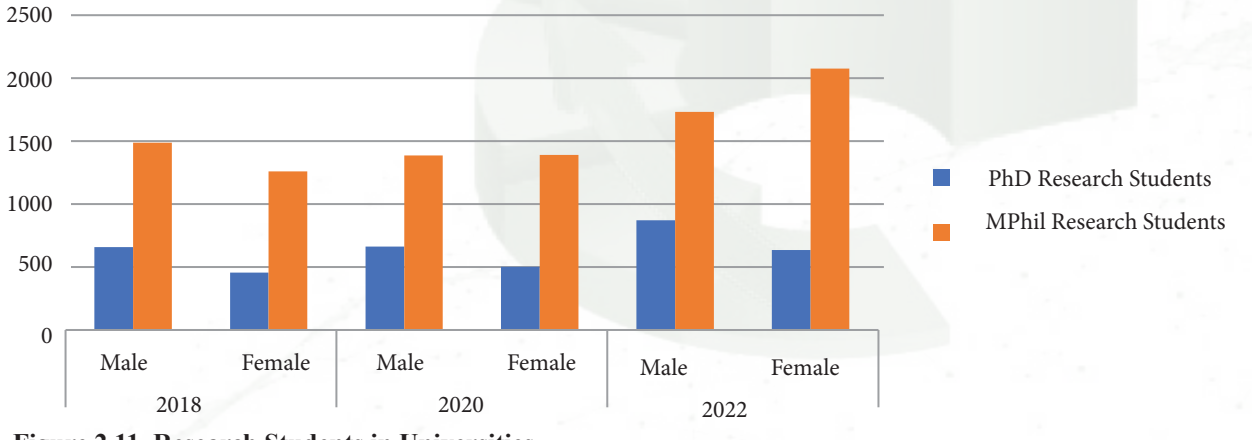


Figure 2.11. Research Students in Universities

Source: National R&D Survey of Sri Lanka, 2018, 2020 & 2022 (NSF)

PERFORMANCE & OUTPUT INDICATORS OF RESEARCH AND DEVELOPMENT

3.1. Patents, Industrial Designs and SCI Journal Publications in 2022

Description		
A)	Number of Patent Registrations (Resident)	80
B)	Number of Patent Registrations (Non- Resident)	110
C)	Total Number of Patent Registrations (A+B)	190
D)	Number of Industrial Designs Awarded (Resident)	74
E)	Number of Industrial Designs Awarded (Non- Resident)	22
F)	Total Number of Industrial Designs Awarded (D+E)	96
G)	Publications by Sri Lankan Scientists in SCI Journals	1,482

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	55
B	Performing Operations, Transporting	22
C	Chemistry, Metallurgy	57
D	Textiles, Paper	7
E	Fixed Constructions	9
F	Mechanical Engineering, Lighting, Heating, Weapons	5
G	Physics	19
H	Electricity	16
	Total	190

