

Alignment of water use licenses with strategic water management objectives for the uMkhanyakude District area, Kwazulu-Natal

NB Nkutha

 orcid.org/0000-0002-6139-597X

Dissertation accepted in partial fulfilment of the requirements
for the degree *Master of Environmental Management with
Ecological Water Requirements* at the North-West University

Supervisor:	Prof FP Retief
Co-Supervisor:	Mr HJ Moolman

Graduation May 2022

26452464

PREFACE AND ACKNOWLEDGMENTS

Acknowledgements

I wish to express my sincere appreciation and gratitude to the following individuals, without whose assistance, this study would not have been possible:

- This has been a bumpy experience; however, his Grace and Faithfulness have endured and sustained me throughout this time. Lord almighty, I know that what is impossible with man is possible with God and this journey has personally revealed this. When I thought I could not complete this programme, the Lord gave me strength, wisdom and made a way. It has truly been by the Grace of God that I have been able to complete this EWR programme. I can quote a few scriptures, but Mark 11:22 will suffice. Amen.
- To my supervisor, Mr Jurie Moolman, thank you for your unwavering support, leadership and guidance throughout the period of this research.
- To Mzukisi for the encouragement and your never failing support displayed towards me.
- To all participants and respondents who made this study possible by completing the questionnaires, I extend my deepest appreciation.
- A special thanks to my parents, Mbuyiselwa and Thumani Nkutha, who have been my greatest supporters – indeed you are truly a godsend for continually strengthening and motivating me. You have been my pillar of strength and I will forever be thankful – this one is for the both of you!
- To my siblings, Ndumiso, Thokozani, Siyabonga and Sibusisiwe, for never-ending support. Indeed, it is possible for those who believe through Jesus Christ. I would like to further stress that with purposeful hard work and concerted efforts you can achieve a lot in life.
- To my children, Ayanda and Letlotlo, thank you for your patience and all the sacrifices you made during this mammoth task.

Finally, yet importantly, I want to thank Ntombie Madibe for your never-ending support, wisdom and encouragement.

ABSTRACT

In South Africa, water is a scarce resource and the National Water Act (Act No. 36 of 1998) makes provision for water resources to be used, controlled, protected, managed and developed to ensure sustainable use for all. The study was undertaken in the uMkhanyakude District Municipality (UKDM), situated in the KwaZulu-Natal (KZN) Province. The motivation for this research study is the on-going water shortages and droughts experienced in the Republic of South Africa (RSA), especially the UKDM. With the focus on the understanding by the members of the uSuthu to Mhlathuze Catchment Management Forum (CMF) regarding water governance in the area, a questionnaire was developed to capture the views and perspective of water users within the uSuthu to Mhlathuze Catchment Management Area (CMA). The idea was to gain an understanding of the knowledge of participants related to their authority regarding water governance and water management within the area. Of significance to the study was to incorporate the involvement of those within the CMF and their knowledge on water governance and its implementation. The collected data identified constraints and limitations experienced at catchment level and enabled the making of recommendations to address the issues currently faced by the catchment.

A concern is that water uses to some extent of the RSA, especially country areas, are not regulated in an effective and efficient manner. This raises concerns about how water use is unaccounted for in some areas. The National Water Resource Strategy (NWRS) makes provision for instruments, such as Resource-directed Measures (RDM) and Source-directed Measures (SDM) to affirm that the nation's water resources are shared equitably in order to ensure sustainability and the efficient use thereof and to ensure that water is not over-allocated or used and that the quality thereof is not compromised. Chapter 4, Part 1 of the NWA (1998) requires that water uses, as defined in section 21 of the Act, must be authorised. Thus, this raises a question to determine whether authorised water quantities are aligned with the predetermined water quantities of the uSuthu to Mhlathuze CMA. A literature review and secondary data from the Department of Water and Sanitation's (DWS) Water use Authorisation and Registration Management System (WARMS) was used to determine whether issued water use authorisations of the uSuthu to Mhlathuze CMA are in line with strategic objectives of the area. The information gathered regarding water uses within the study area revealed allocations, different uses and users per sector. However, current information regarding the volume within the catchment could not be provided.

Keywords: Water governance, water resources, Catchment Management Area, water use licence and water use

ABBREVIATIONS AND ACRONYMS

CMA	Catchment Management Area
CMF	Catchment Management Forum
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
ELU	Existing Lawful Use
EMRG	Environmental Management Research Group
FNASREC	Faculty of Natural and Agricultural Sciences' Research Ethics Committee
GA	General Authorisation
HDI	Historically Disadvantaged Individuals
IWRM	Integrated Water Resource Management
NWA	National Water Act (Act No. 36 of 1998)
NWU	North-West University
UKDM	uMkhanyakude District Municipality
UNDP	United Nations Development Plans
UNDP	United Nations Development Programmes
UNESCO	United Nations Educational, Scientific and Cultural Organisation
RDM	Resource-directed Measures
RSA	Republic of South Africa
RQOs	Resource Quality Objectives
WARMS	Water Use Authorisation and Registration Management System
WUL	Water Use Licence
WWTW	Waste Water Treatment Works
WMA	Water Management Area
WSA	Water Service Act (Act No. 108 of 1997)

KEY DEFINITIONS

Water service is defined as what a client/customer gets as far as water amount, quality, availability, dependability and propriety. The expenses, or the reasonableness, of the stockpile ought to be considered as a feature of the assistance level, as it is an impression of the monetary (or the executives) expenses to offer a specific support level. The water supply administrations as well as sterilization administrations, or any part thereof, should be given in a dependable, moderate, compelling, effective, practical and fair way (DWS, 2017).

Water governance is defined as governance that is active, transparent, responsive, commitment to consensus, effective and efficient, inclusive, and law-abiding (Wallace *et al.*, 2015).

Water resource is defined as a watercourse, surface water, estuary or aquifer (National Water Act (Act No. 36 of 1998)).

Water scarcity is characterised as far as changes in environment and land cover and is turning into a reality at various levels (Vairavamoorthy *et al.*, 2008).

Reserve means the quantity and quality of water required to meet basic human needs by securing a basic water supply, as defined by the Water Services Act, 1997 (Act No. 108 of 1997), for people who are now or will be in the reasonably near future relying on, taking water from, or being supplied from the relevant water resource; and to protect aquatic ecosystems in order to ensure ecological sustainability (NWA, 1998).

Resource quality objectives (RQOs) give mathematical and/or potential proclamation about the organic, synthetic and physical characteristics that describe a resource for the level of protection defined by its class. Thus, resource quality objectives may portray, in addition to other things, the amount, example and timing of instream stream, water quality, the character and condition of the riparian habitat, and the characteristics and condition of the aquatic biota. Resource quality objectives should assess the user prerequisites and the class of the resource (NWRS; DWAF, 2004).

TABLE OF CONTENTS (HEADING 0)

PREFACE AND ACKNOWLEDGMENTS	I
ABSTRACT	II
ABBREVIATIONS AND ACRONYMS	III
KEY DEFINITIONS	IV
CHAPTER 1 INTRODUCTION.....	1
1.1 Background	1
1.2 Problem Statement and Rationale for the Study	4
1.3 Research Aim / Objective / Question	5
1.4 Structure and Outline of the Study.....	5
CHAPTER 2 METHODOLOGY	6
2.1 Introduction	6
2.2 Research Design	6
2.2.1 Qualitative Research	6
2.2.2 Purposeful Sampling.....	7
2.3 Data Collection	7
2.3.1 Primary data: Questionnaire	8
2.3.2 Secondary Data: Content analysis (Document Review).....	9
2.4 Data Analysis	11
2.5 Description of the Study Area.....	11
2.6 Ethical Considerations.....	13
2.7 Methodological Limitations	14

2.8	Chapter Summary.....	14
CHAPTER 3	LITERATURE REVIEW.....	15
3.1	Introduction	15
3.2	Overview of Governance and Related Legislation	15
3.2.1	Water Governance	15
3.2.2	Legislation related to water governance in South Africa.....	18
3.2.2.1	The Constitution of the RSA	18
3.2.2.2	The National Water Act.....	19
3.2.2.3	The Water Services Act.....	20
3.3	Management of Water Resources	21
3.3.1	Integrated Water Resource Management (IWRM)	22
3.3.2	Water management instruments.....	23
3.3.2.1	Resource-directed Measures (RDM)	24
3.3.2.2	Source-directed Measures (SDMs).....	25
3.3.2.3	Resource Quality Objectives (RQOs)	25
3.4	Permissible water uses	27
3.5	Water Governance within the uMkhanyakude District Municipality.....	29
3.6	The economic status of the UKDM	30
3.7	Surface, Groundwater and Catchment Characteristics	31
3.8	Water Management Institutions (WMI)	33
3.9	Water Scarcity and Climate Change.....	34
3.10	Chapter summary	36

CHAPTER 4 RESULTS, DATA ANALYSIS AND DISCUSSION	38
4.1 Introduction	38
4.2 Results related to the General Understanding of Water Governance, Legislation and Policies and Approaches and Instruments used for Water Governance	38
4.2.1 Results related to the General Understanding of Water Governance	38
4.2.2 Results related to Legislation and Policies.....	43
4.2.3 Results related to approaches/instruments used for water governance	44
4.3 Results related to the WARMS Database for the uMkhanyakude District Municipality.....	46
4.3.1 Authorised and Registered Water Users according to section 21(a) of the NWA.....	46
4.3.2 Registered Water users according to section 21(b) of the NWA	47
4.3.3 Authorised Registered Water Use according to section 21 (d) of the NWA	48
4.4 Chapter summary	50
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS	51
5.1 Introduction	51
5.2 Conclusions	51
5.2.1 Understanding Water Governance.....	51
5.2.2 Authorised water quantities aligned with predetermined water quantities of the uSuthu to Mhlathuze catchment.....	53
5.3 Recommendations and areas for future research.....	53
BIBLIOGRAPHY	55
ANNEXURE A REQUEST TO CONDUCT RESEARCH	68

LIST OF TABLES

Table 1-1: Water uses as per section 21 of NWA (1998).....	3
Table 3-1: Principles of effective water governance (Source: Rogers and Hall, 2003.)	17
Table 3- 2: The table shows the backlog of water services for the UKDM (Source: Bigen Africa, 2016).....	21
Table 3-3: Permissible water use	28
Table 3- 4: Water Use Authorisation issued from 1998-2016 (Source: DWS, 2017)	29
Table 3-5: Figures showing water balances on the Pongola, Mkhuze and iMfolozi River systems (Source: DWAF (2004).....	33
Table 4- 1: Reconciliation of water requirements/allocations and available water for the year 2000 (million m ³ /annum).....	48

LIST OF FIGURES

Figure 2-1: Area map showing uMkhanyakude District Municipality (Source: Municipalities, 2020).....	12
Figure 3-1: The water resource management business process: (Source: DWAF, 1999)	24
Figure 3-2: The UKDM contribution of each sector to the UKDM's economy (Bigen Africa, 2016).....	31
Figure 3-4: 2030 Water Demand in the Republic of South Africa.....	35
Figure 4-1: Registered water users per sector, with an insert showing the percentage of HDI according to section 21(a) of the NWA (1998), within the UKDM.....	47

CHAPTER 1 INTRODUCTION

1.1 Background

The Republic of South Africa (RSA) is a water-stressed country, with an average rainfall half of that of the world (DWS, 2014). As pointed out by the DWA (2013) and Wepener *et al.* (2018), most of the annual precipitation (73%) falls within a narrow belt along the eastern and southern coast of the country, with 27% distributed across the rest of the country. Thus, it is clear that besides the country being semi-arid, there is also a major spatial variation in the distribution of the rainfall, which then further emphasises the necessity for better water resources management. The Western Cape Province is a winter rainfall area which further highlights the seasonality with respect to the availability of water. The National Water Resource Strategy 2 (NWRS2) admits that South Africa is a water-stressed country with a variety of water-related difficulties and concerns, including water security, environmental degradation and resource pollution, and wasteful water usage. Activities, such as an increasing population, urbanisation and an increase in pollution exacerbate the pressure on this limited resource which calls for sound water governance structures (Grasham *et al.*, 2019; Rockström *et al.*, 2009; Vairavamoorthy *et al.*, 2008). Cape Town, for example, faced extremely low dam levels in 2018 (Enqvist and Ziervogel, 2019) which resulted in approximately four (4) million residents faced with severe water restrictions. (This led to there being talk of Day Zero when the water would run out completely.) The above-mentioned scenarios are stressing constraints faced by the current water supply and the management thereof (Pigram, 2007), which are further aggravated by water wastage, illegal connections and leaking taps and pipes (Mbokazi, 2009). A similar pattern was also noted by Tang *et al.* (2015), who stated that water resource struggles are extremely common worldwide, especially in developing countries.

To accomplish effective resource protection, the National Water Act (Act No. 36 of 1998) (NWA) (1998) makes provision for two different types of water governance approach, namely (Wepener *et al.*, 2018)

- i) resource-directed measures (RDMs); and
- ii) source-directed measures (SDMs).

Section 12 (2) of the NWA (1998) requires the establishment of RDMs through developing a system to classify the country's water resources by means of a classification system. After the water resources have been classified, the reserve (refer to Figure 1-1) of the water resource needs to be determined to ensure that the basic human needs and ecological water

requirements are met. This is determined by setting Resource Quality Objectives (RQOs) for each water component of the water resource, based on the evaluation of achieving the set objectives (NWA, 1998).

The NWA (1998) has provided for the SDMs as a measure taken at the source of impact to avoid the impact from occurring and resulting in the protection of the water resource. This is done through the issuing of water use licences (WUL), authorisations and permits that are required for any activities which may potentially have an impact on a water resource. The application for WULs, authorisations and permits are evaluated by the Department of Water and Sanitation (DWS) by assessing the impact on water resources against the objectives, as set out in the NWRS and the Catchment Water Resource Strategy, as well as the RQOs for the resource.

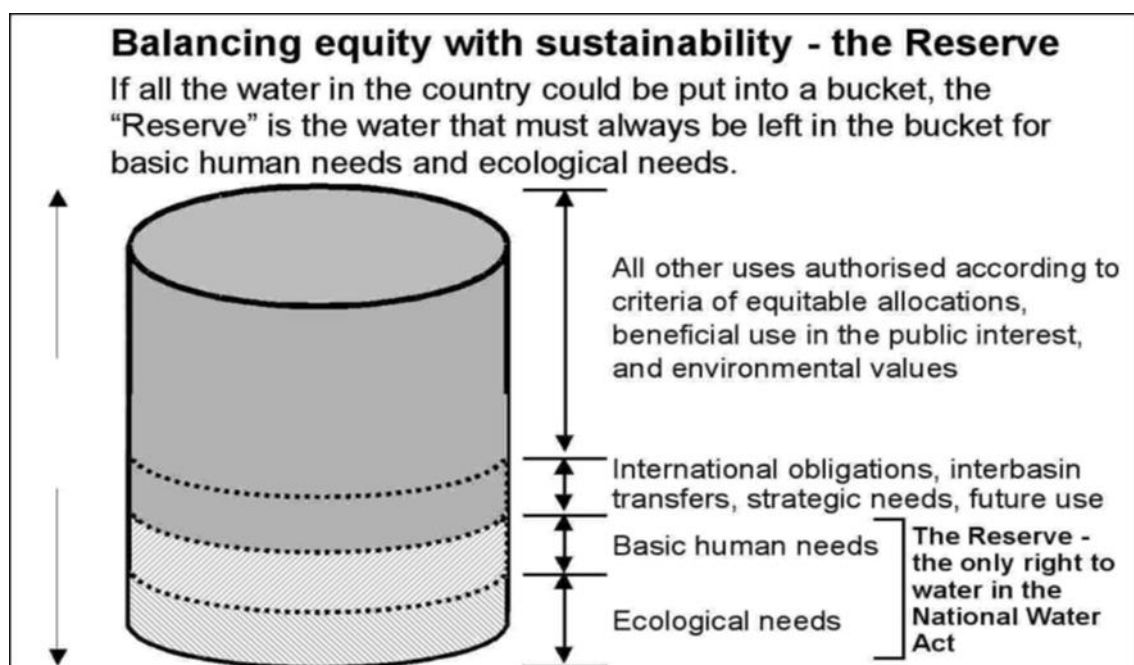


Figure 1-1: A schematic representation of water allocation showing the Reserve (DWS, 2002)

The management of South Africa's water resources is required to ensure that water is provided for basic human needs whilst sustaining the ecological reserve of the aquatic system, and at the same time sustainably promoting activities that stimulate the growth of the economy (DWA, 2013). The Minister of the DWS is the custodian of all water resources in the RSA and the DWS is responsible for the water resources management, aiming to (DWA, 2013):

- ensure a reliable and equitable supply of water for sustainable economic and social development, including poverty eradication;
- ensure the protection of the resource;

- ensure and support the development of effective water management institutions; and
- align staff and stakeholders towards a common vision of integrated water resource management (IWRM).

Chapter 3 of the NWA (1998) provides for the protection of basic human needs and the country's ecological system. The NWA (1998) uses various management tools for water resource management and protection and its legal basis is accounted for in Chapter 4, Part 1 of the NWA (1998) that requires water use licences and permissible water uses in section 22. The NWA (1998) identifies the different water uses in section 21 of the Act. According to section 21 of the NWA (1998), there are eleven water uses, as stated below:

Table 1-1: Water Uses according to section 21 of the NWA (1998)

Section 21	Description of water use
a)	<i>"Taking water from a water resource</i>
b)	<i>Storing water</i>
c)	<i>Impeding or diverting the flow of water in a watercourse</i>
d)	<i>Engaging in a stream flow reduction activity contemplated in section 36</i>
e)	<i>Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1)</i>
f)	<i>Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall, or other conduit</i>
g)	<i>Disposing of waste in a manner that may detrimentally impact a water resource</i>
h)	<i>Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process</i>
i)	<i>Altering the bed, banks, course or characteristics of a watercourse</i>
j)	<i>Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people</i>
k)	<i>Using water for recreational purposes"</i>

All water uses mentioned in Table 1-1 are related to activities that are contributing to the economy of the country. Water use authorisation is thus a tool that is used to regulate the usage of water, mainly by the following sectors (see Figure 1-2) (DWS, 2013).

