

A STUDY OF AN INTEGRATED MANAGEMENT INITIATIVE TO IMPROVE THE BERG RIVER, WESTERN CAPE, SOUTH AFRICA

By

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DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

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ABSTRACT

Integrated Water Resource Management (IWRM) is acclaimed as an important paradigm in the sustainable management of water resources. While the logic of IWRM is largely undisputed, it is often criticised for lacking sufficient guidance on its practical implementation. The gap between theory and practice in IWRM is mainly attributed to divergent interpretations of integration and how implementation should be practically pursued in water governance regimes. This research contributes to the on-going discussion around IWRM by investigating an integrated management initiative in the Berg River Catchment, in the Western Cape, South Africa. The Berg River Partnership (BRP) is a collective of government and non-government actors and stakeholders working together in an effort to improve the Berg River. The Berg River is a socially and economically important water system within the region, supporting a number of crucial industries. The Berg River is also under serious environmental stress due to polluted urban runoff, wastewater effluent discharges, agricultural runoff and the presence of alien invasive flora. The Management and Transition Framework (MTF) is adopted in this study as the framework that underpins the structured analysis of the Berg River Partnership, allowing the principles of IWRM to be identified and assessed in the governance structures and processes of the BRP. The study demonstrates how some principles of IWRM are practically implemented within the Berg River Partnership, while confirming some of the limitations of implementing IWRM.

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LIST OF ABBREVIATIONS

BRIP	Berg River Improvement Plan
BRP	Berg River Partnership
BRWQTT	Berg River Water Quality Task Team
CASIDRA	Cape Agency for Sustainable Integrated Development in Rural Areas
CSIR	Council for Scientific and Industrial Research
DEADP	Department of Environmental Affairs & Development Planning
DWAF	Department of Water Affairs & Forestry
DWS	Department of Water & Sanitation
IWRM	Integrated Water Resource Management
MTF	Management and Transition Framework
UCT	University of Cape Town
UWC	University of the Western Cape
WCDM	West Coast District Municipality
WFW	Working for Water
WWF	World Wide Fund for Nature

CHAPTER 1: INTRODUCTION

Integrated Water Resource Management (IWRM) has had a relatively long history of development, and has been widely embraced by policy-makers and academics. However, IWRM, and the enthusiastic embrace that it has received, has been heavily criticised for failing to translate a theoretical framework into practice. IWRM has been crippled by disparate definitions of integration and differing ideas of what needs to be integrated (Merrey, 2008). In addition, IWRM has lacked an appropriate policy blueprint that is pragmatic and flexible in guiding its practical implementation in varying contexts (Funke, et al, 2007). Thus, Jeffrey & Gearey (2006) conclude that,

“Empirical evidence which unambiguously demonstrates the benefits of IWRM is either missing or very poorly reported. Hence, there is no recipe book, no laws, no formulae, no blueprint. Little wonder then that the migration of IWRM from theory into practice has been sluggish”.

Despite these shortcomings, integration remains valuable for the sustainable management of water resources (Merrey, 2008). River catchments are complex hydrological systems requiring a collaborative management approach that is cognisant of the multiple components and processes within a catchment, and one that brings together a multiplicity of actors responsible for various aspects of, and processes within, the system (Hooper, 2010). Thus, some form of integration is arguably necessary. Yet, how the concept of integration can be successfully applied to remedy the often-fragmented management of water resources is a question that has not yet been satisfactorily answered in practice. There is confusion and uncertainty regarding how integration is defined and what governance configurations and processes lend themselves to effective integration (Medema, et al., 2008). The need for clarity and evidence in this regard is the rationale for this research.

This need for progress in IWRM implementation is relevant in the South African context for a number of reasons. There remains deep social inequality in the country, coupled with a diversity of often competing needs (including the conflicting pursuit of accelerated socio-economic development and environmental sustainability). In addition, IWRM forms a centrepiece of South African policy and legislation in the water sector. While there has been considerable literature and study devoted to the implementation of IWRM in more developed economies, the same is not true for developing nations (Akpabio, 2007). Thus this study forms a valuable part of the on-going work to move IWRM beyond theory and into practice in developing contexts.

This study investigates an initiative within the Berg River catchment, in the Western Cape, South Africa as an illustration of the implementation of IWRM to improve the water quality in the Berg River. The Berg River Partnership (formerly known as the Berg River Water Quality Task Team) is a collaborative partnership of actors from various government and non-government sectors. This initiative is an attempt at establishing an adaptive and transitional approach to integrative management within a large and complex catchment. Although the Berg River Partnership (BRP) is still ‘finding its feet’ in some ways, the BRP is a useful case study to examine integration and collaboration in water resource management set in a South African context. The BRP is not explicitly legislated or mandated as an IWRM institution, but has emerged as a transitional and pioneering attempt to establish a form of integrated management to address the pressing needs of a complex environment. Based on the argument outlined in the previous paragraph, the broad aim of this research is to explore how the BRP may represent an adaptive and transitional approach to IWRM that overcomes some of the shortcomings of previous attempts. While the debate in academic literature on the subject has uncovered valid criticisms of IWRM, alternatives or solutions to the wicked problems found in water

resource management have not been forthcoming. This study of the Berg River Partnership may provide further lessons that can contribute to on-going dialogue concerning the establishment of effective integrated management strategies for water resource management.

AIMS AND OBJECTIVES

The water quality of the Berg River, in the Western Cape, South Africa, is degraded for several reasons. Three reports were referred to determine the major threats facing the ecological health of the Berg River Catchment. These were the 2004 Berg River chapter of the *State-of-Rivers Report*, prepared by the River Health Programme, under the direction of the national Department of Water Affairs and Forestry (DWAF). The 2007 *Final Report of the Berg River Baseline Monitoring Programme*, also conducted by the DWAF, was also consulted. Finally, 2011 the *Western Cape IWRM Action Plan: Status Quo Report Final Draft*, produced by the Department of Environmental Affairs and Development Planning was referenced. Per these three reports, the multiple drivers of water quality degradation include point and non-point source pollution from urban settlements, wastewater treatment works, and agricultural runoff. Abstraction and flow alterations from farming practices and the construction of dams have also resulted in degraded water quality and quantity. In addition, the presence of invasive plant and fish species has become problematic within the river system. This has not only resulted in the environmental degradation of the river system, but has far reaching socio-economic consequences due to the various industries and communities in the area which depend on water from the Berg River. The Berg River catchment has been selected as the area of study because of the diversity of actors and drivers of environmental degradation in the catchment; a challenge for the sustainable management of the river; and an opportunity for the BRP to take advantage of an integrated management approach.

The history and establishment of the Berg River Partnership is somewhat vague, and accounts differ somewhat regarding the timeline of the Partnership's formation. Between 2007-2009 a cross-sectoral task team was established with the intention of creating a forum for cooperative management and improvement of the environmental health of the Berg River Catchment. Although it is not explicitly stated as an aim in the Terms of Reference promulgated at the time BRP was established, the Partnership represents an attempt to transition towards integrated management within the catchment. It is clear, at least, from the dynamic, cross-sectoral, structure of the BRP that the intention was to pursue integrated management in the catchment.

IWRM is a management paradigm that is based on the acknowledgement that water resources form part of complex systems, with processes and interactions between a multiplicity of components and actors across different spatial scales. Within a catchment, each aspect of the system has a dynamic and interdependent relationship with many other elements, and actions or processes that occur in one part of the system will invariably affect actors or processes in other parts the system. This includes actors and processes not commonly included in water resource considerations. Traditional sectoral approaches to the management of these resources have failed to account for these complexities. Actors often operate within sectoral silos, without sufficient cognisance of other components of the system and their interdependent nature. Often the jurisdictional boundaries of these actors are mismatched to the spatial scale of the physical system's boundaries, causing further fragmentation. Thus, IWRM is ideally characterised by multi-institutional and multi-stakeholder coordination and cooperation that accounts for the complexity of the system. This shift towards alignment and collaboration in management efforts is been captured in the term "integration". However, as valuable

as this logic is, there has been little evidence to show meaningful translation of discourse into practice. While widely accepted, IWRM has remained largely a concept embedded in academic literature and government policies, with limited successful practical adoption. Interpretations of integration are varied, and guidelines on its implementation have either been too vague or too prescriptive (Funke, et al., 2007; Ferguson, et al., 2013). There has therefore been a growing disenchantment with IWRM expressed in the academic literature, and yet limited progress has been made to advance the concept beyond criticism. What has appeared in the literature is a need for a more adaptive and transitional approach to implementing integration that conforms to the needs and resources available in specific contexts. However, for this to be possible, improved understanding is needed in at least two areas. Firstly, understanding is needed about forms of integration, and secondly, about forms of governance including institutions, structures, actions and processes that are capable of facilitating a transitional and adaptive pursuit of integrated management. This research focuses on developing clarity in this regard by examining the Berg River Partnership as an example of an integrated management initiative. Experiences from the BRP will serve to address, overcome, or affirm limitations of IWRM.

The primary research question that guides this study is:

How do different governance structures and processes enable integration to be incorporated and practiced in catchment management?

To this end, the following objectives were pursued:

1. Adopt a suitable water management systems framework that identifies and explains the universal components and processes of water management, and identify how integration may normatively apply to this framework.
2. Assess the Berg River Partnership's composition, structure, activities and experiences using this framework as a departure point for a structured analysis.
3. Examine the Berg River Partnership as an example of working integration and determine whether or not the manner in which the BRP incorporates integrated forms of management addresses, overcomes, or affirms limitations described in the IWRM literature.

The initial component of this research is a literature review of relevant theory, and a synthesis of the voluminous literature on IWRM that includes themes such as integrated resource management, governance, and adaptive management. This literature review provides a comprehensive theoretical overview of the various conceptualisations of IWRM. However, to investigate these concepts in a case study requires a suitable water management systems framework, to which these concepts of integration can be applied. This allows for a systematic and structured analysis of a water governance regime through which indicators of integration can be investigated.

The Management and Transition Framework (MTF) is one such framework, which provides a conceptualisation of water governance regimes, to which IWRM theory can be applied. This creates a generalised scheme for integrated water resource management, which can be pursued and measured, in different scenarios using the framework for structured analysis. Using this framework, the Berg River Partnership is investigated through a combination of a review and analysis of secondary data such as reports and minutes of meetings, and semi-structured interviews. This is the second component of the research, which provides some detail on the composition, structure, actions and experience of the BRP.

OUTLINE

Chapter 2 is a literature review that discusses the foundations and failings of IWRM as a management framework. The chapter describes how IWRM arose as a conceptual solution to the problem of fragmented management in complex water resource systems. It also describes the shortcomings of IWRM. Despite an enthusiastic embrace by many, IWRM has failed to demonstrate effective practical implementation in many settings. The chapter maintains, however, that the underlying logic of IWRM remains valuable. A flexible, adaptive and transitional pursuit of integration in water resource management regimes is suggested.

The chapter continues by explaining why the Management and Transition Framework (MTF) is identified as the tool selected for this research. This selection is justified based on the usefulness of the MTF as an analytic tool for conceptualising water resource management regimes, which enables large and complex systems to be analysed in a manageable way. The discussion continues by showing how the principles of IWRM can be applied to the MTF to provide a useful way of conceptualising integration in a water resource management regime. This conceptualisation is presented as a basic normative sketch of integration in water resource management, based on the structure and composition of the MTF. This provides a departure point from which to investigate integration without being overly prescriptive or dogmatic. The chapter concludes in the production of a list of indicators of *de facto* integration, based on the categories of the MTF. This then serves as an analytic tool for the study of the Berg River Partnership (its structures, processes, activities and experiences).

Chapter 3 introduces the study area in more detail. The Berg River catchment is described and the chapter explains why the catchment is an ideal study area for research into IWRM. The catchment is a dynamic and complex system, with multiple environmental and social components and processes and a diversity of socio-economic and environmental needs. The catchment also is of high socio-economic importance in the area, making effective integrated management a crucial issue. A more detailed narrative of the Berg River Partnership is also given, focussing on its foundations as a governance network. A more detailed history of the BRP can be found in the results in Chapter 5.

Chapter 4 provides an overview of the methodological considerations for this research, and discusses how a combination of the review secondary data such as reports and meeting minutes, interviews and questionnaires is used to bring together diverse sources of data in a qualitative assessment of the management initiative. The limitations of this research are also acknowledged.

Chapter 5 presents the results of this study. An overview of the legislative institutional environment provides a backdrop to the history and establishment of the Berg River Partnership. A description of composition and operation of the BRP follows. The results also suggest the different values and management goals held by the actors, the ways in which actors perceive the state of the Berg River, and the threats that these actors identify within the catchment. The chapter follows with an overview of the various management interventions pursued by the BRP, according to the action plan adopted by the Partnership. The chapter concludes with findings regarding knowledge generation and sharing within the BRP.

Chapter 6 provides an analytical and critical discussion of these results. The chapter uses the list of indicators produced in Chapter 2 as a framework for assessing the governance structures and processes identified in this research, discussing how these structures and processes may contribute to integrated management in the Berg River catchment.

Chapter 7 concludes with a summary of the governance structures and processes that demonstrate how IWRM has been pursued and implemented within the Berg River Partnership, and how these

structures and processes may be universally applicable to water resource management scenarios elsewhere. The chapter also comments on how the use of the Management and Transition Framework has contributed to this study and suggests further avenues of research.

This chapter has introduced IWRM as an important theoretical discourse in addressing the problematic management of water resources as complex socio-ecological systems. The idea underpinning IWRM is that the management of water resources needs to take into consideration the complex and multiple components and drivers of water resource systems and manage these holistically. However, there has been difficulty in translating this logic into practice and a dearth of examples where this has been done effectively. The chapter also introduces the Berg River Catchment as the area of study, and the Berg River Partnership (as an example of an integrated management initiative) as the focus of this research. The aim of this research is to investigate what processes and drivers of governance facilitate integrated management by examining the Berg River Partnership's composition, structure, activities and experiences. To this end, the Management and Transition Framework (MTF) is chosen as an analytical tool. The chapter that follows reviews the literature surrounding IWRM and the MTF and how these can be used together to suggest how integrated management may be wrought in practice.

CHAPTER 2: LITERATURE REVIEW

INTEGRATED WATER RESOURCE MANAGEMENT: FOUNDATIONS & FAILINGS

Integrated Water Resource Management is often described as an emerging model for water resource management. In reality, however, the concept of integrated resource management is not entirely new (Allan, 2003; Biswas, 2004; Merrey, 2008). IWRM remains emergent in the sense that it continues to develop as a management paradigm (Jeffrey & Gearey, 2006; Funke, et al., 2007; Merrey, 2008). IWRM is strongly linked to the acknowledgement that water resources are complex, dynamic systems with multi-actor and multi-scalar interactions (Kidd & Shaw, 2007; Medema, et al., 2008; Merrey, 2008; Hooper, 2010; Wiek & Larson, 2012; Patterson, et al., 2013;). It offers a “new” normative stance for the management of water resources and seeks to redress fragmented governance regimes of the past (Metcalf, et al., 2013). In 2002, at the World Summit on Sustainable Development in Johannesburg, the following definition for IWRM was given:

“[IWRM is] a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (quoted from Rahaman & Varis, 2005, pp. 15).

Acknowledgement that water resources are complex systems has led to the recognition that they cannot be reduced to their component parts and managed in isolation (Rockström, et al., 2014). The properties of complexity and uncertainty must be reflected and incorporated into the management systems of these socio-ecological systems (Medema, et al., 2008). Biswas (2004) summarises this as a growing appreciation that “water problems have become multi-dimensional, multi-sectoral, and multi-regional and filled with multi-interests, multi-agendas, and multi-causes, and which can be resolved only through a proper multi-institutional and multi-stakeholder coordination” (2004, pp. 7). Each aspect of the system has a dynamic and interdependent relationship with many other elements in which actions or processes in one part of the water system will invariably affect actors or processes in other parts the system. This has implications for governance, meaning that any attempt to govern water resources must account for the various components that make up the water resource system, and therefore requires that the various actors involved in the governance of each component cooperate and coordinate their efforts (Akpabio, 2007; Bodin & Crona, 2009; Farrelly & Brown, 2011; Pahl-Wostl, et al., 2011; Rijke, et al., 2013). This would mean including processes and actors that are not normally associated with water resource management (such as, *inter alia*, land-use management, socio-economic considerations and waste management). It then also requires that coordinated governance efforts occur at an appropriate scale so as to incorporate all of the interdependent elements of the system. Hence IWRM suggests that management efforts operate at a catchment level, or greater (Horlemann & Dombrowsky, 2011). IWRM therefore demands for major shifts and realignments of government structures and processes (*ibid.*).

As applied specifically to the actors within a system, Hooper’s (2010) definition of the overall thrust of IWRM is helpful:

“In practice, IWRM must bring together a diverse array of people who have a “stake” in a system if it is to collaboratively manage the activities and impacts... This participatory approach produces strategies that are more coordinated, more cognisant of interconnections,

and more inclusive of the diversity of goals. Furthermore, it increases support and commitment as well as the likelihood of implementation.” (Hooper, 2010, p. 15)

IWRM has become widely embraced by those involved in water resource management (Horlemann & Dombrowsky, 2011). Despite a large corpus of conceptual literature and wide acceptance, IWRM has been criticised by some for remaining a body of ideologies and “lofty phrases” that evade practical implementation (Biswas, 2004; Funke, et al., 2007; Merrey, 2008; Medema et al., 2008; Horlemann & Dombrowsky, 2011). As IWRM has evolved as a concept over time, proponents have developed their own emphases and definitions of integration and its nuanced manifestations in governance settings (Biswas, 2004; Funke, et al., 2007; Medema, et al., 2008). For example, how one author defines integration and suggests that it should be implemented in a water management setting may differ from another author.

A seven-step IWRM cycle has also been developed (van der Keur, et al., 2008) that describes the idealised implementation of IWRM without excessive prescription:

1. Establish the status of, and goals for, integrated management of water resources.
2. Build commitment to reform through raising political will and public awareness, and through multi-stakeholder dialogue.
3. Perform a gap analysis of water resource management functions.
4. Prepare an action plan.
5. Build commitment to the plan through political adoption, stakeholder acceptance and committed financing.
6. Implement the action plan.
7. Monitor and evaluate progress.

In this study, integration is not taken to mean the amalgamation of all management activities and actors into one single grand unit of management – that is neither practical nor desirable (Biswas, 2004; Medema, et al., 2008). Rather, integration describes the coordinated collaboration of the management efforts of different existing actors, taking a holistic account of the different interests, drivers and processes within a catchment. Perusal of the vast body of literature on the subject reveals that this would therefore include various forms of integration, on a horizontal and vertical scale. Many of these forms of integration overlap, as the following paragraph describes.

Integration includes managing different aspects of the extended hydro-physical system in a coordinated manner to take into account processes and drivers not normally included in water resource management, but which necessarily impact on the water resource system (e.g. integrating land-use management into water resource considerations). This management needs to occur at an appropriate spatial scale so as to include all pertinent aspects and actors in the system (typically the river basin or catchment scale). Furthermore, integrating socio-economic considerations into ecological management efforts, and vice-versa is necessary (e.g. housing and settlement or industrial and agricultural interests, which necessarily impact upon, and are themselves frequently dependent upon, water resources). Water resource systems are socio-ecological systems. This means that cognisance of socio-economic issues must be included in ecological management initiatives, as these two aspects of the greater system are intrinsically linked. The Management & Transition Framework demonstrates that both a societal and ecological sub-system exist within the water system. Ignoring the socio-economic issues and processes that drive environmental degradation, by simply focussing

on traditional technological interventions, will limit the extent to which systemic drivers of ecological harm can be addressed. The implications of this is that symptomatic water quality issues are often addressed, leaving the more deeply-rooted problems driving these issues unchanged. This will result in short-term fixes that do not effect long-term remedies to the causal and underlying problems.

In keeping with this holistic approach, integration also means coordinating the management of different water uses including supply, wastewater treatment, and river management (whereas often these are managed in silos). Linked to these ideas, is vertical coordination between water-related government institutions and agencies at local, regional and national spheres. This needs to be coupled with horizontal coordination of the efforts of different government entities within each sphere, across departmental and sectoral lines. Integration also requires an inclusive management approach that involves the participation of non-government interested and affected parties (these “stakeholders” are those responsible for affecting a resource through use or management, or those who are affected by the management of the resource). This requires managing the diverse interests, needs and activities of various stakeholders, government actors and NGOs, and other water users from different social groups and sectors. Finally, policy integration is another aspect of IWRM, which seeks alignment in water-related legislation, including those policies not directly from the water sector but that have implications for water management. Actors must be guided by agreed-upon principles, management rules and policies. The intended aim herein is to achieve greater congruence within socio-economic and environmental governance efforts, through alignment of relevant policy, and within water-related legislation itself.

In addition to this diversity of potential applications of integration, there has been little guidance on how to practically implement these ideals. Three coordination challenges are highlighted by Horlemann & Dombrowsky (2011): coordination between (1) different jurisdictions at the river basin level, (2) different water using sectors and (3) water management across different levels of administration. It is therefore necessary to establish what governance processes and structures may facilitate these kinds of coordination.

Criticism also follows that, where blueprints have been drawn up for IWRM implementation, they are inflexible and often ill-suited for the complex settings in which they are pursued (Ferguson, et al., 2013). For the purposes of this study, integration is taken to mean that management incorporates horizontal and vertical coordination and collaboration of actors across sectors, modes of governance and spatial scales towards a shared goal of sustainable resource management. However, it is acknowledged that the pursuit of the aforementioned goals will need to adapt to the context in which IWRM is applied.

The criticisms, while valid, should not completely undermine the value of the theory of IWRM. Even Merrey’s criticism of the unquestioned pursuit of IWRM acknowledges that “IWRM as a systems paradigm for understanding the problems and limitations of single-factor solutions is a critical requirement” (Merrey, 2008, p. 902). Although it has proven difficult to implement, it is unfair to label IWRM as defunct (*ibid.*). It is arguable that the inherent logic and value of IWRM remains, despite difficult implementation due to circumstances that fall outside of the scope of the framework, for example, capacity or funding problems (Medema, et al., 2008).

There is no contention around the need for some form of integration. The criticism simply affirms the need to translate this theory into meaningful principles that can be practically implemented to

improve the sustainable management of precious water resources (Funke, et al., 2007; Pahl-Wostl, et al., 2011; Patterson, et al., 2013). Nor is the argument herein a naïve assumption that IWRM is a panacea to all water management problems, and that its implementation will result in a “nirvana” of sustainable water resource management. IWRM cannot dissolve all conflicts of interest or need for compromise within resource governance networks. Nevertheless, pursuing integration as a journey, rather than a destination, is a more helpful way of embracing this philosophy (Biswas, 2004). In a similar way to which sustainability is conceptualised, IWRM is not an end-state to be achieved, but rather a continuous process of seeking to holistically integrate pertinent aspects into the management of water resources (Medema, et al., 2008). The principles of integration map out a journey towards good governance. Thus, agreeing with Merrey (2008), this research does not propose that the dogmatic pursuit of IWRM is either possible or desirable. It is true that “no particular management arrangement or approach will be complete or fully adequate over time” (Patterson, et al., 2013, p. 448). Thus there is value in pursuing integration in a transitional, adaptive, and pragmatic manner. According to Farrelly and Brown (2011) integration needs to be embraced through an adaptive and flexible approach, operating within an organisational culture that embraces experimentation and learning towards the end of adaptation. The pursuit of integration within water resource management needs to follow this transitional approach – a gradual and continuous process of structural change (*ibid.*). Rockström, et al., (2014) describe this as a deep mind shift towards a socio-ecological water paradigm through experimentation with resilience-based approaches to IWRM.

