

REPORT ON THE EVALUATION OF THE 2022 UNIVERSITIES' RESEARCH OUTPUTS

February 2024

Evaluated in terms of the Research Outputs Policy, 2015



higher education
& training

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Published by the Department of Higher Education and Training

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FOREWORD BY THE DIRECTOR-GENERAL

It is with great pride that the Department presents the report on the evaluation of the 2022 publications from public higher education institutions (universities). This sectoral report provides detailed analysis of the sector's performance in research and knowledge production.

The Department of Higher Education and Training (the Department) is responsible for implementation of the *Research Outputs Policy (2015)* and in terms of this policy, universities through their research offices are required to submit their subsidy funding claims for scholarly publications on or before 15 May every year. The Department allocates research subsidy based on unit calculations for approved publications. To assist with the evaluation of the publications, the Department constitutes and convenes expert sub-panels from the higher education sector. There are six sub-panels generally organised according to broad research domains: *Natural Sciences; Engineering and Technology; Medical and Health Sciences; Agricultural and Veterinary Sciences; Social Sciences; Humanities and the Arts.*

Over the years the publications in accredited journals, scholarly books and published conference proceedings has been increasing. The total number of publications has increased from 7 230 units in 2005 to 24 402.84 units in 2022 which translates into a compound average annual growth rate (CAGR) of 7.42%. Our universities are indeed contributing towards global knowledge production.

However, despite the significant growth in the number of units allocated for approved publications, various studies over the past 10 years have unfortunately also revealed that the policy instrument has produced several unintended negative consequences, for instance, some researchers have begun to game the system through publications in predatory journals, listing of ghost affiliations and engaging in salami slicing to maximize the number of submissions. As a result, the Department approved a three-year collaborative Publications Quality Framework (PQF) programme, funded under the University Capacity Development Programme (UCDP), to investigate ways in which the current policy framework can be improved, and more specifically, how it can be revised to reduce unethical and questionable publication practices by some researchers.

The Department would like to thank sub-panel members for their participation and contribution in the evaluation process which assists in the allocation of research subsidy to our universities. The annual evaluation of publications depends on the valuable contribution made by sub-panel members as experienced academics in their respective field of studies. Thanks and appreciation must be directed to the National Research Foundation (NRF) and the Centre for Research on Evaluation and Technology (CREST) for continuous support and contribution in this critical work.


Dr Nkosinathi Sishi

Director-General: Department of Higher Education and Training

Date: 2024 / 02 / 25

Table of Contents

1. INTRODUCTION: PROCESS AND PROCEDURE	12
1.1. The process.....	12
1.2. Methodological notes	13
1.2.1 Publication output units and publication outputs.....	13
1.2.2 Classification of outputs by scientific field or discipline	14
1.2.3 The definition and meaning of normalized indicators used in the report.....	14
1.2.4 The analysis of demographic trends in publication output.....	14
1.3. Quality and Integrity of Research Outputs	14
2. OVERALL RESEARCH PUBLICATIONS OUTPUT	16
2.1. Overview and trends.....	16
2.2. Publications units by publication type	17
3. JOURNAL PUBLICATION OUTPUTS	20
3.1. Overview of journal publications	20
3.2. Publications disaggregated by Index or Journal List.....	22
3.3. Journal publication outputs by scientific field	24
4. BOOK AND BOOK CHAPTER OUTPUTS	26
4.1. Overview and trends.....	26
4.2. Book and book chapter outputs by university	27
5. PUBLISHED CONFERENCE PROCEEDINGS	31
5.1. Overview and trends.....	31
6. NORMALIZED RESEARCH OUTPUT INDICATORS	34
6.1. <i>Per capita</i> research publication output	34
6.2. Weighted <i>per capita</i> research output.....	35
6.3. Proportion of academic staff with doctorates	37
6.4. Ratio of doctoral graduates to academics with doctorate	39
7. DEMOGRAPHIC TRENDS	42
7.1. Publication outputs by gender of author	42
7.2. Publication outputs by country of birth of the author.....	43

7.3. Publication outputs by race of author44
7.4. Publication outputs by age of author.....45
6. GENERAL OBSERVATIONS AND CONCLUSIONS.....47

List of figures

Figure 1: Total Publication Units awarded, 2005 – 2022.....	16
Figure 2: Percentage Growth Rate and 3-year Cycles of CAGR, 2005 - 2022.....	17
Figure 3: Relative cumulative share to sector output by individual universities 19	
Figure 4: Increase in the number of journals in which SA academics published (2005 - 2022).....	20
Figure 5: Trend in the number of journal article output units, 2005 – 2022.....	21
Figure 6: Comparing article units awarded grouped by university for 2022 and 2021	22
Figure 7: Comparing articles units awarded with articles by main subject field 25	
Figure 8: Trend in book and book chapter output from 2005 to 2022.....	26
Figure 9: Comparing book and book chapter units awarded for 2022 and 2021 by university	30
Figure 10: Trends in production of published conference proceedings between 2005 and 2022.....	31
Figure 11: Comparison of conference proceeding units awarded for 2022 and 2021 by university	33
Figure 12: Trend in Per Capita Publications Output and Weighted Research and Normalized Weighted Research Output 2005 – 2022.....	37
Figure 13: Trend in percentage of staff with doctorate degrees from 2005 to 2022.....	39
Figure 14: Gender of authors of journal articles: 2005 - 2022.....	43
Figure 15: Percentage of authorships produced by South African nationals: 2005 to 2022	44
Figure 16: Percentage of authors by race (SA nationals only) between 2005 and 2022	45
Figure 17: Trend in age of authors 2005 to 2022	46

List of tables

Table 1: Publication output units by publication type by universities, 2022.....	17
Table 2: CAGR by rolling three-year windows for journal articles, 2007–2022... 	21
Table 3: Journal Publication Outputs by Index, 2022 (n=30 809).....	23
Table 4: Number of Articles by Scientific Fields, 2015 to 2022	25
Table 5: CAGR by rolling three-year windows for books and chapters, 2007-2022.....	26

Table 6: Percentage of book publications output units by university, 2020 and 2022	27
Table 7: CAGR of book publications units by university, 2015 - 2022	28
Table 8: CAGR values for growth rates in annual published conference proceedings (2007 to 2022)	31
Table 9: Published Conference Proceedings Units per university, 2015 – 2022	32
Table 10: Per capita research publications outputs, 2022	35
Table 11: Weighted per capita research output (2022)	36
Table 12: Number of permanently employed academics by highest qualification, 2022	37
Table 13: Ratio of doctoral graduates to doctorate staff member by university (2022)	40
Table 14: Supervisory load per doctorate academic staff by university (2022) ..	41
Table 15: Trend in race of authors 2005 to 2022	45
Table 16: Trend in age of authors 2005 to 2022	46

ACRONYMS

CAGR	Compound Average Growth Rate
CESM	Classification of Educational Subject Matter
CPUT	Cape Peninsula University of Technology
CUT	Central University of Technology
DHET/ the Department	Department of Higher Education and Training
DOAJ	Directory of Open Access Journal
DUT	Durban University of Technology
HEMIS	Higher Education Management Information System
IBSS	International Bibliography of Social Science
ISBN	International Standard Book Number
ISI	Institute of Science Information
MUT	Mangosuthu University of Technology
NMU	Nelson Mandela University
NRF	National Research Foundation
NWU	North West University
ROSS	Research Outputs Submission System
RU	Rhodes University
SciELO SA	Scientific Electronic Library Online South Africa
SMU	Sefako Makgatho Health Sciences University
SPU	Sol Plaatje University
SU	Stellenbosch University
TUT	Tshwane University of Technology
UCT	University of Cape Town
UFH	University of Fort Hare
UFS	University of the Free State
UJ	University of Johannesburg
UKZN	University of KwaZulu-Natal
UL	University of Limpopo
UNISA	University of South Africa
UNIVEN	University of Venda
UNIZULU	University of Zululand
UP	University of Pretoria
UWC	University of the Western Cape
VUT	Vaal University of Technology
WITS	University of the Witwatersrand
WoS	Web of Science
WSU	Walter Sisulu University

List of CESM Categories

CESM
01: Agriculture, Agricultural Operations and Related Sciences
02: Architecture and the Built Environment
03: Visual and Performing Arts
04: Business, Economics and Management Studies
05: Communication, Journalism and Related Studies
06: Computer and Information Sciences
07: Education
08: Engineering
09: Health Professions and Related Clinical Sciences
10: Family Ecology and Consumer Sciences
11: Languages, Linguistics and Literature
12: Law
13: Life Sciences
14: Physical Sciences
15: Mathematics and Statistics
16: Military Sciences
17: Philosophy, Religion and Theology
18: Psychology
19: Public Management and Services
20: Social Sciences

1. INTRODUCTION: PROCESS AND PROCEDURE

1.1. The process

The Department of Higher Education and Training (the Department) implements the *Research Output Policy (2015)*, which provides a framework for the evaluation and subsidy allocation for research outputs produced by South African public higher education institutions (universities). The subsidisation of research outputs forms a basis for sustaining research and promoting increased research productivity and other forms of knowledge generation required to meet national development needs.

The Policy recognises three types of publications: journal articles, book publications and published conference proceedings. It relies on the principle of peer review, among others, for quality academic publications, and accords all South African universities with the responsibility to co-own its implementation and ensure the improvement of quality research output from the sector. In order to reduce errors, institutions are required to ensure that all research office personnel are well acquainted with the policy; and that an institutional panel assesses all publications before submitting to the Department as per paragraph 8.2 (d) of the Research Outputs Policy, and that all are familiar with the general requirements, principles, objectives and ethics upon which the policy is set. Only claims that meet the policy requirements must be submitted to the Department.

All 26 universities submitted their 2022 research publication outputs by 15 May 2023 for the purposes of subsidy claims. The Directorate: University Research Support and Policy Development together with the National Research Foundation (NRF) administered the process and evaluated the technical compliance of all submissions. The Research Outputs Submission System (ROSS) that has been developed and managed by the NRF facilitates the online research outputs submissions and their processing through to the outcomes of the evaluations by the relevant field-specific expert peer review sub-panels. The sub-panels use pre-determined evaluation criteria in line with the Research Output Policy. The sub-panellists, who are drawn from the university sector, are expert practitioners in their respective fields. The sub-panels conducted evaluations of book publications and conference proceedings under the guidance of the Research Output Evaluation Panel (the Panel), whose members chair the respective sub-panels.

The online research outputs submissions and evaluation process has proven to be convenient and efficient because the evaluations were completed by end of July 2023. It also allowed for a longer and more thorough process of evaluations.

The Policy requires institutions to submit audited subsidy claims for research outputs appearing in approved journal indexes and lists. The Department recognises the following lists: Scopus; Scientific Electronic Library Online South Africa (SciELO SA); the Norwegian Register for Scientific Journals; Clarivate (formerly Thomson Reuters) Web of Science; the ProQuest International Bibliography of the Social Sciences (IBSS) and the Department of Higher Education and Training (DHET) list of SA journals.

The process followed for evaluating the 2022 research outputs was as follows:

- a) The Department received all electronic copies of publications in the form of Books, Conferences and Journals and the required supporting documentation in May 2023.
- b) The Department screened all the submissions for eligibility and according to the technical criteria as per the policy.

- c) Field-specific expert peer review sub-panels were convened from 17-31 July 2023 and evaluated the research outputs according to predetermined criteria and scholarship of the publications. This was the first time that the evaluations were conducted before August – previously they could only be conducted between August and October. The efficiency was due to the online system of evaluation that is facilitated through ROSS.
- d) The Department, supported by the NRF, analysed the outcomes of the sub-panels and calculated the number of units allocated to each institution for publications in books and conference proceedings.
- e) Audited claims for publications in accredited journals submitted by universities were checked and verified against approved journal indexes and lists, and final unit allocations for each institution were calculated.
- f) Individual institutional reports were developed by the Department and sent to the respective institutions in December 2023.
- g) This report on the evaluation of 2022 Universities' research outputs was drafted by the Department, with the assistance of the Centre for Research, Evaluation, Science and Technology (CREST) on statistical analysis and quality.

Late publications for the year 2021 (n-2) were considered where valid and legitimate reasons for late submission were provided and accepted, but publications dating before 2020 (n-3 and beyond) were not considered, as stipulated in the policy. For research purposes, and improving its systems, the Department will in future request a separate submission of n-3 publications and articles appearing in non-approved publications, however, they will still not be considered for subsidy.

1.2. Methodological notes

Several methodological clarifications are in order with regard to-

- The distinction between publication output units and publication outputs,
- The classification of scientific fields/disciplines,
- The definition and meaning of normalized indicators used in the report, and
- The analysis of demographic trends in publication output.

1.2.1 *Publication output units and publication outputs*

This report makes a distinction between publication output **units** and publication **outputs**. The former refers to the subsidy units awarded for each approved publication (according to the criteria set out in the policy) based on the submissions made in a particular year. This means that a university is awarded a total subsidy based on the calculation of all submissions made, for example, 2023 for the preceding year (2022). However, as the policy allows for late submissions accompanied by valid reasons (i.e. 2021 – 1 year or year n minus 1), the result is that the total subsidy units awarded in 2023 for 2022 publications will invariably include a small proportion of publications that had been published in 2021. In this report, the total number of subsidy units (or output units) that have been awarded to universities are based on the submissions made in 2023 and are reported at the beginning of each section. When the results are reported by scientific field, journal index or demographics, the analyses are based on the actual publication year of each output instead of the submission year of publication output.