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

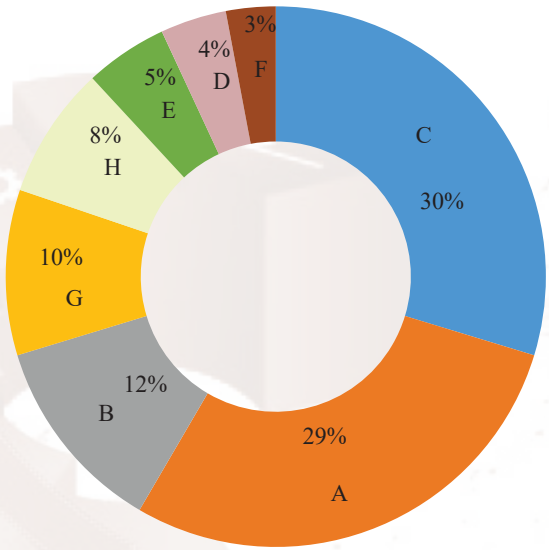


Figure 3.1. Major Patent Types

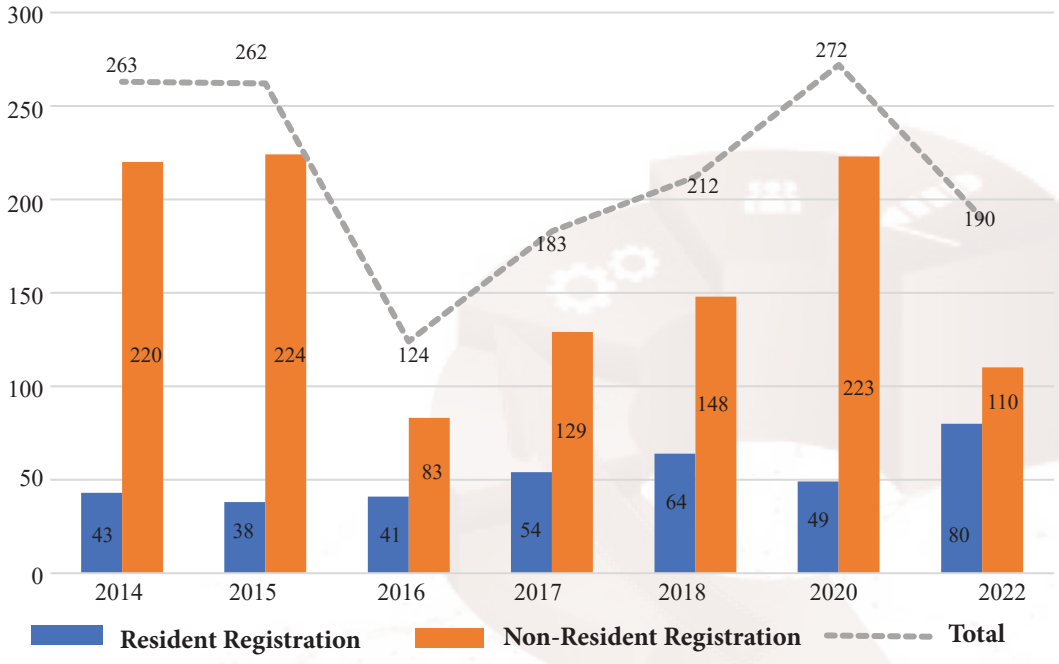


Figure 3.2. Time Trend of Patent Registrations

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	
2	Articles of clothing and haberdashery	8
6	Furnishing	5
9	Packages and containers for the transport or handling of goods	9
10	Clocks and watches and other masuring instruments, checking abd signalling instruments	2
12	Means of transport or hoisting	16
13	Equipment for production, distribution or transformation of electricity	6
14	Recording, telecommunication or data processing equipment	2
23	Fluid distribution equipment, sanitary, heating, ventilation and air-conditioning equipment, solid fuel	4
25	Building units and construction elements	29
31	Machines and appliances for preparing food or drink	2
32	Graphic symbols and logos, surface patterns, ornamentation	13
	Total	96

