

The Contribution of the Water Research Fund For Southern Africa (WARFSA) to Knowledge Production and Policy in the SADC Water Sector

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Introduction

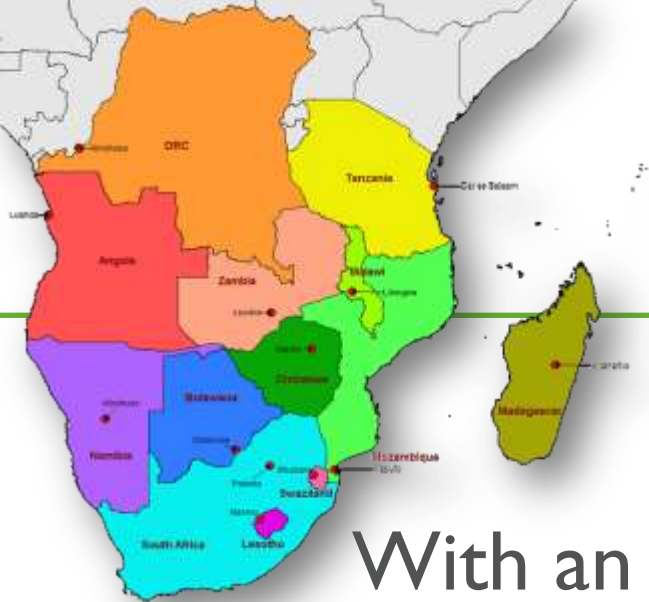
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Introduction

The Water Research Fund for Southern Africa (WARFSA)

- Established as a Southern African Development Community (SADC) in February 1999
- Purpose of building research capacity among regional institutions and individuals, as well as to promote the utilisation of research results to support the practice and understanding of the concept of Integrated Water Resource Management (IWRM) in the sub-region.



Introduction

With an initial implementation of two phases, the WARFSA directly supported 78 water-related research projects between 1999 and 2007.

Problem statement

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Problem statement

- Research projects and programmes are required to place a strong emphasis on presenting evidence of the impacts achieved through the research they undertake (UKCDS, 2013).
- Various conceptual frameworks have been developed on research-use and how research could be used to analyse impact –
- Impact could include scientific-, policy-, economical-, social- and ecological benefits.

Problem statement

- The WARFSA provided an opportunity to analyse the impact such a programme had in the SADC water sector.
- However, the time lag since the WARFSA programme ended in the mid-2000s, do provide opportunities and constraints in analysing the scientific-, policy-, economical-, ecological- and social benefits of the WARFSA programme.

Problem statement

- **Scientific impact:** As a time lag often occur since research outputs are produced and the actual citing of such research occur, the of the WARFA funded research projects could be assessed.
- **Policy aspects:** if a sufficient number of researchers associated with the WARFSA funded research projects could be interviewed.
- However, no mechanism was put in place to attribute and monitor **economical-, ecological- and social benefits**

Aim of the study

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Aim of the study

To assess the output and production of knowledge under the WARFSA programme.

More specifically, the two main objectives

- to assess the scientific (citation) impact of such knowledge produced
- policy uptake and impact thereof.

Thesis outline

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Thesis outline

PART A - Framing the researcher project, literature review and identifying the research methodology.

- Introduction and statement of the problem in **Chapter 1**.
- In **Chapter 2**, the HERG Payback Framework is presented, which provides a conceptual framework for the study.
- **Chapter 3**: literature review of the empirical studies on the contribution of water research in the SADC region
- **Chapter 4**: a review of literature on knowledge for policy
- **Chapter 5**: research methodology of the project, Mixed methods > quantitative and qualitative datasets.

Thesis outline

PART B - Sector analysis of the SADC water sector

- **Chapter 6** overview of the institutional landscape. Local and international institutional overview of the region;
- **Chapter 7** overview bibliometric analysis of water research knowledge production -1980 to 2016, in the context of water research in the African continent and global water research. In addition, the relative effort SADC countries devote to water research, and an analysis of water patents from the region.

Thesis outline

PART B (continue) – Sector analysis of the SADC water sector.

- The **research output** in the SADC region and countries;
 - **Citation analysis** of research papers;
 - The distribution of water research by **journal**; and
 - Who the organisations are providing financial **support** for the research.
-
- **Chapter 8: All SADC countries**
 - **Chapter 9: South Africa**
 - **Chapter 10: SADC countries excluding South Africa:**

Thesis outline

PART C - Knowledge produced and policy- and practitioner aspects of the WARFSA programme as a case study

- **Chapter 11** presenting knowledge produced from the 78 WARFSA-funded research projects
- **Chapter 12** addressing policy-/practitioner aspects as observed from WARFSA-funded research projects.

Theoretical Framework

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Theoretical Framework

- HERG Payback Framework. Health Economics Research Group (HERG) at Brunel University London to evaluate the payback (or impact) of research in the health systems (M. Buxton & Hanney, 1996)
- 2 Elements
 - a set of five research impact categories (or dimensions) to classify the research paybacks
 - a six stage logical model representing the research process (or research story).

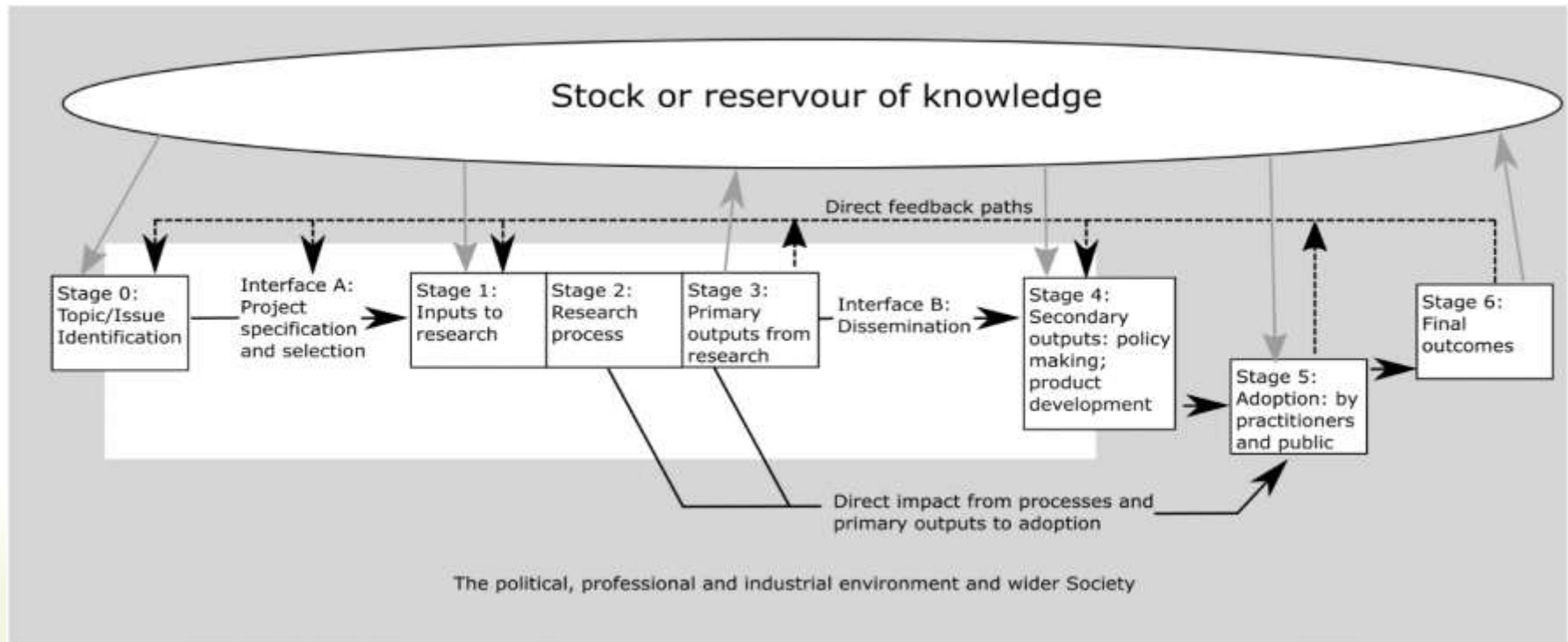
Theoretical Framework

Five research impact categories (or dimensions) to classify the research paybacks

- *Knowledge and innovation products*
- *The benefits to future research and research use*
- *Benefits from informing policy and product development*
- *Health and health sector benefits*
- *Benefits derived within the broader economy*

Theoretical Framework

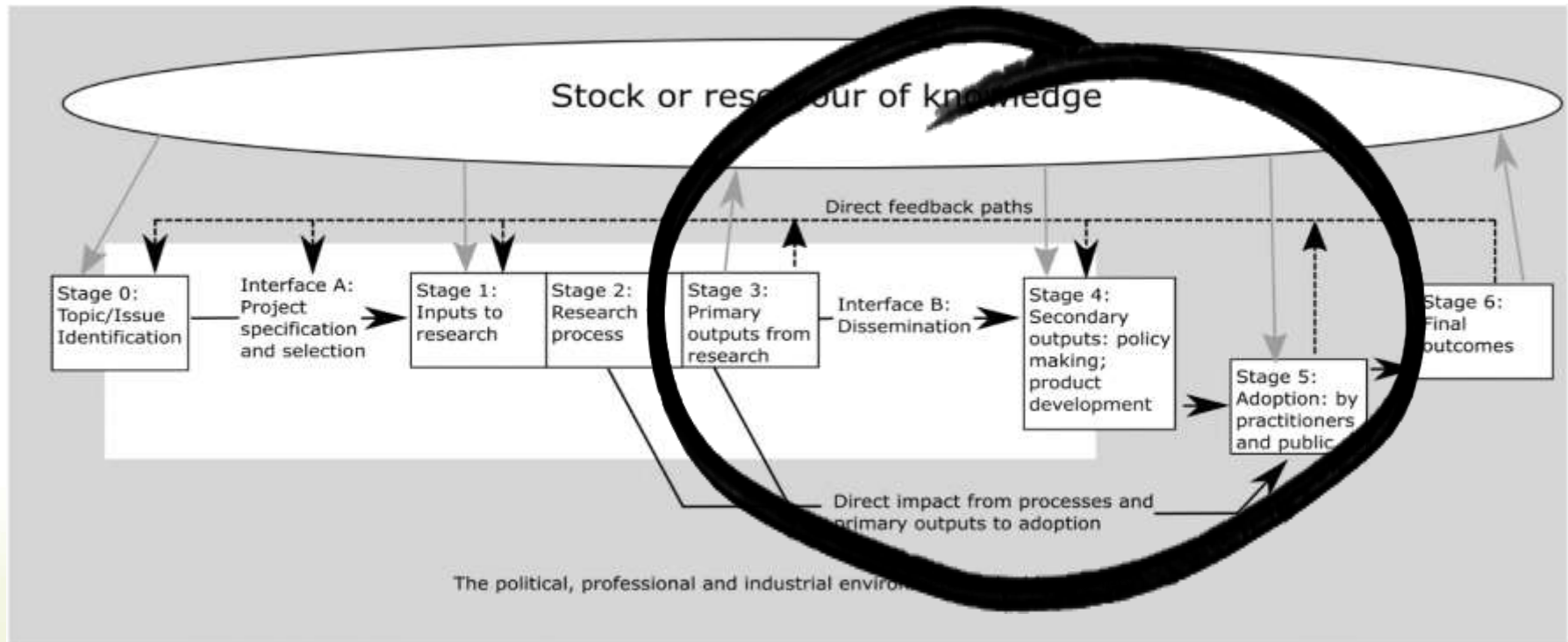
A six stage logical model representing the research process (or research story).



Source: (S. R. Hanney et al., 2004)

Theoretical Framework

The HERG Payback Framework and the research objectives



Source: (S. R. Hanney et al., 2004)

Primary results

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Primary results – Literature review on Knowledge Produced and Citation Impact (Ch.3)

- Various bibliometric studies on South Africa.
 - Pouris (2013; 2015); Jacobs, Pouris, et al., (2014) – Pulse studies of water research in South Africa
 - Siebrits & Winter (2013); Siebrits et al. (2014); R. M. Siebrits et al., (2014). *Water research paradigm shifts in South Africa*,
 - Jacobs, du Plessis, Trollip, & van Vuuren, (2014). *South Africa's 20-year journey in water and sanitation research*
- Only one bibliometric study directly relating to the water sector (van der Zaag, 2007). Qualitative and quantitative contribution of the WaterNet/WARFSA/GWP-SA symposium papers, and also the WaterNet/WARFSA/GWP-SA symposium papers published in five special issues (2002-2006) of the scientific journal, *Physics and Chemistry of the Earth (PCE)*, which is linked to the symposium.
- **Few water research bibliometric studies have been undertaken in the SADC region, with a number of studies mainly focussing on South Africa.**

Primary results – Literature review on Knowledge for Policy (Ch.4)

- Knowledge utilisation has mainly centred around the **instrumental-**, **conceptual-**, and **symbolic-** and **process use** of knowledge.
- Two Communities Theory (Caplan, 1979)
- Bridging the gap between two communities
- Dissemination and Utilisation
- Research Impact Assessment
 - Challenges in linking research to research impacts
 - *Attribution, additionality, time lag, timing of assessments*

Primary results – Institutional Landscape (Ch.6)

- *AU/NEPAD Southern African Network of Water Centres of Excellence (AU/NEPAD SANWATCE),*
- *WaterNet network.*
- *Applied Centre for Climate & Earth Systems Sciences (ACCESS);*
- *The Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL);*
- *Global Water Partnership (GWP) with its SADC regional office GWP-SA,*
- *United Nations Educational, Scientific and Cultural Organization (UNESCO),*
- *the International Water Management Institute (IWMI)*
- *Stockholm International Water Institute with a regional office in South Africa, and*
- *Cap-Net.*
- *South African Water Research Commission (WRC),*
- *the Water Institute of Southern Africa (WISA) and*
- *the South African Young Water Professionals (YWP-ZA)*

Primary results – Knowledge Production in the SADC Water Sector (Ch.7)

	1980 - 1999						2000 - 2016					
	Articles	Water research publications	Water research as share of SADC	Water research as a share of total publications	Population ave - 1980-1999 ('000)	Per capita output water research per million (Rank)	Articles	Water research publications	Water research as share of SADC (increase or decrease)	Water research as a share of total publications (increase or decrease)	Population ave - 2000-2016 ('000)	Per capita output water research per million (Rank, rank '80-99)
Global	20 324 924	104 647		0,51%			3338026	209673		0,63% (0,11%)		
African	209 068	2 907		1,39%			530434	8803		1,66% (0,27%)		
SADC	100 762	1 812		1,80%			216463	3917		1,81% (0,01%)		
South Africa	86 247	1 632	90,07%	1,89%			179844	3034	77,46% (-12,61%)	1,69% (-0,21%)		
SADC-ExSA	14 958	186	10,26%	1,24%			42213	1031	26,32% (16,06%)	2,44% (1,20%)		
<i>Detail of SADC countries</i>												
Botswana	1 014	31	1,71%	3,06%	1,367	23 (3)	4245	163	4,16% (2,45%)	3,84% (0,78%)	2,012	81 (1, 3)
Swaziland	233	6	0,33%	2,58%	0,834	7 (6)	623	24	0,61% (0,28%)	3,85% (1,28%)	1,206	20 (6, 6)
Zimbabwe	4 395	46	2,54%	1,05%	9,874	5 (7)	5951	295	7,53% (4,99%)	4,96% (3,91%)	14,235	21 (5, 7)
Namibia	563	11	0,61%	1,95%	1,416	8 (5)	2091	71	1,81% (1,21%)	3,40% (1,44%)	2,202	32 (4, 5)
Lesotho	235	7	0,39%	2,98%	1,599	4 (8)	413	12	0,31% (-0,08%)	2,91% (-0,07%)	2,047	6 (9, 8)
Mozambique	402	7	0,39%	1,74%	14,289	0 (11)	2554	61	1,56% (1,17%)	2,39% (0,65%)	24,010	3 (12, 11)
Tanzania	3 393	31	1,71%	0,91%	25,855	1 (10)	11632	265	6,77% (5,05%)	2,28% (1,36%)	45,828	6 (9, 10)
Malawi	1 312	7	0,39%	0,53%	8,761	1 (10)	5309	111	2,83% (2,45%)	2,09% (1,56%)	15,050	7 (8, 10)
South Africa	86 247	1632	90,07%	1,89%	37,628	43 (1)	179844	3034	77,46% (-12,61%)	1,69% (-0,21%)	51,488	59 (3, 1)
Seychelles	109	3	0,17%	2,75%	0,073	41 (2)	484	7	0,18% (0,01%)	1,45% (-1,31%)	0,090	78 (2, 2)
Mauritius	327	18	0,99%	5,50%	1,068	17 (4)	1850	12	0,31% (-0,69%)	0,65% (-4,86%)	1,235	10 (7, 4)
Zambia	1 720	18	0,99%	1,05%	8,052	2 (9)	3821	51	1,30% (0,31%)	1,33% (0,29%)	13,825	4 (11, 9)
Madagascar	21	0	0,00%	0,00%	11,833	0 (11)	2905	13	0,33% (0,33%)	0,45% (0,45%)	20,877	1 (13, 11)
DR Congo	1 248	3	0,17%	0,24%	35,686	0 (11)	1797	19	0,49% (0,32%)	1,06% (0,82%)	64,257	0 (14, 11)
Angola	101	0	0,00%	0,00%	12,397	0 (11)	656	1	0,03% (0,03%)	0,15% (0,15%)	23,207	0 (14, 11)

Source: Clarivate Analytics™ Web of Science™. For the calculation of per capita output: Worldometers (www.Worldometers.info) Elaboration of data by United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2017 Revision. (Medium-fertility variant).