1.2.2 *Classification of outputs by scientific field or discipline*

The analysis may refer to the Classification of Education Subject Matter (CESM) categories which have been extensively used in the previous reports. The use of CESM categories for analysis in this report

has been minimised since it is a tool for subsidy allocations and not entirely suitable for the classification of research publication outputs.

1.2.3 The definition and meaning of normalized indicators used in the report

Four indicators are included in the report:

- Per capita research **publication output** (where the total number of publications by a university is divided by the headcount of the permanent instructional and research staff in the same year). The result is the number of publications per permanently employed academics per annum.
- Weighted per capita **research output** (where all research output - including research masters and doctoral graduates - is calculated against set norms and divided by the headcount of academic staff in the same year). Each research masters graduate has a weight of 1 unit while a doctoral graduate has a weight of 3 units.
- Proportion of academic staff by their highest degrees or qualifications against the research outputs.
- Proportion of doctoral graduates per doctorate academic staff.

1.2.4 The analysis of demographic trends in publication output

This report includes several analyses related to demographic shifts in the publication outputs of universities. Four demographic variables used in these analyses are:

- Gender of the author
- Country of birth of the author (SA-nationals and foreign nationals)
- Race of the author (only for SA nationals)
- Age of the author

The analyses of the above categories are based on data sourced from the most recent submissions. It is important to point out that coverage of these variables in the current version of the database varies (for example, 'gender of author' is much better covered than the 'nationality of the author'). However, in all cases, information about these variables is available for more than 90% of the individual records on which the final analyses were conducted.

The purpose of analysing the demographic patterns assists the Department in monitoring the trends in the transformation of knowledge production in the university sector, particularly the development of young academics into experienced researchers. Such knowledge assists the Department in designing the necessary interventions as, for example, in the University Capacity Development Plan. The understanding of shifts in the above-stated demographics over time is imperative if the Department and the individual institutions are to contribute to redress and transformation in the sector.

1.3. Quality and Integrity of Research Outputs

The Department remains committed to ensuring that an appropriate framework is in place to assure the quality and integrity of academic publications. There is currently such an initiative (The University-led Collaborative Programme on a Publication Quality Framework under the auspices of the UCDP) to strengthen existing frameworks and procedures. The Department will continue to communicate with the sector on these initiatives and any changes that may be required in the future to ensure that the subsidy system is guarded against abuse and only publications of high quality and ethical integrity are subsidised. As stated before, the Department reserves the right to withhold payment of research output subsidy in respect of any publication unit that does not meet the criteria as outlined in the research

output policy and any publication that violates international rules about research integrity and ethics, as well as acceptable academic practices of good scholarship.

The purpose of the Research Outputs Policy is to “encourage research productivity by rewarding quality research outputs at public higher education institutions”. The emphasis must be put on ‘quality’ research and publications. Each year the Department assesses the quality of submissions made by institutions in order to improve the policy; processes and procedures for submission and determination of subsidy allocations.

Institutional reports for the 2023 submissions contain some information about the publication units that were withheld from the 2022 submissions (2021 publications). Following further investigations, some submissions were declined in 2022 and excluded in this report.

2. OVERALL RESEARCH PUBLICATIONS OUTPUT

2.1. Overview and trends

A total of 24 402.84 publication subsidy units in all publication categories (journal articles, books, book chapters and published conference proceedings) were awarded to universities for the 2023 submission cycle (2022 publication year). This constitutes a 4.21% increase from the 2021 publication units, from 23 416.32 to 24 402.84 units (or an increase of 986.52 units). **Figure 1** presents the timeline of approved publications units generated by the university sector for the past 18 years.

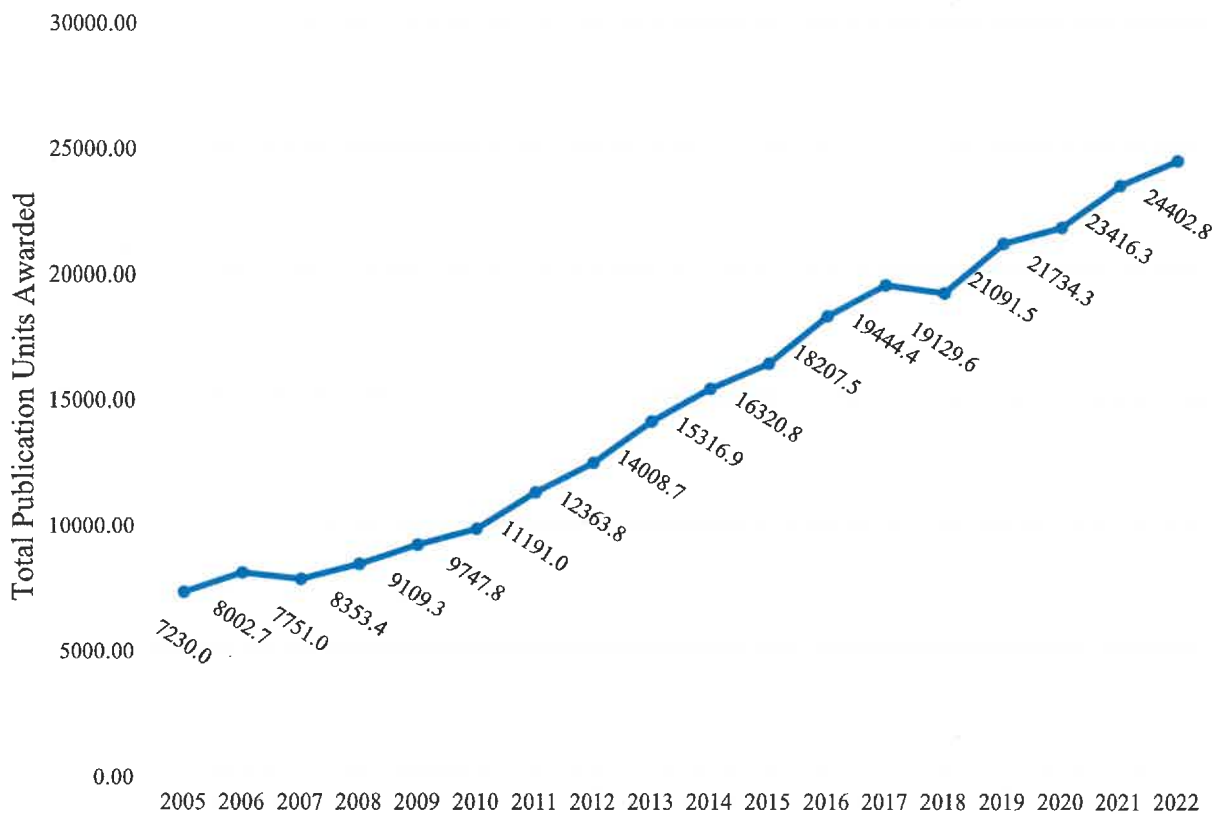


Figure 1: Total Publication Units awarded, 2005 – 2022

A better understanding of the overall trend can be achieved by focusing on the rate of growth in publications as measured by the Compound Average Growth Rate (CAGR) shown in **Figure 2**. The CAGR (equivalent to exponential growth rate) factors the previous percentages of growth and is reported here in three-year periods.

The overall percentage growth rate of research publications outputs from 2005 to 2022 was 7.42%(CAGR).

The year-to-year growth in publication outputs over the past 18 years peaked at 14.81% in 2011. Further disaggregation of the CAGR into three-year time frames (**figure 2**) helps to explain the differences in trends in publication output over the past 18 years. The CAGR bar for 2008, for instance, represents compounded growth between 2005 to 2008, and so on. The compounded growth rate of publications output peaked at 12.62% between 2010 and 2012, following a period of strong growth, with double-digit annual growth recorded in 2011 and 2012. Since then, the rate of increase has declined but in recent years stabilized at around 6%.

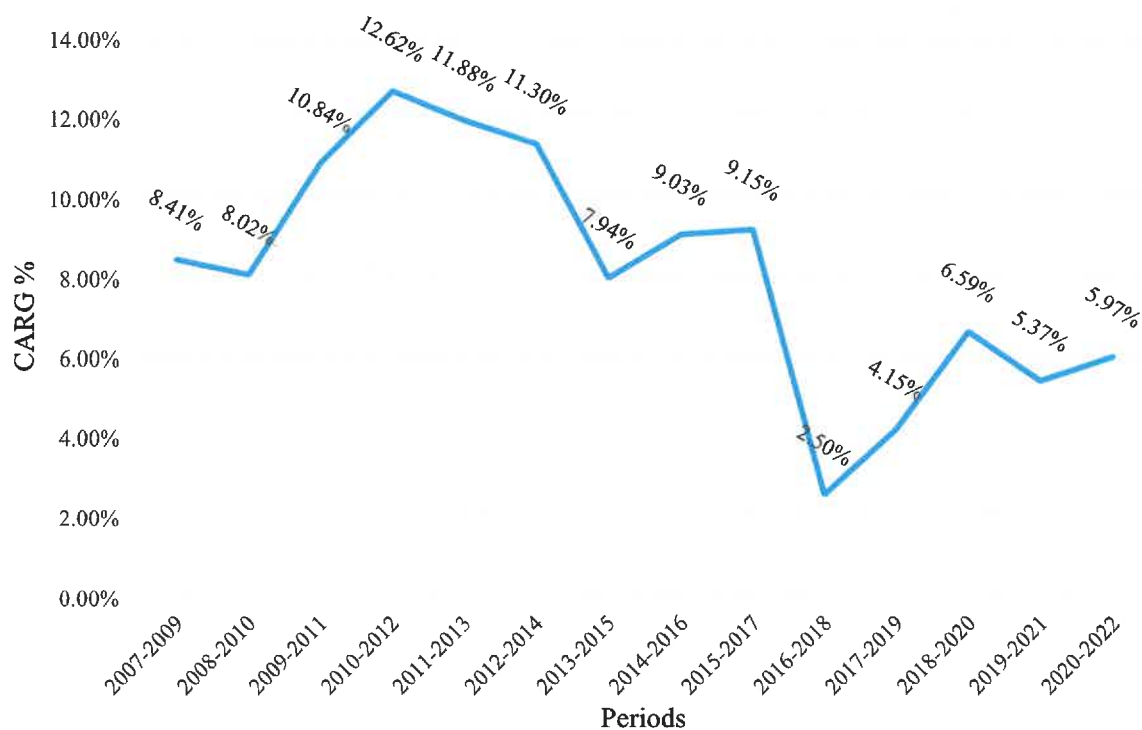


Figure 2: Percentage Growth Rate and 3-year Cycles of CAGR, 2005 - 2022

2.2. Publications units by publication type

The Research Outputs policy recognises book publications (i.e. books and book chapters); published peer-reviewed conference proceedings and journal articles. The output units awarded in 2022 by each type and by university are listed in **Table 1** (in descending order of overall sector units of 2022). Please note a few institutional shifts that occurred from the 2021 overall institutional allocation of units.

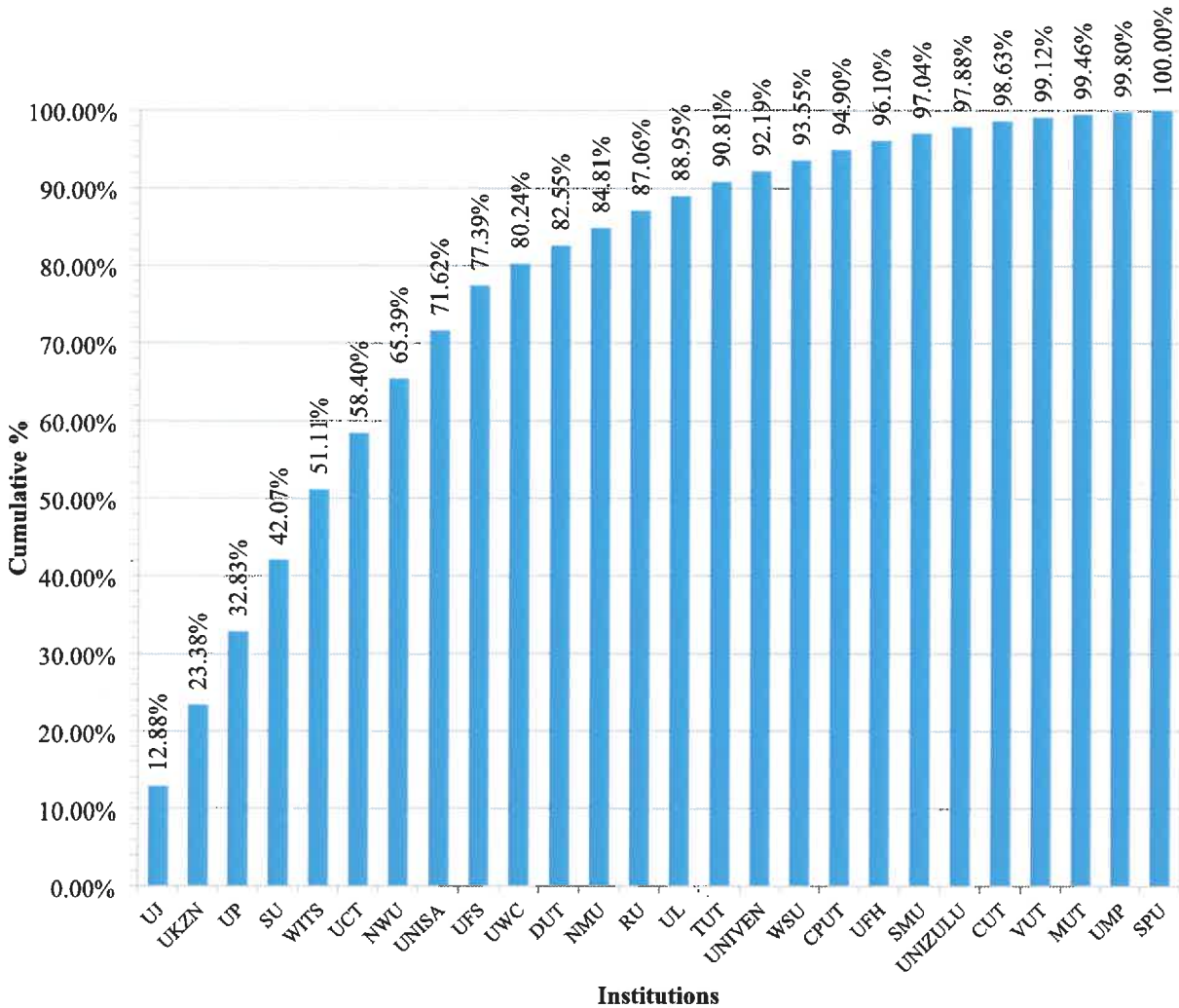
Table 1: Publication output units by publication type by universities, 2022