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

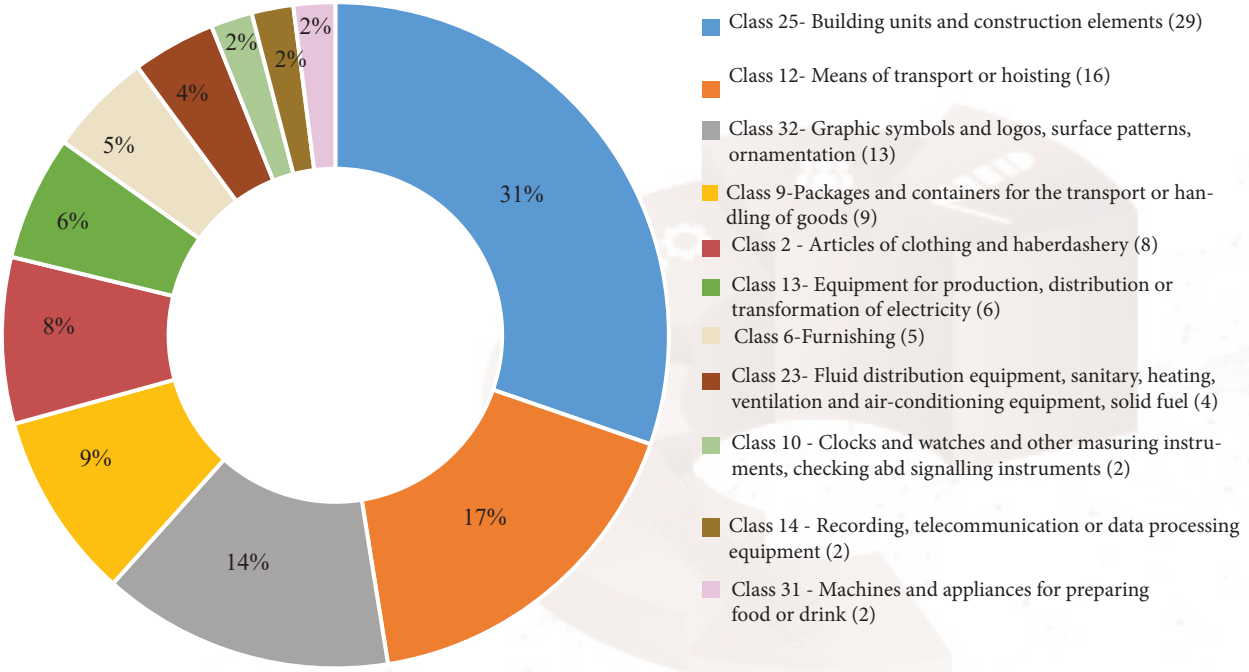


Figure 3.3. Major Industrial Design Types

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

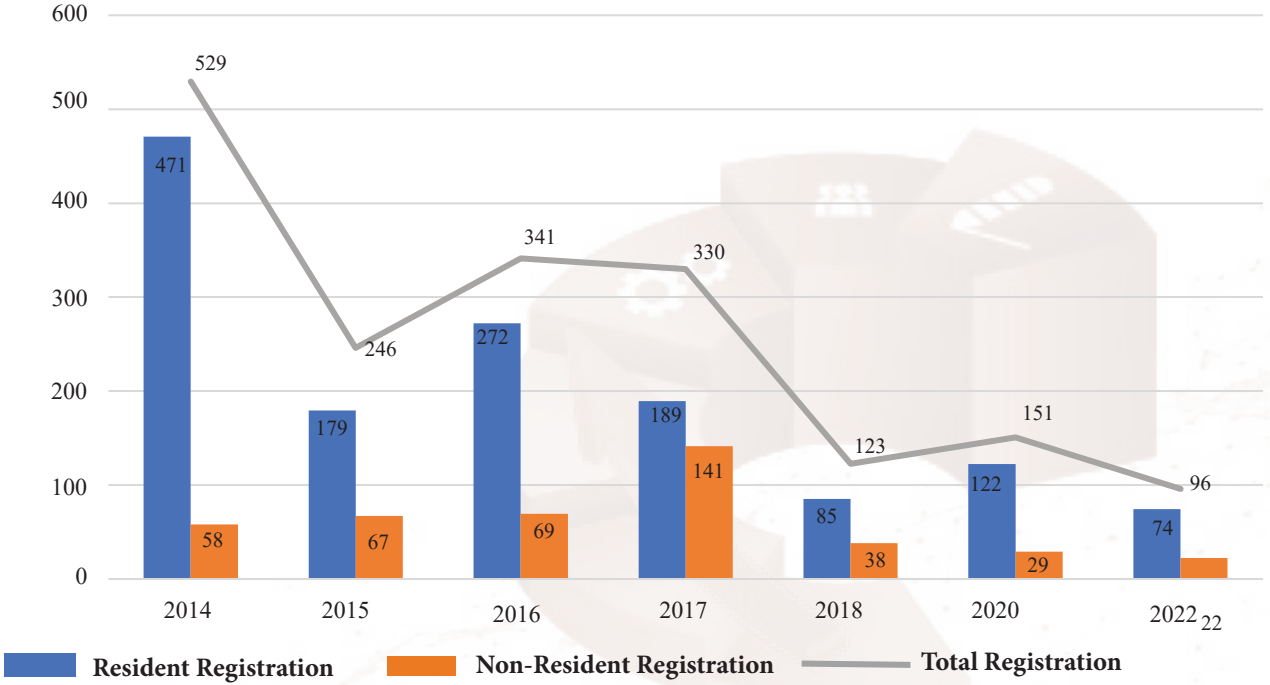


Figure 3.4. Time Trend of Industrial Designs Registration

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	112	1,651	57	1,820
b	Existing Products/Services/Processes Significantly Improved	73	909	6	988
c	New Plant Varieties/Hybrids Developed	42	62	2	106
d	Import Substitutes Developed	13	65	1	79
e	Designs/Prototypes Developed	42	671	11	724

