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Pandora's Box: assessing the current trends and challenges of IWRM in the uMngeni catchment

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ABSTRACT

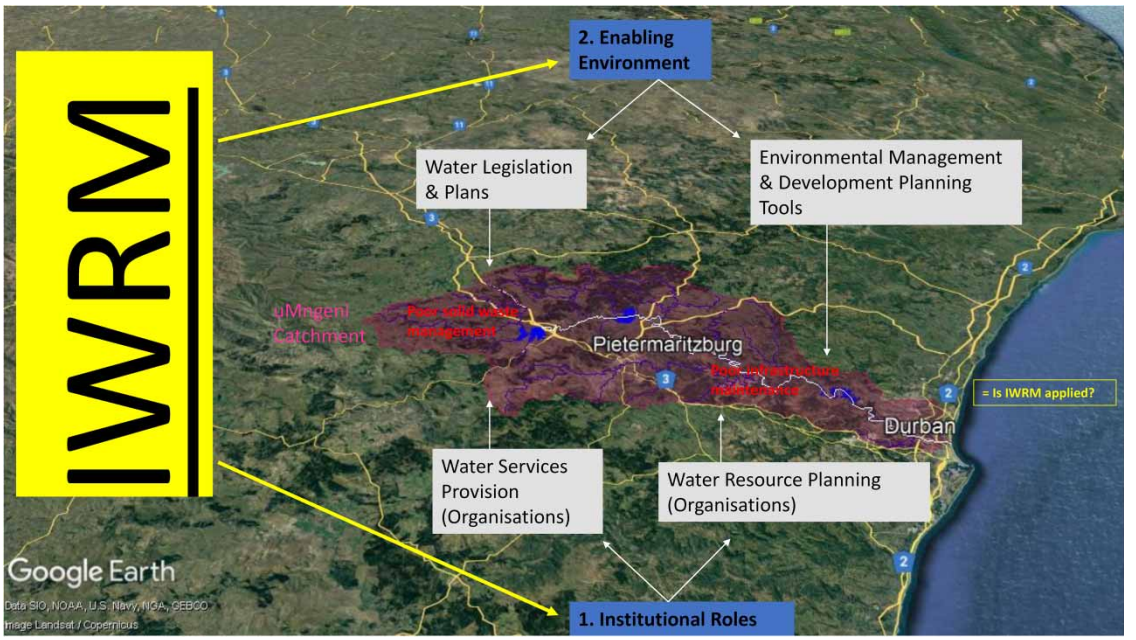
The uMngeni catchment in KwaZulu-Natal faces numerous challenges that threaten the availability and quality of water resources. To understand the prevalent issues, the purpose of the study was to assess the institutional aspects that may or may not have facilitated Integrated Water Resource Management (IWRM). Twenty-one semi-structured interviews were conducted, and development planning and environmental management tools were analysed. Water User Associations (WUAs) are statutory bodies and have not been established at the local level. Moreover, an operational Catchment Management Agency (CMA) at the regional level is non-existent. Consequently, the implementation of IWRM has been very limited. The establishment of the uMngeni Ecological Infrastructure Partnership (UEIP) has facilitated the integration of role-players in the absence of an operational CMA. Most of the spatial planning and environmental management tools feature water resource planning except for the integrated waste management plans. As a result, poor solid waste management contributes to the poor water quality in the uMngeni catchment. The challenges remaining are the poor implementation of plans due to a lack of human and financial resources. Therefore, the gap created by a non-existent operational CMA means catchment management activities will continue to negatively affect water resources and the degree to which water resource management is integrated.

Key words: CMA, IWRM, South Africa, UEIP, uMngeni, water resource management

HIGHLIGHTS

- The uMngeni catchment is a critical water resource area in South Africa and faces numerous challenges.
- The institutional landscape is indicative of IWRM; however, lacks key institutions for integrative water management.
- Increased coordination and partnership have reduced the gap created by non-existent institutions at the local and regional levels.

GRAPHICAL ABSTRACT



INTRODUCTION

Integrated Water Resource Management (IWRM) is described as an ongoing process that aims to challenge conventional water management approaches which have been characterised as highly fragmented, top-down and largely technical (Elias, 2017; Godinez-Madrigal *et al*., 2019). Instead, IWRM seeks out integrated decision-making across multiple sectors regarding water use. The implementation of IWRM depends largely on ensuring transparent processes, including a wide array of interest groups in the decision-making process, holding role-players accountable, and ensuring equity and efficient use of water resources (Clement *et al*., 2017; Kluge, 2018). In addition, IWRM requires an enabling environment, institutional dynamics, and the use of management instruments which are collectively referred to as the IWRM Toolbox (Agarwal *et al*., 2000). An enabling environment is the suite of legislation, policies and financing tools that allow for an integrated nature in water management. The institutional dynamics are the roles and functions of organisations, their capacity to fulfil their mandates and the channels for public participation in the decision-making process. The toolbox is completed by the management instruments which assist decision-makers in making informed decisions. These include regulatory instruments, demand management, communication and information systems, and evaluation techniques (Agarwal *et al*., 2000; Tejada-Guibert, 2015; Grigg, 2016).

