An Investigation into How Value is Created Through Water Sensitive Urban Design

by

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ABSTRACT

A key challenge facing developing countries is the rapid increases in urbanisation and the effect this has on their water systems. Water sensitive urban design (WSUD) is a process that considers the entire water system with the aim of achieving a water sensitive city (WSC). However, little is known about how value can be created through WSUD in terms of the sustainability of urban precincts in South Africa. The researcher therefore considered the well-established literature highlighting the relationship between WSUD and sustainable urban development. To understand the value derived from these concepts, two case studies were assessed, namely the Victoria & Alfred Waterfront (V&A Waterfront) and Century City. However, it should be highlighted that due to the uniqueness of these cases, no generalisations from the findings can be generated.

The methodology implemented for the case studies was social constructivist in nature and to satisfy the research objectives, semi-structured interviews were conducted, documentary material was gathered, and photographic evidence was collected. Moreover, a diverse collection of data was assessed, which was extracted through various methods of data collection, thereby resulting in an in-depth understanding of the case studies.

This research concludes there is a relationship between WSUD, sustainable urban development and value. It further argues that the underlying principles of facilities management (FM) and more specifically urban FM provide a managerial framework that can connect these concepts to achieve sustainability for urban precincts. Furthermore, the study uncovered the need for value capture mechanisms as a form of infrastructure financing and value creation for urban precincts. However, it was established that neither case study make use of such mechanisms, so future research is required in this regard.

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LIST OF ABBREVIATIONS

ACC	African Centre for Cities
ADEC	African Development Economic Consultants
BID	Business Improvement District
CID	Central Improvement District
CCPOA	Century City Property Owners' Association
CTCC	Cape Town City Council
CoGTA	Department of Cooperative Governance and Traditional Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
ES	Ecosystem Services
EPA	Environmental Protection Agency
FM	Facilities Management
GI	Green Infrastructure
GWP	Global Water Partnership
ICT	Information and Communication Technology
IUCN	International Union for Conservation of Nature
IUWM	Integrated Urban Water Management
IUWRM	Integrated Urban Water Resources Management
IWRM	Integrated Water Resources Management
IWA	International Water Association
LVIT	Land Value Increment Taxes
NDP	National Development Plan
NWRS	National Water Resource Strategy
PIC	Public Investment Corporation
PPP	Public-Private Partnerships
RICS	Royal Institute of Chartered Surveyors
RSA	Republic of South Africa
RSC	Regional Services Council
SANDF	South African National Defence Force
SuDS	Sustainable Drainage Systems

SUWM	Sustainable Urban Water Management
TEEB	The Economics of Ecosystems and Biodiversity
TIF	Tax Increment Financing
TOD	Transit-oriented Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UN	United Nations
UWM	Urban Water Management
WCED	World Commission on Environment and Development
WRM	Water Resource Management
WRC	Water Research Commission
WSC	Water Sensitive City
WSUD	Water Sensitive Urban Design
WWAP	World Water Assessment Programme
WWF	World Wide Fund for Nature
V&A Waterfront	Victoria & Alfred Waterfront

CHAPTER 1 INTRODUCTION

1.1 Introduction

This chapter provides a background to the research, including urban water management (UWM), water sensitive urban design (WSUD), value capture, and urban facilities management (FM). A description of the research problem underlying the research question introduces the document's purpose. Following this, the research aim, proposition and objectives are outlined together with any limitations associated with the study. The chapter concludes with an outline of the dissertation.

1.2 Research background

The rapid increase in urbanisation, climate change and industrialisation is leading to negative environmental and social consequences for water systems, which in turn is focusing worldwide attention on UWM (Carden, 2013). A current initiative driven by the United Nations (UN), *World Water Day*, epitomises this issue, emphasising the need to preserve and nurture this precious resource (UN Water, 2015). In 2016, *World Water Day* focused on 'Water and Sustainable Development', which was also the theme of the annual UN World Water Development Report (published in collaboration with the World Water Assessment Programme (WWAP) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), highlighting the importance of water influencing *inter alia:* health, nature, and energy (WWAP, 2015). In addition, the UN Department of Economic and Social Affairs has stated that one million people move into cities every week, with 93% of that urbanisation occurring in poor or developing countries (UN Water, 2015). As such, water and subsequent UWM are areas of major concern (World Water Council, 2015).

Globally, it is accepted that the planet could be rapidly approaching an international water crisis (World Water Council, 2015). The most recent UN World Water Development Report has, however, identified that this 'crisis' is not necessarily resource-related, but rather one associated with governance, and

therefore amendable through improved management systems (WWAP, 2015). Urban water systems should be able to meet the ever-changing synthetic (man-made) and environmental demands, without upsetting the associated environmental and ecological integrity of the system (Carden, 2013). These demands are worsened by the unprecedented rate of urbanisation and subsequent development within cities – hence the UN Water's focus on 'Water and Sustainable Development' (WWAP, 2015). By the same token, as over half the world's population lives in cities, the concept of sustainable cities is a primary focus on the international agenda (Carden, 2013; UN Water, 2015). In this regard, McCormick *et al.* (2013) have argued that urban spaces and particularly urban precincts play a fundamental role in achieving a sustainable city.

The WWAP noted that effective management of water systems through increased investment in water infrastructure and capacity development are major aspects of achieving a sustainable city, and therefore absorbing the rapid increase in urbanisation (Carden, 2013; WWAP, 2015). In doing so, these water systems should aim to withstand the associated social and economic development pressures. However, it has been previously suggested that urban infrastructure and therefore UWM issues vary significantly between developed and developing countries and that there are disparate standpoints when it comes to the degree of investment and the pressing issue of developed and developing countries' ability to improve urban water sustainability (Tejada-Guibert & Zandaryaa, 2010).

WaterAid (2015) has exposed concerning statistics estimating that only one in ten of the world's population has access to safe water, one third of the world does not have access to adequate sanitation, and over five hundred thousand children die every year because of unsafe water and poor sanitation. Unfortunately, these statistics are heavily weighted towards developing countries, with South Africa being one of them (Barilla Group *et al.*, 2009; Department of Water Affairs (DWA), 2013a). More recently, the DWA released an article titled '*there is no substitute for water*' in which it explains that the supply of water is a major challenge and that intervention is the key to resolving these

issues (Simelane, 2015: 1) if it is to reach its 2030 NDP target of all South Africans having affordable access to sufficient safe water and hygienic sanitation to live healthy and dignified lives.

1.2.1 Urban water management in South Africa

Water management and water scarcity is an increasingly prevalent problem facing South Africa's rapidly urbanising economy (Armitage *et al.*, 2013a; DWA, 2013a). In many developing economies, including South Africa, the provision of water is a primary challenge (Barilla Group *et al.*, 2009; Muller *et al.*, 2009; Armitage *et al.*, 2013a; Armitage *et al.*, 2014; Lamond *et al.*, 2014).

Integrated Water Resources Management (IWRM) is a concept directly related to existing water management systems and, together with water efficiency planning, has gradually gained attention over the past 20 years (Carden, 2013). Carden (2013) goes on to explain that principles such as a balancing competing uses of water, water use efficiency, the application of appropriately sound technology and equity of access are all factors relating to IWRM. More recently, Martínez-Santos *et al.* (2014) describe IWRM as a paradigm that essentially promotes the responsible use of water by considering cross-sectoral dependencies. It has however been accepted that there are many ways to define IWRM, or rather that IWRM has no unique definition due to varying topography, planning objectives, and so on, of any given catchment (Carden, 2013; Martínez-Santos *et al.*, 2014). The most widely accepted definition for IWRM, proposed by the Global Water Partnership (GWP), is as follows:

> *"… a process that promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (GWP, 2010: 1).*

As mentioned above, there are disparate views and differences when it comes to UWM between developed and developing countries; the same is true of IWRM. Schulze (2007: 275) explains this notion by describing how poorer infrastructures and associated management systems are more vulnerable to natural abnormalities. As such, developing cities direct their focus towards more

pressing, '*life-threatening'* issues such as management of water scarcity. Conversely, a developed city, with advanced infrastructure, can focus on *'non-life-threatening'* issues such as the preservation of the environment or the improvement of existing infrastructure. To illustrate this point, Schulze (2007: 276) contrasts primary areas of focus between developed and developing cities, as depicted in Table 1.1.

Table 1.1: Urban water management issues – developed vs. developing cities (Source: adapted from Schulze (2007: 276))

Developing cities	Developed cities
Providing basic potable water supplies to households	Providing water of the highest quality
Managing water supply	Managing water demand
Poverty alleviation	Quality of life enhancement
Harnessing the local environment	Sustaining the local environment
Seeking short-term needs	Implementing long-term perspectives
Creating a basic infrastructure	Maintaining and improving existing infrastructure

These contrasting focus points of UWM systems between developing and developed cities is fundamental to this research, as IWRM is a principle endorsed by the National Water Act of South Africa (Act 36 of 1998) (Department of Water Affairs and Forestry (DWAF), 2004). As South Africa would fall within the Developing Cities' classification, it is important to note that IWRM has experienced difficulties in practice because local municipalities' experience challenges from a technical or administrative perspective to fulfil such water service delivery functions (Haigh *et al.*, 2010; Giordano and Shah, 2014).

Another key concept, which focuses on urban areas and extends the definition of IWRM, is that of Integrated Urban Water Resources Management (IUWRM). Anderson and Iyaduri (2003: 21) refer to IUWRM as:

> *"… a structured planning process to evaluate concurrently the opportunities to improve the management of water, sewerage and drainage services within an urban area in ways which are consistent with broader catchment and river management objectives."*

Importantly, IUWRM disregards the linear approach of treating water supply and wastewater separately, but rather integrates all urban related water. To this end, water supply, sanitation, urban stormwater, urban runoff and waste disposal can be treated synonymously, in an effort to achieve a balance between economic, social, environmental and political objectives (Carden, 2013). Carden (2013) goes on to explain how IUWRM in a South African context has not been successfully implemented primarily because of a lack of integration between local authorities, particularly Water Resource Management (WRM) and water service provision at a provincial and national level (Muller, 2012). In this regard, it is internationally accepted that local government is responsible for the financing of green spaces, including those that influence water (van Zoest & Hopman, 2014).

Armitage *et al.* (2014: 2) argue along similar lines, stating that the historic, linear approach to UWM requires "*alternative, systems-based approaches to conventional water management of water supply and modes of ensuring water quality."* They explain that this 'systems- based' approach should be one with various objectives, including sanitation, water treatment and drainage. Such systems could transform 'water-wasteful' urban areas into 'water-sensitive' areas/cities.

1.2.2 Introducing water sensitive urban design (WSUD)

Brown *et al.* (2008) first proposed the concept of a water sensitive city (WSC). A subsequent conceptual framework for benchmarking the evolution towards a WSC was then put forward by Brown *et al.* (2009). This framework to ensure that water attains due prominence was envisaged bearing in mind what the Australians term Water Sensitive Urban Design (WSUD) (Armitage *et al.*, 2014).