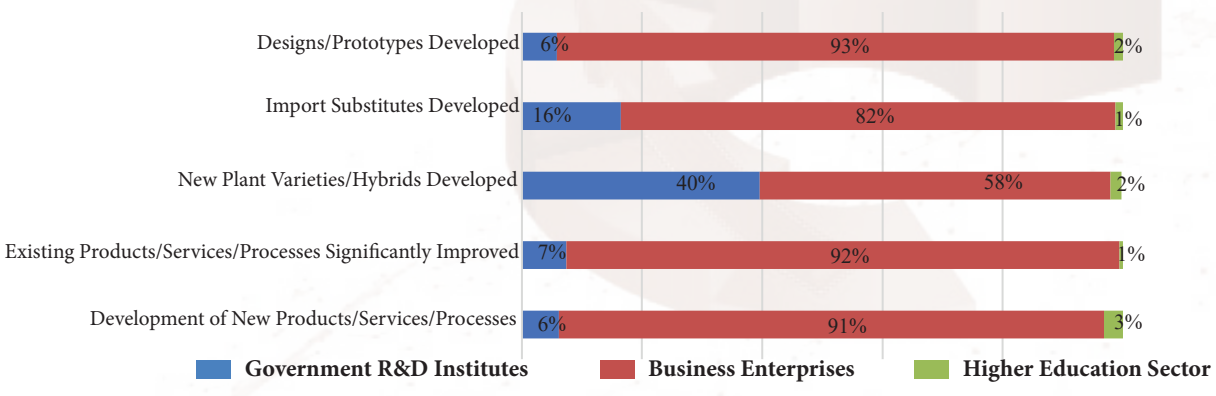


Figure 3.5. Sector-wise Contribution to Innovation

Source: National Research and Development Survey of Sri Lanka 2022

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	16	996	36	1,048
b	Commercialization of Improved Existing Products/Services/Processes	115	849	5	969
c	Commercialization of New Plant Varieties/ Hybrids	6	62	1	69
d	Commercialization of Import Substitutes	13	65	0	78
e	Commercialization of Designs/Prototypes	43	671	2	716

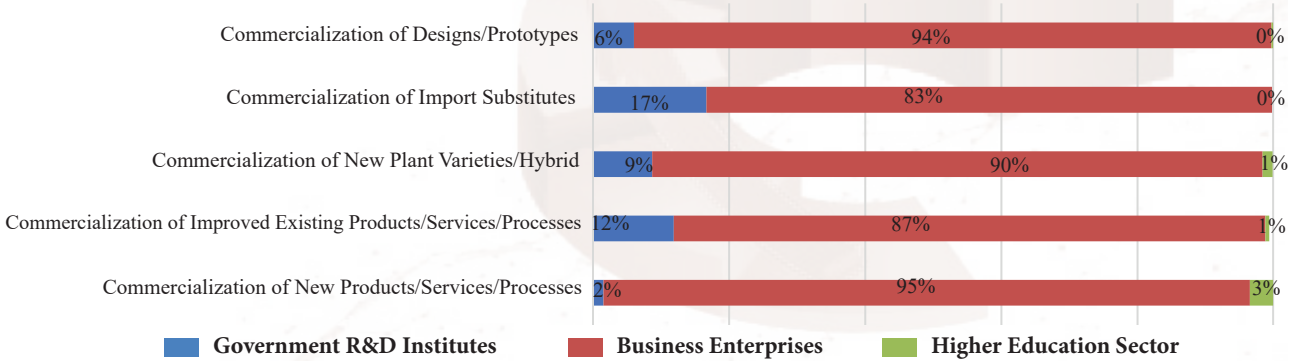


Figure 3.6. Sector-wise Innovation Commercialization

Source: National R&D Survey of Sri Lanka, 2022 (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	507	341	67%
Engineering and Technology	274	212	77%
Medical Sciences	473	326	69%
Agricultural Sciences	205	147	72%
Social Sciences and Humanities	23	20	87%
Total	1,482	1,046	71%

