KNOWLEDGE REVIEW AND AGENDA SETTING FOR FUTURE INVESTMENTS IN RESEARCH ON WATER GOVERNANCE IN SOUTH AFRICA

Report to the
Water Research Commission

by

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EXECUTIVE SUMMARY

BACKGROUND

Water governance, simply put, is a set of systems that control decision-making with regard to water resources development and management. An analysis of global trends in water governance shows a need to address a worsening water crisis, compounded by climate change, rising urbanisation and population growth. Closely aligned to these trends, but distinct in its own trajectory, South Africa's water governance dynamics have evolved through a period of considerable socio-political change marked by inequitable resource allocation and water scarcity.

This report presents an overview and analysis of the state of water governance research in South Africa from 1990 to 2019, with the overall aim of supporting the future research agenda for the Water Research Commission (WRC).

AIMS

The following were the aims of the project:

General:
Review of the state of knowledge on water governance in order to inform the process of agenda setting for future WRC investments in research on water governance.

Specific:

- Stocktake and analysis of current knowledge on water governance in or relevant to South Africa, including international and South African reports and articles across academic journals and grey literature, and building on other recent scientometric and other analyses (e.g. Water RDI Roadmap implementation plan).
- Examination of the WRC-funded component of this knowledge set, with particular reference to the extent to which this knowledge has been published beyond WRC reports.
- Mapping of the institutions that are the main generators of water governance research outputs in South Africa and analysis of linkages to government, industry and civil society in order to understand relevant impact.
- Contribution to WRC-led processes of horizon scanning and agenda setting for future WRC investments in water governance research, in consultation with the relevant communities of practice (including researchers, policy makers and other users of water governance research).

METHODOLOGY

Two main phases characterised this study (i) a stock take and scientometric analysis of the state of current knowledge on water governance in, or relevant to South Africa, as well as a particular analysis of a data mining exercise on the WRC water governance portfolio, and (ii) a stakeholder engagement process consisting of a consultative workshop and a session at the WRC's Biennial Symposium.

Scopus, as the largest abstract and citation database of peer-reviewed literature, was used for the scientometric assessment, and included a dataset of 511 publications covering a wide range of research topics in the domains of water governance; water policy; water law; Integrated Water Resource Management (IWRM); water regulation; and catchment management. These search terms were consistent with the definition of water governance used in this project – *the political, social, economic and administrative systems in place that*

influence water's use and management including who gets what water, when and how, and who has the right to water and related services, and their benefits. In addition to the primary keywords used, a total of 150 secondary keywords were found in the document titles and abstracts of the dataset. The complete dataset was then analysed for 1) the production of knowledge produced (e.g. the number of water governance publications identified per year, top publishing institutions, top publishing authors, and subject areas covered by the research); and 2) the influence it had (e.g. most influential publications in terms of their number of citations, and the top funders of water governance research and development (R&D)).

In addition, a data mining exercise was conducted of the WRC portfolio's water governance projects, using the earliest available project meta-data, which was 1990 up to and including 2019. The data mining method used was to review all the WRC Knowledge Reviews published electronically. A total of 336 projects were identified as water governance projects, either classified as such by the WRC under various portfolios, or by the project team upon review of the project description in the Knowledge Reviews. The WRC dataset was cross-checked against the Scopus dataset to compare and contrast trends such as the top publishing institutions and whether they were similar to the top-funded institutions by the WRC, the top publishing authors and whether they reflected a similar WRC project leader cohort, thematic areas most published and themes of WRC projects. Both of these datasets were then also compared to the existing global and national discourse and similar studies conducted to analyse overall trends and patterns in water governance paradigm shifts over time.

RESULTS AND DISCUSSION

Scientometric stocktake and analysis of current water governance R&D

In this phase, through a systematic scientometric analysis of the Scopus database, it was found that (i) the number of water governance publications per year has been steadily increasing from 1990 with a noticeable spike in 1995 – attributed to policy reforms following South Africa's democratic transition in 1994 and, (ii) the highest number of peer-reviewed publications on water governance were recorded in 2016. Among the top five institutions publishing water governance research were the Council for Scientific and Industrial Research (CSIR) (16%), the University of KwaZulu-Natal (UKZN) (13%), the Department of Water Affairs and Forestry (7%), the International Water Management Institute (IWMI) (6%), and the University of Pretoria (5%). While nine of the top ten institutions were South African, several international institutions such as IWMI, the Norwegian University of Life Sciences (Universitetet for miljø- og biovitenskap) (with 15 publications), the Institute of Development Studies (IDS) (with 14 publications), the University of Sussex (with 12 publications), and Wageningen University (with 11 publications) also play a key role as publishers of water governance research on South Africa. Another significant finding was the role of the Department of Water and Sanitation (DWS) as both a generator and user of knowledge, and indeed, the third biggest publishing institution of water governance R&D. Of concern however, is the downward trend in the production of knowledge by the department over time.

Further, an analysis of individuals leading these publications revealed a wide range of disciplinary backgrounds, from natural and environmental sciences to political science and economics. Despite the disciplinary diversity, the demographic profile of the leading water governance researchers still reflects a largely older, white, male cohort.

The WRC was found to be the leading funding agency for water governance research contributing 33% towards total funding, followed by the CSIR (12%) and the National Research Foundation (NRF) (12%). International funders also funding water governance research in South Africa included the Social Sciences and Humanities Research Council of Canada (7%), Department for International Development (DFID), United Kingdom (7%) and the Research Council of Norway (Norges Forskingsråd) (7%).

The data mining exercise conducted of the WRC's funding portfolio revealed that since 1990, the WRC funded a total of 336 projects identified as water governance related. Private sector consultants were awarded 43%

of the total number of projects while higher education institutions (HEIs) were awarded 33% and parastatals and government agencies, 12%. During the period 1990-2019 the CSIR and UKZN were awarded the greatest number of projects, each receiving 28 and 22 respectively out of the 336 water governance-related projects for that period. In total, the WRC has awarded R320,745,250 to water governance and related research from 1990 to 2019. The bulk of this funding was awarded to HEIs at 47% (R149,633,566), followed by the private sector at 32% (R101,603,219) and parastatals/government agencies at 14% (R44,197,405). An observable trend worth noting is that while HEIs received a lower number of projects, the individual grant amount awarded per project was generally greater, suggestive of HEI projects being of longer duration (reflective of long-term research and post-graduate study support) than those undertaken by consultants. The WRC funding portfolio also reflects similar patterns found in the scientometric analysis in terms of the key institutions publishing water governance research (CSIR, UKZN, UCT, Rhodes University), indicating that the institutions receiving the highest number of WRC-funded projects are also the highest publishing institutions.

In summary, the allocation of WRC funds to water governance R&D is, on average, 15% of the total WRC portfolio but may be more if we had to take into consideration several studies that indirectly covered issues pertaining to governance but were not mapped to the water governance portfolio or to the WRC's Key Strategic Area (KSA) 1 (before the WRC's water governance portfolio was conceptualised). Finally, the trend analysis confirms a reactive/responsive analytical trend vs a proactive/forecasting/predictive trend in the content. In other words, and acknowledging the conventional publication lag period, research outputs were responsive (at the best of times) or reactive (at the worst of times) to previous trends and key developments in the water governance landscape. This issue was further unpacked in the stakeholder engagements held.

Stakeholder engagement: Knowledge review and agenda setting

Stakeholders, drawn from a cross-section of the sector, took part in a consultative workshop to review water governance research in South Africa and to deliberate on the preferred course for the future. A second consultation was held at the WRC Biennial Symposium where the broader research community engaged with the project's findings and the initial inputs of the consultative workshop. Four main areas emerged as defining the current state of water governance research knowledge and its uptake: 1) Research relevance and responsiveness; 2) Availability and nature/source of funding; 3) Addressing the implementation challenge, and 4) The silo approach.

<u>Research relevance and responsiveness</u>

Key message: *Water governance research is passion-driven as opposed to being needs-based, and slow in responding to urgent needs.*

Stakeholders observed that current national water governance R&D outputs are 'passion-driven' as opposed to being 'needs-based', in that researchers tend to research what they enjoy/are passionate about instead of addressing an important national governance challenge. On the other hand, stakeholders also acknowledged the individualisation of research focus, and the world views shaping researchers' approaches to water governance and how they research it.

When knowledge is generated reactively rather than proactively, it fails to keep up with current needs. It emerged from the discussion that research outputs fall behind current water governance issues, particularly in a fast-paced environment where there is a dire need for research knowledge to respond with agility to emerging issues. Increased support from the research fraternity to government departments is needed particularly in crisis periods where decisions have to be made at a political level.

<u>Availability and nature/source of funding</u>

Key message: *We need to be mindful of how funding flows influence what we research, particularly how international interests shape the national water governance agenda.*

Funding availability was discussed in two instances, (i) where resources available for research are increasingly under strain, thus limiting the scope of areas that can be addressed, and (ii) when research is guided by the source of funding rather than the need, typically related to international donor agendas. This oftentimes stands in the way of research innovation and applicability. It also results in the implementation of isolated projects. In this regard, the water governance R&D community were criticised for not being good at building a pipeline of expertise and a programmatic approach to address key challenges.

Addressing the implementation challenge

Key message: *We need to interrogate policy implementation or the lack thereof as a research field, i.e. the need for embedded research.*

Stakeholders emphasised several policy implementation challenges including: limited appropriate planning, capacity challenges, mismanagement and corruption, as well as the lack of clearly articulated impact pathways and/or theories of change. This is compounded by weak support from the research community (in terms of implementation) for government departments, who at times do not have the required technical capacity to appropriately execute policy recommendations.

Moreover, impact assessments of existing policies have not been adequately conducted. There is both a need for a greater partnership between government and the research community to co-create and jointly implement evidence-based governance solutions, as well as a need for 'embedded research' and the need to study implementation as a research field.

The silo approach

Key message: *We need to look at the impact of 'boundary spanners' or 'norm entrepreneurs' and profile these champions.*

Stakeholders from both government and the research community lamented that interdepartmental relationships within government are not solution-oriented in that departments still frequently operate in silos with few cases of effective coordination and alignment between them. As a result of this silo approach, there is no learning culture and no evaluation of failures. Stakeholders suggested that we need to look at the impact of 'boundary spanners' – those individuals that can and do work across institutions, spheres of government and sectors, and profile them as champions for their ability to promote interdepartmental learning and the co-development of governance solutions.

In terms of stakeholders' perceptions on *future* water governance trends and needs, three issues were highlighted: 1) the focus on institutional integrity and good corporate governance; 2) the need for a rapid response water governance research mechanism; and 3) transformation of and within the water governance R&D community. Finally, discussions on the enabling environment highlighted two key elements: 1) packaging and communication of water governance research, and 2) the role of the WRC.

Focus on institutional integrity and good corporate governance

Stakeholders noted the ever-increasing emphasis placed on compliance, dealing with corruption as well as institutional integrity and corporate hygiene.

The need for a rapid response water governance research mechanism

The notion of a constructive, adaptive and rapid response research mechanism in an environment of increasing change and uncertainty was suggested. This would serve as a support mechanism to government in responding to immediate crises and challenges in the short-term.

Transformation of and within the water governance R&D community

The demographic profile of the leading water governance researchers as well as the size of the top author cohort were regarded as limiting. In this regard, there is a need to focus on the transformation of the water

governance R&D community that promotes the inclusion of more, and particularly, younger, black and female voices. The study makes an important point that transformation in this context is not just about increasing the diversity of researchers from a representation point of view, but equally about challenging the hegemony of paradigms.