In 1992, Mouritz first conceptualised WSUD in Australia (Fletcher *et al.*, 2014), in his doctoral dissertation. Whelans *et al.* (1994) then published a report for the Western Australian Government in response to challenges relating to the quality, quantity and drainage of water (Armitage *et al.*, 2014; Fletcher *et al.*, 2014). The next few years saw numerous definitions and explanations of WSUD, with primary commonality surrounding the notion that there is a ''*need to consider*

stormwater management within an integrated framework considering the entire urban water cycle'' (Mouritz *et al.*, 2006; Wong, 2007; Fletcher *et al.*, 2014: 4).

In South Africa, WSUD is a new paradigm in UWM and it involves the *"integration of the entire urban water cycle – including stormwater – with urban design*"(Armitage *et al.*, 2013a: 1). More recently, Armitage *et al.* (2014) contend that ecologically sustainable development is the central theme of WSUD. In other words, sustainable urban water management is achievable when all components of the water cycle and their interaction with urban design are considered – including urban water infrastructure and the design and planning process associated with this (Armitage *et al.*, 2014).

However, Armitage *et al.* (2014) also propose that, although the concept of WSUD is indeed applicable in a South African context and may assist with confronting the challenges within our water sector, the framework needs to be contextualised from its current form to meet South Africa's unique water challenges. To this end, the South African Water Research Commission (WRC) solicited research propositions in 2011 with the intention of providing direction to UWM decision-makers in terms of the use of WSUD in a South African context (Armitage *et al.*, 2014). These proposals intended to extend WRC Project no. K5/1826 'Alternative Technology for Stormwater Management' (Armitage *et al.*, 2013b), which provided guidelines for the implementation of sustainable drainage systems (SuDS) in South Africa.

1.2.3 Sustainable drainage systems (SuDS) and WSUD

The increase in urbanisation has had a corresponding influence on urban stormwater and the management of urban drainage when it comes to humans and aquatic ecosystems (Chocat *et al.*, 2001; Fletcher *et al.*, 2014). In South Africa, stormwater management largely focuses on collection and distribution to the nearest watercourse, with impetus on quantity (flow) rather than environmental preservation (Armitage *et al.*, 2013b). Globally, however, the emphasis has shifted from conventional urban drainage approaches (largely aimed at reducing flooding) to alternative, multi-dimensional systems that essentially aim to protect the environment (Fletcher *et al.*, 2014; Lamond *et al.*,

2014). Recently, South Africa has paid increased attention to these alternative approaches that consider stormwater as part of the urban water cycle (the concept of WSUD) (Armitage *et al.*, 2013b), with the objective of reducing pollution, siltation and erosion by managing stormwater more sustainably and in part, through SuDS (Fletcher *et al.*, 2014).

The notion of sustainable drainage was initially advocated by Butler and Parkinson (1997) and D'Arcy (1998) whereby becoming ''less unsustainable'' was promoted (Butler & Parkinson, 1997: i). This was in line with O'Regan and Moles (1997) who maintained that conventional drainage practice was failing due to a lack of understanding of the underlying structure of urban systems (Armitage *et al.*, 2013a). A major set of guidance documents, published in 2000 for England, Northern Ireland, Scotland and Wales, formalised the term 'sustainable drainage systems' (Construction Industry Research and Information Association (CIRIA), 2000).

French *et al.* (2011) explain that conventional piped drainage systems were designed to accommodate lower density urban areas. Increased pluvial flooding and associated pollution has been established to be the result not only of changing weather patterns but also of increased urbanisation and subsequent development (Lamond *et al.*, 2014). As retrofitting these drainage systems is time-consuming, expensive and disruptive to the urban affected segments, alternative systems need to be designed to imitate and restore natural infiltration patterns (Armitage *et al.*, 2014; Lamond *et al.*, 2014). These systems should therefore aim to integrate the entire urban water cycle – including stormwater – with urban design (the concept of WSUD), thereby improving water quality and attenuating peak flows. In this regard, the use of SuDS, and therefore also stormwater, can be perceived as an asset, rather than as waste needing to be disposed of via the closest watercourse (Armitage *et al.*, 2013b; Armitage *et al.*, 2014; Fletcher *et al.*, 2014).

Armitage *et al.* (2014: xxvi) define SuDS as:

> *"…a sequence of management practices and/or control structures or technologies designed to drain surface water in a more sustainable manner than conventional techniques."*

They explain that SuDS have the potential to mitigate the negative environmental impact associated with stormwater through improved water quality treatment, water quantity management, maintenance of biodiversity and enhanced amenity. This aligns directly with the Fletcher *et al.* (2014) theory that urban drainage actually presents opportunities rather than just problems.

SuDS manage the quantity and quality effects of urban runoff by dealing with stormwater as close to its source as possible, aiming to promote more natural drainage (Armitage *et al.*, 2013b). In doing so, SuDS attempt to manage quantity, quality, amenity and biodiversity more effectively. Thus, the concept whereby stormwater forms part of the urban water cycle (WSUD), with the stormwater management component being known as SuDS, is widely accepted. SuDS (and WSUD) "*attempt to manage surface water drainage systems holistically in line with the ideals of sustainable development"* (Armitage *et al.*, 2013a: iii). Moreover, Armitage *et al.* (2013b) describe the alternative technology available for stormwater management. In their paper, three intervention points are identified in the treatment of stormwater, each pertaining to permutations of SuDS options, for example, the use of 'retention ponds' for non-potable water re-use (Armitage *et al.*, 2013b).

1.2.4 Collating WSUD and water sensitivity within the built environment

WSUD and (sustainable) development planning in South Africa are integral to future economic growth and resource consumption (Armitage *et al.*, 2014). The National Development Plan (NDP) and the National Water Resource Strategy 2 (NWRS-2) are important documents that aim to guide the management of the water sector. The NDP, published by the National Planning Commission (Republic of South Africa (RSA), 2011b), aims to reduce inequality and eradicate poverty; the NWRS-2, issued by the DWA (2013a) stresses that water is fundamental to equitable social and economic development. Armitage *et al.*

(2014) argue that WSUD can augment the objectives of these documents to achieve the overarching goal of a WSC.

As mentioned earlier, the notion of a WSC was conceptualised by Brown *et al.* (2008) as a city where water receives due prominence. WSUD was then found to be an integral concept in the creation of a WSC (Brown *et al.*, 2009). To this end, water sensitivity is a paradigm that maintains significant influence when assessing a city's attention to water. It has been defined as a theory "*that provides a vision to identify the most viable options for managing water availability (either too little or too much) and water quality"* (Ashley *et al.*, 2013: 66). Other authors highlight the link between water sensitivity, urban design, liveability and place-making (Brown, 2012), with the ultimate goal of sustainable urban water management within a sustainable, water-sensitive city (Ashley *et al.*, 2013). In South Africa, therefore, water sensitivity needs to be defined to put into context the influence that WSUD may have in benchmarking a WSC. Armitage *et al.* (2014: ii) define water sensitivity as:

> *"…the management of the country's urban water resources through the integration of the various disciplines of engineering, social and environmental sciences."*

They expand on this definition in a South African context by acknowledging that South Africa is a water scarce country (Kusangaya *et al.*, 2014); water is a finite and precious resource, fundamental to sustaining all life and development, as well as the broader environment (DWAF, 2011; Ranchod *et al.*, 2015); it is a basic human right to have access to adequate potable water (Mokonyane, 2015); water should be viewed as an economic good (Cullet, 2014); and water management should surround the notion of a participatory approach (Brown, 2011).

This definition and subsequent expansion of water sensitivity and its implications for WSUD in South Africa reveal how intrinsically linked WSUD and the built environment are, particularly when it comes to sustainable development (Ashley *et al.*, 2013).

1.2.5 WSUD and sustainable development

The role of water, within the construct of sustainable development, has gained significant attention in recent years (McCormick *et al.*, 2013; Lamond *et al.*, 2014). For example, the use of stormwater for non-potable requirements, in an attempt to reduce the demand for potable water, has received substantial attention since the early 1990s (Hatt *et al.*, 2006). This was in response to global freshwater consumption increases surpassing population increases by more than 50 percent (Harris, 2006). To this end, Potter *et al.* (2011) recognised the cost benefits of linking water with other urban services, as opposed to dealing with water, urban design and other services separately. More recently, urban planners, architects and designers have recognised the value of water in an urban context, as well as the importance of 'green infrastructure' (GI) (Elmer & Fraker, 2012). Keeley *et al.* (2013: 1093) define GI as a:

> *"…general term referring to the management of landscapes in ways that generate human and ecosystem benefits."*

GI is used to achieve stormwater management goals and is a term used in conjunction with other urban stormwater terms such as SuDS and WSUD (Keeley *et al.*, 2013).

In this regard, WSUD has been defined as a paradigm that:

> *"…seeks to maximise opportunities for living with and exploiting the supply, use, reuse and management of waste water to enhance and support human health and wellbeing by minimising the impacts of urbanisation on the natural environment and water cycle"* (Ashley *et al.,* 2013: 67).

This is achievable by, among others, protecting and enhancing natural landscapes, using natural water systems to reconnect synthetic structures and natural landscapes, and SuDS (Armitage *et al.*, 2013b; Ashley *et al.*, 2013). In this way, the social and economic development pressures of UWM, mentioned by Carden (2013) can be absorbed – thereby increasing biodiversity, improving microclimates and enhancing amenity. The WSUD principles should therefore include multidisciplinary sectors aiming to most effectively design and plan

urban areas in a way that harnesses sustainable development (Ashley *et al.*, 2013).

Ashley *et al.* (2013) expand on this concept by highlighting the relationship between WSUD and sustainable development, drawing on Hoban *et al.* (2006) as depicted in Figure 1.1.