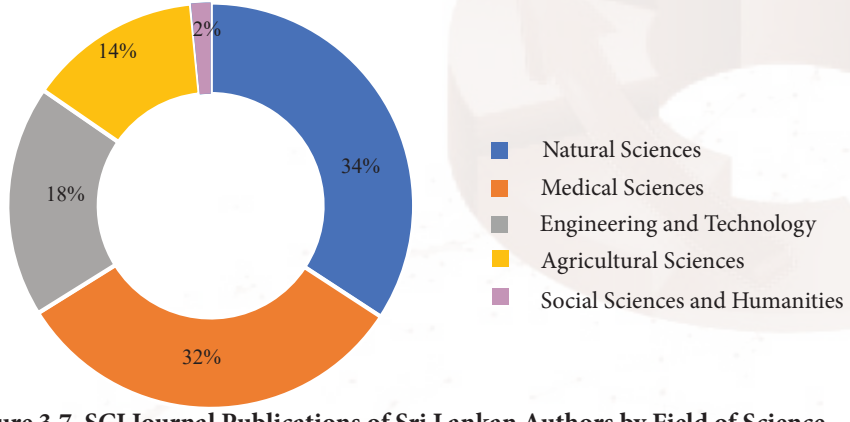


Figure 3.7. SCI Journal Publications of Sri Lankan Authors by Field of Science

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

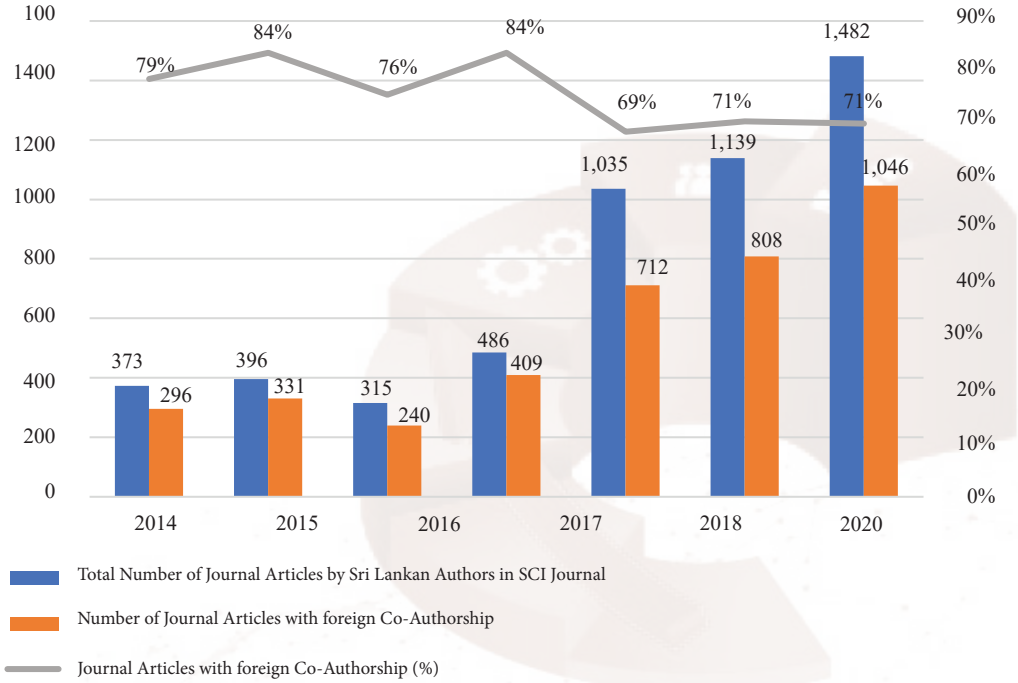


Figure 3.8. SCI Journal Publications - Time Trend

Source: Adopted from the Scopus and Science Citation Index
Figures of 2014-2018 - Scopus and Science Citation Index