Note: SADC-ExSA countries refer to all SADC countries excluding South Africa

Primary results – Knowledge Production in the SADC Water Sector (Ch.7)

MAP: Per capita output of water research in SADC countries (Pub.per million) 2000 to 2016



Rank	Country	Per capita output per million (Pub.per capita, rank 1980 to 1999)
1	Botswana	81 (23, Rank 3)
2	Seychelles	78 (41, Rank 2)
3	South Africa	59 (43, Rank 1)
4	Namibia	32 (8, Rank 5)
5	Zimbabwe	21 (5, Rank 7)
6	Swaziland	20 (7, Rank 6)
7	Mauritius	10 (17, Rank 4)
8	Malawi	7 (1, Rank 10)
9	Lesotho	6 (4, Rank 8)
9	Tanzania	6 (1, Rank 10)
11	Zambia	4 (2, Rank 9)
12	Mozambique	3 (0, Rank 11)
13	Madagascar	1 (0, Rank 11)
14	DR Congo	0 (0, Rank 11)
14	Angola	0 (0, Rank 11)

Primary results – Knowledge Production in the SADC Water Sector (Ch.7)

The Activity Index (AI) provide an indication of the relative effort a country devotes to a research field (Frame, 1977; Schubert & Braun, 1986), and is calculated as:

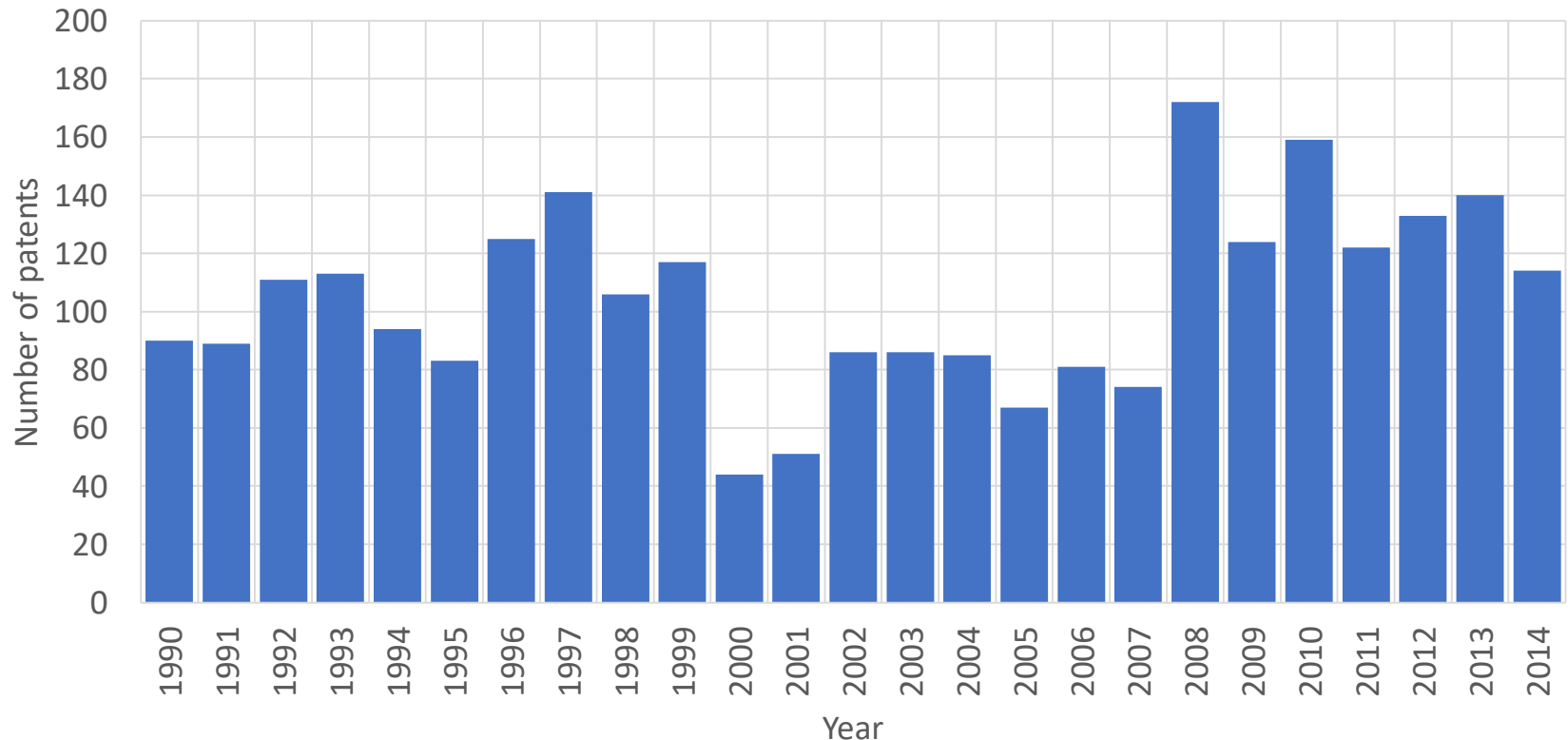
$$AI = \frac{\text{a country's share in the world (or regional) publication output (in a particular research field)}}{\text{a country share of the world's publication output in all science fields}}$$

	1980 to 1999			2000 to 2016		
	Global Water Research AI	Africa Water Research AI	SADC Water Research AI	Global Water Research AI	Africa Water Research AI	SADC Water Research AI
Global publications	1,0			1,0		
African publications	2,7	1,0		2,6	1,0	
SADC publications	3,5	1,3	1,0	2,9	1,1	1,0
South Africa publications	3,7	1,4	1,1	2,7	1,0	0,9
SADC-ExSA publications	2,4	0,9	0,7	3,9	1,5	1,3

Source: Clarivate Analytics™ Web of Science™

The relative effort SADC countries devote to water research compared to Africa and the world (1980 to 2016)

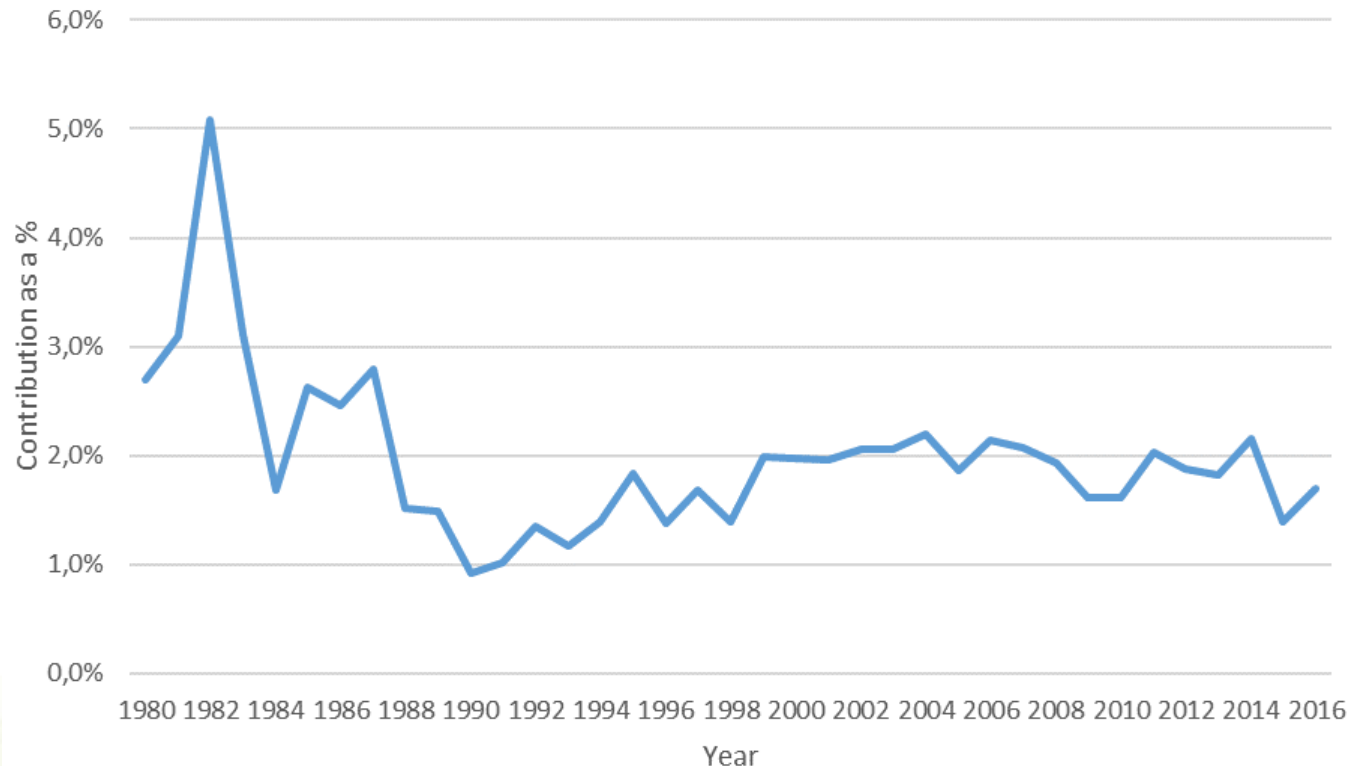
Primary results – Knowledge Production in the SADC Water Sector (Ch.7)



Source: Thomson Innovation

Figure 17: Southern African patents awarded (1990 to 2014)

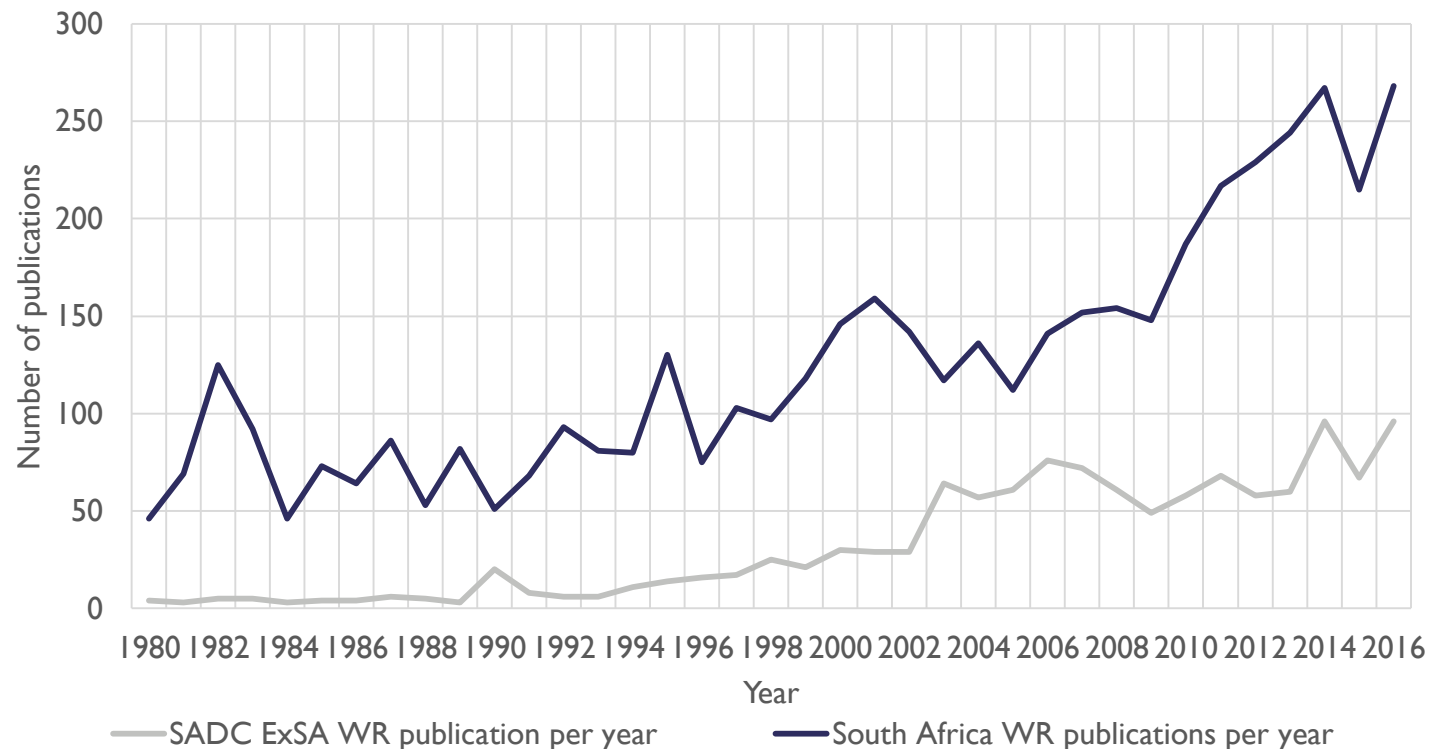
Primary results – Water Publications by SADC Countries (ch.8)



Source: Calculated from data obtained from Clarivate Analytics™ Web of Science™

SADC world share (%) of water research publications (1980-2016)

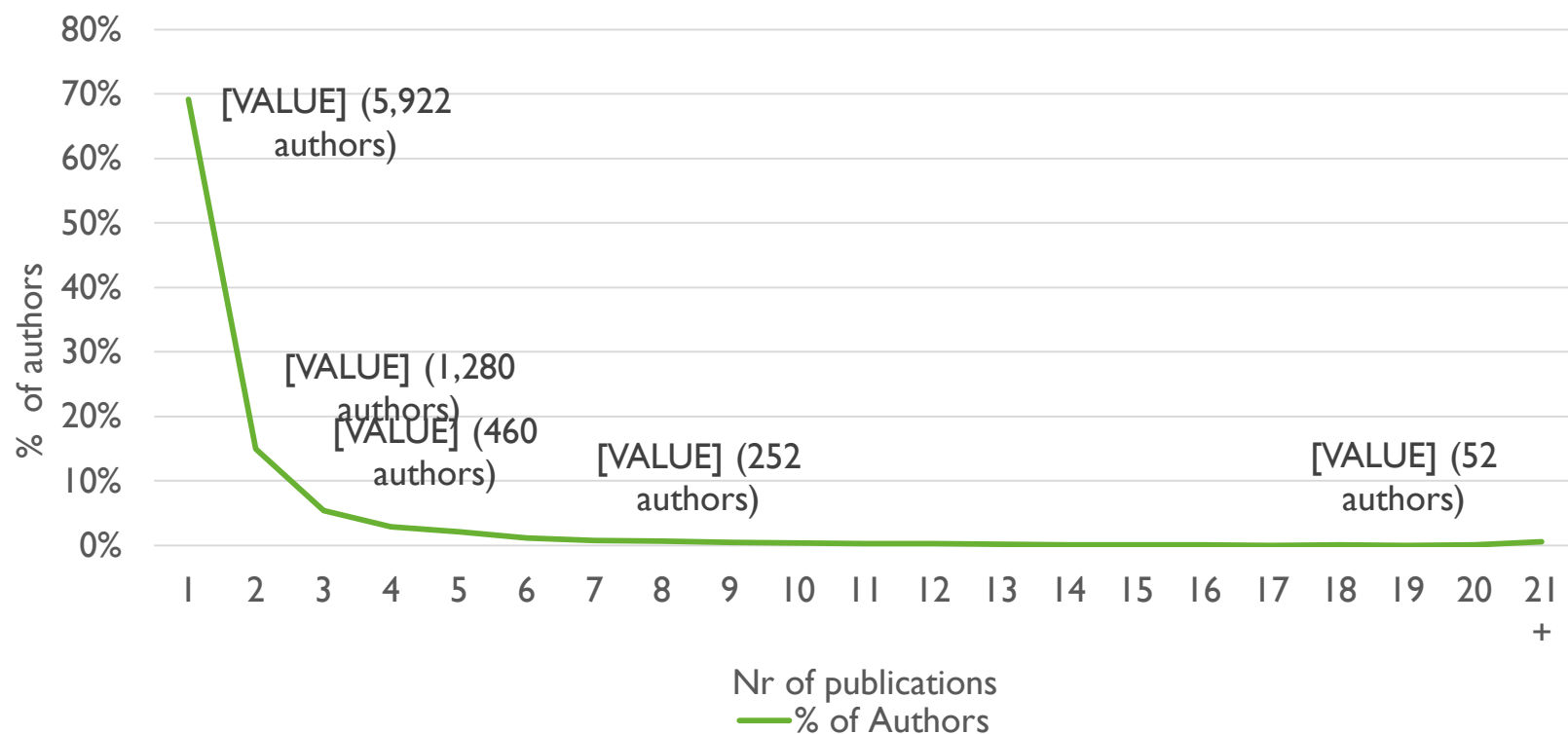
Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