Within water resource governance there is a global move towards the pursuit of integrated forms of management. This global vision is realised where implementation and experimentation is evident at a local scale (Farrelly & Brown, 2011). The success or failure of this transformation at the local level is dependent upon the context and system within which the transformation is pursued. A governance system that is resistant to change or that has a low adaptive capacity is unlikely to succeed, resulting in system breakdown or a short-lived transformation followed by backlash (*ibid.*). However, providing that the local scale efforts are effective, they generate lessons that help to shape and establish the global movement. This research examines the BRP as an example of a local-scale experiment in pursuing integration, with the hope that lessons learned may contribute to further discussion around integrated water resource management.

ADOPTING THE MANAGEMENT & TRANSITION FRAMEWORK

Traditional urban water resource systems have been defined as “large-scale, centralised and mechanised systems operating within a management regime of expansion and efficiency, facilitated by technical, professional elites, who in turn operate in a rigid regulatory framework” (Farrelly & Brown, 2011, p. 721). While these systems have been reasonably successful historically, the emerging and complex challenges faced by these systems have rendered them largely dysfunctional (*ibid.*). Thus, new forms of governance have been pursued that are better able to manage these complex systems. Water resource governance refers to “the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society” (Rogers & Hall, 2003). The United Nations Development Programme (UNDP) offers another helpful definition: “the political, economic and social processes and institutions by which governments, civil society, and the private sector make decisions about how best to use, develop and manage water resources” (Lautze, et al., 2011). Both of these definitions emphasise equally important components of water governance, namely the *systems and structures* and the *processes* at play within a water resource system.

There is some disagreement as to whether governance should conceptually include policy formulation (which determines the systems, structures and processes), or whether governance simply refers to the systems, structure and processes in place to carry out and administrate those policy agendas. What is uncontested is that governance is influenced by a political system in which policies are formulated (Lautze, et al., 2011). The specific aim of water governance is to allocate and manage water equitably and efficiently, while ensuring environmental sustainability (Rogers & Hall, 2003). The outworking of that aim is guided by politically engineered policy and implemented by governance structures and institutions. This research focuses on the structures and processes of governance systems, with a cognisance of the political and legislative that informs them.

A working framework is required to identify the various elements that make up a water governance system, and the interactions and processes that exist between those components, in order to undertake a successful analysis of a water governance initiative (Ferguson, et al., 2013). The framework needs to provide a description and explanation of the system for analysis (*ibid.*). Water systems, and specifically those that occur in urban settings, consist of many components. These may include ecological elements (e.g. rivers, wetlands, estuaries), social structures (e.g. institutions, knowledge, values), and technological infrastructure (e.g. conduits, dams, water treatment works) (*ibid.*) Ferguson, *et al.*, (2013) states that it may also be helpful to conceptualise water resource systems as comprising structures, processes, actors, and context. Structures may be social or biophysical, including the ones listed above. Processes may also be social or biophysical. Actors (either individuals or organisations) influence structures by driving or influencing processes. In turn, their actions are shaped by their context (e.g. the political or social institutional environment). Simply stated like this, it is a rather unwieldy explanation. Therefore a conceptual framework is needed to incorporate these ideas into a helpful and manageable flow of structures and processes.

One attempt at producing a framework for the analysis of water governance is the Management and Transition Framework (MTF) developed by Pahl-Wostl *et al* (2009-2012). The MTF is a systems-based framework that attempts to represent the complex components and processes within a water management system, with an emphasis on the dynamics of water resource management and transitions toward new governance regimes (Binder, et al., 2013). The MTF seeks to enable a structured and systematic analysis of the various elements of the governance system, as well as the processes and interactions therein. The framework embraces the complexity of interactions that characterise governance regimes, but enables them to be simplified enough for analysis (Pahl-Wostl, et al., 2010). The use of a framework assumes that all water resource systems are made up of the same basic structure, although the make-up and complexities within may vary infinitely (Pahl-Wostl, et al., 2008; Pahl-Wostl, et al., 2010). Consistency in analysis across case studies is one major benefit that the framework provides as it proffers a set of variables that can be applied in a variety of contexts. The framework is specifically designed so as to allow the researcher to apply it at a scale and level of detail that suits the specific study in question (Binder, et al., 2013).

Ferguson, et al., (2013) compare five analytic frameworks that are specifically tailored to resource management systems. From their work, the MTF stands out as the most appropriate framework for this kind of research. The purpose of the framework is to allow for the analysis of a governance regime by focussing on the relationships and processes that exist between the various elements that make up water resource and management systems. With this in mind, the MTF is a well-suited framework with which to assess the structures, processes and experiences of the Berg River Partnership. In addition, the MTF is one of few frameworks that explicitly address the reciprocity between social and

ecological aspects of the system. The MTF does this by acknowledging that both the ecological and socioeconomic aspects exist within the same larger water system, and thus changes or actions in one aspect will affect the other (Binder, et al., 2013).

Within the societal system, the MTF uses a conceptual unit of analysis known as an 'action situation'. The framework identifies what structures and processes are contained within an action situation, and how these components interact to produce outcomes in the system (see Figure 1). An action situation is a conceptual space within which actors work within the bounds of socio-political institutions, and according to the knowledge available to them, to produce operational outcomes. These outcomes in turn feedback into the water system.

The processes and interactions in those action situations can be mapped, reflecting real-world governance interactions, and these in turn can be assessed by the researcher. The governance system will comprise a number of different action situations, each focussing on a specific management issue, and each comprising of the relevant network actors, institutions and knowledge.

The concept of an action situation is used because identifying an appropriate level of analysis in a governance system has traditionally been a challenge. This is because a single analysis of a complete system becomes too unwieldy and complex for research unless a suitable sub-unit of analysis is identified. Thus, it is necessary to focus on some sub-unit of evaluation within the complex whole. Ostrom (2011) agrees with Koestler (1973) in suggesting that a term called a "holon" best describes a legitimate stable sub-whole of a governance system. The complex, hierarchically-organised nested system can be "dissected" into these subunits (termed "action situations" in the MTF) for analysis (Ostrom, 2005, p. 11). According to the literature on the MTF, an action situation is defined as "an analytic concept that enables an analyst to isolate the immediate structure affecting a process of interest to the analyst for the purpose of explaining regularities in human actions and results, and potentially to reform them" (Ostrom, 2011, p. 11). Ostrom (2011, p. 34) states that "the working parts of an action situation are both necessary and sufficient to describe the structure of an action situation". These working parts, and the ways in which they interact, are described below.

Various classes of governance components exist within an action situation. Figure 1 below identifies these classes and the nature of the connections between them. These classes include actors, institutions, and knowledge. In theory, the individual elements that exist within each of these classes interact and influence one another within the action situation, which in turn results in operational outcomes that feedback into the system.

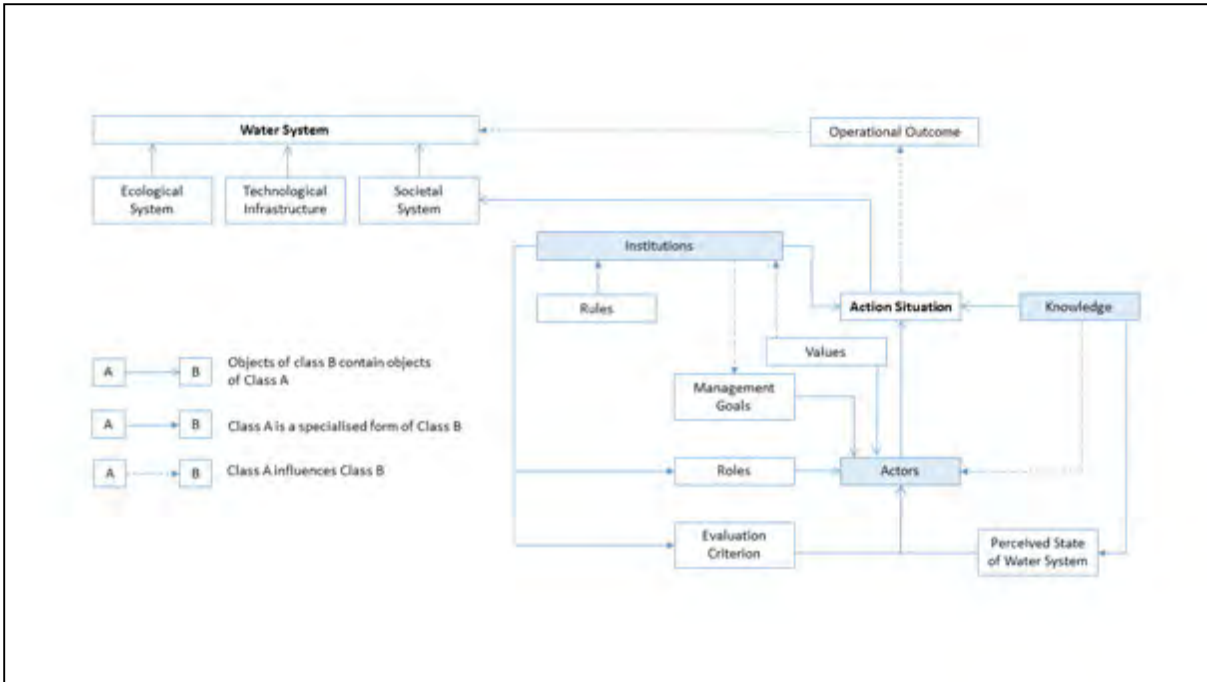


Fig. 1 A simplified water management systems framework, adapted from the Management and Transition Framework (Pahl-Wostl et al, 2009-2012)

An action situation contains a number of actors. Depending on the detail of analysis, actors may include, *inter alia*, government departments, water users, cooperatives and NGOs, academic organisations, economic sectors or specific industries, community groups and political agents (Pahl-Wostl, 2009). These actors bring various resources to that action situation, act according to institutionally-defined roles, and are driven by various management goals (Pahl-Wostl, et al., 2008). Their actions are governed by the institutional arrangements present within the action situation. These institutional arrangements function as rules and define actor’s jurisdictions, their position within the governance network, the scope of their agency, the knowledge available to them, and the potential choices that they may make (Möllenkamp, et al., 2008). The institutional arrangements are in turn influenced by the values held by each actor as they generate these institutions, and values continually shape the actions of each actor within the action situation (Pahl-Wostl, 2009).

Institutions are defined as “prescriptions that humans use to organise all forms of repetitive and structured interactions” (Ostrom, 2005, p. 3). Thus institutions represent the formal and informal arrangements that govern processes within the action situation, including the rules that determine the ways that actors behave. They may also include organisational or network structures that determine the partnerships that exist between actors within an action situation.

The processes and interactions within an action situation result in “operational outcomes”, which then determine the state of the water system. As actors operate within the water system, governed and influenced by the various factors in the action situations, their actions will produce outcomes within the system. These are referred to as operational outcome. They reflect the changes that these actors cause in the system through their operations and management efforts.

Each actor has a defined role within the action situation and will also work towards a specified management goal. Actors also employ their own set of evaluation criteria that dictate how they perceive and frame knowledge such as the state of the water system and the success of management

actions. In addition to their evaluation criteria, actors act according to the knowledge available to them. This knowledge may be comprised of, *inter alia*, knowledge of the state of the water system, an awareness of the drivers that impact the water system, a knowledge of other actors and their actions, and how these interplay.

INTEGRATION IN PRACTICE

APPLYING THE PRINCIPLES OF INTEGRATION TO THE MTF

It is argued that by using the MTF, it is possible to interpret how the principles of IWRM are evident in a governance regime that facilitates and brings attention to integrated management. The principles of integration can be applied to the various classes of the MTF (actors, institutions and knowledge) to suggest ways in which a governance initiative may operate in an integrated manner.

Institutions include the formal and informal rules that determine how governance regimes operate. They dictate the form and function of governance networks and inform the roles and agency of actors within these networks, and how these actors interact through formalised relationships (governance structures). Examples of institutions include legislation, policies, plans, memorandums of understanding, and strategy documents. They may also include arrangements such as multi-actor platforms and bridging organisations, and less tangible informal agreements and arrangements between actors (Pahl-Wostl C., 2009; Patterson, et al., 2013). Institutional arrangements within a water governance regime are a determining factor in the pursuit of integration. The inference from IWRM principles is that institutions must facilitate, enable, encourage or enforce the cross-sectoral coordination and cooperation (i.e. the integration) of management efforts between the diverse arrays of actors within a water system at an appropriate scale. The scale at which this takes place is important so that all of the relevant components of the system (those which influence or are influenced by the system) are incorporated. As shown by the MTF, these institutions will affect the management goals, roles and evaluation criteria of each actor. Each of these will in turn affect the degree to which integration can be embraced (as divergent goals, conflicting roles and incompatible evaluation criteria will hamper attempts at integration). The institutional environment is also the way that knowledge is created and disseminated within a governance network, which also influences integration. Working together with shared knowledge has the potential to facilitate coordinated efforts, while working in silos of self-generated knowledge will likely lead to dissonance between actors.

The institutional environment of water resource management is therefore significant. The complex systemic nature of water resources necessitates that these institutional arrangements foster collaboration and cooperation between actors, both vertically and horizontally (Bellamy, et al., 2002; Moss, 2004; Thompson H., 2006; Saravanan, 2008; Fish, et al., 2010; Loorbach, 2010; Patterson, et al., 2013). According to Moss, “implementing IWRM into an environment in which there are conflicting structures and institutional arrangements will hamper or delay implementation” (2004, p. 91). Thompson states that, “the organisational framework is one of the most important aspects of water management, because it determines the effectiveness of policy implementation” (2006, p. 215). However, water governance systems are often marked by fragmentation and poor coordination. Government departments and branches tend to operate in sectoral silos. Coordination between state and non-state actors is frequently ineffective and public participation is often poor. Coordination and support between different tiers of government is also limited (Moss, 2004; Kidd & Shaw, 2007; Schmid & Morrison, 2012). A study by Chereni (2007) who investigated the implementation of IWRM in Zimbabwe revealed the following:

“Far from fostering integration, institutions involved in water resources management are multiple, disparate and discordant. In practice, associational relationships – specifications of mandate based roles, lines and direction of accountability and evaluation criteria – of institutions intended to foster sectoral integration in natural resources management are not defined. These poorly defined associational relationships coupled with a dearth of a catchment management and development outline plan have translated into a lack of compulsion of duty among institutions... institutions, it has been shown, lack harmonious associational relationships necessary for practical implementation of IWRM.” (Chereni, 2007, pp. 1246, 1254)

The pursuit of integration will require a degree of institutional reform or transition is often required to remedy fragmentation in management (Hooper, 2010; Loorbach, 2010). The institutional reform needed may be a “turbulent and arduous process”, but the benefits that can be reaped in the long term are certainly worth the effort (Metcalf, et al., 2013, p. 2).

Thus, for integration to be implemented effectively, the institutions present within a governance regime must display evidence of enabling and encouraging integration between all stakeholders, at appropriate scales, between sectors, and across horizontal silos and vertical tiers of government. Consequently institutional environment of a water governance regime needs to be a focus for assessment.

INSTITUTIONAL AND *DE FACTO* INTEGRATION

The institutional arrangements, although important, are in themselves insufficient to ensure integration and their presence therefore does not necessarily serve as a reliable indicator for actual integrated management. Institutional integration demonstrates the pursuit of integration ‘on paper’. It shows evidence of an intentional attempt to facilitate integration through the creation of an enabling institutional environment. While institutional reform is important for implementing IWRM it does not demonstrate whether or not integrated management is occurring in practice.

There are a number of evidences of *de facto* (or, in-practice) integration that must also be investigated (Gallego-Ayala & Juárez, 2012). These are indicators that show that a governance regime has actually implemented a working integrated management approach, as demonstrated by how the governance regime operates and functions in reality. Thus, methodologies used in an investigation require not only an analysis of governance institutions (what appears on paper) but also an investigation of the *de facto* integration present in the governance regime (what happens in practice). Methodologies such as field observation, surveys, and interviews can be employed to assess the extent to which actors are coordinating their efforts in practice within a governance regime, and the degree to which a shared knowledge-base is being built to facilitate this integration.

INDICATORS OF INTEGRATION

Using the MTF as a framework for analysis, a review the literature suggests the following indicators of integration, many of which are co-dependent and thus overlap. The action situation is used as the unit of analysis and the concept of integration is applied to the various elements of the MTF that make up an action situation. These indicators assess institutional arrangements, governance structures, practices and processes.

With respect to **actors**, IWRM requires management scenarios that demonstrate:

- The inclusion of the different actors responsible for managing or influencing all aspects of the ecological and hydrological systems (especially those aspects normally excluded from water resource management but which impact on the water resource).
- The inclusion of actors from across the breadth of the entire catchment, so as to include all relevant processes (geographic integration).
- The inclusion of actors that represent socio-economic sectors and interests, where these sectors impact upon the water system, or are dependent upon the resource.
- The inclusion of actors that represent the different water uses (water allocation, abstraction, river management, wastewater treatment, etc.).
- The intentional inclusion of non-government actors in the governance network.

With respect to ***structures and institutions***, IWRM requires management scenarios that demonstrate:

- Institutional environments that facilitate integration through (i) policy alignment and (ii) the establishment of governance structures that promote integration.
- Action situations that make use of bridging organisations and multi-actor platforms to facilitate coordination and alignment, cooperation, the development of shared management goals and evaluation criteria, and the co-generation and sharing of knowledge.
- Mechanisms of accountability, monitoring and evaluation across the catchment, such that stakeholders can monitor and hold to account other actors within the catchment.

With respect to ***governance processes and practices***, IWRM requires management scenarios that demonstrate:

- Action situations that show horizontal cooperation between different government sectors, agencies or departments.
- Action situations in which there is vertical cooperation between different spheres of government.
- Action situations in which non-governmental stakeholders are meaningfully included in the governance process (such that they can meaningfully influence management decisions and practices).
- Action situations in which the various actors create and work towards united management goals.
- Action situations that demonstrate the co-generation and sharing of knowledge across the catchment, that ensures that all actors operate using the same information.
- Action situations where actors employ the same evaluation criteria to ensure that knowledge is interpreted and evaluated with the same measures.
- Clearly defined and complementary roles for actors within action situations that avoids unnecessary conflict or duplication of effort.
- Cost-sharing between actors within action situations, avoiding free-riders and to increase actor buy-in and ownership.

This is an extensive set of indicators that are suggestive of the various forms and means of integration endorsed in IWRM theory, both institutionally and in practice. The indicators are broadly conceptualised to allow for these forms of integration to be implemented in a suitable manner,

according to the specific context the case study (they are not excessively prescriptive or detailed regarding the manner in which they are to be implemented).

This set of indicators forms a normative framework with which a case study can be assessed. Thus, the list of indicators above is central to this study of the Berg River Catchment. It is this list that informs the analysis of the BRP documentation, shaped the interview process, and informs the discussions in chapters 5 and 6. This study therefore focuses on assessing the composition of the BRP (with respect to its membership), the practices and processes of the BRP, and the structures and institutions that influence the Partnership.

This chapter has reviewed the voluminous literature on IWRM, unpacking its origins as a body of discourse, acknowledging its criticisms and shortcomings, while affirming the valuable logic of integrated water resource management. The chapter demonstrates the vast potential application of the theory of integration in water resource management and its implications. It shows that although integrated management is necessary, the disparate understandings of integration and how it may apply to water resource management, have made it difficult to implement. The chapter then introduces the MTF as a conceptual framework to which IWRM may be applied, to give structure to the theoretical application of integration to a water resource system. This allows for a set of indicators of the principles of integration to be developed, by which integration can both be implemented and measured in practice. This is a significant step forward in the theoretical work on IWRM and it is upon this foundation that the rest of the research is built. The next chapters introduce both the Berg River Catchment and the Berg River Partnership, outline the research methods employed, and then present the findings of the research and a detailed discussion of how the Berg River Partnership serves to illustrate some of these indicators of integration in its structures and processes. The concluding chapters discuss the implications of this study for IWRM implementation elsewhere, and also suggest further avenues of research.

CHAPTER 3: AREA OF STUDY

THE BERG RIVER CATCHMENT

The Berg River catchment is an area of approximately 8 980 km² and is located in the Western Cape, South Africa (DWAF, 2007). The Berg River is approximately 285km in length and rises in the Franschhoek and Drakenstein mountains, flowing in a north-westerly direction to discharge into St Helena Bay on the west coast (DWAF, 2007). A number of towns and settlements appear along the course of the Berg River (Figure 1). It has nine major and seven minor tributaries, six of which are naturally perennial (River Health Programme, 2004). Four major dams have been built in the catchment (the Berg River Dam, the Wemmershoek Dam, the Misverstand Dam, and the Voëlvelei Dam) and smaller farm dams are found in the eastern area of the catchment (DWAF, 2007).

The catchment covers a large area and includes a wide variety of ecoregions based on different topographical, geological and biological characteristics (Figure 2). The catchment also includes a wide spectrum of land uses, ranging from residential to industrial, informal settlements, and various types of agricultural activity. This all presents unique challenges to water resource management. Differing water uses and drivers of pollution need to be managed within the system, including diffuse sources of pollution. The catchment contains a diversity of actors with divergent needs and interests – but who are all inextricably linked by their common use of, and impact on, the water resource. The diversity within the system reiterates the need for IWRM, but also suggests that implementing IWRM is likely to be a challenge. The catchment is also under the jurisdiction of five different local municipalities (Figure 3). This requires cross-sectoral integration between different government and non-government actors in the catchment, between departmental silos within government, coordination between the municipalities themselves, and vertical cooperation between municipalities, and provincial and national spheres of government. This integration also needs to occur spatially across a large catchment and incorporate all aspects of the physical hydrological system.