However, IWRM is heavily criticised for being vague and being an 'one-size-fits-all' approach (Biswas, 2004; Lubell & Edelenbos, 2013; Kluge, 2018). The rejuvenated advocacy of IWRM post multiple conferences saw many countries incorporating the principles of IWRM in their water legislation and a review of macro-scale projects from across the world aiming to improve water governance; but the universality of the concept remained questionable. How could a single concept be applied in different contexts and conditions? The implementation of IWRM in developed countries cannot be used as a blueprint in developing countries because of the social and economic challenges and institutional landscape that exists (Lenton & Muller, 2009). Thus, examining the

institutional dynamics in a site-specific context is important in understanding the implementation of IWRM. This paper investigates the extent to which IWRM is implemented at a municipal level with a focus on institutional dynamics. The purpose of the study is to assess the institutional aspects that may or may not facilitate IWRM in the uMngeni catchment. This is achieved firstly by identifying the relevant institutions and their sphere of influence with regard to water resource management. In this context, the sphere of influence refers to the organisations' individual and/or shared responsibilities and mandates. Secondly, the paper investigates how water resource management features in development planning and environmental management tools in relation to service provision and municipal functions.

MATERIALS AND METHODS

This study was conducted in the uMngeni catchment which is approximately 4,439 km^2 in the KwaZulu-Natal (KZN) Province of South Africa as shown in Figure 1. The Msunduzi Municipality and eThekwini Metropolitan Municipality are the most populous municipalities in the catchment and depend on the catchment for potable water supply. Furthermore, the catchment accommodates various land-use activities, i.e. farmlands, wetlands and grasslands which are located upstream before reaching the middle of the catchment, which is built-up and residential areas. Industrial activities, natural bush and sugar cane fields are prevalent downstream before opening to the Indian Ocean. Informal settlements and communities are located along the uMngeni River as they rely on the water resource for domestic purposes (Umgeni Water 2017; Shoko *et al.*, 2016).

The catchment is plagued with numerous challenges that indicate the lack of integration in water resource management and planning, e.g. poor maintenance of water infrastructure which is evident through leaks, high levels of effluent waste flowing into rivers and ineffective solid waste management which negatively affects water quality (Kidd, 2011).

Research design

The case study research method was employed to assess the institutional aspects that may or may not facilitate IWRM implementation within the uMngeni catchment. This approach enables an in-depth understanding of a phenomenon within its context including its natural setting (Bhattacherjee, 2012; Lam & Law, 2016; Harrison *et al.*, 2017) and was an appropriate method to gain an authentic interpretation of IWRM implementation in the current institutional landscape. The approach is limited in the sense that the findings may not be applied in a different setting, therefore, reflecting the uniqueness required by IWRM.

Data collection and analysis

A review of published literature was conducted to understand the nature of water resource planning and management in South Africa and in the catchment. However, published literature provided limited information pertaining to the institutional landscape of the catchment. Therefore, primary data were collected through 21 semi-structured interviews which were conducted between May and December 2019. Each interview was structured according to the participants' field of specialisation to gauge their understanding of IWRM, their perceptions of the current challenges and their willingness to adopt an integrative management system. Due to the scope of this research paper, these questions were excluded. Questions were designed to assist in mapping out the current institutional landscape and the sphere of influence of each organisation. The questions that were essential in identifying the relevant institutions included, 'What is your organisation's role in water resource management?', 'How is the current institutional set-up and co-ordination with other organisations with regards to WRM?' and 'Can you describe the nature of water resource planning in the catchment?'. An additional question on coordination was posed to better understand the integrative nature of water resource planning in the catchment. This question