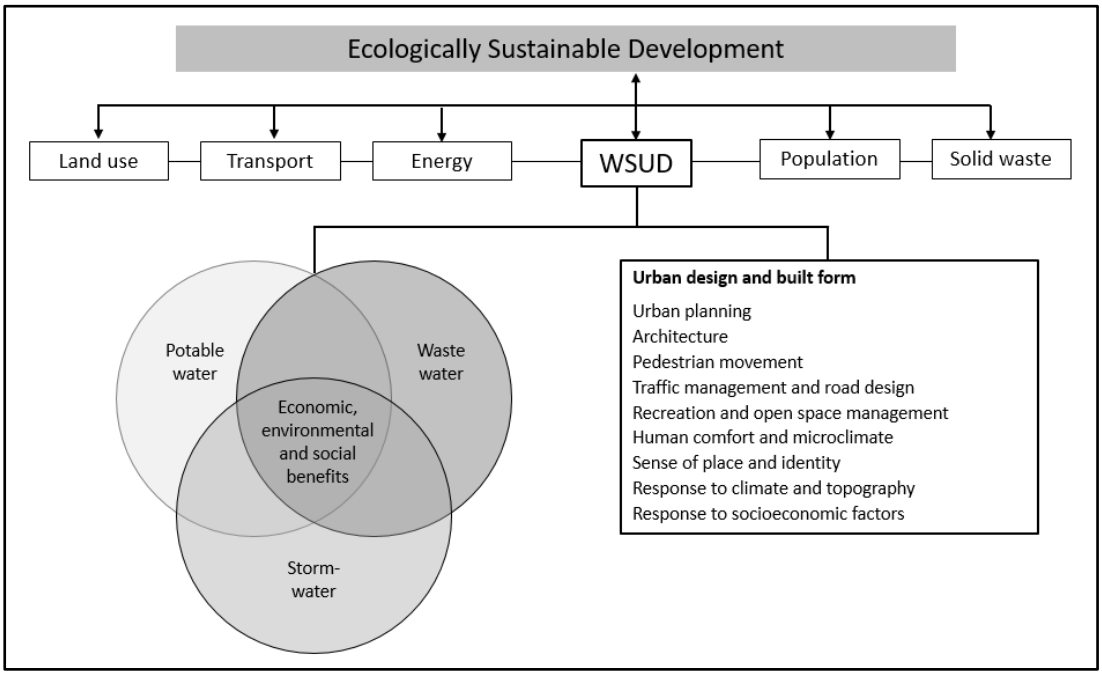


Figure 1.1: The Interactions between WSUD, the Built Environment, and the Urban Water Cycle (Source: Hoban *et al.* (2006: 9))

Figure 1.1 highlights how the management of water in urban areas is fundamental to future sustainability (Ellis & Revitt, 2010; Potter *et al.*, 2011; Ashley *et al.*, 2013). By the same token, the WRC describes how the management of water in urban areas is an area of strategic importance, and that an alternative approach to conventional UWM is needed to ensure the sustainability of our cities (Armitage *et al.*, 2014; WRC, 2015).

The Environmental Protection Agency (EPA) defines sustainability as "*creating and maintaining the surroundings under which humans and nature can exist in productive harmony*" (EPA, 2015: 1). The frequently quoted Brundtland Report in '*Our Common Future'* by the World Commission on Environment and Development (WCED) defines sustainable development as "*development which*

meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 43).

Moreover, sustainable development is said to address the '*triple bottom line*' – the phrase first proposed by Elkington (1994: 1) as economic, social and environmental sustainability. However, Allen (2001) argues that this model does not portray the balance or contradictions inherent in the pursuit of the triple bottom line. Moreover, Allen (2001) argues that the relationship among development, growth, environment, macro-strategies and social problems at an urban level is not depicted in this model. Five categories were suggested to assess sustainable urban development; there were later adapted by Pieterse (2010) into a five-dimensional model, namely: economic, social, physical, ecological and political sustainability as depicted in his model shown in Figure 1.2.

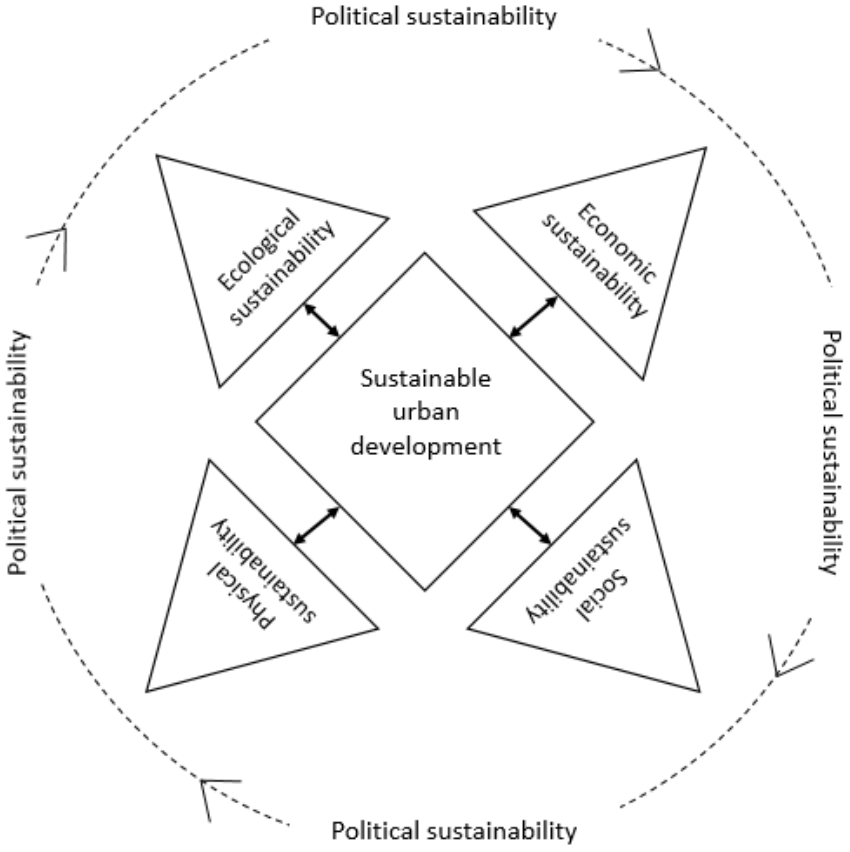


Figure 1.2: The Five Dimensions of Urban Sustainability (Source: adapted from Pieterse (2010: 14)

This research questions the possibility of a correlation between the five dimensions of sustainability and water sensitivity in South Africa because WSUD stemmed from a city's attempts to become more water-sensitive (Brown *et al.*, 2008). The definition of water sensitivity in South Africa can therefore be assessed in terms of the five-dimensional model of sustainability presented in Table 1.2.

Table 1.2: Creating the link between WSUD and the five-dimensional model of sustainability

The correlation between WSUD and the five-dimensional model of sustainability		
Sustainability dimension	**Relationship**	**Reference**
Economic	Water should be viewed as an economic good.	*(Cullet, 2014).*
Social	It is a basic human right to have access to basic potable water.	*(Mokonyane, 2015).*
Ecological	Water is a finite and precious resource, responsible for sustaining all life, development and the broader environment, making it a fundamental aspect in the achievement of Ecological sustainability.	*(Ranchod et al., 2015).*
Physical	The way the structure and layout of the built environment influences social interaction, movement and human life capacity. The physical structure or design of urban space (and its resultant efficiency) has a direct impact on ecological sustainability.	*(Pieterse, 2010).*
Political	How the other dimensions are influenced and governed by political sustainability UWM should surround the notion of a participatory approach, thereby including public and private action, implying that the state has a direct impact on UWM.	*(Brown, 2011).* *(Simelane, 2015)*

As previously mentioned, urban spaces and urban precincts are major contributors to the sustainability of a city (McCormick *et al.*, 2013). Michell (2013) describes the increasing demand from both the public and the private sector to create and manage sustainable cities. In this context, urban FM has been described as the logical extension of the need to reinvest in the community in terms of facilities and systems and that it provides a platform for the creation

of public and private partnerships (Roberts, 2004). It is argued that urban FM can be utilised to leverage the value required in the achievement of sustainable urban development (Michell, 2013), which raises the question for the researcher of how to leverage value in the context of UWM.

1.2.6 Urban FM

Theoretically, FM strategically aligns an organisation and its output through the provision of facilities and utilities (McGregor & Then, 1999; Alexander, 2003; Atkin & Brooks, 2005). At a local government level, the '*strategic alignment'* is documented in the Constitution, 1996, and other relevant legislation in South Africa (Michell *et al.*, 2008: 4). Michell *et al.* (2008) further argue that operationally, local government is required to provide utilities including water supply, sanitation, road infrastructure. Municipalities should therefore use FM principles at a strategic level to increase economic development and social prosperity. Urban FM assists in finding innovative ways to manage public facilities and community assets in a more sustainable manner (Tobi *et al.*, 2013). It is regarded as a flexible platform through which the public and the private sector may coordinate in a participatory manner to benefit society at the urban precinct level (Michell, 2013). At a micro level, the physical infrastructure of a building needs to be maintained to aid and sustain the social processes between a building and its users. This can also be applied at a macro level, in observing an urban precinct.

The formation of precincts is regarded as an urban phenomenon (Yigitcanlar *et al.*, 2008), whereby living and working facilities are combined in a mixed-use environment (Cullen, 1971; Cunha & Selada, 2007). Precincts are deliberately located to form a distinct part of a city to enable the urban design, technology and property development domains to collaborate (Yigitcanlar *et al.*, 2008). The physical environment of an urban precinct is vital for the sustainability of cities and the spatial experience of urban precinct users (Michell, 2013).

1.2.7 Value capture

Value capture has been described as the process of extracting the incremental value that accumulates to a property following some form of public investment (Smolka & Amborski, 2000; Peterson, 2008; Alterman, 2011; Brown-Luthango, 2011; Ingram & Hong, 2012; McGaffin *et al.*, 2014). In other words, public investments in infrastructure, such as the provision of public transport, can precipitate increases in adjacent land values, thereby generating '*unearned*' profits for private landowners (Alterman, 2011: 759). These 'unearned' values can be captured, either directly or indirectly, by the state through various mechanisms and public finance channels (Alterman, 2011; McGaffin *et al.*, 2014). This is reasonably accepted, as it is justifiable that the additional value created resulted from the state's actions and not those of the private landowner (Rodriguez & Mojica, 2008).

1.2.8 Value capture mechanisms

Several value capture mechanisms are utilised on an international scale (Ingram & Hong, 2012). However, McGaffin *et al.* (2014) suggest that such mechanisms can be difficult to comprehend, primarily because certain mechanisms with equivalent or similar characteristics are labelled differently; and, depending on the legal, economic and institutional context in which they are being applied, can have various permutations. For example, development charges, used in a South African context are relatable to developer exactions. For these reasons, McGaffin *et al.* (2014) categorise value capture mechanisms into two groups, highlighting the characteristics of the mechanism over its label. In South Africa, the two broad value capture mechanisms are social/use-related mechanisms and income-generating mechanisms, both of which are discussed below.

Social/Use-related mechanisms

This type of mechanism aims to utilise the increased value to enable a broader '*social/ land use related outcome*' (McGaffin *et al.*, 2014: 378). In other words, these value capture mechanisms benefit the community and hold a societal value (Brown, 1997; Smolka & Amborski, 2000; Ingram & Hong, 2012). For example,

African Development Economic Consultants (ADEC) explain in their 2010 report how local municipalities can grant various property rights in return for the provision of public amenities or affordable housing (ADEC, 2010).