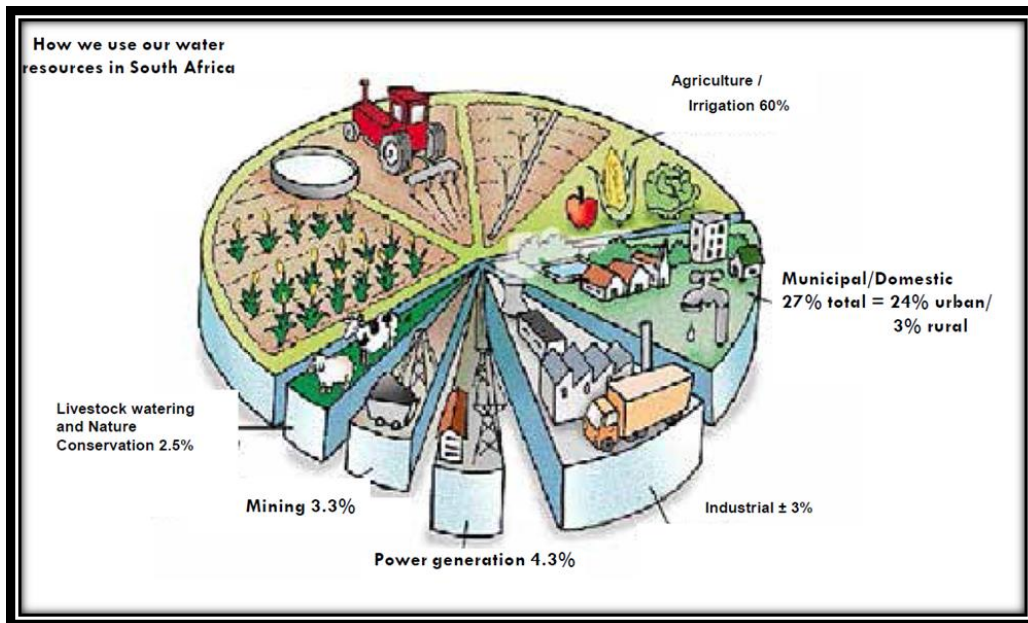


Figure 1- 2: Estimated Water Use per Sector (DWS, 2013)

Holling and Meffe (1996) and Wepener *et al.* (2018) indicated that the issuing of water use authorisation implies a command and control approach to manage water uses that have an effect on water resources. Section 22 of the NWA (1998) makes provision for permissible water use. The DWS, through Catchment Management Agencies (CMAs), is accountable for the processing and issuing of such authorisations which could be existing lawful use, General Authorisation and licenses (DWS, 2007). The DWS manages water and permissible use through authorisations and informing existing water users of the DWS's approach to water resource management (DWAF, 2004). It therefore highlights the importance of protecting and managing our water resources to ensure that all can benefit.

1.2 Problem Statement and Rationale for the Study

Within the uMkhanyakude District Municipality, the proportion of homes receiving water through regional and local water schemes (UKDM) is 42% compared to the provincial average of 72% (Stats SA, 2011). Currently, the UKDM is experiencing a shortage of water (UKDM, 2018). This predicament is made worse by the fact that the RSA is facing major water deficits (Wepener *et al.*, 2018). This was evident when, in 2014, the KwaZulu-Natal Legislature, due to the on-going drought (KwaZulu-Natal, 2014), declared the UKDM as an emergency disaster area. The current water use activities as per section 21 of the NWA (1998) within the UKDM relate to mining, agriculture, and wastewater treatment works (WWTWs). The water quality and quantity deterioration within the catchment is largely due to the poor performing WWTWs, mining in upstream catchments, waste disposal sites, agricultural activities, and settlements with inadequate sanitation and waste services (UKDM, 2018).

The challenges faced in the catchment area are a result of a combination of causes that need to be managed by the CMAs and the DWS (DWA, 1998). The CMA or DWS uses Catchment Management Forums at a local level to manage water resources at a catchment level (Meissner *et al.*, 2003). It is on the premise of the above-mentioned challenges faced by the catchment that this research study aims to provide an overview of the understanding of the water governance approaches within the uSuthu to Mhlathuze catchment and to determine whether the authorised water quantities are aligned with the resource quality objectives (RQOs) of the catchment.

1.3 Research Aim / Objective / Question

The research seeks to address the following questions:

- What is the understanding of Catchment Management Forum (CMF) members regarding water governance in the uSuthu to Mhlathuze Catchment Management Area (CMA)?
- Are the authorised water quantities aligned with the predetermined water quantities of the uSuthu to Mhlathuze Catchment Management Area?

1.4 Structure and Outline of the Study

To be able to answer the research questions, the study is organised systematically into the following five chapters, namely

Chapter 1 in which a background to the study is provided. The problem statement and the research questions are introduced. An overview of the research aim and research questions concludes the chapter.

Chapter 2 in which the methodology that is used in this study to gather data with the aim of addressing research questions is outlined.

In Chapter 3, an overview of water governance that is applied internationally and within the RSA is discussed together with applicable legislation and policies associated with water regarding the authorisation of different water uses.

Chapter 4 in which an overview of the data analysis and a discussion of the results is presented.

In Chapter 5, the concluding comments and recommendations on water governance and the alignment of water use licences with strategic water management objectives of the study area are provided.

CHAPTER 2 METHODOLOGY

2.1 Introduction

In this section an overview of the following key elements of the methodology used in this research, namely the research design, data collection tools and techniques, data analysis, description of the study area, ethical considerations, and methodological limitations related to the study is discussed.

A qualitative research approach will be used to gather information, as described by Levitt *et al.* (2016). This is affirmed by Brynard (2006), stating that qualitative methodology is the kind of research that yields descriptive data generally through the participants' own written or spoken words about their experience or perception.

A purposeful sampling approach, as described by Benoot *et al.* (2016), will be used for the selection and collection of data. This will enable the researcher to collect the information regarding water governance within the UKDM. The other advantage of using such a method is that it guarantees consistency in the gathering of the data, improves quality (and relevance) of data, and hence adequately addresses specific research questions (Levitt *et al.*, 2016).

2.2 Research Design

Proper planning of the research design is critical in order to address the research questions of any study (De Vos *et al.*, 2012). In this research study, the qualitative approach, as described by Welman *et al.* (2005) will be used. This will involve collecting existing data from literature (through document analysis) and selected participants (such as members of the uSuthu to Mhlathuze CMF, government officials, etc.) Therefore, the reflexivity, trustworthiness, authenticity, adequacy, and resonance will be taken into account for qualitative requirements (Rose and Johnson, 2020).

2.2.1 Qualitative Research

A qualitative research approach aims to address questions in order to have to an in-depth understanding of the meaning and experience of the participants on a particular subject (Fossey *et al.*, 2002). Hennink *et al.* (2020) comment that qualitative research assist in the gathering of data of the experience of participants regarding a particular subject or matter. This means that the questionnaire that was sent to the participants and the responses given are those of the respondents without the influence of the researcher. The following two qualitative research techniques will be utilised in order to collect data for the study:

- Questionnaire; and
- Content analysis (Document Review).

2.2.2 Purposeful Sampling

The purposeful sampling approach, as described by Benoot *et al.* (2016) will be used for the selection and collection of data. This will enable the researcher to collect the information regarding water governance within the UKDM. Another advantage of using such a method is that it guarantees consistency in the gathering of data, improves the quality (and relevance) of the data, and adequately addresses specific research questions (Levitt *et al.*, 2016). According to Patton (1990), the use of purposive sampling necessitates the selection of participants who knowledgeable about the research topic or subject. This was applied to the questionnaire that was sent out.

The participants who were selected, form part of the uSuthu to Mhlathuze CMF and below are their responsibilities within the forum:

- Chairperson of the CMF: Responsible for planning and conducting CMF meetings and ensuring the involvement of CMF members in the forum work; responsible for the management, effective performance of the forum, and provide leadership; ensuring proper and appropriate information is provided to CMF members; responsible for updating and making certain that the NWA (1998) policies, municipal by-laws and applicable legislation are adhered to; implementation of water management strategy reports and any other water-related issues that require comments from the forum members.
- Members of the CMF: Attend the quarterly meetings of the forum. Report any water-related issues that require assistance. Ensure that queries and water issues are resolved. Seek assistance about water use licence applications and funding.

Raw data were used to reflect a respondent's view of water governance within the uSuthu to Mhlathuze CMF. These views assisted in concluding the study. In this case, the use of anonymity was adopted to protect the participant under the citation.

2.3 Data Collection

As mentioned by Kabir (2016) and King *et al.* (2018), data collection indicates the collection methods, discussion, participation, assessment, and case study that are used during the research, hence the qualitative research approach. A questionnaire will be used as the primary

source of data collection from the uSuthu to Mhlathuze CMF members. For this research study, data will be gathered from primary and secondary sources.

2.3.1 Primary data: Questionnaire

The researcher utilised a questionnaire to gather primary data for the study. The purposive sampling technique was used to select participating individuals from the uSuthu to Mhlathuze CMF in the uMkhanyakude District Municipality (Etikan *et al.*, 2016). Purposive sampling, or a targeted sampling technique, is called judgment sampling. Etikan *et al.* (2016) argue that purposive sampling is the intentional decision of the participant due to the characteristics the participant has. A non-irregular procedure doesn't require fundamental hypothesis or a set number of participants; the researcher chooses what needs to be known and embarks to discover individuals who can and will to give the data through information or experience. To aid with the process of gathering information for the study, the following steps were followed:

- The North-West University (NWU) gave permission to conduct the study (see Annexure A);
- A non-binding letter was sent by the researcher to prospective respondents – explaining that the research would only be done for academic purposes and anonymity would be ensured (see Annexure B);
- A Consent Form to be signed by prospective respondents was also sent (see Annexure C); and
- A Questionnaire was crafted to gather information (see Annexure D).

The Questionnaire was set out as follows:

a. General understanding of water governance: Here the aim was to gauge their understanding on water governance.

The researcher developed nine (9) questions as part of the questionnaire. The questions were developed with the aim of understanding the views and perspectives of the uSuthu to Mhlathuze CMF members. The questions aimed at gathering data in order to establish the understanding of the uSuthu to Mhlathuze CMF members regarding water governance. The following nine (9) questions were crafted as part of the questionnaire:

1. What is your understanding of water governance?
2. Does the uMkhanyakude District Municipality advocate water governance within its local municipalities? If yes, in what way or form?
3. In your understanding, what is intended to be achieved by water governance in the District?

4. Is there room for improvement in terms of water governance in the District Municipality? If yes/no, please elaborate on your answer.
5. Do the water policies and applicable water by-laws in the uMkhanyakude District Municipality promote water governance? If yes, in what way or form?
6. Is water governance reflected in the uMkhanyakude District water service development plan (WSPD)? If yes, in what way or form?
7. Do you think water governance can be used to address water issues in the municipality? If yes/no, please elaborate on your answer.
8. What types of water governance approach / instrument does the district or local municipalities implement?
9. Does the approach / instrument that is used by the district or local municipality provide any success or failures within the water governance sphere?

This questionnaire was sent via email to the participants due to the Covid-19 National Lockdown Regulations and Restrictions.

A total number of 30 questionnaires were emailed to uSuthu to Mhlathuze CMFs representatives which included municipalities, farmers, and different departmental officials. Out of 30 questionnaires emailed, only 16 participants responded while 14 participants showed no interest in participating in the study.

Raw data was used to reflect a respondent's view on water governance amongst the uSuthu to Mhlathuze CMF members. These views assisted in concluding the study. In this case, the use of anonymity was adopted to protect the participants.

In Chapter 4, the questionnaire and the results are explained in greater detail. Annexure D reflects the questionnaire sent to the uSuthu to Mhlathuze CMF members and the responses received.

2.3.2 Secondary Data: Content analysis (Document Review)

Whilst the study adopted the qualitative method, relevant literature from various journals was collected as secondary data. This also included literature on water governance, existing documentation from different authors, legislation and internet research. Data from the Water Authorisation and Registration System (WARMS) database from the DWS on the authorised water quantities and predetermined water quantities for the uSuthu to Mhlathuze CMA was assessed. Information from the UKMD literature and from other authors that was relevant to the study was reviewed. In Chapter 3, the literature reviewed regarding water governance and water quantities related to the study is discussed.

Content analysis was used as described by Patton (2002), taking into account the quantity of qualitative material and categories with similar consistencies. The NWA (1998) defines eleven (11) water uses in section 21 (a)-(k). However, water uses that are relevant to the study are outlined in section 21 (a), section (b) and section (d). The selected water uses are relevant, as they relate to quantities (volumes) of water in the catchment. In an attempt to analyse the content of the raw data obtained from the DWS Water Use Authorisation and Registration Management System (WARMS), the following reports were used:

- DW760: taking water from a water resource (section 21 (a));
- DW762: storing water (section 21 (b)); and
- DW764: engaging in a stream-flow reduction activity (section 21 (d)).

According to the NWA (1998), all existing water users will have to be authorized at some point, and this licensing process will have to account for both fundamental human needs and ecological reserves. This means that water users must meet certain conditions before being allowed to extract water. Water resources provide a basic source of water to those living near the resource while also ensuring the resource's environmental sustainability.

Permission to obtain data from the WARMS database for the UKDM area was obtained from the DWS. The data searched focused on section 21 (a), section (b), and section (d) of the registered and authorised water uses. The data obtained was used to specify:

- how many WULs are issued within the UKDM,
- the sector in which they fall and the number of Historically Disadvantage Individuals (HDI),
- the types of water use within the sector,
- the resource name, and
- the status of the licence, and the number of HDI.

The above-mentioned will indicate whether or not the issued water use licences are aligned with the predetermined strategic objective of the UKDM. The Department of Water Affairs and Forestry together with the Tlou and Matji (2004) developed the Internal Strategic Perspective for the uSuthu to Mhlathuze Water Management Area. This was undertaken to find solutions to cross cutting issues of strategic objectives that affect the NWA and NWRS for the uSuthu to Mhlathuze Water Management Areas.

2.4 Data Analysis

The data was gathered from both primary and secondary sources by the researcher. Kumar (2011) describes data analysis as a procedure of providing structure to separate data, portraying it, and sorting out it. The researcher observed patterns in the responses received. The researcher used the qualitative research method to analyse data. The choice of this method was guided by the flexibility and ease, which make it possible to generate a conclusion. The data collected by using a questionnaire for participants' responses was compared for similarities. Some data was collected into charts while other data was utilised in its raw state as direct quotes (Spencer and Ritchie, 2002). To analyse the WARMS data obtained from the DWS, an Excel spread sheet was used to extract the WUL issued, the number of sectors and HDI within the UKDM.

2.5 Description of the Study Area

The UKDM is categorised as a class C municipality in the Constitution of South Africa (1996) and in the white paper on local government (1998), covering an region of 12 818 km² and having a populace of 625 846. The UKDM area is known to be the second largest District Municipality in KwaZulu-Natal and in the far northern region of the province is where it is located. The Acacia Xanthophloea fever tree is known as uMkhanyakude, which means "light from afar." In December 2000, the UKDM was created as part of a municipal separation including the disadvantaged and poor regions of KwaZulu-Natal (Iyer, 2003).

Isimangaliso Wetland Park, which is a renowned world heritage site with more than 200 km of coastline, is located within the uMkhanyakude District Municipality (UKDM, 2018/19). After the 2016 local government elections, its borders underwent a further round of separation during which the Big Five False Bay and Hlabisa Local Municipalities merged into one local municipality, namely the Big Five Hlabisa Local Municipality (UKDM, 2018/19). The UKDM currently has four local municipalities which are Jozini Municipality, Mtubatuba Municipality, the Big 5 Hlabisa Municipality, and uMhlabuyalingana Municipality (UKDM, 2018/19). See Figure 2-1: Area map showing uMkhanyakude District Municipality (Source: Municipalities, 2020).

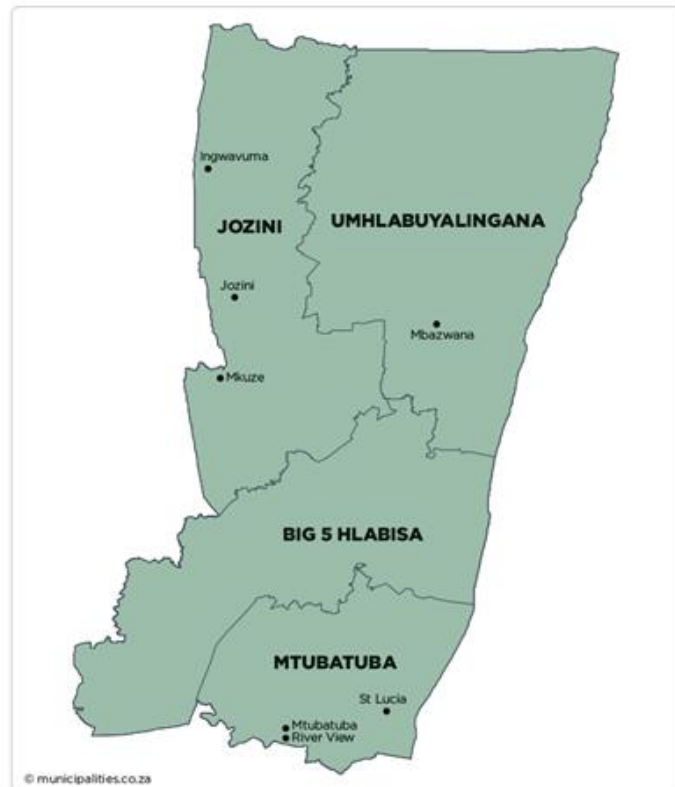


Figure 2-1: Area map showing uMkhanyakude District Municipality (Source: Municipalities, 2020)

The District Municipality is in the town of Mkuze, which has the Indian Ocean to the east, the Republic of Mozambique to the north, and the Kingdom of Eswatini to the north-west. In the south, King Cetshwayo District Municipality can be found and the Zululand District Municipality is on the west side of the uMkhanyakude District Municipality. The main economic activities within the area are agriculture, trade, and tourism (UKDM IDP, 2018/2019).

The uSuthu to Mhlathuze catchment, which encompasses the entire uMkhanyakude area, is the UKDM's principal surface catchment area (UKDM IDP, 2008/2009). The UKDM major rivers include the Pongola River, which is located in the north-west and drains in a northerly direction into Mozambique, and the Msunduzi and Mkuze Rivers which drain in the central areas, whereas the Hluhluwe, Nyalazi, and Mfolozi Rivers drain to the south (Umngeni Water, 2016).

Afforestation inside the catchment region is viewed as perhaps the biggest client of water resource, eliminating an enormous extent of the water resource from the aquatic environments. It typically happens inside the higher-lying spaces of the catchment where the sources of many of the streams happen from slopes inclines and drainage wetland inside the mountains (UKDM IDP, 2018/2019).

Agriculture, afforestation, overgrazing, unstructured urban sprawl, including informal settlements have all added to the degradation of the catchment regions. Reports express that degraded regions represent 16% of the Jozini region (Marais, 2011). When it comes to river catchment areas, 3 percent of the Great uSuthu River's catchment, 19 percent of the Pongola River's watershed, and 15% of the Mkuze River's catchment are considered degraded (Marais, 2011). This is usually caused by severe erosion or the inundation of high-density alien vegetation (UKDM IDP 2018/19).

2.6 Ethical Considerations

The research ethics policy of the North-West University (NWU) (2018) states that research must be guided by core principles and upheld as per the research in question. Furthermore, it says that ethical consideration must be given and explicitly delineated during the research undertaken. The Scientific Committee of the Environmental Management Research Group (EMRG) viewed the research proposal and research study. The Faculty of Natural and Agricultural Sciences' Research Ethics Committee (FNASREC) made the final review and decision. The FNASREC exempted this research study from a full ethical review on the basis that the research study does not include '*any risk to animal or human participants*' and the methodology for the study is outlined below.

The researcher informed all the participants that their identities would stay classified. This was to permit participants to address the interview questions uninhibitedly without the fear of disclosure. This was reiterated by Allmark *et al.* (2009) that to assert that guaranteeing discretion is a critical part when leading interviews on a fragile matter. Furthermore, Allmark *et al.* (2009) approve that empowering confidence amongst the researcher and a participant is a critical cycle in working with a casual setting for responders. Before the interview, all of the respondents who took part in it gave their permission. A letter to conduct academic research from the NWU (see Annexure A) allowing the researcher to conduct the investigation was made available to interview participants during the interview procedure to ensure the study's approval.