Institution	Books		Conferences		Journals		Overall Institutional units 2021	Overall Institutional units 2022	% Share of Overall Sector units 2022
	Units	% of institutional units	Units	% of institutional units	Units	% of institutional units			
UJ	507.0	15.27%	277.1	25.99%	2359.6	11.76%	2753.4	3143.7	12.88%
UKZN	205.4	6.19%	14.2	1.33%	2343.0	11.70%	2658.2	2562.7	10.50%
UP	346.3	10.43%	74.0	6.94%	1884.9	9.41%	2353.1	2305.2	9.45%
SU	397.5	11.98%	107.1	10.04%	1750.5	8.74%	2157.9	2255.1	9.24%
WITS	323.6	9.75%	60.5	5.67%	1822.4	9.10%	2443.6	2206.4	9.04%
UCT	208.1	6.27%	54.9	5.15%	1514.2	7.56%	1801.1	1777.3	7.28%
NWU	272.6	8.21%	91.5	8.58%	1342.1	6.70%	1656.0	1706.2	6.99%
UNISA	172.2	5.19%	59.4	5.57%	1290.0	6.44%	1390.3	1521.5	6.24%
UFS	333.6	10.05%	52.4	4.91%	1020.4	5.10%	1270.9	1406.4	5.76%
UWC	128.6	3.87%	15.3	1.44%	552.7	2.76%	651.1	696.6	2.85%
DUT	76.2	2.30%	27.0	2.54%	461.0	2.30%	423.7	564.2	2.31%
NMU	49.0	1.48%	32.8	3.07%	468.3	2.34%	580.6	550.0	2.25%
RU	77.2	2.33%	17.8	1.67%	454.5	2.27%	594.5	549.6	2.25%
UL	25.3	0.76%	19.8	1.86%	416.5	2.08%	570.4	461.6	1.89%
TUT	28.1	0.85%	35.3	3.31%	390.0	1.95%	274.0	453.4	1.86%
UNIVEN	28.5	0.86%	1.0	0.09%	308.3	1.54%	116.2	337.8	1.38%
WSU	29.1	0.88%	28.6	2.68%	274.1	1.37%	192.2	331.8	1.36%
CPUT	28.2	0.85%	25.8	2.42%	275.2	1.37%	334.0	329.2	1.35%
UFH	25.0	0.75%	11.7	1.10%	255.1	1.28%	245.2	291.9	1.20%
SMU	0.7	0.02%	0.9	0.08%	228.7	1.14%	238.8	230.2	0.94%
UNIZULU	10.4	0.31%	7.0	0.65%	187.9	0.94%	238.4	205.3	0.84%
CUT	5.0	0.15%	28.7	2.69%	148.2	0.74%	157.7	181.9	0.75%
VUT	1.8	0.06%	17.8	1.67%	101.3	0.51%	138.4	120.9	0.50%
MUT	1.0	0.03%	3.3	0.31%	78.1	0.42%	68.9	82.4	0.34%
UMP	31.4	0.95%	0.5	0.05%	50.1	0.25%	57.6	82.0	0.34%
SPU	7.7	0.23%	1.9	0.18%	39.9	0.20%	50.1	49.5	0.20%
Total	3319.6	100.00%	1066.0	100.00%	20017.3	100.00%	23416.3	24402.8	100.00%

A graphic presentation of the cumulative relative share to sector output by individual universities is presented in **Figure 3**. The graph shows that 51% of the research publications output units were produced by five universities in the sector whilst 77% of all output was produced by nine universities. These figures, which have not changed fundamentally over the recent past, brings to sharp focus universities that need more support in knowledge production. Although there have been major changes

to the entire sector, such as the overall phenomenal growth in the publications outputs since the policy came into effect (past 18 years), the proportional contribution of institutions suggests that universities will need to collaborate far more significantly to ensure collective contribution to knowledge production.

Figure 3: Relative cumulative share to sector output by individual universities



The specific areas of performance of the system are captured in the following sub-sections of the report.

3. JOURNAL PUBLICATION OUTPUTS

3.1. Overview of journal publications

Coupled with the growth of publication outputs from the sector, the addition of more journal indexes in the 2016 revision of the policy provided academics with a broader range of publication outlets for journal articles. **Figure 4** shows the increase in the number of journals in which SA academics have

published in the past 18 years. The inclination of the graph from 2016 is a function of the inclusion of new indexes (Scopus predominantly) as well as the expansion of journals indexed in all indexes. It is of interest, that the total number of journals which South African academics published in 2022 (7620) represents only 14% of the overall number of journals in, hitherto, recognised six indexes (WoS, IBSS, Scopus, Norwegian List, SciELO SA, DOAJ and DHET List).

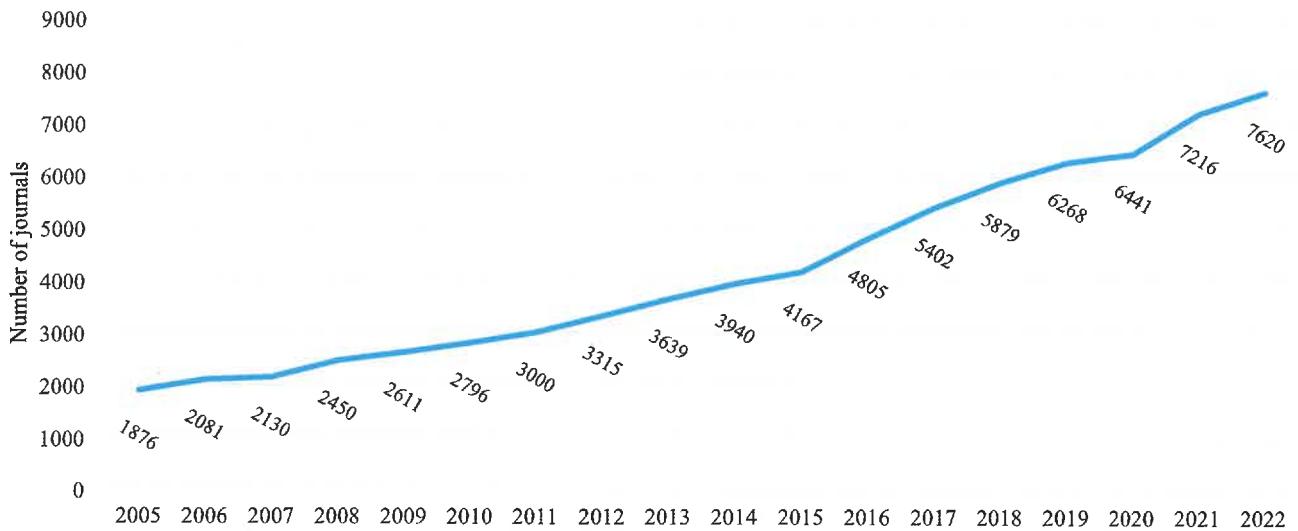


Figure 4: Increase in the number of journals in which SA academics published (2005 - 2022)

Journal articles are the predominant mode of knowledge dissemination across most scientific fields and disciplines. **Figure 5** shows the trend of units awarded for journal article outputs since 2005. A marked increase in the number of research output units was recorded from 2019 (journal publications of 2018) to 2020 (publications of 2019), that is, two years after the addition of new indexes. The new indexes started to be analysed in the 2017 report (publications of 2016). This shows that the expansion of the indexes, with additional journals, introduced in 2016 did not have an immediate impact on the number of units (which could have been observed in the 2017 report of 2016 publications). However, the predominant trend is the consistent increase in the annual number of articles published with a suggestion that the rate of increase in the most recent year (2022) may be slowing down.

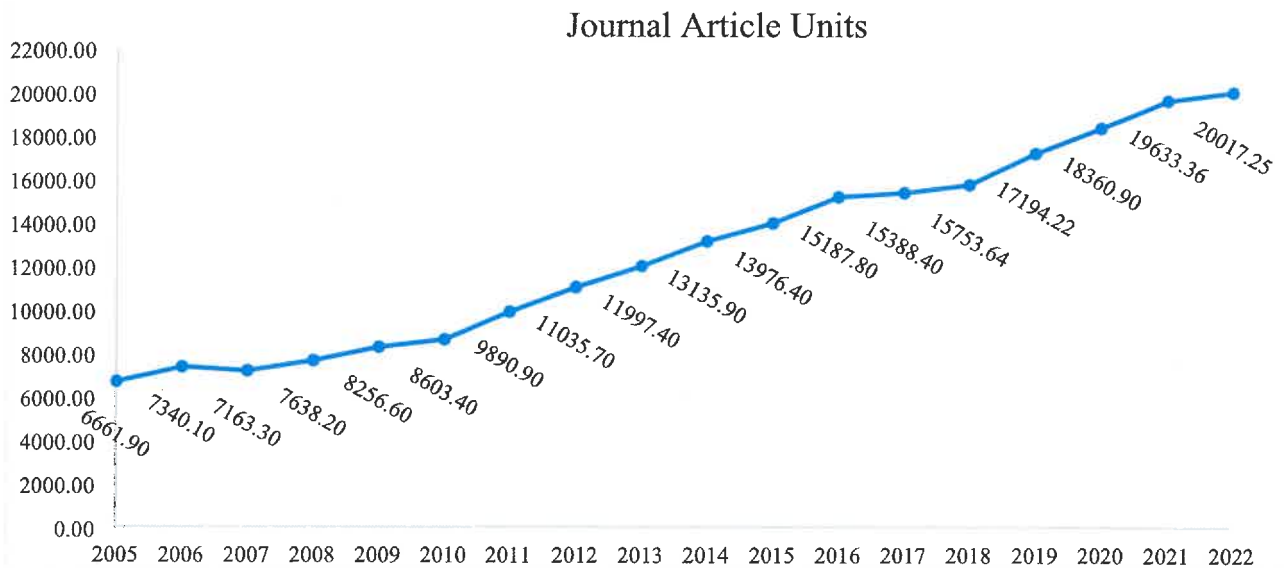


Figure 5: Trend in the number of journal article output units, 2005 – 2022

The Compound Average Growth Rate (CAGR)-values over this period are presented in **Table 2**. The three-year periodical CAGR presented in Table 2 provides an overview of the publication output performance trends, including the changes in publication outputs in past 18 years.

Table 2: CAGR by rolling three-year windows for journal articles, 2007–2022

Publication Year	Journal Article Units	Annual Growth	3Yr CAGR
2005	6661.90		
2006	7340.10	10.18%	
2007	7163.30	-2.41%	
2008	7638.20	6.63%	4.66%
2009	8256.60	8.10%	4.00%
2010	8603.40	4.20%	6.30%
2011	9890.90	14.97%	9.00%
2012	11035.70	11.57%	10.15%
2013	11997.40	8.71%	11.72%
2014	13135.90	9.49%	9.92%
2015	13976.40	6.40%	8.19%
2016	15187.80	8.67%	8.18%
2017	15388.40	1.32%	5.42%
2018	15753.64	2.37%	4.07%
2019	17194.22	9.14%	4.22%
2020	18360.90	6.79%	6.06%
2021	19633.36	6.93%	7.61%
2022	20017.25	1.96%	5.20%

The number of article subsidy units awarded is shown in **Error! Reference source not found.** It is noteworthy that apart from UJ, which experienced strong (11.8%) annual growth, all the universities in the top seven positions showed a decline in the production of journal article units.