Income-generating mechanisms

These types of mechanisms '*extract income in the form of a tax or user charge from the increment value to finance the infrastructure or some other development*' (McGaffin *et al.*, 2014: 378). For example, the provision of public infrastructure would shed light on the feasibility of a proposed development (Appraisal Institute, 2008; Peterson, 2008; African Centre for Cities (ACC), 2014). If such development is deemed to be viable, it could increase the property values in that area, which would subsequently increase the associated property rates. The use of land/property rates and taxes can be used for improved or more effective urban management of the infrastructure in question (Fensham & Gleeson, 2003).

As mentioned above, numerous value capture mechanisms are used internationally, under various labels (McGaffin *et al.*, 2014). Smolka and Amborski (2000: 2) display a similar approach to categorising these mechanisms by describing how there can be '*Fiscal*' instruments, which make use of taxes and fees; or '*Regulatory*' instruments, which lead to some form of public benefit. In both cases, the authors cite public authorities using value capture mechanisms to solve social issues, finance urban regeneration and manage the development of urban land (Smolka & Amborski, 2000; Ingram & Hong, 2012; McGaffin *et al.*, 2014). It is in this context that the use of urban FM principles can be utilised as a way of managing urban regeneration/urban land/urban precincts to leverage and capture the associated value (Michell, 2013).

1.2.9 The role of water in urban precincts

Traditionally, local municipalities appear to have shown a lack of interest the importance of green spaces in urban areas or towns (Tyrväinen & Väänänen, 1998). However, many authors argue that incorporating green spaces or sustainable urban areas is now of strategic importance when it comes to quality of life in rapidly urbanising cities (Allen, 2001; Chiesura, 2004; Pieterse, 2010;

Michell, 2013). The presence of '*natural assets*' (urban parks, forests and greenbelts) and their '*components*' (water and trees) has been empirically shown to improve the 'liveability' of cities, not only from a social perspective but also from an economic and environmental viewpoint (Tagtow, 1990; Luttik, 2000; Chiesura, 2004: 129-130). It is within this context that water, UWM and WSUD play a critical role in the sustainability of our cities (Coutts *et al.*, 2012).

The role of urban precincts and their physical makeup assisting in the achievement of a sustainable city is not a novel paradigm (Chiesura, 2004). Efforts to address sustainability through sustainable urban precincts in cities has been suggested by numerous authors, most notably in the book *Caring for the Earth: A Strategy for Sustainable Living,* published in partnership by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF) (Munro and Holdgate, 1991). Chiesura (2004) extends this notion and explains how urban precincts contribute to the sustainability of a city, with water being integral to achieving that sustainability. Figure 1.3 provides a basic depiction of the role of urban precincts in the achieving a sustainable city.

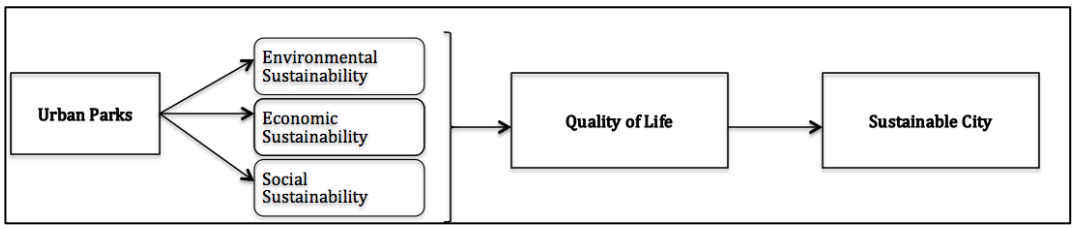


Figure 1.3: Urban parks and city sustainability (Source: adapted from Chiesura, 2004: 131)

As previously discussed, water/water sensitivity/WSUD can be represented by the five-dimensional model of sustainable urban development thereby making, water a defining feature in the sustainability of a precinct. The role of non-potable water in a precinct includes irrigation, temperature control, stormwater harvesting, sanitation, aesthetics, and so on. (Hatt *et al.*, 2006; Coutts *et al.*, 2012).

It is within this context that the researcher aims to assess the role of water and WSUD in the creation of value and the subsequent sustainability of urban

precincts. Figure 1.4 provides an overview of the key concepts assessed in this research, outlining the interrelationship of WSUD, sustainable urban development and value. Moreover, it depicts the role of value capture and whether urban FM can provide a managerial framework to link the concepts together.

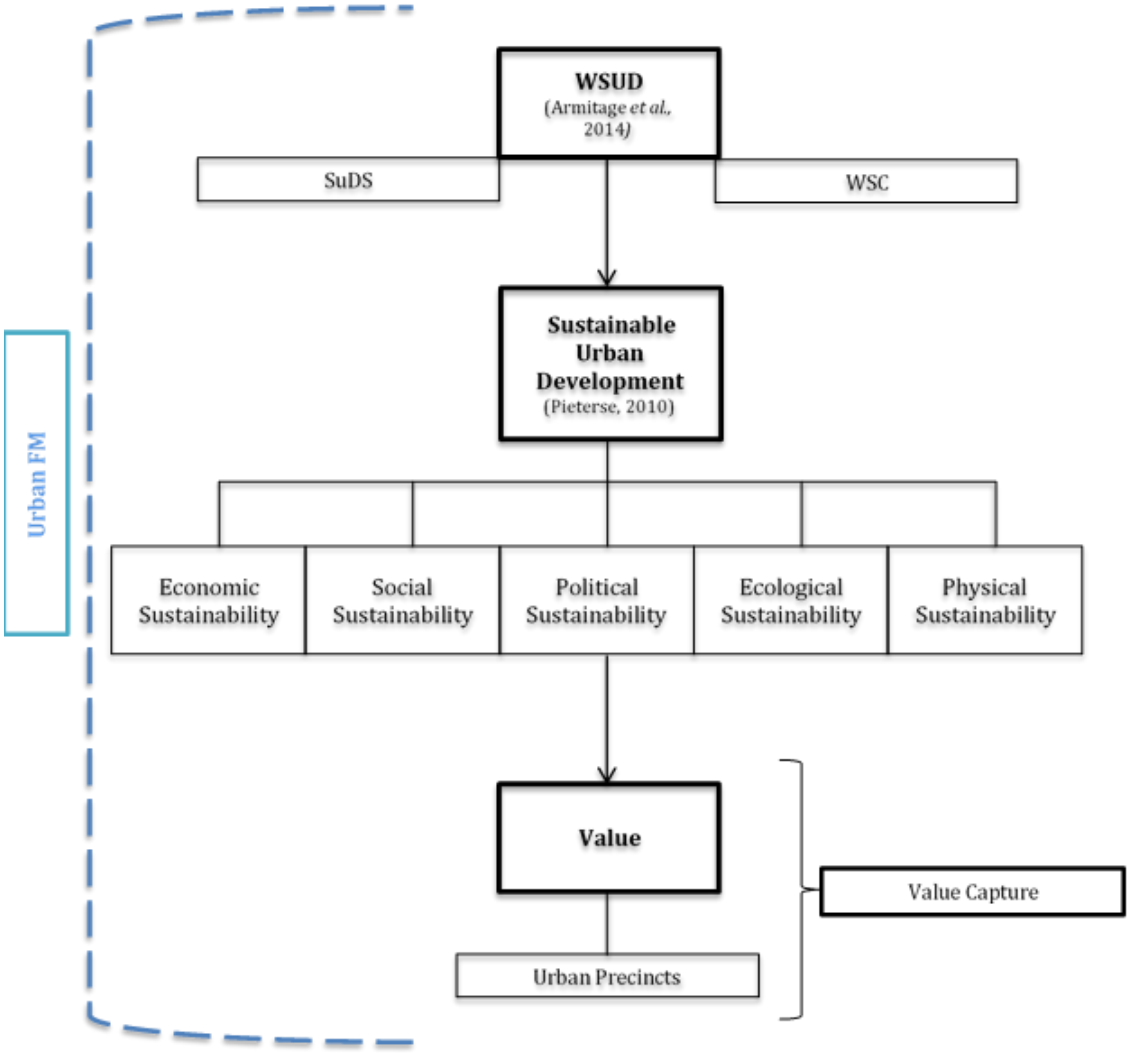


Figure 1.4: The interrelationship between WSUD, urban FM, value capture and sustainable urban development

As depicted in Figure 1.4, it is arguable that, given the right conditions, there should be a relationship between WSUD, sustainable urban development and value. WSUD has the ability, through its implementation, to augment the ideals of sustainable development (Wong, 2007). For example, SuDS, in part, attempt to manage the quantity and quality of urban stormwater in a more sustainable manner, with WSCs as the overarching objective (Armitage *et al.*, 2013b). The

infrastructure (or Green Infrastructure) required to achieve a WSC can be funded by local government (Luttik, 2000) and the state's investment creates additional value (McGaffin *et al.*, 2014). The use of urban FM principles can leverage this value at an urban precinct level to achieve the five-dimensional model of sustainable urban development (Michell, 2013), thus demonstrating the relationship between WSUD, sustainable urban development and value. Little is known, however, about how value is created through WSUD and the role urban FM can play as a strategy for urban precincts in achieving a more sustainable urban environment.

1.3 Problem area

The investigative focus of this research is as follows:

> *Little is known about how value is created through WSUD in achieving the sustainability of urban precincts. As a consequence, integration of WSUD into the urban FM framework is required to highlight the relationship that exists between WSUD, sustainable urban development and value.*

1.4 Research question

The research question posed is:

> *Can urban FM provide a managerial framework that reflects the relationship between WSUD, sustainable urban development and value for urban precincts?*

1.5 Research aim

The proposed aim of this research is to:

> *Investigate the role that urban FM can play in highlighting the relationship between WSUD, sustainable urban development and value for sustainable urban precincts.*

1.6 Research proposition

The intended outcome of this research is as follows:

The relationship between WSUD and sustainable urban development creates value and urban FM can provide a managerial framework which ties these concepts together for the sustainability of urban precincts.

1.7 Research objectives

The research objectives of this study are to:

1.7.1 identify the principles of WSUD, sustainable urban development, value, value capture and urban FM;

1.7.2 establish the relationship between WSUD, sustainable urban development and value;

1.7.3 determine whether the principles identified in 1.7.1 could form part of an urban FM-aligned managerial framework for WSUD, sustainable urban development and value;

1.7.4 identify the value created through WSUD.

1.8 Research methodology

A social-constructivist approach was implemented to achieve these objectives and the following research methodology employed the following:

- A literature review into the principles of WSUD, value, value capture and urban FM, with particular emphasis on how value is created through WSUD. Moreover, the role of urban FM in providing a managerial framework, which shows the relationship between WSUD, sustainable urban development and value of urban precincts.
- Multiple case study research that includes the Victoria and Alfred Waterfront and Century City in Cape Town. The case studies utilised the following methods of data collection:
    - One-on-one, semi-structured interviews with key individuals involved in the management of the urban precinct
    - Photographic material
    - Documentary evidence.

The data was then analysed to establish how value is created and captured through WSUD and how urban FM principles are an integral part in showing the relationship between WSUD, sustainable urban development and value.