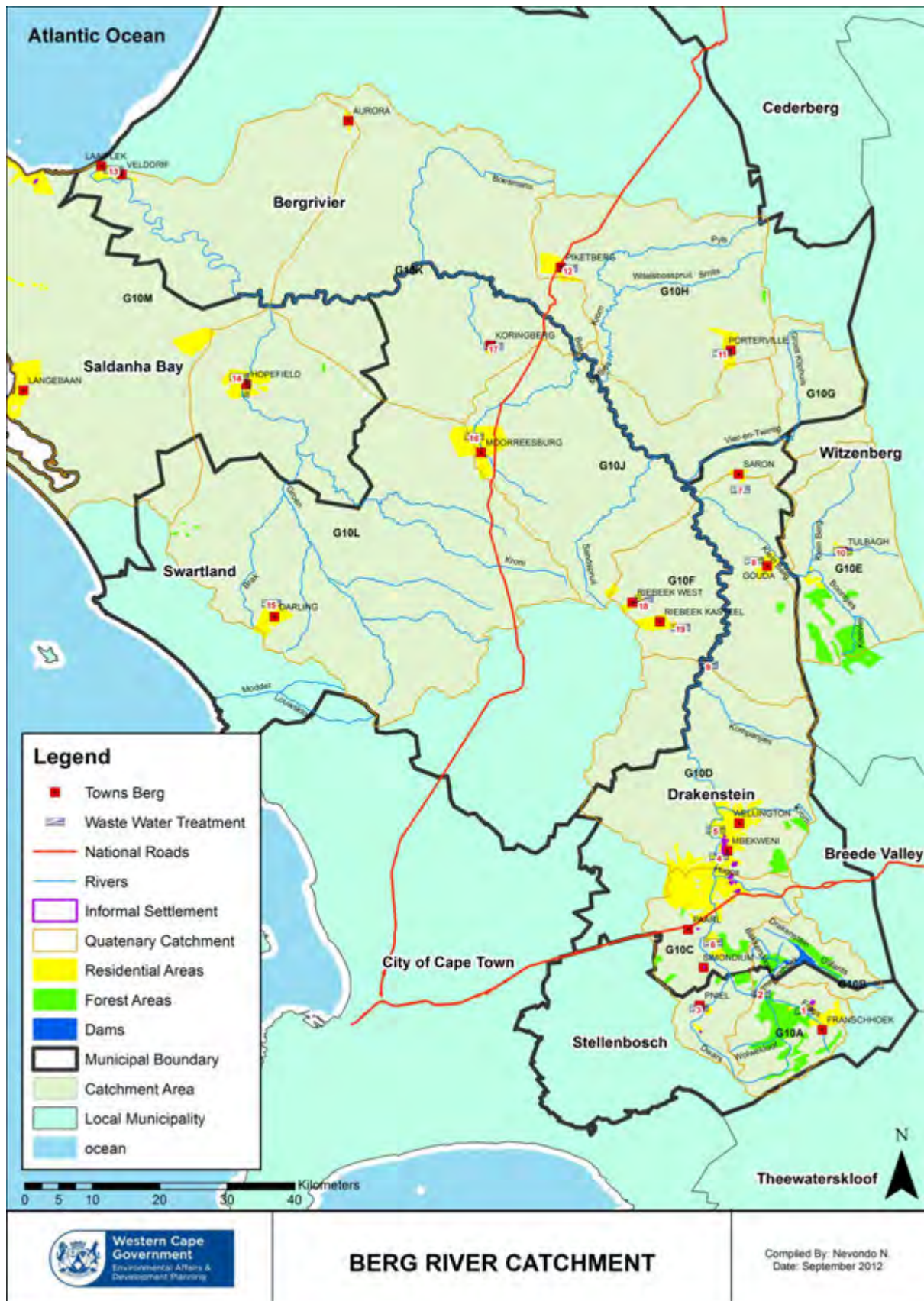


Figure 1. The Berg River catchment area, in the Western Cape, South Africa (Department of Environmental Planning and Development, 2012)

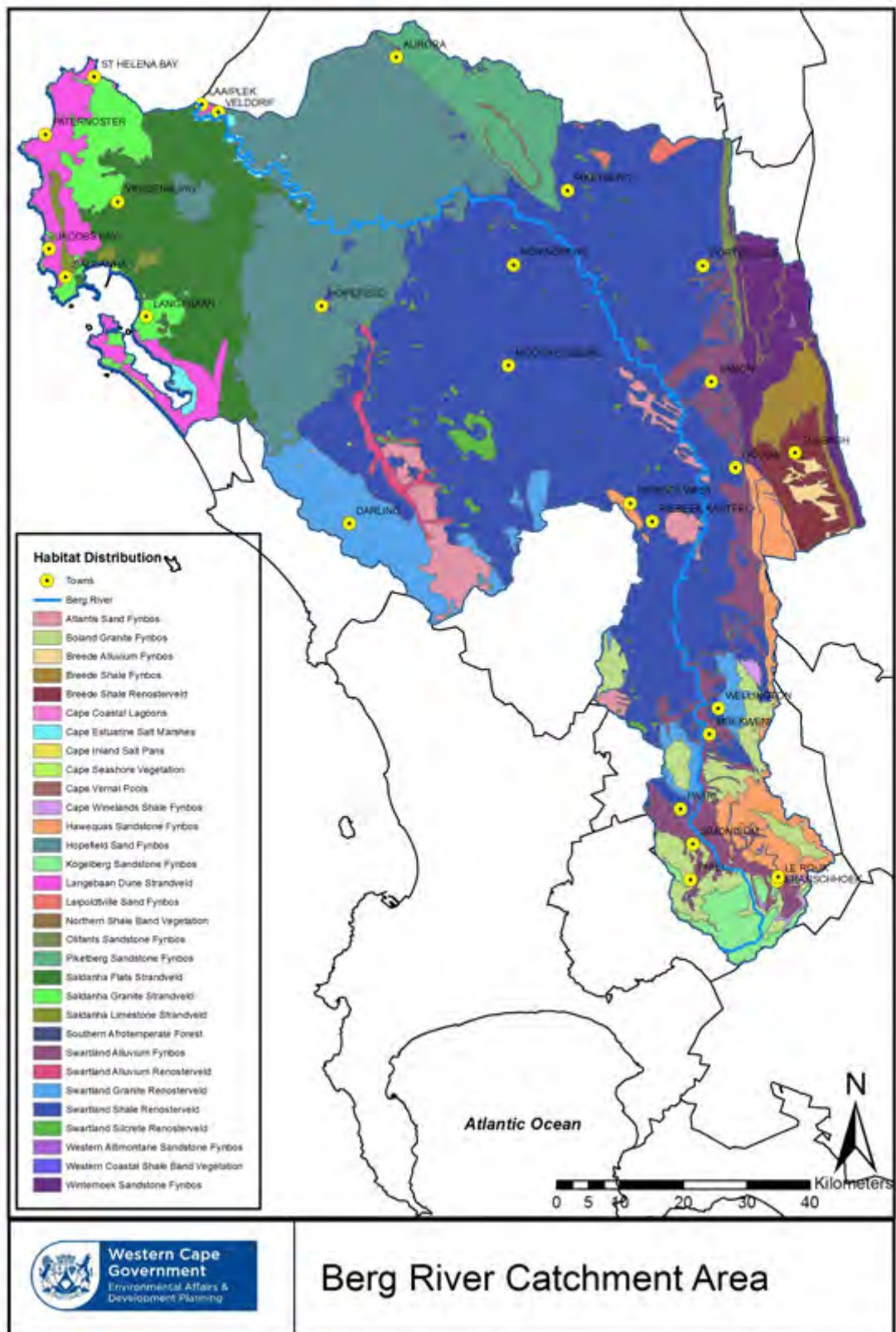


Figure 2. Ecoregions in the Berg River Catchment (Department of Environmental Planning and Development)

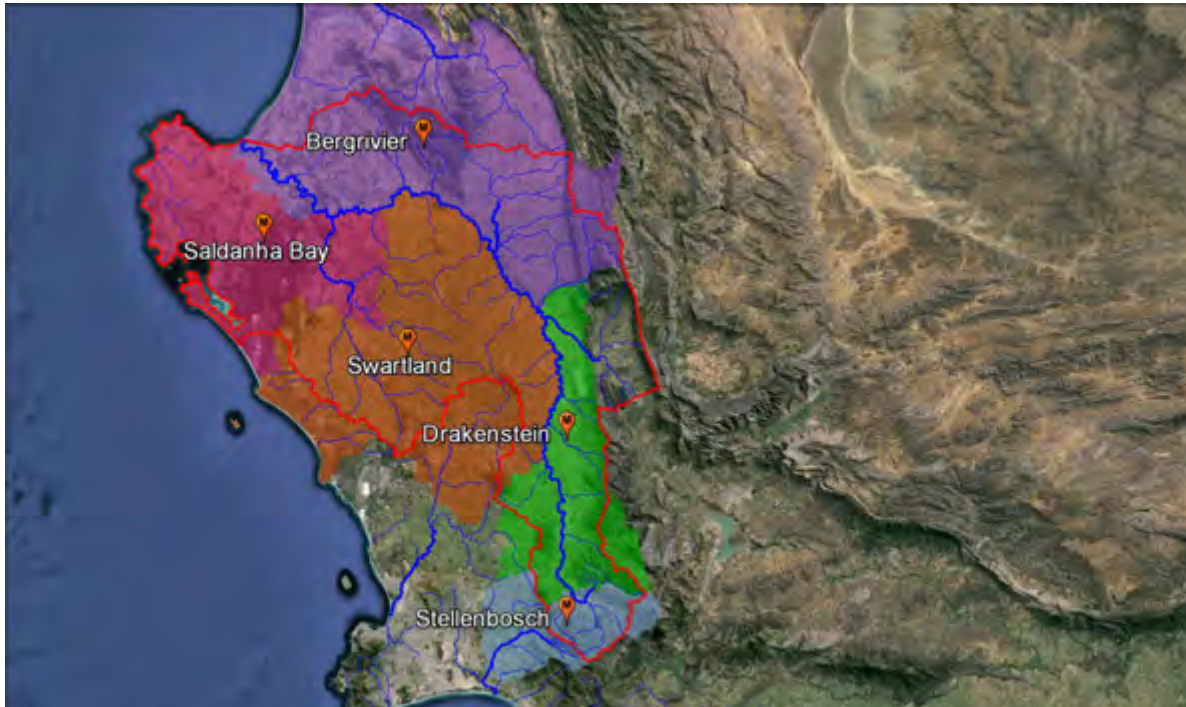


Figure 3. Berg River catchment (outlined in red) and the various local authorities involved in its management (Department of Water & Sanitation, 2014; Google Earth, 2014)

Poor water quality in the Berg River has negative impacts on the agricultural sector where water quality standards do not meet those of potential export markets, with substantial risk to the economic productivity of the sector (DEADP, 2011). It also presents challenges to communities along the Berg River who are reliant on this water resource for domestic and recreational purposes. Therefore carefully managing the various drivers of pollution through integrated management is essential for the socio-economic and ecological well-being of the region.

Most of the original vegetation has been replaced by agricultural and urban development in the catchment (River Health Programme, 2004). Viticulture and deciduous fruits grown in the area form the backbone of the economy in the catchment, along with dryland wheat farming and sheep farming (*ibid.*). Commercial pine forests can be found in the Franschhoek area in the upper reaches of the catchment. Wineries, canneries and other food processing plants form the major industrial activities in the catchment (*ibid.*). Wineland tourism provides another major source of income for the catchment, while recreational industries dominate the estuary. The estuary also contains some commercial fisheries and a medium-sized salt-works. Approximately 420 000 people are recorded to be resident within the catchment, according to a 2004 survey. Almost 80% of the population live in urban areas (*ibid.*). This places intense urban and industrial pressures on the ecology of the catchment.

The river system has been traditionally categorised into four major sections: the Upper Berg, Upper-Middle Berg, Lower-Middle Berg, and Lower Berg River.

The Upper Berg River remains in the best ecological condition, however the water quality and habitat integrity deteriorate downstream due to alien vegetation, the aforementioned inter-basin transfer,

and river modification (River Health Programme, 2004; DEADP, 2011). Municipal and wine farm effluent from Franschhoek affect water quality and flows are negatively affected by the Wemmershoek Dam (River Health Programme, 2004; DWAF, 2007).

In the Upper-Middle Berg River urban and agricultural development present the largest problems. River modification, abstraction and polluted runoff are the main drivers of ecological degradation (River Health Programme, 2004). Agricultural runoff has resulted in increased salinity levels in some stretches of this section of the river (DEADP, 2011). Alien vegetation also remains problematic in this region (River Health Programme, 2004).

In the Lower-Middle stretch of the Berg River weirs constructed in tributaries have affected natural flow regimes. Alien fish are prevalent in this region, and agricultural activities further impact on the quality of the water.

The Lower Berg River is mainly affected by agricultural processes, alien fauna and flora, and compromised releases from the Misverstand Dam (River Health Programme, 2004). Runoff from informal settlements presents a further diffuse source of pollution for the catchment, especially in the Middle-to-Lower reaches (DEADP, 2011). Salinity and nutrient enrichments are noted as the major concerns for the river system (*ibid.*).

THE BERG RIVER PARTNERSHIP

Migration into urban areas, population increase, as well as economic and industrial growth in the Western Cape has put enormous pressure on natural water resources, both in terms of demand and pollution. Government departments and local municipalities have historically struggled to deal with these mounting problems (Barnes, 09 November 2015). The availability and quality of water became a pressing issue that could no longer be ignored by government in South Africa.

South Africa recognises IWRM as a key part of national policy and as a fundamental strategy to overcome the difficulties stated above. However its effective implementation remains to be demonstrated (Funke, et al., 2007, p. 1237). These authors claim that while “national policies and statements of intent sound promising on paper, there is little evidence to indicate that IWRM is being implemented effectively in practice” (*ibid.*). A range of institutional challenges persist within the country that hamper the implementation of IWRM. These challenges largely exist around fragmented and misaligned policies and government operations (*ibid.*). The South Africa context is also one in which governance is crippled by restricted financial and human resource capacity, and where socio-economic inequalities add increasing pressure to the demands on governance.

National water management strategy also closely revolves around catchment delimitations, the thrust of which is to establish management agencies in each catchment to oversee and implement the management of that river basin. These Catchment Management Agencies (CMAs) are currently being formed and operationalised within South Africa (Enright, 15 September 2015; Lintaar-Strauss, 27 October 2015).

The Berg-Olifants River CMA (the CMA that is to incorporate the Berg River Catchment) is not yet operational, and in the interim the Berg River Partnership has been formed in an effort to bring about integration within the Berg River Catchment. Initially formulated as the Berg River Improvement Plan (BRIP) – a strategic plan produced by the Department of Water Affairs and later driven by the provincial Department of Environment and Development Planning (DEADP) – this initiative evolved

into a cooperative network that included some non-government actors. This network (initially called the Berg River Water Quality Task Team) was then renamed as the Berg River Partnership, to better reflect the more inclusive and holistic nature of the initiative. The formation, composition and operation of the Berg River Partnership are described in more detail in Chapter 5.

This chapter has described the Berg River catchment and introduced the Berg River Partnership as an interesting example of an integrated management initiative. The Berg River catchment is a large complex socio-ecological system, with diversity in ecology, geography and regarding the political and socio-economic aspects of the system. It is also a crucially important system from an economic point of view, with the economics and the ecological health of the system closely linked. The chapter demonstrates how, considering the aforementioned, the Berg River catchment provides both a challenge and opportunity for integrated water resource management. The Berg River Partnership is thus well placed to address this challenge and as such provides an interesting opportunity to investigate IWRM in practice. The next chapter outlines the research methods used to investigate the BRP to this end.

CHAPTER 4: RESEARCH METHODS

This study assesses how the Berg River Partnership is an example of applied integration in a management initiative, and what governance processes and structures contribute toward integration. Where integrated management approaches have largely been flawed and criticised, as discussed above, the BRP may proffer lessons about fostering integrated management. Due to the transitional nature of the BRP – one where the actors themselves are learning and adapting as they go – it needs to be examined as a process. The dynamic nature of this study makes it suitable for a form of action research that makes use of participants' reflections on a particular issue to form accounts and explanations of their situation and potentially to move towards developing plans that address the issues examined (Berg, 2001). The participants of this study reflect on their past and current experiences as members of the BRP. This was facilitated through a period of observation, literature review, and lastly, a set of interviews. The action research procedure involves first gathering information relating to the research question, analysing and interpreting that information, and then sharing the results with participants and creating opportunities for reflection and feedback (Berg, 2001). Action research also benefits from a triangulation approach, where multiple methods are used to collect and assess data with the intention of detecting and confirming trends through different sources. This cross-validation of results ensures that the findings are accurate (the results are more likely to be accurate when multiple sources of data affirm the same findings).

An initial research phase was undertaken where Berg River Partnership meetings were attended for observation purposes. Meeting agendas and minutes were collected and assessed during this phase. This phase of the research was crucial in developing an understanding of the workings and operations of the Berg River Partnership. A review and analysis secondary data such as BRP reports and meeting minutes was also conducted, and followed by semi-structured interview questionnaires with actors. During these interviews actors were asked about their experiences and activities within the Berg River Partnership and initial research findings from the observation and review of BRP documents were shared with the actors for reflection and comment.

The Management and Transition Framework (MTF) suggests that the institutional arrangements in an action situation are a determining factor in terms of the operational outcomes of that action situation. The MTF indicates that the institutional arrangements will influence the roles, evaluation criteria and the management goals of actors. These in turn will impact on how effectively integrated management may be implemented. The activities of the Partnership, and the activities of its constituent members, are shaped by this legislative environment. Therefore, the legislative context in which the BRP operates is an important aspect of this broader institutional environment. A review of the legislative framework of the BRP was undertaken to assess the extent to which integration is facilitated at the level of law and policy that influence the BRP and its constituent members. This aspect of the study provides commentary on whether or not the legislative environment of the BRP is one that facilitates the implementation of IWRM, or whether it may hinder the pursuit of integrated management.

The actors within the BRP, and their interactions with one another, are also influenced by the internal institutional arrangements that Partnership itself constructs. Therefore a review of the BRP terms of reference, project reports, agendas, meeting minutes, action plans, and similar documents was conducted (Knieper, et al., 2010; Knüppe & Pahl-Wostl, 2012). This review attempts to elicit the management goals, roles, knowledge building and sharing capacities, and evaluation criteria created by the Partnership as recorded in these documents. The findings of this review were presented to actors in the interviews for their comment. The actors either confirmed these findings or clarified any misinterpreted analysis.

As shown by the MTF, the actors within an action situation are logically the primary agents of action. IWRM suggests that, in order for integration to be effective, there needs to be an intentional representation of different sectors, interests and aspects of the hydrological system through the actors involved in the governance network. The composition of the Partnership was investigated through the review of the BRP action plan, meeting minutes and agendas. This revealed which sectors, interests and geographic areas are represented by the different actors in the BRP. It also revealed which actors were active or worked together in the various management interventions, and how these actors engaged with the Partnership as a whole. This gave insight into whether or not the relevant aspects of the hydrological system, socioeconomic interests, water uses and non-government actors were fairly represented in the Partnership through its membership. It also demonstrated the nature of the relationships between the actors, showing what kinds of coordination and cooperation were occurring between different actors.

The interviews built upon this assessment of BRP documents by confirming or correcting the initial findings. The interviews also elicited further data regarding the operation of the Partnership and the kinds of integration present. The script that was used to structure the interviews was developed according to the MTF and the set of indicators promulgated in the previous chapter. Each question related to the different elements of the MTF and interrogated the forms of integration potentially relevant to each.

In the interviews actors were asked to describe their activities within the catchment, to identify the other actors with whom they cooperate, and to denote the nature of this relationship (for example, if it is based on collaboration, cost-sharing, or knowledge-building). This made use of reciprocated identification: unless both actors acknowledge the relationship it is not included in the results. The aim of using this kind of social network analysis as a tool for governance analysis is to probe beyond the institutional arrangements set out in policy documents and legislation and identify the interactions between actors in the network that occur in reality (Stein, et al., 2011). This methodology builds a picture of the various action situations present within the BRP and is an approach adopted from the work by Knüppe & Pahl-Wostl (2012). The interviews establish the actual links between the various actors in the BRP and give an indication of cooperation and collaboration between different actors.

The MTF suggests that actors within an action situation act according to their own held values, perceptions, management goals and evaluation criteria. The governance environment in which these actors operate influence these values, perceptions and goals. It is suggested that for integration to be effectively implemented, that the governance structures and processes in place should facilitate the creation of shared perceptions, goals, values and evaluation criteria. Interviews were used to confirm the values, perceptions, management goals and evaluation criteria held by each actor in the Partnership. The degree to which the BRP had facilitated the creation of shared values, perceptions, goals and evaluation criteria is assessed, depending on the congruency of these variables between actors. It is assumed that if actors express very different perceptions or values that the BRP has not been effective in bringing about the shared values and goals necessary for integrated management. Similarly, interviews also confirm the degree of consensus regarding the perceived state of the water system, and the threats that are identified by each actor.

Finally, the interviews were used to examine the ways in which knowledge is gathered and shared within the BRP. The MTF notes that knowledge is an important aspect of an action situation because actors base their actions and decisions on the knowledge they have. IWRM suggests that when actors co-generate and share knowledge it becomes more likely that those actors will cooperate within the governance network.

These questionnaires were conducted personally with actors in the Partnership, with the researcher leading the process in a semi-structured interview. The real-time flexibility afforded by this method helps to clarify and confirm data as it is collected. Literature on governance assessment suggests that interviews are an effective way to collect data for this type of investigation (Moss, 2004; Chereni, 2007; Möllenkamp, et al., 2008; Saravanan, 2008; Knieper, et al., 2010; Pahl-Wostl, et al., 2010; Farrelly & Brown, 2011; Schmid & Morrison, 2012; Larson, et al., 2013; Rijke, et al., 2013). The list of interviewed actors is included in a table at the end of this chapter.

As with all research, there were a number of limitations to this study. The availability of members of the BRP for interviews was one area of difficulty. Actors were either unavailable for interviews due to time constraints or simply did not respond to requests for interviews. Some actors were reluctant to be interviewed and expressed concerns that if they were openly critical of the work of the Berg River Partnership that it might upset some of the sensitive political relationships within the Partnership. The resulting small sample size of the interviewed actors does represent a limitation. Due to the subjective nature of interviews, and indeed the politically sensitive nature of this research, a large sample size is desired to provide unbiased and well-represented opinions experiences. Notwithstanding this limitation, the sample does represent a diversity of actors by sector, with no substantial bias towards a particular interest group. In addition, the actors interviewed are considered by the researcher as key role-players within the Berg River Partnership based on observation in BRP meetings. It is also acknowledged that this research represents a short two-year snapshot of the lifespan of the BRP. The history and establishment of the BRP was scantily recorded in documentation and may not have been fully recalled in interviews. Various actors move in and out of the partnership quite fluidly, according to the various projects and interventions being pursued. Therefore it is challenging to collate and capture the entire spectrum of activities and interactions within the partnership in a short time. Furthermore, the success of the BRP, as an example of IWRM in practice, remains to be seen. Thus no firm conclusions can be made regarding the success or effectiveness of the governance structures and processes that are found to contribute to integration in this study. It can only be concluded that these structures and processes contribute to apparent integration within the BRP, and are likely to facilitate effective integration if pursued in other contexts. Finally, in instances where evidence of integration may appear lacking it is acknowledged that this may not necessarily be due to a lack of integration. Rather, it may be the case that the methods used in this research did not reveal this integration.