CONCLUSIONS

This report highlighted the on-going debate in the water governance R&D community (and similarly, in other epistemic communities as well) between the degree to which research is retrospective (analysing and responding to governance challenges of the time) vs being sufficiently pre-emptive (providing predictions and forecasts to address future challenges and at least when they arise). Striking a balance between the two is key in having a research community that can add value to practice.

Water governance R&D also tended to be based on researchers' individual interests and passions as opposed to being needs-based. Water governance R&D will have to assume a certain agility that can keep up with the demands for timely evidence-based responses. As such, a more practical approach to research has to be considered which actively seeks to implement research knowledge.

Finally, the role of the WRC was examined in strengthening the enabling environment. The WRC is strategically positioned to direct and coordinate the future of water governance research by convening a national community of practice that is well-coordinated in its engagement with government. While this short-term project kick-started an important process toward setting the agenda for future investment in water governance research for South Africa, it is now imperative to not only build a programmatic approach and pipeline of diverse expertise, but also the strengthen the water governance R&D community of practice, as well as develop a dedicated rapid-response mechanism to adequately support government in responding to immediate challenges.

RECOMMENDATIONS

This study recommended that:

- Future research be more solution oriented.
- There is need for a new paradigm in water governance research – an adaptive and rapid response research agenda in an environment of increasing change and uncertainty.
- The WRC has an important role to play in driving the water governance research agenda. Its key functions in this discourse would include:
    - Establishing a community of practice for water governance experts that can respond to issues with agility.
    - Developing a programmatic approach to its water governance portfolio by consolidating knowledge generated from different projects to provide an overall picture for challenges being addressed.

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Dr Kevin Winter	Lecturer, UCT
Ms Shanna Nienaber	Water RDI Roadmap Manager, WRC
Dr Barbara van Koppen	Principal Researcher, IWMI

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ACRONYMS & ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research, South Africa
DFID	Department for International Development, United Kingdom
DWS	Department of Water and Sanitation, South Africa
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
KSA	Key Strategic Area (WRC)
NGO	Non-governmental organisation
NPO	Non-profit organisation
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development
ToR	Terms of Reference
UKZN	University of KwaZulu-Natal
WGF	Water Governance Facility
WRC	Water Research Commission

CHAPTER 1: BACKGROUND

1.1 INTRODUCTION

Water governance is the overarching yet ambiguous domain people point at when water systems fail the world over – “the water crisis is a crisis of governance” (GWP, 2002; OECD, 2011). And yet it is not so easily defined. A widely accepted albeit very broad definition of this term is provided by the Global Water Partnership (GWP), that defines it as “the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society” (Rogers and Hall, 2003). Simply put, water governance is the set of systems that control decision-making with regard to water resource development and management. Water governance is therefore much more about the way in which decisions are made (i.e. how, by whom, and under what conditions decisions are made) than about the decisions themselves (Moench et al., 2003). Most often it is about the political choices about where water should flow; the norms, rules and laws on which such choices should be based; who is best able or qualified to decide this; and about the kind of societal future such choices support (WIREs Water, 2017). It is as much about the formal institutions and processes by which authority is exercised as it is about the informal processes and institutions doing the same.

In addition, water governance, as approached and applied in academic and also decision-making circles, is often more about what water governance *should be* as opposed to what it actually *is* (WIREs Water, 2017). For example, the concept of ‘good governance’ adopted by funders such as the World Bank and others in their lending policies to developing countries, has come to be associated with the promotion of transparency, accountability, and integrity, and has become the ‘neutral’ title for a distinct political reform agenda (Colebatch, 2014; WIREs Water, 2017). This agenda has merged New Public Management principles with support for liberal democracy (Rhodes, 1996; WIREs Water, 2017) through advocating for the free market economy; the privatization of public enterprises; the movement towards a leaner civil service; the introduction of budgetary discipline; the decentralization of administration and the greater reliance on non-governmental organizations (WIREs Water, 2017). Most notably, this reform agenda has also purported for the creation of markets or quasi-market mechanisms for regulating water resources or water rights with the assumption that it would improve the productivity of water uses and address the challenges of environmental degradation (Ahlers and Zwarteveen, 2009; Bakker, 2007; Boelens, Zwarteveen and Prices, 2005; WIREs Water, 2017).

More recently, normative approaches have become more nuanced. As noted by the Water Governance Facility (WGF), “governance should mainly be perceived as a neutral term. What is good for some can be bad for others” (UNDP, 2016). These trends reflect the notion that improved governance is path dependent and needs to be linked to particular development goals in society, such as water services and sanitation for all, equitable reallocation of water between users, or any other goals such as food and energy for all, or conservation/restoration of ecosystems. It therefore refers not only to the state of government, but to the overall health of society and to civil society and the private sector, and where development takes place within different constellations of these three entities. The Organisation for Economic Co-operation and Development (OECD) Principles on Water Governance is a good example of this, providing 12 must-do actions for governments to design and implement effective, efficient, and inclusive water policies. To date, they have been endorsed by 170+ stakeholder groups or governments – “Coping with future water challenges raises not only the question of “what to do?” but also “who does what?”, “why?”, “at which level of government?” and

"how?". Policy responses will only be viable if they are coherent, if stakeholders are properly engaged, if well-designed regulatory frameworks are in place, if there is adequate and accessible information, and if there is sufficient capacity, integrity and transparency." (OECD, 2015: 1).

These normative conceptualisations also reflect several historical trends over time. Situating the South African water governance R&D discourse in a broader (international) context, this knowledge review acknowledges these global trends and normative conceptualisations but does not delve into them in any great level of detail. The term 'water governance' itself, marks a change in policy emphasis from infrastructure to the organizational, financial, and institutional arrangements needed to regulate and order flows of water – a shift that came about in the 1980s-1990s, (WIREs Water, 2017; Batchelor, 2006). But as a concept, it has only recently been used in the water sector (Franks and Cleaver, 2007), making its appearance in the Second World Forum on Water held in The Hague in 2000 (Rogers and Hall, 2003). Later, when the WGF was established in 2005 out of a partnership between the UNDP and the Stockholm International Water Institute (SIWI) they provided a more thorough and specific definition that includes those essential elements that water governance should address including, principles such as "equity and efficiency in water resource and services allocation and distribution, and balances water use between socio-economic activities and ecosystems", demanding the "clarification of the roles and responsibilities of government, civil society and the private sector in relation water resources and services" (UNDP, 2020).

Indeed, since the 1990s, and particularly in South Africa because of the democratisation process, the water governance narrative has been situated within an open social structure that predisposes broader participation by civil society, private enterprises and the media, all networking to support and influence government (Batchelor, 2006). This growing trend has emphasised informal water governance systems to supplement formal authority through public-private coordination and co-operation (ibid). We have seen the growth of consensus forums and non-consensus forums (e.g. World Water Forum); the shift away from centralised public law treatment of the social good nature of water towards a more private law treatment of the commodity of water (with privatization of water services; governance under the bilateral investment treaties and international arbitration); and a shift to more pluralistic and multilevel governance systems of water management (Gupta, 2011).

How then have these global shifts played out in the South African water governance context, and what has been the research and development (R&D) response and critique of the changes? More importantly, what has been the impact of the R&D response to addressing some of the major water governance questions and challenges over the past two decades? And have the radical policy and governance changes from two decades ago helped to address some of the major water challenges unique to South Africa?

This short-term, solicited project was therefore a call by the Water Research Commission (WRC) to the epistemic community to provide support for the critical analysis and provision of innovations in crafting its water governance research strategy and agenda with a distinctly South African perspective. While water governance has been an area of research for the WRC for several decades, the funding approach was dispersed throughout its key strategic areas (KSAs), which resulted in a poorly coordinated approach to the water governance portfolio, lacking the desired coherence and inputs for the sector. The commitment of a dedicated resource pool with a defined portfolio can significantly enhance the WRC's contribution to addressing matters of water sector governance in South Africa.

This new research agenda will conceptualise a portfolio that encompasses multiple scales (from the international to the sub-national and even individual), responds to current and immediate challenges while at the same time continuing to scan the horizon in order to surface future risks and opportunities, and also be as much forward thinking as it is retrospective (learning from the past).

1.2 PROJECT AIMS

The WRC therefore commissioned a short-term project to conduct a review of the state of knowledge on water governance in South Africa in order to inform the process of agenda setting for future WRC investments in research on water governance.

Its specific project aims were:

1. To conduct a stocktake and analysis of the state of current knowledge on water governance in or relevant to South Africa, including international and South African reports and articles across academic journals and grey literature, and building on other recent scientometric and other analyses (e.g. the Water RDI Roadmap implementation plan)
2. To examine the impact of the WRC governance portfolio in terms of the extent to which this knowledge has been published beyond WRC reports.
3. To identify the main contributors to this body of work in South Africa and their linkages to government, industry and civil society.
4. To support the WRC in its horizon-scanning and agenda-setting processes for future WRC investments in water governance research, in consultation with the relevant communities of practice (including researchers, policy makers and other users of water governance research)

The project was conceptualised in two phases. In its first phase, this project completed a review of water governance R&D using scientometric methods and a data mining exercise of the WRC funding portfolio. Based on this desktop approach, the project team compiled a preliminary database of water governance R&D projects, institutions, individuals, funders and focus areas. We also analysed key trends and patterns emerging from the scientometric analysis against the WRC portfolio data mining exercise. In its second (stakeholder engagement) phase, the project team co-convened a national stakeholder workshop with the WRC to cross-validate and triangulate the scientometric and data mining findings. The workshop also sought to gather stakeholder inputs on the current and future governance challenges and knowledge gaps, the research priorities that it suggests as well as the enabling environment needed to build and/or strengthen the water governance R&D community of practice. Participants included leading water governance authors, policy and decision-makers in government as well as representatives from the private sector and civil society. A second consultative engagement was coordinated at the WRC Symposium to get further inputs to the key findings of the stakeholder workshop. Together, these consultative sessions contributed to participatory agenda-setting of the WRC's water governance R&D portfolio. It is hoped that this will lead to the creation of a more coordinated water governance R&D community of practice that can support the WRC in the crafting and implementation of its water governance R&D agenda and strategy.

1.3 SCOPE AND LIMITATIONS

Despite its use in this study, the project team is well aware of the limitations of scientometric methods. The first well-acknowledged limitation is the emphasis it places on peer-review journal articles, that by nature omits the critically important role and impact of grey literature (including books, social media, etc.), particularly for social science and humanities disciplines that tend to make more use of books and other outputs to communicate research findings (Mingers and Leydesdorff, 2015). It is for this reason that this study also included a data mining exercise of the WRC funding portfolio to include the grey literature included in WRC-funded projects such as WRC reports.
Another limitation of scientometrics which is relevant to note in this study is the focus on the citation as the primary tool of measuring impact and influence, i.e. the assumption that the quality of a particular article is reflected by the frequency of its citations in other articles (Mingers and

Leydesdorff, 2015). Originating from the works of Eugene Garfield in the 1950's, the importance of the citation and later, the idea of the Science Citation Index (SCI) and the company, the Institute for Scientific Information (ISI), was born (Garfield, 1955; Garfield, 1979). However, in the humanities and social sciences, there is a lower tendency of citation practices compared to other academic disciplines (Mingers and Leydesdorff, 2015). In response to this challenge, it was important that this study supplement the scientometric study with a consultative process to ascertain the influence/impact of water governance R&D on individual stakeholders, representative of the sector. As Glänzel (2003: 4) notes, scientometric methods "can only supply a very limited picture of the research they are trying to describe". It is therefore advantageous when scientometric analyses are coupled with other techniques.