Article units awarded by university

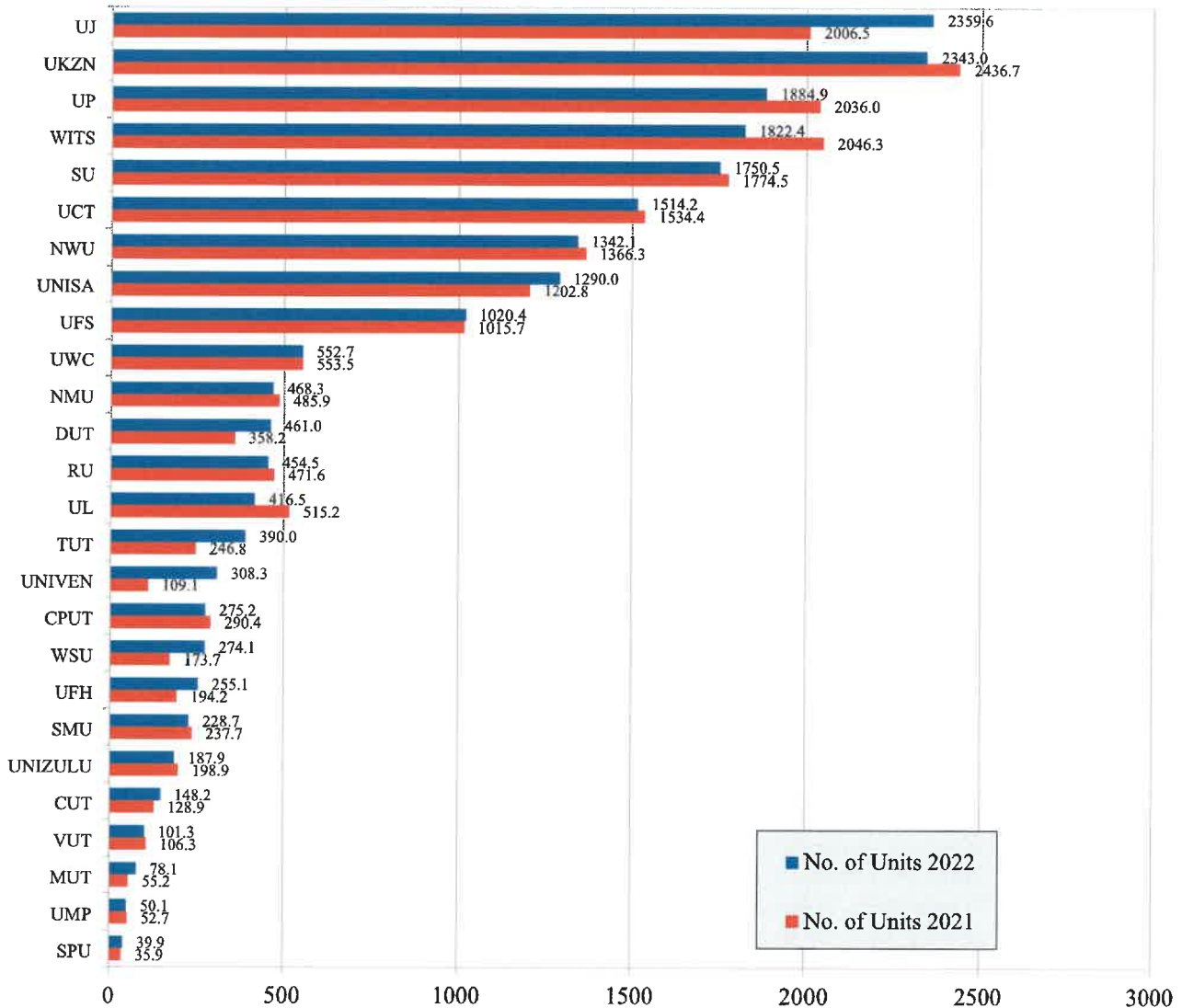


Figure 6: Comparing article units awarded grouped by university for 2022 and 2021

3.2. Publications disaggregated by Index or Journal List

The inclusion of new indexes after the 2016 review of the policy started having a clear effect on the publication output from 2019 onwards. The newly added indexes from 2016 are **Scopus**; Scientific Electronic Library Online South Africa (**SciELO SA**) and the Norwegian Register for Scientific Journals, Series and Publishers and since 2021, the Directory of Open Access Journals (**DOAJ**). **Table 3** presents the breakdown of journal output by journal index or list.

Table 3: Journal Publication Outputs by Index, 2022 (n=30 809)

DHET	WoS	Scopus	DOAJ	IBSS	SciELO	Norwegian List*	Number of articles	Percentage
YES	YES	YES	YES	YES	YES		45	0.15
YES	YES	YES	YES	YES			3	0.01
YES	YES	YES	YES		YES		527	1.71
YES	YES	YES	YES				16	0.05
YES	YES	YES		YES			100	0.33
YES	YES	YES			YES		79	0.26
YES	YES	YES					255	0.83
YES	YES						3	0.01
YES		YES	YES	YES	YES		77	0.25
YES		YES	YES	YES			53	0.17
YES		YES	YES		YES		562	1.83
YES		YES	YES				254	0.83
YES		YES		YES			52	0.17
YES		YES					371	1.21
YES			YES	YES			4	0.01
YES			YES		YES		204	0.66
YES			YES				266	0.87
YES				YES	YES		3	0.01
YES				YES			42	0.14
YES					YES		157	0.51
YES							1205	3.92
	YES	YES	YES	YES		YES	1	0
	YES	YES	YES	YES			8	0.03
	YES	YES	YES		YES		131	0.43
	YES	YES	YES			YES	138	0.45
	YES	YES	YES				1667	5.42
	YES	YES		YES		YES	225	0.73
	YES	YES		YES			710	2.31
	YES	YES			YES		110	0.36
	YES	YES				YES	2297	7.47
	YES	YES					9243	30.07
	YES		YES			YES	3	0.01
	YES		YES				90	0.29
	YES			YES			9	0.03
	YES					YES	17	0.06
	YES						1174	3.82
		YES	YES	YES			22	0.07
		YES	YES		YES		19	0.06
		YES	YES			YES	2	0.01
		YES	YES				2437	7.93

DHET	WoS	Scopus	DOAJ	IBSS	SciELO	Norwegian List*	Number of articles	Percentage
		YES		YES			415	1.35
		YES			YES		15	0.05
		YES				YES	25	0.08
		YES					4690	15.26
			YES	YES			63	0.2
			YES		YES		3	0.01
			YES			YES	1	0
			YES				2172	7.07
				YES			727	2.36
					YES		61	0.2
						YES	3	0.01
							53	0.17

* Norwegian Register for Scientific Journals, Series and Publishers

All journal articles are linked to a specific journal that is indexed or listed in one or more of the DHET-approved journal indexes or lists. The results show the dominance of two indexes: Scopus and the ^{CA}Web of Science. Slightly more than half (51%) of all journal articles in 2022 were published in either the ^{CA}Web of Science (WoS) or Scopus. Articles published in the Scopus index-listed journals only constitute 15.26% of all articles published. The next single largest component is the DOAJ-listed journals (7.07%). The Norwegian list again included the fewest index unique articles published at 0.01% of the total journal articles. Publications exclusive to the DHET-listed journals declined from 5.16% in 2020 to 3.92% in 2022. It is significant to note that 79.7% of all publications overlap with Scopus and 54.7% overlap with WoS.

This may account for the surge in publications outputs that occurred from 2019 (see also **figures 1, 4 and 5**). The inclusion of DOAJ in 2021 has had a significant impact, having 7.07% exclusive publications and 28.5% publication overlap with other indexes.

3.3. Journal publication outputs by scientific field

As noted in the previous report, there have been no, or very small, shifts over the past three years with regard to the proportional shares by scientific field. **Table 3** (overleaf) presents the number of articles by scientific fields.

Table 4: Number of Articles by Scientific Fields, 2015 to 2022

Domains	Number of articles	Units Awarded
Natural sciences	9895	5554.1344
Health sciences	7937	5328.0906
Social sciences	7009	4331.4291
Engineering	3323	2081.3091
Humanities and arts	1954	1702.8447
Agricultural sciences	1363	835.4069

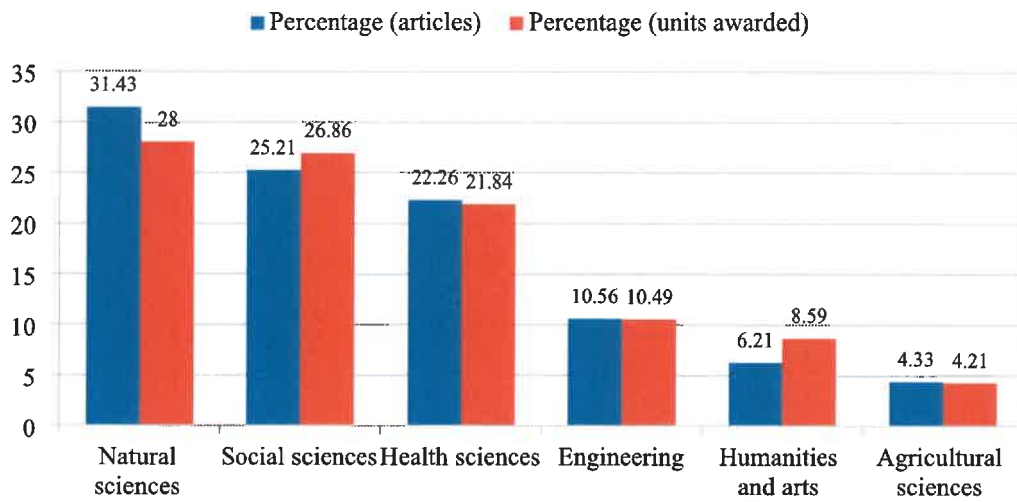


Figure 7: Comparing articles units awarded with articles by main subject field

4. BOOK AND BOOK CHAPTER OUTPUTS

4.1. Overview and trends

Research publication units in scholarly books for 2022 amounted to 3319.6 units, an increase of 422.7 units from 2897.9 units in 2021 (a 14.6% increase). The longer-term trend of book publication outputs is presented in **Figure 8**.



Figure 8: Trend in book and book chapter output from 2005 to 2022

The pattern of growth in book publications over the years is illustrated by the CAGR-values for three-year window periods from 2005 as shown in **Table 5**. The highest CAGRs were recorded in 2016 and 2017. These two years followed the introduction of the doubling of the monetary value awarded to books in the 2015 new policy. Since 2018 annual increases have continued with little or no year-to-year fluctuations.

Table 5: CAGR by rolling three-year windows for books and chapters, 2007-2022

Year	Books & Chapter Units	Annual Growth	3Yr CAGR
2005	223.3		
2006	311.0	39.27%	
2007	266.1	-14.44%	
2008	266.4	0.11%	6.06%
2009	376.7	41.40%	6.60%
2010	401.7	6.64%	14.71%
2011	412.5	2.69%	15.69%
2012	580.8	40.80%	15.53%
2013	774.4	33.33%	24.46%
2014	879.7	13.60%	28.72%
2015	994.8	13.08%	19.65%

Year	Books & Chapter Units	Annual Growth	3Yr CAGR
2016	2275.6	128.75%	43.23%
2017	2207.9	-2.98%	35.90%
2018	2076.4	-5.96%	27.80%
2019	2554.7	23.04%	3.93%
2020	2626.4	2.81%	5.96%
2021	2896.9	10.30%	11.74%
2022	3319.6	14.59%	9.12%

CAGR (2005-2022) 17.21%

In 2022 book publications constituted 13.6% of overall publication units, compared with journal articles which accounted for 82% of all outputs. Conference proceedings (4.4%) constituted the remainder.

4.2. Book and book chapter outputs by university

The distribution of book publications units by university for the past two years is presented in **Table 6**. The results are organized in descending order by the relative share of each university of the 2022 book publications output units.

Table 6: Percentage of book publications output units by university, 2020 and 2022

Institution	2021		2022		Difference (year to year)	% Growth
	No. of Units	% of Total	No. of Units	% of Total		
CPUT	28.078	0.97%	28.243	0.85	0.165	0.59%
CUT	1.593	0.05%	4.979	0.15	3.386	212.63%
DUT	43.783	1.51%	76.189	2.3	32.406	74.01%
MUT	12.277	0.42%	1.004	0.03	-11.273	-91.82%
NMU	55.748	1.92%	48.977	1.48	-6.771	-12.15%
NWU	222.899	7.69%	272.618	8.21	49.719	22.31%
RU	105.820	3.65%	77.241	2.33	-28.579	-27.01%
SMU	0.000	0	0.659	0.02	0.659	0.00%
SPU	12.384	0.43%	7.712	0.23	-4.672	-37.73%
SU	304.643	10.51%	397.538	11.98	92.895	30.49%
TUT	6.732	0.23%	28.061	0.85	21.329	316.85%
UCT	212.179	7.32%	208.130	6.27	-4.049	-1.91%
UFH	39.997	1.38%	25.039	0.75	-14.959	-37.40%
UFS	211.125	7.29%	333.617	10.05	122.492	58.02%
UJ	510.504	17.62%	507.017	15.27	-3.487	-0.68%
UKZN	200.964	6.93%	205.400	6.19	4.436	2.21%
UL	44.229	1.53%	25.264	0.76	-18.965	-42.88%
UMP	3.537	0.12%	31.422	0.95	27.885	788.41%
UNISA	141.499	4.88%	172.164	5.19	30.665	21.67%

Institution	2021		2022		Difference (year to year)	% Growth
	No. of Units	% of Total	No. of Units	% of Total		
UNIVEN	5.906	0.20%	28.466	0.86	22.560	381.96%
UNIZULU	36.373	1.26%	10.396	0.31	-25.977	-71.42%
UP	244.735	8.45%	346.313	10.43	101.578	41.51%
UWC	90.084	3.11%	128.596	3.87	38.512	42.75%
VUT	18.443	0.64%	1.835	0.06	-16.608	-90.05%
WITS	338.542	11.68%	323.581	9.75	-14.961	-4.42%
WSU	5.829	0.20%	29.091	0.88	23.262	399.11%
TOTAL	2897.900	100.00%	3319.551	100.00%	421.650	14.55%

The longer-term trend in the production of books and book chapters by university is presented in **Table 7**. The table is organized in descending order of the CAGR percentages. Institutions moving from a relatively low base and experiencing significant growth have higher percentages of CAGR. However, there are also institutions with a significantly higher book publication output levels with significantly higher growth rates. It will also be noted that the new universities do not have a long enough span that cover the period presented in the table.