SADC water-related research output (1980-2016)

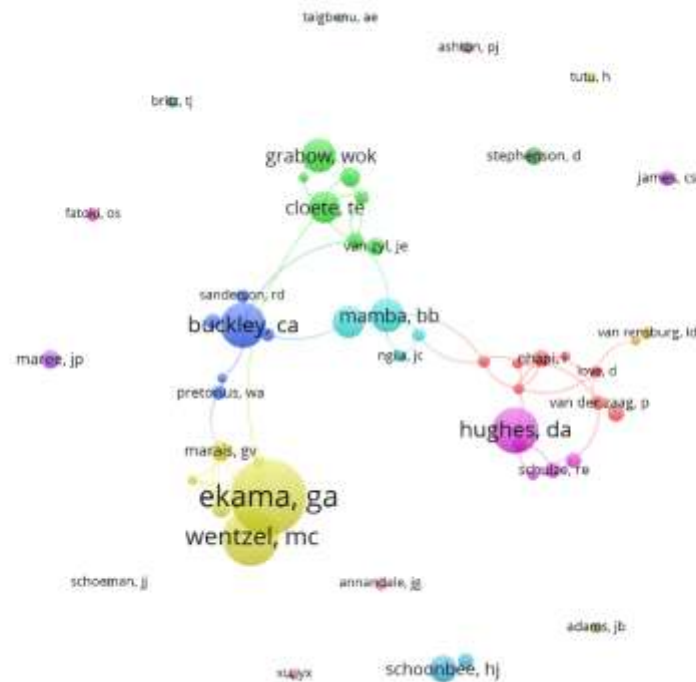
Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

Distribution of SADC water research publications by number of publications between 1980 and 2016

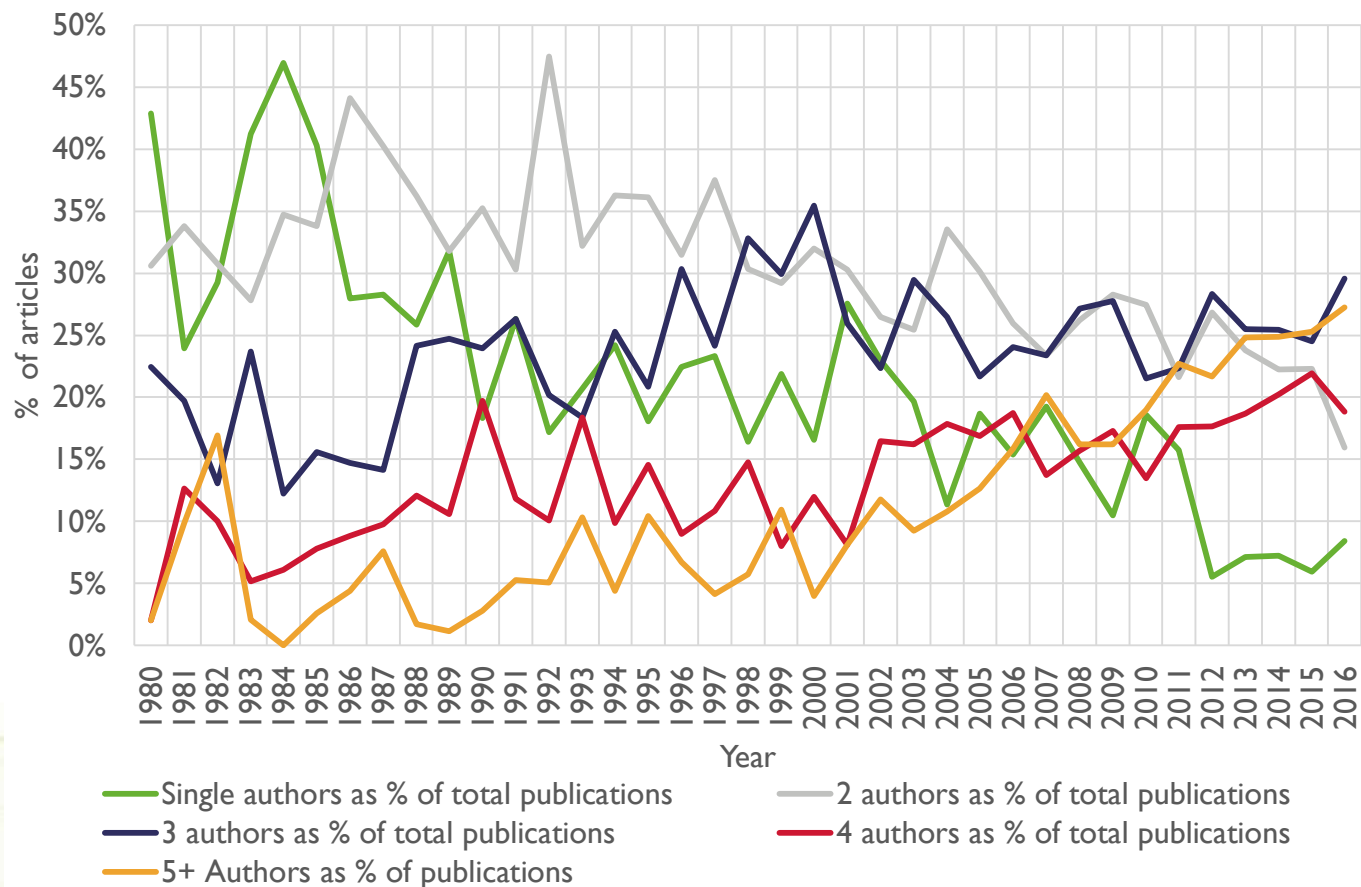
Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

Author network visualisation of SADC water researchers that have published more than 20 publications each (1980-2016)

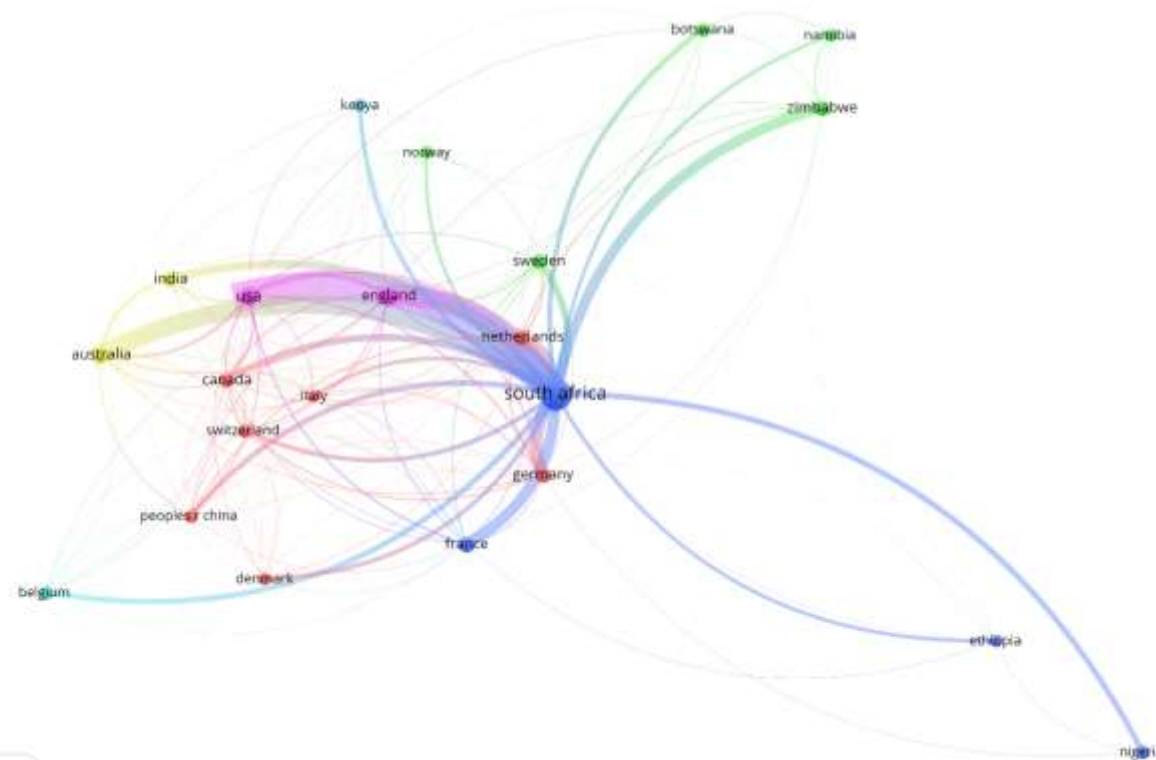
Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

Co-authorship trends of SADC water research publications (1980-2016)

Primary results – Water Publications by SADC Countries (ch.8)



Min count of articles between countries: 20

Data source: Clarivate Analytics™ Web of Science™ and analysed with VOSviewer®

Country network visualization: Co-authorship of water research in the SADC water sector (1980 to 2016)

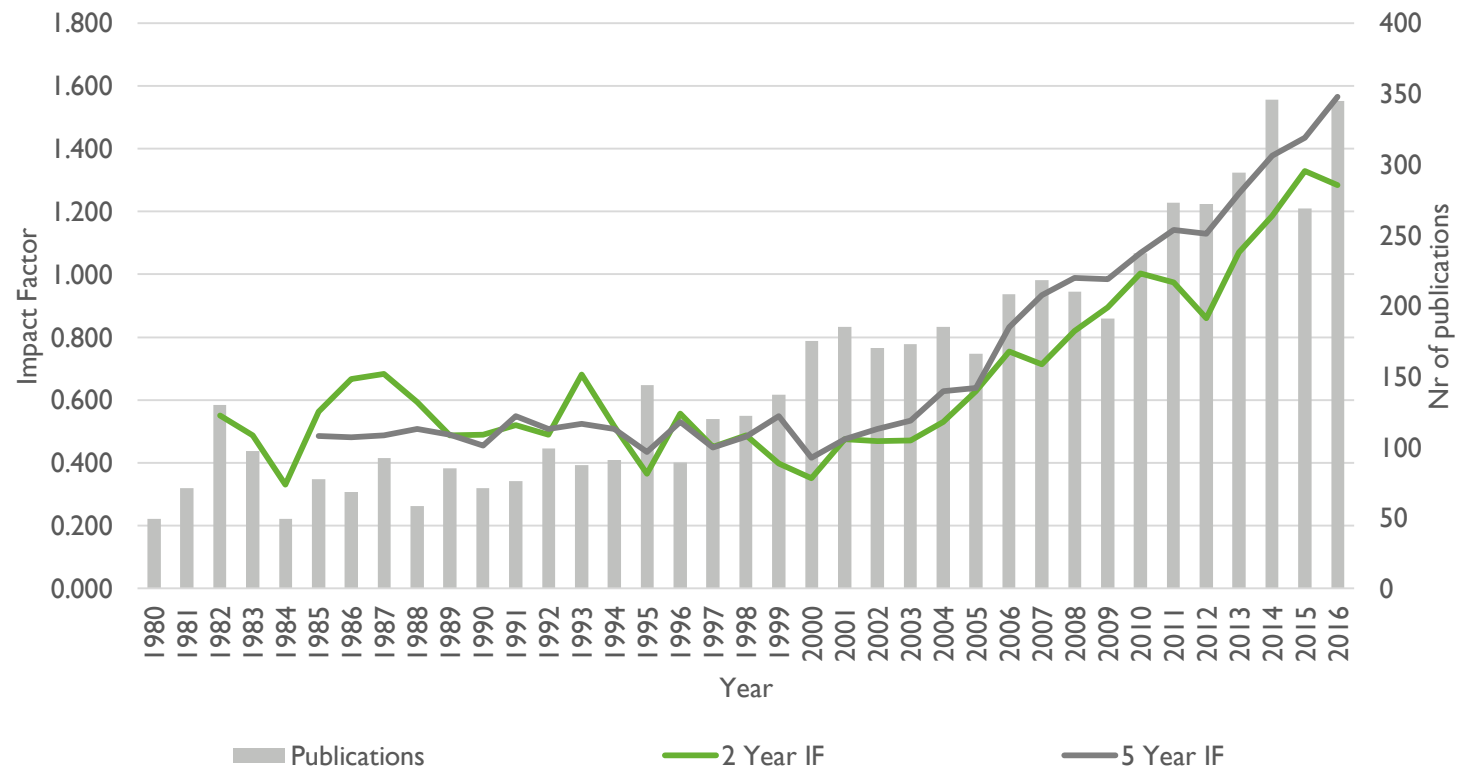
Primary results – Water Publications by SADC Countries (ch.8)

Citation range	Nr of publications	% of publications	Nr of citations	% of citations	Citation rate
0	1390	24,26%	0	0	
1-10	2988	52,16%	12294	22,88%	4,11
10-20	743	12,97%	10864	20,22%	14,62
20-30	246	4,29%	6090	11,33%	24,76
31-40	130	2,27%	4620	8,60%	35,54
41-50	76	1,33%	3465	6,45%	45,59
51-60	49	0,86%	2717	5,06%	55,45
61-70	30	0,52%	1956	3,64%	65,20
71-80	12	0,21%	900	1,67%	75,00
81-90	17	0,30%	1445	2,69%	85,00
91-100	8	0,14%	775	1,44%	96,88
100+	40	0,70%	8610	16,02%	215,25
Totals	5729	100%	53736	100%	
Average citation rate			9,38		

Source: Clarivate Analytics™ Web of Science™

Distribution of SADC water research publications and citations (1980 to 2016)

Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

Impact Factor of SADC water research (1980 to 2016)

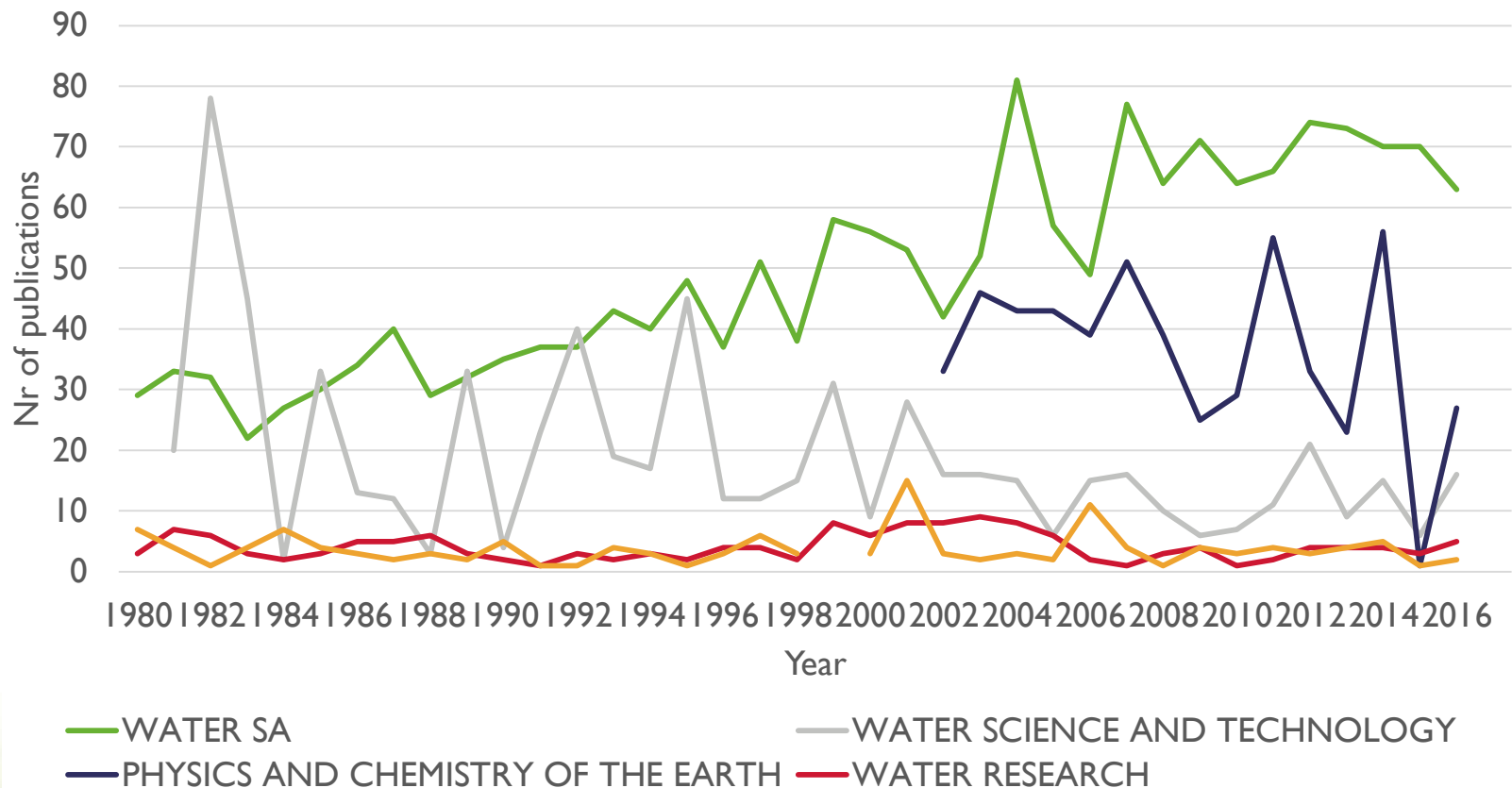
Primary results – Water Publications by SADC Countries (ch.8)