Similarly, several authors have noted the limitation of the publication count (e.g. the H-index in the case of individual researchers) prioritizing quantity over quality of research outputs, and its associated problems such as gratuitous co-authoring of articles; different publication practices across fields; and difficulties of defining fields of research especially given strong trends towards collaborative research (Laloë and Mosser, 2009; Lundberg, 2006). As above, it is for these reasons that this study needed to include a more qualitative, consultative approach on the nature and relevance of the water governance body of research produced in South Africa, by users of that research including policy-makers and practitioners, not purely academics. In addition, this study has therefore not delved into the deeper statistical citation analyses that scientometrics offer. Instead, it has been used to provide a snapshot of the state of water governance R&D in South Africa.

CHAPTER 2: METHODOLOGY

2.1 SCIENTOMETRIC ASSESSMENT

An analysis of the state of water governance R&D in South Africa was conducted using scientometric methods. First coined by Nalimov and Mulcjenko (1971: 2) the term scientometrics is regarded as "the quantitative methods of the research on the development of science as an informational process." In other words, it is the quantitative study of science and/or scientific disciplines as a process of communication (Mingers and Leydesdorff, 2015) – in essence, a science about science (Price, 1963).

Typically, scientometric studies have been used 1) to measure, classify, and describe the nature of scientific outputs; 2) to understand the dissemination of knowledge; 3) to identify the theoretical and practical impact of academic studies; 4) to understand the behaviour of individual researchers, research teams, and institutions; 5) to explore the nature of scientific outlets; 6) to determine the most efficient allocation of resources to maximise research output and impact; and 7) to propose recommendations for research policy development (Serenko, 2013). These studies have grown in prominence particularly because of their use in the evaluation and management of research performance by governments and their science-based and funding agencies, whether at the level of the researcher, research group, institution or journal.

For this scientometric assessment, Scopus was used, as the largest abstract and citation database of peer-reviewed literature. Scopus is Elsevier's abstract and citation database launched in 2004 covering roughly 36,377 publication titles dating back to 1966 from approximately 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields: life sciences, social sciences, physical sciences and health sciences (Burnham, 2006).

The following keywords were used in the Scopus Boolean search:

- Water govern* and South Africa
- Water polic* and South Africa
- Water law and South Africa
- IWRM and South Africa
- Water regulat* and South Africa
- Catchment manage* and South Africa

These search terms are consistent with the definition of water governance used in this project, i.e. that which refers to the political, social, economic and administrative systems in place that influence water's use and management. Essentially, who gets what water, when and how, and who has the right to water and related services, and their benefits (Allan, 2001; UNDP, 2020). This broad conceptualisation also focuses on issues of equity and efficiency in water resource and services allocation and distribution, and balances water use between socio-economic activities and ecosystems. Given that governing water is not only limited to government, the search went broader than issues pertaining to the regulatory ambit of government to also include the clarification of the roles and responsibilities of civil society and the private sector in relation water resources and services.

In addition to the primary keywords used, a total of 150 secondary keywords were found in the document titles and abstracts of the dataset as illustrated in the word cloud in Figure 1, including but

not limited to: South Africa; Water Resource; Water Management; Catchment; Water Supply; Southern Africa; Africa; Sub-Saharan Africa; Water Resource Management; Water Planning; Sustainable Development; Integrated Water Resources Management; Water Quality; Governance Approach; Runoff; Decision Making; Water Governance; Management; Rivers; Water; Water Use; Sustainability; Climate Change; Resource Allocation; Integrated Approach; Stakeholder; Water Policy; Institution; Resource Management; Catchment Management. The greater the size of the font of the keyword in Figure 2, the more times it appeared in the dataset.

Figure 1. Word cloud of keywords found in the Water Governance in South Africa R&D dataset

2.2 DATA MINING THE WRC PORTFOLIO

A database of all WRC-funded water governance projects was compiled from a data mining exercise of the WRC portfolio from the earliest available project meta-data, which was 1990. The decision to analyse the WRC portfolio was made based on the assumption that as the majority funder (accountable for approx. 65% of total funding) of water R&D in South Africa, the WRC would also be the majority funder of water governance R&D.

The data mining method used was to review all the WRC Knowledge Reviews published electronically. The WRC Knowledge Review is a comprehensive report on projects funded/co-funded by the WRC in a given financial year. The first electronic version dates back to 1990 and provides an excellent overview of the fund portfolios as well as project summaries that include 1) project title; 2) project description 3) contract value and 4) duration of project.

The research strategy used to select projects for inclusion in the water governance project list was 1) it was classified as such by the WRC under various portfolios (using similar keywords to the scientometric assessment, i.e. water policy, IWRM, catchment management, water law, water resource management, etc.), or 2) it was classified as such by the project team upon review of the project description. The need for additional manual classification by the project team was due to the fact that the WRC only conceptualised its water governance portfolio in the mid-2000s. Before that, the focus of the WRC portfolio was largely engineering and natural-science based. That is not to say that water governance research was not funded, but it was not mapped to a specific water governance portfolio or Key Strategic Area. The project team needed to sieve through the WRC's earlier (pre-2000) portfolio using keywords used in the scientometric assessment to identify those water governance projects that may have been classified under, and mapped to, other portfolios, e.g. several projects mapped to the water quality portfolio had significant water governance (water quality management and its regulatory mechanisms) components.

2.3 CONSULTATIVE STAKEHOLDER ENGAGEMENT PROCESS

Finally, the scientometric analysis and data mining exercise enabled the project team to map the top publishing institutions of water governance research outputs in South Africa, but a stakeholder mapping and engagement exercise was needed to answer the second part of the review, namely to analyse the linkages of these institutions and research outputs to government, industry and civil society in order to understand relevant impact. The latter involved the identification, mapping of relevant stakeholders in water governance research in South Africa, to ensure contextually relevant data and outcomes. Stakeholder mapping determines the likely relationship between stakeholders and the project, and helps to identify the appropriate consultation methods for each stakeholder group during the life of the project. Some of the most common methods used to consult stakeholders include: semi-structured interviews, focus group discussions and consultative workshops.

Based on the scientometric analysis and data mining exercise conducted, the project team compiled an initial stakeholder database of names, affiliations and contact details, and built on this through the identification of additional stakeholders (for example through snowballing) as the project progressed.

A water governance R&D stakeholder database was produced, and from that, a selected and representative group of water governance knowledge generators, policy makers, industry practitioners and 'boundary spanners' (i.e. those individuals who facilitate working across different spheres of government, institutions and sectors) were brought together for a consultative stakeholder knowledge review and agenda setting workshop in August 2019. The aim of the workshop was to enable the relevant communities of practice to engage with the results of the analysis and begin co-creating a future research agenda for the WRC water governance portfolio, by deliberating on the current state of water governance R&D, and to build on this to map future research focus areas. Group discussions were structured around the following themes:

1. The current key governance challenges and knowledge gaps:
    a. What is being done/not done?
    b. What research priorities does that suggest?
    c. What should we be focusing on now?
2. Future water governance trends:
    a. How do you see water governance playing itself out in the medium-long term?
    b. To respond to future governance challenges, what should we be doing now? How?
3. A focus on the enabling environment:

a. Is there a water governance R&D community of practice active in the country? Do we need to invest in building a community/strengthening existing communities?
b. What role should the WRC be playing in relation to this community of practice?
c. What resources are needed?

In addition to the stakeholder workshop, the project's findings and stakeholders' inputs were presented at the WRC Symposium in September 2019 to a broader research community as a way of triangulating stakeholder inputs.

CHAPTER 3: RESULTS

3.1 SCIENTOMETRIC ASSESSMENT

In terms of the selection criteria, the scientometric search included both open access and other access types from 1990 to 2019, identifying a total of 592 publications. However, after screening the initial dataset, the dataset was manually filtered for South Africa-specific publications, and non-governance publications were removed. The revised dataset included 511 publications of which 92 were open access and 419 were other access types. A range of document types were included through an advanced search with the large majority of documents in the dataset being peer-reviewed journal articles (373 or 73%) as shown in Figure 2.

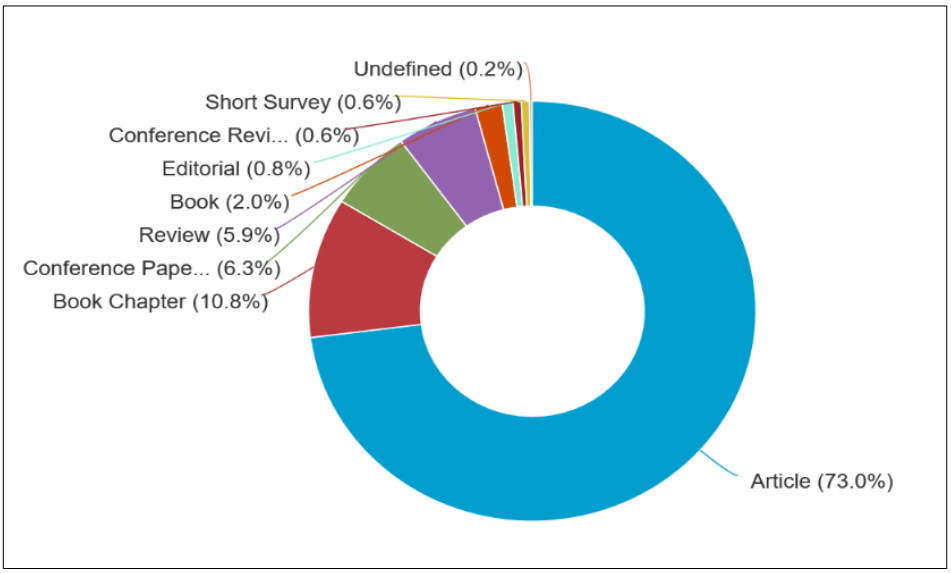

Figure 2. Breakdown of document types included in the Scopus search

3.1.1 Production

Figure 3 shows the temporal distribution (by year) of the publications related to water governance in South Africa. There is a gradual increase in water governance publications over time, with a significant spike in 1995 following analyses of the democratic dispensation and the range of policy reforms underway at the time. We compare this study's findings to the global study by Durán-Sánchez et al. (2019) which found an exponential increase in publications from 2009 when, they argue, the real 'boom' of the discipline took place, with about two-thirds of the papers being published in the last five years, and with 2018 being the year in which the highest number of publications were produced.

While Durán-Sánchez et al. (2019) note that the first water governance paper appeared in 2003, in the South African dataset used, the first related articles date back to 1990, albeit focusing more on a broader water resource management paradigm. This could largely be attributed to South Africa's democratization process and the attention placed on IWRM (even if not referred to by that name yet) and participatory forms of management in the lead up to the historic 1994 election and the constitutional settlements of 1993. Specifically, since 2013, roughly 40% of the total number of Scopus articles in this study's dataset have been published. This does not corroborate the findings of Durán-Sánchez et al. (2019) who found a higher (70%) concentration of articles between 2013

and 2017, and who related this to the fact that the Water Governance concept did not begin to be considered as an independent discipline until the definition of the United Nations Development Program. The reason for the difference can be attributed to the pronounced earlier South African water governance narrative in the early 1990s. It could also be attributed to this study's inclusion of the development trajectories of related terms such as IWRM and integrated catchment management, and not only a strict use of "water governance" as the primary keyword in the scientometric search.