Table 7: CAGR of book publications units by university, 2015 - 2022

Institution	2015	2016	2017	2018	2019	2020	2021	2022	CAGR
UJ	92.37	228.20	326.54	220.42	359.00	344.64	510.50	507.02	27.54%
SU	78.00	284.93	266.02	280.51	327.70	444.45	304.64	397.54	26.19%
UP	101.10	195.24	237.67	266.81	296.00	301.06	244.74	346.31	19.23%
UFS	79.08	178.22	239.20	182.55	305.90	320.68	211.13	333.62	22.83%
WITS	159.40	241.68	286.36	196.46	272.40	235.21	338.54	323.58	10.64%
NWU	48.84	118.99	110.03	131.85	189.20	233.43	222.90	272.62	27.84%
UCT	161.47	223.56	185.98	169.63	220.00	165.61	212.18	208.13	3.69%
UKZN	66.47	275.47	128.09	176.05	156.80	131.22	200.96	205.40	17.49%
UNISA	71.79	238.71	117.61	146.56	125.60	149.92	141.50	172.16	13.31%
UWC	29.34	94.33	53.18	45.43	68.00	32.24	90.08	128.60	23.50%
RU	48.10	47.22	99.22	94.87	65.80	54.53	105.82	77.24	7.00%
DUT	16.59	23.77	28.58	49.66	33.70	48.40	43.78	76.19	24.33%
NMU	10.05	30.84	22.52	35.48	21.00	67.06	55.75	48.98	25.39%
UMP	0.00	0.00	0.00	3.33	1.70	2.95	3.54	31.42	
WSU	0.08	1.00	1.14	0.73	4.50	12.78	5.83	29.09	132.17%
UNIVEN	10.80	23.29	8.38	10.76	6.70	12.63	5.91	28.47	14.85%
CPUT	5.99	11.87	25.84	13.90	32.00	12.30	28.08	28.24	24.80%
TUT	3.02	10.52	6.47	3.86	8.20	0.39	6.73	28.06	37.50%
UL	3.66	1.59	21.41	2.71	13.10	13.22	44.23	25.26	31.78%
UFH	2.99	18.60	13.81	12.05	7.60	11.00	40.00	25.04	35.47%
UNIZULU	4.52	5.17	24.90	17.38	19.10	16.18	36.37	10.40	12.64%
SPU	0.00	0.00	0.00	0.00	4.60	2.29	12.38	7.71	

Institution	2015	2016	2017	2018	2019	2020	2021	2022	CAGR
CUT	1.11	9.89	3.21	6.19	9.50	4.64	1.59	4.98	23.91%
VUT	0.00	4.00		2.74	4.70	8.15	18.44	1.83	
MUT	0.00	1.33	0.78	0.00	0.50	0.42	12.28	1.00	
SMU	0.00	0.65	1.00	0.00	1.20	1.00	0.00	0.66	
TOTAL	994.77	2269.07	2207.94	2069.93	2554.50	2626.40	2897.90	3319.55	18.79%

In Figure 9 below we compare the changes in units awarded to universities within the two most recent years. The most salient results are the substantial increases of 101.57 and 122.49 units recorded for UP and UFS respectively.

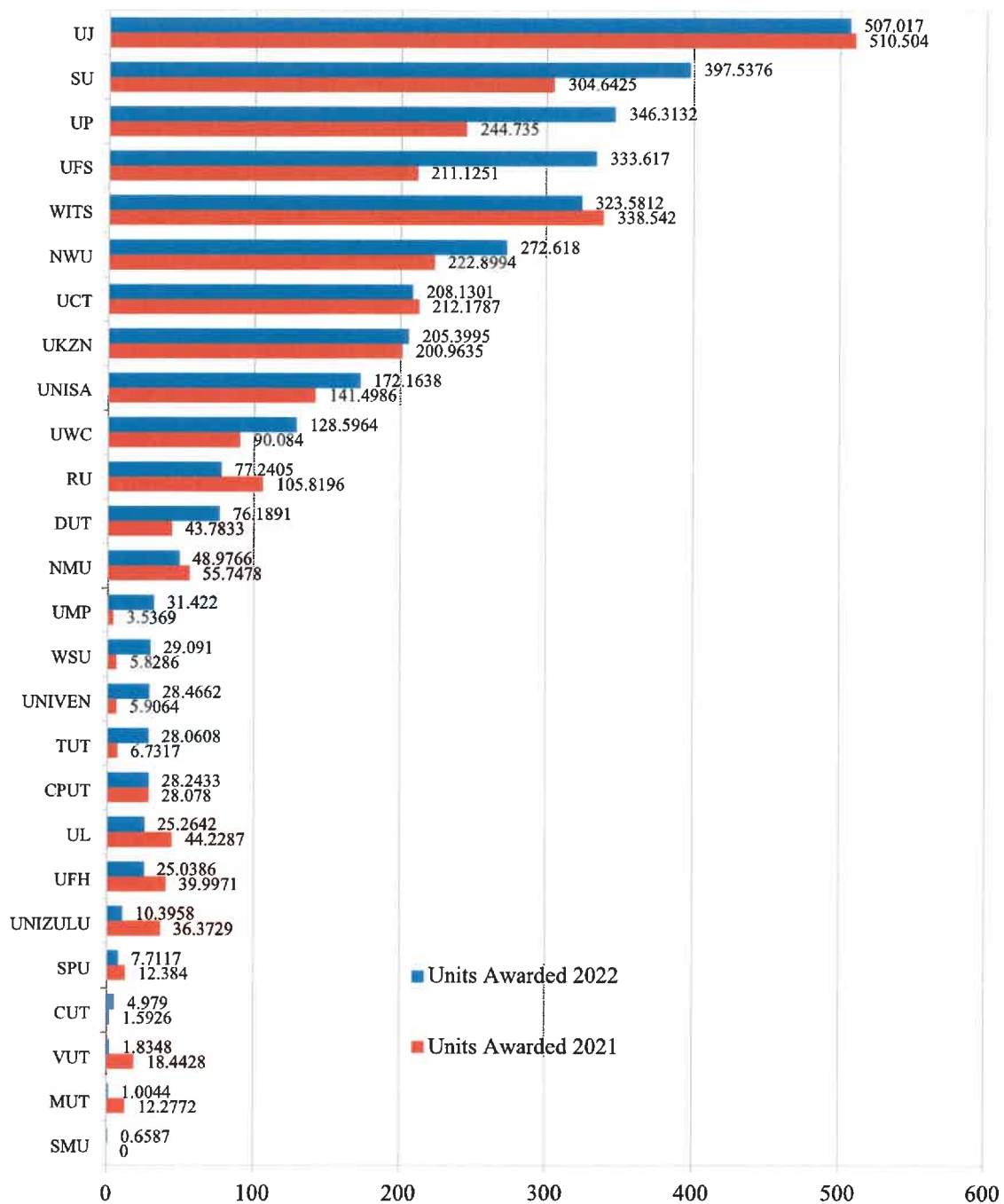


Figure 9: Comparing book and book chapter units awarded for 2022 and 2021 by university

5. PUBLISHED CONFERENCE PROCEEDINGS

5.1. Overview and trends

The trend line of published conference proceedings (Figure 10) shows that after the steep decline in units to 747.0 in 2020 a recovery followed, rising to 1066.04 units in 2022. A few submissions for conference proceedings have been declined and some were not approved by the sub-panels of experts.

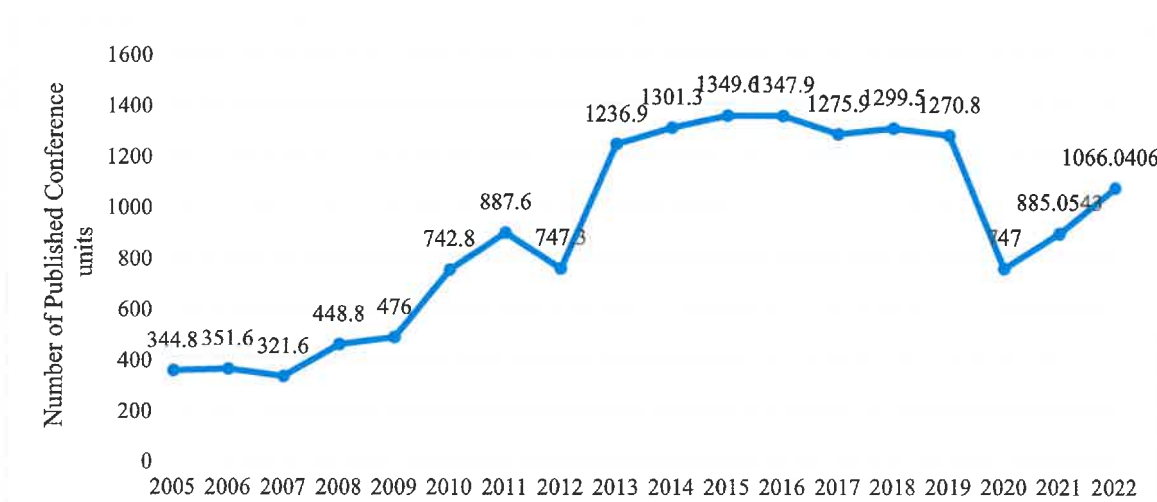


Figure 10 : Trends in the production of published conference proceedings between 2005 and 2022

Table 8: CAGR values for growth rates in annual published conference proceedings (2007 to 2022)

Year	Conference Proceedings Units Awarded	Annual Rate of Growth	3Yr CAGR
2005	344.8		
2006	351.6	1.97%	
2007	321.6	-8.53%	
2008	448.8	39.55%	9.18%
2009	476	6.06%	10.62%
2010	742.8	56.05%	32.19%
2011	887.6	19.49%	25.52%
2012	747.3	-15.81%	16.22%
2013	1236.9	65.52%	18.53%
2014	1301.3	5.21%	13.60%
2015	1349.6	3.71%	21.78%
2016	1347.9	-0.13%	2.91%
2017	1275.9	-5.34%	-0.65%
2018	1299.5	1.85%	-1.25%
2019	1270.8	-2.21%	-1.94%
2020	747	-41.22%	-16.34%
2021	885.0543	18.48%	-12.02%
2022	1066.0406	20.45%	-5.69%
CAGR	6.87%		

The compound growth rate of published and approved conference proceedings units per institution – for the past 8 years - is summarized in **Table 9**. The table shows that the absolute number of proceedings produced declined over this period. This trend has resulted in an overall negative rate for conference proceedings for the sector. Moreover, conference publications have consistently constituted the smallest percentage of publications outputs, which was 4.37% in 2022.

Table 9: Published Conference Proceedings Units per university, 2015 – 2022

Institution	Units per year								CAGR
	2015	2016	2017	2018	2019	2020	2021	2022	
UJ	288.4	301.7	303.7	301.1	294.8	173.7	236.4532	277.0552	-0.57%
SU	82.6	115.2	105.2	97.6	110.2	74.6	78.6754	107.0667	3.78%
NWU	126.8	89.1	82.4	133.4	118.8	38.8	66.8823	91.5034	-4.55%
UP	151	138.6	111.9	85.2	82.2	49.1	72.3772	74.0269	-9.68%
WITS	86.4	79	102.9	83.4	68.5	50.8	58.7249	60.4636	-4.97%
UNISA	87.7	84.7	57.9	75.1	73.1	37.7	46.0001	59.3532	-5.42%
UCT	102.6	103.9	104.5	101.2	79.9	63	54.467	54.8879	-8.55%
UFS	46.3	27.3	39.7	27	52.3	31.3	44.0999	52.3759	1.78%
TUT	44.4	47.9	49.5	41.3	58.4	22.1	20.4702	35.3147	-3.22%
NMU	63.6	83.1	54.2	41.9	49.6	24.9	38.9583	32.7637	-9.04%
CUT	30.9	40.4	44.2	58.9	49.1	38.8	27.2082	28.6853	-1.06%
WSU	2.5	2.3	4	3.9	4	9.5	12.75	28.6096	41.65%
DUT	31.8	8.5	21.3	18.5	19.5	30.1	21.775	27.0345	-2.29%
CPUT	33.4	32.6	23.4	41.9	32.6	18.3	15.4583	25.7509	-3.65%
UL	33	15.4	16	31.4	25.9	7.4	10.9667	19.7844	-7.05%
RU	34.6	29	23.8	12.8	21.7	6.1	17.0834	17.8339	-9.03%
VUT	13.3	18.2	22.9	40.6	29.9	14.7	13.7083	17.7505	4.21%
UWC	6.8	10.4	7.3	11.3	12.3	10.9	7.5167	15.3228	12.31%
UKZN	51.2	61	67.1	46.6	61.9	29.2	20.5415	14.2096	-16.73%
UFH	8.9	16	17.9	2.8	1.5	2	11	11.7088	4.00%
UNIZULU	11.3	6.3	5.6	8.2	17.2	6.9	3.0625	6.979	-6.65%
MUT	1.3	2.9	0.3	1.9	0.4	1.3	1.4168	3.3336	14.40%
SPU					2.4	3	1.8334	1.8752	
UNIVEN	9.1	12.9	8.9	5.4	1.4	1.2	1.1667	0.9763	-27.30%
SMU	1.5	0	0	0.6	0	1.2	1.0833	0.875	-7.41%
UMP	0	0	1.5	0.8	3.1	0.4	1.375	0.5	
TOTAL	1349.6	1326.2	1275.9	1272.8	1270.7	747	885.0543	1066.0406	-3.31%

The percentage share of total conference publications for 2022 for the sector is presented in **Figure 11**. The profile of the graph has remained similar to that of the previous year however, the order of institutions has changed, apart from UJ which increased its sector share to 26% in 2022.