Rank	Journal Titles	Nr. of publications	% of publications	Journal Rank				
				2016	2015	2014	2013	2012
1	WATER SA	1814	31,66%	66/88	62/85	69/83	61/81	57/80
2	WATER SCIENCE AND TECHNOLOGY	679	11,85%	61/88	54/85	52/83	44/81	44/80
3	PHYSICS AND CHEMISTRY OF THE EARTH	543	9,48%	55/88	47/85	38/83	38/81	47/80
4	WATER RESEARCH	152	2,65%	1/88	1/85	1/83	1/81	1/80
5	JOURNAL OF HYDROLOGY	134	2,34%	6/88	6/85	7/83	10/81	5/80
6	DESALINATION	112	1,95%	2/88	2/85	2/83	2/81	4/80
7	AGRICULTURAL WATER MANAGEMENT	101	1,76%	14/88	10/85	16/83	18/81	15/80
8	HYDROLOGICAL SCIENCES JOURNAL (JOURNAL DES SCIENCES HYDROLOGIQUES)	83	1,45%	24/88	16/85	36/83	39/81	43/80
9	WATER AIR AND SOIL POLLUTION	76	1,33%	39/88	35/85	35/83	31/81	27/80
10	IAHS PUBLICATION	70	1,22%	Null	Null	Null	Null	Null
	Other journals	1965	34,30%					

Source: Clarivate Analytics™ Web of Science™ and InCites™ Journal Citation Reports®

Top 10 journals of water research publications in SADC (1980 – 2016)

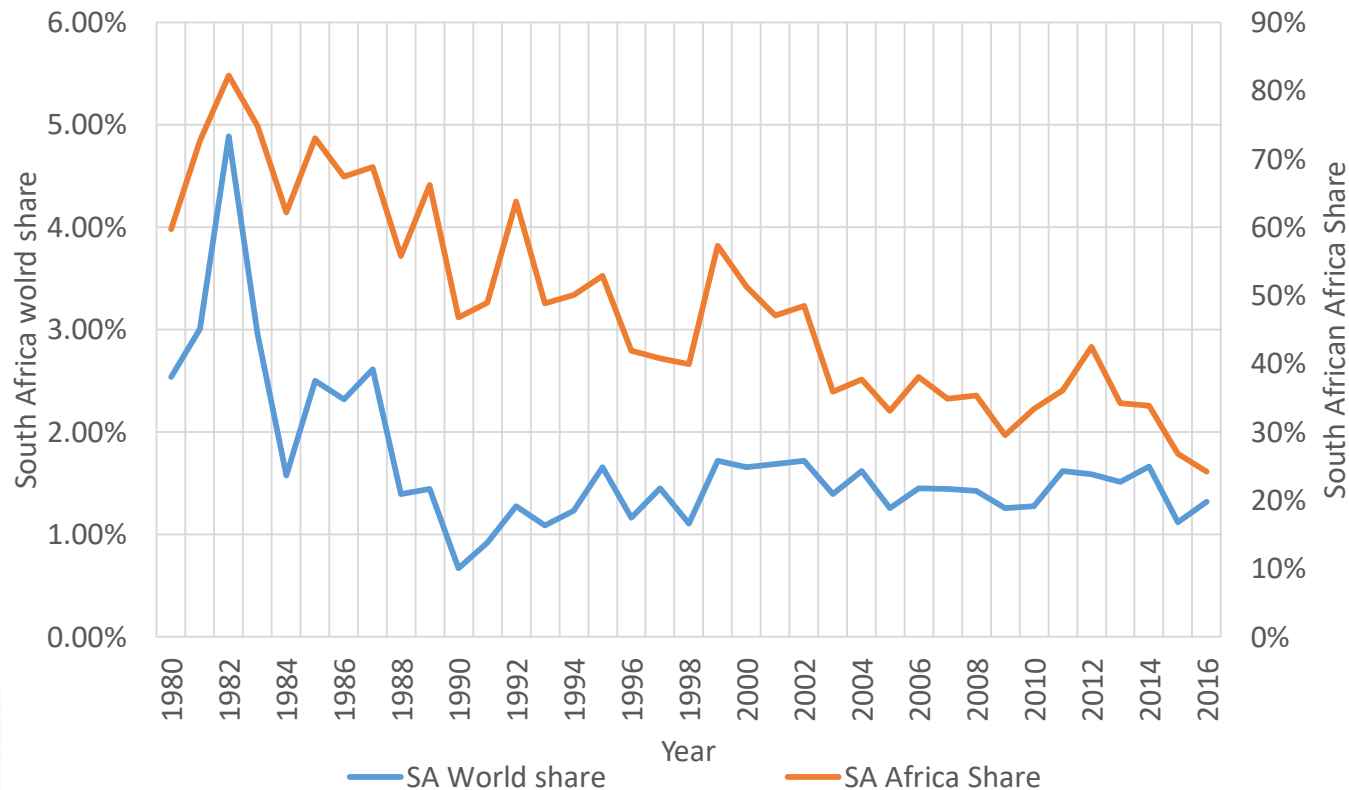
Primary results – Water Publications by SADC Countries (ch.8)



Source: Clarivate Analytics™ Web of Science™

Annual distribution between 1980 and 2016 of SADC water research publications: Top 1-5 journals

Primary results – Water Publications in South Africa (ch.9)



Source: Clarivate Analytics™ Web of Science™

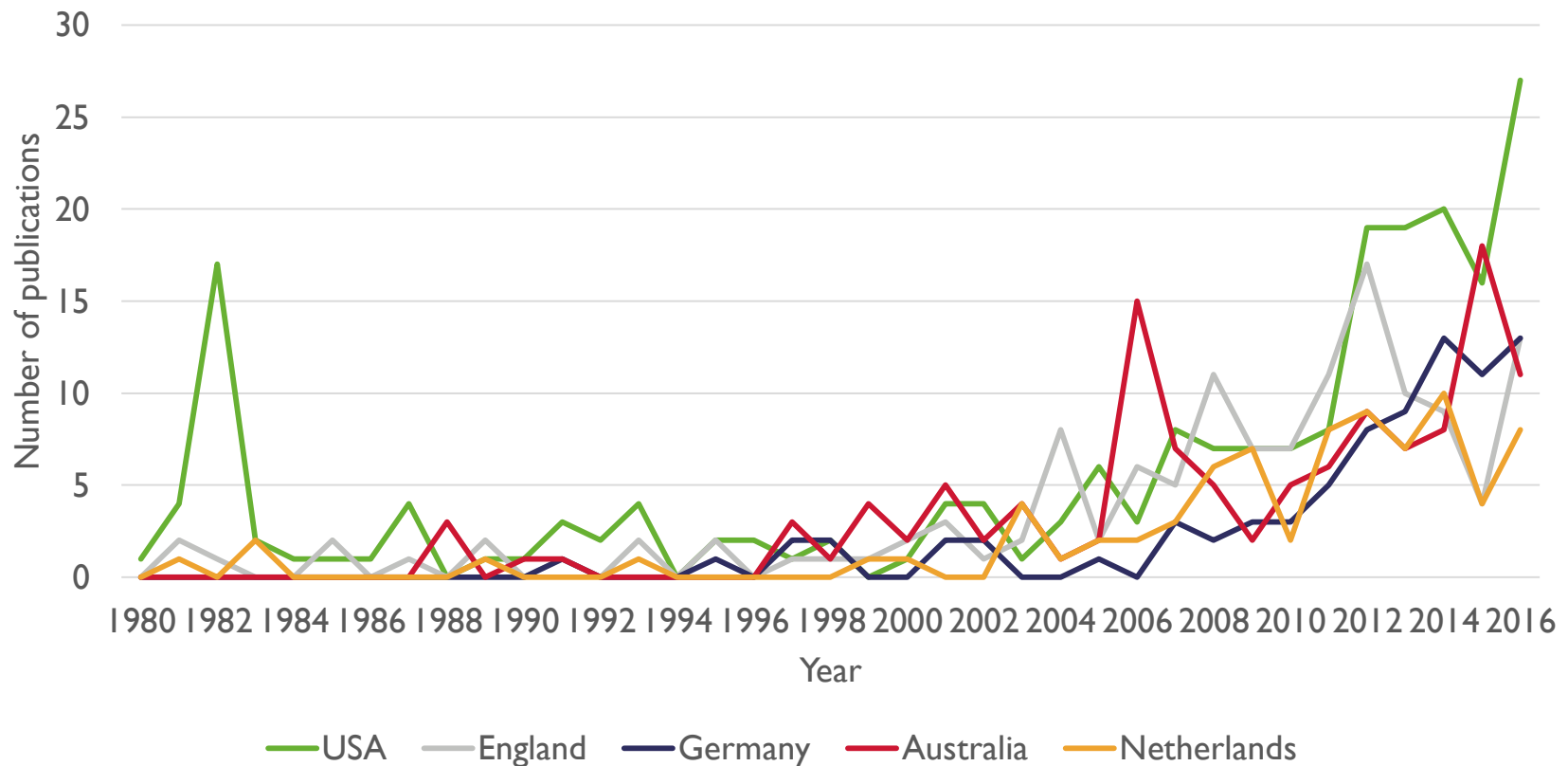
South African share of Africa and World water research publications (1980 – 2016)

Primary results – Water Publications in South Africa (ch.9)

Ran k	Authors	Publicati ons	% of 6,532 publicati ons	Ave citatio ns per item	Times cited	Self citatio ns	Self citations as % of articles	h-index	Organisation	Country
1	EKAMA GA	155	3,32%	26,48	4105	758	18,5%	33	UCT	South Africa
2	WENTZEL MC	112	2,40%	30,61	3428	472	13,8%	29	UCT	South Africa
3	HUGHES DA	103	2,21%	15,02	1547	292	18,9%	21	RU	South Africa
4	BUCKLEY CA	103	2,21%	11,57	1192	28	2,3%	17	UKZN	South Africa
5	MAMBA BB	68	1,46%	6,31	429	40	9,3%	12	UJ	South Africa
6	GRABOW WOK	67	1,44%	16,03	1074	57	5,3%	18	UP	South Africa
7	CLOETE TE	64	1,37%	10,83	693	40	5,8%	15	SU and UP	South Africa
8	HAARHOFF J	62	1,33%	7,47	463	40	8,6%	13	UJ	South Africa
9	SCHOONBEE HJ	54	1,16%	7,15	386	107	27,7%	11	UL	South Africa
10	MARAIS GV	54	1,16%	36,06	1947	65	3,3%	22	UCT	South Africa
40	WIECHERS HNS	22	0,47%	0,73	16	3	18,8%	3	WRC	South Africa
41	DOLD PL	21	0,45%	59,10	1241	23	1,9%	11	UCT	South Africa
42	EHLERS MM	21	0,45%	15,38	323	9	2,8%	10	UP	South Africa
43	SCHOEMAN JJ	21	0,45%	13,43	282	9	3,2%	9	CSIR and UP	South Africa
44	SCHUTTE CF	21	0,45%	17,19	361	1	0,3%	8	UP	South Africa
45	WALKER S	21	0,45%	9,24	194	7	3,6%	10	UFS	South Africa
TOTAL		1824	39,09%		27482	2618				
AVERAGE				13,52	610,7	58,18	8,4%			
(SA 4,4%)										

Researchers that have published more than 20 water research publications in South Africa (1980 – 2016)

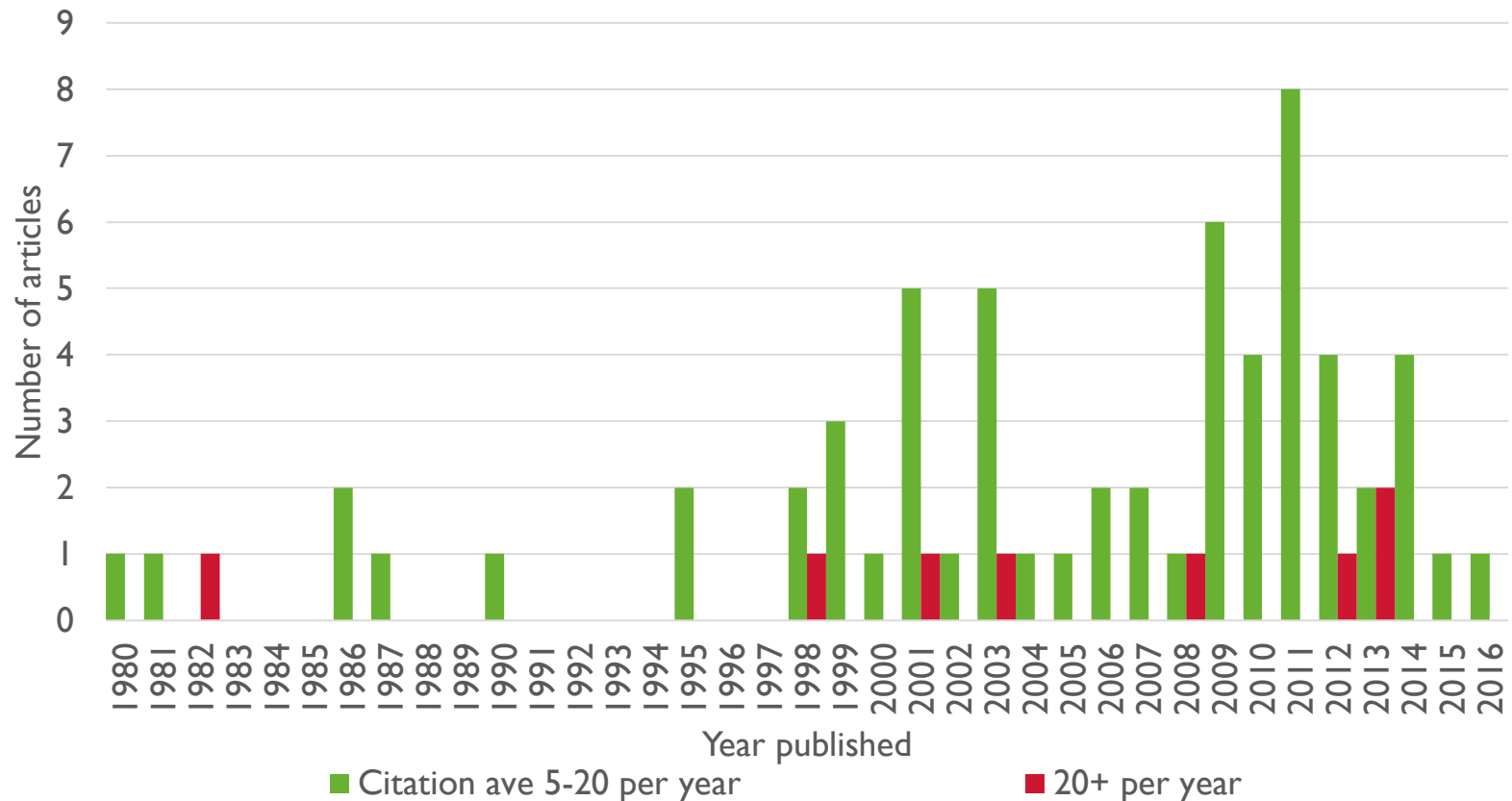
Primary results – Water Publications in South Africa (ch.9)



Source: Clarivate Analytics™ Web of Science™

Annual distribution of publications from top 5 countries which co-author water research with South Africa (1980 to 2016)

Primary results – Water Publications in South Africa (ch.9)



Source: Calculated from data obtained from Clarivate Analytics™ Web of Science™

Distribution of South African water research articles with high average number of citations (1980-2016)