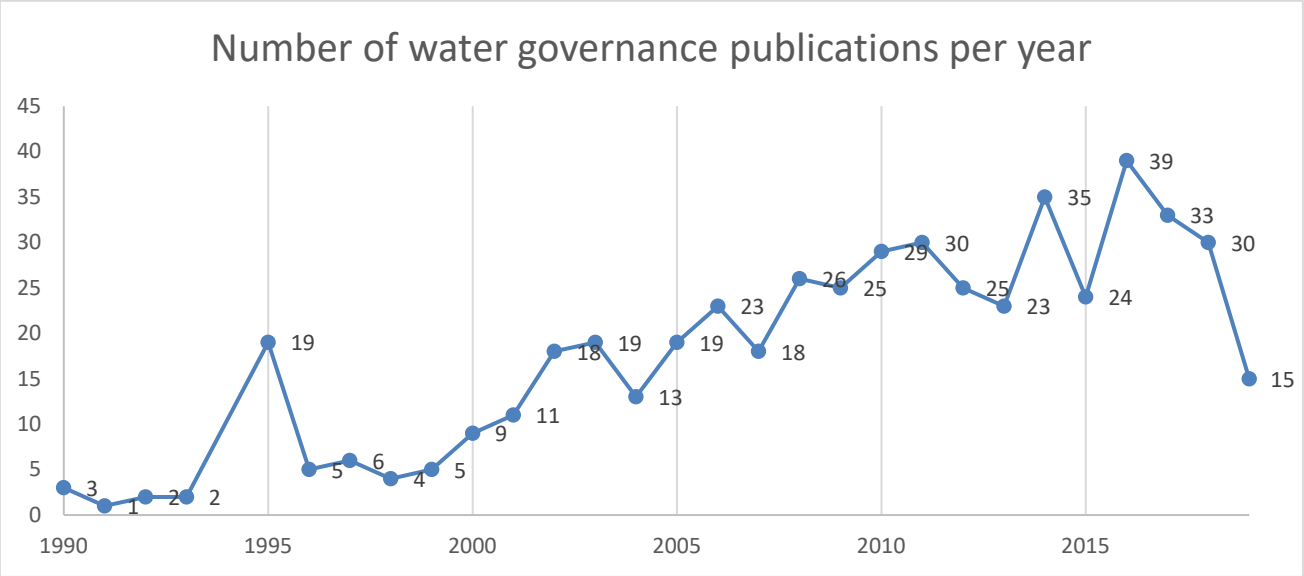

Figure 3. Number of water governance publications identified by this study, per year

Figure 4 illustrates the top 50 institutions publishing water governance research in Scopus in terms of the number of papers published. The Council for Scientific and Industrial Research (CSIR) is at the top of the list (83 publications), followed by the University of KwaZulu-Natal with 64 publications, the Department of Water and Sanitation (then Department of Water Affairs and Forestry) with 34 publications, and the International Water Management Institute (IWMI) with 31 publications. While nine of the top ten institutions are South African, several international institutions such as IWMI, the Norwegian University of Life Sciences (Universitetet for miljø- og biovitenskap) (with 15 publications), the Institute of Development Studies (IDS) (with 14 publications), the University of Sussex (with 12 publications), and Wageningen University (with 11 publications) also play a key role as publishers of water governance research on South Africa. Another significant issue worth noting is that there is generally an under-recognition of the role of DWS as both a generator and user of knowledge. Due to acclaimed research generated from the DWAF-affiliated Institute for Water Quality Studies and other knowledge hubs within the Department, DWS is acknowledged as the third biggest publisher of water governance R&D. Of concern however, is the downward trend in the production of knowledge by the department over time.

In terms of the individuals publishing the most articles on water governance research on South Africa, Figure 5 illustrates the top 50. These individuals publish from a wide range of disciplines including social science (political science, economics, international relations, sociology, gender studies), and natural science (environmental management, hydrology, climate change, etc.) (See Figure 6). Dr Barbara van Koppen (IWMI) is listed as the top publishing author followed by Dr Anthony Turton (Water Chamber), Barbara Schreiner (Water Integrity Network), Dr Richard Meissner (CSIR) and Dr Sharon Pollard (AWARD). It is interesting to note that many of the top individual publishers (Ashton, Schulze, Jewitt, Van Wilgen, Hughes, Le Maitre, etc.) are top publishing authors in other technical domains, e.g. hydrology, climate change modelling, aquatic ecology, etc., who, later in their careers, start to write about the impact of governance challenges on their respective technical landscapes.

Figure 6 provides a breakdown of the specific subject areas represented in the Scopus dataset using the subject-area taxonomy developed by Scopus.

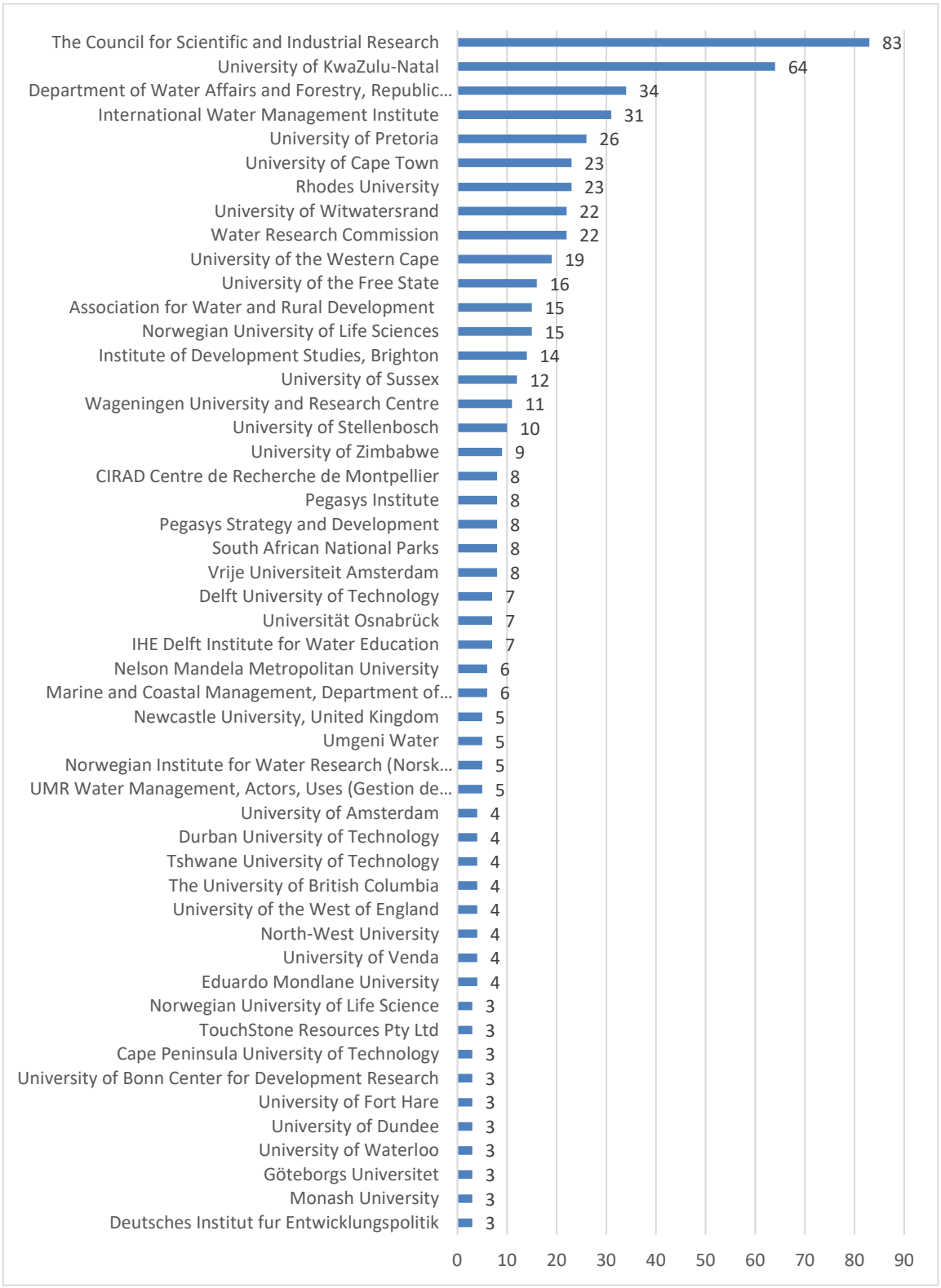

Figure 4. Top 50 water governance R&D-producing institutions

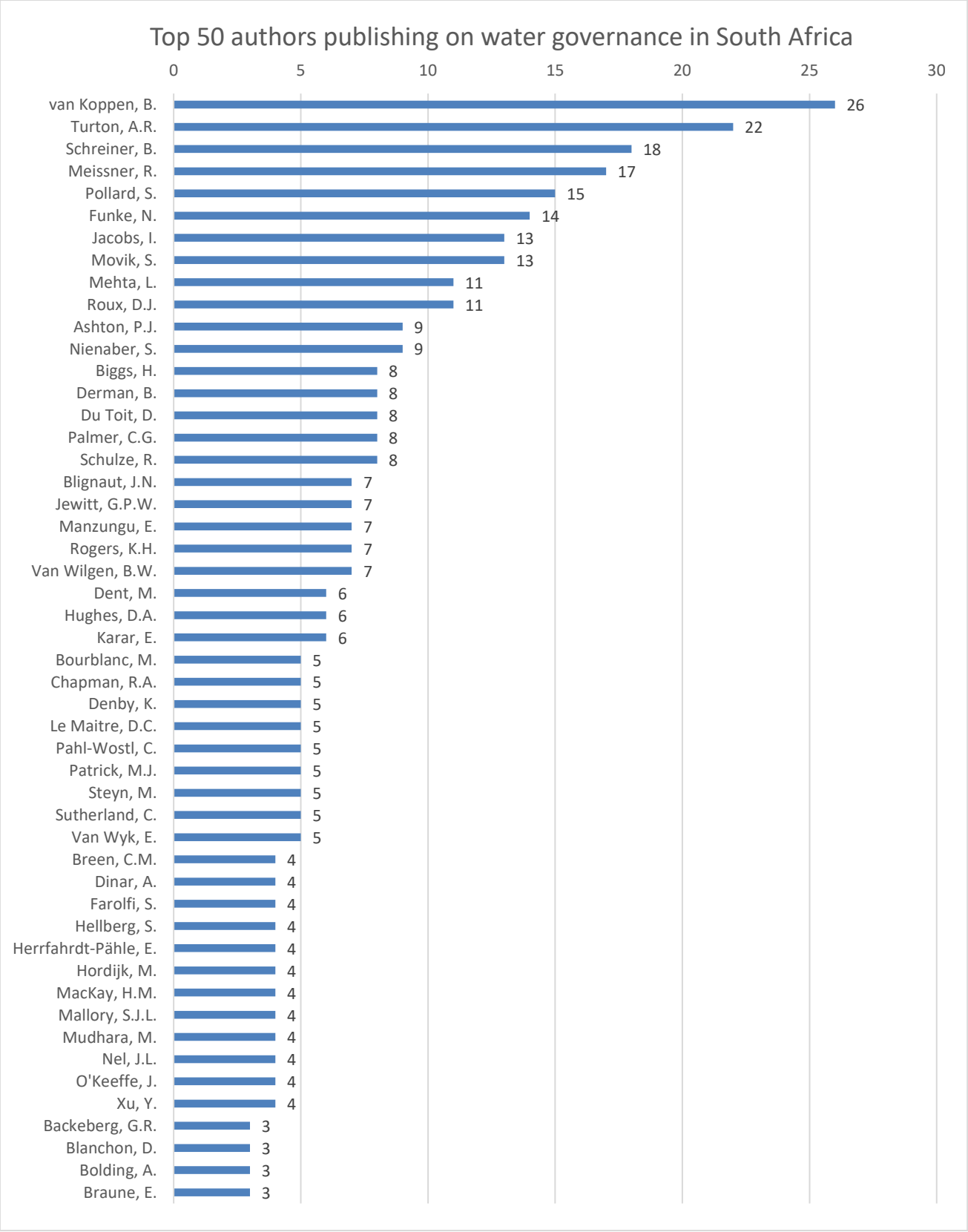

Figure 5. Top 50 authors publishing on water governance in South Africa

3.1.2 Influence

The 511 articles in Scopus received a total of 5863 citations, which averaged 14.97 citations/document. A more detailed citation analysis reveals that 1.2% of publications (6 publications in total) received more than 100 citations; 3.5% (or 18 publications) between 50-100 citations; and 26.8% between 10-49 citations. Additionally, 23.29% of articles did not receive any citation.