Notwithstanding these limitations, this research is one of the first South African studies to apply a theoretical framework to identify the relationships, processes and structures of a functioning case of IWRM. The review and analysis of BRP documents (including reports and meeting minutes) and interviews provide insight into the governance structures and processes present in the case study and enable assessment of the degree to which these facilitate integrated resource management in the present case. The MTF provides a framework with which to collect and investigate this data. Governance arrangements are often complex and difficult to analyse. The MTF provides a conceptualisation of the governance regime that makes it manageable for the researcher to assess, while remaining comprehensive enough to capture full extent of the different aspects and relationships within the system. The results reveal which forms of governance structures and processes within the BRP have contributed to integrated management, and which aspects of governance might be lacking or perhaps have hindered integration in the Partnership.

Table 1. Interviewed actors

Name	Organisation Represented	Date of Interview
Dr Jo Barnes	Berg River Main Irrigation Board	09-11-2015
Jessica Charmier	Council for Scientific and Industrial Research	11-09-2015
Willie Enright	Berg River Main Irrigation Board	15-09-2015
Garnet Titus	West Coast District Municipality	16-09-2015
Francis Steyn	Department of Agriculture	28-09-2015
Jason Mingo	Dept. Environmental Affairs & Development Planning	08-10-2015
Melissa Lintaar-Strauss	Department of Water Affairs	27-10-2015
Jean Jeffery	Private Landowners Association	29-10-2015

CHAPTER 5: RESULTS

LEGAL & INSTITUTIONAL ENVIRONMENT

The Management and Transition Framework (MTF) recognises that actors within a given governance regime are all influenced by the various formal and informal institutions currently in effect in that action situation. Institutions can be likened to rules that define an actor's jurisdiction, their position within the governance network, the scope of their agency, the knowledge available to them, and the potential choices available to them in decision-making. Institutions also shape the management goals of actors, ascribe them certain roles within a governance network, and set out the evaluation criteria that each actor will use when making decisions. Thus the institutional environment is a critical factor in determining whether or not integration may be successfully pursued or implemented as it determines how that actor may interact with other actors in an action situation.

In this case study, institutions comprise the prescriptive policy and legislation that govern the govern the roles, activities and interactions of the various actors within the BRP, and determine the environment the space in which the BRP exists and operates legislatively. These are institutions that may be considered as external to the BRP.

The Berg River Partnership is itself a type of institution, and has its own internal institutional environment in which actors operate. It is a formalised structure that facilitates and influences the interactions of different actors within the catchment. Thus, the other institutions relevant to this study are those that are internal to the BRP – namely the composition and operation of the partnership. These external and internal institutions all shape the actions and decisions of the actors within the BRP. Institutions set out the objectives for each actor while requiring or prohibiting certain actions. They may establish sanctions and penalties for prohibited actions, or create organisational structures that determine how actors interact.

As will be discussed further, the BRP is not a legislatively mandated institutional structure. There are no laws that require its establishment or existence. Yet there does exist a body of legislation and policy

in South Africa that has indirectly encouraged the formation of the BRP. This same legislation motivates and guides the actions of the individual actors involved in the Partnership.

In assessing this legislation, the following questions are considered:

- To what extent does each legal institution explicitly foster integration and coordination in a water management system by requiring (i) that actors coordinate and cooperate (ii) that the physical water system is managed as a whole and (iii) all actors with an interest in, or impact on, the water system are included in the governance efforts?
- Do these institutions promote united management goals among actors, specifically creating a shared ambition for environmental sustainability?
- Are clear and complementary roles ascribed for actors that may facilitate effective coordination and cooperation within a governance network?
- What mechanisms of accountability do these institutions create such that actors can be held accountable for actions within a catchment that might impact on other water users?

The various institutions that are pertinent to the Berg River Partnership and its member actors are discussed below in chronological order of their establishment, and each of the questions above is answered in the description.

CONSTITUTION OF SOUTH AFRICA (1996)

Chapter 3 of the Constitution sets out that the government in the country is constituted as national, provincial and local spheres, and that each sphere is distinctive, interdependent and interrelated. This chapter is specifically concerned with establishing *cooperative government*.

Section 41(1)(h) of Chapter 3 of the Constitution sets out the following provision:

“All spheres of government and all organs of state within each sphere must... co-operate with one another in mutual trust and good faith by -

- fostering friendly relations;*
- assisting and supporting one another;*
- informing one another of, and consulting one another on, matters of common interest;*
- co-ordinating their actions and legislation with one another;*
- adhering to agreed procedures; and*
- avoiding legal proceedings against one another.”*

Schedules in the Constitution detail the various responsibilities of each sphere of government. Pertinent to the BRP, the national and provincial spheres share concurrent responsibility for, *inter alia*, the environment, housing, nature conservation, pollution control, and urban and rural development. Local government is exclusively responsible for water and sanitation service delivery, including water supply and sewage treatment.

In addition to establishing the principle of cooperative governance, the right to an environment that is not harmful to health and well-being is set out in Section 24 of the Constitution, under the Bill of Rights. This section provides every person the right to have the environment protected through reasonable legislative and other means. This obligates all other legislation to comply with this requirement as well as binding all organs of the state to work towards ensuring this right, regardless of their constitutional responsibility in terms of service delivery.

The Constitution provides for some accountability in this regard, in that it is binding on all organs of state. Any actions that conflict with the provisions of the Constitution are deemed illegal and can thus

be taken to task. Section 24, as discussed, embodies an overarching obligation to sustainable environmental management, and secures everyone the right to a safe and healthy environment

SOUTH AFRICAN WATER QUALITY GUIDELINES (1996)

This extensive document sets out standards for water quality for a variety of uses and was published by the Department of Water Affairs and Forestry (DWAF) in 1996. It contains guidelines for a number of uses, including recreational, industrial, and irrigation use. It also specifies quality guidelines for aquatic ecosystems. These guidelines then inform the management and protection of all water resources for all relevant authorities. In essence this then provides a national benchmark for the quality of water resources in South Africa. These guidelines are still in use today and enforced by the National Department of Water and Sanitation (DWS).

WATER SERVICES ACT (ACT 108 OF 1997)

This Act regulates local government in their provision of water services as well as the oversight function of the DWS. It also contains monitoring and intervention provisions for the DWS in the event of non-performance by a municipality. This provides the national department with the authority to monitor and intervene in the delivery of water and sanitation services if a municipality is failing in this respect. The Act also requires local authorities to take reasonable measures to ensure environmentally sustainable access to water services. Thompson writes, “the Act is infused with the spirit of cooperative government with the emphasis on building capacity at all levels of government” (Thompson, 2006, p. 205).

NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

This piece of legislation gives effect to the constitutional right to a healthy environment. It provides a legal framework and sets out principles to prevent environmental degradation by government and private persons. The Act guides decision-making on matters affecting the environment by bringing establishing certain principles pertaining to environmental sustainability and protection. The Act contains a number of principles that bind all members of state to act with environmental sustainability in mind. These include the principles of “duty of care” and “remediation of environmental damage,” which are broad enough to encompass water pollution (Glazewski, 2012).

This legislation has a binding effect on the activities of all natural and juristic persons and organs of state and the Act contains provisions that allow for the prosecution of any person or organisation that causes environmental damage.

NATIONAL WATER ACT (ACT 36 OF 1998)

The National Water Act manages the protection, use and conservation of ground and surface water resources, based on the Constitutional right to a healthy and safe environment. The Act requires that all phases of the hydrological system be managed, which falls in line with principles of IWRM. The NWA mandates the Department of Water & Sanitation to ensure that all water resources be managed in line with the provisions of the Act.

The Act binds all organs of the state and acknowledges that overall responsibility for, and authority over, the nation’s water resources rests with national government (namely, the DWS). It specifically emphasises that the protection of the nation’s water resources is necessary for sustainability and is in the interests of all water users. It also requires the protection of aquatic ecosystems and the reduction and prevention of pollution and degradation of water resources. The Act states, “water is to be protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons and in accordance with its constitutional mandate” (National Water Act, Section 3(1)). It also states, “water is [to be] allocated equitably and used beneficially in

the public interest while promoting environmental values” (National Water Act, Section 3(2)). In a similar vein, the preamble of the Act contains references to protecting aquatic and associated ecosystems and their biological diversity, and reducing and preventing pollution and degradation of water resources (National Water Act, Section 2). Glazewski (2012) acknowledges that the Act is generally underpinned by ecological considerations, and that it places great emphasis on the conservation and ecological aspects of water management.

NATIONAL WATER RESOURCE STRATEGY (2004)

This policy document, which national government is required to produce in terms of the National Water Act, is essentially the blueprint for water management within the country. It contains principles that originally appeared in the National Water Policy for South Africa (1995). It re-clarifies the role of the Department of Water & Sanitation as having overall responsibility and as a central decision maker, and emphasises the need for cooperation between the various tiers of government and Catchment Management Agencies (CMAs). The role of CMAs is to coordinate water resource management at a catchment scale by bringing together various stakeholders onto a management board. The relevant CMA has not become operational for the Berg River Catchment although it is proposed that the CMA will be established in mid-2016 (Lintaar-Strauss, 2015). The establishment of a CMA for the catchment brings into question what role the BRP will continue to play or how it may fit within this new institutional structure.

The National Water Resource Strategy (NWRS) makes reference to the Constitutional Bill of Rights by stating that equitable access to water needs to be environmentally sustainable and that water resources must be protected. The NWRS states, “water required to meet basic human needs and to maintain environmental sustainability will be guaranteed as a right” (NWRS, p. 7).

The NWRS document states that the responsibility and authority for water resource management is to be progressively decentralised and that the role of the DWS will progressively become “to provide the national policy and regulatory framework within which other institutions will directly manage water resources, and to maintain general oversight of the activities and performance of these institutions” (NWRS, p. 92). This sets the DWS up for assuming a regulatory role with regards to the environmental protection of aquatic resources in South Africa.

This section outlines how the external institutional (legislative) environment of the BRP is one that provides a platform for IWRM. The most explicit mention of IWRM in the policy described above is through the establishment of Catchment Management Agencies (CMAs) by the National Water Resource Strategy. However, these are still in the process of becoming operational throughout the country (Enright, 2015). The principles behind the establishment of CMAs may have influenced the formation and structure of the Berg River Partnership, although the BRP is not directly the product of any specific legislative mandate. What will become pertinent is the fate of the BRP when the relevant CMA for the Berg River catchment becomes established, as there will be an overlap in function. Perhaps most important legislative aspect for the Berg River Partnership is the persistent environmental agenda present throughout the relevant legislation. This creates a shared responsibility for all actors within the catchment to pursue the environmentally sustainable management of the river. In addition to this, clear roles are ascribed for the different government actors involved in water resource management, with mechanisms for accountability in terms of non-performance. The water quality guidelines also provide a shared set of evaluation criteria for these actors. However, the emphasis on coordination within the legislation is largely limited to government actors. The legislation does not make notable mention of the inclusion of stakeholders from outside of the realm government. It does, however, require the management of water resources at a catchment scale, and

requires the holistic management of all aspects of the hydrological system at this scale. This certainly bears on the structure and operation of the Berg River Partnership, by encouraging actors to coordinate management at the appropriate catchment scale.

HISTORY & FORMATION OF THE PARTNERSHIP

The history and formation of the Berg River Partnership is somewhat vague and poorly recorded. This is possibly as a result of its uncomfortable political history, outlined below. While different members trace a slightly different chronology of the establishment of the Partnership, all of the members that were interviewed for this research gave an essentially unified account of the events leading up to its formation. The history and formation of the BRP is particularly important in understanding its present structures and functions.

The establishment of the BRP was driven largely by a political agenda and by government actors (although motivated by environmental and economic concerns) (Barnes, 09 September 2015). The Berg River is crucial to the local agricultural industry in the catchment, which depends on the water from the river to irrigate crops (River Health Programme, 2004; DWAF, 2007). While tourism generates some income for the area, agricultural export is arguably the largest income-generating activity within the catchment (River Health Programme, 2004). International import and export standards require that the water used to irrigate crops and fruit for export meets a certain standard of quality, in particular for bacteriological loads (Barnes, 09 September 2015). Where water extracted from the Berg River for irrigation purposes does not meet this standard it poses a threat to the income of local farmers (*ibid.*). This is a threat that is keenly felt by farmers within the area, reflected in discussions and concerns raised by Irrigation Board members recorded in the BRP meeting minutes (Berg River Water Quality Task Team, 2014).

Simultaneously within the Berg River Catchment, population growth and in-migration has put increased pressure on local municipalities' wastewater treatment works (WWTWs), which are not able to cope with the increased load (Barnes, 09 September 2015; Enright, 15 September 2015). This failure is commonly attributed to ageing infrastructure and a lack of human and financial resources within local municipalities. This means that WWTWs are often unable to effectively treat wastewater and release effluent that is of an acceptable standard (which eventually makes its way directly into the Berg River or via its tributaries). The expansion of informal settlements has also increased the amount of polluted urban runoff reaching the river (see Figure 1 for reference to the distribution of urban areas in the Berg River catchment). This ultimately impacts farmers in the catchment for aforementioned reasons. It should be noted that the urban areas are largely upstream of the agricultural areas and users who draw water from the river (polluted input into the river upstream of these actors will affect their activities).

As the preceding section demonstrates, the national Department of Water & Sanitation (DWS) is the custodian of water resources in South Africa and carries the responsibility to ensure that these resources are managed and protected in an environmentally sustainable way. Legislation also imbues the responsibility for water and sanitation service delivery to local municipalities, while giving the national DWS oversight and intervention authority. In the case of failure on the part of local government, the DWS may issue directives to municipalities to ensure compliance with the relevant service delivery and water quality standards.

Local farmers in the area are represented by a number of irrigation boards. Within the Berg River catchment the umbrella organisation for these boards is the Berg River Main Irrigation Board (hereinafter referred to as the Irrigation Board).

This context, in itself, creates an argument for integrated management: in the present case the activities of actors in one aspect of the hydrological system (runoff and effluent discharge) and in one area of the catchment (urban residents and municipalities) have a direct impact on the interests and activities of other actors dependent on the water and who operate in another area of the catchment (local farmers abstracting water for irrigation) – all managed by, and affecting, a variety of different government and non-government actors and stakeholders.

Circa 2000 the Irrigation Board began to put mounting pressure on the DWS and local municipalities to improve the water quality of the effluent discharged into the Berg River from WWTWs. The DWS was reluctant to issue directives to local municipalities and that the Department received internal instruction to avoid taking other organs of state to court for non-compliance to national water quality standards (presumably in the interests of maintaining agreeable intra-governmental relationships and avoiding legal costs) (Barnes, 09 September 2015; Enright, 15 September 2015). The Irrigation Board then resorted to undertaking legal proceedings against the DWS in terms of the National Water Act. An out-of-court settlement was reached and to avoid further conflict a government intervention was initiated to improve the Berg River. Toward this end, the DWS (then the Department of Water Affairs & Forestry) launched the Berg River Baseline Monitoring Programme in November 2002. The final report of this monitoring programme was delivered in 2007.

The individuals interviewed for this study reported that following the production of this report little action was taken by the DWS in terms of actively addressing the causes of pollution and environmental degradation identified in the report. The provincial Department of Environmental Affairs & Development Planning (DEADP) then assumed a more active role in the catchment by developing the Berg River Improvement Plan (BRIP). The DEADP's BRIP brought together various stakeholders into a collaborative steering committee with the aim of improving river health. This created some overlap in intention, responsibility, and management control in the catchment between the DWS and DEADP initiatives. In an effort to rectify this, the DWS established the Berg River Water Quality Task Team (BRWQTT) in 2007 with the initial aim of integrating the different actors responsible for the monitoring of the Berg River (Barnes, 09 September 2015; Lintaar-Strauss, 27 October 2015). The BRWQTT then adopted the BRIP, such that the BRIP now forms part of the BRP action plan. As this new umbrella institution grew and evolved the BRWQTT was renamed to the Berg River Partnership in early 2014 to reflect its broader membership and interests.

The BRIP steering committee (lead by the DEADP) established an initial network of actors. When the BRP was formed this network was extended to include additional actors from other sectors. The BRP also adopted the river improvement strategy initially created by the BRIP committee. The BRP has subsequently added two additional action points to produce a comprehensive action plan for the catchment.

The DEADP continues to execute the BRIP, but this work is now communicated back into the BRP forum during meetings. At an institutional level, the BRP is seen as an umbrella institution that the BRIP falls under. Interviewees indicated that this does create some confusion in terms of leadership and ownership of the various interventions.

The contents of the BRP action plan are outlined in the section on Action Situations below. Each point on the BRP action identifies an action situation, as per the MTF. Action situations are units of measurement in the MTF and represent issues that pull different actors with similar interests together.

GENERAL COMPOSITION OF THE PARTNERSHIP

The Management and Transition Framework (MTF) identifies that the various actors that make up the governance network underpin the action situations. For IWRM to be effective it is suggested that the network of actors involved in resource management be diverse in terms of sectoral and geographical representation. Integrated management seeks to bring together all actors who influence, or are influenced by, the water system – including actors who previously would have been excluded from water management, but who, in rational terms, still have an interest in the management of the system. Furthermore, integration also seeks a fair geographical representation of actors from across the catchment due to the fact that activities in one area of the catchment will likely impact actors and their operations in other areas of the catchment.

For the purposes of this study, an ‘actor’ within the BRP refers to a member organisation rather than an individual. The Berg River Partnership primarily comprises of organisations rather than individuals (although it may be the case that a single individual might represent an organisation in the BRP). Furthermore, organisations tend to be a more stable unit of identifying nodes in a social network when compared to individuals. Individuals may move in and out of networks quite fluidly, although their parent organisation remains.

The results below are extracted from an analysis of BRP meeting minutes from January 2014 to October 2015, which was the full extent of meeting minutes available at the time of the study.

It is difficult to define who might be considered a ‘true’ member of the BRP. Membership is ‘amorphous’ according to one interviewed member (Barnes, 09 September 2015). Although the Terms of Reference list a specific number of organisations that are considered to be members of the Partnership it was clear that this list was not a true reflection of the actual *de facto* membership structure. The line between ‘member’ and ‘guest’ is vague. New individuals and organisations are frequently invited to the meetings and to become a part of the Partnership. This is the case if the current members feel that a new member could add value to the Partnership or may have an interest in the management of the Berg River catchment. Meeting minutes reflected that it was suggested in one of the BRP meetings that appointment letters or a memorandum of understanding be issued to formalise membership in the Partnership, but this idea had not been fully implemented at the time that this study was written.

For the purpose of this study, if an organisation has been listed as an attendee in the meeting minutes they are considered to have been a part of the BRP governance network. This attendance gives an indication of an intentional attempt to include the organisation into the management network and provides an opportunity for that organisation to bring some contribution to the partnership with respect to one of the action situations.

Over the course of the measured period, 76 individuals attended Berg River Partnership meetings, representing 25 distinct network actors/organisations across a number of different sectoral designations (see Appendix 1 for the full list of attendees).

Within government there is a good representation of different spheres and sectors, as shown by the table below.

Table 2. Government representation in the Berg River Partnership

Department	Sphere	Sector	Responsibility
Department of Water & Sanitation	National	Water	Water quality monitoring; oversight of water and sanitation service delivery
Department of Environmental Affairs	National	Environment	Alien vegetation clearing
Department of Cooperative Governance & Traditional Affairs	National	Governance	Support of local government
Department of Human Settlements	National	Housing	Upgrading of informal settlements
Department of Agriculture	National	Agriculture	Support of agricultural industry
Department of Environmental Affairs & Development Planning	Provincial	Environment / Development	Monitoring environmental impact
District municipalities	Local	Administration of services	Bulk water supplier
Local municipalities	Local	Administration of services	Water and sanitation service provider

Table 2 outlines the representation of government departments both vertically (across spheres) and horizontally (cross-sectoral representation). This kind of representation within a single forum such as the Berg River Partnership, working together towards a united management goal, aligns with the principles of IWRM. It should be noted that some national departments might also have provincial offices.

The following table gives a breakdown of government and non-government actors within the Berg River Partnership. The table lists the total number of individual attendees from each sector, and indicates how many distinct organisations are represented within each sector (there often multiple individuals representing the same distinct organisation or interest group). For example, with reference to Table 3, there were 14 individuals who attended the BRP from the private sector. That group of 14 people represented 5 distinct organisations or interest groups. Each of these organisations is considered to be an actor within the BRP.

Table 3. Composition of the Berg River Partnership by Sector

Sector	Number of Individuals/Attendees	Number of Distinct Actors/Organisations
Private Sector	14	5
User Association	4	2
Government	45	11
Parastatal	5	1
Education	4	3
NGO	3	2
Foreign Government	1	1

These numbers were further assessed according to a more detailed breakdown of sectoral interest, as shown below:

Table 4. Composition of the Berg River Partnership by Sectoral Interest

Sectoral Interest	Number of Individuals / Attendees	Number of Distinct Actors / Organisations
Private Sector: Engineering	1	1
User Association: Agriculture	3	1
Local Government	8	5
Government Agency	3	1
Private Sector: Communications Consultant	4	1
Government-Funded Research Agency	5	1
National Government	24	4
Provincial Government	10	1
Private Sector: Agriculture	5	1
Private Sector: Agriculture Research	3	1
Private Landowners Representative	1	1
University / Research	4	3
Private Sector: Research	1	1
NGO: Conservation	3	2
Foreign Government	1	1

The perspective offered by Table 4 allows for an impression of the kind of presence that each sector has within the BRP network, as indicated by the number of individuals per sector present at each meeting. This breakdown illustrates that by sheer virtue of the number of people representing a particular sector or interest group, that sector may have dominance within the BRP. For example, although there is only one provincial government actor, this single actor is represented by 14 individuals in the meetings – suggesting that this provincial government actor may have unfair dominance within the BRP. Similarly, national government has an overwhelming presence at the BRP meetings, as indicated by the number of attendees in that sector.

A visual representation of the table above gives a more helpful analysis of these figures, in terms of the sectoral diversity and representation in the Berg River Partnership. Comparing the graphs below reveals an interesting finding regarding the composition and representation of the BRP. The sectoral diversity (shown in the first graph, and indicated by the number of different actors represented) seems positive. National, provincial and local government make up only 40% of the BRP, with the remaining 60% composed of non-government stakeholders. However, when one compares this with the second graph (which indicates the actual representation of each sector in terms of the number of attendees) it becomes clear that government actors dominate the Partnership, simply by virtue of having a larger presence in meetings.

The point made here is that it may appear at first glance that the BRP is a positively diverse network of actors, when one interrogates only one view of the data. If one is to only consider how many different sectors and interest groups are represented it would appear that there is highly diverse representation (which bodes well for integration). However, when one interrogates the data further and looks at what kind of presence each of these actors has within the BRP (based on the number of people representing each sector who attend the BRP) it quickly becomes apparent that some actors have an overwhelmingly dominant presence. This may equate to an imbalance of power and influence within the Partnership. To avoid this, careful leadership and chairmanship is required to ensure that parties who are less well-represented are still meaningfully included in management and decision-making processes.