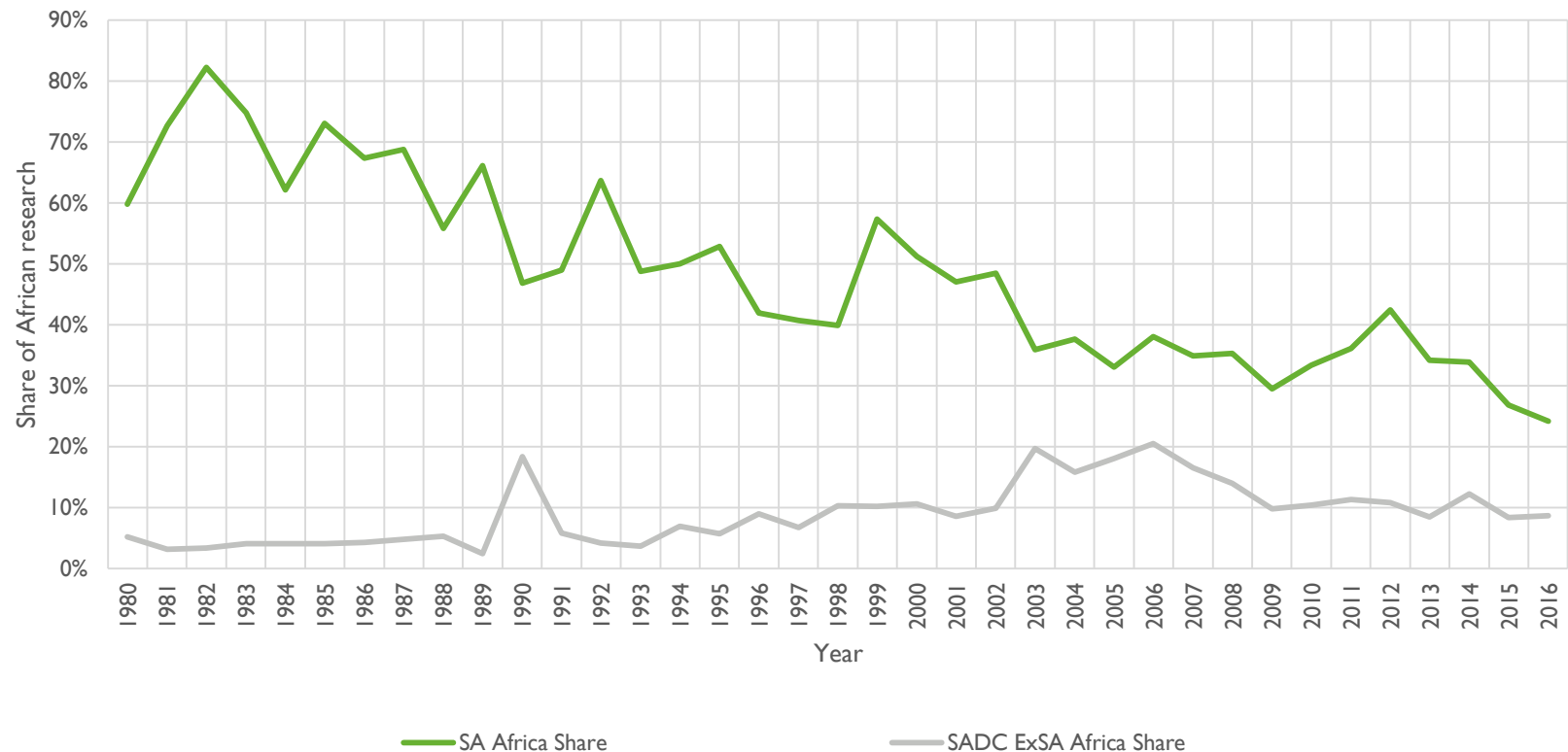
Primary results – Water Publications in South Africa (ch.9)

Rank	Source Titles	Nr. of publications	% of publications	Journal Rank				
				2016	2015	2014	2013	2012
1	WATER SA	1771	37,96%	66/88	62/85	69/83	61/81	57/80
2	WATER SCIENCE AND TECHNOLOGY	644	13,80%	61/88	54/85	52/83	44/81	44/80
3	PHYSICS AND CHEMISTRY OF THE EARTH	223	4,78%	55/88	47/85	38/83	38/81	47/80
4	WATER RESEARCH	136	2,91%	1/88	1/85	1/83	1/81	1/80
5	DESALINATION	103	2,21%	2/88	2/85	2/83	2/81	4/80
6	JOURNAL OF HYDROLOGY	97	2,08%	6/88	6/85	7/83	10/81	5/80
7	WATER AIR AND SOIL POLLUTION	65	1,39%	39/88	35/85	35/83	31/81	27/80
8	IAHS PUBLICATION	59	1,26%	Null	Null	Null	Null	Null
9	HYDROLOGICAL SCIENCES JOURNAL (JOURNAL DES SCIENCES HYDROLOGIQUES)	55	1,18%	24/88	16/85	36/83	39/81	43/80
10	AQUATIC CONSERVATION MARINE AND FRESHWATER ECOSYSTEMS	47	1,01%	9/88	13/85	18/83	29/81	22/80
	Other journals	1466	31,42%					

Source: Clarivate Analytics™ Web of Science™ and InCites™; Journal Citation Reports®

Top 10 citing journals of South African Water research publications (1980-2016)

Primary results – Water Publications in SADC-ExSA (ch.10)



Source: Clarivate Analytics™ Web of Science™

SADC-ExSA and South Africa share of African water research publications (1980-2016)

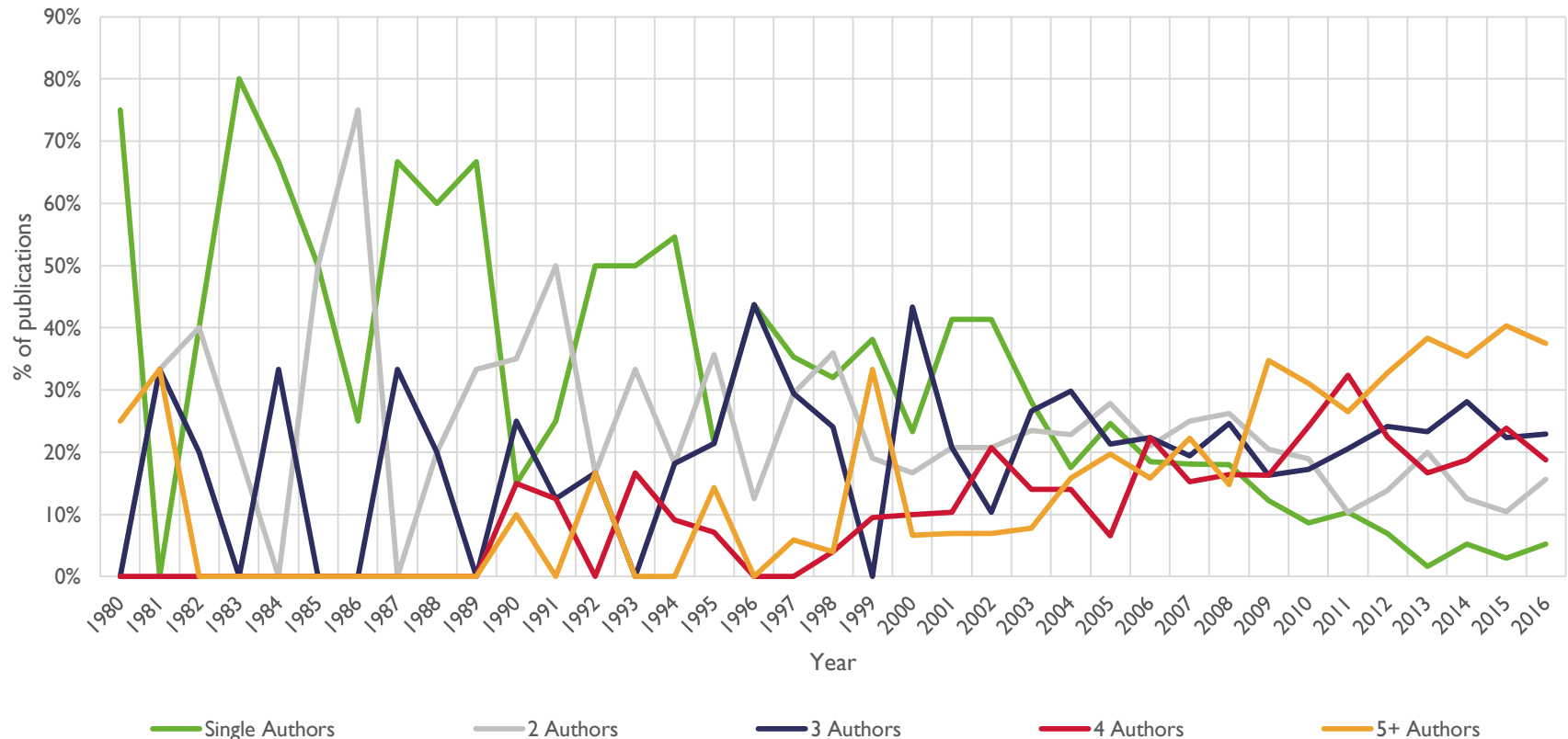
Primary results – Water Publications in SADC-ExSA (ch.10)

Rank	Authors	Publications	% of 2,699 publications	Average citation per item	Times cited	Self citations	Self citations as % of articles	h-index	Organisation	Country
1	NHAPI I	32	2,6%	5,19	166	14	8,4%	7	Uni Zimbabwe, Chinhoyi Uni Technol	Zimbabwe
2	VAN DER ZAAG P	26	2,1%	10,65	277	20	7,2%	13	WaterNet, Delft Uni of Tech	Netherlands
3	LOVE D	24	2,0%	16,63	399	39	9,8%	13	WaterNet, Uni Zimbabwe	Zimbabwe
4	MAHOO HF	23	1,9%	13,17	303	9	3,0%	9	Sokoine Uni	Zimbabwe
5	MAKURIRA H	22	1,8%	8,36	184	17	9,2%	10	Uni Zimbabwe	Zimbabwe
6	HOKO Z	21	1,7%	11,57	243	16	6,6%	9	Uni Zimbabwe	Zimbabwe
Sub-total (20+ articles)		148	5,5%		1572	115				
Average (20+ articles)				10,93	262	19,16		10,17		

Source: Clarivate Analytics™ Web of Science™

Researchers that have published more than 20 water research publications in SADC-ExSA countries (1980 – 2016)

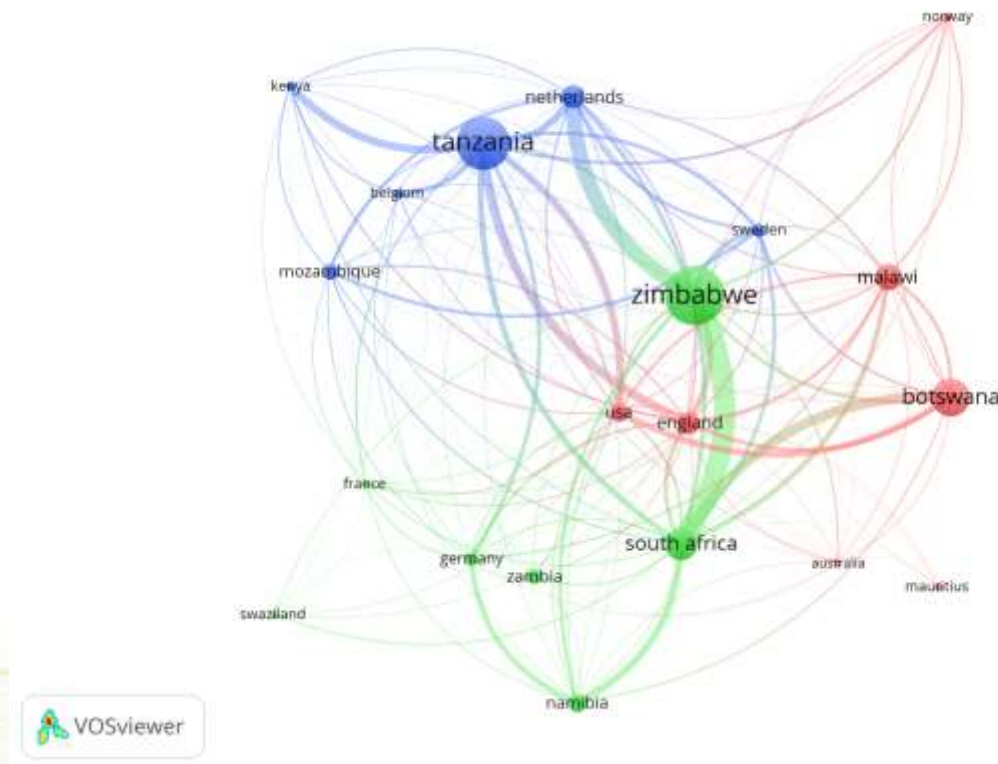
Primary results – Water Publications in SADC-ExSA (ch.10)



Source: Clarivate Analytics™ Web of Science™

Co-authorship trends of SADC-ExSA water research publications (1980-2016)

Primary results – Water Publications in SADC-ExSA (ch.10)



Min count of articles between countries: 20

Data source: Clarivate Analytics™ Web of Science™ and analysed with VOSviewer®

Country network visualization: Co-authorship of water research in the SADC-ExSA water sector (1980 to 2016)

Primary results – Water Publications in SADC-ExSA (ch.10)

Rank	Source Titles	Nr. of publications	% of publications	Journal Rank				
				2016	2015	2014	2013	2012
1	PHYSICS AND CHEMISTRY OF THE EARTH	373	30,65%	55/88	47/85	38/83	38/81	47/80
2	WATER SA	70	5,75%	66/88	62/85	69/83	61/81	57/80
3	AGRICULTURAL WATER MANAGEMENT	60	4,93%	14/88	10/85	16/83	18/81	15/80
4	JOURNAL OF HYDROLOGY	44	3,62%	6/88	6/85	7/83	10/81	5/80
5	OCEAN COASTAL MANAGEMENT	42	3,45%	32/88	31/85	28/83	27/81	33/80
6	WATER SCIENCE AND TECHNOLOGY	39	3,20%	61/88	54/85	52/83	44/81	44/80
7	HYDROLOGICAL SCIENCES JOURNAL (JOURNAL DES SCIENCES HYDROLOGIQUES)	31	2,55%	24/88	16/85	36/83	39/81	43/80
8	CATENA	29	2,38%	8/88	9/85	8/83	15/81	25/80
9	AQUATIC ECOSYSTEM HEALTH MANAGEMENT*	23	1,89%	84/105	96/104	69/103	62/103	75/100
10	JOURNAL OF WATER SANITATION AND HYGIENE FOR DEVELOPMENT	18	1,48%	72/88	65/85	73/83	71/81	NULL
Other journals		488	40,10%					

Source: Clarivate Analytics™ Web of Science™ and InCites™; Journal Citation Reports®

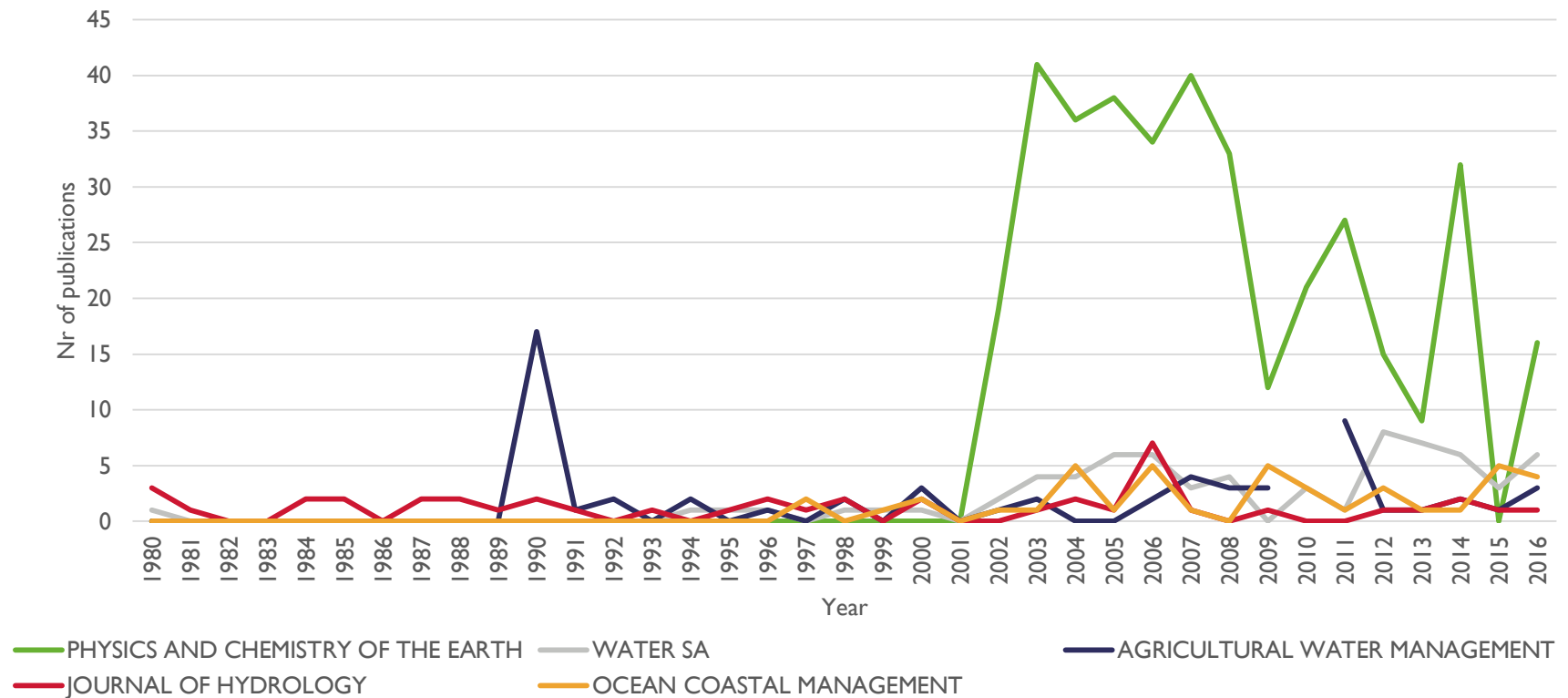
Top 10 journals of water research publications in SADC-ExSA countries (1980 – 2016)