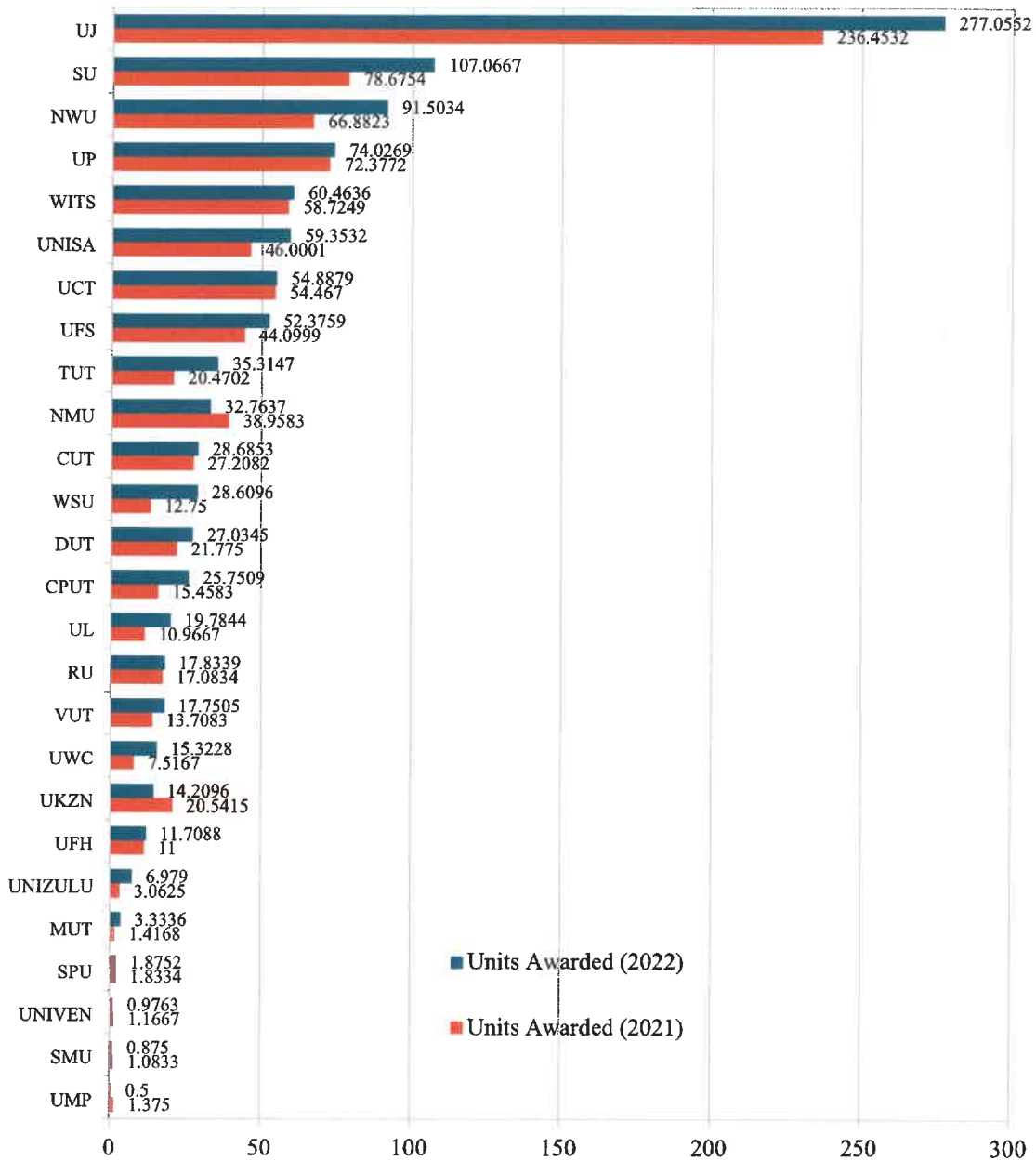


Figure 11: Comparison of conference proceeding units awarded for 2022 and 2021 by university

6. NORMALIZED RESEARCH OUTPUT INDICATORS

The results presented in this report thus far represented absolute numbers of subsidy-units awarded irrespective of the size of the respective universities. In this section, we report on four indicators where the data is normalized to enable a fairer comparison of the ‘research performance’ of South African universities.

- *Per capita research publication output* - the total number of publications (all document types) by a university is divided by the headcount of the permanently employed instructional and research staff.
- *Weighted per capita research output* - the sum of the total number of publications (all document types) together with the number of research masters graduates and doctoral graduates (weighted by a factor of 3) produced divided by the headcount of the permanently employed instructional and research staff.

The first two indicators can be interpreted as proxy indicators of the research publication intensity and research intensity of SA universities respectively¹.

The third indicator – the percentage of academic staff with doctoral degrees – can be interpreted as a proxy for doctoral quality at a university. The fourth indicator included here is defined as ‘the ratio of doctoral graduates to doctorate academic staff’ which can be interpreted as a research productivity measure.

6.1. *Per capita* research publication output

The average per capita research publication output for all universities in 2022 was 1.19 units which constitutes a small increase from the previous year of 1.15 publication units per staff member (**Table 10**). This means that the average permanently employed academic in the sector produced one research publication unit in 2022, or an equivalent of a peer-reviewed article in a journal or a research masters graduate. Academics at eight universities (UKZN, SU, UJ, UP, UCT, WITS, RU and UFS) on average produced research publications higher than the sector average.

¹ It is important to note that the first indicator is referred to as the per capita **publication** output and the second as the weighted pe capita **research** output, as the latter combines publications with the production of post-graduate students as forms of research output.

Table 10: Per capita research publications outputs, 2022

Institution	Headcount of permanently employed academics (A)	Research Publications Units (B)	Per Capita Research Publication Output (B/A)
UJ	1328.00	3143.718	2.37
UKZN	1176.00	2562.651	2.18
WITS	1178.00	2206.4004	1.87
UP	1269.00	2305.24	1.82
SU	1295.00	2255.1224	1.74
UFS	862.00	1406.3702	1.63
RU	368.00	549.5689	1.49
UCT	1192.00	1777.2564	1.49
Sector Average		1.19	
UWC	607.00	696.6456	1.15
NWU	1678.00	1706.2164	1.02
UFH	337.00	291.894	0.87
UNISA	1822.00	1521.5481	0.84
DUT	676.00	564.2178	0.83
NMU	719.00	550.0473	0.77
UNIVEN	469.00	337.7662	0.72
UL	664.00	461.5915	0.70
UNIZULU	334.00	205.2966	0.61
CUT	321.00	181.8747	0.57
TUT	875.00	453.4084	0.52
UMP	179.00	82.0339	0.46
CPUT	820.00	329.2048	0.40
MUT	229.00	331.7549	0.39
WSU	906.00	82.4217	0.37
SPU	141.00	49.5352	0.35
VUT	345.00	120.8512	0.35
SMU	705.00	230.2037	0.33

6.2. Weighted per capita research output

The weighted per capita research output indicator sums the publications in all categories (journal articles, books, book chapters and published conference proceedings) and divides the total research publication output units by the headcount of permanently employed academic (instructional and research) staff at a university. The results as presented in Table 11 shows that the average weighted per capita research output value across all universities in 2022 was 2.16 units. This constitutes a slight

improvement from the previous year (average of 2.10 units). However, despite this improvement of the average score, the results re-affirm an uneven performance across the sector with only nine universities (UKZN, UP, WITS, UJ, SU, RU, UCT, UWC and UFS) recording a score above the sector average, and signifying that universities are not collaborating sufficiently.

Table 11: Weighted per capita research output (2022)

Institution	Headcount of permanently employed academics	Research Publications Units	Research Masters Graduates Units	Doctoral Graduates Units	Total Weighted research Output Units (1+2+3)	Weighted per capita research output (1+2+3)/A
	(A)	-1	-2	-3		
UKZN	1176	2562.651	713.853	1440	4716.5	4.01
UJ	1328	3143.718	842.95	834	4820.7	3.63
WITS	1178	2206.4004	972.735	957	4136.1	3.51
UP	1269	2305.24	1010.19	996	4311.4	3.40
SU	1295	2255.1224	918.569	834	4007.7	3.09
UCT	1192	1777.2564	726.916	840	3344.2	2.81
RU	368	549.5689	168.5	240	958.1	2.60
UFS	862	1406.3702	332.405	489	2227.8	2.58
UWC	607	696.6456	312	498	1506.6	2.48
Sector Average						2.16
UNISA	1822	1521.5481	733.177	1575	3829.7	2.10
NWU	1678	1706.2164	519.076	639	2864.3	1.71
UFH	337	291.894	88.05	171	550.9	1.64
DUT	676	564.2178	203.5	294	1061.7	1.57
NMU	719	550.0473	218.554	249	1017.6	1.42
UNIZULU	334	205.2966	72.528	150	427.8	1.28
UL	664	461.5915	245.13	91.5	798.2	1.20
TUT	875	453.4084	293.333	261	1007.7	1.15
UNIVEN	469	337.7662	64	94.5	496.3	1.06
CUT	321	181.8747	64	51	296.9	0.92
CPUT	820	329.2048	201.168	147	677.4	0.83
VUT	345	120.8512	80	45	245.9	0.71
UMP	179	82.0339	29	0	111.0	0.62
SMU	705	230.2037	50.275	18	298.5	0.42
WSU	906	331.7549	19.465	24	375.2	0.41
MUT	229	49.5352	0	0	51.5	0.39

SPU	141	82.4217	2	0	82.4	0.37
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Figure 12 presents the trend in the values of the two normalized indicators (**per capita research publication output** and the **weighted per capita research output** of the past 18 years. The results clearly show that the higher education sector has continued to improve its research performance consistently over this period. SA universities have more than doubled both their average publication and research output from 2005 to 2022.

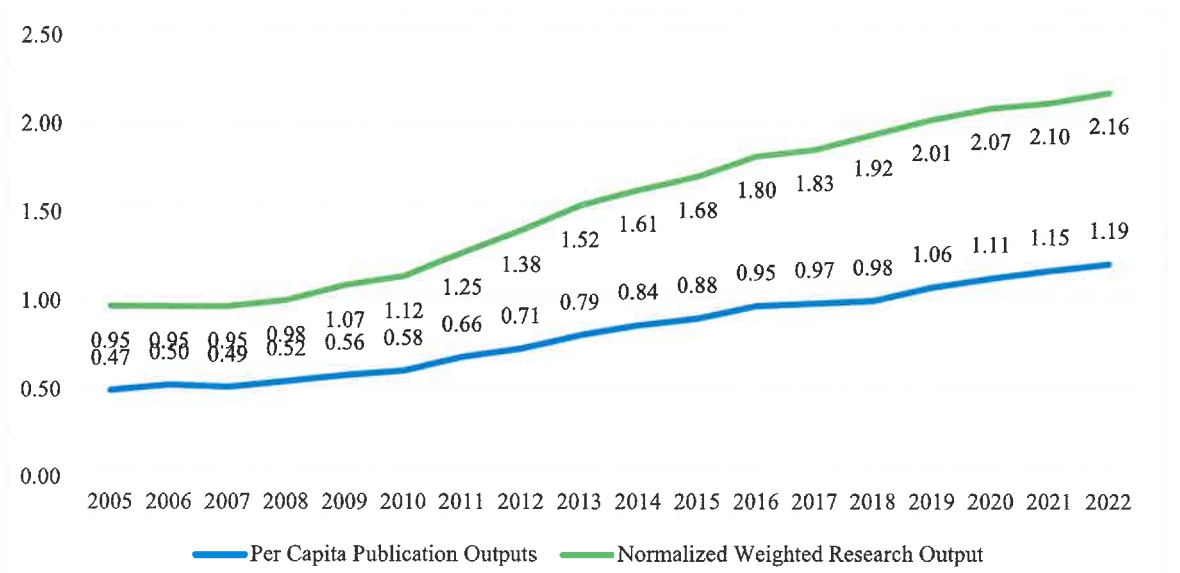


Figure 6: Trend in Per Capita Publications Output and Weighted Research and Normalized Weighted Research Output 2005 – 2022

6.3. Proportion of academic staff with doctorates

The proportion of academic staff with doctorates is generally used as a proxy for the ‘quality’ of academic staff. It is also an indicator which correlates strongly with the research publication output of a university. Over the years it has been shown that universities with a higher proportion of academics with doctoral degrees are typically more research-active than other institutions with a smaller percentage of doctorate staff.