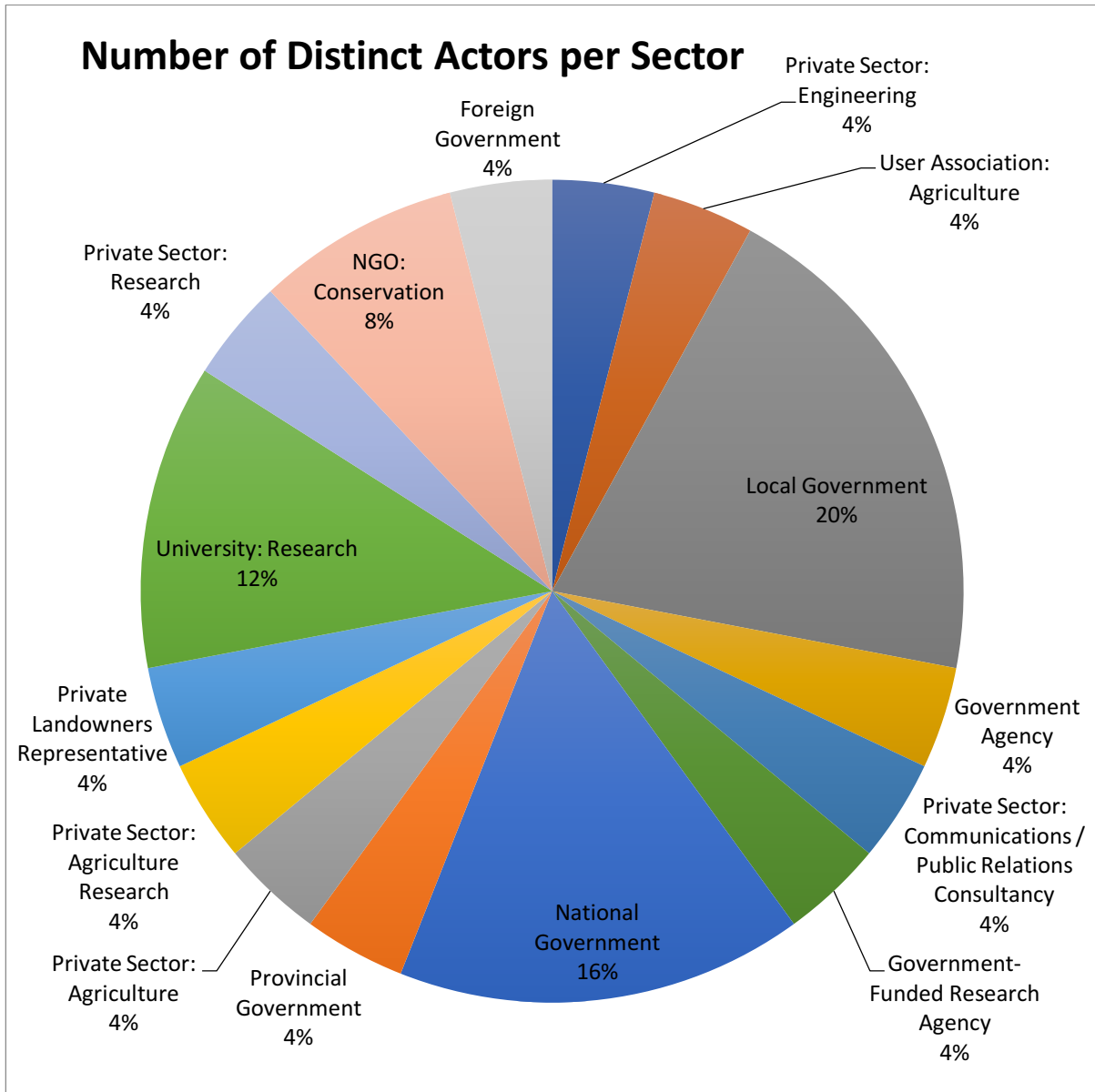


Figure 4. Graph demonstrating the composition of the Berg River Partnership in terms of the number of distinct actors per sector.

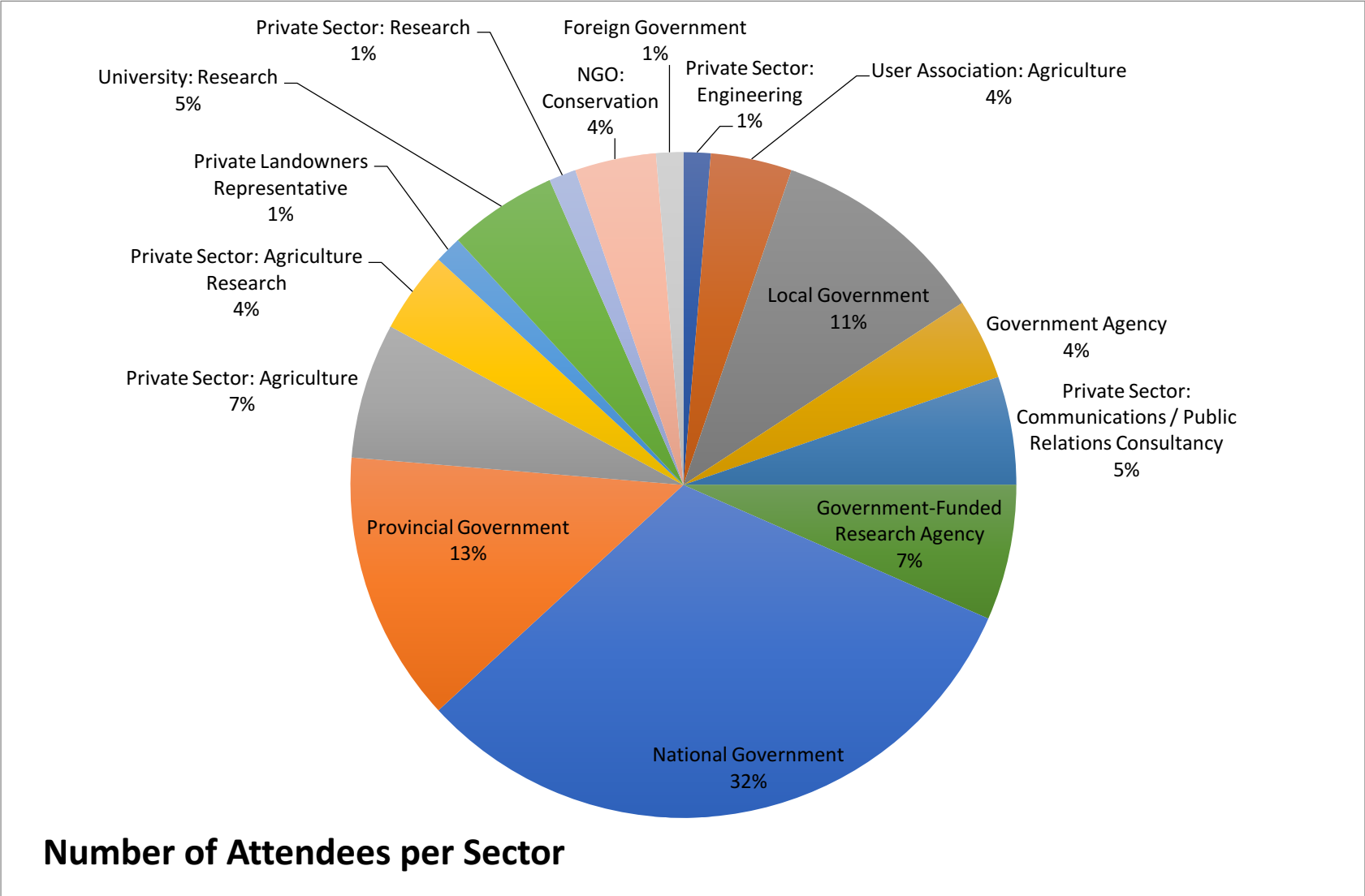


Figure 5. Graph outlining the composition of the Berg River Partnership in terms of the number of attendees per sector.

OPERATION OF THE PARTNERSHIP

The following account is largely based on participant observation of the researcher, as well as reviews of the documents published by the Berg River Partnership (including the Terms of Reference, meeting agendas, and meeting minutes).

The BRP currently meets quarterly. Partnership meetings are chaired by the DWS and hosted by the Cape Agency for Sustainable Integrated Development in Rural Areas (CASIDRA). CASIDRA is an implementing agency that assists rural development projects through project management services. The main role of CASIDRA within the BRP is to provide secretariat and administrative support. Some frustration was expressed during interviews that there is some ambiguity as to which member organisation is steering the BRP. Although theoretically chaired by the DWS, the DEADP perceived by members to drive much of the action (Barnes, 09 September 2015).

A senior representative from the DWS chairs the meetings. The BRP Terms of Reference outline the function of the chairperson as follows:

“The chairperson must facilitate the discussions at the meeting and the time allowed for each agenda point. He/she will see that “sufficient” discussions take place before a decision is made, repeat the decision for the secretary to minute and close discussions on that item. It is his/her responsibility to regulate the time spent for the meeting to be efficient and effective.”

The agenda for each quarterly meeting is principally structured around the action plan that the BRP has adopted as a strategy for river improvement. The action plan tasks are divided between members according to their legislated responsibility within the catchment. For example, the DWS is responsible for water quality monitoring and the local municipalities are responsible for wastewater treatment and the upgrading of human settlements (as per the National Water Act and Water Services Act). The relevant member(s) give feedback to the other BRP members pertaining to the activity in the action plan for which they are responsible. There is limited discussion among the group about each action point. The chairperson facilitates this discussion by inviting comments or questions from other members. Where a decision is made or further action required the secretary notes this and it is recorded in the minutes. Follow-up and reporting on these action points occurs in the next BRP meeting. Ad hoc presentations from members or special guests give more in-depth feedback on certain projects and initiatives, or report results and findings from studies conducted in the catchment. The meetings are punctuated by short tea breaks that are valuable times for connection and discussion between individual attendees. Outside of these quarterly meetings individual members of the BRP occasionally host workshops, symposiums or informational events that highlight work being done within the catchment. The eight action points that form the agenda for these meetings are discussed in another section below in more detail.

According to the BRP Terms of Reference, decisions within the BRP are conducted on the basis of consensus and in the absence of consensus, a majority vote applies. However in practice it was reported that if a disagreement arises the matter is often postponed until the next meeting with no guarantee that the issue will be resolved (Barnes, 09 September 2015). This has the potential to result in perpetuating problems that are often discussed but seldom addressed (*ibid.*). Meeting minutes are circulated via email after each meeting by CASIDRA. Observation and interviews suggest that conflict over poor- or non-performance within the BRP is avoided between members. Grievances are seldom aired and there is little accountability or sanctions enforced (*ibid.*). Individuals who were interviewed acknowledged that because the BRP lacks a legislative mandate, it was difficult to use the Partnership as a space to enforce accountability (Barnes, 09 September 2015; Mingo, 08 October 2015). Legally,

the BRP does not have any power to dictate or enforce any decisions or actions among its members – a consequence of its institutional environment. The voluntary membership also means that members are less inclined to engage in conflict for fear of souring relationships with other actors (Barnes, 09 September 2015). Other legally prescribed procedures for accountability and conflict resolution exist outside of the BRP structure. As these are legislated procedures, members are obliged to follow these external routes rather than use the BRP as a forum for addressing these matters (Lintaar-Strauss, 27 October 2015). In addition, as the BRP is not a legislated institution, and has no legal mandate to exist, its performance as an institution is not measured, nor accounted for. This brings the legislative ‘fit’ of the BRP into question.

The DWS finances the cost the BRP meetings, however the BRP as an institution does not mandate, nor fund, any of the activities within its action plan (Barnes, 09 September 2015; Mingo, 08 October 2015; Lintaar-Strauss, 27 October 2015). The various projects and initiatives that are reported within the BRP are largely self-funded by the responsible actor (Barnes, 09 September 2015; Charmier, 11 September 2015; Steyn, 28 September 2015; Mingo, 08 October 2015).

One member of the Berg River Irrigation Board expressed concern about declining attendance at the BRP meetings (Barnes, 09 September 2015). An average of 10 people were absent from each meeting during the two-year period of this study. BRP meetings have an average expected attendance of around 36 people (as indicated by the minutes), meaning that close to one third of expected attendees were often absent from meetings. Meeting minutes revealed that this frequently meant that feedback on specific issues would be postponed until the next meeting (sometimes only months later). Barnes (09 September 2015) also reported frustration due to a lack of meaningful action taken as a consequence of the BRP meetings, in addition to the postponement of meetings (Barnes, 09 September 2015; Enright, 15 September 2015).



Presentation given by the Department of Water & Sanitation at a Berg River Partnership meeting, hosted at CASIDRA offices in Paarl, Western Cape. 26 November 2015. (Photograph: Kent Locke)

VALUES, GOALS AND PERCEPTIONS OF THE CATCHMENT

The Management & Transition Framework suggests that within a water management scenario each actor can be attributed management goals, evaluation criteria, values and a perceived state of the water system. Integration in water resource management requires that actors in the governance network have shared values, goals, and perceptions of the catchment to enable them to work together more effectively (as far as this is reasonably possible for a diverse network of actors). Where these differ or conflict it becomes challenging for actors to collaborate effectively. It is acknowledged that it is naïve to assume that a network of actors with diverse needs and expectations could come to share perfectly united values and management goals. However, a generally shared understanding of the nature and state of the water system is necessary for actors to effectively cooperate. It is assumed that actors are more likely to be able to cooperate if they base their actions and decisions on a shared body of knowledge and understanding. In addition, management of the system in an environmentally sustainably manner is a management goal that mutually benefits all actors with an interest in the system, regardless of their specific interest in the river. Thus, it is not unrealistic for this management goal to be held by all actors.

A more critical question to be asked is whether or not the BRP has fostered shared perceptions, management goals and values. The research goal of this study is to investigate whether or not the structures, practices and processes of the BRP have facilitated the implementation of IWRM. If actors share management goals, values and perceptions, can this be credited to the BRP as an institution of IWRM?

VALUES & MANAGEMENT GOALS

The BRP (at the time still known as the BRWQTT) contracted the services of a professional communications consultant ('Chatroom') to assist the team with developing a united vision, as well as developing a communications strategy to broadcast their efforts and progress to the general public (Berg River Water Quality Task Team, 2014). Chatroom worked with the BRWQTT to develop a vision that could be shared by all of its members. A workshop was held and facilitated by Chatroom in which members contributed to constructing a shared vision statement, mission, set of values and a new logo. In April 2014 the BRWQTT was renamed to the Berg River Partnership and the new logo and vision was formally adopted (Chatroom, 2014).

The mission statement contains explicit references to the restoration of an ecologically healthy catchment, with water quality fit for all users, and with the aim of socio-economic development and prosperity. References to collaboration and stakeholder ownership were also made (Chatroom, 2014).

Observation and interviews suggested that each actor was still largely focused on their particular interests in the catchment. These interests ranged from commercial or economic interests (Department of Agriculture and the Irrigation Board), environmental interests (DEADP), or primarily viewing the river as a convenient as a research opportunity (CSIR). Notwithstanding this, Lintaar-Strauss (27 October 2015) claimed that the shared vision of an ecologically healthy Berg River that served the diverse needs of the actors in the catchment has certainly been facilitated by the BRP and the work of Chatroom.

PERCEIVED STATE OF BERG RIVER

Actors' perception of the state of the Berg River is probably the aspect of management that reflected the most divergence in understanding. Some actors suggested that the Berg River is in a 'relatively good condition', especially when compared to some of the other waterways in the country (Charmier, 11 September 2015; Lintaar-Strauss, 27 October 2015). These actors suggested that the river receives

particularly bad press due to its economic significance (*ibid.*). Other actors referred to the river as being in a 'reasonable' (Jeffery, 29 October 2015) or 'stable' state (Mingo, 08 October 2015), while still others described it as 'deteriorating' (Barnes, 09 September 2015) and 'problematic' (Titus, 16 September 2015). One particular actor described the river as effectively ruined (Steyn, 28 September 2015). It was clear that, despite significant contact and discussion through the BRP, actors held perceptions of the state of the Berg River that varied significantly. This would potentially impact the manner in which actors engage with the management of the river. For example, if an actor perceives that the river is in a stable state it might reduce the urgency with which that actor deals with problems or allocates resources toward interventions in the catchment.

IDENTIFIED THREATS TO THE BERG RIVER

Despite the aforementioned divergence in actors' perceptions of the state of the Berg River, there was a much higher degree of congruence with regards what actors identified as threats to the Berg River during interviews.

Most actors were in agreement that poorly treated wastewater effluent, discharged from municipal WWTWs into the river, was a major threat. Interestingly, one of the research-focussed actors suggested that bacteriological contamination was much less significant than had been assumed by many in the BRP (Charmier, 11 September 2015). A second threat that most of the interviewees identified was polluted stormwater runoff from informal settlements and urban areas. One representative of a district municipality mentioned threats not identified by the majority, including agricultural runoff, solid waste, and salination in the estuary of the river (Titus 16 September, 2015). One actor stated in an interview that the biggest threat to the river was in fact a lack of management in the catchment (Jeffery, 29 October 2015). These areas of concern are clearly also raised in the BRP meeting minutes, and reflected by the specific interventions listed in the action strategy. General agreement on the threats to the Berg River between actors will facilitate integration by informing management strategies that can be shared by all actors, and thus improve coordination and cooperation. It was also generally agreed between actors that membership in the BRP had increased their awareness and understanding of the various issues facing the river system.

Interviews largely suggested that there was a growing unity among actors with respect to the above criteria, although divergent views are still held by some actors with regards to the state of the Berg River and the facing the catchment. In most cases, however, all actors acknowledged that the Berg River Partnership had been crucial in contributing to their understanding of the system, from its physical condition to the social and governance structures in place.

ACTION SITUATIONS

This section outlines the various action situations present within the Berg River Partnership, and is compiled from the Berg River Action Plan documents, meeting minutes and interview notes.

1. WATER QUALITY MONITORING

GENERAL COMMENTS ON WATER QUALITY MONITORING

A number of actors within the partnership conduct their own water quality monitoring in the catchment, which is briefly described below. Although each actor currently undertakes their own monitoring, a water quality monitoring sub-committee has been established in the BRP to help coordinate these efforts. The DWS is also in the process of developing a centralised water quality database for the area, as outlined in a later section.

A concern was raised in BRP meetings that the water quality results from each actor vary and that action should be taken to investigate why there are discrepancies in the results between each actor. Split-sampling at a single site was conducted, where all actors involved in water quality monitoring analysed a shared sample of water in their own laboratories. As yet no feedback has been given at the BRP meetings as a follow-up to this exercise. There was also a suggestion by Hortgro (a BRP member involved in agricultural research) that chlorate and perchlorate parameters be included in water quality monitoring as these are aspects of water quality of major concern for fruit growers. Similarly, as yet no action appears to have been taken on this point. Much of the monitoring takes place in the upper Berg River catchment. Meeting minutes reflected a growing awareness to increase water quality monitoring attention in the lower reaches and estuary of the Berg River, but it was acknowledged that no accredited laboratory was currently available in the area. Nevertheless, these concerns do indicate a desire to improve coordination and cooperation in water quality monitoring.

THE MAIN IRRIGATION BOARD

The Irrigation Board monitors bacteriological parameters (*E. Coli*) in the Berg River, as this parameter impacts on export licences for local farmers. The Irrigation Board has 14 points that are monitored monthly. The area of sampling starts at Franschoek, downstream of the Berg River Dam, to Piketberg. The results are sent to the DWS on a monthly basis. Although initially only covering the upper reaches of the catchment, sampling carried out in the lower reaches by smaller sub-irrigation boards was amalgamated into the sampling undertaken by the Main Irrigation Board. Thus sampling carried out by the Main Irrigation Board now includes the entire catchment. However, it was pointed out in interviews that this amalgamation (a geo-spatial integration of efforts) was not driven by the BRP. It was emphasised that this integration of monitoring was an in-house process carried out by the Main Irrigation Board, driven by the interests of the cooperative of farmers along the river.

DEPARTMENT OF ENVIRONMENTAL AFFAIRS & DEVELOPMENT PLANNING

The DEADP appointed the Council for Scientific and Industrial Research (CSIR) to sample 10 sites in the estuary and 10 sites along the Berg River. The monitoring programme established a baseline investigation and trend analysis on selected chemical parameters, bacteriological loading, and selected heavy metals and pesticide residues. This is the only current monitoring programme in the catchment that provides on-going sampling of metals and pesticides. Sampling sites were positioned where likely pollution of the river could be expected and in areas with elevated water use. Most of the sites on the river are located in the upper and middle Berg River around the major towns, while the estuary sites are located within the first 20km from the river mouth. DEADP frequently makes comments in the BRP meetings about water quality along the river, suggesting that they are keenly aware of the water quality in the catchment.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)

The CSIR has conducted two further project-based monitoring initiatives in the upper Berg River. As these are project-based initiatives they have a limited lifespan and the CSIR is uncertain of their continued membership in the BRP. These projects investigated water quality, nutrient enrichment and related human health concerns in the upper Berg River. Specific research into phosphorous sensitivity and a related cost analysis of algal blooms impacting farmers in the area was also conducted.

The CSIR collaborated with the University of the Western Cape (UWC) who have been undertaking ground water monitoring in the area. The CSIR also indicated some collaboration with the DEADP in these projects, including sharing of data and some limited financial support. The CSIR hopes to further collaborate with the DEADP in implementing riparian rehabilitation and bioremediation strategies based on their completed research. The DEADP reciprocated an acknowledgement of this collaboration and credited this to the BRP. It was also highlighted at meetings that more of a focus on

ground water monitoring is needed and that the DWS hopes to work more closely with the UWC in this regard.

The results and findings of the CSIR projects have been shared with the BRP by means of presentations at Partnership meetings. The CSIR also noted that, where there had been requests from other actors, water quality data had been shared with those actors, thus contributing to the knowledge-base of the BRP.

WEST COAST DISTRICT MUNICIPALITY (WCDM)

The WCDM have been monitoring water quality specific to their needs as a bulk water supplier for municipalities in the area, to ensure that the water that they abstract from the Berg River is of an acceptable standard.

DRAKENSTEIN MUNICIPALITY

The Drakenstein Municipality has conducted a special monitoring programme within its own municipal boundaries in an effort to improve confidence in water quality monitoring data within the municipality, especially with respect to effluent discharged by the municipality's WWTWs. The municipality has established a fully staffed laboratory for this purpose.

STELLENBOSCH MUNICIPALITY

There is only one record in the BRP meeting minutes concerning water quality monitoring by Stellenbosch University. The note in the minutes indicated a lack of staff in the municipal laboratory, which singularly services five WWTWs. It was indicated that CSIR laboratories will be used in the future and the municipality requested assistance from the BRP with regards to water quality monitoring.