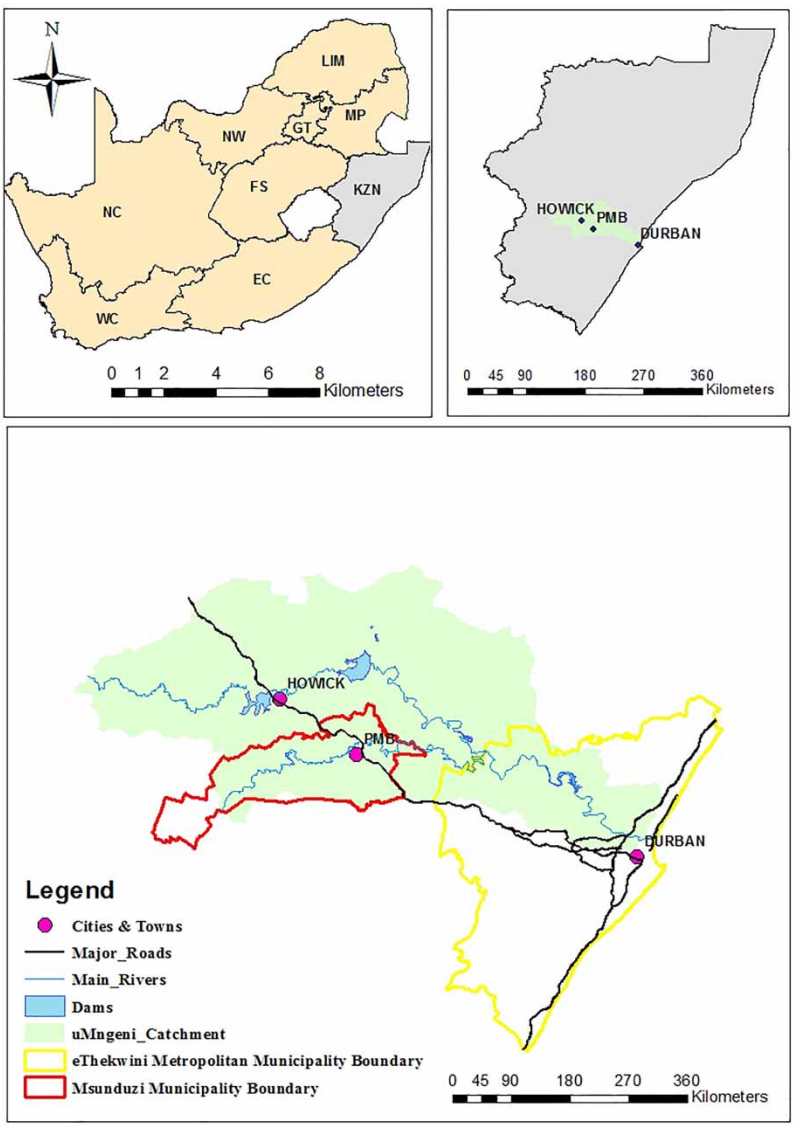


Fig. 1 | uMngeni catchment boundary relative to the Msunduzi Municipality (red) and eThekwini Metropolitan Municipality (yellow) boundaries. Please refer to the online version of this paper to see this figure in colour: http://dx.doi.org/10.2166/wp.2023.183.

was, 'Concerning the idea of coordination, have the Department of Water and Sanitation actively involved (stakeholder) and other stakeholders in IWRM planning?' The questions were open-ended with the purpose of the participant engaging with the questions. Furthermore, to avoid participants providing favourable responses termed social desirability bias (Bergen & Labonte, 2019), all the participants remained anonymous.

Semi-structured interviews were the most appropriate tool as the research questions required subjective knowledge regarding IWRM in the catchment, which could not be obtained from the literature (McIntosh & Morse,

2015). Ten participants were initially identified by the researcher and through the snow-ball sampling technique, additional participants were identified. Snow-ball sampling was essential in building up the sample size due to the difficulty in identifying the professionals of interest in the catchment (Waters, 2015; Etikan *et al*., 2016).

Secondary data sources involved an analysis of the National Water Act (NWA) 36 of 1998, Water Services Act 108 of 1997, National Water Resources Strategy, Catchment Management Strategy (CMS), the Msunduzi Integrated Development Plan (IDP) 2018–2019, Msunduzi Local Municipality: Water Master Plan for Pietermaritzburg 2016; Msunduzi Sewer Master Plan 2016, Msunduzi Spatial Development Framework 2009, Msunduzi Integrated Waste Management Plan 2014–2018, Msunduzi Environmental Management Framework 2010, eThekwini Water Services Development Plan (WSDP) 2012, eThekwini Municipality IDP 2017/2018–2021/2022, eThekwini Municipal Spatial Development Framework 2019–2020, Integrated Waste Management Plan 2016–2021 Draft, and the Proto CMS for the Pongola-Mtamvuna Water Management Area (WMA): 90% Draft Version October 2019, to supplement the interviews. These management and planning tools were accessed from official government and municipality websites, with a few located by a Google search. The tools were analysed to identify how water resource management is incorporated, understand the link between water service provision and IWRM at the local level, and how the tools facilitate or hinder IWRM implementation. The listed tools are current, and some are designed to be implemented over a 5 to-10-year time frame.

Interview transcripts were analysed by grouping responses together according to themes and reoccurring responses termed Thematic Analysis or Coding (Clarke *et al*., 2015; Vaismoradi *et al*., 2016) and analysed through inductive reasoning (Kyngas, 2020). The environmental management and planning tools were analysed by extracting sections that promoted water resource conservation and protection, either directly or indirectly.

RESULTS

During the interview sessions, each participant was asked to describe the current institutions involved in water resource management and the role of their organisations. From the 21 participants, seven provided valuable contributions in identifying the institutions involved in water resource management. In addition, these participants clearly defined the roles and responsibilities of each of the institutions and highlighted the shortcomings of non-existent bodies. Five participants identified impacting institutions that do not necessarily partake in water resource management; however, their functions have an indirect impact on water resources. The remaining nine participants were able to outline their organisation's role in catchment management, with a couple of the participants stating that they had no knowledge of the participating institutions. The participants' contributions informed the institutional map in Figure 2, which is further elaborated on below.

The institutional landscape in the uMngeni catchment

At the national level, the Department of Human Settlements, Water and Sanitation (DWS) formerly known as the Department of Water and Sanitation, is the national regulator and leading institution in water resource planning for South Africa (South Africa, Department of Water and Sanitation, 2019). As the custodians for water resources, DWS is responsible for monitoring water resources, enforcing water legislation and guideline tools for water resource management, establishing the national water resource strategy, determining the pricing strategy, implementing tariffs, determining water resource classes and Resource Quality Objectives (RQOs), establishing reserves, authorising and allocating water use licensing for strategic purposes and/or inter water management areas. Two respondents made direct reference to the Water Research Commission (WRC) and the Department of Mineral Resources (DMR) as organisations that play an impacting role at the national level. The WRC is a non-statutory, non-governmental research funding organisation that strives to be a water knowledge hub in South Africa and globally. A respondent stated that the WRC funds research that has been