The following ethical considerations applied:

- The study took into account the ethical consideration which will be addressed through voluntary participation;
- The right to privacy for the participants was considered by obtaining consent. Anonymity was guaranteed to avoid bias responses from the participants;
- Permission was sort from the Universities ethics committee, the Catchment Management Forum Committee, and the Local Municipality; and

- For legitimacy, the questions were designed to suit the requirements of the subjects for whom they were intended.

2.7 Methodological Limitations

It was anticipated that the interviews were going to be conducted with 30 members within the uSuthu to Mhlathuze catchment. Out of 30 emailed participants selected, only 16 participants responded due to limited resources, such as internet connection and access to emails. The response rate was low due to the COVID-19 Lockdown Regulations and Restrictions that were experienced by South Africans. The participation of all selected participants was important, as it is believed they would be knowledgeable about water governance and its implementation.

2.8 Chapter Summary

In this chapter, the methodology applied to the research study was presented. An overview of the research design, the methods and techniques used for the research study, including the interviews and content analysis used to collect data was provided. The data analysis approach adopted and the steps implemented were also discussed and illustrated. The ethical considerations were taken into account and the methodological limitations of the study were mentioned.

CHAPTER 3 LITERATURE REVIEW

3.1 Introduction

In this chapter, an overview of governance, water governance, the Constitution of Republic of South Africa (Act No. 108 of 1996), the National Water Act (Act No. 36 of 1998) and the Water Services Act (Act No. 107 of 1997) will be provided, all of which have an important role in the water resources management in South Africa. Furthermore, a review on Integrated Water Resource Management (IWRM) and water resources management, including Resource-directed Measures (RDM), Source-directed Measures (SDM) and permissible water uses will be addressed, with a reflection on water management institutions. Challenges related to climate change and water scarcity, and how these relate to resources management, will be analysed. The literature review will conclude with the economic activities that have an impact on water in the UKDM, as well as water governance within the UKDM and contracts that are in place to ensure service delivery is deliberated.

3.2 Overview of Governance and Related Legislation

In the opinion of Eberhard *et al.* (2017), governance is a form of decision-making processes and tools (laws, rules, norms, and customs) planned by organisations and formed by philosophical preference. The United Nations Development Plan (UNDP) (2001) further describes governance as the application of economic, political, and administrative powers which are aimed at achieving the welfare of the organisation. On the other hand, poor governance can be related to the lack or inadequacies in the decision-making processes and/or tools (such as legislation, policies, laws, etc.) concerning water resource management (Ackerman, 2004). Governance is becoming more prominently used when referring to the state or government (Bevir, 2008); however, it does not necessarily exclude private sector and civil society organisations (Tortajada, 2010; Wilde *et al.*, 2012). Governance also plays a significant role in managing water resources which is seen as a sub-set of governance.

3.2.1 Water Governance

Water governance relates to the broader management (i.e., inclusive of all key stakeholders or role players) of the water resources, focussing on the key issues, such as social, political, economic and administrative aspects at all spheres of government (Global Water Partnership, 2002; Williamson, 1996) and plays a major role in realising the principles of Integrated Water Resource Management (IWRM).

Both the United Nations Development Programme (UNDP) (UNDP, 2004) and United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2006) highlighted that the water challenges do not seem to mainly emanate from lack of water supply or the related technology, or even finances, but rather mainly stem from poor water governance. Studies indicate that a number of governments around the world still tend to have a centralised structure for the governance of water resources and a call to re-think such an approach is becoming more imperative (Gera, 2008). Van Koppen *et al.* (2006) argue that the structuring of water governance, including policy making, implementation, subsidising, and financing by government, is sector-based and should follow a top-down approach.

Governance associated with water resources management seems to be increasingly receiving attention, as it received the platform at an international space (i.e., Second World Water Forum held in the Hague in 2000), with ministries confidently calling for the astute governing of water to guarantee good governance (Roger *et al.*, 2003).

The NWA (1998) states that the DWS is the custodian of all water resources in the country and requires that the Department ensures effective water governance by implementing the main principles of the NWA (1998); i.e., efficiency, equity, sustainability (DWS, 1997). The principles of the NWA (1998) aim to ensure that water resources are not wasted, are distributed in an equitable manner, as well as taking current and future water needs into consideration (DWS, 1997).

Over the past few years, due to political changes in South Africa water governance framework has undergone significant changes (Van Koppen *et al.*, 2006). Only a few of the changes include a major shift from centralized to diffused power, hierarchical to horizontally shared control, and a shift from state-enforced norms and rules to inter-organizational relations and cooperation (DWS, 2016). Even though there is such a change in the direction, there is still a long way to go in achieving the total decentralisation of powers to local levels, such as CMAs. The decentralisation of powers is in line with the IWRM principles for the management of water resources at the lowest suitable level, taking into account the fundamental aspect of openness, transparency, inclusivity, communicativeness, coherence, integration, equity, and ethics (see Table 3-1) (GWP, 2002; Rogers *et al.*, 2003).

Table 3-1: Principles of effective water governance (Source: Rogers and Hall, 2003.)

Principles	Application
“Open and transparent	<i>Water institutions should work openly and in a transparent manner, using language understandable to the public; water policy decisions should be transparent, particularly regarding financial transactions.</i>
Inclusive and communicative	<i>Wide participation should be ensured throughout the water policy chain, from conception to implementation and evaluation; governance institutions must communicate amongst water stakeholders both horizontally at the same levels and vertically between levels.</i>
Coherent and integrative	<i>Water policies and actions must be coherent, with political leadership and a strong responsibility taken by institutions at different levels; water institutions should consider all potential water users and sectors and their linkages with, and impacts on, the traditional water sector</i>
Equitable and ethical	<i>Equity between and amongst various water interest groups, stakeholders, and consumers should be carefully monitored throughout the policy development and implementation process; penalties for corrupt behaviour or sharp practices should be applied equitably; water governance must be strongly based on the ethical principles of the society in which it functions and on the rule of law.</i>
Accountable	<i>The rules of the game, as well as legislative roles and executive processes, must be clear; each water-related institution must explain and take responsibility for its actions; penalties for violating the rules and arbitration-enforcing mechanisms must exist to ensure that satisfactory solutions to water issues can be reached.</i>
Efficient	<i>Concepts of political, social, and environmental efficiency related to water resources must be balanced against simple economic efficiency; governmental systems should not impede needed actions.</i>
Responsive and sustainable:	<i>Water demands, evaluation of future water impacts, and past experiences should be the basis for water policy; policies should be implemented, and decisions made, at the most appropriate level; water policies should be incentive-based, to ensure clear social or economic gain if the policy is followed; long-term sustainability of water resources should be the guiding principle.”</i>

Governance and water governance in the UKDM are currently at an all-time low. Due to governance and water governance failures experienced within the district, the KwaZulu-Natal Member of the Executive Council (MEC) for the Department of Cooperative Governance and Traditional Affairs (CoGTA) and Provincial Treasury in accordance with section 154 of the Constitution of the Republic of South Africa (Act No. 108 of 1996), the government decided to interfere by sending a support team to the municipality, which included financial, technical, and governance professionals. These governance challenges have translated into a backlog of supplying water to areas around the UKDM due to rivers being dry as a result of severe drought (Bigen Africa, 2016). This also refers to the poor infrastructure that is meant for the provision of water and irrigation schemes. This has resulted in a lack of storage of water which yields low water requirements that cause lack of water during severe drought events (Bigen Africa, 2016).

3.2.2 Legislation related to water governance in South Africa

Leftwich (2010) comments that the written constitution, laws, policies, rights, and regulations, all of which are enforced by official authority, are examples of formal institutions. Informal institutions, on the other hand, are unwritten social norms, habits, or traditions that influence how people think and act. There are numerous different pieces of legislation that frame the management and/or governance of the water resources. These include the Constitution of the Republic of South Africa (Act No. 108 of 1996), the National Water Act (Act No. 36 of 1998) and the Water Service Act (Act No. 108 of 1997). On a local level, the UKDM promulgated by-laws, which aim to manage water resources at the district level.

3.2.2.1 The Constitution of the RSA

The Constitution of the Republic of South Africa (Act No. 108 of 1996) (hereafter the Constitution) is regarded as the highest and most important law of the land. As a democratic country, the RSA uses the Freedom Charter of 1955, as well as the Constitution (1996), to serve as its cornerstone, and several subsequent sections of the legislation promulgated in the last 25 years. The Constitution (1996) stipulates in Section 27 (1) (b) that, “everyone has the right to have access to sufficient water.” De Coning and Sherwill, 2004 comments that the statement has, however, proven to be extremely difficult to be effectively implemented by the Government in South African, mainly due to discrepancies in using neoliberal market-based approaches to balance the supply of free water (Macdonald and Pape, 2002; UNDP, 2010). To be able to provide basic services and address the imbalances of the past, the Constitution (1996) has mandated the government to ensure that every citizen has access to essential services such as water and sanitation. According to Gleick (1998), the RSA was the leading country in the world to embrace the importance of access to water as a human right enshrined

in the Constitution. However, several challenges exist which prevent the realisation of this fundamental human right.

The DWA (2012) states that inadequate access to acceptable quality and quantity of water has had a negative impact on society, the environment and the economy. Like many other emerging countries, the RSA is flooded with water supply and distribution problems caused by natural and socio-political matters (Olorunfemi, 2011).

The Constitution (1996) is relevant to the provision of water for the following two reasons:

- Firstly, the Constitution (1996) stipulates that everyone has the right of access to adequate water. The DWS, as the custodian of water resource in the RSA, has the responsibility to realise this right; and
- Secondly, the Constitution (1996) has the legal basis to assign powers to different spheres of government to regulate the provision of water.

Promulgated legislation, such as the NWA (1998) and the Water Service Act (WSA) (Act No. 108 of 1997) stipulate roles and responsibilities, as well as powers to different spheres of government in relation to the management of water resources.

3.2.2.2 The National Water Act

The DWAF (2007) remarks that the National Water Act (Act No. 36 of 1998) came into effect on 1 October 1998, with the main purpose of, *“safeguarding the nation's water resources, which are to be protected, used, conserved, managed, developed, and controlled in a way that takes into account:*

- *meeting the basic human needs of current and future generations;*
- *promoting equitable access to water;*
- *redressing the results of past racial and gender discrimination;*
- *promoting the efficient, sustainable, and beneficial use of water in the public interest;*
- *facilitating social and economic development;*
- *providing for the growing demand for water use;*
- *protecting aquatic and associated ecosystems and their biological diversity;*
- *reducing and preventing pollution and degradation of water resources;*
- *meeting international obligations;*
- *promoting dam safety; and*
- *managing floods and droughts.”*

This new water act is regarded as one of the best in the world with respect to the management and use of water resources (Muller *et al.*, 2009); however, it is also clear that there are some shortcomings with respect to the implementation and/or enforcement thereof (DWS, 2013; Karodia and Weston (2001) and Kahinda *et al.* (2009).

3.2.2.3 The Water Services Act

The Water Services Act (Act No. 108 of 1997) obtained its mandate through section 27 of the Constitution (1996), which states that *"everyone has the right to have access to sufficient food and water, and the State must take reasonable legislative and other measures to achieve the progressive realisation of these rights"* (DWA, 2011). The Act emphasises the interest of customers and clarifies the function of other water services.

This Act (WSA, 1997) further *"makes provision for an institutional legal framework for the delivery of potable water supply and sanitation, which includes the following main objective:*

- *the setting of national standards and norms and standards for tariffs in respect of water services;*
- *preparation and adoption of water services development plans by water services authorities;*
- *the regulatory framework for water services institutions and water services intermediaries;*
- *establishment and disestablishment of water boards and water services committees and their duties and powers;*
- *monitoring of water services and intervention by the minister or by the relevant provincial government;*
- *financial assistance to water services institutions, e.g. Water Boards; the gathering of information in a national information system and the distribution of that information;*
- *accountability of water services providers; and*
- *promotion of effective water resource management."*

This Act identifies the local government as the responsible authority to ensure that water service delivery is provided to the citizens in their respective areas (WSA, 1997). Whilst implementing this mandate, the local authority is expected to take in account all the provision of the IWRM practices in the context of a legal framework for water services (Haigh *et al.*, 2010).

The DWA (2013) states that although the RSA has respectable laws governing the supply of drinking water, some remote areas still do not have access to drinking water supply from their

local authority or provider. The NWRS (2013) states that access to adequate water for development is essential to rival uses and beneficial of racial and gender balance. The water service backlog within the UKDM in the year 2016 (see Table 3-2) indicated that 53.2% the population has access to below the national standard level of water services (Bigen Africa, 2016). The Integrated Development Plan 2018/2019 of the UKDM indicated that households with access to water number 103 496 (68%), whilst households with no access to water account for 47 749 (32%) of the total households of 151 245 in the area. This information about the service backlog was sourced from Census (2011) and StatsSA (2016) Community Survey by the UKDM. However, this shows that from 2016 to 2018 there is a slight improvement in the provisioning of water to households even though it may not be according to the national standard level of water services as outlined by the study done by Bigen Africa in 2016.

Table 3- 2: The table shows the backlog of water services for the UKDM (Source: Bigen Africa, 2016)

Local Municipality	Population	Percentage of the population with access below National standard level of water service			
		Census 2011 Level of Water Services	Asset Register Infrastructure Data	Verified Consultants Infrastructure Data	Combined Infrastructure Data
uMhlabuyalingana	155140	52.7%	50.6%	60.2%	28.5%
Jozini	185790	62.4%	67.4%	47.1%	42.3%
The Big 5 False Bay	35195	37.0%	28.2%	32.5%	20.7%
Hlabisa	71902	60.8%	48.7%	37.9%	36.3%
Mtubatuba	175359	44.0%	50.3%	28.9%	17.6%
uMkhanyakude	623387	53.2%	54.1%	43.3%	30.0%

3.3 Management of Water Resources

According to Pahl-Wostl *et al.* (2006), the management of water resources is an approach to learn, prepare, observe, and demonstrate the quantitative and qualitative control and development means for a lengthy time with having abundant uses. In the opinion of Larson (2010), the significance of management of water resources is not about the scarcity of the resource, but rather the multiple connections of numerous topographies of water's cultural, social, political, and ecological implications. The effects of the management of water resources

(which takes into account the supply of safe and dependable domestic and irrigation water, protection of aquatic ecosystems, and flood protection) has many difficulties in various areas across the world (Hering and Ingold, 2012).

The NWRS-2 (2012) emphasises the important role which water managers and water users play to ensure effective management of water resources in the country. In the view of Claassen (2013), in the RSA, the management of water resources has shifted its approach from the private good, having a robust role of the state and institutions, to a better public virtuous and network system. The UKDM is amongst other rural areas in the RSA that has limited water resources (Mulopo *et al.*, 2020). Furthermore, Everard (2009) and Dollar *et al.* (2010) comment that water resources in the RSA are significantly overstressed. It is therefore imperative to ensure that the objectives of the NWA (1998) (equity, sustainability, and efficiency) are attained by users without compromising the ecology. One such approach embedded in the NWA (1998) to ensure the achievement of its objectives is IWRM.

3.3.1 Integrated Water Resource Management (IWRM)

According to Claassen (2013), IWRM permits for policy and regulating environment, roles and responsibility, and managing instruments to enable water resource to support social and economic growth whilst safeguarding the sustainability of the resource. The IWRM emphasises water challenges, such as water quality, and flow needs in the environment, demand management, and water reform that are concerned with growth challenges (Merrey, 2008).

The idea of the IWRM method is described as the organised development of water resources, land, and economic and social welfare in a reasonable way without affecting the ecosystem's sustainability (GWP, 2000). The IWRM includes the four Dublin principles, which state that freshwater is a limited and susceptible resource which is vital to maintain life, growth and the environment. They further state that the water development and management must be according to participatory method that involves planners, policy makers at all stages and users. Women are recognised for playing an important role in the supply, management and protection of water. Additionally, the principle maintains that water has an economic worth which ought to be acknowledged as an economic good.

In the 1990s, the RSA embarked on IWRM, and paved the way for water reforms in the country (Manzungu and Mabiza, 2004 and Molle, 2008). The approach of IWRM was the cornerstone of the newly promulgated National Water Act (1998), only four years after the attainment of South African democracy in 1994. The NWA (1998) was, however, founded on the IWRM approach. Even with concerns that it was adapted from the north, there were questions regarding its

implementation in the Southern African environment due to poor access to water and lack of adequate water infrastructure (Boshoff, 2010; SADC, 2005 and Swatuk, 2008). In addition, the NWA (1998) included principles of optimal water resources protection, sustainable development, and equitable utilisation which are accepted internationally as a philosophy of IWRM (Manzungu and Mabiza, 2004). The DWAF (2004) states that to achieve integrated planning and management approach as mentioned by IWRM, it aims to achieve the requirements of allocation of water resources as mentioned by the NWA (1998).

The NWA (1998) places emphasis on the water resources management at national and catchment levels, which has made detailed requirements for the protection of water resources and recognised tools to ensure equitable and efficient water use. These tools provide participatory administration, consequently supporting the Dublin Principles of social and monetary benefit, community participation, a policy framework, and the role of communities and women (Claassen, 2013). To be able to implement the NWA (1998) effectively, the NWRS was established and is effective through the IWRM tools, i.e., RDMs and SDMs (Odume *et al.* (2018). The outcome from the strategic planning session held at the UKDM in March 2018 indicates that the district hopes to maintain and improve on the integrity and quality of natural resources between 2014 and 2030 (UKDM, 2018). Due to the poor engineering designs that resulted in ineffective infrastructure being built, the water quality and regulatory flow have been affected (UKDM, 2018). This is compounded by aging and failing infrastructure. The UKDM (2018), states that wetlands are constrained due to an increase in population and developments that have an effect on the ecological functioning.

3.3.2 Water management instruments

The IWRM embraces the use of water management instruments (see Figure 3-1), such as Source-directed Measures (SDM) to control water uses, and Resource-directed Measures (RDM) which regulate water resources (NWRS, 2002).