Primary results – Water Publications in SADC-ExSA (ch.10)

Conference Titles	Nr. of public ations	% on confere nces
WATERNET/WARFSA/GWP-SA SYMPOSIA	275	60%
OTHER SYMPOSIA (107 conference titles)	187	40%
Total	462	

Distribution of SADC-Ex SA water research at conferences (1980 to 2016)

Primary results – Water Publications in SADC-ExSA (ch.10)



Source: Clarivate Analytics™ Web of Science™

Annual distribution between 1980 and 2016 of SADC-ExSA research publications: Top 1-5 journals

Primary results – Water Publications in SADC-ExSA (ch.10)

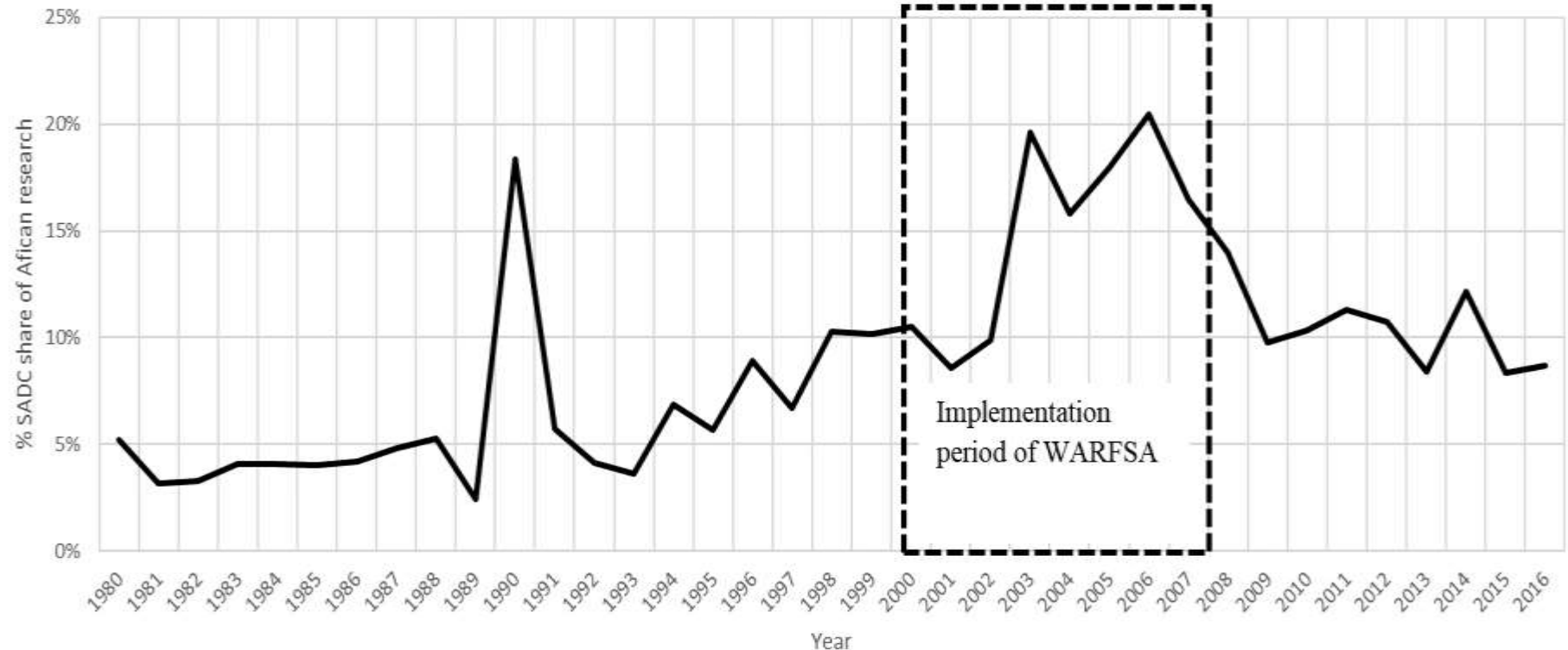
Type of funding organisation	Geographical location	Count	% of total acknowledgements	% of total acknowledgements (South Africa). Refer to chapter 9.
Research Funding Agency	Local	30	5,1%	40,0%
<i>Research Funding Agency</i>	<i>South Africa</i>	17	2,9%	38,4%
	<i>SADC-ExSA</i>	13	2,2%	1,6%
Research Funding Agency	International	301	51,4%	16,1%
University/Research Institute	Local	47	8,0%	17,6%
<i>University/Research Institute</i>	<i>South Africa</i>	16	2,7%	17,0%
	<i>SADC-ExSA</i>	31	5,3%	0,6%
University/Research Institute	International	76	13,0%	4,8%
Government	Local	34	5,8%	7,1%
Government	International	48	8,2%	3,8%
Private industry	Local	5	0,9%	5,1%
Private industry	International	16	2,7%	2,3%
Other		29	4,9%	3,2%
TOTAL		586	100%	100%

Source: Clarivate Analytics™ Web of Science™

Note: Funding Agency records were limited to between 2008 and 2016, as Clarivate Analytics™ Web of Science™ actively started capturing such data in 2008.

SADC-ExSA water research funding institutions by type

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Source: Clarivate Analytics™ Web of Science™

WARFSA implementation period in relation to water research output from SADC-ExSA countries as a share of Africa

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

Knowledge and innovation type	Count	% of 230
Scientific journal publications	102	44%
Conference proceedings	99	43%
BSc/ Mphil/ MSc/ MA/ PhD	75	33%
Technical reports	14	6%
Book chapters	9	4%
Policy document	5	2%

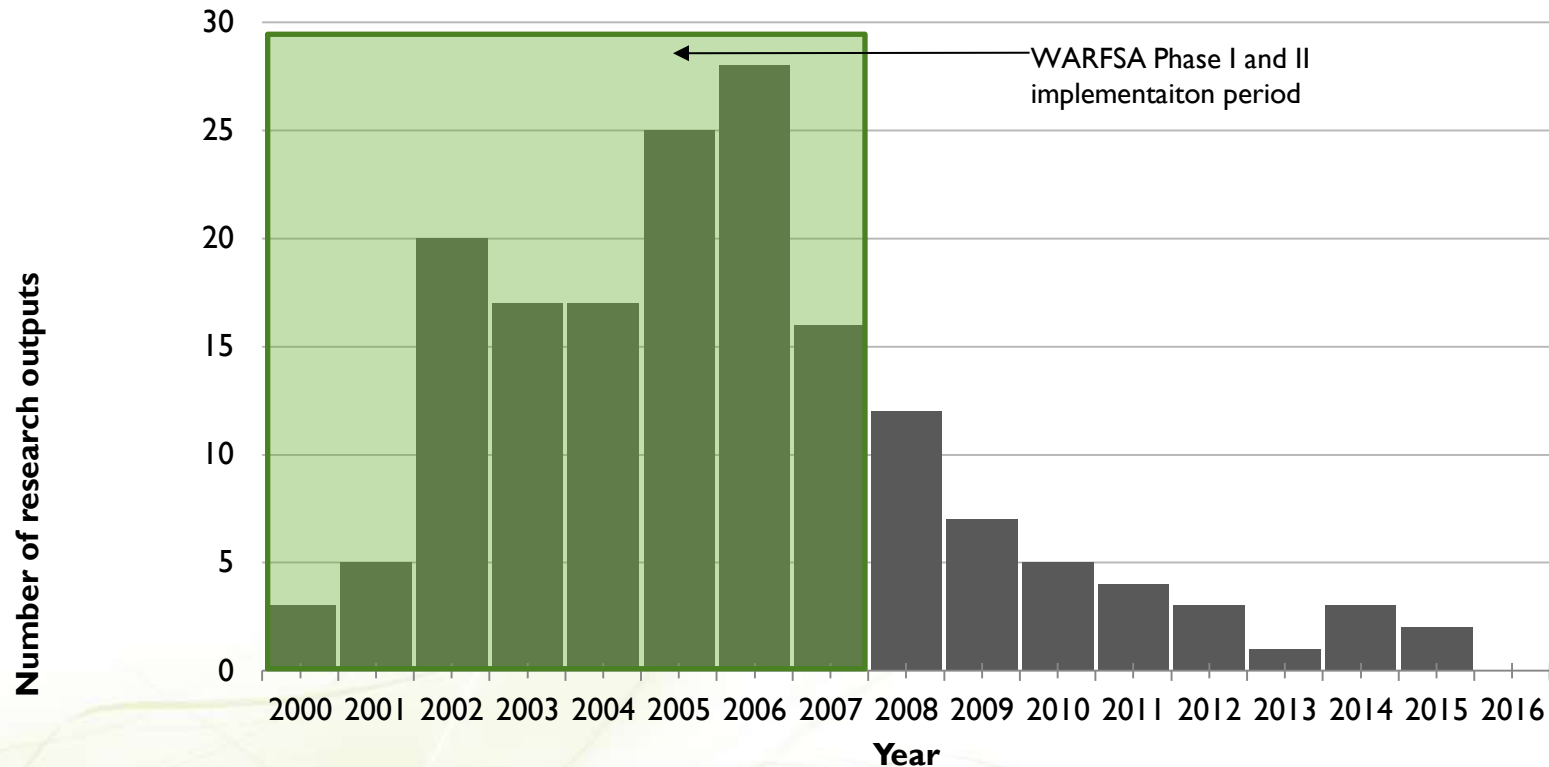
Number of WARFSA-related knowledge outputs by type (2000 to 2016)

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

Publication	# of Publications	As % of ALL research outputs	
Physics and Chemistry of the Earth	68	29,6%	Publications used for publication- and citation trend analysis.
Water SA	2	0,9%	
Onderstepoort Journal of Veterinary Research	2	0,9%	
Aquatic Ecology	2	0,9%	
Plant Ecology	1	0,4%	
Transactions of The Royal Society of Tropical Medicine and Hygiene	1	0,4%	
Journal of Arid Environments	1	0,4%	
Applied Geochemistry	1	0,4%	
African Journal of Ecology	1	0,4%	
Hydrogeology Journal	1	0,4%	
Bulletin of Environmental Contamination and Toxicology	1	0,4%	
Japanese Journal of Veterinary Research	1	0,4%	
Environmental Monitoring and Assessment	1	0,4%	
Water International	1	0,4%	
Proceedings of a WaterNet/WARFSA/GWP-SA Symposium ONLY	13	5,7%	
Null*	70	30,4%	
Various online platforms	66	28,7%	
Total	230	100,0%	

Availability of WARFSA Phase I and II publications

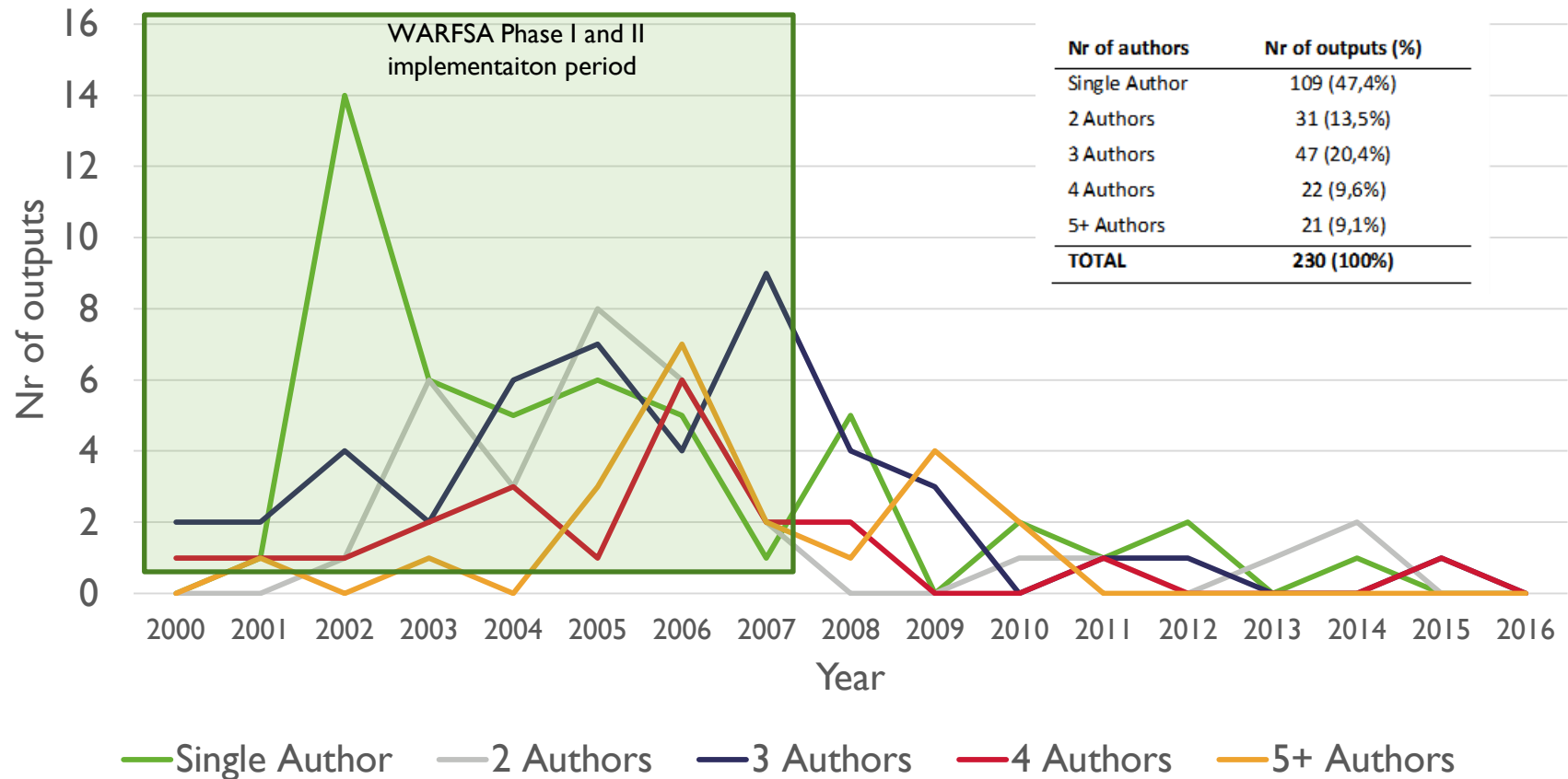
Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Total: 230 (note that the publishing date of 62 research outputs could not be established)

Annual research outputs from the WARFSA programme (all types)

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Note: The publication date for 62 outputs could not be determined

Nr. of authors per research output of WARFSA-funded research projects

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

	Nr. of articles	Nr. of citations	Citation rate
WARFSA publications	85	1 246	14.66
SADC publications	3 557	26 625	7.49
South Africa publications	2 729	19 880	7.28
SADC-ExSA Publications	972	8 006	8.24
African publications	8 181	76 980	9.41

Source: Clarivate Analytics™ Web of Science™

Citation rate of WARFSA-funded articles vs SADC regional water research (2002 – 2016)

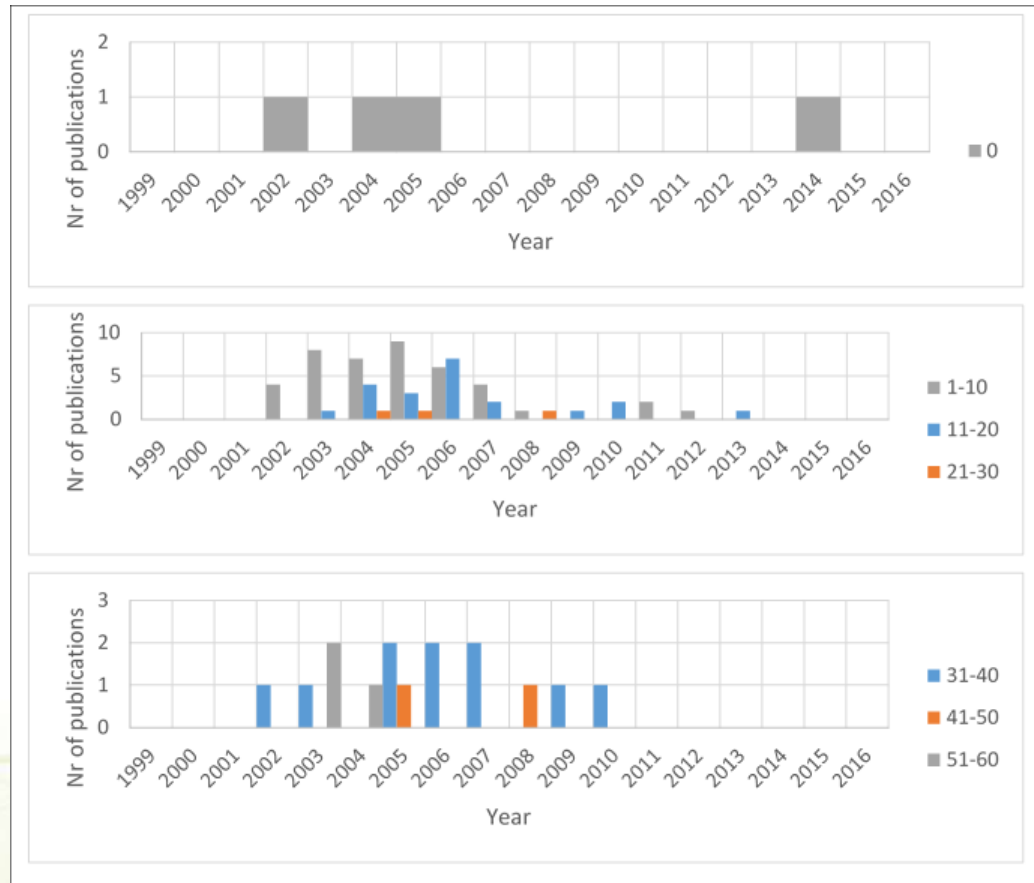
Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