DEPARTMENT OF WATER & SANITATION

The DWS undertakes in-house water quality monitoring along the length of the Berg River. Monitoring by the DWS has been hampered by internal resource restrictions but, at the time of writing, the DWS were resuming water quality monitoring in the Berg River.

In addition to its usual monitoring efforts the Department has contracted an engineering consultant (Aurecon) to design and develop a unified water quality database for the catchment. This database is set to capture water quality data from each actor that monitors in the catchment. Specifically mentioned are the DWS, the Irrigation Board, and the WCDM. The aim of this project is coordinate monitoring efforts throughout the catchment and to create a database with a high-resolution of water quality data that could provide a detailed overall picture of the health of the Berg River and identify pollution hotspots. The collective monitoring also helps to increase geospatial coverage of monitoring in catchment. As different actors conduct monitoring with a focus on different parameters (chemical versus biological, for example), to combine the different monitoring efforts of each actor provides a more comprehensive water quality monitoring strategy for the catchment. The DWS also noted that having the support of other actors who conduct monitoring is helpful due to the limited resources of the Department. It is hoped that as this project is rolled out, universities will be included to assist with processing and interrogating the data (Lintaar-Strauss, 2015).

According to the meeting minutes and interviews with the DWS, the design of this system has been completed but it has not yet been populated with data by the DWS due to a lack of resources within the Department.

2. UPGRADING OF WWTWS

One of the major challenges identified in the Berg River catchment is the limited capacity of wastewater treatment infrastructure, resulting in poorly treated effluent being discharged into

waterways. Ageing infrastructure needs to be upgraded to cope with the increased demands on the sewerage system. As demonstrated in previous sections, this is of concern not only because of the general impact on the ecological system, but also because of the implications it has for agricultural water users who abstract water from the river to irrigate their crops. Thus the Irrigation Board has a keen interest in this process.

The actual upgrading of wastewater treatment works, as per the Water Services Act of 1997, is the responsibility of the relevant local municipality. Municipalities report back on their progress in this regard at BRP meetings.

According to the action plan, the Drakenstein municipality has undertaken to upgrade four treatment works within its municipal boundaries and construct a further pumping station to increase its ability to effectively treat wastewater. The Drakenstein municipality frequently gave feedback on their progress in BRP meetings. This feedback is largely positive and occasionally challenges and limitations are acknowledged to the rest of the BRP, managing the expectations of other BRP members.

The Stellenbosch municipality is recorded only twice in the minutes giving feedback on their WWTWs upgrades. Witzenberg municipality are listed on the agenda but have not been present to give any feedback during BRP meetings.

While WWTWs upgrading is primarily the responsibility of local municipalities, the DWS are involved insofar as they are legally responsible for the issuing of authorisations for upgrades and water-use licences. The DWS is also responsible for monitoring the wastewater treatment services of municipalities, and ensuring that water quality standards for effluent are met.

The Department of Agriculture have identified themselves as having a 'lobbying' role in this action situation. Poor wastewater treatment performance by municipalities has an impact on farmers and their ability to obtain fruit export licences. Hence the Department of Agriculture has used the BRP as a forum to put pressure on municipalities to take action in this regard. However, the BRP does not provide legislative recourse for accountability in this regard.

Along with the need for upgrades, there is a critical threat to wastewater treatment that has been identified. 'Load shedding' (planned temporary cuts to the electricity supply) in South Africa poses a serious threat to wastewater treatment facilities. Backup generators can only run WWTWs for a limited period. When these generators fail the inflow of wastewater to treatment works continues, potentially resulting in untreated effluent being released into rivers. In response to this and other concerns, a BRP workshop (involving the interested and affected parties in the catchment) was held around the issue of incident reporting and contingency plans for WWTWs. Incident reporting would notify the DWS and water users such as the Irrigation Board of pollution incidents. The Department Cooperative Governance and Traditional Affairs (also referred to by its former name, the Department of Local Government) has been involved in facilitating the development of contingency plans by local municipalities. These plans have been forwarded to the DWS for circulation to BRP members. It was acknowledged that smaller municipalities in the area, with limited resources, should be supported by the BRP in conducting risk assessments and contingency plans.

3. UPGRADING OF INFORMAL SETTLEMENTS

Upgrading of informal settlements refers to the retrofitting of water and sanitation infrastructure to existing households in informal settlements, as well as the provision of government-subsidised housing that is connected to the centralised sewerage system. As with WWTWs upgrading, this is the responsibility of local municipalities.

In the Berg River catchment the Drakenstein municipality is working on installing water and sanitation services in the informal settlements in their jurisdiction. The meeting minutes give vague indication that the national Department of Human Settlements is also involved in supporting this work. Progress on this initiative is reported in BRP meetings.

The DEADP is involved in bioremediation and sustainable urban drainage projects in the upper sections of Berg River catchment, supporting local municipalities in their upgrading of informal settlements. The DEADP is working with engineering firms to develop bioremediation technologies for treating stormwater effluent in informal settlements (notably, Langrug and Mbekweni informal settlements). In Langrug the DEADP is working towards implementing sustainable urban drainage systems (SUDS) in the informal settlement to help treat stormwater runoff. In the Mbekweni informal settlement the DEADP has been developing artificial wetlands for the same purpose.

In addition to this the DEADP and the University of Cape Town are working on setting up a Training and Research Education Centre for sustainable urban drainage systems in the Franschhoek area. This project aims to repurpose the old Franschhoek WWTW site, which is no longer operational. The goal of the project is to actively treat stormwater in the area using SUDS technology while simultaneously creating opportunities for research and education efforts.

4. BEST PRACTICE IN AGRICULTURE

Best practice in agriculture has not received as much detailed attention in the meeting minutes and action plan as other initiatives. The goal is to create a standard of agricultural best practice for the region, establishing guidelines for sustainable farming practices. Meeting minutes simply reflected that actors agreed that this is a necessary strategy, but that little has yet been done. The initiative is an existing broader initiative that is already underway throughout the Western Province, and given leadership by the Department of Agriculture. Its main focus is improving water-use efficiency in agriculture and is a largely research-focused intervention at this point. Some presentations have been delivered in BRP meetings, giving overviews of some best-practice models currently available. The Department of Agriculture and Hortgro have both given presentations to the Partnership, outlining potential best practice guidelines that could be adopted in the region. Actors such as Hortgro, Fruitworks and the World Wide Foundation for Wildlife are included in the BRIP best practice in agriculture working group as consultant members, and thus attend the BRP meetings. The DEADP is involved in this action situation insofar as best practice in agriculture forms part of the BRIP, which the department oversees.

5. RIPARIAN ZONE REHABILITATION AND MANAGEMENT

One aspect of concern in the Berg River catchment is the presence of invasive and alien species of flora, both in the river itself and in riparian zones.

The national Department of Environmental Affairs has an on-going project known as Working for Water (WFW) that is involved in alien vegetation clearing across South Africa. This project emphasises the use of local labour to clear areas of alien vegetation with the dual aim of environmental improvement and job creation. The WFW project is active in clearing sites along the Berg River through their Berg River Alien Clearing Project, and has brought significant funding (to the tune of R32 million) into the area. The Department of Agriculture is also involved in alien vegetation clearing along the Berg River through their Land Care programme. The Department of Agriculture and the WFW representative in the BRP both report back on this project. An interview with the Department of Agriculture suggested increasing collaboration between these two actors.

The Department of Water Affairs and the DEADP are drawing up a River Maintenance Management Plan, which details the strategy for alien clearing in the catchment. The Management Plan was to be drawn up by the Irrigation Board, in conjunction with the DWS, the DEADP and Department of Agriculture. Certain information needed for this plan (such as findings from a study on ecological reserves) was obtained through the BRP from the DWS. According to meeting minutes, the DWS and DEADP are working together to discuss the operationalization of this management plan.

In addition to this the DEADP is involved in the replanting of indigenous species in cleared riparian areas by the Department of Agriculture and WFW. This collaboration was not driven by the BRP but the working relationship was strengthened through the Partnership (Mingo, 2015).

The action plan suggests that the Drakenstein Municipality is also involved in alien vegetation clearing in the riparian zones within its boundaries in an effort to curb riverbank erosion. While an interview with the West Coast District Municipality (WCDM) revealed that the WCDM Environmental Health Department is involved in alien clearing, the BRP action plan and interviews with other actors involved in alien clearing did not acknowledge this activity.

6. VALUE OF WATER

As part of the BRIP, the DEADP is conducting a financial cost-benefit analysis of action versus inaction in the catchment. Specifically, this research investigates what financial consequences a business-as-usual case in the Berg River Catchment may have, compared to the financial implications of taking action to improve the sustainable management of the river. The findings of this research have already been presented to the BRP, although the study is on-going. As part of this work, the DEADP is to work with heads in the fruit export industry to engage around water quality concerns for stakeholders. Alongside this research, the Department of Agriculture is investigating the profitability of selling biomass from alien vegetation clearing to help cover the cost of this activity within the catchment.

Investigating and developing eco-tourism opportunities in the Berg River has been added to the BRIP as a formal undertaking by the DEADP. A private landowners representative, funded by a small group of landowners in the upper catchment, has been tasked with this responsibility. Her work will be to investigate opportunities to revive tourism potential in the area, with a focus on eco-and-adventure tourism.

7. STAKEHOLDER EDUCATION & COMMUNICATION

Chatroom was contracted to assist the BRP with external communications, as well as with internal vision-creation. Working largely with the DWS, Chatroom aided the BRP in publicising their work and progress through local media, such as newspapers and radio. Chatroom provided critical skills that enabled government actors to communicate more effectively with stakeholders external to the BRP. Chatroom's contract with the BRP has now ended.

In addition to this strategy, the DWS is involved in community outreach and awareness programmes to educate local communities about the value of the water system and how to protect it. The DWS has also continued to publicise the Partnership's progress through local newspapers.

In BRP meetings, members raised concerns about 'sensationalised' media reporting around pollution incidents within the Berg River. It was acknowledged that BRP members are ill-equipped to deal with media enquiries and that a communication liaison should be appointed within the Partnership to facilitate swift and coordinated responses to media enquiries. A private landowner representative, who is a member of the BRP through their involvement in the BRIP, is looking to assist the Partnership in this regard.

Other stakeholder education initiatives include events and conferences run by BRP members, that highlight work and research that is being conducted within the Berg River Catchment. The DEADP and the Department of Agriculture have both hosted such events. BRP members are usually invited to these events and the DWS has encouraged all Partnership members to actively support these initiatives.

8. POLLUTION REPORTING AND INCIDENT MANAGEMENT SYSTEM

The DWS and Aurecon are developing a pollution incident management system for the Berg River Catchment. The aim is to implement a system for the reporting of pollution incidents, the monitoring of the response to these incidents, and an early-warning system to alert water users of possible water quality impacts. This initiative specifically involves the district and local municipalities and the Irrigation Board as the pertinent actors, and is being driven by the DWS.

KNOWLEDGE GENERATION AND SHARING

Knowledge is one of the classes identified by the Management & Transition Framework. Knowledge (including the perceived state of the water system) exists within each action situation and influences the activities of actors, their decision-making, and how easily they will be able to cooperate or coordinate their efforts. Coordination will be difficult if actors base their decisions and activities on incomplete, incorrect or different sources of knowledge (van der Keur, et al., 2008). An important aspect of IWRM is the collective generation and sharing of knowledge. This creates a governance scenario where management actions are empowered by an increased knowledge base, and knowledge that is shared by all actors. Well-informed decisions and actions are empowered by an increased knowledge base. Thus it is important that actors are sharing knowledge and contributing to this knowledge base. It is also in the interests of IWRM that knowledge be shared within a governance network because if multiple actors base their respective opinions, decisions and activities and on the same, shared knowledge, it is more likely that cooperative decision-making will be the result.

Different actors have different types, kinds, and aspects of knowledge and perspectives. Some pertinent forms of knowledge in a water management scenario, for example, might include:

- The state of the water system
- How physical and social processes in the particular water system operate and interact
- The causes of pollution and harm in the water system (threats to the water system)
- The actions and activities of other actors in the water system and how these impact on the water system

In the Berg River Partnership knowledge is shared as actors give feedback in terms of their work, research, challenges, and concerns in the catchment. In this way, different actors share their particular understandings and perspectives, and can make other actors in the Partnership aware of their work. Actors share concerns that they become aware of, especially pertaining pollution incidents. For example, the Irrigation Board may highlight that they are aware of poor water quality in a specific stretch of the river, or a local municipality may give feedback about upgrades to WWTWs. Where research has been conducted, or a specific project is running, the relevant actor is invited to give a presentation to inform and update the other members of the Partnership.

The BRP includes individuals who could be considered experts in their field, including university academics, engineers and water managers with decades of experience. During the interviews conducted as part of this study, knowledge generation and sharing was positively reported as perhaps the most beneficial aspect of the Berg River Partnership.

The range of knowledge that was reportedly gained by members through their inclusion in the BRP was vast. It included new insight into the administrative aspects of catchment management, insight into the activities of other members, valuable input from other members in their own work, a greater awareness of the other activities in other areas of the catchment, and increased technical and scientific knowledge (Barnes, 09 September 2015; Charmier, 11 September 2015; Titus, 16 September 2015). The Department of Agriculture also indicated that the BRP has been a helpful source of knowledge (Steyn, 28 September 2015). The DWS specifically made mention of the presentations and informal discussions as important ways in which knowledge, technical or otherwise, was shared among the members (Lintaar-Strauss, 27 October 2015). The sharing of water quality data has been another important source of knowledge, in particular for the DWS (*ibid.*).

Despite a very positive report on knowledge generation and sharing within the BRP, the Department of Agriculture also expressed some frustrations. The Department noted, notwithstanding the platform created by the BRP for knowledge sharing between actors, that some actors continued to act in a manner that was incongruent with the knowledge shared. The Department of Agriculture cited the example of municipalities who continued with current wastewater treatment strategies, despite shared knowledge in the BRP suggesting that these strategies were inappropriate and needed to change.

CHAPTER SUMMARY

This chapter recorded the findings of the combined review and assessment of the BRP documentation (including various reports, meeting agendas and meeting minutes) and the semi-structured interviews. As the MTF was selected as the theoretical framework for this investigation, and used to produce the set of indicators of integration used for the assessment of the BRP, the findings in this chapter are recorded and structured according to the MTF.

In summary, the following were investigated:

- The legal and institutional environment of the BRP
- The values, goals and perceptions of the actors within the BRP
- The action situations identified in the BRP
- The knowledge generation and sharing facilitated by the BRP

The institutional environment will influence an actor's jurisdiction, their position within the governance network, the scope of their agency, the knowledge available to them, and the potential choices available to them in decision-making. In this research, both the external legislative environment and the internal operational environment of the BRP were investigated. The following indicators were assessed:

- Does the legislative environment explicitly require coordination and cooperation between both government and non-government actors?
- Does it foster integration by providing united management goals with a focus on environmental sustainability for all actors?
- Is there policy integration in this regard across different government sectors?
- Does the institutional environment create clear roles and responsibilities, and associated accountability?

The findings demonstrate that the legislation in effect does call for integrated management in the form of CMAs. However, the BRP is not technically a CMA and it is likely to be absorbed into the relevant CMA once established. The legislated principles that call for the formation of CMAs are likely

to have influenced the formation of the BRP as an interim measure. It was noted that in the legislation there is an emphasis on integration between government actors, with little focus on the inclusion of non-government actors in management beyond awareness.

It was found that there is general policy alignment across sectors and a shared environmental responsibility is created through the various legislation in effect. In addition, water quality guidelines help to give actors united management goals and evaluation criteria.

It was noted that the formation of the BRP was largely pushed by a political agenda driven by government actors. Despite this, there is still a fair representation of non-government actors within the BRP, representing a range of sectors and interests. Further analysis did reveal that despite the inclusion of these actors, government actors still dominate the space and the degree to which non-government actors are meaningfully involved in management and decision-making must be questioned. Geographically, there is also a heavy bias of representation of actors from the upper reaches of the catchment and a lack of representation of actors from the lower reaches.

It was also noted that there is a distinct lack of accountability within the BRP, indicated by high absenteeism from meetings and the general feeling from actors that feedback on issues is often postponed resulting in a lack of effective action.

In terms of IWRM theory, actors need to share aligned goals, values and perceptions to effectively collaborate in an integrated management initiative. The findings show that the BRP has facilitated a shared set of values, goals and perceptions of the water system between actors from diverse sectors. Despite this, there remain discrepancies (especially in regards to perceptions of the state of the catchment).

The following action situations were identified within the BRP:

- Water Quality Monitoring
- Upgrading of WWTWs
- Upgrading of Informal Settlements
- The development of Best Practice in Agriculture guidelines
- Riparian zone flora rehabilitation
- A study on the economic value of water in the region,
- Stakeholder education
- Pollution reporting and incident management.

Each action situation had a different set of actors working together around each issue or initiative, collaborating to varying degrees.

Finally, with regard to knowledge generation and sharing, the BRP was found to be a forum in which knowledge was collectively created and shared between actors. In fact, this was probably one of the most acknowledged benefits of the BRP by the interviewed actors. However, a concern was raised that despite knowledge being shared among actors it did little to shape the actions of the actors (indicating a lack of accountability).

In the next chapter these findings are discussed in terms of IWRM discourse, as applied to the MTF, and the indicators of integration promulgated through the literature review. The chapter identifies which aspects of IWRM can be seen to be functioning within the BRP and how these have been achieved through the governance structures and processes of the BRP. It also addresses some of the weaknesses of integrated management in the BRP.

CHAPTER 6: DISCUSSION

The theoretical foundation of this research is based on the acknowledgement that IWRM is arguably needed, but that the practical implementation of integrated management has been heavily criticised to date. These criticisms rest on a failure to translate the theory of integrated management into pragmatic guidelines for the implementation of IWRM in a given water management scenario. Thus what is crucially needed is greater understanding regarding how integration is defined and what governance configurations and processes lend themselves to effective integration (Medema, et al., 2008). This research contributes to this by providing a workable set of indicators of integration in water management, and by testing the measurement of these indicators in the case of the Berg River Partnership. If these indicators are tested and found to be accurate in demonstrating effective integration in water resource management, they may also serve as guidelines for the practical implementation of IWRM in future cases.

The Management & Transition Framework (MTF) was adopted for this study as this framework provides a useful conceptualisation of water governance systems by outlining the components and relationships that exist universally within such systems. Applying IWRM ideologies to the MTF produces a set of guidelines and indicators for the practical implementation, and subsequent measurement, of integration in a given water management scenario. These indicators pertain to the composition of actors in a management scenario, the structures and institutions that shape their actions, and the processes and practices that demonstrate different forms of integrated management. This set of indicators identifies governance configurations that may facilitate IWRM at an action situation level.

The MTF is also used to give structure to the analysis of the Berg River Partnership. The MTF identifies the conceptual elements and processes that make up water management regimes, using the 'action situation' as a central unit of measurement. The indicators were worked into a questionnaire used to interview actors within the Berg River Partnership, and were also used to interrogate national legislation and the organisational documents published by the BRP (including meeting minutes, agendas, and reports).

The indicators underpin the discussion that follows, with regards to the Berg River Partnership and its attempt to establish integrated management within the catchment. By studying the Berg River Partnership, this research identifies the processes and structures evident in the BRP that have facilitated integration, and whether or not the manner in which the BRP incorporates integrated forms of management addresses, overcomes, or affirms limitations described in IWRM literature. A critical question asked in this study, is what interventions under the Berg River Partnership demonstrate integrated management, and what structures and processes in the BRP can be credited as having facilitated this integration? Through this analysis, this study contributes to the development of IWRM as a management paradigm by confirming what theoretical aspects of integration can be implemented and how these are demonstrated in the case of the Berg River Partnership.

IWRM theory, when applied to the MTF, suggests that governance networks need to be inclusive of a diversity of actors. This is reflected in action situations that include all actors responsible for influencing and managing different aspects of the physical water system, as well as the actors that are representative of the different water uses, and interests, within the system. Integrated management also requires action situations that include actors from across the entire geo-spatial extent of catchment, so as to include all relevant physical and social processes that necessarily interact in the

system (referred to as geographical integration). This theoretical ideal was confirmed and demonstrated in practice within the Berg River Partnership. Within the Berg River Partnership there is a positively diverse composition of actors. The Partnership includes actors responsible for abstraction, irrigation, wastewater treatment, stormwater management, as well as those actors tasked with the responsibility to ensure the environmental protection of water resources in government. It is also positive to note that ground water quality is being studied by the BRP, as this is noted in the literature as an important aspect of the physical system that is often neglected. However, recreational users are notably absent from the Partnership and there is limited representation of the public (especially those landowners in urban areas and informal settlements).

While there is a generally diverse group of actors represented within the Partnership as a whole, it is also important that each action situation demonstrates a similar diversity and the necessary inclusion of the relevant stakeholders pertaining to the issue at hand. It is also important to ascertain whether or not these actors are working together in a manner that demonstrates integrated management, and if so to determine what governance configurations have facilitated this. For example, within the water quality monitoring action situation there is a healthy diversity of actors, including government departments, agricultural actors, and actors with a research interest. This demonstrates good cross-sectoral representation of actors, both from within and outside of government spheres. The different actors measure different water quality parameters, depending their unique interest in measuring the water quality. For example, the Irrigation Board monitors bacteriological loads while the research conducted by the CSIR is focussed more on chemical and nutrient loading. Bringing these different aspects of water monitoring together creates a better overall picture of the health of river system by incorporating these different parameters. It also improves the geographic coverage of monitoring across the catchment, sharing the burden of water quality monitoring between actors in different areas. Having this knowledge available to the rest of the Berg River Partnership is valuable for integration, as shared water quality data can help to ensure that actors throughout the catchment have a common understanding of the state of the water system. Linked to this, the pollution incident reporting system has drawn in the expertise and resources of an external engineering consultant. This action situation provides strong evidence that the Berg River Partnership has brought about meaningful collaboration through its role as a multi-actor platform.

Similarly, with the work undertaken concerning informal settlement upgrading, there appears to be a positive inclusion of multiple actors cooperating around this intervention. Notably, the DEADP and the University of Cape Town are active in this initiative alongside the municipalities, bringing additional resources (financial and knowledge-based resources) into the action situation.

Likewise, there appears to be good collaboration around riparian zone rehabilitation, although this is predominantly between government departments. The national Department of Environmental Affairs (Working for Water), the national Department of Water and Sanitation, and the provincial Department of Environmental Affairs and Development Planning appear to be progressively collaborating around this intervention. This demonstrates positive vertical and horizontal integration within government. This collaboration was reportedly driven largely through the Berg River Partnership (Steyn, 28 September 2015).

Best practice in agriculture is another action situation that benefits from the inclusion of market-place and research-based consultants, working with the Department of Agriculture in establishing this intervention. However, it would appear that this initiative exists independently of the BRP.