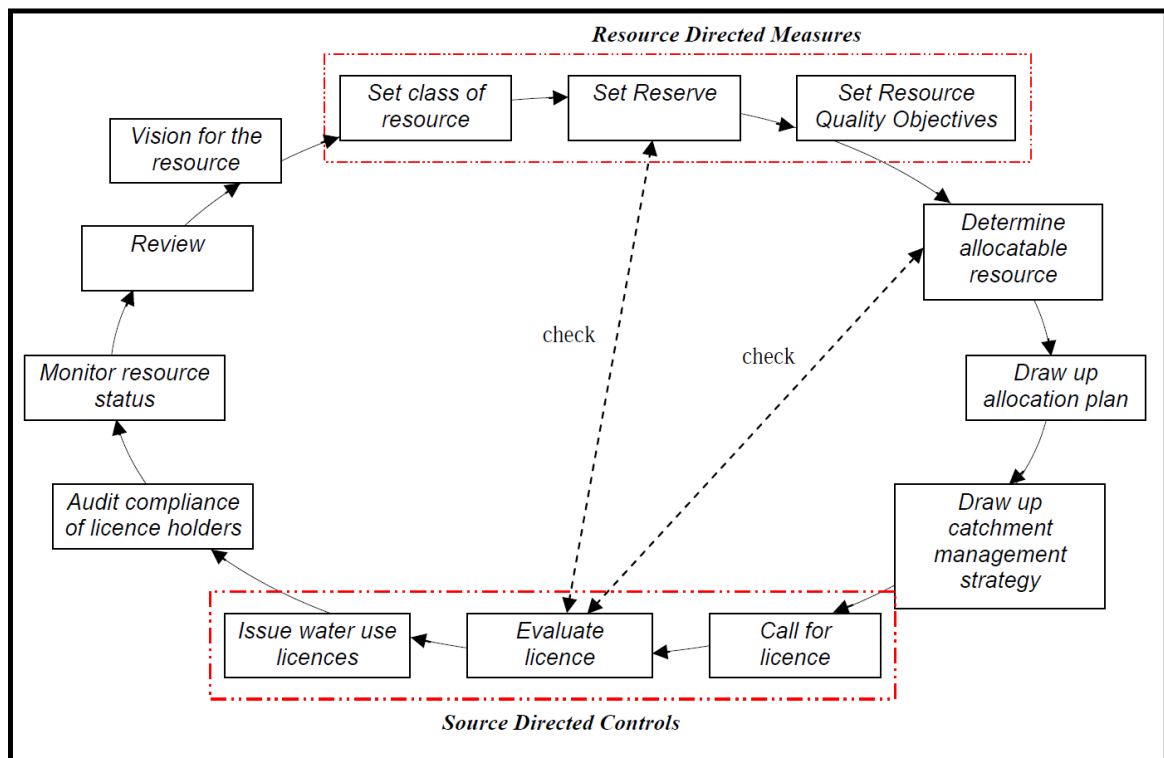


Figure 3-1: The water resource management business process: (Source: DWAF, 1999)

3.3.2.1 Resource-directed Measures (RDM)

According to Parsons and Wentzel (2007), RDMs are a method and strategy that is used to realise the objectives of the NWA (1998) by means of the classification of water resources, the determination of the reserve, and setting of RQOs. In the opinion of Ginsburg *et al.* (2010), the RDMs set goals and objectives for the preferred condition of water resource in an aquatic ecosystem whilst protecting the water resources. Parsons and Wentzel (2007) further state that RDMs aim to ensure the proactive protection of the water resource together with the sustainable principles. The RDMs use the illustration (Figure 3-1) of the water resource management to ensure that the sustainability of water use is a proactive method to manage water resources.

In the opinion of Parsons and Wentzel (2007), the DWS is responsible for the realisation of RDMs with the purpose of implementing the NWA (1998). This means that it lies with the Chief Directorate: Resource-directed Measures (RDM) with the DWS. According to Odume *et al.* (2018), to avert challenges related to RDMs, it is essential to ensure that the methods are scientifically justifiable so that their application is not refused by stakeholders and/or affected and interested parties. The RDMs thus attempt to warrant that water resources are given the level of protection that will guarantee the level of growth for the future (Parsons and Wentzel, 2007). According to Ginsburg *et al.* (2010), it is important to note that the RSA uses the RDMs and SDMs to manage water resources and emphasise the principle of sustainability.

3.3.2.2 Source-directed Measures (SDMs)

The SDMs outline the criteria for regulating activities of water use and their impacts on the ecosystem (Ginsburg *et al.* 2010). The NWA (1998) makes provision for the SDMs as steps performed at the point of impact to prevent the damage from occurring, resulting in water resource protection. According to Parson and Wentzel (2007), the purpose of SDMs is pollution control and management that relates to wastewater disposal and over-abstraction from water resources. The SDMs examples include the general authorisation (GA) of water use, the licensing of water use (WUL), minimum waste disposal criteria, general and particular effluent disposal standards, and special phosphate discharge standards in water containing waste (Parson and Wentzel, 2007). In the opinion of Odume *et al.* (2018), the SDMs' purpose is to regulate water resource impacts, using regulatory methods, such as registrations, permits, directives, prosecution, and monetary value to ensure that RQOs are met. Some of the issues that relate to SDMs are effluent discharge as a result of untreated waste water from waste water treatment works (Odume *et al.* 2018). The DWAF (2009) has noted that faecal coliform and salinity are some issues that relate to SDMs which then affect the water quality of the river. For WULs with no published RQOs there is a concern as to what advises conditions and discharge quality (Odume *et al.* 2018). These can be said to be some the issues that relate to SDMs and may have an impact in the issuing of WULs.

The SDMs use the WULs to ensure that water activities within a catchment are accounted for without compromising the basic human needs and to ensure that the ecological reserve is catered for (Parson and Wentzel, 2007). For water use licences (WULs) that have no published RQOs, it is unclear what influences the exact conditions contained in such WULs, and what is regarded an acceptable discharge quality for variables of concern, taking into account the needs of economic development while guaranteeing resource sustainability (Odume *et al.* 2018).

3.3.2.3 Resource Quality Objectives (RQOs)

The Minister of DWS is responsible for determining RQOs as per Chapter 3 of the NWA (1998) that is based on the DWS policy statement and methodology which are aligned with NWRS (Parsons and Wentzel, 2007). The RQOs of water resources are obligatory as per section 13(1) (b) of the NWA (1998). Odume *et al.* (2018) state that RQOs are numerical and narrative descriptors of criteria's to be met for the desired management scenario to be realised for the resource classification. According to Odume *et al.* (2018), the purpose of RQOs is to create clear goals relating to the quality of the significant water resources. Furthermore, Odume *et al.* (2018) state that for each selected resource unit or hydrological note the RQOs need to be

defined in terms of water quantity, quality, habitat and biota (Odume *et al.*, 2018). As stated in section 13(3) of the NWA (1998), the reserve, the in-stream flow and water level, specific quality, and in-stream and riparian habitat of the water resource in question, are activities which may affect quality and quantity of water resources and require regulation.

When a WUL is issued, RQO conditions have to be met to achieve the required management scenario as provided during resource classification (Odume *et al.*, 2018). In the opinion of Colvin and Cave (2004), RQOs can include any conditions which have to be met to safeguard water, preserved in a maintainable and wanted state in line with the NWRS and takes into account the Reserve. Furthermore, Odume *et al.* (2018) state that tools, such as water use licences, permits, general authorisation, water quality guidelines, and standards become the regulator's target. In the opinion of Mackay (2001), water resource managers generally need the information on the RQOs to assist in the issuing of water use licences and to know the quantity and quality of available water. This means that the water resource managers need information about the water resource and the available water so that they can ensure that the basic human need and reserve are accounted for. Furthermore, Mackay (2001) states that the resource quality has four critical components (the quantity, quality, characteristic and condition of in-stream and distribution of the aquatic biota) associated with them that are important to protect the aquatic ecosystem function and health as stated in the NWA (1998). The RQOs are essential for the quality and flow (volume, velocity, and distribution through time) of the water resource (Colvin and Cave, 2004).

The RQOs are used to put a class and reserve into operation by indicating conditions that will protect the class and not compromise the reserve (Parsons and Wentzel, 2007). According to Colvin and Cave (2004), the RQOs are seen as an authoritative tool for protecting water resources to ensure their sustainable use. When the RQOs have been defined, they become compulsory to all authorities and organisations when regulating any permissible water uses under the NWA (1998) (Parsons and Wentzel, 2007). However, Odume *et al.* (2018) argue that there has been a concern from industries that the appropriate methods for setting WUL conditions exclude stakeholders and ecological requirements reflection. This then raises questions on how WUL conditions are set to be able to realise the set RQOs. According to Odume *et al.* (2018), the RQOs can notify authorisation discharge standard and *vice versa*; however, the relation between the two is not clear to numerous water users and regulators.

Unregulated water uses and development in areas lead to poor water quality and discharge into the rivers (Odume *et al.* 2018). This was seen in 1890 with the pollution by mine water that resulted in livestock deaths due to discharge into the river (Turton *et al.* 2006). Therefore this goes to show that the implementation of the conditions that are set in the WUL is essential to

ensure that pollution occurrences are averted. A study which was commissioned in the Vaal highlighted that there were concerns as to how the conditions in the WUL and discharge quality specifications are set that relate to pollution and water quality (Odume *et al.* 2018).

3.4 Permissible water uses

The NWA (1998) makes provision for realising section 27 of the Constitution (1996) by setting the basis for equitable access to water for all citizens. Section 27 of the NWA (1998) requires a water user to apply for a WUL when undertaking a water use as stipulated in section 21 of the NWA (1998). According to section 151(1) of the NWA (1998), it is an offense to use water without authorisation or failing to comply with the conditions as stipulated in the water use license. The manner in which water uses is authorised currently determines the effectiveness of water resources to be managed in the future, thus it is important that the procedure is conducted efficiently (DWAF, 1995). This process is called Water Use Licence (WUL) (see Table 3-3).

The NWA regulates water use and makes provision for the authorisation of water use in five (5) manners, namely (see Table 3-3):

Table 3-3: Permissible water use

Permissible water use	Description
“Schedule 1	<i>Schedule 1 refers to water use that does not require registration and/or authorisation, as it only uses small volumes of water, and is within the permitted range, and is mainly for domestic uses (e.g. cooking, washing, gardening, etc.) (DWS, 2007).</i>
General authorisation (GA)	<i>The general authorisation (GA) refers to all the water uses that do not fall under Schedule 1, but are still of less impact on the water resource, and do not require a full WUL (NWA, 1998). General authorisations must be within the defined limits and comply with conditions as set out in the GA Notice; however, they need to be registered with the DWS (DWS, 2007).</i>
Existing lawful use (ELU)	<i>Prior to the promulgation of the NWA in 1998, the Water Act (Act No. 54 of 1956) governed the use of water. As a rule, all water uses that commenced before 1998 are deemed as Existing Lawful Use (ELU) in terms of the Water Act (1998). However, relevant records, such as irrigation infrastructure designs need to be in place to prove that the water use occurred before 1998, and thus the existing lawfulness must be verified and validated by the DWS. All existing lawful uses need to be registered with the DWS.</i>
Water use licence (WUL)	<i>All other water uses need to be authorised by means of a water use licence (WUL). These are high impact water uses, which need more stringent and specific conditions in their authorisation. The WUL is lawful for a period not exceeding 40 years with stipulated conditions; a responsible authority may review it at least every five years (DWAF, 2004; DWS, 2013).</i>
Dispensing with Licence Requirements	<i>Chapter 4 of the NWA (1998) states that a responsible authority may dispense with the requirement for a license for water use if it is satisfied that the purpose of this Act will be met by the grant of a license, permit, or other authorisation under any other law”.</i>

The DWS has issued 5 956 water use licences (see Table 3-4), by sector (i.e., agriculture, mining, industry, local government and development) between 1998 and 2016. These WULs include agriculture, SFRA, local government and development and industry.

Table 3- 4: Water Use Authorisation issued from 1998-2016 (Source: DWS, 2017)

Year	Agriculture	SFRA	Mining	Local Gov. and Development	Industry	Total
1998-2010	1427	761	118	227	82	2615
2011	292	871	97	132	66	1458
2012	90	9	59	67	37	262
2013	78	37	36	60	11	222
2014	100	15	28	87	26	256
2015	275	3	96	205	57	636
2016	109	50	118	152	78	507
Total	2371	1746	552	930	357	5956

3.5 Water Governance within the uMkhanyakude District Municipality

The governance within the UKDM is characterised by institutional arrangements for water in the country, as per the NWA (NWA, 1998 and Berkowitz *et al.*, 2009). The government's water arrangement has shifted to a decentralized structure of Catchment Management Agencies (CMAs) and Water User Associations (WUAs) after the promulgation of the NWA (1998). (Berkowitz *et al.*, 2009). The CMAs function at a catchment level, whilst the WUAs are at a localised level; both of which are aiming at managing water resources at a local level as prescribed by the NWA (1998). The challenges of establishing CMAs in the RSA is well documented (Meissner *et al.*, 2017) and the Pongola to UMzimkhulu CMA (under which the uSuthu to uMhlathuze WMA falls) has not yet been established (referred to as Proto-CMA). The DWS (national and regional offices), the UKDM as the Water Service Authority (WSA), and uMhlathuze Water Board and Water and Sanitation Services South Africa (WSSA) as contracted Water Service Providers (WSPs) make up the wider water governance framework inside the UKDM (UKDM, 2016).

Following these contractual agreements with water service providers, the UKDM is accountable for water extraction, treatment, bulk water distribution, and waste water management. As per section 152 of the Constitution (1996), the local governments' primary job and function is to foster social and economic development while also ensuring that residents have access to

adequate water supplies. Numerous environmental (natural), economic (financial), social, technological, and institutional aspects have been identified as affecting and influencing overall capacity for water provision (Rahman, 1998). As a result, the UKDM as an institution is accountable for carrying out this mandate. The role that the UKDM plays in uSuthu to Mhlathuze is sharing knowledge, making recommendations about water issues, learning about other problems, finding solutions, and protecting the land and rivers within its region of authority.

The UKDM's governance issues have drawn the attention of many government departments, with some authorities criticizing the council for its inability to handle numerous difficulties despite enormous backing from provincial and national government organizations (CoGTA, 2016). Given the financial, social, and environmental implications of inadequate governance, there is a pressing requirement to monitor and assess the performance of current water governance structures.

3.6 The economic status of the UKDM

The UKDM (2018/19) has stated that the economic status in the area has seen an increase from 1995 (R 2.7 billion) to 2011 (R 7.1 billion) with the biggest economic sectors being retail, catering and accommodation. Subsequently, followed by the manufacturing sector, agriculture, storage and business services presented an upsurge between 2001 and 2011 (UKDM, 2018/19). Davis *et al.* (2012) add that the economic activities in the region contain manufacturing, real estate, and business services, government, mining and quarrying, retail, agriculture, gas, water, and electricity. The agriculture and tourism are two of the most important sectors identified as pillars of the UKDM's economy (Davis *et al.*, 2012; UKDM, 2015). With the area being identified as one that is poverty-driven, numerous citizens depend on agriculture, government grants and family members working outside the area (UKDM, 2015). The municipality is a popular tourist and agricultural destination because to its mix of productive land, water, and significant biodiversity of both animals and vegetation (UKDM, 2015). These sectors made major contributions to the provincial economy (see Figure 3-2). The agriculture consumes up to 60% of the water allotment per sector, according to the DWS's strategic water resources strategy (2015). The municipalities (27%), mining (3%), industry (3%), energy (2%), and afforestation (3%) are the remaining sectors of the economy at the national level (DWS, 2015). The link to water (surface or ground water) highlights the economy's complicated need on water for long-term growth. As a result, it is necessary to strike a balance amongst the economic, social, and environmental importance of water in order to support municipal growth, as stated in the UKDM's IDP (UKDM, 2016).

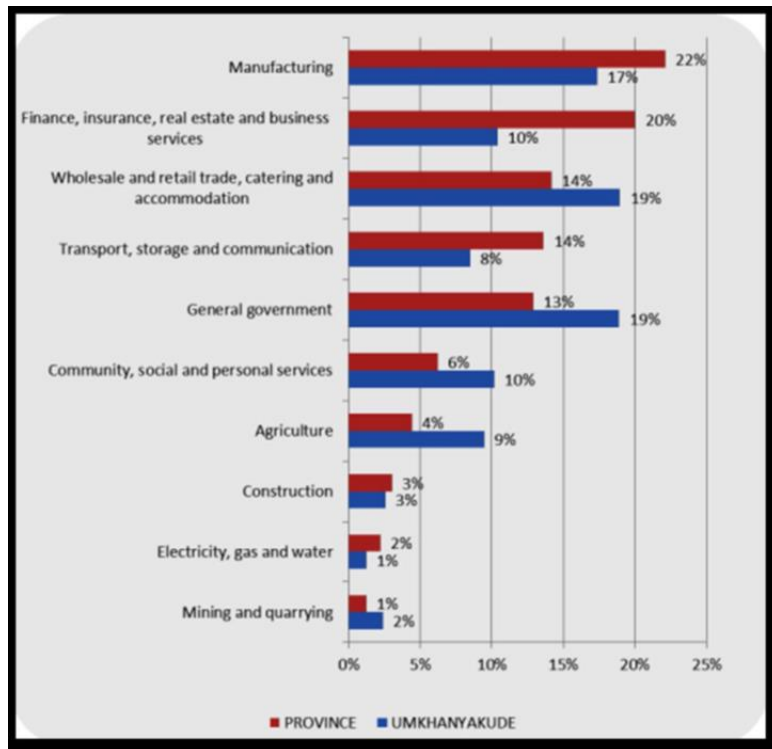


Figure 3-2: The UKDM contribution of each sector to the UKDM's economy (Bigen Africa, 2016)

3.7 Surface, Groundwater and Catchment Characteristics

The combination of the UKDM's temperature and subtropical landscapes, mountains and flat grasslands creates perfect conditions for the maximum potential of surface water resources. The UKDM is known for its abundant agricultural potential, which goes far beyond the potential of its natural water resources (UKDM, 2015). The Jozini Local Municipality strategically stands along the Lebombo Mountain range and has a non-perennial river that flows into the Pongola River. Although the Jozini Dam is the largest in the country and has a great potential for the UKDM it has contributed minimally to the local community due to historical and private ownership rights (Gumede, 2017). Originally, a dam and a broad plan with a concrete dam and connected channel were built to regulate floods and store water for sugar cane irrigation and agricultural reasons (UKDM, 2016). The Pongolapoort Dam that is known as the Jozini Dam and is the largest dam in KwaZulu-Natal was established in 1973, as a part of Pongolapoort-Makhathini Flats Government Water Scheme, adjacent to Jozini.

The uMhlabuyalingana Local Municipality is characterised by a flat landscape, thus having small key river courses, large portions of wetlands and coastal lakes. Lake Sibiya is the region's only supply of water, and it is bounded by smaller pans that dry up during the dry season. There are numerous small water bodies and many, rivers that flow into Lake Sibiya before emptying into the Indian Ocean are non-perennial. The Big Five False Bay and Hlabisa Local Municipalities were merged to become the Big Five Hlabisa Local Municipality, which is currently named as

the Big Five Hlabisa Local Municipality. These two municipalities share a flat terrain that typifies the topography of the area. The Mzimeni River is the major watercourse in the Big Five False Bay area, which flows into Lake St Lucia and passes through into the Indian Ocean. The region has numerous water rich wetlands, as well as a floodplain and pan. The Mfolozi and Nyalazi Rivers are the main freshwater sources in the region of the Hlabisa Local Municipality. The quality of the water declined significantly in recent years as a result of the cultivation of sugar cane and sulphate seepage from mining activities.

Similarly, the Mtubatuba Local Municipality is also facing challenges related to water quality problems. For example, during the dry season, the uMfolozi River has limited flow as the river experiences high levels of silt due to the low levels of the water flow. The Msunduzi and Nyalazi Rivers are other watercourses in the region.

A research project by the Council for Scientific and Industrial Research (CSIR) (1995) indicated that the possibility for groundwater in ground RSA is split into three sections. The first section is the main groundwater system that can provide a community of approximately 4 890 people with a typical yield of 4.26 l/s, well above 30 l/p/day. The second section has a small groundwater system that can provide a community of up to 1 510 people with a typical yield of 1.58 l/s, equivalent to 30 l/p/day. The third section comprises a poor groundwater system that provides 30 l/c/day to a community of 1 200 people at typical yield of 1.25 l/s (UKDM, 2015). In the east, the UKDM is located on a large groundwater system, whereas in the west, it is located on a minor groundwater system. The groundwater systems in the UKDM have adequate groundwater potential, yet restricted by drilling problems issues caused by soil type's limit it (UKDM, 2015).