Finally, conclusions were drawn from the data collected.

1.9 Limitations

The following limitations apply to this research:

- The urban precincts are defined, thus restricting the range of possible outcomes.
- Specific case studies were analysed in defined areas, thus results and conclusions cannot be viewed as generalizable.
- The research methodology is subject to individual opinion, and it is acknowledged that this is intrinsic to a social constructivist philosophy.

1.10 Dissertation outline

Chapter 2 presents a literature review in the form of a theoretical framework that explores the UWM literature in South Africa, the principles of WSUD, value capture, urban FM and sustainable urban development. Moreover, it establishes how value is created through WSUD and the role that urban FM plays in highlighting the relationship that exists between WSUD, sustainable urban development and value. The methodology employed in the study – two case studies were utilised for analysis through one-on-one, semi-structured interviews, and photographic material and documentary evidence was collected – presented in Chapter 3. Chapter 4 collates the findings of the case studies and documents the data analysis. Lastly, conclusions are drawn in Chapter 5.

CHAPTER 2 THEORETICAL FRAMEWORK

2.1 Introduction

This chapter provides further detail on the aspects introduced in Chapter One. This comprises an expansion of UWM followed by a discussion on the integrated response to water management in the achievement of a water sensitive city. Water sensitive urban design is then explored in a South African context highlighting the relationship between the built environment and sustainable development after which the role of water in an urban precinct and its respective value is explored. Finally, the influence of urban facilities management in highlighting the relationship between these concepts is explored. These concepts provide the basis upon which the research was conducted and translated into data to be used in the ensuing chapters.

2.2 Urban water management

It is globally accepted that the effective management of existing water systems is critical to our rapidly urbanising economies (Barilla Group *et al.*, 2009; Jacobsen *et al.*, 2013; World Water Assessment Programme (WWAP), 2015). This is in light of the fact that the world may be approaching a *"global water crisis"* (WaterAid, 2015: 1), attributable not only to water shortages but also to a poor understanding of management systems. The notion that the planet is approaching a water crisis was emphasised by the United Nations Development Programme (UNDP) as early as 2006, when it described how inequality in distribution, poverty and power struggles combined with rapid rates of urbanisation contributes to these water-related issues (UNDP, 2006). Moreover, it has been expressed that these issues are especially prevalent in developing countries (Mays, 2009). In this context, Tejada-Guibert and Zandaryaa (2010) summarise the differences in the status of urban water problems between developed and developing cities, in Table 2.1.

Table 2.1: Urban water management issues – developed vs. developing cities. (Source: Tejada-Guibert and Zandaryaa, 2010: 10)

	Developed cities		Developing Cities	
Urban water problem	**Status**	**Possible response**	**Status**	**Possible response**
Access to water supply and sanitation	Solved	N/A	• Issues with access to water supply and sanitation • Urban fringes creating informal settlements	• Collaborative, participatory and demand-led initiatives • Capacity building and skills development
Wastewater management	Mostly solved	Recycling of nutrients.	• Low levels of management	• Source control technologies • Recycling and recovering nutrients from waste • Decentralised systems
Urban drainage and stormwater • Stormwater collection (Quantity) • Stormwater Pollution (Quality)	Quantity – solved Quality – problematic	• WSUD methods • SuDS	• Very low levels/non-existent	• WSUD methods possible here • SuDS • On-site treatment and/or recycling of stormwater
Water pollution • Aquatic ecosystems	Mostly solved	• Restoration / protection efforts required	• Highly polluted	• Improve wastewater collection and treatment system • Improve quality of stormwater discharges
Global climate changes • Floods • Droughts • Water scarcity	Unresolved, dealing with uncertainty	• Water demand management (WDM) • Institutional reforms	• Unresolved, dealing with uncertainty	• Integrated land-use and service delivery planning

In their presentation at World Water Week, Tejada-Guibert and Zandaryaa (2010) essentially condensed and highlighted the UWM issues that exist on a global scale between developed and developing nations as represented in Table 2.1. Five issues were brought to light, including: Access to water supply and sanitation, wastewater management, urban drainage and stormwater, water pollution, and global climate change.

Each issue was given a 'status,' as well as a 'possible response' – which is expanded on in a South African context, with the support of more recent literature.

2.2.1 Access to water supply and sanitation

In South Africa, one of the primary challenges facing the economy is the adequate provision of basic services, including water (Armitage *et al.*, 2014). Moreover, Musungu *et al.* (2014) describe the risks of poor quality water within informal settlements and the relative risk of poorly drained land. Furthermore, it is argued how in the Western Cape, the Cape Town City Council (CTCC) has not implemented the correct risk management techniques to support informal settlements, largely due to a lack of information and availability of data.

It has been previously argued by Schaub-Jones (2010) that collaborative approaches, where local authorities coordinate civil society and local private sectors, are proving to be effective responses to providing and sustaining the service delivery function.

2.2.2 Wastewater management

South Africa has low levels of management, when it comes to water issues in general; the same is true of wastewater management (Giordano & Shah, 2014). Municipalities have little data available regarding the treatment or collection of wastewater in Sub-Saharan Africa. For example, data on wastewater generation, treatment and use is available for only three out of 48 countries: the Seychelles, South Africa and Senegal; furthermore, the data from the Seychelles and South Africa has only been captured between 2000 to 2003 (Sato *et al.*, 2013). It has been noted previously that a lack of efficient data stemming from inadequate administrative skills in local government makes it difficult to fulfil effective water service delivery functions (Haigh *et al.*, 2010).

Despite source control technologies such as SuDS being a possible remedy to the low levels of management, Armitage *et al.,* (2014: 34) describe how the DWA fails to consider the '*total water cycle*' in its NWRS-2 – meaning that the potential to use strategies such as SuDS are not considered.

2.2.3 Urban drainage and stormwater

This issue is broken up into two factors: the collection of stormwater (quantity) and the pollutant levels within stormwater (quality). Similarly to wastewater management, South Africa has implemented low levels of infrastructure to deal with the problem (DWA, 2013b), largely due to the hierarchy of issues at play. In other words, there is a need to confront life-threatening issues such as the mandatory access to water supply and sanitation ahead of those issues that pose less of a societal threat (Simelane, 2015).

2.2.4 Water pollution

South Africa has high levels of pollution in its water supply (DWA, 2013a). Pietersen *et al.,* (2012) point to an inadequate level of groundwater monitoring networks; Armitage *et al.,* (2014) add that increasing population growth, and the consequent increased demands on the resource-based industrial sector are other causes of the pollutant levels in South Africa's water supply.

2.2.5 Global climate changes

Floods, droughts and water scarcity always carry a degree of uncertainty (Tejada-Guibert & Zandaryaa, 2010). Despite integrated systems, involving strategic planning, being fundamental to absorbing such pressures, South Africa's fragmented governing structures make this difficult to achieve (DWA, 2013b).

The 2011 census revealed that 63% of South Africans live in urban areas (StatsSA, 2015) and the Department of Cooperative Governance and Traditional Affairs (CoGTA) expects this to increase to 80% by 2050 (CoGTA, 2014). It is within this context of rapid urbanisation that UWM is a major concern (Armitage *et al.*, 2014), as South Africa is already "*severely constrained by low rainfall, limited underground aquifers, and reliance on significant water transfers from neighbouring countries*" (Barilla Group *et al.*, 2009: 10). To this end, the DWA referred to the following challenges in its NWRS-2 Report in 2013 (DWA, 2013b), shown in Table 2.2

Table 2.2: Challenges facing South African water systems (Source: DWA, 2013a: 6-8)

Problem	Description
Surface water resources	Most surface water resources are fully accounted for, meaning that increased demand could result in a supply deficit.
Wastewater	The resource-based industrial sector, increasing urban population, and increasing demand for water are creating a growing burden on wastewater.
Water treatment	Water treatment is currently compromised, which increases the pollution of surface and groundwater.
Institutional structures	South Africa has a complex and fragmented governing structure.
Perceived value of water	There is a general disregard, both socially and economically, when it comes to the perceived value of water.

Table 2.2 highlights the challenges facing South African water systems and the DWA, (2013a) proceeds to show how water systems not only support the environment, but are also responsible for the production of food and energy, thereby influencing social and economic development (Armitage *et al.*, 2014). As such, it is imperative that cities find effective ways of managing urban water in the most sustainable manner (Costa & Hoyer, 2014). Wong (2014) argues the importance of demonstrating the social and economic benefits of a WSC and . Carden (2013) suggests that to effect change and respond to the water challenges in South Africa, a more integrated approach amongst stakeholders is required – a reference to IWRM. In this regard, Armitage *et al.* (2014: i) call for "*alternative, systems-based approaches to conventional water management of water supply*" to address the challenges facing South Africa's water systems.

2.3 An integrated response to water management: Integrated Water Resource Management (IWRM)

The basic idea behind IWRM can be traced back to the mid- to late nineteenth century (White, 1998; Mitchell, 2006; Giordano & Shah, 2014); the traditional paradigm, however, which aims to assist in managing water more holistically (Giordano & Shah, 2014) was first advocated by the UN in the 1950s (Howard, 2015). Historically, urban water services were forced to respond to typhoid and cholera epidemics that were rampant in European and American cities between the 1830s and 1870s, which resulted in dramatic advances in the hygiene of urban areas (Harremoës, 1997) although many of the methods used had adverse economic and environmental impacts – largely due to a fragmented approach to solving urban-related water issues (Mitchell, 2006). The

philosophies behind the early ideals of IWRM have been formalised over the years, and have been defined as a paradigm that "*advocates a coordinated approach for managing water resources in a way that balances social and economic needs with care for nature"* (Martínez-Santos *et al.*, 2014: 17).

However, the ideals of IWRM are vastly different when it comes to developed and developing countries (Schulze, 2007). South Africa, for example, is more focused on the urban water challenges depicted in Table 2.2, while a developed nation would focus its attention on, for example, improving its existing water infrastructure (Walmsley *et al.*, 2004; Schulze, 2007). Moreover, South Africa has seen difficulty in practice when it comes to implementing an IWRM approach, as technically and administratively it is unable to fulfil these water service delivery functions (Haigh *et al.*, 2010).

2.3.1 Integrated urban water resource management (IUWRM)

Importantly, IWRM is applied at catchment level, which is one of the reasons why it has no unique definition (Carden, 2013; International Water Association (IWA), 2015). IUWRM is another key concept that aims to promote more efficient and sustainable use of water resources in urban areas, with the overall objective of achieving a WSC. However, IUWRM aims to align the broader catchment and river management objectives (Anderson & Iyaduri, 2003). According to (Mitchell, 2006), IUWRM can be summarised by five key points:

- It considers all parts of the water cycle, but as an integrated system.
- It considers all the requirements for water, both those related to its associated pollutants and those related to ecological considerations.
- It considers the environmental, cultural, social and economic perspectives in a local context.
- It includes all stakeholders, not only in the decision-making process but also in the planning stages.
- It aims to achieve an equitable balance between economic, social and environmental needs.