Citation					
range	Nr of publications	% of publications	Nr of citations	% of citations	Citation rate
0	4	4,71%	0	0,00%	0
1-10	42	49,41%	260	20,87%	6,19
10-20	21	24,71%	305	24,48%	14,52
20-30	3	3,53%	72	5,78%	24,00
31-40	10	11,76%	352	28,25%	35,20
41-50	2	2,35%	87	6,98%	43,50
51-60	3	3,53%	170	13,64%	56,67
61-70	0	0,00%	0	0,00%	0
71-80	0	0,00%	0	0,00%	0
81-90	0	0,00%	0	0,00%	0
91-100	0	0,00%	0	0,00%	0
100+	0	0,00%	0	0,00%	0
500+	0	0,00%	0	0,00%	0
Totals	85	100%	1246	100%	
Average citation rate			14,66		
SADC-ExSA average citation rate*			8,24		
South Africa average citation rate*			7,28		
SADC average citation rate*			7,49		

Source: Clarivate Analytics™ Web of Science™

Distribution of articles and citations from WARFSA funded research

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

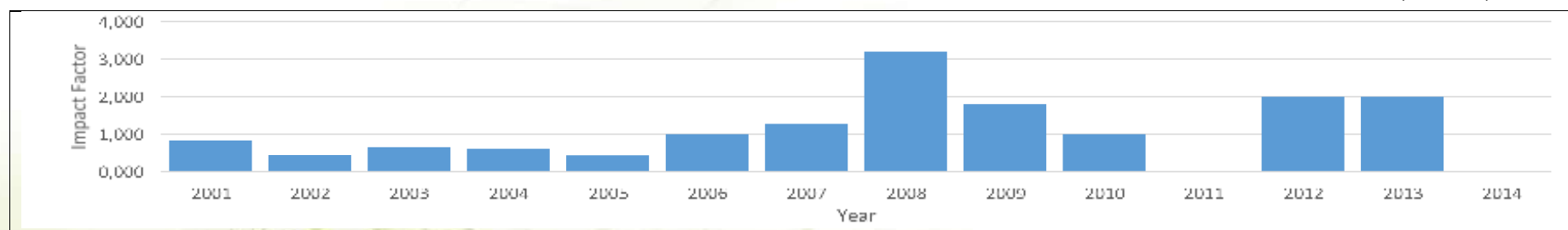


Source: Clarivate Analytics™ Web of Science™

Annual distribution of WARFSA funded research articles in citation ranges of ten

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

Year	Total publications	Citations per year																Total citations	Citation index	Impact Factor
		'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16			
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2002	6		0	5	3	2	3	5	6	4	4	5	2	5	4	5	5	58	9,67	
2003	12			0	5	12	4	15	11	20	17	23	18	28	11	20	16	200	16,67	0,833
2004	14				0	5	15	9	8	16	19	14	13	22	25	23	22	191	13,64	0,444
2005	17					0	4	10	12	21	24	26	15	44	21	36	43	256	15,06	0,654
2006	15						0	4	18	18	11	25	20	25	38	23	31	213	14,20	0,613
2007	8							0	5	7	9	14	14	16	15	19	22	121	15,13	0,438
2008	3								0	7	11	10	6	11	10	7	12	74	24,67	1,000
2009	2									1	5	7	5	5	13	6	8	50	25,00	1,273
2010	3										0	2	4	10	18	17	12	63	21,00	3,200
2011	2											0	1	0	2	1	1	5	2,50	1,800
2012	1												0	0	1	1	0	2	2,00	1,000
2013	1													0	3	4	6	13	13,00	0,000
2014	1														0	0	0	0	0,00	2,000
2015	0															0	0	0	0,00	2,000
2016	0																0	0	0,00	0,000
TOTAL	85	0	0	5	8	19	26	43	60	94	100	126	98	166	161	162	178	1246		
AVERAGE																			10,78	1,090



WARFSA publications, citations and Impact Factor (2001-2016)

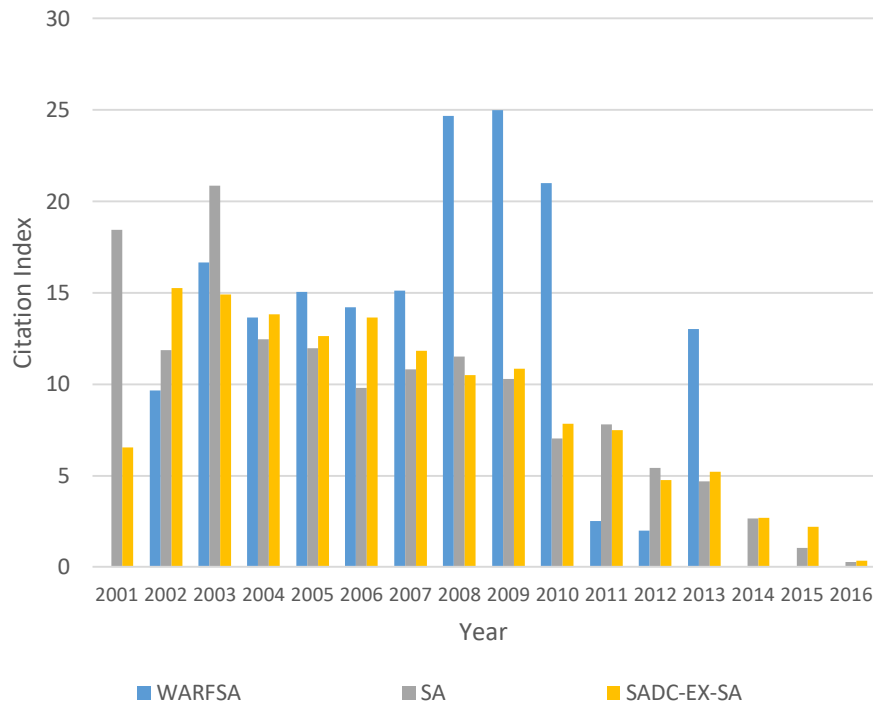
Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

		'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
Citation Index	WARFSA	0,00	9,67	16,67	13,64	15,06	14,20	15,13	24,67	25,00	21,00	2,50	2,00	13,00	0,00	0,00	0,00
	SA	18,44	11,86	20,86	12,46	11,97	9,78	10,82	11,51	10,28	7,02	7,79	5,42	4,70	2,64	1,05	0,26
	SADC-EX-SA	6,55	15,24	14,91	13,82	12,62	13,64	11,83	10,51	10,84	7,84	7,47	4,76	5,22	2,68	2,21	0,33
Impact Factor	WARFSA	0,000	0,000	0,833	0,444	0,654	0,613	0,438	1,000	1,273	3,200	1,800	1,000	0,000	2,000	2,000	0,000
	SA	0,489	0,502	0,478	0,537	0,597	0,714	0,767	0,765	0,951	1,040	0,916	0,874	1,110	1,129	1,327	1,166
	SADC-EX-SA	0,373	0,288	0,414	0,516	0,769	0,873	0,591	1,007	0,820	0,927	1,196	0,786	0,913	1,331	1,237	1,632

Source: Clarivate Analytics™ Web of Science™

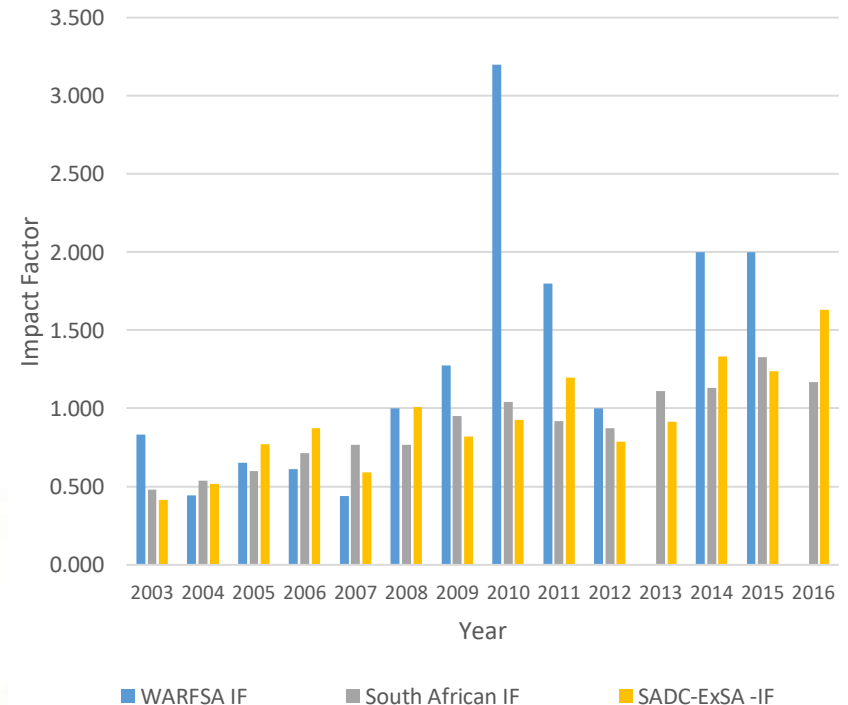
Comparative Citation Index and Impact Factor of WARFSA, South African and SADC-Ex-SA countries water research (2001 – 2016)

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Source: Clarivate Analytics™ Web of Science™

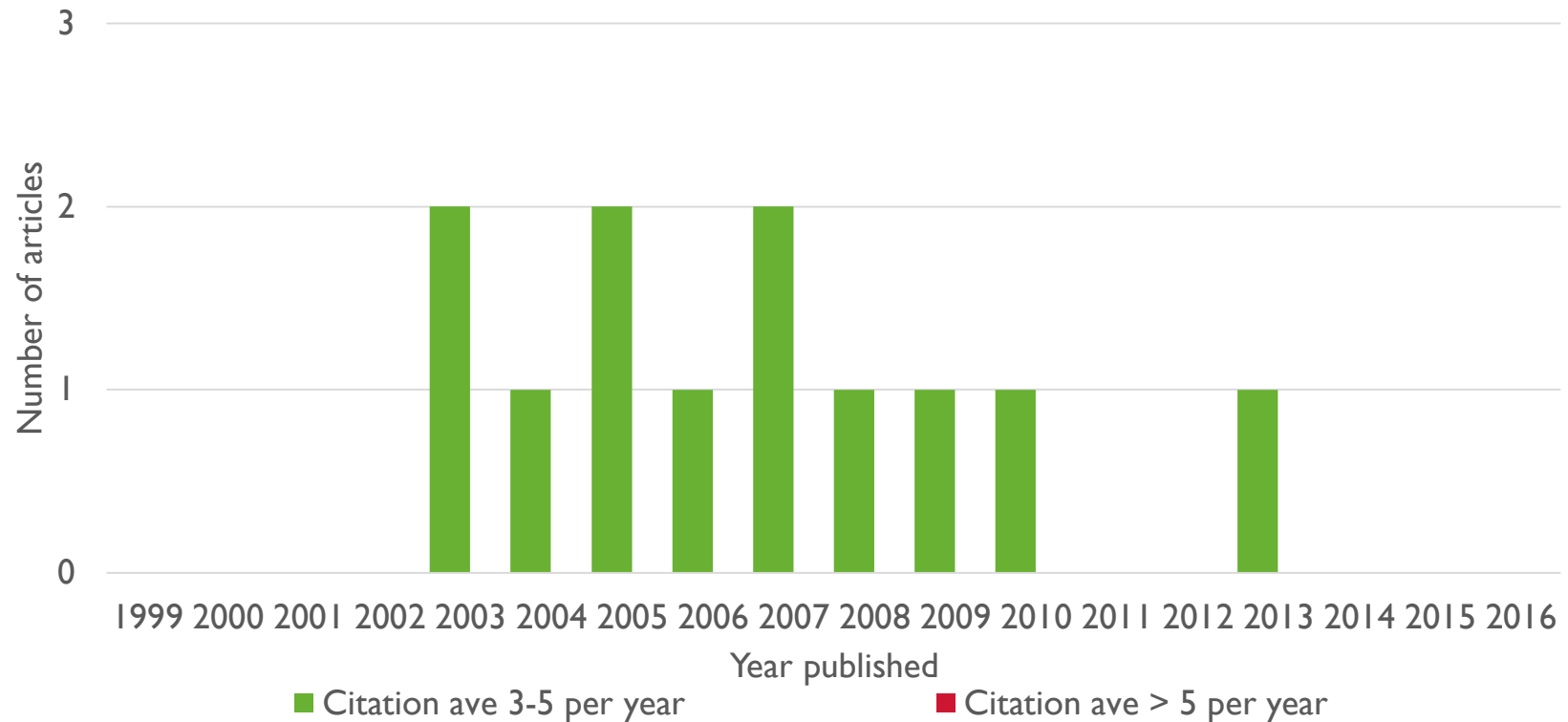
Annual distribution of Citation index of WARSA, South African, SADC-ExSA water research (2001 – 2016)



Source: Clarivate Analytics™ Web of Science™

Annual distribution of Impact Factors of WARSA, South African, SADC-ExSA water research (2001 – 2016)

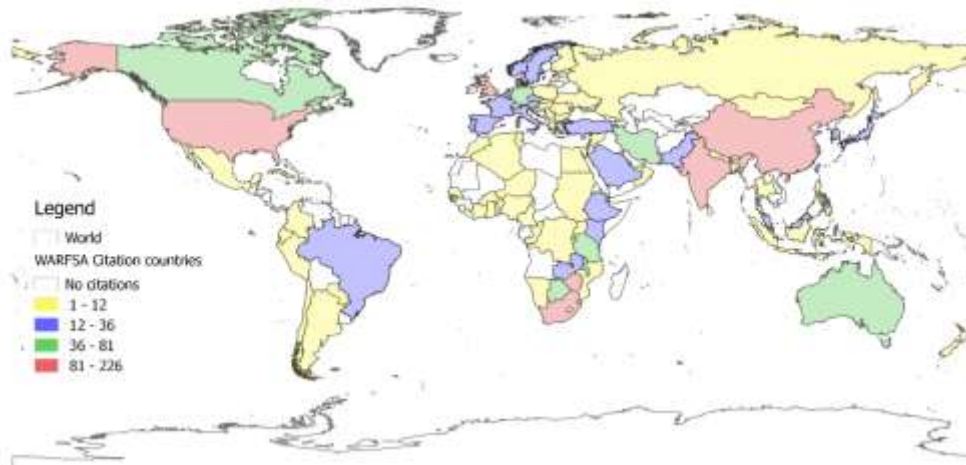
Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Source: Clarivate Analytics™ Web of Science™

Distribution per year of WARFSA Funded articles with high average number of citations per year

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Continent	Total	%
Africa	660	32,4%
Europe	637	31,2%
Asia	505	24,8%
North America	180	8,8%
South America	53	2,6%
Australasia	4	0,2%

Source: Clarivate Analytics™ Web of Science™

Map: Continental and sub-regional distribution of countries citing WARFSA-funded research articles