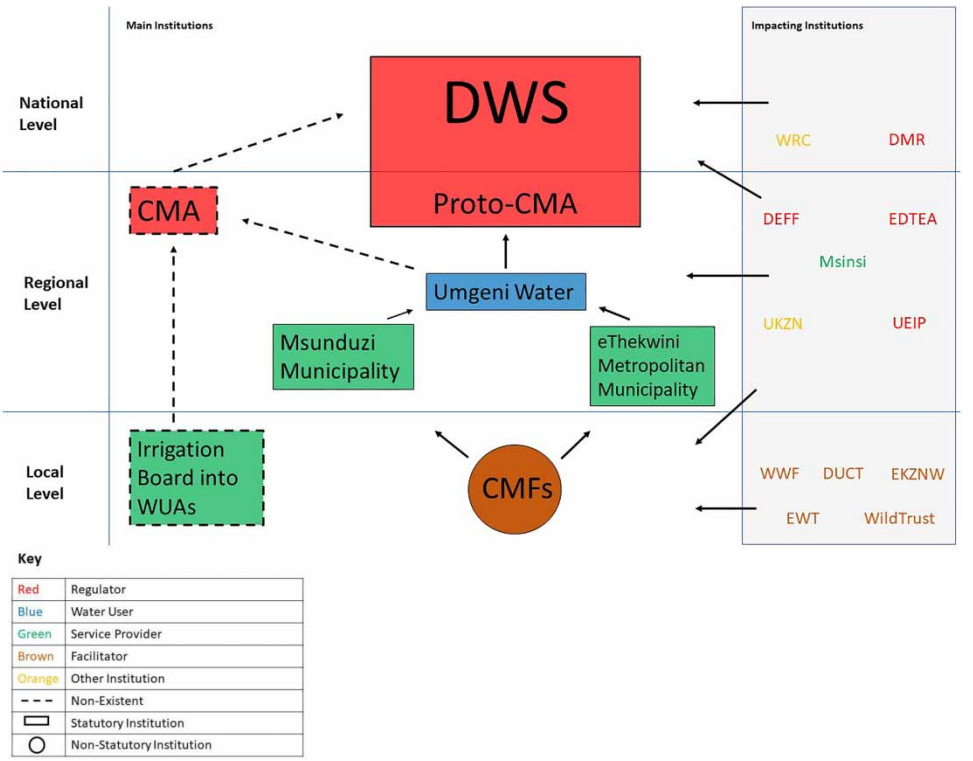


Fig. 2 | A layout of the institutional landscape in the uMngeni catchment, informed by the interviews. Please refer to the online version of this paper to see this figure in colour: http://dx.doi.org/10.2166/wp.2023.183.

identified as a research need or priority in the water sector in South Africa. They are also involved in setting research agendas and implementing measures that will facilitate information dissemination when research has been concluded. According to the IWRM guidelines and pilot implementation, the DMR is the national government department responsible for promoting and regulating the minerals and mining sector in South Africa; for transformation, development and growth that leads to the overall benefit of South African citizens. The participant described the role of the DMR in water resources management relating primarily to the issue of sand mining, as it negatively affects catchment management in the uMngeni. Sand mining causes massive sedimentation in water resources and reduces water quality leading to a significant loss of dam capacity. As shown in Figure 2, DWS and DMR are represented in red due to their roles as regulators while WRC is represented in orange as an 'other institution'.

At the regional level, the Catchment Management Agency (CMA) is represented in red for its role as a regulator. Through published articles, it is identified that CMAs are statutory river basin organisations responsible for resource protection and water use management within a WMA. Responsibilities include formulating a CMS, determining reserves and RQOs when it is delegated to them by DWS, authorising and enforcing water use, setting and collecting water use charges, planning water resources, overseeing water transfers, resource rehabilitation, licensing, managing river health and protecting the state of rivers in a WMA. Most of these functions are delegations that the Minister would need to transfer to the CMA once it is established and operational. A CMA's responsibility further extends to regulating and monitoring resources, including civil society in decision-

making and commissioning studies or investigations that will contribute to planning and making informed decisions. However, numerous participants stated that a CMA for the Pongola-Umzimkulu WMA which would be responsible for the uMngeni catchment is not operational due to political factors; hence the dotted line representation in Figure 2. In the absence of a functioning CMA, DWS formed a sub-section known as the Proto-CMA which fulfils some of the functions a CMA would. However, a respondent stated that the proto-CMA is not as effective in resource planning because it does not have the capacity to coordinate land-use practices and better catchment management, which has an influence on resource planning. A conventional CMA would coordinate and support the water board (Umgeni Water 2017), incorporate WUAs to regulate farmers and their water use including other water users, a department focused on environmental affairs for monitoring, and the conservation authority namely Ezemvelo KZN Wildlife (EKZNW). Unfortunately, the uMngeni catchment is not under an operational CMA and the gap created by a non-existent CMA is identified as hindering the facilitation of IWRM in the catchment. This is supported by published articles on CMAs in South Africa. In addition, due to the shortcomings of the proto-CMS, most of the participants stated that there is very limited water resource planning. The respondents characterised the current water resource planning as reactive rather than proactive, and the current institutions are focused on potable water supply and water quality. Without the CMA, the catchment lacks comprehensive water resource planning. It is essential to mention that a respondent highlighted that DWS is in the process of establishing the CMA that will be operating in the Pongola-Mtamvuna WMA, which will include the uMngeni catchment. DWS had the objective of finalising a CMA by October 2020, with an advisory committee that has sat to discuss the appointment of a governing body and establish the Terms of Reference. In addition, the committee plans on completing a business plan and appointing a Chief Executive Officer (CEO) in the CMA.