In order to identify the most influential researchers in water governance research, those articles that received the highest number of citations are identified (Table 1). Two articles received over 200 citations in Scopus although the field of focus may be a contributing factor: (1) “Climate change and water resources management in arid and semi-arid regions: Prospective and challenges for the 21st century” with 241 citations; and (2) “The working for water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa” with 207.

Table 1. Most influential articles according to the criterion, number of citations

Authors	Title	Year	Source title	Cited by
Ragab R., Prudhomme C.	Climate change and water resources management in arid and semi-arid regions: Prospective and challenges for the 21st century	2002	Biosystems Engineering	241
Turpie J.K., Marais C., Blignaut J.N.	The working for water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa	2008	Ecological Economics	207
Le Maitre D.C., Van Wilgen B.W., Chapman R.A., McKelly D.H.	Invasive plants and water resources in the Western Cape Province, South Africa: Modelling the consequences of a lack of management	1996	Journal of Applied Ecology	181
Le Maitre D.C., Van Wilgen B.W., Gelderblom C.M., Bailey C., Chapman R.A., Nel J.A.	Invasive alien trees and water resources in South Africa: Case studies of the costs and benefits of management	2002	Forest Ecology and Management	176
Huntjens P., Lebel L., Pahl-Wostl C., Camkin J., Schulze R., Kranz N.	Institutional design propositions for the governance of adaptation to climate change in the water sector	2012	Global Environmental Change	135
Warner J.F.	More sustainable participation? Multi-Stakeholder Platforms for integrated catchment management	2006	International Journal of Water Resources Development	117

3.1.3 Focus and funding

Finally, Figure 7 shows the top 10 funders of water governance research in South Africa. The WRC is the largest funder of this portfolio at 33%, followed by the NRF and the CSIR at 12% each, and DFID, UKZN, the Research Council of Norway, and the Social Sciences and Humanities Research Council of Canada all contributing 7% each of water governance research funding.

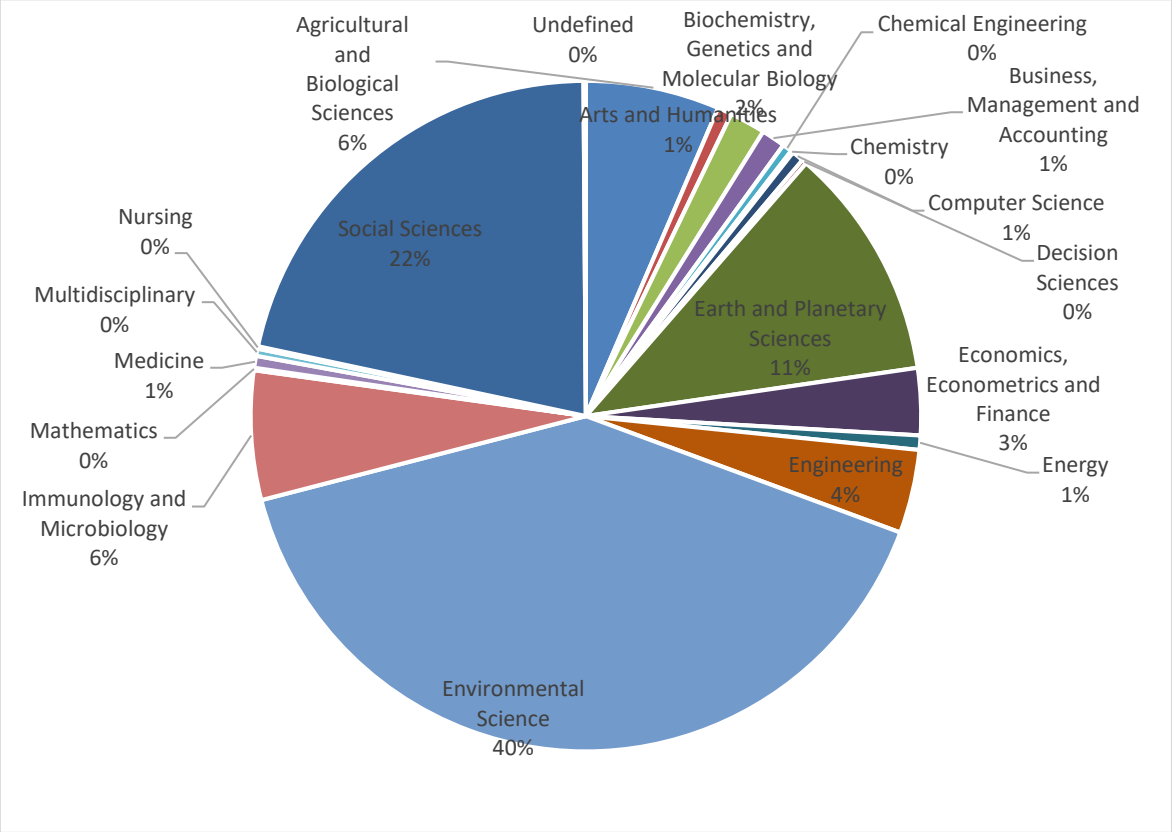

Figure 6. Subject areas covered in Scopus dataset of water governance research in South Africa

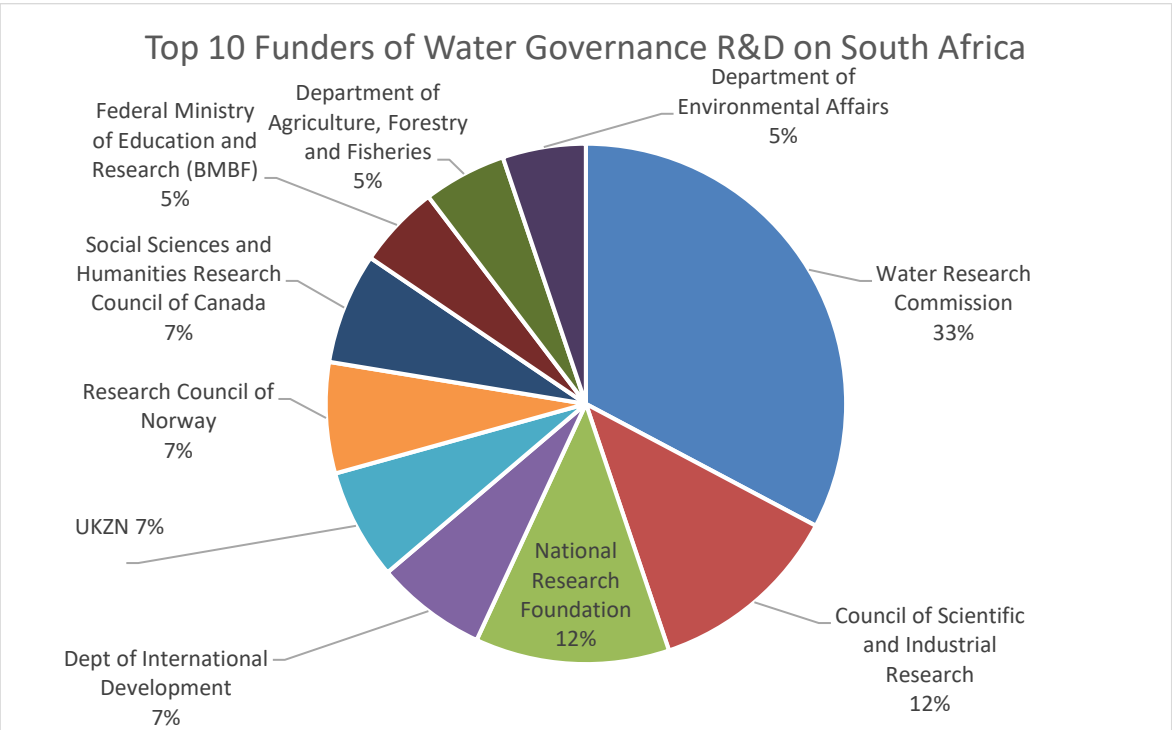

Figure 7. Top 10 funders of water governance R&D in South Africa

3.2 ANALYSIS OF THE WRC WATER GOVERNANCE PORTFOLIO

A total of 336 projects were identified as water governance projects, either classified as such by the WRC under various portfolios, or by the project team upon review of the project description in the Knowledge Reviews. Of this, 333 projects were awarded to South African institutions, while only 3 were awarded to international institutions (European Science and Environment Forum, IUCN, and the Institute for Security Studies).

The majority of projects are awarded to the private sector (consultants) at 43% and to higher education institutions at 33%, and significantly fewer are awarded to parastatals and government agencies at 12% (Figure 8). The remainder is spread across national government departments, networks and associations, NGOs, non-profit organisations (NPOs) and other institutions. However, the institution that received the greatest number of research project contracts between 1990 and 2019 on water governance was the CSIR (with 28 projects funded) followed by the University of KwaZulu-Natal at 22 projects; and the Palmer Development Group (PDG) at 17 (Figure 9). This is consistent with the scientometric assessment confirming the CSIR and UKZN as the top two publishing institutions on water governance in the country.