The Pongola, Sibaya, Mkuze/Hluhluwe, and Mfolozi catchments, which are shared between southern Mpumalanga and other portions of KwaZulu-Natal, Swaziland, and Mozambique, are included in the UKDM (UKDM, 2015). The water balances figure for the Pongola, Mkuze, and Mfolozi River Systems are illustrated in Table 3-3. For stakeholders who are downstream and upstream, the water source area is of a trans-boundary nature of the catchment (UKDM, 2015). This is dependent on the effective management of the resource system by all stakeholders relying on the diverse aquatic resources and wetlands of the water system (Bigen Africa, 2016). The location has allowed for the development of sugar cane and forests, which are the region's main job creators. (Bigen Africa, 2016).

The water balance below (see Table 3-5) indicates that there is a shortfall of water which will have an impact on the issuing of WULAs. Given the significance of water resources to human communities, it is crucial that the DWS finds ways and means to ensure the protection of and safeguarding against the over-use, abstraction, allocation and management of the resource

(NWA, 1998). According to Bigen Africa (2016), the UKDM gets its water from both surface and groundwater for both domestic and commercial usage. Furthermore, Bigen Africa (2016) states that the UKDM is faced with an enormous water resource deficit and it is crucial that the DWS speeds up the validation and verification of water use which will result in equitable allocation of the resource. This is also reiterated by Mallory (2002) who comments that the uMfolozi River is used beyond its capacity whilst the Mkuze is over-developed due to irrigation, resulting in water deficiency and substandard water quality for downstream users. Furthermore, Mallory (2002) states that while there are abundant possible resources in the catchment, but due to insufficient infrastructure to supply viable yield, this results in water deficiency during the drier months of the year. This will assist the DWS with the issuing of WULs in the UKDM area, as the water situation is known before WULs can be issued.

Table 3-5: Figures showing water balances on the Pongola, Mkuze and iMfolozi River systems
(Source: DWAF (2004))

Yield and Abstractions in m3/annum		River System		
		Pongola	Mkuze	iMfolozi
Available Water	Local yield	645	33	51
	• Transfer in	0	33	0
	• Total	645	66	51
Water requirements	Local requirements	255	78	80
	Transfer out	38	0	18
	Flood plain releases	250		
	• Total	543	78	98
• Balance		102	-12	-47

3.8 Water Management Institutions (WMI)

The NWA (1998) enables the formation and transformation of Water Management Institutions (WMI) to ensure that the DWS provides effect to its primary mission (development, protection,

conservation, allocation of water resources, and the regulation of water services and water use). The WMIs, namely the (a) Water User Associations (WUA), (b) Catchment Management Agencies (CMA) manage water resources and encourage stakeholder engagement through (c) Catchment Management Forums (CMF) at the local catchments (DWS, 2013). The DWS as a custodian of managing the water resources of the RSA and having a regulatory role uses the WMIs at local level (example of WMI below):

- (a) **Water User Associations (WUAs):** The NWA (1998) allows for the establishment of WUAs. The WUAs operate at a controlled local level and are represented by different water users who have an interest in water-related activities for a common benefit.
- (b) **Catchment Management Agency (CMAs):** Chapter 7 of the NWA (1998) provides for the establishment of a CMA with the role of managing water resource functions at a local level. This will improve stakeholder participation in decision making locally and management of water resources. The Minister is responsible for the appointment of a board, which will govern the CMA and represent the interest of participants, water users and government (ought to include WUA representatives where applicable). With the CMA's main focus being on urban areas of Richards Bay /Port Shepstone and not the rural regions of the northern KwaZulu-Natal, the backlog within the rural areas lingers to worsen poverty and stunt development (Moisa, 2004).
- (c) **Catchment Management Forum (CMFs):** The CMFs are non-statutory organisations established through the NWRSII, which is different from the CMAs and WUAs that are established through the NWA (1998). The CMFs are non-statutory organisations as defined in Chapter 8 of the NWRSII with the aim of supporting participant involvement in integrated management of water resources and providing support to CMAs (DWAF, 2013). The water users from different sectors (the mining industry, irrigation, forestry, and domestic sectors) make up the CMF and have a common interest to manage, use, allocate, protect, and conserve water resources. However, the UKDM is experiencing water shortages which then make it difficult to effectively manage water resources.

3.9 Water Scarcity and Climate Change

According to the United Nations-Water (2012), water is regarded as one of the main contributors to all worldwide challenges. Pereira *et al.* (2009) explain water scarcity as a condition in which water availability in a nation or area is below 1 000 m³/person/year. Jack *et al.* (2016) noted that water is very scarce in heavily populated areas, such as Central, West- and North-Africa, with an estimate of less than 1 000 m³/person/year. Hussein *et al.* (2006) add that internationally, 1.7 million people in over 80 countries, including the RSA, are facing water shortage. In the opinion of Jiang (2009), the northern part of China is facing progressing serious water scarcity that has

resulted in the irregular supply of water resources, fast economic growth, and urbanisation with rising population and poor water resource management. Yet Pereira *et al.* (2009), on the other hand, dispute that population growth is entirely responsible for water scarcity.

Environmental variability and climate extremes, mainly due to droughts and floods, then call for better adaptation capacity in dealing with the consequences thereof (Blignaut and Van Heerden, 2009). In the RSA, various groups in a community experience water scarcity differently, with the poorest communities tending to be mostly negatively affected in the event of such variation taking place (DWA, 2012). For example, even though the same community may be affected, the affluent may still be able to have means of accessing water (either through existing infrastructure or other means), whilst the poor may really struggle to get alternative natural water resources. The influx of people further exacerbates the pressure posed on the natural water resources. The study area chosen in this research falls under one such area in KwaZulu-Natal, and Figure 3-3 below presents the breach between existing supply and projected demand.

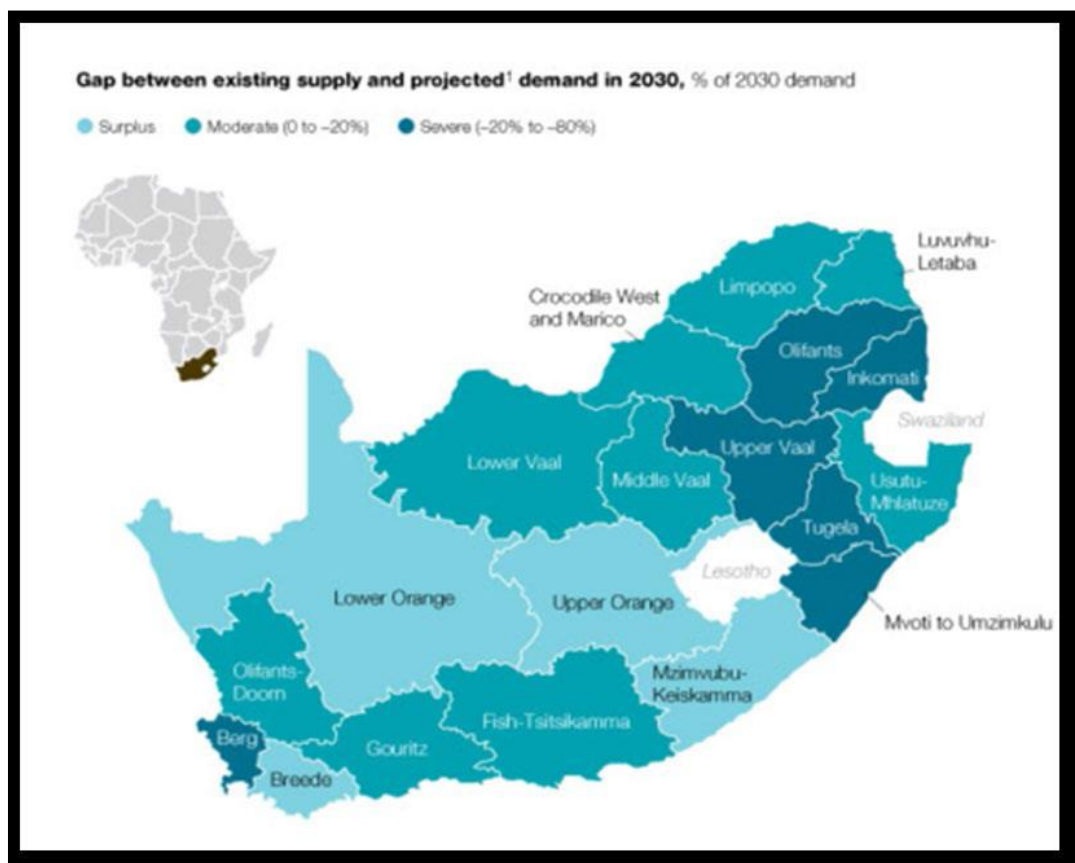


Figure 3-3: 2030 Water Demand in the Republic of South Africa

Source: Water Research Commission; South African Department of Water Affairs and Forestry (DWAf); Statistics South Africa; 2030 Water Research Group

Mehta (2014) highlights that a number of studies done on water scarcity tend to focus more on the provision of water globally, whilst there is little focus on discussing varying patterns of consumption and cumulative equity. According to Noemdoe *et al.* (2006), the idea that water scarcity is a biophysical issue that can be corrected by technological and infrastructural involvements is dismissed. The problem of water scarcity is complex and is due to socio-political conditions; however, it could arguably be managed with adequate assurance, should there be buy-in by all parties (Mehta, 2014). These views have raised a substantial number of audiences amongst those concerned with power and politics, resulting in influencing water governance. Mehta (2014) concludes that the problem with many traditional studies on water scarcity is that they do not ask how scarcity is accumulated; rather it is presumed to be true to a definite degree.

According to Otto *et al.* (2018), climate change is likely to triple the chances of drought to occur which also adds to challenges of water scarcity. On the continent of Africa there is an average temperature rise of about 6^o C, which is mostly caused by droughts and climate change in different parts of sub-Saharan Africa (Otto *et al.*, 2018). Engelbrecht *et al.* (2015) comments that the RSA experienced an average temperature above 20^o C/century between 1931 and 2015. With the RSA ranked the 30th driest country in the world and having less water per person than all her countries, the effects of climate change on water resources are therefore expected to be very high (DWA, 2013; Engelbrecht *et al.*, 2015). Kabuyaya *et al.* (2017) add that the UKDM is a classic rural area with a sub-tropical climate characterised by hot and humid summers (November-February) and cooler and drier winters (June-August). Dlamini (2018) states that the major challenge facing the UKDM regarding water supply is to allocate the available physical resource equally through existing resources, such as infrastructure and water systems. Furthermore, Dlamini (2018) explains that a continuous political struggle in the UKDM over power at both regional and district level was an impediment to the progress of the provision of municipal services, and thus further increased water scarcity problems.

3.10 Chapter summary

In this chapter, an overview of governance and water governance in the international and the RSA context was provided. A discussion on water governance within the UKDM and how external expertise was sourced to be able to assist the municipality in rendering the services to the community was presented. The water resources that are within the study area, as well as how the area is one of the water-scarce regions within the RSA were discussed. A brief on permissible water uses, as per the NWA, was also given, linking IWRM, RDMs, SDMs and RQOs. An overview of the water available and the Reserve within the UKDM was discussed in order to assist in planning for future allocation and/or use. Water scarcity and climate change,

and how political interference has an impact on service delivery, as well as the economy of the area were also discussed.

CHAPTER 4 RESULTS, DATA ANALYSIS AND DISCUSSION

4.1 Introduction

In this section of the research study, the results and discussion on the general understanding of water governance by members, and alignment of authorised water quantities with predetermined water quantities of the uSuthu to Mhlathuze CMA are provided.

In the first part of this chapter, the responses from the interviews conducted with CMF members are interpreted. The technical questions (Questionnaire) are also addressed. The questionnaire is divided into General understanding of Water Governance, legislation and policies and instruments used for water governance. This answers the first research question of the research study – the general understanding of water governance.

In the second part of this chapter, WARMS, which provides information on water uses as per section 21 of the NWA (1998), and specifically section 21(a) that deals with the abstraction of water from the resource; section 21(b) which deals with the storage of water; and section 21(d) which is related to Stream-Flow Reduction Activities (SFRA) – all of which are related to quantities (volumes), and not quality is investigated. The focus will only be on the permissible water uses, as per section 22(1) of the NWA (1998); i.e., not illegal or unauthorised water uses.

4.2 Results related to the General Understanding of Water Governance, Legislation and Policies and Approaches and Instruments used for Water Governance

In this second section, the investigation of the understanding of water governance by the participants or members of the CMF is undertaken. In order to facilitate the understanding, the responses from the questionnaire are grouped as the understanding of water governance, legislation and policies and approaches and instruments used for water governance.

4.2.1 Results related to the General Understanding of Water Governance

With respect to the understanding of water governance by participants, ten (62%) indicated that they understand, or at least had some level of understanding whilst six (28%) did not have or show any idea of understanding. According to Rogers *et al.* (2003), water governance involves political, social, economic, and institutional dimensions and spans different levels of society to influence interactions between society and water. The ten respondents understood and to some extent agreed that water governance is explained as the political, social, economic and administrative systems that are in place which have an influence on water use and management. Furthermore, the respondents argued that water governance relates to the

manner in which the UKDM has to ensure the equitable and sustainable use of water in the area, not forgetting the rules, practices and processes which decisions for the management of water resources, services implemented and decision makers are held accountable. It is also confirmed by Muller *et al.* (2009) that water governance is fundamental to ensure economic development and sustainable growth at various levels. Furthermore, Muller *et al.* (2009) state that to achieve effective water governance, management of water and the manner in which it is used, socio-economic and social welfare are essential at all levels of government. According to McEwan (2003), to achieve water governance, the introduction of local government to govern water-related issues at a catchment level is needed. Six respondents defined water governance as the access to water for many people that is needed for a matter of daily survival, or that can help to break the vicious cycle of poverty. Furthermore, the respondents described water governance as an effective co-ordination and experience dividing between association's organisations and delivering water-related data between data makers and users, and across levels of government, whilst advancing commitment with stakeholders in the plan and implementation of water data frameworks.

The information gathered from respondents indicates that the UKDM has not yet succeeded in promoting water governance as nine (56%) lacked relevant information and knowledge regarding water governance that is advocated by the UKDM within its local municipalities. The other seven (44%) agreed, but with some reservations, especially with respect to the implementation and application of water governance within their local municipalities. From the responses received, the participants mentioned that the UKDM advocating water governance within its local municipality is inadequate, as most areas do not have access. The participants revealed that it is due to political interference that the UKDM is unable to effectively advocate water governance within its local municipalities. The responses received highlighted that the documents and reports that are produced by the UKDM do promote water governance; however, the implementation thereof is ineffective and limited due to political interference. The inclusion of people, more especially women, plays a critical role in the decision making regarding water-related issues (Van Koppen *et al.*, 2006). It would appear that water governance is spoken about, but the application is lacking. This was in agreement with the finding by Neal *et al.* (2014) who indicate that political interference does affect water governance in various municipalities. Furthermore, the participants mentioned that the UKDM does not care about its local municipalities; only when the UKDM stands to benefit does it advocate water governance within its municipalities. The participants mentioned that the UKDM is failing to advocate water governance within its structures in the municipality, so it will be difficult to cascade it to its local municipalities. This was in agreement with the findings by

García *et al.* (2019) who stated that municipalities are facing a number of challenges, including internal and external effective collaboration when advocating water governance.

The responses received from participants on their understanding of what water governance intends to achieve varied significantly; however, they can be broadly grouped into the following three categories, namely:

- a. The majority of respondents (81%) were of the opinion that it is meant to coordinate and manage the water resources for the purpose of benefiting all users, whilst protecting the water resource;
- b. Two respondents (13%) indicated that the sentiment they have is that it is meant to take powers away from people to the politicians; and
- c. One participant (6%) did not seem to have an idea or opinion on the matter, as he/she left this question unanswered. There is, however, a possibility of not wanting to share ideas on this matter.

This is in agreement with Neal *et al.* (2014) who comment that water governance is not defined by one definition, but a structure which takes into account the management of water as per purposes that take into account the socialite objectives. However, Ashton *et al.* (2005) argue that water governance is defined as a system that includes numerous organisations and a variety of institutions that function at a range of levels. This is also in agreement with Pahl-Wostl (2015) who describes water governance as a social system that controls and manages water resources at various levels of society. However, it is clear that most participants understood the dynamics and challenges faced by the water managers, especially in light of the fact that the RSA has a history of a centralised and hierarchical water management system along administrative boundaries (DWS, 2016).

Six (38%) of respondents believe that water governance can be used to address water issues in the UKDM, as opposed to the ten (62%) who do not believe it could. This seemed contrary to the previous question (on their understanding of what is intended to be achieved by water governance in the District, as per Question 5 above). Upon close scrutiny of the answers and explanations thereof, it was clear that the main point of departure was their lack of trust in the system, especially with respect to it addressing water issues without any external influences, etc. In the opinion of Schreiner *et al.* (2012), section 3 of the NWA (2012) enables the Minister of the DWS as the custodian of water resources to safeguard that water provision is conducted in a manner that ensures that all citizens benefit from it. Water is considered as the important resource and it is the basic requirement which is needed for survival on earth (Hossain, 2015). Since the promulgation of the NWA (1998), only two CMAs (The Breede Overberg CMA and the

Inkomati CMA) have been established from the proposed 19 CMAs which were later revised to nine CMAs (Schreiner *et al.*, 2012). Various provinces in the RSA are conflicted, whilst others are not cooperative with the establishment of CMAs which has resulted in the delay and they view it as not critical (Movik *et al.*, 2016). Capacity limitations resulted in impending centralisation/decentralisation and water allocation that have an impact on water resource management (Schreiner and Hassan, 2011). Carrying out setting up 19 CMAs ended up being a verbose task. One issue was basically due to capacity restraints whilst the government was attempting to do everything simultaneous (Schreiner and Hassan, 2011), yet additionally due to unanticipated local opposition, approaching strains of centralisation/decentralisation, and the tenacity of water designation change.

Furthermore, Schreiner *et al.* (2012) comment that the established CMAs are not used to their potential that enables them to function effectively. The NWA (1998) makes provision for the “*protection, use, development, conservation, management and control of the nation’s water resources*”, as well as the establishment of WMI, such as the CMAs (Schreiner *et al.* (2012). The purpose of the CMAs is to delegate WRM at regional or catchment level to deal with catchment issues and the involvement of communities in water issues that affect them directly (Schreiner *et al.*, 2012). In the opinion of Muller *et al.* (2009), the water sector in the RSA is faced with trials associated with water resources and water services. Furthermore, Muller *et al.* (2009) highlight that the manner in which water is managed and used can have a substantial effect on the nation’s social welfare and economic activities, such as developing infrastructure to store and provide water to users, distributing the resource to different users, encouraging its effective use and protecting it (Muller *et al.*, 2009). In the view of Muller *et al.* (2009), the water crises or issues identify the following aspects: the shortage of water supply, flooding, pollution and allocation that play a crucial role in stating the availability of water in the country, its usage and the how the resource is managed. With the findings by Muller *et al.* (2009), it is clear that the UKDM needs to promote water governance so that it can be able to address the water issues in the area.