Participants described Umgeni Water as a water board and Water Service Provider (WSP) responsible for treating raw bulk water, before supplying six Water Service Authorities (WSAs). Water flowing from a source is diverted to Darvil treatment works where it is treated before ending up in a reservoir where the municipality allocates water to the respective water users. Wastewater is also treated by Umgeni Water before entering river systems. Their primary responsibility further extends to managing bulk water infrastructure on behalf of the DWS, co-ordinating with DWS on water allocation and water use, monitoring water quality, and being informed on catchment-wide activities. Therefore, the organisation is represented in blue because it is a water user but can also be represented in green because it is a service provider. Due to its functions, the water board is well positioned to bridge the gap between water resource management occurring within the proto-CMA and reticulation by the municipalities at a local level; thus, playing an instrumental role in water resource management. The organisation realises that catchment management activities affect the quality of water found in the uMngeni River which ultimately affects their business. As a result, Umgeni Water has been in the process of setting up a new catchment management department to improve coordination in the catchment, which contributes to implementing IWRM. Impacting organisations at the regional level include the Department of Environment, Forestry and Fisheries (DEFF), the uMngeni Ecological Infrastructure Partnership (UEIP), the Department of Economic Development, Tourism and Environmental Affairs (EDTEA) and Msinsi Holdings which are described below.

Secondary sources reveal that DEFF is the national department that provides leadership in environmental protection, management and conservation and is the custodian of the natural environment (air, water and land), including forestry and fisheries. DEFF is identified as the 'watch dog' in the water sector by one participant and published articles. The same respondent stated that DEFF plays a role in dealing with spillages and implementing a variety of programmes directed at improving catchment management. The UEIP is a non-statutory catchment-wide partnership comprising representatives from various organisations (i.e., private sector, academic

institutions and Non-Governmental Organisations (NGOs)) and government and is therefore not considered a formal institution. A specific participant provided in-depth details on the UEIP stating that it is a loose partnership based on the representatives signing a Memorandum of Understanding (MoU) for 5 years. Representatives agree to attend biannual meetings to discuss issues prevalent in the catchment and possible solutions that can be implemented by the respective organisations. The partnership may be found operating beyond the borders of the uMngeni catchment. Moreover, the partnership was formed to bridge the gap in planning regarding ecological infrastructure (EI) investment in the catchment as a supplementary approach to water security and resource management. The same respondent stated that the UEIP does not have its own mandates, but the individual organisations do, therefore the partnership ensures that signatories are fulfilling their responsibilities through collaboration and coordination, reducing institutional gaps. This allows for institutional reflection to improve the effectiveness of individual organisations. This contributes to the UEIP's role in water resource management in the catchment as it fosters coordination among the role-players in the water sector. In addition, a different respondent stated that the partnership is concerned with enhancing the capacity of the proto-CMA and the main CMA when it is established and operational. The UEIP is categorised in Figure 2 as an impacting 'institution' and not as a main role player due to its non-statutory status.

Plans are in place to make the UEIP an official governing body (legal entity) to further improve integration and resource planning, where a sub-committee has already been established. This will attract funds, attract industry, and increase its legitimacy; but there is still a lot of work to be done in this respect. DWS is aware of these plans and is in support. Moreover, the UEIP has an investment plan detailing the investment need for EI in the catchment. Once the funds are in, each organisation will be able to implement its projects which feed into the CMS. Many of the participants view the UEIP as the space or partnership attempting to bridge the gap in coordination where its reach is limited to a few organisations and individuals who attend the UEIP meetings. However, the UEIP has improved individuals' and organisations' knowledge on the issues prevalent in the catchment and the various projects that are implemented. Only one respondent described the UEIP as very uncoordinated, whereas, other respondents highlighted the partnership's efforts in facilitating coordination in the catchment, which directly influences IWRM implementation.

EDTEA is a commenting authority (regulator) working alongside DWS in assessing the impacts of development on the environment, and either denying or approving development plans in the catchment. A respondent knowledgeable on EDTEA stated that the department also manages and polices land management activities with the aim of ensuring best practice and environmental sustainability. Their impact on water resource management is evident through their efforts of protecting water production areas by limiting development, which ultimately protects water quality. A different respondent stated that EDTEA professionals are known to attend Catchment Management Forum (CMF) meetings where they may discuss potential developments in the catchment and the associated implications, which supports the first respondent on EDTEA. Finally, Msinsi Holdings operating as Msinsi Resorts and Game Reserves is a subsidiary of Umgeni Water. The organisation is responsible for managing the water resources in proximity to the dams owned by Umgeni Water and runs the nature reserves the dams are located on. This was stated by a respondent and supported by a secondary source. Their role as an impactor and service provider as represented in green is essential in ensuring that the activities on nature reserves do not negatively impact on water resources.