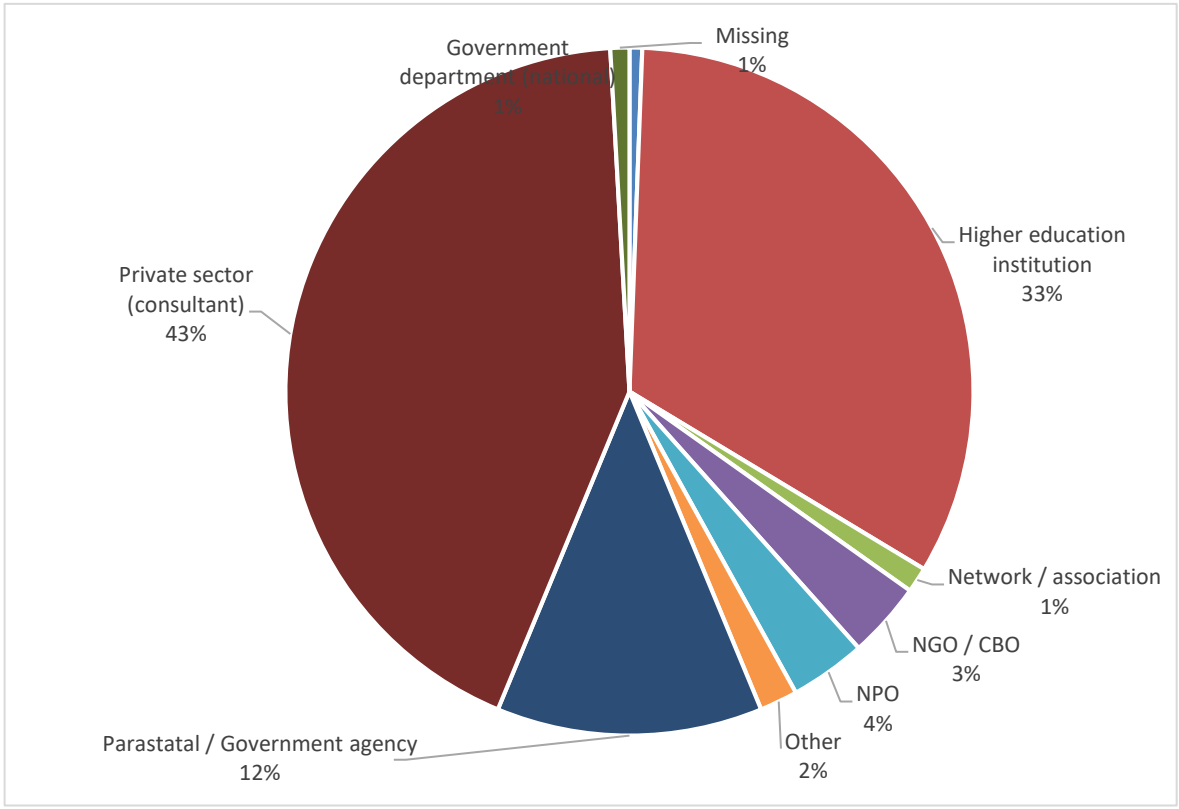

Figure 8. Proportion of WRC-funded water governance R&D projects (number of projects) according to institution type

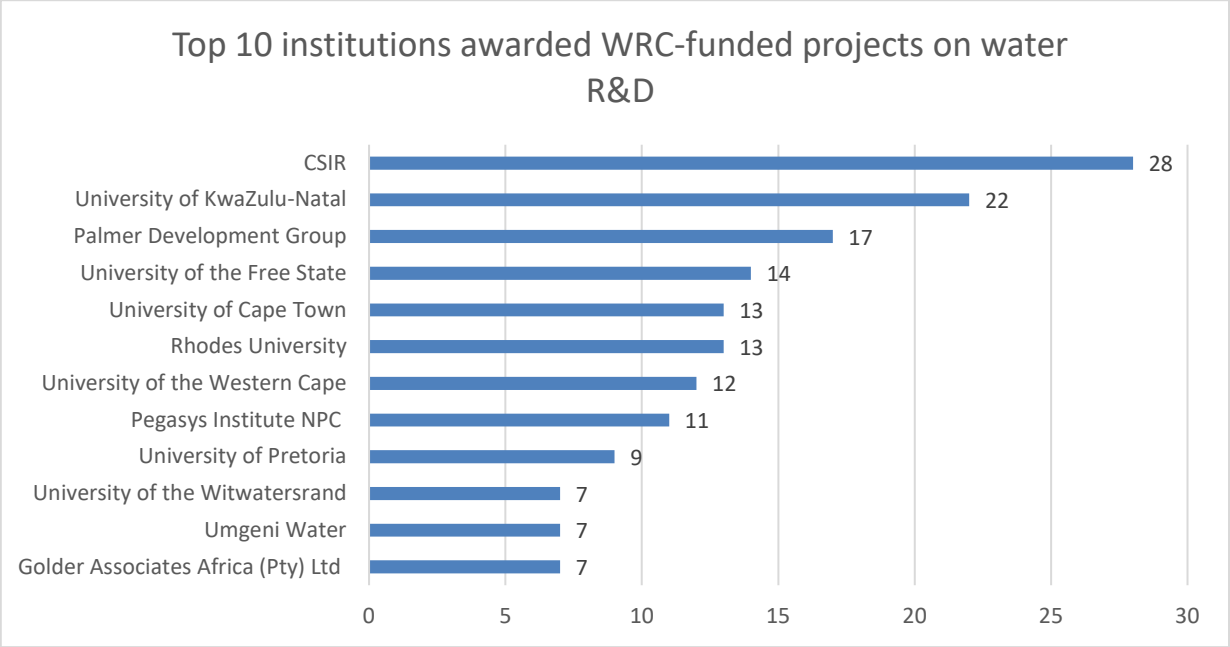

Figure 9. Institutions that received the highest number of research project contracts on water governance from the WRC

In total, the WRC has awarded R320,745,250 to water governance and related research from 1990 to 2018. As indicated in Figure 10, the bulk of this funding is awarded to HEIs at 47% (R149,633,566), followed by the private sector at 32% (R101,603,219) and parastatals/government agencies at 14% (R44,197,405). It is noteworthy to mention that while HEIs received a lower number of projects, the individual grant amount awarded per project was generally greater, suggestive of HEI projects being of longer duration (reflective of long-term research and post-graduate study support) than those undertaken by consultants.

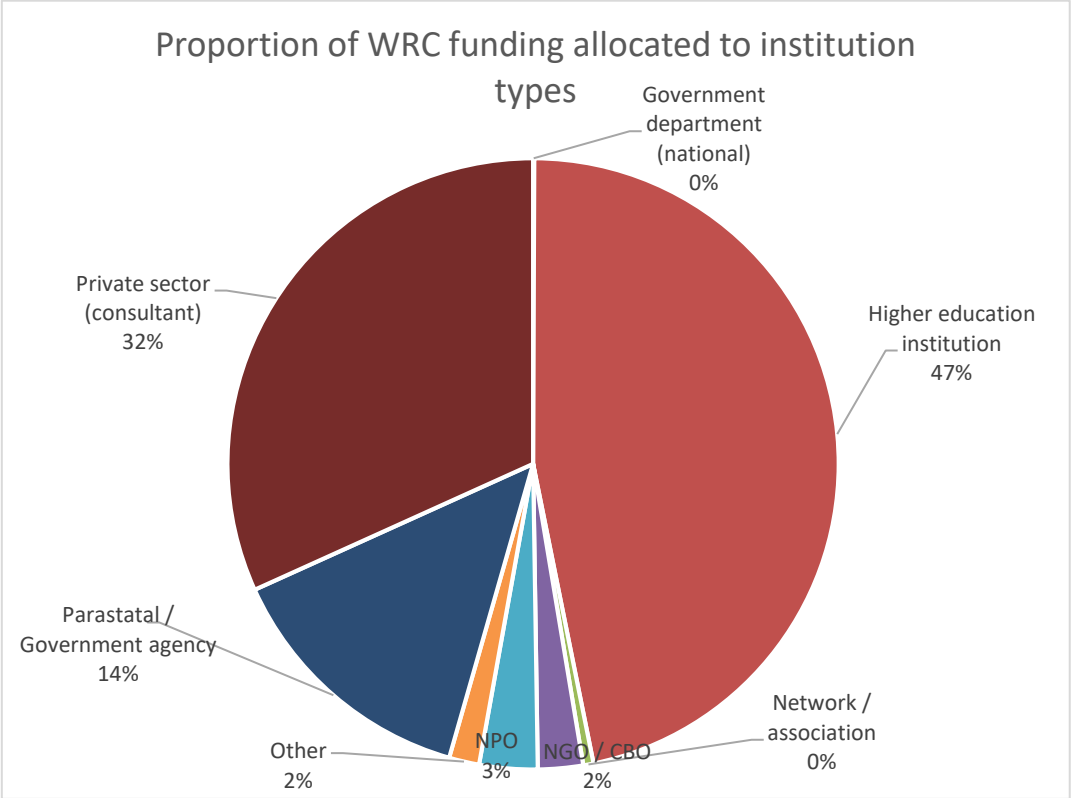

Figure 10. Proportion of WRC funding allocated to institution types

In summary, the allocation of WRC funds to water governance R&D, is on at the least, 15% of the total WRC portfolio (classified by the WRC in their Knowledge Reviews as 5% water policy; 10% IWRM) but may be more if we had to take into consideration several studies mapped to other KSAs and that have indirectly covered issues pertaining to governance. The WRC funding portfolio is reflective of the scientometric analysis in terms of the key institutions publishing water governance R&D (CSIR, UKZN, UCT, Rhodes University), although interesting outliers such as the Palmer Development Group, that received a high number of WRC-funded projects in the early 1990s, have not resulted in the expected number of research publications. This can however be expected given that the focus of private consultancies such as this is not necessarily to contribute to the knowledge base in the form of research publications but to address a specific client need. Finally, the trend analysis confirms a responsive/reactive analytical trend vs a proactive/forecasting/predictive trend. In other words, and acknowledging the publication lag, i.e. that publications tend to be published one, two or several years after research has been concluded, research outputs were responsive (at the best of times) or reactive (at the worst of times) to previous trends and key developments in the water governance landscape. This issue was further unpacked in the consultative workshop and is documented in the next chapter.

CHAPTER 4: DISCUSSION ON KEY TRENDS

4.1 SCIENTOMETRIC AND DATA MINING ANALYSIS AND COMPARISONS WITH SIMILAR STUDIES

The scientometric analysis confirmed several dominant narratives that have played themselves out in South African water governance R&D since the 1990s. It should be noted however that several other studies have taken longer-term approaches to mapping dominant paradigms to water governance R&D, globally and in South Africa (Allan, 2005; 1999; Siebrits, Winter & Jacobs, 2014; Tempelhoff, 2018; Tempelhoff, Hoag, & Ertsen, 2009).

At the global level, Allan (2005) refers to the transition of five water management paradigms, each with its own distinct focus and function. He calls the first of the five paradigms 'the pre-modern paradigm,' which spanned from 1850 to the beginning of the 19th century, and which was dominated by a general increase in water supply and use. During this period, the world saw great engineering ingenuity. The second paradigm, occurring from the early to late 20th century, was characterised by industrial modernity and again featured an increase in activity in the hydraulic mission. This period also saw an increase in water demand as a result of agricultural activity shifting from subsistence to commercial, followed by further demands on water resources as a result of the rapid increase in industrial activity. The third paradigm in Allan's (2005) framework, present only in industrialised nations from the 1960s onwards, shows a shift towards sustainable resource management and a concerted effort to redress the damage done by previous paradigms. The fourth, gaining currency in the early 1990s to the 2000s, is characterised by a period of economic expansion (particularly in the North) and by smart economic decisions that offer several environmental advantages, but is also characterised by a general decline in the hydraulic mission. This paradigm was inspired by economists who began to advocate to water users in the North, the economic value of water and its importance as a scarce economic input. Finally, the fifth paradigm, taking shape from the 2000s is based on the notion that water allocation and management are political processes. It is also dominated by political and institutional change which becomes increasingly aligned with global shifts towards sustainability and also a rapid decline in the hydraulic mission.