All sixteen (100%) respondents were conflicted about there being improvement in terms of water governance in the UKDM. This stance was, however, contrary to the previous comments with respect to what the municipality was doing or not doing and how well it was implementing policies and by-laws. Two possible explanations could be drawn from these, and this could mean that:

- a. respondents seemed to rather have issues with understanding the question; or

- b. they simply did not have faith that the municipality could be any better – thus the answers were more about them indicating their opinion that there is no hope for improvement in the foreseeable future.

The latter seemed true, especially when one delved into the explanations given, a summary of which is listed below:

- Nothing is happening as the water service delivery is non-functional in most areas;
- Communication to the affected areas is lacking;
- No clear roles and responsibilities;
- Political interference in the operation of the municipality;
- No accountability; and
- Failure to implement policies, monitoring and enforcement of by-laws.

According to Schreiner (2009), to achieve good water governance, the following fundamentals are critical a clear policy direction, professional bureaucracy and an empowered civil society; something that participants felt was lacking or not applied efficiently within the UKDM. Furthermore, Schreiner (2009) comments that in the RSA, these fundamentals are not practised enough in the water sector. Good governance must be tailored to local circumstances, and incremental development and adaptability are essential (Adams *et al.*, 2020). However, this does not seem to be the case at the UKDM, as participants do not have confidence in the UKDM. According to De Stefano *et al.* (2014), it is the responsibility of all spheres of government to work with the residents to ensure that there are improvements in water governance. In the opinion of Schreiner *et al.* (2012) the historical and on-going water pollution as a result of over-abstraction of water and discharge of dirty water in the agricultural sector, as well as failure of municipal water treatment and discharge of untreated sewage into our watercourses, have put strain on our water governance framework. Furthermore, Schreiner *et al.* (2012) highlighted that to enable effective water governance, section 24, section 27(1) (b) and section 156 and Schedule 4 of the Constitution, the NWA (1998), the DWS, the Municipalities, Section 3 of the NWA (1998) and the NWRS (2004) are legislation and institutions that are of importance; not forgetting the minister responsible for the implementation of the NWA (1998), CMAs, WUAs, CMFs, Water Service Authorities and Water Tribunal (Schreiner *et al.*, 2012). The participants highlighted that water governance is just on paper, but in reality, the UKDM is failing; hence they are doubtful of the improvement in water governance within the UKDM.

4.2.2 Results related to Legislation and Policies

12 (75%) respondents indicated that the UKDM still has a long way to go with regard the water policies to promote water governance. Only four (25%) respondents agreed that water policies and applicable water by-laws in the UKDM do promote water governance. This is supported by Okumah and Yeboah (2020) who state that municipalities need to promote applicable water policies and by-laws to promote water governance in their respective areas. In the opinion of Schreiner (2009), in the RSA, a number of issues related to policy direction exists which makes it difficult for the institutions to apply applicable water-related policies. The findings were also supported by Vani (2009), who stated that the integration and definition of roles and responsibilities are critical, albeit lacking in most organisations.

Schreiner (2009) comments that a report by the Department of Cooperative Governance and Traditional Affairs highlighted the following in policy and promotion of water government:

- *“policy inconsistency and incorrect policy assumptions between spheres and communities with regard to municipal ability to deliver;*
- *instability between spheres of government, lack of governance or policy coherence;*
- *weak oversight, supervision, support and intervention mechanisms across government;*
- *poor political management and leadership;*
- *poor ethics, governance paralysis, poor support to cope; and*
- *weak and insufficient service delivery capacity.”*

The UKDM has water policies in place to promote water governance; however; the concern is the implementation which is also supported by the report by the Department of Cooperative Governance and Traditional Affairs (2009). This was also evident as Denby *et al.* (2016) commented that the NWRS2 has realised the slow growth in the RSA when implementing water policies. This goes to show that not only the UKDM is struggling with the implementation of water policies or the promotion of water governance.

Nine (56%) respondents were not aware if water governance was reflected in the districts WSDP. Seven (44%) respondents commented that water governance was reflected in the WSDP; however, four (57%) of those who agreed (7) (or 25% of the total number of respondents (16)) stated that water governance was reflected for compliance sake. The WSA (1997) section 12 (1) of the NWA (1998) requires that every water service authority prepare and submit a draft water service development plan and a summary of the plan. In the views of Du Plessis (2007), the information that is provided in the water service development plan is compulsory as per the legislation and it provides the municipalities with a plan to able to

measure their achievement against the objectives and aims set. Finewood (2016) noted lack of integration of water governance in local plans of municipalities. The respondents commented that water governance was reflected in the UKDM water service development plan; however, its implementation and practice was minimal or non-existent. The respondents commented that the water service development plan is supposed to outline the municipality's plans in providing water services to its citizens. However, the respondents highlighted that the UKDM is not implementing what is mentioned in the water service development plan and this was also advocated by the Helen publication (2019) which states that the water services development plans of municipalities are frequently invalid and not properly implemented. This is highlighted when the UKDM (2018/19) mentioned that currently there is no valid water service development plan in place, as the last was reviewed and updated in 2009. The respondents commented that water governance was reflected in the water service development plan, outlining the social, economic and administrative arrangements that impact on the water use and management thereof. However, this was recognised by the District as one of the critical issues to be addressed during the 2019/18 financial year (UKDM, 2018/19). According to Du Plessis (2007), the water service development plan's purpose is to realise the management of water-related issues, proper preparations and budget processes to be able to render water services. This is affirmed by Solanes (2006) who comments that it is imperative for institutions to plan how and by whom water will be used, also taking into account its social and economic benefit. Additionally, the respondents highlighted that the UKDM reflects water governance in the water service development plan to ensure that they receive funding or grants. In the opinion of Solanes (2006), the institutions need to meet certain requirements to be able to get subsidies and funding to enable the institutions to render service delivery to the communities. Adams *et al.* (2020) state that water governance is not limited to economic, political, environmental change, and stakeholder participation.

4.2.3 Results related to approaches/instruments used for water governance

The majority of the respondents, eleven (69%), did not know what type of water governance approaches or instruments the district or local municipality implemented. On the other hand, five (31%) respondents believed that the water governance instruments that are used by the district or local municipality are not implemented effectively, but rather serve the minority group who stand to benefit or gain. The following issues were highlighted:

- Communication to the areas with serious water shortage is minimal;
- Inclusion on water-related issues is not transparent;
- Lack of accountability of the municipal officials;
- Lack of implementation of water policies and related legislation; and

- Compliance and enforcement of water policies, water by-laws, and applicable legislation.

Twelve (75%) of the respondents remarked that the instruments or approaches were not successful, but rather failures within the UKDM water governance sphere due to lack of communication, implementation, compliance, and enforcement. They further explained that service delivery was poor and there was a lack of accountability by the district. Four (25%) of the respondents stated that to a certain degree, the instrument or approaches were successful to enable the district to gather support within the water governance sphere. The one issue that was also flagged by most participants was that they felt that some approaches and/or instruments were there as a 'tick-box' exercise (e.g. to motivate and/or comply for grants, etc.). In the opinion of Schreiner *et al.* (2018), approaches are used to measure or evaluate the effects of policy interventions which are what the UKDM can apply to measure its success or failures. Furthermore, Schreiner *et al.* (2018) comments that an assessment is needed to check before and after the approach is implemented to enable measuring of the failure or success thereof. These findings were in line with the observations by Adams *et al.* (2020) who stated that water governance change includes, but is not limited, to economic, political, environmental change and stakeholder participation – which was the case and/or the opinion of most participants. According to the UNDP (2007), corruption is still one of the most under-addressed issues in water governance and service delivery, which is noted by Adams *et al.* (2020), who highlighted that it is becoming more tolerated by organizations, including governments around the world.

According to Neal *et al.* (2014), water approaches have changed over the years. This is evident, as Muller *et al.* (2009) comment that administrations of the world through the Nations Commission on Sustainable Development continue to be dedicated to the water management approach. Furthermore, Muller *et al.* (2009) comment that the water in the RSA is extensively used at 31% of the available water supply which warrants for the approaches to be used to ensure success or failure in the management of the resource. Approaches can be used in various situations across the water sector to grow its benefit which can be functional (Van Koppen *et al.* (2006). Miranda *et al.* (2011) argue that the failure or success of water approaches is dependent on how water is managed and administrated. Van Koppen *et al.* (2006) argue that the approaches can provide success if increased ownership, improved productivity and inclusivity of local people in water-related issues and water governance are taken into account. Some respondents argued that water governance approaches do not work; however, a Batchelor (2007) comment that approaches is essential to safeguard better management and protection of water resources. Furthermore, Batchelor (2007) states that

approaches are needed to ensure access to water and arrangement with the increasing demand on the resource, lack of responsibility and transparency, water rights and inclusivity of women in water-related decision making. This is what the respondents have highlighted, namely that the UKDM is not transparent and forthcoming with water-related issues, especially matters that concern the community. In the opinion of Schreiner *et al.* (2018), approaches are needed to enable the institution to measure its success or failure against the goals set.

4.3 Results related to the WARMS Database for the uMkhanyakude District Municipality

In this section of the study, information on water uses as per section 21 of the NWA (1998), and specifically sections 21(a), (b) and (d), which deal or are related to quantities (volumes), and not quality is provided. Results on the percentage or number of Historically Disadvantaged Individuals (HDI) within the UKDM, who are formally authorised and registered with WARMS, are also provided.

4.3.1 Authorised and Registered Water Users according to section 21(a) of the NWA

The total number of authorised and registered water users (see Figure 4-1) as per section 21(a) of the NWA (1998) in the WARMS database, for the UKDM was found to be 257. Schedule 1 accounted for 87 water users. Mining accounted for one (1) authorised and registered water user. Agriculture: irrigation accounted for 128 water users, whereas agriculture: watering livestock accounted for 12 registered water users. The industry non-urban water user had three (3) authorised and registered users, whereas the industry-urban accounted for two (2). The water supply services had 24 authorised and registered users on the WARMS database. Of the total number of users (257), 60 Historically Disadvantaged Individuals (HDIs) were authorised and registered on the WARMS database. According to Mallory (2002), a study on the Mkuze River System highlighted that there is a enormous inconsistency in the water resource allocation in the uSuthu to Mhlathuze WMA because the community residing on communal lands only gets a minimal fraction of the allocation. Furthermore, Mallory (2002) commented that the catchment is over-allocated with regard to its water resources that are founded on its real water use. The region is perceived to be a possible industrial development; hence water resources are required to safeguard the future. The water resources accessible to the Mhlathuze catchment are over-distributed, yet founded on actual water use. The Mhlathuze catchment is likewise viewed as an area of possible industrial development and the water resources of the area need to be secured for the future.

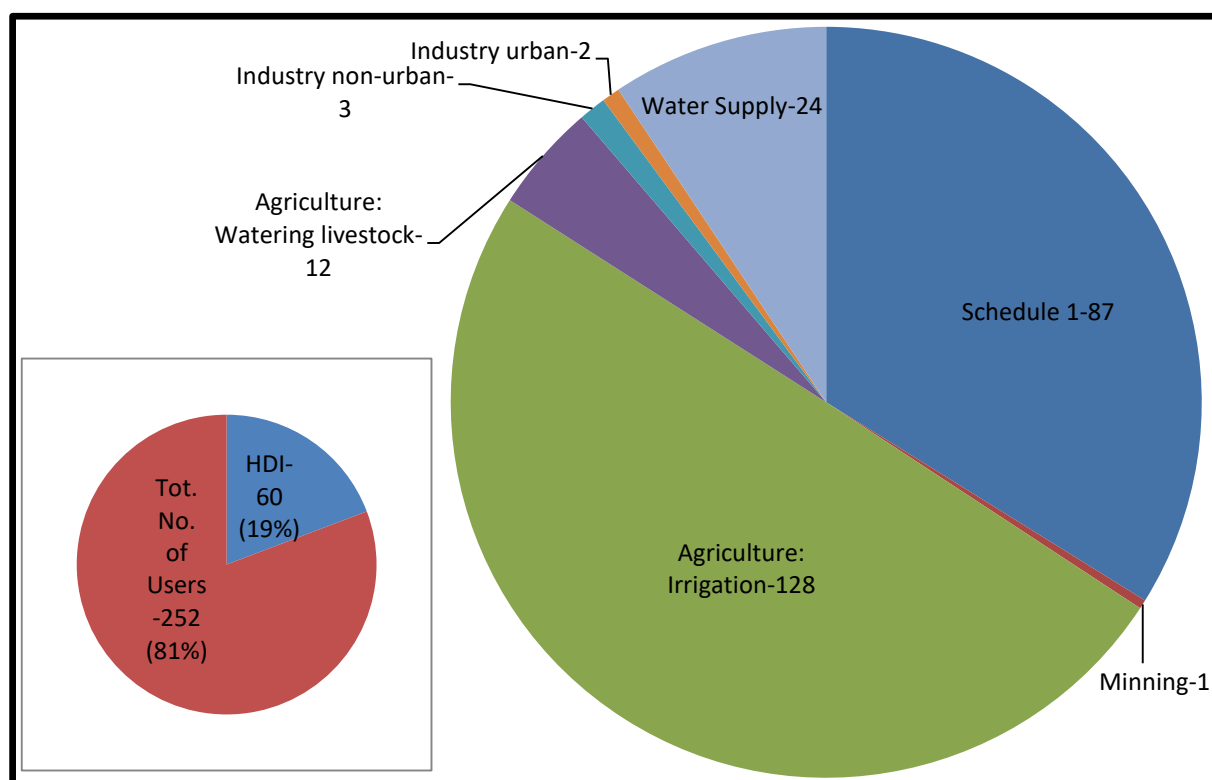


Figure 4- 1: Registered water users per sector, with an insert showing the percentage of HDI according to section 21(a) of the NWA (1998), within the UKDM

4.3.2 Registered Water users according to section 21(b) of the NWA

The DWAF (2007) describes the water used for storing water from a water resource such as natural runoff or river water that comprises water stored in a dam, reservoir, and other impoundments either in a watercourse or in off-channel. In this section authorised and registered water users (in the WARMS database) for storing water as per section 21(b) of the NWA (1998) are disclosed. The number of authorised and registered users for storing water is 3 987 in the KwaZulu-Natal Region, and the UKDM accounts for 36 users. For Agriculture: irrigation the total number of authorised and registered water users is 10, whereas for Agriculture: watering livestock the number is 13. Water users under Schedule 1 account for 13. The study conducted by Mallory (2002) highlighted that irrigation in the uMfolozi catchment contributes to the highest number of water users in the area, followed by the water that is allocated from the Lower uMfolozi to the Mhlathuze for utilisation by Richards Bay Minerals. Furthermore, Mallory (2002) commented that the Mkhuze catchment presently has restricted water resource infrastructure growth; however, irrigation utilises the run-off of the river flow. The Pongolapoort Dam is enormous, having an extensive yield, but its utilisation is limited which causes great concern (Mallory, 2002).

4.3.3 Authorised Registered Water Use according to section 21 (d) of the NWA

The DWAF (2007) states that the stream-flow reduction activity (SFRA) is a land-use activity that has the potential to lower stream flow in a watercourse, with commercial afforestation being the only SFRA that requires water use authorization at the moment. In this section, authorised and registered water users (in the WARMS database) for SFRA as per section 21(d) of the NWA (1998) are discussed. A total of 236 water users are authorised and registered in the WARMS database and the UKDM accounts for 228. A total of 42 water users represented the authorised and registered HDIs. The commercial sector is registered for 220 and the commercial woodlot accounts for eight (8).

According to the DWAF (2004), the water requirements/allocation for the uSuthu to Mhlathuze was 952 million m³/annum, i.e., 816 million m³/annum for local requirements and 136 million m³/annum for the out transfers. The available water was therefore 268 million m³/annum (see Table 4-1). However, it must be noted that the mentioned volumes were calculated 21 years ago. The latest available volumes could not be found to verify where there is alignment of water use authorisation with strategic management objectives for the study area.

Table 4-1: For the year 2000, a comparison of water requirements/allocations and available water (million m³/annum)

Sector/Sub-area	Available water			Water requirements / allocations			Balance
	Local yield	Transfers In	Total	Local Requirements	Transfers out	Total	
Upper uSuthu	202	0	202	69	131	200	2
Pongola	645	0	645	255	38	293	352
Mkuze	33	33	33	78	0	78	(45)
Mfolozi	51	0	51	52	18	70	(19)
Mhlathuze	178	80	258	342	3	345	(85)
W11 and W13	49	3	52	20	0	20	32
TOTAL	1 158	62	1 220	816	136	952	268

The information obtained on the three sections above focused on the different sectors and number of water users. Unfortunately, the data on actual volumes per sector and/or individuals could not be obtained. This could have been very valuable information, as even though there are 60 HDI accounted for section 21(a), there was always the issue of the percentage of actual volume of water allocated, which is very low. Even on farmers, there seem to be one or two individuals who have access to the lion's share of the total allocation. This is also true for the previous two sections dealing with the storage and SFRA.

Mallory (2002) has commented that afforestation has caused a reduction in runoff from the Pongola and Mkuze River Systems and this has had a damaging influence on the irrigators. Mallory (2002) also mentions that this has had an insignificant environmental impact. The Mfolozi River System is also impacted by afforestation which decreases the runoff and with the inadequate water use in the area water can be accessible for further stream-flow reduction activity (Mallory, 2002). A study conducted by Versfeld (2003) highlighted that in KwaZulu-Natal, various rural residents have taken the option of supplying water to users (1 ha=1 000m³) as a stream-flow reduction activity for small growers.

The DWS (2004) commissioned a report on uSuthu to uMhlathuze and the study mentioned that founded on the desktop study, the ecological reserve will have an effect on the exploitable yield of the Mkuze River System. The DWS (2004) stated that it might be necessary to decrease allocation by means of obligated licencing to ensure that the Reserve supplies are met. The irrigation in the Mkuze catchment accounts for the biggest water demand and it has surpassed the available resource by a substantial amount (Mallory, 2002). The finding by Mallory (2002) indicates that the Mkuze River System is presently overused as a result of restricted growth of the resource and the irrigators using run-off river yield.

Afforestation, sugar cane farming and the construction of the Paris Dam have successfully reduced the yield available on the Pongola River System. With the political and environmental influences, the excess yield becomes less secured (Mallory, 2002). A rapid assessment of the Ecological Reserve that was done indicated that the ecological need of the yield is approximated at 150 million m³/annum (Mallory, 2002). Irrigation is the biggest user of water followed by afforestation which has decreased the guarantee of supply to irrigators over the years (DWA, 2004). The Pongola River System is not effectively used because of social and economic demands related to international need and flood plains downstream which makes it difficult to correctly quantify the allocable surplus from the resource (DWA, 2004).

The uMfolozi River System's water resources are not used effectively to its optimal benefit and currently a minimum of the allocation is used and the majority water use is the runoff river abstractions (DWA, 2004). It is also mentioned by Mallory (200) that the uMfolozi River System is not effectively used. It comprises open tracts of land used for stock farming, game parks and agriculture. The DWS (2004) indicated that the ecological Reserve on the yield is approximated to be 19 million m³/annum and is restricted as a result of a scarcity of development. Afforestation significantly decreases the runoff in the uMfolozi River System and the effect that the implementation of the Reserve may have on the available yield (Mallory, 2002).