Nevertheless, its inclusion in the BRP feedback structures continues to contribute to knowledge generation and sharing. In the other action situations, the actor directly responsible for the activity undertaken is the sole driver of the initiative. However, these action situations are still included in the report-back structure of the BRP, allowing all other members to become aware of the progress of these initiatives.

The Berg River Partnership, through the various action situations it contains, demonstrates the inclusion of multiple actors from different sectors into a governance network. It also demonstrates ways in which these actors can cooperate around issues in a way that mutually benefits the actors and the hydrological system as whole. As shown through the assessment of the different action situations above, by inclusion into the BRP network the different actors with mutual interests are brought together into working relationships that may otherwise have not existed. However, it is difficult to comment on whether or not the BRP as an institution has driven collaboration and integration in these action situations, as there is little empirical evidence that could either confirm or refute this. Therefore a key part of the interviews was to assess whether or not inclusion into the BRP governance structures had driven collaboration. Some actors indicated in interviews that many of these activities and collaborations would likely have occurred regardless of whether or not the BRP exists, simply due to existing relationships and legislative mandates that require certain actors to work together (Barnes, 09 September 2015; Steyn, 28 September 2015; Mingo, 08 October 2015). These actors explained that the BRP brings together different actors who are already currently active in the catchment and who would have normally been involved and cooperating despite the Partnership. It is therefore questionable whether or not the BRP has fostered any new cooperation between actors. For example, there is an existing, legislated relationship between the DWS, the DEADP and municipalities. Some of the interviewed actors therefore questioned the value of the BRP in this regard.

However interviewees did express that the BRP has brought actors into the governance network that would otherwise have likely been excluded. For example, Steyn (28 September 2015) is of the opinion that the involvement of Working for Water (WFW) in the catchment can be credited to the BRP. This is because the Partnership offers an attractive space for actors to become involved as it creates a meaningful management structure into which resources and efforts can be dovetailed (*ibid.*). Actors also noted that the BRP has created awareness between actors that was previously lacking.

What can be concluded is that the BRP is a valuable governance structure that has intentionally brought a diversity of actors together around a specific set of issues, and that it has created a forum for communication and networking. The BRP has acted as a bridging-institution, serving as a platform for discussion and collaboration. This kind of institution is arguably necessary for integration as it gives formal structure to governance networks and allows for the inclusion of actors who would otherwise be excluded from the usual governance network. It was noted that BRP has helped in identifying opportunities for future collaboration with other actors (Mingo, 08 October 2015). The BRP may certainly be credited with having created the space that has fostered the connections between actors and in some ways may have prompted collaboration. This confirms the theoretical argument for creating institutional/governance structures that intentionally include a diversity of actors and interests from the catchment, and demonstrates how these structures contribute to integration through creating increased awareness and knowledge sharing as these actors engage within one another. Viewed through the lens of the MTF, the BRP represents an institution which has brought actors together for the purposes of creating shared goals, values and perceptions that encourage

these actors to cooperate in the sustainable management of the Berg River. The BRP has also been a space in which important knowledge has been shared, and similarly improved the ability of actors to work together to ensure the sustainable management of a shared resource.

With regards to geographic representation within the Partnership, a large portion of the work undertaken under the umbrella of the BRP is concentrated in the upper part catchment, with very little representation and interventions present in the lower reaches. Similarly, the Drakenstein and Stellenbosch municipalities are the only local government representatives involved in the BRP, although a number of other municipalities exist within the catchment (Figure 3). It could be argued that the majority of the environmental impact appears to be in the upper catchment and therefore it seems logical that most of the management emphasis is placed there. Thus an argument could be made that the BRP is right to focus its activities in the upper catchment (Mingo, 08 October 2015). It is also logical that activities and interventions in the upper parts of the catchment will have an impact on the lower areas of the catchment. Thus it could equally be argued, from the same logic, that actors from the lower reaches should be involved in the BRP for the sake of accountability (Steyn, 28 September 2015). It was acknowledged in interviews that more down-stream stakeholders should be included in the BRP but it was also noted that the distance that these actors would need to travel makes their inclusion difficult (Mingo, 08 October 2015). The experience of the BRP in this regard confirms the theoretical suggestion that IWRM is best facilitated when there is appropriate geographic representation in the management structures, as the BRP acknowledged that limited downstream representation was a flaw in its management activities. In order to create shared management goals, values, perceptions and knowledge, which facilitates integrated management, this study affirms the theoretical requirement for total geographic representation that ensures that all sectors and interests in the catchment are meaningfully represented in the governance processes. Should there be a failure to include actors from across the entire breadth of the catchment (as is the case with the BRP) important interests and voices are excluded from governance processes, resulting in limited integrated management.

IWRM also necessitates the inclusion of aspects of the broader water system that not normally included in water resource management, but which necessarily impact on the water resource system. Specifically this means action situations in which socio-economic aspects of the system are represented, where these impact upon the water system, or are dependent upon the resource. Linked to this is the promotion of socioeconomic interventions to complement the usual technical interventions that address pollution. The MTF theorises that the water system includes the societal system, in addition to the ecological system and that management action situations reside within the societal system. IWRM thus suggests that aspects of the societal system that impact on water quality need to be drawn into water resource management, whereas in the past they have been managed as separate concerns. This is particularly pertinent within the South African context, where socio-economic problems are of a particular concern and are often associated with environmental degradation. As mentioned earlier, it is acknowledged that water resource systems are complex socio-ecological systems. A cognisance of socio-economic issues must be included in ecological management initiatives, as these two aspects of the greater system are linked. Ignoring the socio-economic issues and processes that drive environmental degradation, by simply focussing on traditional technological interventions, will limit the extent to which systemic drivers of ecological harm can be addressed. The implications of this is that symptomatic water quality issues are often addressed, leaving the more deeply-rooted problems driving these issues unchanged. This will result in short-term fixes that do not effect long-term remedies to the causal and underlying problems.

Within the Berg River Partnership the Irrigation Board represents a commercial and agricultural interest, in addition to their obvious use of the water for irrigation. Their inclusion is vital due to their dependence on the river for their farming activities and their knowledge of the system. The other members in the Partnership benefit from the resources that the Irrigation Board brings to the BRP. The inclusion of a private landowners representative is an example of an actor who would not normally be involved in water resource management, but who brings a valuable socioeconomic perspective and stakeholder interest into the BRP discussions. The economic research conducted by the DEADP is also a positive move towards the inclusion of socioeconomic considerations, rather than purely technical solutions to problems in the catchment. However, the Berg River Partnership is still largely focussed on technical interventions. For example, the work in human settlements is primarily driven by technical interventions, including the retrofitting of water and sanitation services and bioremediation interventions to help with polluted urban runoff. While these are necessary interventions, IWRM theory endorses including socioeconomic approaches that seek to effect change at a deeper societal level than purely physical and technical interventions. This refers to systemic socioeconomic management interventions that address the socioeconomic ills that may drive pollution and cause environmental degradation. What this demonstrates is the need for the continued pursuit of, and investigation into, the possibilities of including socioeconomic interventions into water resource governance. The experience of the BRP can only confirm that water resource management in this instance remains focused on primarily technical interventions, while neglecting the socioeconomic aspects of the system. As shown, this will effectively limit the ability of the BRP to address some of the root causes of environmental degradation in the catchment.

IWRM suggests that increased cooperation vertically between different government spheres responsible for water resource management is necessary for effective integrated management. When applied to the MTF, this would be demonstrated in the present case by integration between national, provincial and local spheres of government in the various action situations. Beyond this, integration is demonstrated in action situations that show horizontal coordination and cooperation between different government sectors, agencies or departments within the same sphere. This is in contrast to the usual sectoral silos that have dominated water resource management in the past, resulting in ineffective sustainable management of the resource. The Berg River Partnership includes government departments from all three spheres of government, as well as a positive cross-sectoral representation of departments horizontally within spheres. As mentioned, many of the action situations demonstrate that the BRP has stimulated improved interaction horizontally and vertically within government.

At the heart of IWRM is the necessity for non-government actors and stakeholders to be included in the governance process, and that the participation of these actors is meaningful. These actors should be included into governance processes by virtue of the fact that they represent important interests and impacts in the catchment through their use of, or dependence on, the water resource. Meaningful participation requires that these actors are involved in decision-making processes, and can extend to cost and resource sharing between actors within action situations. The sharing of costs and resources avoids free riders and increases actor buy-in and ownership. This requires institutional arrangements that intentionally include non-government actors into action situations, where they can influence the operational outcomes. The BRP does have a number of non-government actors present within its membership. However, as the results show, it is still a space dominated by government actors. It is uncertain how meaningfully involved the non-government actors are within the Partnership. In terms of decision-making, it was argued in interviews that the Department of Water and Sanitation is still in a position where the department drives most of the decisions and that the other actors do little more than give feedback in meetings (Barnes, 09 September 2015). Public participation is evidently lacking.

The only form of public engagement evident in the Partnership is the communications strategy of the BRP through local media. This is largely an informative strategy, which does not create much opportunity for input from the public in terms of management decisions. While there is a representative of private landowners in the BRP, there is no representation of the larger urban communities, and certainly very limited inclusion of their interests in decision-making. Notwithstanding this, BRP has been effective in obtaining a representation of other actors and stakeholders outside of the government realm. By doing so, it has increased awareness of management activities to non-government stakeholders who may otherwise not be aware of these. It is acknowledged that despite this, the BRP is still “missing voices” (Lintaar-Strauss, 27 October 2015). The private sector and recreational users are not well represented and interviewees agreed that the BRP needs to expand its membership to include a representation of larger groups of people (Enright, 15 September 2015; Mingo, 08 October 2015; Lintaar-Strauss, 27 October 2015). Very little cost and resource sharing was evident within the Berg River Partnership, even in cases where there is a clear mutual interest funding particular interventions. This is likely to be a reflection of the somewhat restrictive institutional environment, as discussed below.

The MTF theorises that the institutional environment is a key factor in determining how different actors operate within action situations, and the degree to which these actors are able to cooperate with one another. According to IWRM theory, the institutional environment should be one that assists in the creation of shared management goals that enable actors to cooperate more effectively. These shared management goals can be constructed through effective policy integration, such that the legislation applicable to each actor is harmonious with legislation relevant to the other actors. In addition to policy integration, united management goals are also facilitated through engagement in multi-actor platforms that facilitate dialogue and the co-generation and sharing of knowledge. The institutional environment in which the Berg River Partnership exists is one that does foster integration and united management goals. Firstly, legislative context is one in which environmental protection is a consistent consideration throughout. The Constitution, National Water Act, Water Services Act and National Environmental Management Act all contain references to the sustainable management of natural resources and imbue a responsibility on all organs of state and juristic persons to ensure that their activities fall in line with this aim. The National Water Act, Water Services Act and the National Water Resource Strategy all call for the management of the nation’s water resources in an integrated manner, calling for cooperation and coordination. This is sympathetic of the constitutional call for cooperative governance. Thus environmental sustainability is a legislatively shared goal for all members of the Berg River Partnership. However, despite a shared legislated responsibility for environmental protection and cooperative governance, the BRP is not a legislatively mandated institution in itself. This has implications for how it operates. As the BRP is not a legislated institutional structure with its own recognised powers and formal processes, the processes and policies relevant to individual government departments within the BRP can sometimes hamper and slow down their work within the Partnership. This is because these departments are obligated to follow certain internal procedural policies, which may restrict or delay their activity and collaboration with other actors within the Partnership. This is especially pertinent with regards to decision-making processes and the release of funding for certain initiatives.

As mentioned, the Berg River Partnership acts as a bridging organisation by providing a platform for multiple actors to coordinate and collaborate their respective management efforts through multi-stakeholder dialogue and knowledge sharing. However, it was a common response in interviews that structures such as the BRP require exceptionally strong leadership in the form of a dedicated, impartial chairperson with secretarial support (Barnes, 09 September 2015; Steyn, 28 September, 2015;

Jeffery, 29 October). Without this leadership it is difficult for institutions such as the BRP to transform discussion between actors into meaningful action, and for meaningful collaboration to occur. A strong secretariat is needed to facilitate collaboration between members, and to provide effective follow-up on action points that arise in the meetings. This requires a full-time, dedicated chairperson and secretarial support that the DWS is currently unable to provide (Lintaar-Strauss, 27 October 2015). This is not an aspect of integration made explicit in the literature, but one that aligns with the theoretical need for institutional arrangements that encourage integration. In this case, improving institutional leadership is required.

Within the Berg River Partnership the action plan is an institution that helps to foster united management goals for all of the actors by creating a shared vision and strategy for all actors. The action plan also creates a shared set of evaluation criteria by outlining measurable aspects of success for the Partnership. In addition to united management goals, integration is most effective where actors in a governance network have clearly defined and complementary roles so as to avoid unnecessary conflict or duplication of effort. The action plan also serves this purpose by clarifying roles and avoiding confusion and overlap between actors working in the same space. It is also helpful in structuring the feedback and reporting processes (Mingo, 08 October 2015). Using the language of the MTF the action plan would be considered an institution as it gives structure to the governance network. Having such an action plan is a helpful step towards integration. It offers a blueprint of action for actors within the governance network to unite around, creating action points around which collaboration can occur. At the very least it functions to give clarity and create awareness between actors, allowing for more effective alignment and coordination between the different actors in the governance network. In addition to this action plan, Chatroom (the communications consultant contracted by the BRP) provided assistance with casting and communicating a shared mission statement for the Partnership through a series of facilitated workshops.

An unintended consequence of integration highlighted in the literature is the potential for ambiguity regarding who is responsible for what management activities, where there might previously have been some overlap between the roles of different actors. This is definitely the case within the BRP, partly due to the unique history of the Partnership. Interviewed actors admitted to some confusion regarding functions and leadership within the partnership. This is because of the existing overlap between the BRIP initially created by the DEADP, and the BRP which is chaired by the DWS (Barnes, 09 September 2015; Mingo, 08 October 2015). Some actors were critical of the Partnership's focus on the BRIP, despite claims that the interests and activities of the Partnership are broader than just the activities of the DEADP (Barnes, 09 September 2015). Other actors defended this position, reasoning that the BRIP represents a logical and fairly comprehensive strategy (and thus there is no reason it should not have been adopted by the BRP). Nevertheless, this evidence certainly gives support to the argument for clear roles and ownership of specific management activities within an IWRM governance network, and for a single, united action strategy to avoid overlap and confusion.

Knowledge is another class identified in the MTF. A robust and shared knowledge base within action situations, and across the catchment, ensures that all actors operate using the same information. IWRM theory suggests that shared knowledge is an important aspect of improving integrated management, and the MTF identifies knowledge as an important component of water management systems as it influences the ways in which actors operate within the system. Similarly, action situations in the catchment need to employ the same evaluation criteria to ensure that the knowledge is interpreted and evaluated harmoniously by different actors, further facilitating integration. Water quality sampling is an important part of knowledge generation and sharing within the Berg River

Partnership. It allows for all members to be mutually aware of the state of the river system, and to base this understanding on shared sets of data. Likewise, the BRP serves as a space where members can raise their concerns about the river and notify other members about particular pollution incidents or issues that need to be addressed. For example the Irrigation Board often highlighted particular stretches of the river that had high *E. coli* counts, which were of concern to them, and requested that action be taken by responsible actors to investigate and remedy the issue. The DEADP also raises issues and concerns in meetings as they become aware of them. Interviews suggested a largely united understanding of the state of the river, and the prominent issues affecting water quality (although there were some notable areas of disagreement). This all contributes to a growing mutual understanding of the state of the river system, which facilitates integrated management and improves the sustainable management of the water resource.

Interviews suggested some divergence between actors regarding their perceptions of the state of the river system, with differences in the severity of degradation expressed. This is somewhat surprising, considering the feedback and discussion that occurs in BRP meetings. However, there was more alignment in terms of the threats to the river system that actors identified. Interviews revealed that knowledge generation and sharing was a benefit of the BRP that all actors had benefitted from. This knowledge included new and increased understanding of administrative and technical aspects of water resource management. It also included improved understandings of the physical and social processes at play in the Berg River catchment, and the particular problems threatening the Berg River. There was also an indication that the Berg River Partnership was valuable in creating a space for increased awareness of the management activities of other actors.

A positive consequence of this is that the BRP has increased trust between actors. The Partnership allows for concerns to be raised by actors, and addressed within the forum. The feedback given in BRP meetings also serves to increase trust and confidence as it increases evidence of action and progress (Titus, 16 September 2015). Similarly, the increased transparency and openness between members fosters trust (Lintaar-Strauss, 27 October 2015). The feedback and reporting also allows the expectations of other actors to be managed, reducing the gap between expectation and experience. This also encourages actors not to make promises that they are unable to deliver upon. In this regard, the DWS has reportedly received fewer complaints from water users because the BRP has created a forum to engage with issues timeously, before complaints are lodged (*ibid.*).

Finally, IWRM theory suggests that effective mechanisms of monitoring and evaluation across the catchment are necessary. Stakeholders should be able to monitor, and hold to account, other actors within the catchment. This would be reflected in the institutional environment of the management regime, which would establish mechanisms for monitoring and accountability. One of the major weaknesses of the BRP that was identified in interviews was the lack of authority that the Partnership has with regard to accountability between members. As the BRP exists within an institutional environment where it lacks a legislative mandate, it is somewhat 'toothless' in its ability to monitor and enforce progress or sanction non-performance of actors (Barnes, 09 September 2015; Enright, 15 September 2015; Steyn, 28 September 2015). Frustration around the toothless nature of the BRP has meant that some members have stopped attending BRP meetings (Barnes, 09 September 2015).

CHAPTER 7: CONCLUSION

This study utilised the Management and Transition Framework, a conceptual framework for water resource management regimes by Pahl-Wostl, et al., (2010), to facilitate the structured analysis of the Berg River Partnership (BRP). The BRP is an integrated management initiative that aims to address and improve the health of the Berg River catchment in the Western Cape, South Africa. The Partnership attempts to unite various government and non-government stakeholders, and to coordinate their efforts according to a predefined action plan that addresses the major drivers of pollution and environmental degradation identified within the catchment. The BRP has a unique and interesting history of establishment and although it includes actors from outside of the government sphere, government departments still largely drive the Partnership.

While Integrated Water Resource Management (IWRM) is a valuable concept, very little evidence exists to demonstrate how the theory of integration can be effectively translated into practice. Thus, this research contributes to the on-going work that seeks to move IWRM beyond a theoretical paradigm and into an effective management strategy for the sustainable management of water systems and catchments. The major weakness of IWRM stem from disparate understandings of how integration is defined, and how to implement the theoretical underpinnings of integration into water resource management scenarios.

Using a mix of the analysis secondary data such as reports and meeting minutes, and semi-structured interviews with members of the BRP, this research investigated the governance processes and structures present within the Partnership that facilitate integration within the management of the catchment. This answers the main research question motivating this study: How do different governance structures and processes enable integration to be practically incorporated in catchment management scenarios? This is achieved by identifying what governance configurations in the BRP have facilitated integration and by testing which of these configurations align to IWRM theory and thus demonstrate the successful implementation of this theory in practice.

In order to conduct this assessment, the Management and Transition Framework (MTF) was accepted as a way to conceptualise water governance systems. The MTF outlines the various components, and proposes relationships between those components, that theoretically make up water management systems. The MTF is utilised in this study in two ways: Firstly, the IWRM theory is applied to the MTF to create a set of measurable indicators that relate to the classes identified in the framework. Secondly, the MTF is used to structure the assessment of the Berg River Partnership by identifying aspects of the governance regime that can be investigated (such as actors, institutions and knowledge).

The research provided some insightful lessons regarding the practical implementation of IWRM, confirming some of the limitations noted in the literature, and highlighting some governance structures and processes that are helpful in the implementation of IWRM. The research also proved the Management and Transition Framework to be practical tool with which to conceptualise and assess water management systems.

One significant finding is that the research indicated that integration could be conceptualised as a continuum. This is an important aspect of IWRM that is demonstrated in this study. It confirms the proposals by Biswas (2004) and Merrey (2008) that IWRM should be viewed as a journey of progress, rather than a destination, and that the implementation of IWRM should be pursued in an adaptive and transitional manner. The literature notes diverse and inconsistent definitions of integration among proponents of IWRM, perhaps leading to some of the difficulties in giving integration expression in

practice. The review of academic literature on the subject, when applied to the ‘action situation’, as theorised by Pahl-Wostl, et al., (2008) gave an extensive list of how integration may be implemented, and subsequently measured, in water management scenarios. There is some focus given to holistic integration of the various physical aspects of the system into governance (e.g. the inclusion of ground water in surface water management), and a large focus on the meaningful integration of a diverse spectrum of stakeholders into governance structures (e.g. the inclusion of non-government stakeholders into the management of resources). However, with regard to this inclusion of actors, it is possible to observe different degrees or extents of integration. In its most advanced form, integration could result in actors from different sectors collaborating and sharing resources. In this case, management decisions are made by the collective of actors, action is taken together, and the cost shared by all. However, integration may also mean that actors cooperate and align their activities around united management goals, without actually working together. In this instance, actors carry out their own management activities, but adapt their strategies to more effectively coordinate their efforts with the other actors working within the governance regime. Integration, in its simplest form, may merely mean that the different actors and stakeholders are aware of the other activities within the catchment. In this case, while actors may be cognisant of other activities, there is little in the way of cooperation or coordination. Each step in this continuum builds on the next. For example, for effective collaboration and resource-sharing to occur there needs to be healthy awareness within the governance network. This continuum is demonstrated in Figure 6 below:

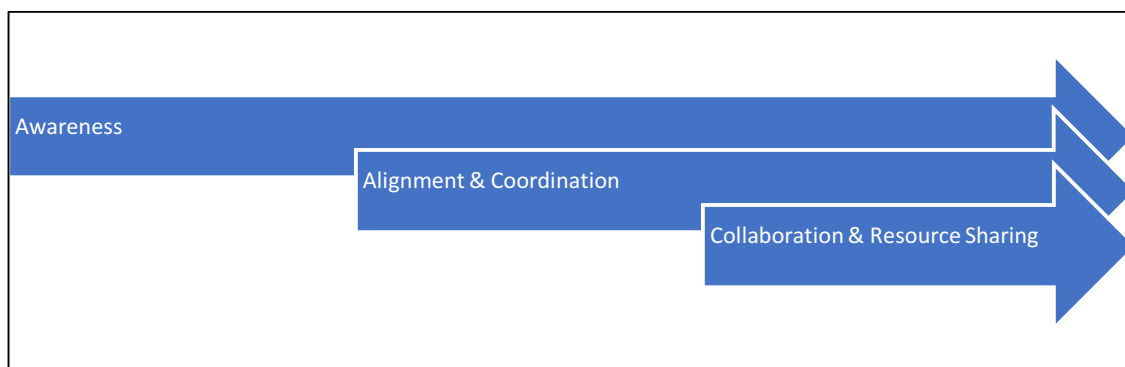


Figure 6. Integration conceptualised as a continuum

The results of this research suggest that the Berg River Partnership demonstrates strong awareness, and some alignment and coordination, but lacks significant collaboration and resource sharing. The one action situation that demonstrated substantial collaboration was water quality monitoring, with some of the other action situations giving evidence of moderate collaboration. Therefore, when assessing the results, one can draw conclusions about what governance structures and processes have been effective in leading to awareness and alignment within the BRP, and some postulation regarding what structures and processes may be lacking.