Table 12 presents the data of permanently employed academics by their highest qualifications in the reporting year of 2022 (The percentage of staff with a doctorate as the highest qualification per university is arranged in descending order from highest to lowest). The average number of academics with a doctorate as the highest qualification in the sector in 2022 was 52.4%, a significant increase from 47.7% in 2021.

Table 12: Number of permanently employed academics by highest qualification, 2022

Institution	Total Instructional/ Research Staff	Academics with Doctorate as Highest Qualifications		Weighted Research Output Units
		Headcount	% of Institutional Total Academics	
UP	1269	913	71.95%	4311.43
UWC	607	421	69.36%	1506.65
WITS	1178	800	67.91%	4136.14
SU	1295	856	66.10%	4007.69
SPU	141	88	62.41%	51.54
RU	368	227	61.68%	958.07
UCT	1192	733	61.49%	3344.17
UKZN	1176	717	60.97%	4716.50
UFS	862	506	58.70%	2227.78
UNISA	1822	1058	58.07%	3829.73
UJ	1328	758	57.08%	4820.67
NWU	1678	932	55.54%	2864.29
UMP	179	94	52.51%	111.03
Sector Average			52.37%	
UNIZULU	334	168	50.30%	427.82
UFH	337	153	45.40%	550.94
NMU	719	326	45.34%	1017.60
UNIVEN	469	205	43.71%	496.27
CUT	321	133	41.43%	296.87
TUT	875	328	37.49%	1007.74
UL	664	248	37.35%	798.22
DUT	676	239	35.36%	1061.72
CPUT	820	278	33.90%	677.37
WSU	906	245	27.04%	375.22
MUT	229	57	24.89%	82.42
SMU	705	173	24.54%	298.48
VUT	345	78	22.61%	245.85
Total or Average	20495	10734	52.37%	44222.21

As shown in **Table 12**, thirteen universities (UP, UWC, WITS, SU, SPU, RU, UCT, UKZN, UFS, UNISA, UJ, NWU and UMP) recorded an above-sector average number of academics with a doctorate as the highest qualification.

Figure 13 presents the time series data of academics with a doctorate as the highest qualification in the sector for the period 2005 to 2022. The overall trend between 2005 and 2018 has been a consistent,

linear increase in the percentage of staff with doctoral degrees. However, over the past four years, it seems as if the sector is stagnating on this indicator with no clear increase in the percentages of doctorate staff. This should be a cause of some concern as well as motivation to expand support to South African academics through, for example, programmes such as the University Capacity Development Programme.

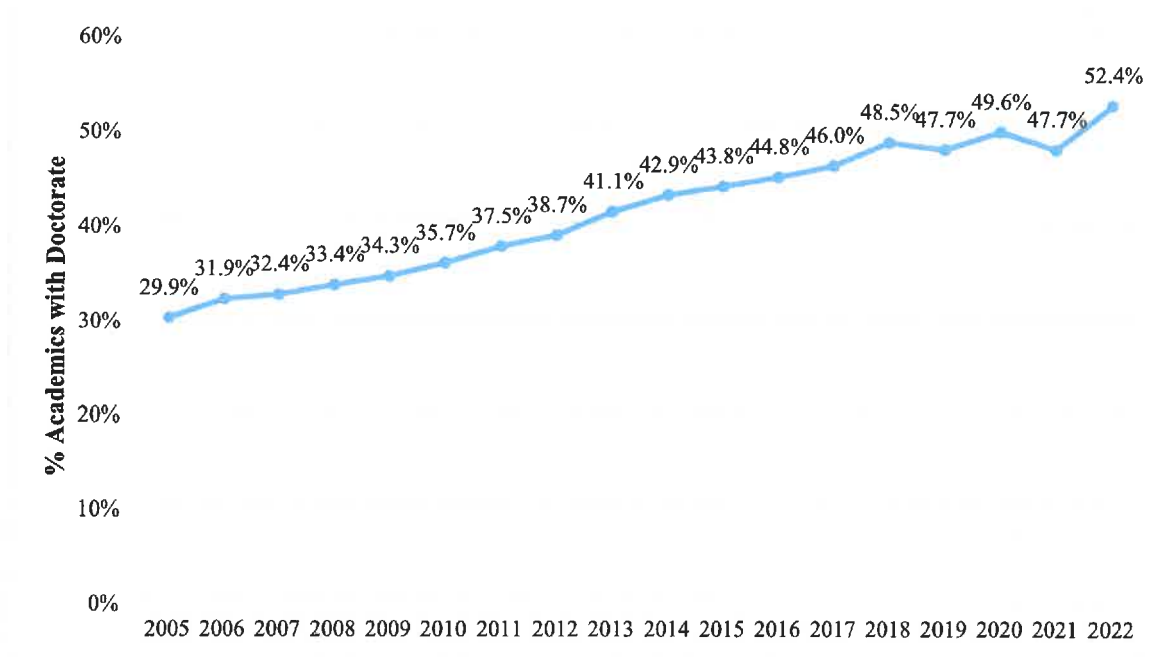


Figure 13: Trend in percentage of staff with doctorate degrees from 2005 to 2022.

6.4. Ratio of doctoral graduates to academics with a doctorate

The final indicator we report on is an indicator of research productivity and specifically the production of highly-skilled and doctoral graduates. The ratio of doctoral graduates to academics with a doctoral degree as the highest qualification is calculated as the number of registered doctoral candidates to academics with a doctoral degree as the highest qualification at a university. **Table 13** shows that the sector average of academics with doctorate and doctoral candidates in 2022 was 0.34.

Table 13 presents an analysis of the ratio of doctoral graduates per permanent doctorated academic by university. Eight universities recorded values above the national average.

Table 13: Ratio of doctoral graduates to doctorate staff member by university (2022)

Institution	Number of academics with Doctorate	Number of Doctoral graduates	Ratio
UKZN	717	480	0.67
UNISA	1058	525	0.50
DUT	239	98	0.41
WITS	800	319	0.40
UWC	421	166	0.39
UCT	733	280	0.38
UFH	153	57	0.37
UJ	758	278	0.37
UP	913	332	0.36
RU	227	80	0.35
Sector Average			0.34
SU	856	278	0.32
UFS	506	163	0.32
UNIZULU	168	50	0.30
TUT	328	87	0.27
NMU	326	83	0.25
NWU	932	213	0.23
VUT	78	15	0.19
CPUT	278	49	0.18
UNIVEN	205	31.5	0.15
CUT	133	17	0.13
UL	248	30.5	0.12
SMU	173	6	0.03
WSU	245	8	0.03
MUT	57	0	0.00
SPU	88	0	0.00
UMP	94	0	0.00

The ratio of doctoral graduates to academics with doctorates as the highest qualification can be used as a proxy for 'supervisory carrying load'. The ratio refers to the number of doctoral candidates per supervisor per academic year. However, the ratio used above does not provide an accurate overview of the **supervisory carrying load** as it excludes research masters graduates. The simple ratio as applied above only factors headcount graduates and not the units. The use of units is likely to be more accurate, particularly in the case of doctoral graduates which are weighed by a factor of 3, which is based on the assumption that the supervision of doctoral candidates utilises relatively more resources. Therefore, a relatively accurate formula would include research masters and make use of units rather than the actual

number of graduates (which does not distinguish between masters and doctoral graduates). Table 14 combines all the above elements and presents the supervisory carrying capacity per institution in 2022.

Table 14 shows that 61% of academics with a doctorate at UKZN in 2021 had an average supervisory load of three doctoral students per supervisor. The disparity, however, can be seen when comparing institutions with relatively higher percentages of academics with a doctorate (UP, WITS and SU) with relatively lower supervisory carrying capacity of 2.2, 2.4 and 2.1 respectively. Thus a more thorough analysis is required to understand the developing trends in this regard.

Table 14: Supervisory load per doctorate academic staff by university (2022)

Institution	Research Graduates Output Units			Academics with Doctorate as Highest Qualifications		Supervisory Carrying Load = Ratio (C/D)
	Masters units (A)	Weighted Doctoral units (B)	Total M+D units (C)	Headcount (D)	% of Institutional Total Academics	
UKZN	713.853	1440.00	2153.85	717	61.0%	3.00
WITS	972.735	957.00	1929.74	800	67.9%	2.41
UJ	842.95	834.00	1676.95	758	57.1%	2.21
UP	1010.19	996.00	2006.19	913	71.9%	2.20
UNISA	733.177	1575.00	2308.18	1058	58.1%	2.18
UCT	726.916	840.00	1566.92	733	61.5%	2.14
DUT	203.5	294.00	497.50	239	35.4%	2.08
SU	918.569	834.00	1752.57	856	66.1%	2.05
UWC	312	498.00	810.00	421	69.4%	1.92
Sector Average						1.86
RU	168.5	240.00	408.50	227	61.7%	1.80
UFH	88.05	171.00	259.05	153	45.4%	1.69
TUT	293.333	261.00	554.33	328	37.5%	1.69
UFS	332.405	489.00	821.41	506	58.7%	1.62
VUT	80	45.00	125.00	78	22.6%	1.60
NMU	218.554	249.00	467.55	326	45.3%	1.43
UL	245.13	91.50	336.63	248	37.3%	1.36
UNIZULU	72.528	150.00	222.53	168	50.3%	1.32
CPUT	201.168	147.00	348.17	278	33.9%	1.25
NWU	519.076	639.00	1158.08	932	55.5%	1.24
CUT	64	51.00	115.00	133	41.4%	0.86
UNIVEN	64	94.50	158.50	205	43.7%	0.77
SMU	50.275	18.00	68.28	173	24.5%	0.39
UMP	29	0.00	29.00	94	52.5%	0.31

Institution	Research Graduates Output Units			Academics with Doctorate as Highest Qualifications		Supervisory Carrying Load = Ratio (C/D)
	Masters units (A)	Weighted Doctoral units (B)	Total M+D units (C)	Headcount (D)	% of Institutional Total Academics	
WSU	19.465	24.00	43.47	245	27.0%	0.18
SPU	2	0.00	2.00	88	62.4%	0.02
MUT	0	0.00	0.00	57	24.9%	0.00
Total	8881.37	10938.00	19819.37	10677.00	52.4%	1.86

7. DEMOGRAPHIC TRENDS

7.1. Publication outputs by gender of author

The Department gathers demographic information of all authors to monitor the national trends in the interest of the transformation of higher education in South Africa. Such information is required to assist the Department as well as the individual universities to introspect, review and improve their profile.

There has been a relative improvement in the quality and reliability of the data since the Department started gathering biographical data about six years ago.

Figure 14 (below) presents the trend by gender in the contribution to the overall publication outputs of the sector since 2005. The figure shows that the contribution of women grew to about 45% in 2022. As had been noted before, the growth of publications published by women must be read against the background that there have been more female enrolments in the sector for the past two decades.

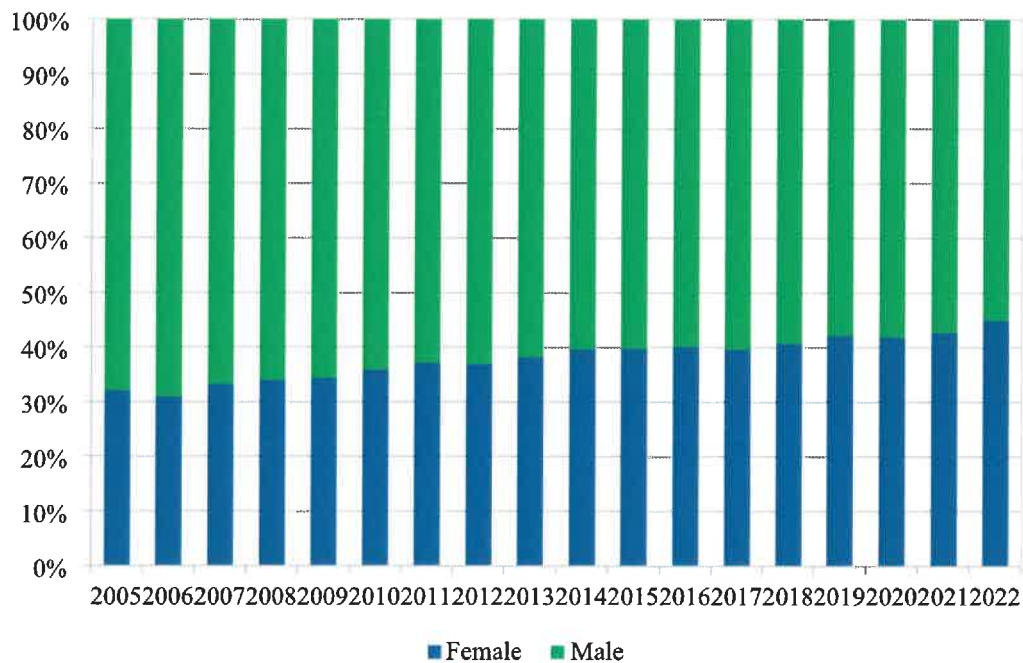


Figure 14: Gender of authors of journal articles: 2005 - 2022

7.2. Publication outputs by country of birth of the author

The focus of this demographic indicator is on establishing trends in the contributions of South African academics (SA, naturalised citizens and permanent residents) in comparison to the contribution of non-South Africans employed at SA universities. The trend exhibited in **Figure 15** overleaf shows a decreasing contribution by SA nationals to overall sector output, from 87% in 2005 to 63% in 2022.