At the local level, a couple of respondents stated that the municipalities' involvement in water resource management is through fulfilling the role of a WSA. They purchase bulk water from Umgeni Water to supply cities for domestic and industrial use. As a service provider represented in green, they are by law mandated to provide access to basic water and sanitation services, to ensure good quality of life for citizens. Services include collection, removal, disposal, purification, supply and regulation of water and sanitation. Moreover, they are to uphold

tariffs, develop and implement WSDPs and develop bylaws for the conditions regarding water services. The Msunduzi Municipality operates in the middle of the catchment and the eThekwini Metropolitan Municipality operates downstream. Due to its location, the eThekwini Metro has a limited role in resource planning, and thus participates in the UEIP for better coordination and capacity building. Both municipalities document their future development plans which are considered by water service providers for water allocation. In addition, the municipalities fulfil several mandates that impact water resources quality and quantity and are described in the Supplementary material, Appendix A. Due to these mandates, the municipalities are well-positioned to coordinate catchment management activities, that facilitate the implementation of IWRM. However, many respondents stated that the municipalities are struggling to maintain water services infrastructure, and effectively provide waste collection services, which hinders the implementation of IWRM. Although municipalities play a significant role in catchment management activities, it is essential to highlight that they do not have water resource management mandates. An operational CMA is critical in co-ordinating the municipalities' roles with that of water resource planning. The University of KwaZulu-Natal (UKZN) has been identified as an impactor institution for its role in conducting research that feeds into water policy and law. A respondent stated that the university also has a good relationship with some of the organisations involved in water management, enabling the communication of research needs. UKZN also contributes towards capacity building, training of water professionals and preparing of graduate students for the sector and is represented in yellow.

Several respondents indicated that CMFs are non-statutory bodies that fall under CMAs at a local level. CMFs are considered by some as the 'eyes and ears' of DWS. An operational CMF is a platform where residents can communicate issues prevalent in the catchment and discuss possible solutions. A respondent stated that forum meetings are attended by DWS representatives and NGOs, but they may not attend on a regular basis. Irrespective of this, it has become a platform where active role-players meet to network, connect, consult on implementing programmes or initiatives, follow-up on what was discussed in previous meetings, and contribute towards future planning. CMFs also assist with the public participation process as EDTEA officials seek out CMFs to engage with civil society regarding developments in an area. Moreover, a respondent stated that there are several CMFs that have been established and are making notable contributions to water resource management. The Msunduzi CMF focuses on the Msunduzi River as it feeds into the uMngeni River. Their focus is on water quality due to the industrial activities taking place along the river and the communities that depend on the river for domestic purposes. The forum meets on a quarterly basis annually where they can provide advice on initiatives that will be implemented by external organisations, provide support to the municipality when required and assess the state of the Msunduzi River based on the water quality reports from Umgeni Water and the Msunduzi Municipality's environmental health department. The Upper uMngeni CMF primarily focuses on areas draining into Midmar Dam which are facing challenges. The Mooi area is under poor conditions due to farming activities whereas Mpophomeni is facing poor sanitation and solid waste management negatively impacting the uMngeni River. Representatives from provincial government, service authorities, rent payers and NGOs attend the Msunduzi and Upper uMngeni forum meetings where DWS often disseminate information and communicate with locals regarding water classification and the monitoring of water allocation and usage. More specifically, the sub-directorate within DWS known as the Institutional Management Directorate: Catchment Management Sub-directorate, has the sole mandate of communicating with CMFs. However, due to CMFs being a non-statutory body, suggested solutions may not be implemented. This is evident as a respondent stated that communication via the directorate does not always reach DWS and are not always incorporated into planning. The implication of this is that problems remain unsolved and the implementation of IWRM hindered. A respondent highlighted that forum meetings are well-attended and active. Due to the role of a facilitator, the CMFs are represented in brown in Figure 2.

Based on the South Africa, National Water Act 36 (1998), irrigation boards which were local-level bodies under the management of large-scale farmers, where their interests with regard to water use were discussed, were to be transformed into Water User Associations (WUAs) which are statutory bodies and representative of not only farmers, but all water users even if they do not have formal water entitlements. This is in effort of including previously disadvantaged individuals in water resource management at a local scale. In the uMngeni catchment, a few participants reiterated that there had not been any irrigation boards. Similarly, there are no WUAs operating in the catchment. Due to the role of a service provider, WUAs are represented in green and in a dotted line indicating the lack of these in the catchment. Therefore, a non-existent statutory body for all water users hinders the implementation of IWRM as water users are excluded from the planning process. Impacting organisations at the local level include the Duzi Umgeni Conservation Trust (DUCT), World Wide Fund (WWF), Ezemvelo KwaZulu-Natal Wildlife (EKZNW), Endangered Wildlife Trust (EWT) and Wildlands Conservation Trust/Wildtrust; represented in brown as their role as facilitators. Based on the responses, DUCT is an implementing agent well-known for its extensive work in the Msunduzi River and beyond regarding catchment management interventions, e.g., sand mining, biodiversity stewardship, alien vegetation clearing and dealing with sewerage charging. A respondent knowledgeable about the organisation stated that the organisation has hopes of having a more strategic influence regarding where and how funds are spent and implementing policy. Similarly, another respondent knowledgeable about WWF described that WWF has different people working on different environmental issues. However, their recent contribution is through their work of engaging dairy farmers in the uMngeni catchment and expanding beyond, regarding water usage, generation of waste and improving self-governance. They are engaging with Nestle, Danone, Fair Cape and Woodlands Dairy as these businesses are operating in the catchment and have an impact on the water resources. Finally, the respondents stated that EKZNW is the provincial conservation organisation in KZN and engage in various catchment management activities. Whereas EWT and Wildlands perform wetland work and waste management respectively.

Therefore, based on the institutions identified, the institutions are geared towards dealing with potable water supply and not necessarily water resource planning. This is evident with a non-existent CMA and WUAs. The implication of this is that the implementation of IWRM is significantly hindered, despite a proto-CMA within the DWS. Many of the above-mentioned institutions are mandated with upholding and implementing a suite of environmental management and development planning tools that are explored.