In other words, it aims to combine all urban, water-related issues in an integrated manner, in an effort to achieve a balance between economic, social, environmental and

political objectives (Carden, 2013). IUWRM, has also failed to be successfully implemented in a South African context, largely due to the fragmented governance of various water components, particularly when it comes WRM and water service provision at provincial and national levels. For example, water service provision is conducted according to political boundaries, while WRM is conducted on a catchment basis (Burke, 2007).

2.3.2 Integrated urban water management (IUWM)

Integrated Urban Water Management (IUWM) forms part of the construct of IUWRM and importantly it addresses the negative impacts of urban society on the natural water cycle (Mitchell, 2006). Moreover, it explores possible remedies for improved service delivery through more efficient or effective management. In this regard, IUWM recognises that for structured, decision-making processes to take place, robust systems are needed, which aim to reconcile economic efficiency and social equity (Carden, 2013). Grit *et al.* (2015: 710) define IUWM as:

> *"… a process which promotes urban water services, viewing water supply, drainage and sanitation as components of an integrated physical system generating nutrient flows and re-use of water resources to maximise the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."*

Mitchell (2006) pre-empted this notion where she explains how urban water services view water sanitation, supply and drainage as constituents of an integrated physical system (the urban water cycle), but with the understanding that the system exists within an organisational framework and in the larger natural landscape. In other words, there are key social drivers for achieving a WSC, particularly in developing nations, that influence a city's functionality, over and above the natural inputs from the larger catchment (Carden, 2013; Marlow *et al.*, 2015; Vairavamoorthy *et al.*, 2015).

However, it is widely accepted that an IUWM approach requires vast amounts of data collection to assess the individual components of the urban water cycle and how they interact with one another (Grit *et al.*, 2015). Consequently, one of the primary challenges facing developing nations is the lack of an economic foundation and human resources to capture such data (Sato *et al.*, 2013; Howard, 2015). So, as discussed regarding IWRM, South Africa's degree of infrastructure development and maintenance, scientific and

administrative skills and long-term planning perspectives make it difficult for IUWM to be achieved (Schulze, 2007; Carden, 2013).

2.3.3 A paradigm shift to a WSC

Transforming our cities to those where water attains due prominence requires *"a major socio-technical overhaul of conventional approaches"* (Wong & Brown, 2008: 2). Urban communities seek resilience when it comes to the uncertainties of water supply or disturbances (such as floods and droughts) that may occur (Wong & Brown, 2008). As such, the concept of IUWM has been extended to encompass the ideals of a WSC, which can be characterised by three key attributes (Wong and Brown, 2008: 4):

- *Cities as Catchments*: access to a diversity of water sources underpinned by a diversity of centralised and decentralised infrastructure;
- *Cities Providing Ecosystem Services*: provision of ecosystem services for the built and natural environment; and
- *Cities Comprising Water Sensitive Communities*: socio-political capital for sustainability and water sensitive decision-making and behaviours.

In other words, to transform cities into becoming water sensitive requires the components of IUWM, as well as the various disciplines associated with the provision of water services. Moreover, there should to be a paradigm shift in urban design to incorporate sensitivity to water and create landscapes that have "*intrinsic ecological functions related to the community and environment*" (Wong & Brown, 2008: 9). This shift in thinking is contextualised in the transitions framework shown in Figure 2.1. The diagram aims to provide insight into 'hydro-social' contracts that exist within cities to assist urban water managers to determine the cultural reform and capacity development initiatives required to promote the transition to more sustainable UWM (Brown *et al.*, 2008: 1). Hydro-social contracts have been defined by Lundqvist *et al.* (2001: 345) as a "*term used to describe the pervading values and often implicit agreements between communities, governments and business on how water should be managed."*

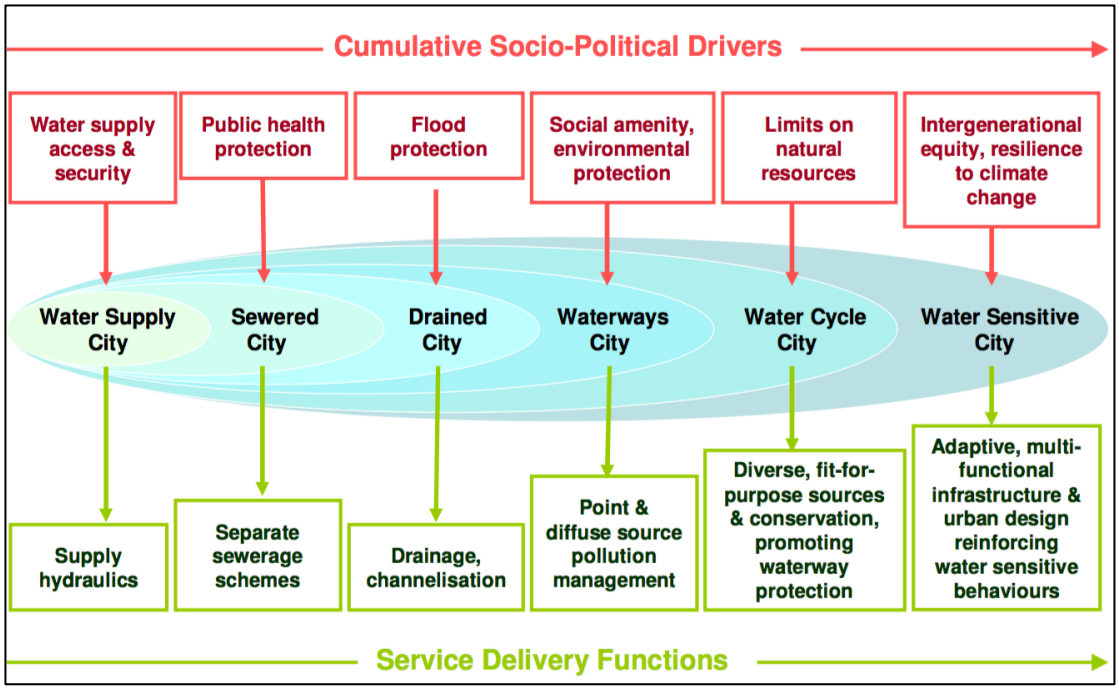


Figure 2.1: UWM Transition Framework (Source: Brown *et al.,* 2008)

As shown in Figure 2.1, the framework pinpoints six urban water transition states: Water Supply City, Sewered City, Drained City, Waterways City, Water Cycle City and Water Sensitive City. Each state carries a socio-political driver as well as its associated service delivery function, thereby highlighting the 'hydro-social contract' existing among the various stakeholders (Brown *et al.*, 2008). The authors go on to explain how the sixth state (a WSC) is dependent on an adaptable institutional framework and a diverse infrastructure capable of continually evolving to achieve the ideals of sustainability.

2.4 Water sensitive cities and water sensitive urban design (WSUD)

A water sensitive city is one where "*water attains due prominence within the urban design process through the integration of urban design with the various disciplines of engineering and environmental sciences associated with the provision of water services including the protection of aquatic environments in urban areas*" (Wong & Brown, 2009: 674). According to Wong and Brown, a WSC can be attributed to three pillars (listed in 2.3.3 above). The first considers cities as catchments and refers to cities having access to a wide range of water sources, other than capturing rainfall-runoff and forested catchments; these would include alternative water sources such as groundwater, urban stormwater, desalinated water, recycled wastewater and rainwater (roof runoff). The

second attribute aims to ensure that cities provide ecosystem services; this deals directly with green infrastructure and ecological sustainability, as both realms are in synergy with the philosophical basis for WSUD. The third 'pillar' of a WSC aspires to align itself with water sensitive communities. WSUD, as the mainstay of this attribute, has been the subject of much research, which has indicated that the institutional capacity of the relevant city is an essential element in achieving this outcome. The fundamental pillars of a WSC, therefore, were envisioned on WSUD philosophies (Armitage et al., 2014).

Therefore, WSUD is an integral concept of cities giving due prominence to water in an attempt to become a WSC (Brown *et al.*, 2009), as WSUD has the ability to augment the objectives of a WSC (Armitage *et al.*, 2014). Over the past decade, academia has seen numerous definitions of WSUD (Fletcher *et al.*, 2014), largely because, globally, the trend pertaining to WSUD focused on stormwater management, as opposed to the expanded definition, which considers the entire urban water cycle with urban planning and urban design (Coutts *et al.*, 2012). In South African literature, although the term WSUD is a relatively new paradigm in UWM, it does encompass the latter notion of WSUD involving integration of the entire water cycle, with the central theme of ecological sustainability (Armitage *et al.*, 2014).

Moreover, Armitage *et al.* (2014: ii), explain how WSUD has the ability to "*mitigate the negative effects of water scarcity; manage and reverse water pollution; develop social and intergenerational equity; increase sustainability; and develop resilience within water systems"* in South Africa. The authors do, however, explain that to implement WSUD in South Africa, the following issues require consideration:

- Institutional structures
- Equity
- Ecosystem goods and services.

Institutional structures

South Africa manages the urban water cycle in a fragmented manner, which results in services not being integrated, which in turn stems from a disjointed allocation of responsibility to various municipal departments. For example, stormwater management is assigned to the roads department and water supply is handled separately to sewage

collection, treatment and disposal. Moreover, South Africa is constrained when it comes to the technical capacity at both national and local government level, meaning that overly intricate technologies should be avoided.

Equity

South Africa's history means it already faces challenges involving the delivery of services to the previously disadvantaged. Basic services need to be in place prior to the implementation of water sensitive projects, unless implemented simultaneously.

Ecosystem goods and services

Globally, the economic value of ecosystem services is recognised, which in turn motivates the adoption of WSUD. However, South Africa is subject to extensive poverty and inequality, meaning that various stakeholders carry opposing interests. For example, politicians may view WSUD as a means of job creation to deliver services more efficiently; conversely, city officials would look at cost and maintenance requirements.

Two important documents (the NDP and the NWRS-2) that aim to guide the South African water sector to realign economic growth and resource consumption (RSA, 2011b) reveal that South Africa understands the reservations relating to the social aspects within the concept of WSUD as well as the overarching theme of ecologically sustainable development (Lundqvist *et al.*, 2001; Brown *et al.*, 2009; Wong & Brown, 2009; Vairavamoorthy *et al.*, 2015).

2.4.1 An overview of the NDP

The National Planning Commission released the NDP in November 2011 laying out South Africa's achievements and shortcomings since 1994 (RSA, 2011a). In doing so, it underlined the major developmental challenges, including: high unemployment, poor quality education, inadequate and under-maintained infrastructure, a lack of inclusive development, an unsustainably resource-intensive economy, a weak public health system, uneven distribution of public service infrastructure, high levels of corruption, and an ongoing divided society. The report underlined four thematic areas emanating from these challenges, including social protection, community safety, the rural economy, and regional and world affairs (RSA, 2011a: 15).