The results of the assessment of BRP documentation and interviews demonstrate that the BRP has helped to create a shared vision for sustainable management within the catchment. This is a vision shared by all actors within the BRP, and one that unites the actors in their management efforts. This shared vision has been facilitated by the input of the hired communications consultant (Chartroom), the action plan that provides a blueprint for all actors to work towards, and the regular meetings and forum provided by the BRP for feedback and reporting. Actors indicated that the BRP created a valuable platform for communication between stakeholders (Barnes, 09 September 2015; Enright, 16 September 2015; Mingo, 08 October 2015; Lintaar-Strauss, 27 October 2015). However, these actors also acknowledged that little collaboration occurs beyond this. Similarly, it was noted that the

BRP is *valuable* in the sense that it has created a platform for knowledge sharing but not *effective* in bringing about collaborative management towards improving the Berg River (Charmier, 11 September 2015). There is sense that individual actors within the BRP have continued running their own projects and activities on a business-as-usual basis, yet with increased awareness of what other actors are doing within the catchment (*ibid.*).

It is therefore questionable to assume that the BRP had driven collaboration and resource sharing. Actors noted that collaboration did occur between BRP members, but that often this collaboration was wrought outside of the BRP meetings. What the BRP did contribute was a network of knowledge and resources that actors could draw from. It was also further noted that two government departments (namely the national Department of Water and Sanitation, and the provincial Department of Environmental Affairs and Development Planning) largely drive the Partnership, with the contribution of other actors largely restricted to feedback.

Pertinent to the main aim of this research, the study of the Berg River Partnership highlighted a number of relevant lessons and contributions towards the work on IWRM and the implementation thereof. These are summarised below:

One governance structure suggested in the literature is the need for some form of bridging-institution or multi-actor platform that serves as a space for stakeholders to develop shared goals, values and perceptions (van der Keur, et al., 2008). This governance structure also facilitates the collective generation and sharing of knowledge, and allows for effective coordination and collaboration between actors. The Berg River Partnership demonstrates the necessity of creating a formal bridging-institution as a platform for integration, which intentionally draws actors from a diversity of sectors from both within and outside of government. The BRP functioned as this bridging-institution and created an institutional 'space' where these actors could interact through the structured feedback, discussions and presentations. The BRP thus facilitated multi-stakeholder dialogue, which drove the creation of united management goals, shared values and perceptions and a shared knowledge base. Implementing IWRM is particularly difficult due to the diverse interests of the different stakeholders within a catchment, and the varying evaluation criteria that these actors use. Actors also work from different sources of knowledge, and perhaps incomplete or inaccurate knowledge. These problems can be overcome to some degree through processes of participatory dialogue and the generation and sharing of knowledge within the network of actors (van der Keur, et al., 2008). Facilitated through a formal multi-actor platform such as the Berg River Partnership, a form of social learning takes place, where actors develop shared interpretations and understandings of the system and reframe their own preconceived ideas and biases. This is aided by a coproduction and sharing of knowledge among the network, as seen in the Berg River Partnership (Pahl-Wostl, 2002, 2006). The generation and sharing of knowledge among members was noted as strength of the BRP, while the regular feedback, discussions and presentations at BRP meetings facilitated awareness and knowledge sharing. The BRP was a clear demonstration of how this kind of multi-actor dialogue can be achieved, and that through the establishment of the BRP as a platform for this dialogue that integrated management was achieved.

Although some concerns were raised that integration within the BRP did not often progress beyond awareness and communication to actual cooperation and collaboration, the awareness and knowledge-sharing demonstrated within the BRP is a crucial first step towards more advanced forms of integration, as discussed above. It is important to recall that IWRM is a journey rather than a

destination, and that adaptive and transitional approaches are necessary to progressively pursue integration in its various forms. The increased awareness that the BRP afforded as a bridging-institution built trust and confidence among actors, and thus creates opportunities for further collaboration and partnership among members.

In particular, the BRP demonstrated good intra-government integration between national, provincial and local spheres. Different departments, functioning in different spheres and across sectors were brought together into the governance network by the BRP. This facilitated coordination amongst these departments that may have otherwise been lacking. However, the BRP also highlighted the need for a governance structure that incorporates non-government actors and facilitates their meaningful engagement as stakeholders. While a number of non-government actors were present within the BRP network, their meaningful engagement as stakeholders in the governance structures was less apparent (in terms of their ability to contribute to the leadership and direction of the Partnership). What was apparent, and acknowledged by BRP members, was a lack of public engagement within the Partnership, which is another crucial aspect of IWRM. The BRP here again confirms that a multi-actor platform such as the BRP needs to intentionally seek a full representation of all interests and activities within the catchment, and in particular confirms the affirmation in the theory that non-government stakeholders need to be meaningfully included in governance structures.

Another pertinent theme raised in this research is the need for geographical integration at a catchment scale. This requires representation from different sectors from across the geo-spatial extent of the catchment, from upper to lower reaches of the river system. Much of the representation and activity within the BRP was confined to the upper reaches of the catchment, with acknowledgement that a lack of representation from the lower extents was one weakness of the BRP. Geographic integration includes both government and non-government representation from across the catchment. It is often the case that, institutional boundaries do not reflect or align with the boundaries of the physical hydrological system or catchment (Horlemann & Dombrowsky, 2011). The BRP lacked full geographical representation from across the breadth of the catchment, and the actors acknowledged this as a limiting factor for integrated management.

One of the clearest lessons evident from this study BRP is that an IWRM governance structure requires strong, impartial leadership with dedicated administrative support. A strong chairperson is required to facilitate integration, and to move integration beyond communication and awareness, to collaboration and resource sharing. As far as possible, the chairperson should be free of bias and able to effectively balance the diverse needs and expectations of the members of the governance network. This was not an aspect of IWRM that was clearly demonstrated in the literature. Yet through this research it became clear that where integration is to be pursued, it requires effective leadership and coordination. Frustrations expressed by members of the BRP often centred on the inability of the Partnership to move beyond discussion to meaningful collaboration. It is proposed here that to bring about true collaboration within a governance network, strong leadership is needed. However, that leadership needs to be able to carefully manage the diverse needs and expectations of stakeholders, while maintaining clarity around roles and responsibilities and continuing to develop a shared vision among actors. Certainly the Berg River Partnership may have benefitted from a leadership structure that was underpinned by this need. Institutional arrangements that give effect to this kind of leadership in IWRM governance structures should be pursued.

The literature concerning IWRM notes the need for an institutional environment that encourages and supports integrated management. In part, this is made possible through policy integration. Policy integration describes a situation where legislation and policy relevant to different sectors is marked by a congruent environmental agenda throughout, such that all actors in different sectors have aligned

policy goals. The institutional environment must also give effect to integrated management by mandating the necessary governance structures and processes. In this instance, the BRP benefitted from broader legislative environment where there is strong alignment in policy and legislation across sectors, insofar as an environmental agenda and the responsibility for environmental care is present throughout. This goes some way to creating united management goals and evaluation criteria for actors. United vision, shared management goals, and clear roles for different actors were also facilitated in the more detailed action plan adopted by the BRP, which underpinned their activities. This action plan gave structure and purpose to the regular meetings of the BRP committee. Notably, the action plan covers relevant aspects of the physical and social systems, which is required for IWRM. However, it could be argued that the BRP action plan lacked an emphasis on socio-economic management interventions, to complement the technical interventions. Integration demands that socio-economic concerns be included in management strategies, as often there are strong links between socio-economic dysfunction and environmental degradation. The implications of a neglect of socio-economic issues is that symptomatic water quality issues are often addressed, leaving the more deeply-rooted problems driving these issues unchanged. This will result in short-term fixes that do not effect long-term remedies to the causal and underlying problems. Continued focus on purely technical interventions, while neglecting the important socio-economic problems within the catchment, will stunt the effectiveness of the BRP. As demonstrated in earlier sections, integration requires that the system be managed holistically, in part by including socio-economic issues into ecological management initiatives.

What perhaps was lacking in the case of the BRP was an institutional environment that gives legitimacy to the BRP as multi-actor governance institution, by incorporating it into formal legislated governance structures such that it has some authority to hold actors accountable, and allows for resource sharing between actors. The 'uncomfortable fit' of the BRP within existing legislated governance structures and processes sometimes hindered partnerships between actors because of restrictive guidelines and processes that governed their operations. What is required for the effective implementation of IWRM is a legislative environment that accommodates and legitimises the establishment of bridging organisations such as the BRP. Research into water resource management has demonstrated that newly established catchment-scale organisations may conflict with existing governance structures that are organised at traditional administrative jurisdictions (Herrfahrdt-Pähle, 2010; Moss, 2012; Pollard and du Toit, 2011). Therefore IWRM may require some broader institutional reform, as suggested in the literature (Hooper, 2010; Loorbach, 2010). In particular, the institutional environment needs to facilitate effective follow-up monitoring and accountability, which was a noted weakness in the BRP.

The experience of the BRP in this regard suggests how this aspect of IWRM theory can be implemented. What this confirms is the theoretical need for policy integration at a broad level, and a more detailed action plan to be developed and adopted by the actors in the governance network. It also emphasises that, in particular, the legislative environment needs to give legitimacy to the bridging institution as a governance structure.

This research has confirmed how certain governance processes and structures can be implemented in water resource management to facilitate integrated management, and contribute to the sustainable management of that resource. However this research has also confirmed some of the limitations criticisms regarding the practical implementation of IWRM, requiring further work and research to address these issues. Both of these broad results contribute to the on-going work on IWRM as a water management paradigm. In particular, this study confirms some of the theoretical principles of IWRM

by demonstrating how they have been brought into effect in the case of the Berg River Partnership. The BRP demonstrated the following:

The BRP confirms the theoretical principle of establishing formal multi-actor governance structures that are inclusive of actors that represent the diverse interests and aspects of the hydrological and socioeconomic systems at a catchment scale. These governance structures provide platforms for multi-actor dialogue and social learning that contribute to the creation of shared values, management goals, perceptions, and evaluation criteria. These governance structures also provide a platform for the co-generation and sharing of knowledge between actors. The BRP demonstrated that these are necessary processes for integrated management efforts, by improving awareness and facilitating improved coordination and potential collaboration between actors.

IWRM theory also suggests that effective integration is facilitated by ensuring that actors work according to clearly defined roles, that are complementary and united by a shared management goal. The frustration expressed by BRP members regarding the confusion about certain roles within the Partnership is evidence for this need. In this instance, the action plan adopted by the BRP is an example of how clear and complementary roles can be established within a governance network, and how these can facilitate integration by coordinating the efforts of the network of actors. The use of a strategic action plan also fosters a shared management goal for the actors involved. This case study went further by demonstrating that to move integration forward in a water management scenario, that strong leadership is required to facilitate collaboration and to give effect to the action plan. IWRM theory notes the challenge of divergent interests and needs within a catchment, and through careful leadership these interests can be managed through the creation of shared management goals and clear strategy.

The BRP demonstrated especially improved intra-government coordination driven by the Partnership, but also highlighted the need for the meaningful involvement of non-government actors. The BRP is an example of how non-government actors can be excluded from governance processes. It also showed that even when included in the governance structures, the involvement of non-government actors could be restricted. IWRM theory notes this as a weakness of integrated management implementation, and so this suggests that institutional arrangements in IWRM governance structures need to ensure the meaningful participation of non-government actors.

The BRP lacked an emphasis on socioeconomic interventions in its action plan, to complement the technical management interventions undertaken in the catchment. This confirms the criticisms highlighted in the literature that IWRM initiatives often neglect these aspects of integrated management and suggests that this is an area of policy integration that should still be explored.

This study of the BRP confirmed the theoretical principle that the external institutional environment, as well as internal institutional arrangements, are critical determinants of how effectively integration can be implemented. In the present case, the external legislative environment did promote a shared pursuit of environmentally sustainable management practices by ensuring that this was a consistent policy goal for all actors in the catchment. However, the legislative environment did not give sufficient legitimacy to the Berg River Partnership as an institution, and thus it lacked the ability to enforce accountability and facilitate the co-funding of management interventions, which are important theoretical aspects of IWRM. Instead, the activities and relationships between actors in the BRP were restricted by the institutional arrangements particular to each actor.

The usefulness of the Management and Transition Framework (MTF) was also demonstrated through this research. The MTF provides a helpful and comprehensive framework that enables a complex

water management system to be assessed in a structured and manageable manner. The MTF is particularly helpful in explaining how different aspects of a water management system relate to one another. These principles are crucial to developing an accurate understanding of how the values of IWRM can apply to a water management scenario. In this study, the MTF was used to establish pragmatic indicators of IWRM, relating to the various aspects and processes of water management systems. This meant that the different aspects and forms IWRM could be investigated and measured within the Berg River Partnership, and the IWRM governance structures proposed in the literature could be tested. This methodology can thus be applied to future studies of water management scenarios such as the Berg River Partnership, with each study contributing further findings to the ongoing work on establishing effective ways to implement IWRM.

RECOMMENDATIONS FOR FUTURE RESEARCH

While this research has been valuable as a pilot study for the investigation of IWRM using the Management the Transition Framework (MTF) in a working case study, there are several avenues for future research that may build upon this work. Firstly, a follow-up study of the Berg River Partnership could provide insight into the degree to which the governance structures and processes identified herein have been successful in facilitating integrated resource management in the longer term. Secondly, similar research conducted in additional case studies will help to refine the theoretical application of the Management and Transition Framework as a conceptual framework in practice, and contribute to improving our understanding of how the MTF may explain the complex processes and linkages in water governance systems. Similar research will also contribute to the growing work on transitioning IWRM from a body of management philosophy into pragmatic guidelines for the implementation of integrated management of water resources in practice.

Furthermore, although beyond the scope of this initial research, it is suggested that further investigation into the imbalance of power and involvement of certain actors in the BRP be conducted. It was noted in the findings that certain actors were more meaningfully involved in the Partnership than others. To foster better integration of management, all actors need to have meaningful participation in the governance network. It would be useful to investigate the reasons behind the imbalance of power, representation and involvement (including an exploration into power, race and class dynamics) so as to suggest ways in which to encourage equal involvement and representation of all actors.

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APPENDICES

APPENDIX 1 – BERG RIVER PARTNERSHIP ATTENDEES AND MEMBERSHIP

Name	BRP Actor Represented	Designation	Sectoral Interest
K Johnson	Aurecon	Private Sector	Private Sector: Engineering
A Visser	Berg River Main Irrigation Board	User Association	User Association: Agriculture
G Booysen	Berg River Main Irrigation Board	User Association	User Association: Agriculture
W Enright	Berg River Main Irrigation Board	User Association	User Association: Agriculture
H Keyser	Cape Winelands District Municipality	Government	Local Government
L Neethling	CASIDRA	Government	Government Agency
A September	CASIDRA	Government	Government Agency
E Deventer	CASIDRA	Government	Government Agency
W van Schalkwyk	Chatroom	Private Sector	Private Sector: Communications / Public Relations Consultancy
M van Schalkwyk	Chatroom	Private Sector	Private Sector: Communications / Public Relations Consultancy
C Sunday	Chatroom	Private Sector	Private Sector: Communications / Public Relations Consultancy
M O'Brien	Chatroom	Private Sector	Private Sector: Communications / Public Relations Consultancy
J Chamier	CSIR	Parastatal	Government-Funded Research Agency
K Nortje	CSIR	Parastatal	Government-Funded Research Agency
M Steyn	CSIR	Parastatal	Government-Funded Research Agency
B Genthe	CSIR	Parastatal	Government-Funded Research Agency
W de Jager	CSIR	Parastatal	Government-Funded Research Agency

W Wentzel	Department of Environmental Affairs / Working for Water	Government	National Government
A Moerat	Department of Environmental Affairs	Government	National Government
F Steyn	Department of Agriculture	Government	National Government
P Keuck	Department of Agriculture	Government	National Government
J Strauss	Department of Agriculture	Government	National Government
J Leaner	Department of Environmental Affairs & Development Planning	Government	Provincial Government
M Kunneke	Department of Environmental Affairs & Development Planning	Government	Provincial Government
E Roux	Department of Environmental Affairs & Development Planning	Government	Provincial Government
C Bill	Department of Environmental Affairs & Development Planning	Government	Provincial Government
Z Brown	Department of Environmental Affairs & Development Planning	Government	Provincial Government
A Horn	Department of Environmental Affairs & Development Planning	Government	Provincial Government
J Mingo	Department of Environmental Affairs & Development Planning	Government	Provincial Government
R Mehl	Department of Environmental Affairs & Development Planning	Government	Provincial Government
L Spele	Department of Environmental Affairs & Development Planning	Government	Provincial Government
H Peck	Department of Environmental Affairs & Development Planning	Government	Provincial Government
I Toerien	Department of Local Government	Government	National Government
D Daniels	Department of Water & Sanitation	Government	National Government
W Kloppers	Department of Water & Sanitation	Government	National Government
F Rhoda	Department of Water & Sanitation	Government	National Government
N Ndobeni	Department of Water & Sanitation	Government	National Government
L Vhengani	Department of Water & Sanitation	Government	National Government
D Japhtha	Department of Water & Sanitation	Government	National Government

M Lintnaar-Strauss	Department of Water & Sanitation	Government	National Government
B Mtandana	Department of Water & Sanitation	Government	National Government
D Jephtha	Department of Water & Sanitation	Government	National Government
P Viljoen	Department of Water & Sanitation	Government	National Government
N Vermaak	Department of Water & Sanitation	Government	National Government
V Ligudu	Department of Water & Sanitation	Government	National Government
F Rhoda	Department of Water & Sanitation	Government	National Government
B Mtandana	Department of Water & Sanitation	Government	National Government
D Jephta	Department of Water & Sanitation	Government	National Government
D Japhtha	Department of Water & Sanitation	Government	National Government
B Masela	Department of Water & Sanitation	Government	National Government
P Mbunquka	Department of Water & Sanitation	Government	National Government
J Knaggs	Drakenstein Municipality	Government	Local Government
S Reece	Drakenstein Municipality	Government	Local Government
A Kleyn	Fruitworks	Private Sector	Private Sector: Agriculture
A Rabie	Fruitworks	Private Sector	Private Sector: Agriculture
F Wolfaardt	Fruitworks	Private Sector	Private Sector: Agriculture
J Viljoen	Fruitworks	Private Sector	Private Sector: Agriculture
W Sawall	Fruitworks	Private Sector	Private Sector: Agriculture
L Benic	Hortgro	Private Sector	Private Sector: Agriculture Research
R Louw	Hortgro	Private Sector	Private Sector: Agriculture Research
L Benic	Hortgro	Private Sector	Private Sector: Agriculture Research

J Jeffrey	Representative of Private Landowners	User Association	Private Landowners Representative
B Dyers	Stellenbosch Municipality	Government	Local Government
S Langner	Stellenbosch Municipality	Government	Local Government
A Brand	Stellenbosch University	Education	University: Research
J Barnes	Stellenbosch University	Education	University: Research
P Muller	Ubuntu Water Quality	Private Sector	Private Sector: Research
K Winter	University of Cape Town	Education	University: Research
G Titus	West Coast District Municipality	Government	Local Government
N Faasen	West Coast District Municipality	Government	Local Government
M Lewarne	WWF	NGO	NGO: Conservation
T Kanyerere	University of Western Cape	Education	University: Research
M Solomon	City of Cape Town	Government	Local Government
L Nel	Living Lands	NGO	NGO: Conservation
M Zwinveldt	Living Lands	NGO	NGO: Conservation
H Gieshe	Delfland Water Authority	Foreign Government	Foreign Government

APPENDIX 2 – INTERVIEW QUESTIONNAIRE

RESEARCH CONSENT FORM

PROJECT: A Study of an Integrated Management Initiative to Improve the Berg River, Western Cape, South Africa

RESEARCHER: Kent Locke

Environmental & Geographical Science Building, South Lane, Upper Campus, University of Cape Town,
Private Bag X3, Rondebosch 7701

EMAIL: [REDACTED]

TEL: [REDACTED]

NAME OF PARTICIPANT: _____

NATURE OF RESEARCH: Interview/questionnaire

PARTICIPANT INVOLVEMENT: The participant is asked to take part in a semi-structured interview, guided by a set research questions, with a focus on their involvement in, and experiences of, the Berg River Partnership. It is expected that this interview will take approximately 1 hour. There are no obvious risks involved in participating in this research. Notwithstanding this, if the participant feels that the information being gathered is of a sensitive nature, anonymity is offered and the participant has the option to withdraw at any stage. There are no costs involved and no payment is offered for participation.

- I agree to participate in this research project.
- I have read this consent form and the information it contains and have had the opportunity to ask questions about them.
- I agree to my responses being used for education and research on condition that my privacy is respected, subject to the following:
 - I understand that my personal details may be included in the research.
 - I understand that I am under no obligation to take part in this project.
 - I understand I have the right to withdraw from this project at any stage.
 - I understand that this research might be published in a research journal or book. In the case of dissertation research, the document will be available to readers in a university library in printed form, and possibly in electronic form as well.

Anonymity Requested (Y/N): _____

Signature of Participant: _____

Signature of person who sought consent: _____

Name of person who sought consent: _____

Date: _____

Name: _____ *

**Name is for record purposes only and shall only be published with the willing consent of the participant.*

Name of organisation represented: _____

Sector under which organisation falls: _____

1. Do you represent any other interests / organisations within the Berg River Partnership?
2. How long have you been involved in the Berg River Partnership? What is your knowledge of its history?
3. What activities do you/your organisation undertake in the Berg River Catchment?
4. Why is the Berg River important to your organisation's interests?
5. How would you describe the current state of the Berg River?
6. What is your main concern about the Berg River? Please explain your answer.
7. Please describe your role in the Berg River Partnership.
8. Why has your organisation become involved in the Berg River Partnership?
9. Is your work in the BRP mandated by any legislation or formal policies?
10. The following set of questions focus on any specific activities/initiatives that your organisation is involved in within the Berg River Partnership. If you are involved in more than one activity please answer the questions below as they pertain to each separate activity.
 - a. What do you do?
 - b. Who else do you work with around this particular activity?
 - c. How do you work together?
 - d. Where does this activity take place within the catchment?
 - e. Why do you see this work as necessary?
 - f. How is this work financed?
 - g. Is this work as a result of your membership in the BRP?
11. Since becoming a member of the Partnership, have you joined any networks or subcommittees?
12. Are you learning new knowledge from the Berg River Partnership, and if so what kind of knowledge?
13. What knowledge have you created and/or shared with other people in Berg River Partnership?
14. How would you describe the overall role of the Berg River Partnership?
15. Would you say it has been effective in this regard?
16. Are there any challenges to your efforts to improve/manage the Berg River?