Integration of water resource management in environmental management and development planning tools

The NWA No. 36 of 1998 and the Water Services Act No. 108 of 1997 provide guidelines on effectively managing water resources and the provision of water services. Moreover, the National Water Resources Strategy aligns national water resource planning with development plans. Thus, these national-level tools provide an enabling environment for the facilitation of IWRM and are further described in the Supplementary material, Appendix B.

At the regional level, the most essential plan regarding water resources planning is the CMS. Each CMA is required to have a CMS which will govern resource planning in a WMA. At the start of this study in 2018, the proto-CMA had a two-page proto-CMS briefly stating the importance of the CMS aligning with national and provincial strategies. It further stated the vision and strategic themes for the catchment. In addition, the two-paged proto-CMS outlined details on the activities that will be carried out in the catchment, current issues, and possible solutions. During the data analysis process of this study in February 2020, the proto-CMA released a draft proto-CMS which was 90% completed. Therefore, the drafting of the proto-CMS places attention on water resource planning which facilitates IWRM. In addition, a Catchment Management Plan for each river or catchment will be drafted and will be linked to the overall proto-CMS. Steps already taken towards this include ongoing

monitoring, the rollout of the 'Adopt-a-River' Programme and the Validation and Verification process determining the number of illegal and legal water users in the catchment (19,000 unauthorised users). Reconciliation studies and assessments performed by DWS determined water availability, supply and alternative methods that will supplement water supply in the WMA, i.e., inter-basin transfer schemes, rainwater harvesting and clearing alien invasive vegetation. Such studies, assessments and consultation meetings are informing the drafting of the proto-CMS which will be a tool for improved planning. Prior to the drafting of the proto-CMS, a comprehensive water resource planning tool at the catchment level was non-existent and will remain this way until the completion of the strategy. However, respondents reiterated that the capacity of the proto-CMA needs to improve to begin implementing the new proto-CMS.

At the local level, ten environmental management and development planning tools are in effect within the uMngeni catchment. Of the ten tools, eight have made provisions for protecting water resources. Moreover, these tools provide guidelines on how future development plans should align with water resource planning. Considering that these tools are sector-specific and may not fall directly under water resource planning, they have been identified as facilitating IWRM within the respective limitations. The remaining two tools which are '*Msunduzi Integrated Waste Management Plan 2014–2018*' and the '*Integrated Waste Management Plan 2016–2021 (Draft)*' do not mention or include aspects of water resource management. IWRM requires long term planning to incorporate the different sector plans. As described in the Supplementary material, Appendix B, the suite of acts and plans create an enabling environment that facilitates the implementation of IWRM.

An important aspect of facilitating IWRM is the coordination within and between organisations, and among individuals at all levels of management. Coordination between DWS and other departments exists to a certain degree. Participants attribute most of the integration to long-lasting and good relationships between individuals/professionals, where knowledge sharing has become easier. Individuals from organisations are well-known in the sector for being knowledgeable and easy to work with which facilitates the implementation of IWRM in the catchment. Organisations are guided by cooperative governance and NEMA regulations that promote public participation processes and thus promote coordination. However, coordination is also limited when fulfilling certain functions that are of concern (e.g. DWS will fulfil its mandate regarding water quality monitoring but that is where it would end, similar case with Umgeni Water as they are suppliers or inter-basin transfers). One respondent attributed the lack of coordination to the lack of planning and tendency of dealing with urgent matters (reactive), which does not enable engagement with other sectors. Similarly, the issue of working in silos has gone on for so long due to organisations, departments or sectors striving to fulfil their mandates and achieve their objectives, thus less effort on initiating cross-sectoral integration which hinders the facilitation of IWRM. Water resource planning will require spatial planning to be considered and it is unknown whether spatial planners attend meetings in Pretoria regarding water resource planning. Coordination may be evident in the implementation of social projects (e.g. the URP) where there may be partner organisations but currently, there is no overall water resources planning and coordination is not continuous.

In as much as coordination is limited and there may be factors hindering it, many organisations have a budget set aside to attend meetings (e.g. CMFs and UEIP) that facilitate coordination. Such meetings are voluntary and are a success when individuals are willing to participate. A couple of the participants elaborated on intra-coordination (within an organisation) stating that it is limited as departments within organisations have their own objectives to achieve with one respondent stating that they also need to achieve IWRM internally in terms of their processes. Another respondent from Umgeni Water stated that the organisation has identified the need to improve on its internal coordination. In actioning this, the Catchment Management Department is being established and will focus on the different activities in the catchment and have representation from different stakeholder groups. In addition, some participants attributed the poor coordination among role-players in

the water sector to a non-operational CMA due to the inherited authority of the CMA to initiate coordination. Many of the participants in the eThekwini Metropolitan Municipality stated that poor coordination is largely attributed to the lack of capacity or poorly resourced divisions within the municipality's departments, where it is common to find one person or a manager who is responsible for a large area which is not practical in dealing with arising issues. Moreover, the participants highlighted the lack of willingness on behalf of individuals to initiate cross-departmental coordination and thus hindering the facilitation of IWRM. Many of the participants in the eThekwini Metropolitan Municipality stated that poor coordination is largely attributed to the lack of capacity or poorly resourced divisions within the municipality's departments, where it is common to find one person or a manager who is responsible for a large area which is not practical in dealing with arising issues. Moreover, the participants highlighted the lack of willingness on behalf of individuals to initiate cross-departmental coordination and thus hindering the implementation of the environmental and development planning tools, and the facilitation of IWRM. Although coordination is an issue, the catchment is fortunate to have role-players with the capacity to engage with resource planning, even though it may only be a small component.