There are elements within Allan's management paradigms that parallel similar developments in water resources in South Africa. Both Siebrits et al (2014) and Tempelhoff (2018) corroborate Allan's global paradigm shifts by observing similar trends in water resources in South Africa. Tempelhoff (2018) takes a historical perspective of water governance in South Africa that mirrors these global trends. He argues that from 1912 to 1947 water governance focused on the realisation of a food-agricultural hydraulic mission, i.e. developing the country's water resources primarily for the farming sector – specifically the irrigation farming sector – to provide food supplies for local consumption and export. He refers to the period between 1947 and 1994 as the second phase, i.e. the energy-industrial hydraulic mission, a period that saw the state backing industrial development by securing sufficient water supplies and also by the generation of electricity. "It was a period notable for the deterministic style of engineering and technology that flourished at an exceptional rate, with significant scientific breakthroughs. For the greater part of the period (especially 1960 to 1990) South Africa was politically isolated from the international community and the key water sector developments commonly trending internationally" (Tempelhoff, 2018: 9).

The third (and current) phase started in 1992, and is referred to as a social ecological hydraulic mission. "The dominant paradigm of the 1990s was the creation of a non-racial democracy in South Africa. Along with a new environmental awareness came a greater awareness of government's social responsibility to secure good drinking water and proper sanitation for all the people resident in the state. From 1994, this frame of mind paved the way for a greater governmental concern for ordinary people, especially those who had been previously disadvantaged by the apartheid era policies of the state. The principle of sustainability ensured that environmental awareness would form part of the legislation related to the country's water resources and

governance" (Tempelhoff, 2018:10). Enter IWRM. However, over the long-term, IWRM appeared difficult to implement and issues of water privatisation and neo-liberal economic policies asserted their influence (Tempelhoff, 2018).

In a study of more recent paradigm shifts, Siebrits et al (2014) refer to two major paradigms and one significant transition period. The first paradigm, most dominant from 1977 to 1991, emphasises the hydraulic mission which focused on securing supply and understanding basic natural systems. Research published in this period is dominated by engineering and laboratory-related disciplines, and characterised by efforts to ensure water supply, drainage and the development of the sewered city. The next ten years (1992-2001) see a transitional period demarcated by water quality constraints and fields of management and planning. "This paradigm is in response to changes in water deficits and a focus on end-use efficiency" (Siebrits et al., 2014: 8). A second paradigm shift occurs with a "new social contract" around water emerging in a period of democratic transition, growing environmentalism and a rise of civil society environmental activism. The need to plan, model catchments and include other disciplines (enter inter/multi/and later trans-disciplinarity) becomes evident in the research environment.

The scientometric analysis conducted in this study confirmed these trends, but sought to focus on even more recent developments up to 2019 (Figure 11). Indeed, as Siebrits et al (2014) observe, this study also observed the 1990s trend that saw the emergence of participatory management and its metamorphosis into Integrated Catchment Management (ICM) with a strong focus on water quality management. Indeed, the South African water governance R&D dataset confirms an earlier focus on water governance than similar global datasets arguably because of South Africa's democratization process and the attention placed on participatory forms of management in the lead up to the 1994 elections and the constitutional settlements of 1993.

A decade later, the focus expanded to water as a human right and broader equity issues. We also see the emergence of overarching normative conceptualisations and inclusive and participatory approaches such as IWRM and sustainable development. Ten years into the new democratic dispensation with the new policy directions well-articulated, we see a clustering of analyses on water policy reform and its impact on broader water resource management. Towards the middle of the 2000s, the first critiques of these policy reforms – Free Basic Water (FBW); Water Allocation Reform (WAR); IWRM – starting to emerge. We also see the narrative of water scarcity and its impact on governance as well as the intersectionality between technical domains of environmental flows and governance, particularly the management of water uses. This was also the heyday of hydropolitics and transboundary water governance given the ratification of the SADC Revised Protocol on Shared Watercourses, the establishment of transboundary river basin organisations and the development of several river basin agreements, and with several seminal research products (e.g. H. Solomon; A.R. Turton (eds). 2000 Water Wars: An Enduring Myth or Impending Reality? African Dialogue Monograph Series No. 2. Durban: Accord Publishers) and schools of thought (e.g. the CSIR Water Governance Group, and the African Water Issues Research Unit (AWIRU) at the Centre for International Political Studies (CIPS), University of Pretoria) documenting and analysing South Africa's role in regional water politics.

The start of the current decade introduced a new wave of domain-specific governance research. As such, a focus on groundwater governance, the politics of climate change, and later still, the water-energy-food (WEF) nexus and its related governance challenges, started to receive greater attention. In addition, cross-cutting focus areas such as gender mainstreaming and governance, strategic adaptative governance also re-emerged. In the period from 2010 to 2015, we also see several studies adopting theoretical frameworks based on legal pluralism and polycentric governance to unpack the interplay between water governance at different levels of scale, the resurgence of water rights and how they are implemented at the local community level. Much of the water governance research published during this time includes the underlying sentiment, "*Our water policies are good, the problem lies in their implementation*."

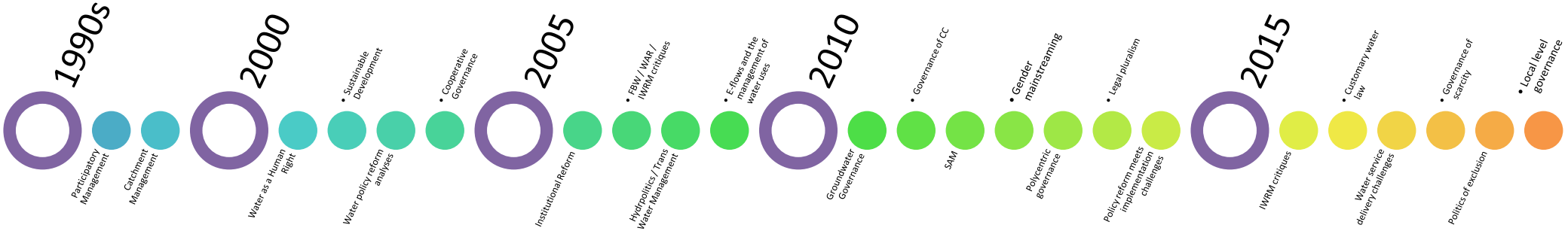

Figure 11. Dominant narratives in water governance R&D in South Africa since the 1990s

From the latter half of the 2010s up to the present day, we see a shift in focus (although not yet mainstream) acknowledging that some aspects of our water policy reform, i.e. the permits system, may not have been as transformative as we would have liked them to be by now. While it may be a bridge too far to claim that there is an emergence of a paradigmatic shift from “South African water policy is good just not well implemented” to “There are some critical flaws to South African water policy that need to be addressed,” there is certainly a school of thought that has gained a foothold looking at the decolonisation of water law (van Koppen and Schreiner, 2018).

Research-based policy dialogue in Africa during the past decade has identified major challenges with the permit systems that currently prevail in four out of five Sub-Saharan African countries, and generated interest among water authorities, water lawyers and researchers in alternatives, in particular ‘hybrid water law’. The main challenge identified was the logistic inability of under-sourced water authorities to implement the statutory blanket permit systems among millions of smallholders. Authorities simply cannot create awareness and process applications, let alone enforce the conditions of permits among these masses of scattered and remote small-scale water users. However, without a permit, investments in water infrastructure for small-scale productive uses are formally illegal. *De minimis* productive water uses that are exempted from the obligation to apply for a permit have a weaker legal standing, if not by law then in its implementation. This legislative criminalization and marginalization contradict national goals of agriculture-led economic growth, food security, nutrition, and poverty alleviation. It also counters governments’ growing understanding of, and support to farmer-led irrigation development. Realizing the colonial roots of permit systems and their post-colonial promotion as ingredient of the Integrated Water Resources Management discourses initiated by the North since the 1990s, hybrid water law has emerged a promising alternative (van Koppen and Schreiner, 2018).

In a similar vein, the challenges of water service delivery and the politics of exclusion have also stimulated a reactionary, perhaps even revolutionary, focus on bottom-up/community-driven self-supply initiatives, as well as an increasing acknowledgement of the role that customary water law and practices play in water governance at the community/local level. Finally, we see a greater focus in the present-day water governance literature on water integrity (transparency, accountability, participation and anti-corruption as defined by the Water Integrity Network), corporate governance, risk management, compliance, and indeed, calling attention to the mismanagement of the sector from a normative perspective, although only a few alternative models are currently proposed.

4.2 SUMMARY OF STAKEHOLDER INPUTS TO FINDINGS

In addition to the cross-validation of how this study’s findings compared to existing literature and academic discourses, the project team also held two consultative engagements with a representative group of stakeholders to understand their interpretations of the data. Stakeholders drawn from a cross-section of the sector took part in a consultative workshop to review water governance research in South Africa and to deliberate on the preferred course for the future. A second consultation was held at the WRC Biennial Symposium where the broader research community engaged with the project’s findings and the initial inputs of the consultative workshop.

As noted in the previous chapter, group discussions were structured around the following themes: the current key governance challenges and knowledge gaps; future water governance trends; and the enabling environment. Four main areas emerged as defining the *current* state of water governance research knowledge and its uptake: 1) Research relevance and responsiveness; 2) Availability and nature/source of funding; 3) Addressing the implementation challenge, and 4) The silo approach. In terms of stakeholders’ perceptions on *future* water governance trends and needs, three issues were highlighted: 1) The focus on institutional integrity and good corporate governance; 2) The need for a rapid response water governance research mechanism; and 3) Transformation of and within the water governance R&D community. Finally, discussions on the enabling environment highlighted two key elements: 1) Packaging and communication of water governance research, and 2) The role of the WRC.

4.2.1 Stakeholder perceptions on current water governance challenges and knowledge gaps

4.2.1.1 Research relevance and responsiveness

Key message: Water governance research is passion-driven as opposed to being needs-based, and slow in responding to urgent needs.

Stakeholders observed that current national water governance R&D outputs are largely 'passion-driven' as opposed to 'needs-based' in that researchers tend to research what they enjoy/are passionate about instead of addressing an important national governance challenge. On the other hand, stakeholders also acknowledged the individualisation of research focus, and the world views shaping researchers' approaches to water governance and how they research it.

In addition, stakeholders agreed with the scientometric analysis that confirmed a reactive/responsive analytical trend vs a proactive/forecasting/predictive trend. It emerged from the discussion that research outputs fall behind current water governance issues, particularly in a fast-paced environment where there is the need for research knowledge to respond with agility to emerging issues. Increased support from the research fraternity to government departments is needed particularly in crisis periods where decisions have to be made at a political level.

4.2.1.2 Availability and nature/source of funding

Key message: We need to be mindful of how funding flows influence what we research, particularly how international interests shape the local water governance agenda.

Funding availability was discussed in two instances (i) where resources available for research are increasingly under strain, thus limiting the scope of areas that can be addressed (ii) when research agendas are guided by the source of funding rather than the need, typically related to international donor agendas. This oftentimes stands in the way of research innovation and applicability. It also results in the implementation of isolated projects. In this regard, the water governance R&D community were criticised for not being good at building a pipeline of expertise and a programmatic approach to address key challenges.