4.4 Chapter summary

In this chapter, the results of the questionnaire related to the understanding of water governance by the members and the alignment of authorised water quantities with the predetermined water quantities of the uSuthu to Mhlathuze CMA were discussed. The responses provided by the participants indicated that only a fraction understood what water governance is and how it is supposed to be implemented. The results that were obtained from the DWS WARMS database indicated how many water users are registered and authorised in relation to section 21 (a), (b) and (d). An overview of the river systems relating to the catchment was discussed along with the yield that is applicable.

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, conclusions are drawn from the research undertaken and a few recommendations, based on the findings are made. Two key research questions were asked, which are: a) What is the understanding of Catchment Management Forum (CMF) members regarding water governance in the uSuthu to Mhlathuze Catchment Management Area (CMA)?; and b) Are the authorised water quantities aligned with the predetermined water quantities of the uSuthu to Mhlathuze Catchment Management Area?.

5.2 Conclusions

5.2.1 Understanding Water Governance

The majority (62%) of participants had an understanding of what water governance within the CMA is. Although this represented the majority of the participants, there is a concern that some of the people who are appointed within the water sector with the responsibility of developing, managing and protecting the water resources within their area of jurisdiction do not seem to have this understanding. Therefore, the UKDM is still required to present workshops for its staff members and water users to better their understanding of water governance which may lead to better management of water within its area of jurisdiction.

The overall response regarding the UKDM advocating water governance in its local municipalities was 56% which is an indication that the municipality is not succeeding in its dissemination and promotion of water governance in its local municipalities. Whilst this does not take away from the fact that only a fraction of people may have knowledge about what the UKDM is doing, it can therefore be concluded that rigorous application and execution are needed. This was confirmed by the 75% of respondents who do not have confidence in the UKDM and its implementation and enforcement of water by-laws to promote water governance. The 56% of respondents who had no idea of whether water governance was reflected in the WSDP is a concern, and was also an indication that to some extent the UKDM is failing or rather its implementation and enforcement are minimal. A similar observation was also noted by other authors who indicated a lack of both horizontal and vertical interactions, as well as bureaucracy in government (Hornby *et al.*, 2016; Kapfudzaruwa and Sowman, 2009; Raffaello and Morris, 2016). As stated by Solanes and Jouravlev (2006), the socio-economic aspect plays a major part in the way governments deal with their people, and this seemed to be true for the UKDM, as it is predominantly rural and not really affluent.

On the issue of whether water governance was reflected in the WSDP, less than half of the respondents (44%) had an idea on the matter; furthermore, half of those (44%) felt that they were just there for the sake of compliance. One can then draw the following conclusions: a) that the UKDM is really not doing well on incorporating water governance in the WSDP; or b) it could mean that they are not doing a good job of ensuring that water governance is effectively implemented.

On the question of what the water governance intends to achieve, the majority of the respondents (81%) seemed to have a good idea on this; thus, either the municipality has done a good job in creating awareness or people have done their homework.

On the issue of water governance's ability to address water issues within the UKDM, only a small percentage (38%) agreed that it could. This then raises an alarming concern with the UKDM and the interaction it has with its residents. However, it can be concluded that operations and the implementation thereof are not effective; hence the respondents lack confidence with in the UKDM.

This was contrary to the findings by Manzungu and Mabiza (2004); however, it was also clear that a lack of political will and/or enforcement of policies or laws was a critical factor they considered for them to arrive at that decision. On the other hand, water governance is vital in developing nations for expanding long-term access to drinking water and enhancing broader local government (Jones, 2011). It is clear that this is not fully implemented and hence its effectiveness or impact at ground level is limited.

On the water governance approaches and/or instruments, the majority of respondents (69%) did not have any idea or understanding on this; the 31% that knew about it were of the opinion that the implementation thereof was not effective. Whilst all sixteen (100%) respondents argued that there was no room for improvement, it is our opinion that there is actually room for improvement, as the respondents seemed to be voicing their lack of trust in the system – i.e., that they did not think it could improve, rather than the need to actually improve some aspects. It can be concluded that approaches and instruments that are implemented in the UKDM need to be more rigorous, especially taking into account the provision of basic human needs as mentioned in the Constitution (Act No.108 of 1996). This limited knowledge on the approaches and/or systems used by the UKDM indicates a need to either showcase or create awareness. The other critical aspect was that of getting people's understanding and buy-in with respect to the operations of the municipality.

With regard to record keeping of water uses in the UKDM, most respondents (81%) had no idea as to how the UKDM keeps records, as they do not work at the institution. However 19% of respondents intimated that the records are kept electronically and manually for customer billing meters. Whilst it could be accepted that the 81 percent of respondents who did not know about the presence of record-keeping mechanisms, as they were external stakeholders, it is also clear that there is something that could still be done by the UKDM.

Based on the responses to the questionnaire, it was clear that a number of respondents understood what water governance is however, there was some discrepancy with respect to its effectiveness and how it was implemented. What was clear is that the municipality lacked effective communication with its communities, especially with regards to areas affected by water shortages. There was also a clear indication that the entire water management aspect is not transparent, or at least to the degree they would have preferred. Above all, it was also clear that there are quite a number of other external factors affecting the people's understanding and also proper implementation of water governance, which includes political and cultural factors, economic status, etc. (Rogers *et al.*, 2003; Zwarteveen *et al.*, 2010).

5.2.2 Authorised water quantities aligned with predetermined water quantities of the uSuthu to Mhlathuze catchment

Based on the results presented in Chapter 4 which was to understand whether authorised water quantities are aligned with predetermined water quantities, it is difficult to conclude with a definite yes or no. However, for section 21 (a), (b) and (d) water uses the information gives an idea on the number of users per sector and the authorised HDI numbers. This does not, however, necessarily equate to actual volumes, as some users or activities use more water than others. This does not give a good indication of the actual quantities per different water uses. For these reasons, the authorised water quantities are not aligned with the predetermined water quantities of the uSuthu to Mhlathuze catchment.

5.3 Recommendations and areas for future research

Based on this research study, the following recommendations were made:

- **Increase participation of females in the water-related activities** – This means addressing root causes by getting women involved in socio-economic activities, such as farming, and involvement in the CMF.
- **Capacity building is needed for the uSuthu to Mhlathuze CMF members** – This involves educating and having awareness workshops related to water governance for all members of the public.

- **Fostering good relations with communities** – This would assist the municipality in getting information, as well as feedback, from its community, on how it is performing.
- **The issue of politics and bureaucracy** – This seemed to present somewhat of a concern, which might need to be addressed.
- **Water user allocation records or record keeping** – Whilst there is record keeping in place, it was clear that there was no data or data availability on the water quantities per sector; and these are critical, especially with respect to water reform. This is a much bigger issue for the municipality, but also talks to the WARMS system of the Department.
- **There is a need for the establishment of the current volumes** – This is necessary in order to ensure proper alignment with the strategic objectives of the area.

BIBLIOGRAPHY

Ackerman, S. 2004. *Global Crises, Global Solutions: The challenge of poor governance and corruption*. Cambridge: Cambridge, University Press.

Adams, E.A., Zulu, L. and Ouellette-Kray, Q. 2020. Community water governance for urban water security in the Global South: Status, lessons, and prospects. *Wiley Interdisciplinary Reviews: Water*, 7(5): pp.1466.

Allmark, P., Boote, J., Chambers, E., Clarke, A., McDonnell, A., Thompson, A., and Tod, A. 2009. Ethical issues in the use of in-depth interviews: literature review and discussion. *Research Ethics Review*, 5(2): pp. 48-54.

Ashton, P.J., Patrick, M.J., MacKay, H.M. and Weaver, A. 2005. Integrating biodiversity concepts with good governance to support water resources management in South Africa. *Water SA*, 31(4): 449-456.

Batchelor, C. 2007. Water governance literature assessment. *International Institute for Environment and Development*, pp. 2523.

Boshoff, N. 2010. South–South research collaboration of countries in the Southern African Development Community (SADC). *Scientometrics*, 84(2): pp.481-503.

Benoot, C., Hannes, K. and Bilsen, J. 2016. The use of purposeful sampling in a qualitative evidence synthesis: A worked example on sexual adjustment to a cancer trajectory. *BMC medical research methodology*, 16(1): pp. 1-12.

Berkowitz, P., Dugard, J., Smith, L. and Tissington, K. 2009. South Africa is rethinking its decentralized water services, *International Research Council (IRC) International Water and Sanitation Centre, Netherlands*. : <http://www.irc.nl/page/50400>. Date of access: 10 May 2020.

Bevir, M. 2008. *Key concepts in governance*. London: Sage Publications.

Bigen Africa. 2016. uMkhanyakude Water Services Master Plan. Richards Bay: Mhlathuze Water.

Blignaut, J. and Van Heerden, J. 2009. The impact of water scarcity on economic development initiatives. *Water SA*, 35(4): pp. 415.

Brandford, P., Hebrank, J.H. and Bryan, T. 2012. Methods and apparatus for identifying live eggs. Embrex LLC, Patent. U.S 8, 235: pp. 003.

Brynard, P.A. 2006. Policy implementation. *Administration*, Pretoria, pp. 13.

Claassen, M. 2013. Integrated Water Resource Management in South Africa. *International Journal of Water Governance*, 1(3-4): pp. 323-338.

Cooperative Governance and Traditional Affairs. 2016. Presentation to the National Council of Provinces select committee on cooperative governance and traditional affairs. Pretoria: Department of Cooperative Governance and Traditional Affairs.

CoGTA (Cooperative Governance and Traditional Affairs). 2016. The back to basics approach concept document. Pretoria: Department of Cooperative Governance and Traditional Affairs.

Colvin, C., Cave, L. and Saayman, I. 2004. A functional approach to setting Resource Quality Objectives for groundwater. Water Research Commission Report No. 1235/1/04. Pretoria: Water Research Commission.

Davis, R., Zunckel, K. and Kruger, T. 2012. Spatial Economic Overview. Pietermaritzburg: KwaZulu-Natal Department of Economic Development and Tourism.

De Coning, C., and Sherwill, T. 2004. An assessment of the water policy process in South Africa (1994 to 2003). WRC Report No. TT232/04, Pretoria.

Dlamini, S.H. 2018. Assessing the capacity of municipalities for water provision within a rural context: a case study of uMkhanyakude District Municipality, KwaZulu-Natal, South Africa (Thesis – PhD), University of KwaZulu-Natal.

Denby, K., Movik, S., Mehta, L. and van Koppen, B. 2016. The 'trickle down' of IWRM: A case study of local-level realities in the Inkomati Water Management Area, South Africa. *Water Alternatives*, 9(3): pp. 473-492.

De Stefano, L., Svendsen, M., Giordano, M., Steel, B.S., Brown, B. and Wolf, A.T. 2014. Water governance benchmarking: concepts and approach framework as applied to Middle East and North Africa countries. *Water Policy*, 16(6): pp. 1121-1139.

Department of Water Affairs and Forestry. 2004. DWAF Report No. PB WMA 06/000/00/0304: Internal Strategic Perspective: uSuthu to Mhlathuze Water Management Area. Tlou and Matji (Pty) Ltd. South Africa.

Department of Water Affairs and Forestry. 2006. Resource Directed Management of Water Quality: Volume 3: Institutional Arrangements. Water Resource Planning Systems Series, Sub-

Series No. WQP 1.5.3, Edition 1. ISBN No. 0-621-36791-5, Department of Water Affairs and Forestry, South Africa, Pretoria.

Department of Cooperative Governance and Traditional Affairs. 2009. State of Local Government in South Africa – Overview Report.

Department of Water Affairs and Forestry. 2007. Internal Guideline: Generic Water Use Authorisation Application Process.

Department of Water Affairs and Forestry. 2009. Vaal River system: Large bulk water supply reconciliation strategy: second stage reconciliation strategy. Department of Water Affairs and Forestry, Pretoria.

Department of Water Affairs. 2010. National Water Act, 1998 (Act no. 36 of 1998): Regulations for the Establishment of a Water Resource Classification System (Notice 810). Government Gazette, 33541: pp. 2.

Department of Water and Sanitation. 2012. National Water Resource Strategy: Managing water for an equitable and sustainable future. Pretoria: Department of Water and Sanitation, pp. 12-40.

Department of Water Affairs and Forestry. 2012. National Water Resource Strategy (NWRS2). Pretoria.

Department of Water and Sanitation. 2013. National Water Resource Strategy: water for an equitable and sustainable future. Department of Water Affairs, South African Government, Pretoria.

Department of Water and Sanitation. 2014. National water resource strategy: Water for equitable and sustainable future. Pretoria, South African Government.

Department of Water and Sanitation. 2015. Strategic overview of the water services sector in South Africa. Pretoria: Department of Water and sanitation.

Department of Water and Sanitation. 2017. National norms and standards for domestic water and sanitation service, V3 final. South African Government, Pretoria.

Department of Water and Sanitation. 2017. Strategic overview of the water sector in South Africa. South African Government, Pretoria.

De Vos, A.S., Strydom, H., Fouche, C.B., and Delport, C.S.L. 2012. Research at grass roots: for the social sciences and human service professions. Pretoria: Van Schaik Publishers.

Dollar, E.S.J., Nicolson, C.R., Brown, C.A., Turpie, J.K., Joubert, A.R., Turton, A.R., Grobler, D.F., Pienaar, H.H., Ewart-Smith, J. and Manyaka, S.M. 2010. Development of the South African Water Resource Classification System (WRCS): a tool towards the sustainable, equitable and efficient use of water resources in a developing country. *Water Policy*, 12(4): pp. 479-499.

Du Plessis, J.A. 2007. Benchmarking water use and infrastructure based on water services development plans for nine municipalities in the Western Cape. *Journal of the South African Institution of Civil Engineering*, 49(4): pp. 19-27.

Eberhard, R., Margerum, R., Mayere, S., Taylor, B., and Vella, K. 2017. The Practice of Water Policy Governance Networks: An International Comparative Case Study Analysis. *Society and Natural Resources*, 30(4): pp. 453-470.

Engelbrecht, F., Adegoke, J., Bopape, M.J., Naidoo, M., Garland, R., Thatcher, M., McGregor, J., Katzfey, J., Werner, M., Ichoku, C. and Gatebe, C. 2015: Projections of rapidly rising surface temperatures over Africa under low mitigation. *Environmental Research Letters*, 10(8): pp. 085004.

Enqvist, J.P. and Ziervogel, G. 2019. Water governance and justice in Cape Town: An overview. *Wiley Interdisciplinary Reviews: Water*, 6(4): pp. 1354. Date of access: 28 Feb 2020.

Etikan, I., Musa, S.A., and Alkassim, R.S. 2016. Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1): pp. 1-4.

Everard, M. 2009. The business of biodiversity. WIT Press.

Finewood, M.H. 2016. Green infrastructure, grey epistemologies, and the urban political ecology of Pittsburgh's water governance. *Antipode*, 48(4): pp. 1000-1021.

Fossey, E., Harvey, C., McDermott, F. and Davidson, L. 2002. Understanding and evaluating qualitative research. *Australian and New Zealand Journal of Psychiatry*, 36(6): pp. 717-732.

García, M.M., Hileman, J., Bodin, Ö., Nilsson, A., and Jacobi, P.R. 2019. The unique role of municipalities in integrated watershed governance arrangements. *Ecology and Society*, 24(1).

Gera, W. 2008. Rethinking bureaucratic institutionalization in Philippine political decentralization. *Indiana Journal of Political Science*. Winter, pp. 28-41.

Ginsburg, A.E., Crafford, J.G., Harris, K.R., Wilkinson, M. and Mashimbye, D. 2010. Resource Directed Measures. *WRC Report No. TT 462(10)*.

Gleick, P.H. 1998. The human right to water. *Water policy*, 1(5): pp. 487-503.

Global Water Partnership. 2000. Towards Water Security: A Framework for Action. Stockholm: Sweden. [https://Global+Water+Partnership.+\(2000\).+Towards+Water+Security:+A+Framework+for+Action.+Stockholm:+Sweden](https://Global+Water+Partnership.+(2000).+Towards+Water+Security:+A+Framework+for+Action.+Stockholm:+Sweden). Date of Access: 3 July 2020.

Global Water Partnership. 2002. Introducing Effective Water Governance: https://www.gwp.org/globalassets/global/gwpcee_files/regional/governance-2003.pdf. Date of access: 30 April 2020.

Grasham, C. F., Korzenevica, M., and Charles, K. J. 2019. On considering climate resilience in urban water security: A review of the vulnerability of the urban poor in sub-Saharan Africa. *Wiley Interdisciplinary Reviews: Water*, 6(3): pp. 1344. Date of access: 10 March 2020.

Gumede, Z. 2017. My history of Jozini Dam. Word press: <https://zgumede.wordpress.com/2017/04/29/my-history-of-the-jozini-dam/>. Date of access: 25 June 2020.

King, N., Horrocks, C. and Brooks, J. 2018. Interviews in qualitative research. London: SAGE Publications Limited.

Haigh, E.H., Fox, H., and Davies-Coleman, H. 2010. Framework for local government to implement integrated water resource management linked to water service delivery. *Water SA*, 36(4).

Hammersley, M. and Atkinson, P. 2007. *Ethnography: Principles in practice*. London: Routledge.

Hart, C. 2018. *Doing a literature review: Releasing the research imagination*. London: SAGE Publications Limited.

Hennink, M., Hutter, I. and Bailey, A. 2020. *Qualitative research methods*. London: SAGE Publication Limited.

Hering, J.G., and Ingold, K.M. 2012. Water resources management: what should be integrated. *Science*, 336(6086): pp. 1234-1235.

Holling, C.S. and Meffe, G.K. 1996. Command and control and the pathology of natural resource management. *Conservation biology*, 10(2): pp. 328-337.

Hossain, M.Z. 2015. Water: the most precious resource of our life. *Global Journal of Advanced Research*, 2(9): pp. 1-11.

Hornby, D., Vanderhaeghen, Y., Versfeld, D. and Ngubane M. 2016. A Harvest of Dysfunction: Rethinking the Approach to Drought, Its Causes and Impacts in South Africa. Report for Oxfam South Africa, South Africa, Johannesburg.

Hussein, H. 2018. Lifting the veil: Unpacking the discourse of water scarcity in Jordan. *Environmental Science and Policy*, 89: pp. 385-392.

Iyer, R. 2003. uMkhanyakude District Municipality Spatial Framework. Durban: IYER.

Jiang, Y. 2009. China's water scarcity. *Journal of environmental management*, 90(11): pp. 3185-3196.

Jones, S. 2011. Participation as citizenship or payment? A case study of rural drinking water governance in Mali. *Water alternatives*, 4(1): pp. 54-71.

Jack, C., Wolski, P., Steynor, A., and Lennard, C. 2016. Climate change projections for the City of Cape Town: An update based on the most recent science. Cape Town, South Africa.

Jacobs-Mata, I., Mukuyu, P. and Dini, J. 2021. A review of trends in scientific coverage of water governance in South Africa and what this means for agenda-setting of public investment in water governance R and D. *Water SA*, 47(1): pp. 10-23.

Kabir, S.M.S. 2016. Basic Guidelines for Research. Chittagong: Book Zone Publication.

Kabuyaya, M., Chimbari, M.J., Manyangadze, T. and Mukaratirwa, S. 2017. Schistosomiasis risk factors based on the infection status among school-going children in the Ndumo area, uMkhanyakude district, South Africa. *Southern African Journal of Infectious Diseases*, 32(2): pp. 67-72.