DISCUSSION

The purpose of this research paper was to identify the institutional aspects that may or may not facilitate IWRM in the uMngeni catchment. This was achieved by identifying the institutions involved in water resource planning and their sphere of influence. Secondly, the suite of environmental management and development planning tools was analysed to highlight the alignment with water resource management. Based on the institutional map, it is evident that water resource planning is very limited due to the absence of water resource planning institutions such as the WUAs and a CMA. The implication of a non-existent WUA is that agricultural activities and other water-use activities along the uMngeni River are not officially monitored and there is a lack of systems in place to ensure farmers are abiding by their water-use license requirements. Non-existent WUAs also means that the challenges water users are facing may not be communicated appropriately to the regional and national levels, meaning the little planning that does occur, does not take into consideration the input of water users. Furthermore, prior to 2020, the uMngeni catchment did not have a CMS that details water resource planning in the catchment. This is mainly attributed to a non-existent CMA. Therefore, without the key organisations responsible for driving resource planning and the key governance tool of the strategy, resource planning has been lacking. The organisations responsible for potable water supply and monitoring water quality are fully established and have their relevant environmental management and development planning tools. If the tools are implemented as outlined, the positive effects will be evident through improved water quality. However, due to limited coordination across sectors, the effective implementation of these tools is compromised, thereby hindering the implementation of IWRM. This is evident as there is poor solid waste management, sewer leaks and the breakdown of old infrastructure. These organisations are further challenged with limited capacity (human and financial) and the implication of this is that they are highly reactive towards environmental and water issues. In reducing these shortcomings, a proto-CMA was formed within the DWS to take on some of the responsibilities an operating CMA would have. However, due to limited capacity, water resource planning is still very limited. Fortunately, the process of forming a CMA and a CMS is already underway which promises to improve the implementation of IWRM in the future. However, until such a time where the CMA is up and running, the active role-players continue to rely on the relationships and departments that have been formed to facilitate water resource planning and the implementation of IWRM.

CONCLUSION

IWRM was introduced as a process that challenged conventional water management regimes characterised as highly fragmented, top-down and exclusive of role-players. The approach seeks out an integrated manner in managing water resources, while striving for transparency, inclusivity and ensuring an equitable and effective use of water resources. However, IWRM has also been heavily criticised as a 'one-size-fits-all' approach. Furthermore, the way IWRM is implemented in developed countries cannot be used as a blueprint in developing countries as different countries have different socio-economic traits, which influence the ability to implement IWRM. Thus, to better understand how IWRM is applied, it is needed to be assessed within a specific context. The uMngeni catchment is home to two of the most populous municipalities in the KZN province, namely Msunduzi Municipality and the eThekwini Metropolitan Municipality. The catchment faces numerous challenges such as poor solid waste management, sewer leaks and poor maintenance of water service infrastructure. These challenges indicate an issue in the management of water resources and a case study approach was used to assess the institutional aspects that facilitate or hinder the implementation of IWRM in the catchment. Twenty-one semi-structured interviews were conducted to identify the institutions involved in water resources management. Ten environmental management and development planning tools, and national-level tools were analysed to identify whether they consider water resources within the respective sectors.

Upon analysis of the data, the institutions were mapped out and it was identified that the CMA and WUAs who would be responsible for water resource planning in the WMA, have not been established, hindering the implementation of IWRM. The implication of this is that the institutions that are mandated for water service provision in the catchment are more focused on potable water supply and dealing with water quality issues rather than comprehensive water resource planning. Due to this shortcoming, the DWS has formed a proto-CMA in effort of facilitating some level of water resource planning. Moreover, the UEIP which is a partnership for EI investment was formed which also facilitates coordination in the catchment. Umgeni Water which is the water board is also in the process of forming a Catchment Management department to facilitate managing catchment-wide activities. These attempts made by the active role-players are all efforts in ensuring that there is a level of water resource planning, despite a non-operational CMA. Eight of the environmental management and development planning tools included guidelines on protecting water resources within the respective sectors. Unfortunately, the remaining two tools which are the integrated waste plans for both municipalities, do not place explicit measures to protect water resources from illegal solid waste dumping. In addition, prior to the commencement of this study, a CMS had not been drafted which means there was no clear strategy for water resource planning in the catchment. The institutions are struggling to increase the degree of integration across sectors and within their own institutions due to the high demand for meeting organisational objectives. Moreover, these institutions lack the capacity in fulfilling their roles and responsibilities, which hinders the implementation of IWRM.

This paper provides evidence that an enabling environment has been created in the uMngeni catchment for the implementation of IWRM. There is a shortfall in the institutional dynamics and management instruments evident through poorly resourced municipal departments to fulfil their responsibilities, the lack of capacity and skills to implement IWRM and non-existent WUAs at the local level. Poor implementation of water sector plans can be addressed by ensuring that there are strong management instruments in place, to also facilitate the coordination between national levels and local levels. Finally, the current institutional landscape in the uMngeni catchment allows for a limited amount of planning to occur which is why many role-players criticise the catchment for being reactive. Without an operational CMA, organisations will continue to be limited when trying to integrate the various water-using sectors in resource planning.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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