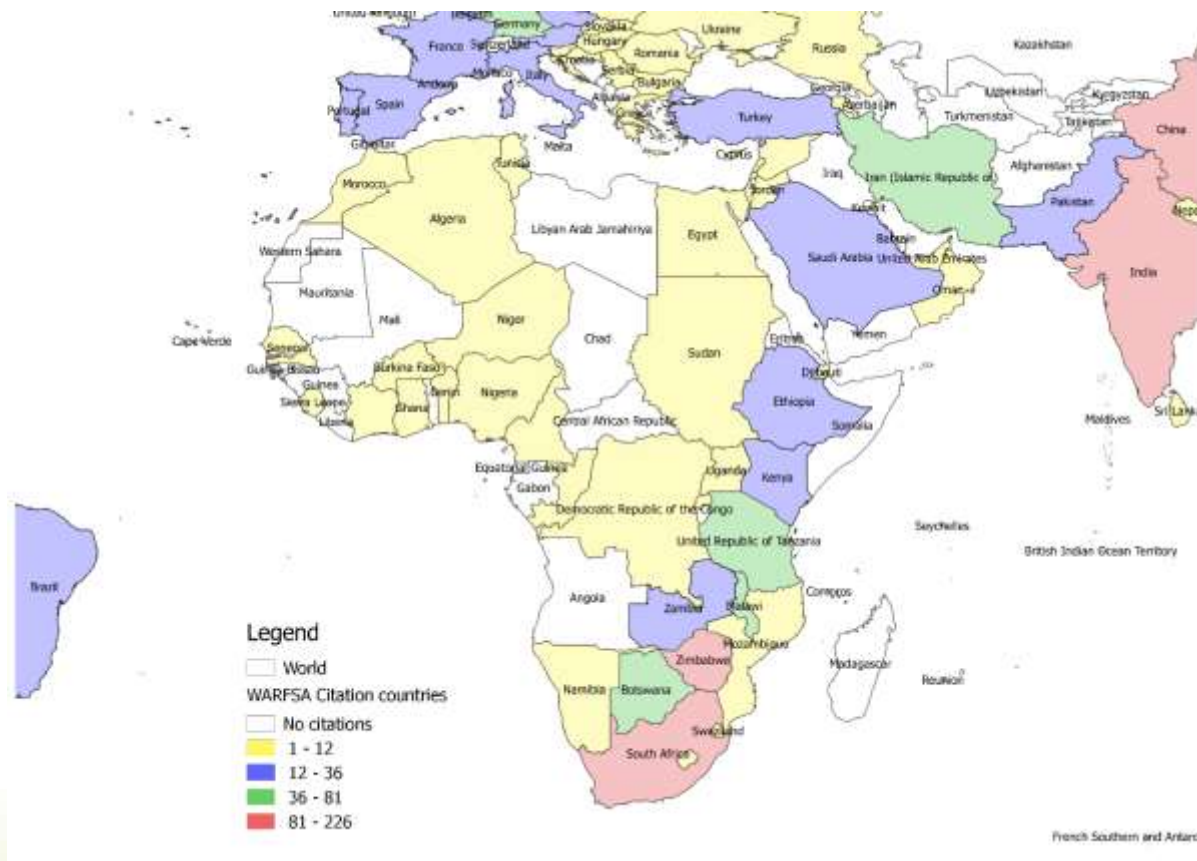
Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

	Rank	Country	Total	%
	1	SOUTH AFRICA	226	11,1%
	2	PEOPLES R CHINA	144	7,1%
	3	USA	124	6,1%
	4	ZIMBABWE	107	5,2%
	5	INDIA	91	4,5%
	6	UK-ENGLAND	88	4,3%
	7	NETHERLANDS	81	4,0%
	8	GERMANY	61	3,0%
	9	AUSTRALIA	59	2,9%
	10	BOTSWANA	54	2,6%
	11	TANZANIA	51	2,5%
	12	IRAN	46	2,3%
	13	CANADA	43	2,1%
	14	MALAWI	43	2,1%
	15	BRAZIL	36	1,8%
	16	MALAYSIA	35	1,7%
	17	JAPAN	31	1,5%
	18	TURKEY	30	1,5%
	19	FRANCE	29	1,4%
	20	SWITZERLAND	28	1,4%
Other countries	86		632	31,0%
Total	106		2039	100%

Source: Calculated from data sourced from Clarivate Analytics™ Web of Science™

Country affiliations of researchers citing WARFSA funded research (top 20 countries)

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)



Source: Clarivate Analytics™ Web of Science™

Continent/Region	Total	%
Africa	660	32,4%
SADC	519	25,5%
East	75	3,7%
West	39	1,9%
North	21	1,0%
Central	6	0,3%

Map: Distribution of African countries citing WARFSA-funded articles

Primary results – Knowledge Produced in research projects associated with WARFSA (ChII)

Research institutions	Country	Records	% of 85
University of Zimbabwe	Zimbabwe	20	23,53%
University of Dar Es Salaam	Tanzania	11	12,94%
University of Cape Town	South Africa	7	8,24%
University of Malawi	Malawi	6	7,06%
University of Johannesburg	South Africa	6	7,06%
University Swaziland	Swaziland	6	7,06%
University Lake Kariba Research Station	Zimbabwe	6	7,06%
Leeds Metropolitan University	United Kingdom	5	5,88%
Centre for Research Environment and Health	Unknown	5	5,88%
University of Zambia	Zambia	4	4,71%
University of the Witwatersrand	South Africa	4	4,71%
University of Botswana	Botswana	4	4,71%
Sokoine University of Agriculture	Tanzania	4	4,71%
Council for Scientific Industrial Research CSIR South Africa	South Africa	4	4,71%
Copperbelt University	Zambia	4	4,71%
University of Pretoria	South Africa	3	3,53%
Institute for Water and Sanitation Development	Zimbabwe	3	3,53%

Note: Minimum number of research publications per institution = 3

Source: Clarivate Analytics™ Web of Science™

WARFSA Research article publications per institutions

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

- Mixed methods, assessment of meta-data in the projects, personal interviews and the coding and interpretation of transcribed interviews, a cross-case analysis of themes are presented - with themes arising from the interviews.
- 78 research projects revealed that 57 projects had any relevant meta-data on projects, which include only 20 projects with progress reports.
- In addition, 26 CVs of researchers were available, which were used in identifying projects for interviews. Meta-data further provided the email address of the project PIs, however this was fairly outdated, as the WARFSA programme implementation concluded more than ten years ago. The email addresses were updated with email data obtained through the WaterNet secretariat, to whom many of the researchers belong and are associated with. Initial email contact was made with WARFSA Project PIs, requesting further information such as project reports, and further if a preliminary indication could be provided if policy update resulted from their specific research. This assisted in identifying active email addresses and secondly potential researchers who could be contacted to be interviewed.

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

- This resulted in 29 projects identified for potential interviews. In addition, a WARFSA Board member and a past programme manager were identified who were available for interviews to supplement questions related to the translation of research into policy and practice.
- interview schedule was developed consisting of two parts. Part I consisting of questions relating to the project itself with the specific aim of “taking researchers back” to the project and to refresh their memory on the specific project. The second part focused on questions relating to the translation of the research project into policy and/or practice.
- In total, ten interviews were conducted, with eight interviews with the PIs from WARFSA funded research projects, and additional interviews with one past-WARFSA Board member and one past-WARFSA programme manager.

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

Background to the research project	Policy and practitioner uptake
Role of WARFSA: PI	Involvement in project selection: Yes
Role of WARFSA: Researcher	Involvement in project selection: No
Role of WARFSA: Board member	Assisting with the project: Yes
Role of WARFSA: Programme Manager	Assisting with the project: No
Impetus: Society need	Disseminate of research
Impetus: Scientific curiosity	Direct citing of research: Yes
Impetus: Policy need	Direct citing of research: No
Influenced by: Own previous research	Citing of subsequent research: Yes
Influenced by: Other research	Citing of subsequent research: No
Subsequent research: Yes	Barriers to research uptake
Subsequent research: No	

Coding of interviews in ATLAS.ti

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

1. A heightened level of optimism and progressiveness were prevalent in relation to water research in the early 2000s. This coupled with the initial implementation of Integrated Water Management at the SADC regional level, provided for an ideal backdrop for the implementation of the WARFSA programme.
2. “Two-communities” exist in the SADC water sector with, on the one hand, the research community and, on the other hand, policy-makers and practitioners. This result to a certain extent, in a gap between the two communities. Within the WARFSA programme, the two communities were also prevalent, even though mechanisms were put in place at the project selection phase to bridge a potential gap between the two communities. From the interviews, evidence do however exist that the main focus of the WARFSA programme was to fund research capacity development as appose to policy-uptake.

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

- 3 Factors which contributed to a gap between policy-makers and the researchers include a sense that policy-makers and practitioners were ill equipped to understand and implement research, and that policy-makers did not seek input from researchers. Researchers themselves did not necessarily disseminate research to policy-makers and practitioners, with a lack of a deliberate action or strategy from the programme implementation perspective. Moreover, a lack of funding hindered researchers to disseminate research, with novice researchers sometimes experiencing difficulty in accessing policy-makers and hindered by a lack of financial resources.

Primary results – Policy- and practitioner aspects evident from WARFSA funded research projects (Ch12.)

- 4 In bridging the gap between the two communities, evidence exist that researchers involved policy-makers and practitioners at the selection of projects and during the research projects. From the interviews, it is apparent that even though the WARFSA-funded research primarily focused on researcher capacity development, outputs were produced from the research which were disseminated to practitioners. Dissemination of research outputs did occur to policy-makers, which in some cases did influence policy, and that this often occurred through subsequent projects and over time through other projects, which resulted from the initial WARFSA-funded research.

Primary results – Knowledge Produced in research projects associated with WARFSA (1999-2016)

- 5 Intermediaries and knowledge brokers are prevalent throughout the SADC water sector, with individuals and government departments playing a role. Moreover, in terms of the WARFSA-funded research projects, the annual WaterNet/WARFSA/GWP-SA symposium, along with implementing agents such as WaterNet and GWP, still provide an intermediately platform for researchers, policy-makers and practitioners to interact.

Conclusions

The background of the slide is a solid light green color. It features several thin, flowing, wavy lines in a slightly darker shade of green and a few thin blue lines, creating a sense of movement and depth. These lines are most prominent in the lower half of the slide, where they appear to sweep across the frame.

Conclusions

With limited funding available for SADC countries excluding South Africa, water research programmes such as the VWARFSA have demonstrated that they could contribute significantly towards knowledge production. As further evident, the time lag since the VWARFSA programme concluded in 2006, and when the bibliometric aspects of this study were conducted in 2015/2016, proved of benefit but also as a constraint in certain aspects. The time lag proved beneficial in assessing the scientific impacts of VWARFSA-funded research outputs as the citing of articles often occur only after a few years.

On the other hand, the time lag proved problematic for assessing the policy/practitioner uptake from the VWARFSA programme, as limited research project documentation was available with only a few of project PIs contactable. The study did however provide valuable insight into the relationship between researchers and the policy-makers/practitioners, and methods researcher employed to bridge an apparent gap between the research community and policy-makers/practitioners .

Conclusions

Where research impact evaluations are undertaken ex post, and especially if it is undertaken after a number of years as in the case of this study, meta-data on the different research projects might be limited. Moreover, project PIs and associated researchers might have difficulty attributing research impact to the specific research after such a long time. Although outcomes might have materialised since the conclusion of the VWARFSA-programme in the mid-2000s, a structured methodology was not followed to track outputs, which leads to a situation where it becomes extremely difficult to attribute research impact of the VWARFSA programme. The study did however succeed in providing some benchmark.

Future research could further develop the theoretical framework used in this study and address some of the issues raised above, to support the evaluating of research projects with an ecological dimension.

Future research

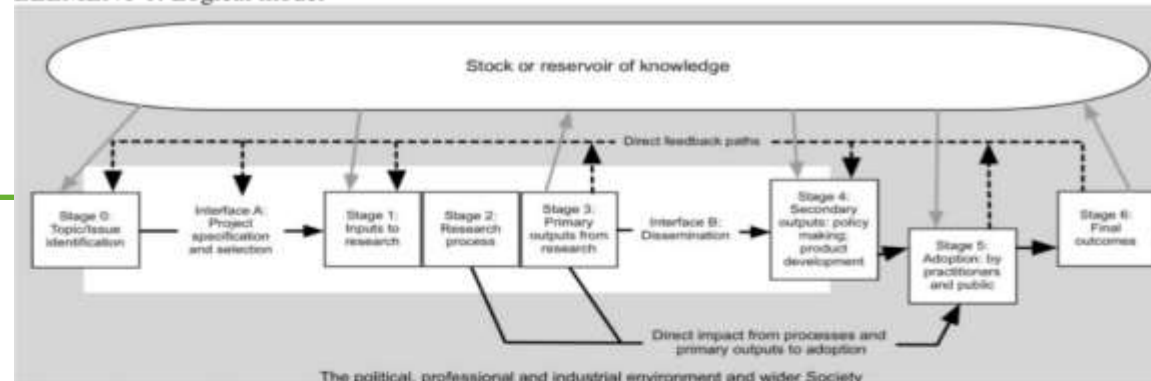
The background of the slide is a solid light green color. Overlaid on this background are several thin, flowing, wavy lines in a slightly darker shade of green and a muted blue. These lines sweep across the lower half of the slide, creating a sense of movement and depth. The lines are not perfectly straight, following a curved, organic path that suggests waves or perhaps the flow of data or research.

Future research

1. As this study focussed on the knowledge production and policy dimension resulting from WARFSA-funded research projects, further research could be conducted to evaluate the economic-, ecological- and social benefits derived from the WARFSA programme itself.
2. There has been notable developments regarding altmetrics with, for example, the integration of the altmetric platform Plum Analytics ([www.plumanalytics](http://www.plumanalytics.com)) into Elsevier in 2017. Such integration provide a broader view on the use of research outputs on media platforms beyond Citation Index databases. Given that such developments are fairly recent, altmetric scores were excluded from this study, and could provide useful information in refining the bibliometric analysis of water research in the SADC region.

The original HERG Payback Framework

ELEMENT 1: Logical model



Source : (Donovan & Hanney, 2011)

ELEMENT 2:

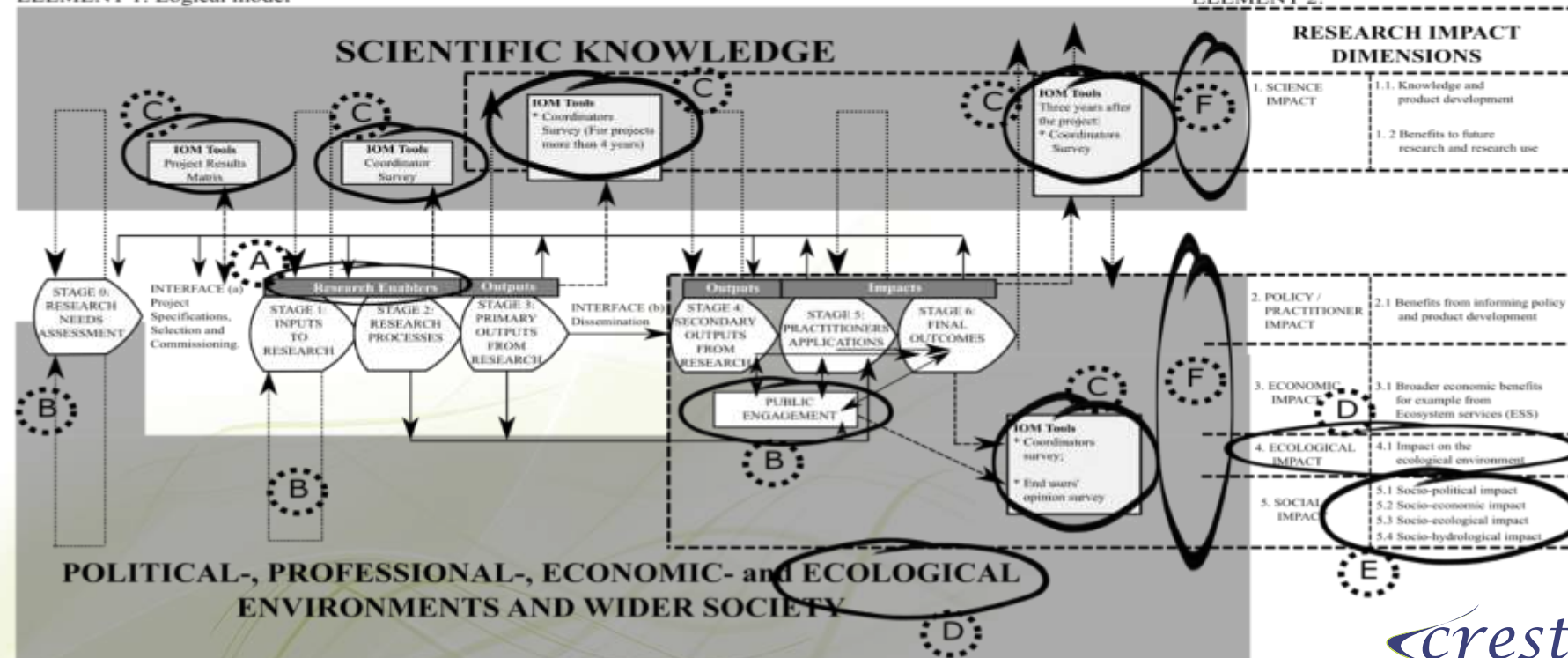
Research Impact Dimensions

1. Knowledge
2. Benefits to future research and research use
3. Benefits from informing policy and product development
4. Health and health sector benefits
5. Broader economic benefits

Source : (Donovan & Hanney, 2011)

The Payback-Eco Framework

ELEMENT 1: Logical model



Thank you

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