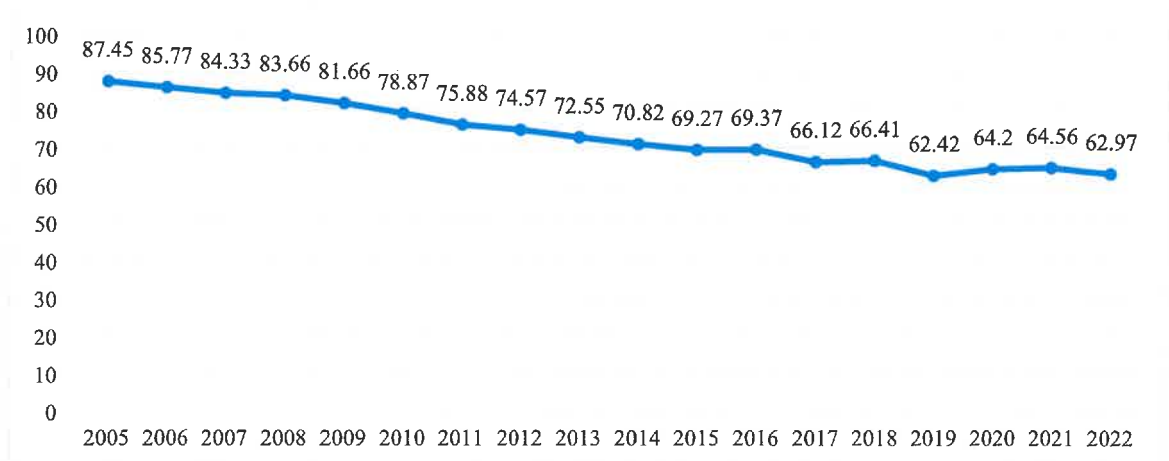


Figure 15: Percentage of authorships produced by South African nationals: 2005 to 2022

7.3. Publication outputs by race of author

Another key variable that is included in the analysis is the ‘race’ of the contributing authors and is confined to South African citizens or permanent residents. According to the Statistics Act of 1996, only SA citizens are classified by population group or race and into four categories: Black African, Coloured, Indian/Asian and White (and reaffirmed by the Employment Equity Act of 1998). The classification by race for purposes of measuring transformation does not apply to non-South African nationals.

Figure 16 presents a trend in the relative contribution by each of the ‘race groups’ to overall publication output between 2005 and 2022. The trend shows the gradual increase of the publication contribution by Black (African, Coloured and Indian/Asian) academics to the sector’s knowledge production. The contribution by black academics surpassed 50% of the overall contributions for the first time in 2022, having grown from about 15% in 2005 to 51.9% in 2022.

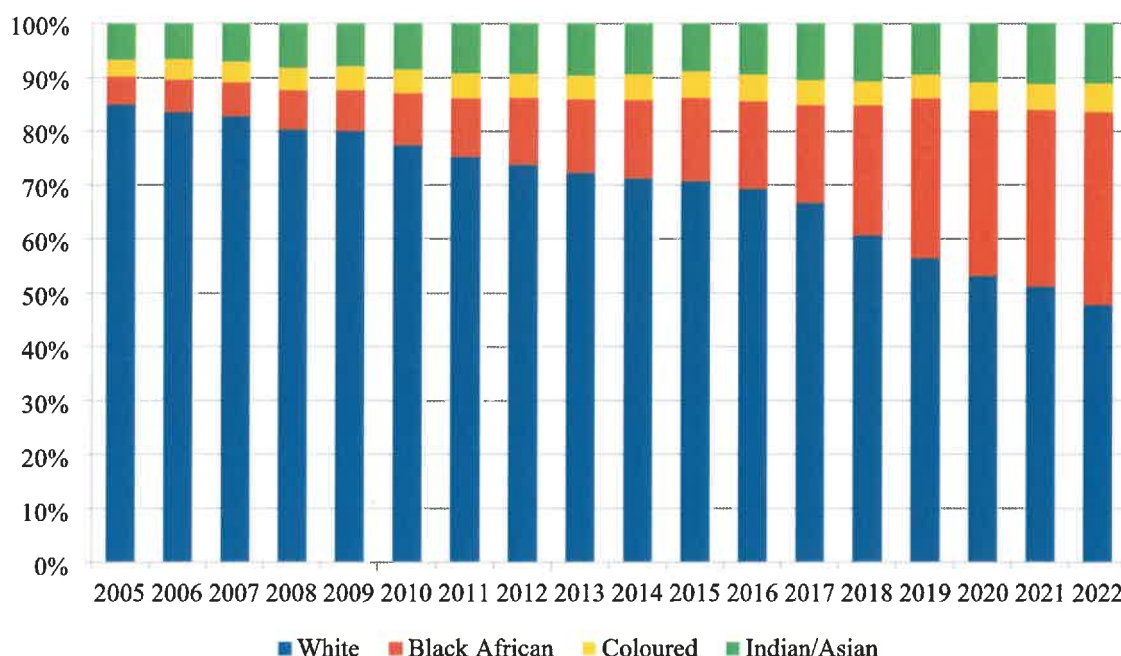


Figure 16: Percentage of authors by race (SA nationals only) between 2005 and 2022

All universities are required to provide data to enable the Department to interpret transformation patterns and trends in knowledge production at universities. The reliability and quality of the data on the demographics of the claiming authors, however, must still be improved.

Table 15: Trend in race of authors 2005 to 2022

Race of author	2005	2010	2015	2020	2022
Black African	5,5%	10,0%	15,0%	25,4%	35.44%
Coloured	2,9%	4,5%	5,6%	5,6%	5.41%
Indian/Asian	7,2%	8,8%	8,8%	11,2%	11.07%
White	84,4%	76,6%	70,6%	57,8%	48.08%

7.4. Publication outputs by age of author

Figure 17 shows the shifts in time of the age of authors (age at date of publication recoded into age intervals) for all the publications from 2005 to 2022. This graph aims to illustrate major shifts in the average ages of actively publishing academics. This information is important when considering the imperative to build the next generation of academics in South Africa. This means that it is important to follow the relative contributions of younger academics over time (under the age of 30 as well as between 30 and 39). At the same time, the contributions made by older generations should not be ignored or discarded. The older generations may be contributing more than this report can measure, especially regarding the mentoring of the younger generations.

The general trend shows an increase over time of younger academics: for under the age of 30, the percentage increased from 5,3% in 2005 to 7,6% in 2020 but decreased to 6.8% in the last two years (2021 – 2022), and for the ages between 30 and 39, the commensurate increase was from 22.2% in 2005 to 27.3%. The relative contribution of academics in the age interval between 40 and 49% recorded a decline from 33,5% in 2005 to 28,5% in 2022. The relative contribution of academics over the age of 60 also increased from 11% in 2005 to 15.2% in 2022.

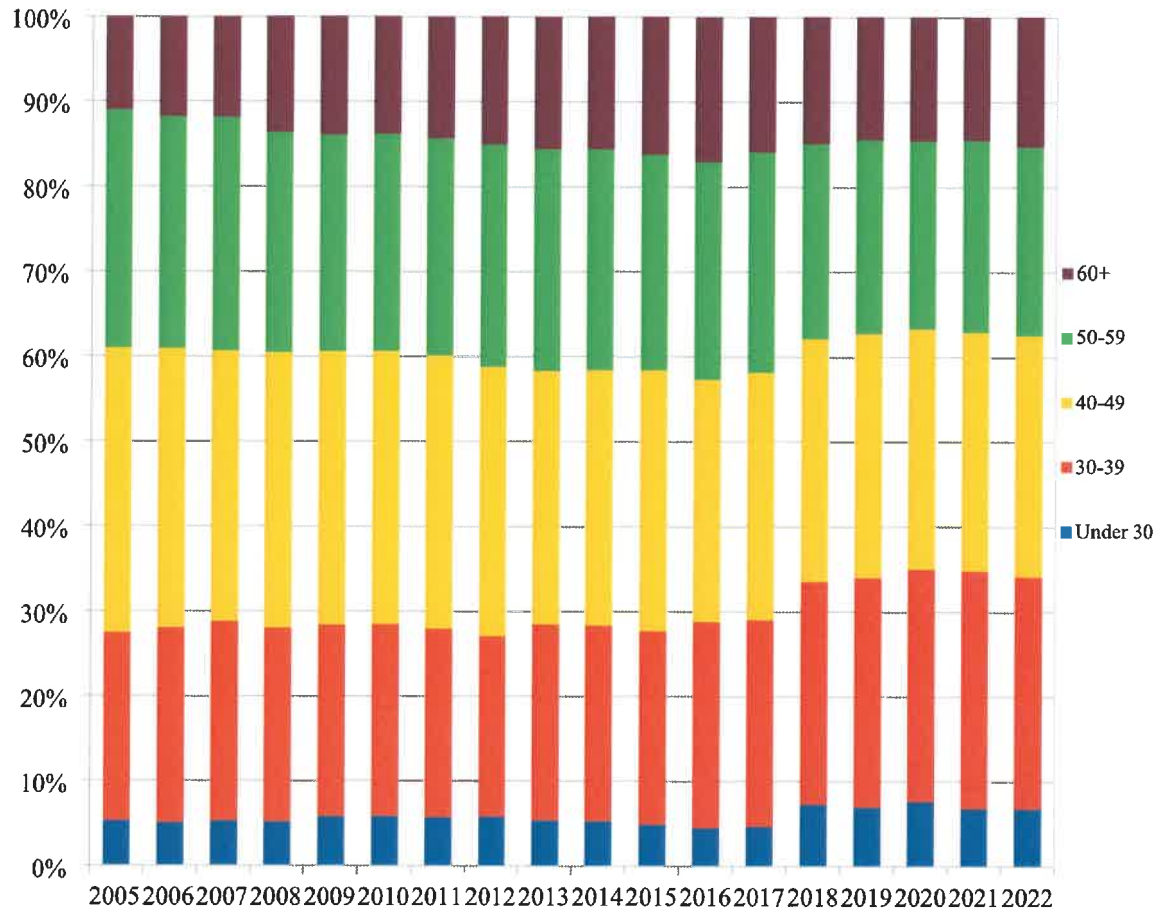


Figure 17: Trend in age of authors 2005 to 2022

Table 16: Trend in age of authors 2005 to 2022

Year	under 30	30 to 39	40 to 49	50 to 59	60+
2005	408	1705	2577	2160	846
2006	459	2089	2991	2492	1071
2007	522	2342	3166	2744	1179
2008	631	2790	3966	3170	1668
2009	776	3033	4332	3425	1874
2010	874	3410	4851	3850	2085
2011	1044	4042	5867	4669	2615
2012	1209	4460	6654	5500	3154
2013	1261	5437	7045	6170	3668
2014	1414	6179	8077	6979	4178
2015	1371	6407	8634	7145	4545
2016	1366	7418	8722	7839	5198
2017	1637	8562	10257	9127	5586
2018	3386	12298	13394	10777	6999
2019	3918	15357	16297	12966	8218
2020	4660	16839	17392	13636	8975
2021	4686	19391	19437	15661	10053
2022	4722	19107	19906	15568	10655

6. GENERAL OBSERVATIONS AND CONCLUSIONS

The Department would like to believe that the sustaining increase of the research publication outputs for the past 18 years is partly a result of the positive impact of the Research Outputs Policy. A correlation between the policy and the performance of the sector has been drawn by some analysts. The Department continues to strive for a better quality and efficient system of processing research publication outputs. The continuous efforts to improve the policy and the processing of the research outputs are meant to facilitate a positive impact on the research productivity of the higher education sector and, most importantly, improve quality in the entire pipeline. Moreover, the Department hopes that its regular improvements to the policy and the system of processing research outputs are replicated at the institutional level so that there is synergy and a common purpose in the higher education sector.

The Department has identified some elements of unethical practices in the publication of research outputs. As recommended in the policy, institutional research integrity committees together with the research offices are urged to put more effort into eliminating unethical practices in research publications and claiming of subsidy. Institutions will be provided with an opportunity to self-correct at the institutional level. The Department has developed a proposal for establishing a framework to improve the quality of research publications which makes allowance for institution-specific initiatives to address unethical practices in research publications.

The claims that were identified to be unethical were identified from the 2022 submissions. Institutional reports provide further detail in this regard. The Department extends an invitation for dialogue with the affected individual institutions. In this regard, it is also worth reminding institutions that the Department reserves the right to withhold payment of research output subsidy in respect of claims that do not meet the criteria as outlined in the research output policy and where the Department has found evidence of unethical conduct relating to the claims.

Research subsidy to the sector is an important component of government funding to the higher education sector. It is upon the sector to guard this resource by whatever means possible and to make sure that it is not open to abuse and unethical practices. The end goal must be that it remains sustainable and provides sustained impetus to research productivity in the higher education sector. By this report, the Department hopes that it provides a complete mirror of research performance by the sector, albeit being reliant on proxies. It is hoped that all our stakeholders will find it useful.