Indeed this also raises the controversial issue of the politics of R&D funding and funding flows: to which institutions and why; the magnitude of funding allocations to specific institutions and research domains; the expansion of research funding beyond basic and applied research into development; how much of R&D budgets are dedicated to commissioned/directed research vis-à-vis open/unsolicited research, and the latter determining the proportion of funding dedicated to addressing client-specific challenges vs unrestricted research that allows for greater innovation from within research communities.

4.2.1.3 Addressing the implementation challenge

Key message: We need to interrogate policy implementation/lack thereof as a research field, including the need for embedded research.

Stakeholders raised several issues pertaining to policy implementation challenges. The first was the well-acknowledged inadequacies of government to implement policy due to, amongst other things, limited appropriate planning, capacity challenges, mismanagement and corruption, as well as the lack of clearly articulated impact pathways and/or theories of change. This is compounded by weak support from the research community (in terms of implementation) for government departments, who at times do not have the required technical capacity to appropriately execute policy recommendations.

Further, impact assessments of existing policies have not been adequately conducted. Not only is there a need for a greater partnership between government and the research community to co-create and jointly implement evidence-based governance solutions, but there is also a need for 'embedded research' and the need to study implementation as a research field – to-date, an untapped value-add of the social science enterprise and its potential contribution to water governance R&D. Embedded research has been defined as the collaborative approach between academia and other host organisations in the public or private sectors, where individuals or teams are based at, or affiliated with, host organizations with the aim of implementing collaborative research agendas (McGinity and Salokangas, 2014). The relationship between the researcher and the host institution is mutually beneficial in that the researcher is provided with greater access to the host institution (in the form of data collection and/or research funding), and the host institution benefits from better access to academic knowledge, networks and critical approaches to developing organisational policies and practices (ibid.). Joint research projects, sabbaticals, associate professorships, and post-graduate study programmes for policy-makers are some of the ways in which embedded research can be undertaken.

4.2.1.4 The silo approach

Key message: We need to look at the impact of 'boundary spanners' and profile these champions.

Stakeholders from both government and the research community lamented that interdepartmental relationships within government are not solution-oriented in that departments frequently still operate in silos with few cases of effective coordination and alignment between them. As a result of this silo approach, there is no learning culture and no evaluation of policy implementation failures or similarly, no evaluation of successes. Stakeholders suggested that we need to look at the impact of 'boundary spanners' – those individuals that can and do work across institutions, spheres of government and sectors, and profile them as champions (Pringle, 2020).

4.2.2 Stakeholder perceptions on future water governance trends and needs

In this section the perception of the stakeholders as to what the future of water governance R&D would and should look like are presented.

4.2.2.1 Focus on institutional integrity and good corporate governance

Echoing the broader governance debates currently underway in South Africa there will be an increasing emphasis placed on compliance, dealing with corruption as well as institutional integrity and corporate hygiene. The water sector including the research community needs to address the elephants in the room (corruption vs water integrity, dysfunctional government departments, etc.).

4.2.2.2 The need for a rapid response water governance research mechanism

Several stakeholders in the water R&D community have, for a few years, been advocating for the development of a new trend in water governance research – a constructive, adaptive and rapid response research mechanism in an environment of increasing change and uncertainty.

The need for solution-oriented water governance R&D including rapid response assessments would serve as a support mechanism to government in responding to immediate crises and challenges in the short-term.

4.2.2.3 Transformation of and within the water governance R&D community

From the scientometric analysis and findings of the data mining exercise, and specifically the analysis of top-publishing individuals leading water governance R&D, stakeholders noted the wide range of disciplinary

backgrounds represented, from natural and environmental sciences to political science and economics. However, despite the disciplinary diversity, the demographic profile of the leading water governance researchers still reflects a largely white, male cohort.

In addition to its lack of diversity, the size of the community was also raised as an issue. Stakeholders put forward, based on their intuition rather than any quantitative analysis, that the South African water governance epistemic community remains small. From a total of 144 authors catalogued by the scientometric dataset, the top 20 authors account for 239 (47%) of the total 511 publications. This can be seen as a high concentration of water governance research being conducted by a small minority (14%) of the author cohort. So, while the size of the epistemic community can not necessarily be considered small, there are a few individuals publishing the majority of water governance research. There is therefore a need to focus on the transformation of the water governance R&D community that promotes the inclusion of more, and particularly, younger, black and female voices. The latter relates to the social construction and politics of knowledge. Indeed, the knowledge being generated, research agendas being pursued, etc. are reflections of dominant paradigms and values held by the dominant voices in this R&D community. Promoting the plurality of voices, perspectives and priorities ensures that transformation in this context is not just about increasing the diversity of researchers from a demographic point of view, but equally about challenging the hegemony of paradigms (John Dini, 2019, personal communication, 9 December).

4.2.3 The enabling environment

Stakeholders deliberated on the enabling environment with an emphasis on the existence, coordination and strengthening of a water governance R&D community of practice, the resources needed as well as the role of the WRC.

4.2.3.1 Packaging and communication of water governance research

Key message: Don't complicate it.

Stakeholders expressed the view that research evidence should be packaged to suit different target groups and/or contexts to enhance uptake. Academic publications may not reach the targeted stakeholders who are in the position to effect change or who may benefit from research outputs. Specific sentiments expressed by government representatives during both the workshop and the WRC Symposium session could be summarised as follows:

1. Don't complicate it – sharpen the message by keeping it clear and easily understandable for policy-makers;
2. Understand your audience – researchers often have little understanding/appreciation of the time constraints government officials are under, or of the nature of their procedures. A greater understanding of this on the part of researchers can go a long way in helping them package information in appropriate user-friendly formats that help address a specific need by government.
3. Government needs to engage with more voices from the research community, especially in times of crisis – government officials expressed the need for greater engagement with evidence-based research from a greater number of researchers to allow for more perspectives and voices to be heard and shared.
4. The research community would be more impactful if they were better coordinated – government officials articulated the unfortunate example when the impact of the research community is diluted because it is uncoordinated in its engagement with government, thus presenting confusing and conflicting messages.

4.2.3.2 The role of the WRC

The role of the WRC was also emphasised in driving water governance knowledge generation. To this end, some key thoughts were put forward.

- Fragmented project outputs do not provide a consolidated picture of the problems addressed. The WRC should work towards a dedicated water governance R&D portfolio, and position it as the primary coordination mechanism for water governance evidence-based advisory services for government.
- The pool of researchers was seen as limited and homogenous in its profile, and could negatively impact knowledge generated. The WRC should focus its attention on promoting young, black and female researchers to work in this field by promoting capacity building through student support and project leadership.
- A narrow scope of research was identified as a current limitation with the bulk of documented research on institutional arrangements such as Catchment Management Agencies and IWRM. More focus still needs to be placed on the intersectionality between land and water rights, behavioural studies on water consumption and demand management particularly in times of growing scarcity, alternative institutional models in decentralised systems, and the political economy of water and aspects of equity.

CHAPTER 5: CONCLUSIONS & RECOMMENDATIONS

Water governance trends, though localised, are nested within a global context. Gupta, Pahl-Wostl and Zondervan (2013), suggest that governance structures will have to adapt to accommodate 'new' water sources such as wastewater, while consolidating the management of ground- and surface water. These trends are already being seen in South Africa, an increasingly water-scarce country struggling to keep up with a growing urban population and needing to secure other alternative sources of water.

The multidimensional nature of water governance, stemming from the multiple uses and sources of water, puts water governance at the centre of the global water crisis discourse. South Africa is not exempt from global pressures such as climate change, urbanisation and population increase to which water is invariably linked, in addition to its own local context. Responding to these challenges requires effective governance systems and structures. An increase in the number of voices demanding a seat at the table along with the increasing complexity of socio-political and environmental challenges, calls for a proactive approach to knowledge generation.

Learning from the past to inform the future is necessary and more so when done systematically to address targeted issues. This report showed that past knowledge generated for water governance in South Africa, responded reactively to the issues of the time, and oftentimes tended to be based on researchers' individual interests and passions as opposed to being needs-based in responding to the key governance challenges at the time. Going forward however, research knowledge will have to assume a certain agility that can keep up with the demands for timely evidence-based responses. As such, a more practical approach to research has to be considered which actively seeks to implement research knowledge. The WRC is strategically positioned to direct and coordinate the future of water governance research by convening a national community of practice that is well-coordinated in its engagement with government. While this short-term project kick-started an important process toward setting the agenda for future investment in water governance research for South Africa, it is now imperative to not only build a programmatic approach and pipeline of diverse expertise, but also invest in strengthening the enabling environment through the strengthening of the water governance R&D community of practice, as well as a dedicated rapid-response mechanism to adequately support government in responding to immediate challenges.

5.1 RECOMMENDATIONS FOR THE WRC

The WRC has an important role to play in driving the water governance research agenda, in light of the new combined ministry of Human Settlements, Water and Sanitation. Further, a consideration of the following was put forward for the WRC:

- The WRC should lead the establishment of a national community of practice for water governance experts that can respond to issues with agility, bringing together and strengthening the smaller governance schools of thought/communities currently operating at universities (Rhodes University, Stellenbosch University, Wits University, and UKZN) and institutions (The CSIR Group, IWMI, Pegasys, etc.). This can be done by hosting national dialogues, and stakeholder workshops as well as through a dedicated water governance call that specifically requires partnerships across institutions.
- The WRC should furthermore consolidate and package knowledge generated from different projects to provide an overall picture for the problems being addressed in user-friendly formats that appeal to government officials.

WRC should look into developing an advisory service platform to rapidly deploy evidence-based advice to government and other partners to help address urgent governance challenges as they emerge.

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APPENDIX A: LIST OF CONSULTATIVE WORKSHOP PARTICIPANTS

Workshop for WRC project K5/2911: Water governance knowledge review and agenda setting workshop

Date: 23 August 2019
Time: 9:00-14:30
Venue: Water Research Commission, Bloukrans Building, Lynnwood Bridge Office Park, Daventry Street, Lynnwood Manor, Pretoria

Name and Surname	Organization	Designation
Mr Tariro Saruchera	IUCN	Senior Programme Manager
Ms Amanda Gcanga	Stellenbosch University	Water Niche Coordinator
Dr Richard Meissner	CSIR	Senior Researcher
Dr Notiswa Libala	Rhodes University	Researcher
Dr Inga Jacobs-Mata	IWMI	Country Representative
Prof Johann Tempelhoff	North-West University	Professor
Mr Nicolaas E Knoetze	SAAFWUA	CEO
Ms Patience Mukuyu	International Water Management Institute	Researcher
Mr Chris Schmidt	DWS	Consultant
Dr Mbangiseni P Nepfumbada	Rand Water /NPC Secretariat	Strategic Advisory
Ms Eustathia Bofilatos	DWS	Director Institutional Establishment
Dr Kevin WInter	University of Cape Town	Senior Lecturer
Ms Anna Mampye	Dept of Environment, Forestry and Fisheries	Director: State of Environment Information
Dr Thomas Lundhede	CEEPA, UP	Researcher
Dr Damien Jourdain	UP-CIRAD	Agricultural & Natural Resource Economist
Dr John Dini	WRC	Research Manager
Dr Shafick Adams	WRC	Executive Manager
Ms Shanna Nienaber	WRC	RDI Roadmap Manager
Ms Thogo Sigwaza	DWS	Chief Director: Institutional Oversight
Dr Leanne Seeliger	University of Cape Town	Programme Manager
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Ms Thobile Mthyiane	DWS	Director: Policy