Karodia, H. and Weston, D.R. 2001. South Africa's new water policy and law. CL Abernethy Intersectoral Management of River Basins. DWAF/IWMI. Pretoria.

Kapfudzaruwa F. and Sowman M. 2009. Is there a role for traditional governance systems in South Africa's new water management regime. *Water SA* 5(5): pp. 683–692.

Kahinda, Jean-marc Mwenge, Jean Ruhiza Boroto, and Source Strategic Focus Pty. 2009. IWRM survey and status report: South Africa. Global Water Partnership: Pretoria, South Africa.

King, N., Horrocks, C. and Brooks, J. 2018. Interviews in qualitative research. London: SAGE Publications Limited.

Kumar, R. 2011. Research methodology: A step-by-step guide for beginners. London: SAGE Publications Limited.

KwaZulu-Natal. 2014. Declaration of KwaZulu-Natal Provincial state of Disaster in terms of Disaster Management Act, 2002. (Notice 167 of 2014). Provincial Gazette, 1288 of 17 December 2014.

Larson, K.L. 2010. An integrated theoretical approach to understanding the socio-cultural basis of multidimensional environmental attitudes. *Society and Natural Resources*, 23(9): pp.898-907.

Leftwich, A. 2010. Beyond institutions: Institutions and organisations in the politics and economics of poverty reduction. Manchester: University of Manchester.

Levitt, S.D., List, J.A., Neckermann, S. and Sadoff, S. 2016. The behavioralist goes to school: Leveraging behavioral economics to improve educational performance. *American Economic Journal: Economic Policy*, 8(4): pp.183-219.

Mackay, H. 2001. Development of methodologies for setting integrated water quantity and quality objectives. (*In Regional Management of Water Resources: Proceedings of an International Symposium (Symposium S2) Held During the Sixth Scientific Assembly of the International Association of Hydrological Sciences (IAHS) at Maastricht*), 268: pp. 115, Netherlands: International Assn of Hydrological Sciences.

MacDonald, D. and Pape, J. 2002. Cost recovery and the crisis of service delivery in South Africa. Cape Town: HSRC Publishers.

Mallory, S. 2002. Overview of the water resources of the uSuthu-Mhlathuze Water Management Area. Department of Water Affairs and Forestry.

Manzungu, E. and Mabiza, C. 2004. Status of water governance in urban areas in Zimbabwe: some preliminary observations from the city of Harare. *Physics and Chemistry of the Earth, Parts A/B/C*, 29(15-18): pp. 1167-1172.

Marais, H. 2011. South Africa pushed to the limit: the political economy of change. London: Zed Books.

- Mbokazi, M.S. 2009. The role of environmental education in reducing water wastage in primary schools in Empangeni district (Thesis - PhD), University of Southern Africa.
- McEwan, C. 2003. Bringing government to the people: women, local governance and community participation in South Africa. *Geoforum*, 34(4): pp. 469-481.
- Mehta, L. 2014. Water and human development. *World development*, 59: pp. 59-69.
- Meissner, R., Mampane, P., Turton, A.R. and Seremo, O. 2003. A hydropolitical history of South Africa's international river basins. Pretoria: Water Research Commission Project K5/1198.
- Meissner, R., Stuart-Hill, S. and Nakhooda, Z. 2017. The establishment of catchment management agencies in South Africa with reference to the Flussgebietsgemeinschaft Elbe: Some practical considerations. (*In Freshwater governance for the 21st Century*, pp.15-28. Springer, Cham.
- Merrey, D.J. 2008. Is normative integrated water resources management implementable: Charting a practical course of action with lessons from southern Africa. *Physics and Chemistry of the Earth*; 33: pp. 899-905.
- Miranda, L., Hordijk, M. and Molina, R.T. 2011. Water governance key approaches: an analytical framework. *Literature Review*, 4: pp. 1-23.
- Moisa, S. 2004. Proceedings of the 2004 Water Institute of Southern Africa (WISA). Biennial Conference 2-6 May. pp. 12-18. Cape Town.
- Molle, F. 2008. Nirvana concepts, narratives and policy models: Insights from the water sector. *Water Alternatives*, 1(1): pp. 131-156.
- Movik, S., Mehta, L., van Koppen, B. and Denby, K. 2016. Emergence, interpretations and translations of IWRM in South Africa. *Water Alternatives*.
- Muller, M., Schreiner, B., Smith, L., van Koppen, B., Sally, H., Aliber, M., Cousins, B., Tapela, B., Van der Merwe-Botha, M., Karar, E. and Pietersen, K. 2009. Water security in South Africa. *Development Planning Division. Working Paper Series*. pp.12.
- Mulopo, C., Kalinda, C. and Chimbari, M.J. 2020. Contextual and Psychosocial Factors Influencing the Use of Safe Water Sources: A Case of Madeya Village, uMkhanyakude District, South Africa. *International Journal of Environmental Research and Public Health*, 17(4): pp. 1349.

- Neal, M.J., Lukasiewicz, A. and Syme, G.J. 2014. Why justice matters in water governance: some ideas for a 'water justice framework'. *Water Policy*, 16(S2): pp. 1-18.
- Noemdoe, S., Jonker, L. and Swatuk, L.A. 2006. Perceptions of water scarcity: The case of Genadendal and outstations. *Physics and Chemistry of the Earth, Parts A/B/C*, 31(15-16): pp. 771-778.
- Odume, O.N., Griffin, N. and Mensah, P.K. 2018. Literature Review and Terms of Reference for Case Study for Linking the Setting of Water Quality License Conditions with Resource Quality Objectives and/or Site-Specific Conditions in the Vaal Barrage Area and Associated Rivers within the Lower Sections of the Upper Vaal River Catchment. WRC Report no. 2782/1/17. Pretoria, Water Research Commission.
- Okumah, M. and Yeboah, A.S. 2020. Exploring stakeholders' perceptions of the quality and governance of water resources in the Wenchi municipality. *Journal of Environmental Planning and Management*, 63(8): pp. 1375-1403.
- Olorunfemi, F.B. 2011. Managing flood disasters under a changing climate: lessons from Nigeria and South Africa. *In NISER Research Seminar Series*, NISER, Ibadan, 3: pp. 1-44.
- Otto, F.E., Wolski, P., Lehner, F., Tebaldi, C., Van Oldenborgh, G.J., Hogesteegeer, S., Singh, R., Holden, P., Fučkar, N.S., Odoulami, R.C. and New, M. 2018. Anthropogenic influence on the drivers of the Western Cape drought 2015–2017. *Environmental Research Letters*, 13(12): pp. 124010.
- Pahl-Wostl, C., Isendahl, N., Möllenkamp, S., Brugnach, M., Jeffrey, P., Medema, W., and De Vries, T. 2006. Paradigms in Water Management: Report of the New Water project – New Approaches to Adaptive Water Management under Uncertainty: <http://www.newwater.uni-osnabrueck.de/deliverables/D112.pdf>. Date of access: 30 April 2020.
- Pahl-Wostl, C. 2015. Water governance in the face of global change. *Springer International Publishing: Switzerland*. 10: pp.978-3.
- Parsons, R. and Wentzel, J. 2007. Groundwater resource directed measures manual. WRC Report No TT 299/07. Pretoria, Water Research Commission.
- Patton, M.Q. 1990. Qualitative evaluation and research methods. 2nd ed. California: SAGE Publication Inc.

Patton, M. 2002. Qualitative research and evaluation methods. 3rd ed. Thousand Oaks: SAGE Publications Inc.

Pereira, L.S., Cordery, I. and Iacovides, I. 2009. Coping with water scarcity: Addressing the challenges. Springer Science and Business Media. Portugal.

Pigram, J. ed. 2007. Australia's water resources: from use to management. Australia: CSIRO publishing.

Raffaello C. and Morris M. 2016. Confronting Drought in Africa's Drylands: Opportunities for Enhancing Resilience. Washington, DC: Africa Development Forum Series. World Bank.

Rahman, Z.A. 1998. Environmental planning for sustainable water use - A case study on the development of catchment management plans in Malaysia. Newcastle: Newcastle University Library.

Republic of South Africa. 1996. Constitution of the Republic of South Africa (Act No. 108 of 1996). Pretoria: Government Printer.

Republic of South Africa. 1998. National Water Act (Act No. 36 of 1998). Pretoria: Government Printer.

Republic of South Africa. 1997. Water Services Act (Act No. 108 of 1997). Pretoria: Government Printer.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J. and Nykvist, B. 2009. A safe operating space for humanity. *Nature*, 461(7263): pp. 472-475.

Rogers, P. and Hall, A.W. 2003. Effective water governance (Vol. 7). Stockholm: Global Water Partnership.

Schreiner, B., Pegram, G. and von der Heyden, C. 2009. Reality check on water resources management: Are we doing the right things in the best possible way? *Development Planning Division*. Working Paper Series No.11, DBSA: Midrand.

Schreiner, B. and Hassan, R. 2011. Transforming water management in South Africa: Designing and implementing a new policy framework. London, New York: Springer Science and Business Media.

Schreiner, B. 2012. Issues of balancing international, environmental and equity needs in a situation of water scarcity. *Policy and strategic behaviour in water resource management*, pp.207-230.

Schreiner, B.G., Mungatana, E.D. and Baleta, H. 2018. Impacts of Drought Induced Water Shortages in South Africa: Sector Policy Briefs. Pretoria: Water Research Commission.

Southern African Development Community. 2005. Regional Strategic Action Plan on Integrated Water Resources Management: Annotated Strategic Plan: 2005-2010. Gaborone, Botswana.

Sehring, J. 2009. Path Dependencies and Institutional Bricolage in Post-Soviet Water Governance. *Water alternatives*, 2(1): pp: 61-81.

Solanes, M., and Jouravlev, A. 2006. Water governance for development and sustainability. ECLAC. United Nations Publication.

Spencer, L., and Ritchie, J. 2002. Qualitative data analysis for applied policy research. (*In Analyzing qualitative data*, pp.187-208. Routledge).

Stein, R. 2004. Water Law in a Democratic South Africa: A County Case Study Examining the Introduction of a Public Rights System. *Tex L. Rev.*, 83: pp. 2167.

Swatuk, L.A. 2008. A political economy of water in Southern Africa. *Water Alternatives*, 1(1): pp. 24.

Tang, W., Mao, Z., Zhang, H., Shan, B., Zhao, Y. and Ding, Y. 2015. Water resources: the prerequisite for ecological restoration of rivers in the Hai River Basin. *Environmental Science and Pollution Research*, Northern China, 22(2): pp. 1359-1365.

Tortajada, C. 2010. Water governance: Some critical issues. *International Journal of Water Resources Development*, 26(2): pp. 297-307.

Turton, A., Schultz, C., Buckle, H., Kgomongoe, M., Malungani, T. and Drackner, M. 2006. Gold, scorched earth and water: the hydropolitics of Johannesburg. *International Journal of Water Resources Development*, 22(2): pp. 313-335.

Umgeni Water. 2016. The Development of Universal Access Plan for Water Services in uMkhanyakude District Municipality Phase 2. Pietermaritzburg: Umgeni Water.

uMkhanyakude District Municipality. 2015. Integrated development plan review. Mkhuze: uMkhanyakude District Municipality.

uMkhanyakude District Municipality. 2016. uMkhanyakude district-wide reviewed spatial development framework. Mkhuze: uMkhanyakude District Municipality.

uMkhanyakude District Municipality. 2018. Integrated Development Plan. <http://www.ukdm.gov.za/>. Date of access: 28 Jan.2020.

United Nations Educational Scientific and Cultural Organisation. 2006. Water a shared responsibility. Paris: United Nations World Water Development Report 2 (WWDR2). UNESCO.

United Nations Division for Sustainable Development. 1992. Agenda 21. Rio de Janeiro, Brazil: United Nations Conference on Environment and Development. pp. 1-5.

United Nations Development Programme. 2001. Making New Technologies Work for Human Development. New York: UNDP.

United Nations Development Programme. 2004. Water governance for poverty reduction: Key issues and the UNDP response to Millennium Development Goals. New York: UNDP.

United Nations Development Programme. 2006. Human development report: beyond water scarcity: power, poverty and the global water crisis. New York: UNDP.

United Nations Development Programme. 2007. Effective Water Governance: The Key to Sustainable Water Management and Poverty Eradication: <http://www.undp.org/water/>. Date of access: 3 July 2020.

United Nations Development Programme. 2010. Human development in India: Analysis to action. New Delhi: United Nations Development Programme.

United Nations. 2012. World Water Development Report. 4th Ed.: Facing the Challenges. Geneva: UNDP.

United Nations Sustainable Development Solutions Network. 2013. An Action Agenda for Sustainable Development: Report for the UN Secretary General.<http://unsdsn.org/2013/06/06/action-agenda-sustainable-development-report/>. Date of access: 11 Jan 2021.

- Vairavamoorthy, K., Gorantiwar, S.D. and Pathirana, A. 2008. Managing urban water supplies in developing countries—Climate change and water scarcity scenarios. *Physics and Chemistry of the Earth*, Parts A/B/C, 33(5): pp. 330-339.
- Van Koppen, B., Moriarty, P., and Boelee, E. 2006. Multiple-Use Water Services to Advance the Millennium Development Goals. Research Report 98. Colombo: International Water Management Institute.
- Vani, M.S. 2009. Community engagement in water governance. *Water and the Laws in India*, pp.167-21. India. SAGE Publication Limited.
- Versfeld, D. 2003. 20 Water for livelihoods: bringing equity and opportunity to the rural poor in South Africa. Water, poverty and productive uses of 21, pp.228. Muldersdrif. Department of Water Affairs and Forestry.
- Wallace, C., Qadir, M., Adeel, Z., Renaud, F., and Dickin, S. 2015. Putting Water and Energy at the Heart of Sustainable Development. University of Tokyo: United Nations.
- Welman, C., Kruger, F., and Mitchell, B. 2005. Research methodology. Cape Town: Oxford University Press.
- Wepener, V., Malherbe, W., and Smit, N.J. 2018. Water Quality Management in South Africa. Water Quality Management (In King, N., Strydom, H. and Retief, F, eds. 2018. Environmental Management in South Africa. 3rd ed. Cape Town: Juta Publishing.)
- Wilde, A., Narang, S., Laberge, M. and Moretto, L. 2012. Measuring Local Governance. Oslo: UNDP Oslo Governance Centre.
- Williamson, O.E. 1996. The mechanisms of governance. Oxford: Oxford University Press.
- Yin, A. 2006. Cenozoic tectonic evolution of the Himalayan orogen as constrained by along-strike variation of structural geometry, exhumation history, and foreland sedimentation. *Earth-Science Reviews*, 76(1-2): pp. 1-131.
- Zwarteveen, M., Kemerink-Seyoum, J.S., Kooy, M., Evers, J., Guerrero, T.A., Batubara, B., Biza, A., Boakye-Ansah, A., Faber, S., Cabrera Flamini, A. and Cuadrado-Quesada, G. 2017. Engaging with the politics of water governance. *Wiley Interdisciplinary Reviews: Water*, 4(6): pp. 1245.

ANNEXURE A REQUEST TO CONDUCT RESEARCH



Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: <http://www.nwu.ac.za>

**UNIT FOR ENVIRONMENTAL SCIENCES AND
MANAGEMENT**

Tel: 018 299 2128 / 1543
Fax: 018 299 1544
Email: Francois.Retief@nwu.ac.za

22 May 2020

To whom it may Concern

REQUEST FOR PERMISSION TO CONDUCT AN ACADEMIC RESEARCH

FACULTY: NATURAL AND AGRICULTURAL SCIENCE
UNIT: UNIT FOR ENVIRONMENTAL SCIENCES AND MANAGEMENT
PROGRAMME: MASTER OF ENVIRONMENTAL MANAGEMENT-ECOLOGICAL WATER
REQUIREMENTS
NAME: MS NB NKUTHA
STUDENT NO.: 26452464

The above mentioned student is registered with the University of North West-Potchefstroom Campus for the abovementioned programme. As part of the requirements for completing her master's degree, the student is anticipated to conduct a research and submit its findings to the University accordingly.

We hereby request you to grant permission for the student to conduct research in your institution and interact with relevant selected office bearers and officials. We have informed the student to observe professionalism and ethical considerations by keeping privacy of the participants concerned. The student has also been advised to retain strict confidentiality in her interactions with respondents.

Once the research is accomplished, it may be availed to your institution on request. We hope that the findings on the research will benefit your institution in particular and country in general.

Please extend every assistance that the student will need during this period.

Yours Sincerely,

Prof Francois Retief

ANNEXURE B: INFORMED CONSENT FORM

INFORMED CONSENT FORM

Dear Participant

You are invited to participate in an academic research study conducted by Nomgqibelo Nkutha, a Masters student in Environmental Management specialising in Ecological Water Requirements at the North-West University Potchefstroom Campus. The title of the study is the alignment of water use licences with strategic water management objectives for the upper the uMkhanyakude District Municipality, KwaZulu-Natal which seeks to address the research question: What is the understanding of catchment management forum members regarding water governance in the uSuthu to Mhlathuze Catchment?

Please note the following:

- The research study is done for the current academic year (2020);
- The questionnaire and interview questions formulated form part of the research project and will be used only for the intended purpose;
- This is an anonymous study and your name will not appear on the questionnaire or dissertation;
- The answers/responses that are provided will be treated as strictly confidential;
- Your participation in this research study is optional and you may choose not to participate or stop participating at any given time;
- If you choose to participate, kindly sign the consent form attached; and

Your participation will include completing the questionnaire and it should not take more than one hour of your time.

Kind regards,

N Nkutha

Student Number: 26452464

Email: ggibelon@yahoo.com

Cell: 082 513 7245

ANNEXURE C: INFORMED CONSENT FORM FOR PARTICIPATION

INFORMED CONSENT FORM FOR PARTICIPATION

I, _____ (print name) hereby give consent to participate in the study.

I understand that:

- ✓ My participation in this study is voluntary;
- ✓ I understand that my participation will be kept confidential;
- ✓ I understand that I am not forced to participate and that I am free to withdraw at any time without giving any reason;
- ✓ I understand that I will not personally benefit in the study;
- ✓ I also agree and understand that the data I will provide will be used for the purpose of the research study only; and
- ✓ I agree to take part in the research study.

Signature: _____

Date: _____

ANNEXURE D: QUESTIONNAIRE

QUESTIONNAIRE GENERAL UNDERSTANDING OF WATER GOVERNANCE

Date of Completion:.....

Questions

1. What is your understanding of water governance?

2. Does the uMkhanyakude District Municipality advocate water governance within its local municipalities? If yes/no, in what way or form?

3. In your understanding, what is intended to be achieved by water governance in the District?

4. Do you think water governance can be used to address water issues in the municipality?
If yes/no, please elaborate on your answer.

5. Is there room for improvement in terms of water governance in the District Municipality?
If yes/no, please elaborate on your answer.

6. Do the water policies and applicable water by-laws in the uMkhanyakude District Municipality promote water governance? If yes/no, in what way or form?

7. Is water governance reflected in the uMkhanyakude District Water Service Development Plan (WSDP)? If yes/no, in what way or form?

8. What types of water governance approach / instrument does the district or local municipality implement?

9. Does the approach / instrument that is used by the district or local municipality provide any success or failures within the water governance sphere?

Thank you for your participation.