In relation to the water sector, the NDP's vision reflects that before 2030:

- *"All South Africans will have affordable access to sufficient, safe water and hygienic sanitation to live healthy and dignified lives.*
- *The country's economic and social development will reflect an understanding of and an alignment with available water resources.*
- *All main urban centres will have a reliable supply of water to meet their needs.*
- *The natural water environment will be protected to prevent excessive abstraction and pollution."* (RSA, 2011b: 154)

2.4.2 An overview of the NWRS-2

The NWRS-2 provides an overview of the state of South Africa's water sector, as it sets out the "*strategic direction for water resources management in the country over the next 20 years"* (DWA, 2013a: 7). It is compiled in terms of the National Water Act (Act 36 of 1998), thereby binding all institutions and authorities performing duties under the National Water Act (DWA, 2013b). Most importantly, it is the primary tool for managing water across all sectors to achieve the Government's development objectives (Armitage *et al.*, 2014).

To this end, it should ensure that water acts as an enabler to economic and social development, as the NWRS-2 addresses concerns that South Africa's socio-economic growth could be restricted if water management, water security and quality issues are not resolved (DWA, 2013a; Armitage *et al.*, 2014). As such, the NWRS-2 provides the strategies to achieve these management concerns, with particular emphasis on the role of the State (DWA, 2013a). The DWA (2013b: 1) has explained that the NWRS-2 "*responds to the NDP and outlines the strategy for controlling, managing, conserving, using, protecting and developing South Africa's scarce water resources towards achieving the 2030 Vision."* In this regard, it was argued that South Africa could have sufficient water resources, but only through the effective and strategic implementation of extended water management options (DWA, 2013a).

WSUD involves the management of the entire urban water cycle (Fletcher *et al.*, 2014) and has the ability to augment the objectives of the aforementioned documents, with the overarching goal of an ecologically sustainable or a WSC (Armitage *et al.*, 2014).

However, 'water sensitivity' is a fundamental paradigm when assessing a city's attention to water and so it should be defined to put into context the influence WSUD may have in benchmarking a WSC (Ashley *et al.*, 2013).

2.4.3 Bringing 'sensitivity' to WSUD

WSUD brings 'sensitivity to water' into urban design (Wong & Ashley, 2006). In other words, the words 'water sensitive' or 'water sensitivity' represent a new paradigm in the integrated total urban water cycle, incorporating various disciplines of engineering and environmental services to protect urban water resources (Wong, 2007). More recently, Armitage *et al.* (2014: 17) have defined 'water sensitivity' as *"the management of the country's urban water resources based on five principles selected from the National Water Act, the NWRS-2, the RSA Constitution and the Dublin Principles."* These five principles are outlined below:

- South Africa is water-scarce.
- It is a basic human right to have access to sufficient potable water.
- Water has economic value, recognisable as 'natural capital' or an 'economic good' – including the acknowledgment that natural ecosystems provide valuable goods and services.
- All stakeholders, including users, planners and policy-makers at various levels should be involved in the management of water, but in a participatory manner.
- Water is a finite and vulnerable resource.

2.4.4 The WSUD process

With the notion of 'Water Sensitivity' in mind, WSUD "*is a framework that provides a common and unified method for integrating the interactions between the urban built form (including urban landscapes) and the urban water cycle*" (Wong, 2006: 2). In other words, the built environment needs to identify not only the most viable option for managing water supply and water quality, but also the link between urban design, place making and liveability (Ashley *et al*., 2013).

Initially, WSUD was perceived as a means to manage stormwater more efficiently but it is widely accepted that there is a need to enhance living conditions and take advantage of the management, use and reuse of wastewater, whilst supporting human health and

minimising the impact of urbanisation on the natural water cycle (Ashley *et al.*, 2013). Ashley *et al*. (2013) suggest this is achievable through the reconnection of built and natural forms, thereby highlighting the high-level relationship between the built environment and WSUD. With the notion of 'Water Sensitivity' in mind, WSUD "*is a framework that provides a common and unified method for integrating the interactions between the urban built form (including urban landscapes) and the urban water cycle*" (Wong, 2006: 2). In other words, the built environment needs to not only identify the most viable option for managing water supply and water quality, but also the link between urban design, place making and liveability (Ashley et al., 2013).

2.5 WSUD, the built environment and sustainable development

The aforementioned explanation of WSUD and its guiding documents, 'Water Sensitivity' and the description of WSUD as a process, reveals how WSUD and sustainable development have a high-level relationship within the construct of the Built Environment (Beecham *et al.*, 2012; Ashley *et al.*, 2013).

2.5.1 Sustainable (urban) development

Sustainable development is most commonly quoted from the Brundtland Report as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 43). As previously mentioned, sustainable development is said to address the 'triple bottom line' – economic, social and environmental sustainability (Elkington, 1994: 1). However, this model was later argued to misrepresent the "trade-offs and contradictions inherent in the pursuit of economic, social, and environmental goals" and to portray too abstract a picture when it comes to the "relationship between growth, development, and environment unfolds at the urban level, and how macro-economic strategies and urban social and environmental problems relate to each other" (Allen, 2001: 154). As a result and for the purpose of this research, a five dimensional model for sustainable urban development has been adopted, based on Pieterse (2010: 14), which includes economic, social, physical, ecological and political sustainability.

Economic sustainability

Economic sustainability has been defined as *"the maintenance of capital"* (Goodland & Daly, 1996: 1003). In an urban environment, it refers to the local economy's ability to sustain itself, without damaging the natural resource base upon which it depends (Allen, 2001). In other words, a local economy should consume and produce within its natural limits and without exploiting the environment.

Social sustainability

There is little consensus on how social sustainability should be defined as it is argued that it could encompass a range of dimensions (Davidson, 2010). Despite this, it is widely accepted as a means of creating and forming a sense of community (Payne *et al.*, 2003; Basile and Gutierrez, 2011). It is held to encompass two broad concepts: '*Social Equity'* and *'Sustainability of Community'* (Dempsey *et al.*, 2012: 94). Social equity refers to the equitable access and distribution of rights to natural and built environment resources, while sustainability of community represents the integration of individual behaviour in a wider collective social setting. For example, holding a positive sense of identification and pride in one's community.

Ecological sustainability

Natural resources constantly endure pressures from local societies, but rational management of these natural resources is fundamental to the achievement of ecological sustainability, particularly when it comes to demand management (Allen, 2001). More specifically, this dimension refers to the "*impact of urban production and consumption on the integrity and health of the local economy"* (Pieterse, 2010: 14).

Physical sustainability

This dimension refers to the structure and layout of the built environment and how it influences social interaction, movement and human life capacity (Pieterse, 2010). The physical structure or design of urban space (and its resultant efficiency) directly impacts the dimension of ecological sustainability.

Political sustainability

This dimension addresses how the dimensions outlined above are influenced and governed by political sustainability, which is understood as the democratisation and participation of the local civil society in decision-making processes. In other words, it refers to the quality of governance systems guiding the stakeholders involved in the other four dimensions (Pieterse, 2010).

The extent to which economic, social, ecological, physical and political performance is sustainable is dependent upon whether the pressures exerted by these dimensions are kept within the ecological capacity of the urban development. This is overseen by the political sustainability dimension, which is represented as the governance framework regulating the performance of the other four dimensions (Allen, 2001). This research therefore considers the role WSUD can play in the achievement of sustainable urban development.

2.5.2 WSUD and sustainable urban development

The role of water, within the construct of sustainable urban development, has received wide-spread attention in recent years (McCormick *et al.*, 2013; Lamond *et al.*, 2014), largely because freshwater demand surpassed population growth by more than fifty percent between 1900 and 1995 (Harris, 2006). In fact, in many cities, water use exceeds the limits of sustainability, meaning that demand management of water has required increased attention to address this issue (Hatt *et al.*, 2006). However, Coutts *et al.* (2012) contend that urban infrastructure is designed to export stormwater away from the urban environment to reduce the risk of flooding, meaning that countries experiencing water scarcity (South Africa being one of them) are forced to supplement this stormwater by importing potable water – an unsustainable approach. The authors therefore outline how WSUD could be implemented as a strategy to improve stormwater management and water issues in general. They define WSUD as:

> *"WSUD involves technologies and approaches that aim to retain water in the urban land- scape through stormwater harvesting and fit- for-purpose reuse and infiltration into soils to meet ecological, social and financial objectives."* (Coutts et al., 2012: 3)

In other words, urban development should aim to view stormwater as an asset vital to recharging water supplies in urban areas (Haskins, 2012) – a more sustainable approach

to water management. To this end, urban drainage becomes an important function when it comes to sustainable urban development. SuDS offer an alternative approach to conventional drainage practice, as they attempt to view drainage, holistically and in line with the ideals of sustainable development (Armitage *et al.*, 2014).

2.5.3 SuDS

The stormwater component of WSUD within the entire urban water cycle has been more significantly focused on in recent years (Armitage *et al.*, 2013b). For example, the WRC sought out research propositions in 2011 geared towards providing guidelines to assist UWM decision-makers in South Africa on the implementation of SuDS (Armitage *et al.*, 2014). This was a response to increases in urbanisation, which adds pressure to the management of urban drainage in terms of aquatic ecosystems (Fletcher *et al.*, 2014). In South Africa, SuDS have been defined as:

> *"A sequence of management practices and/or control structures or technologies designed to drain surface water in a more sustainable manner than conventional techniques."* (Armitage et al., 2014: xxvi)

The authors contend that this is achievable by simulating the natural hydrological cycle through sequential interventions in the form of a 'treatment train' (Armitage *et al.*, 2013a: 1). Treatment trains are defined as "*a combination of different methods implemented in sequence or concurrently to achieve best management of stormwater. These methods include both structural and non-structural measures*" (Armitage *et al.*, 2013a: xvii) various authors have argued that mimicking the hydrological cycle by passing stormwater through these treatment trains improves amenity and quality of water, advocates biodiversity and reduces the possibility of flash flooding (Semple *et al.*, 2004; Melbourne Water, 2005; Woods-Ballard *et al.*, 2007).

It is important to recognise that SuDS are not standalone interventions, their implementation may be inappropriate in certain conditions, and they are not site-specific (California Stormwater Quality Association, 2003; Donovan & Naji, 2003; Idaho Department of Environmental Quality, 2005). In South Africa, three intervention points are identified in the treatment of stormwater, each being a permutation of a SuDS option (Armitage *et al.*, 2014). This is shown in Figure 2.2, which highlights The SuDS Treatment Train.