3.7. Publications of Sri Lankan Scientists in SCI Journals by Field of Science (2014-2022)

Field of Science	2014		2015		2016		2017		2018		2020		2022	
	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 (%)	Total Number	With foreign Co-authorship (%)
Natural Sciences	95	79	102	84	120	88	167	92	319	68	462	75	507	67
Engineering and Technology	80	86	76	80	52	71	95	81	227	78	150	71	274	77
Medical Sciences	118	69	126	84	92	71	126	79	319	64	384	66	473	69
Agricultural Sciences	71	93	80	89	46	65	79	76	105	70	115	70	205	72
Social Sciences and Humanities	9	56	12	58	5	40	19	100	65	65	28	75	23	87
Total	373	79	396	84	315	76	486	84	1,035	69	1139	71	1482	71

Source: Adopted from the Scopus and Science Citation Index
Figures of 2014-2020 - Scopus expanded & SCI

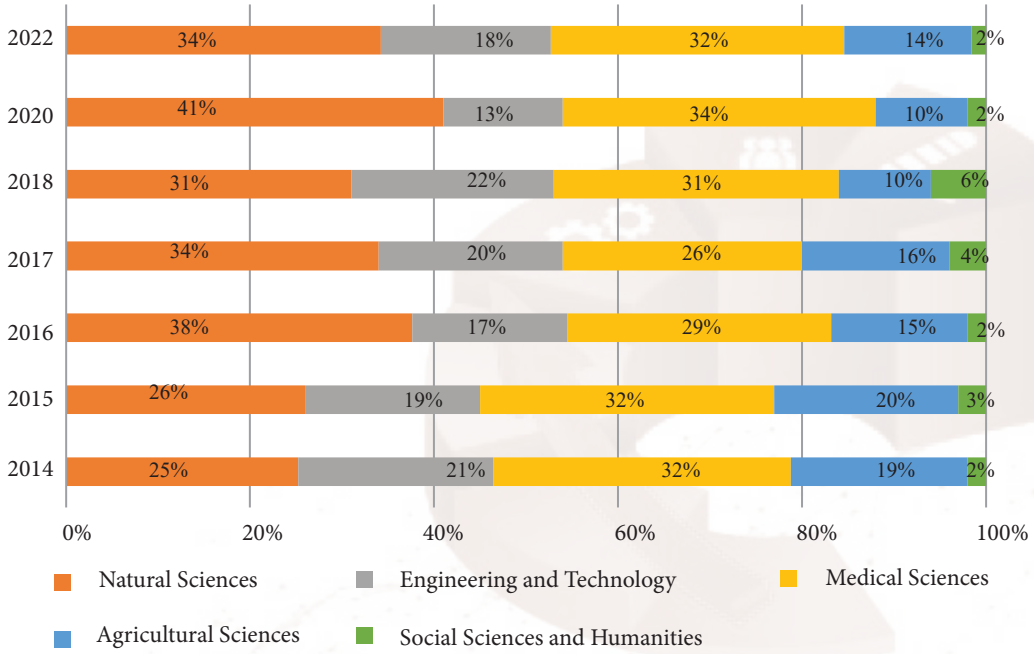


Figure 3.9. Articles in SCI Publications by Field of Science (2014-2022)

Source: Adopted from the Scopus and Science Citation Index
Figures of 2014-2020 - Scopus expanded & SCI

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 knowlwdge, 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 in which the Research & Development are carried out.

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 – 300 institutions were selected for the survey considering the degree of their R&D activity and the proportion of their contribution to the 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) Reccurent 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 a statistical unit or at an aggregate level, during a specific reference period (usually a calendar year).

Full Time Equivalent (FTE) : The ratio of working hours actually spent on R&D during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or by a group. (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 collecting 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.

Survey Team of the Science & Technology Policy Research Division (STPRD)

Mr Wasantha Anuruddha, (Head/ STPRD)
Overall supervision of the survey

Mrs Dilushi Munasinghe, Scientific Officer
Overall coordination of the survey including data collection, data analysis, indicator development and preparation of the handbook

Mrs Chandima Samarasinghe, Management Assistant
Assisted data collection and compilation, data entry, designed the handbook including the cover page, maintained correspondences with data providers

Mrs Madhumali Wickramasinghe, Management Assistant
Assisted data collection and compilation, data entry, maintained correspondences with data providers

Mr Dinujaya Gunathilake, NAITA Traninee
Assisted data collection and compilation, data entry, maintained correspondences with data providers

National Science Foundation
47/5, Maitland Place
Colombo 07
Sri Lanka.
www.nsf.gov.lk
Tel/Fax : 0112675841

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