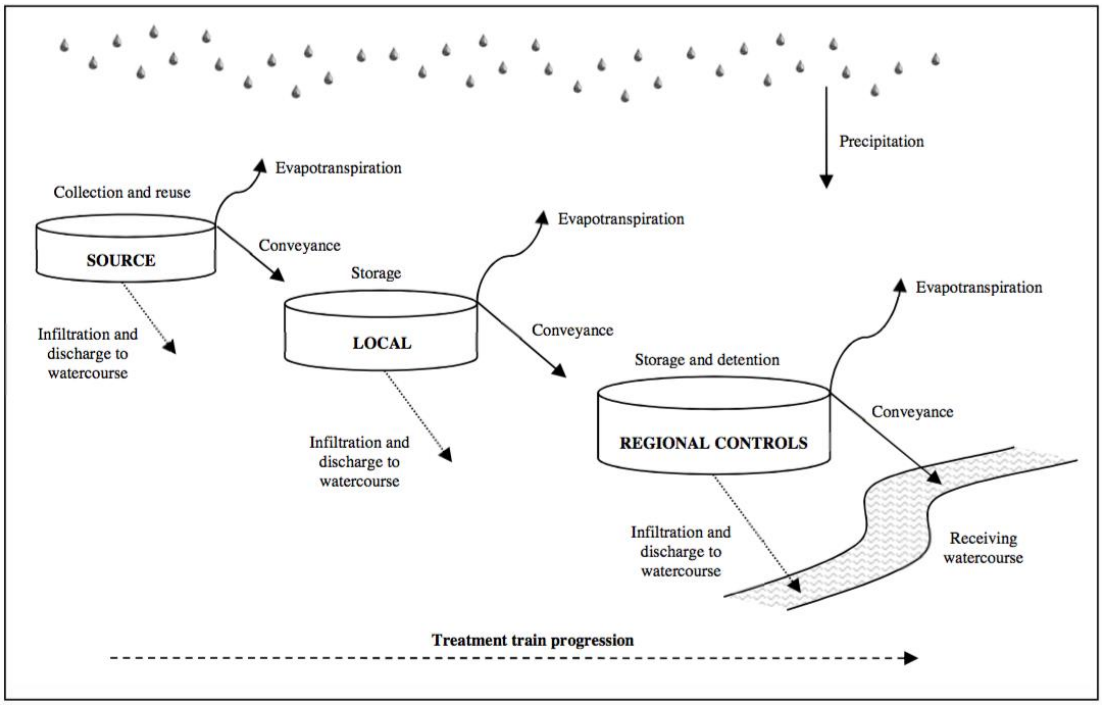


Figure 2.2: The SuDS Treatment Train (Source: Woods-Ballard *et al.,* 2007)

As indicated in Figure 2.2, there are three primary intervention points within the Treatment Train progression: source controls, local controls and regional controls. This progression was later adapted to include another stage at the beginning of the treatment train – 'good house-keeping', which should be positioned ahead of 'source controls' (Armitage *et al.*, 2013b). The four intervention points are defined as follows:

- **Good house-keeping:** Aims to minimise the release of pollutants (such as solid waste) into the environment where it may subsequently be transported by stormwater.
- **Source controls:** Manage stormwater runoff as close to its source as possible, usually on site. Typical SuDS options include: green roofs, rainwater harvesting, permeable pavements and soakaways.
- **Local controls:** Manage stormwater runoff in the local area, typically within the road reserves. Typical SuDS options include: bio- retention areas, filter strips, infiltration trenches, sand filters and swales.
- **Regional controls:** Manage the combined stormwater runoff from several developments. Typical SuDS options include: constructed wetlands, detention ponds and retention ponds.

Each intervention point encompasses variations of SuDS types, utilised at different scales within a city, to promote more natural drainage (Armitage *et al.*, 2013b). In this paper, twelve families of SuDS options are presented. The options should be determined by the characteristics of the site. Table 2.3, 2.4 and 2.5 provide a description of each SuDS option, highlighting the intervention point at which it should exist (Armitage *et al.*, 2013a). For the sake of consistency, definitions follow those set out by Armitage *et al.* (2013b: vi-vii) in their report for the WRC.

Table 2.3: Source controls and the associated SuDS options (Source: adapted from Armitage *et al.,* 2013a)

Intervention Point	SuDS Option	Description	Example
Source controls	*Green roofs*	Green roofs are vegetated roofs (Stahre, 2006; Wanielista *et al.*, 2008). The image provides an example of the eThekwini Green Roof Pilot Project, Durban CBD (Armitage *et al.*, 2013b: 22).	
	Rainwater harvesting	Refers to the temporary storage and reuse of rooftop and/or surface runoff (Melbourne Water Corporation, 1999). The image provides an example of roof runoff storage tanks for household purposes (Armitage *et al.*, 2013b: 25).	
	Soakaways	Usually excavated pits packed with course aggregate and other porous media, which are used to detain and filter stormwater runoff from a single source (Armitage *et al.*, 2013b). The image provides an example of groundwater recharge of runoff from a single residential dwelling, Cotswold Downs Estate, Hillcrest (Armitage *et al.*, 2013b: 28).	
	Permeable pavements	Load-bearing, durable and pervious surfaces such as concrete block pavers laid on top of granular or stone base that can temporarily store stormwater runoff (Armitage *et al.*, 2013b). The image provides an example of permeable concrete block pavers with open joints and slotted ends filled with pea-sized gravel (Armitage *et al.*, 2013b: 31).	

Table 2.4: Local controls and the associated SuDS options (Source: adapted from Armitage *et al.,* 2013a)

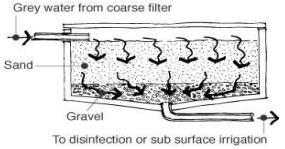
Intervention Point	SuDS Option	Description	Example
Local controls	*Filter strips*	Vegetated areas of land used to manage shallow overland stormwater runoff through filtration (Debo & Reese, 2003). The image provides an example of vegetated filter strips adjoining a meandering stream (Armitage *et al.*, 2013b: 35).	
	Swales	Shallow grass-lined channels with flat and sloped sides used to convey stormwater from one place to another. They typically remain dry between rainfall events (Parkinson and Mark, 2005). The image provides an example of a roadside swale, Cotswold Downs Golf Estate, Hillcrest (Armitage *et al.*, 2013b: 37).	
	Infiltration trenches	Excavated trenches lined with a geotextile and backfilled with rock or other relatively large granular material. They are typically designed to receive stormwater runoff from adjoining residential properties (Hobart City Council, 2006). The image provides an example of an infiltration trench in Wales (SuDS Wales, 2016: 1).	
	Bio-retention areas	Landscaped depressions used to manage stormwater runoff through several natural processes such as filtration, adsorption, biological uptake and sedimentation (Debo & Reese, 2003). The image provides an example of a bio-retention area situated between housing units, Evergreen Retirement Village, Cape Town (Armitage *et al.*, 2013b: 43).	
	Sand filters	Usually an underground sedimentation chamber connected to a filtration chamber in which stormwater runoff is temporarily stored before being filtered through a sand filter (Woods-Ballard *et al.*, 2007). The image provides an example of a sand filter (Renewable Energy Website (REUK), 2015: 1).	

Table 2.5: Regional controls and the associated SuDS options (Source: adapted from Armitage *et al.,* 2013a)

Intervention point	SuDS option	Description	Jpg Example
Regional controls	*Detention ponds*	Relatively large depressions that temporarily store stormwater runoff to reduce the downstream flood peak (Woods-Ballard *et al.*, 2007). The image provides an example of a large roadside detention pond, Hillcrest (Armitage *et al.*, 2013b: 49).	
	Retention ponds	Also known as 'retention basins' – formed by excavating below the natural ground water level and lining the base to retain stormwater runoff (Debo & Reese, 2003). The image provides an example of a large retention pond, Cotswold Downs Golf Estate, Hillcrest (Armitage *et al.*, 2013b: 51).	
	Constructed wetlands	Attempt to mimic the characteristics of natural wetlands using marshy areas and aquatic-resilient plants. They can be aesthetically pleasing and provide a vibrant wildlife habitat (North Carolina Division of Water Quality (NCDWQ), 2007; Woods-Ballard *et al.*, 2007). The image provides an example of a constructed wetland, Century City, Cape Town (Armitage *et al.*, 2013b: 54).	

SuDS aim to imitate and restore natural infiltration patterns (Lamond *et al.*, 2014) and therefore tend to function as the stormwater management component within the WSUD construct (Armitage *et al.*, 2014). In this regard, it has been argued that SuDS are an example of GI, which refers to the management of landscapes that benefit man-made structures and natural ecosystems (Keeley *et al.*, 2013). WSUD is also achievable by protecting natural landscapes, using natural water systems to reconnect man-made structures and natural landscapes, and using SuDS (Ashley *et al.*, 2013).

As this all-encompassing notion of WSUD clearly has a direct relationship with sustainable urban development, the researcher proposes the possibility of a correlation between the five dimensions of sustainable urban development and WSUD in South Africa. This is based on the attention that South Africa has focused on 'Water Sensitivity' (Armitage *et al.*, 2014).

2.5.4 The relationship between WSUD and the five-dimensional model of sustainability

The expanded definition of 'Water Sensitivity' and Pieterse's five-dimensional model of sustainable urban development together provide a basis for linking WSUD and the built environment. Each dimension is attributable to one of the corresponding five components highlighted by Armitage *et al.* (2014: 17). Table 2.6 correlates the dimensions to each definition component. In addition, it highlights other authors sharing the viewpoint as (Armitage *et al.*, 2014).

Table 2.6: Correlation between WSUD and the five-dimensional model of sustainable urban development

Correlation between WSUD and the five-dimensional model of sustainable urban development		
Sustainability dimension	**Armitage *et al.* (2014: 17) Definition**	**Additional reference**
Economic	Water has economic value, recognisable as 'natural capital' or an 'economic good' – including the acknowledgment that natural ecosystems provide valuable goods and services.	*(Cullet, 2014)*
Social	It is a basic human right to have access to sufficient potable water.	*(Mokonyane, 2015)*
Ecological	South Africa is water-scarce.	*(Ranchod et al., 2015)*
Physical	Water is a finite and precious resource, responsible for sustaining all life, development and the broader environment	*(Pieterse, 2010)*

Correlation between WSUD and the five-dimensional model of sustainable urban development		
Sustainability dimension	**Armitage *et al.* (2014: 17) Definition**	**Additional reference**
Political	All stakeholders, including users, planners and policy-makers at various levels should be involved in the management of water, but in a participatory manner.	*(Brown, 2011; Simelane, 2015)*

With Table 2.6 in mind, it is important to note that an urban space or an urban precinct has the ability to contribute to the sustainability of a city, with water being an integral feature in achieving that sustainability (Chiesura, 2004; McCormick *et al.*, 2013).

2.5.5 The role of water in urban precincts

Green spaces or sustainable urban areas being of strategic importance is not a new concept particularly in relation to the 'liveability' of urbanising cities (Allen, 2001; Chiesura, 2004; Pieterse, 2010; Michell, 2013). GI essentially aims to benefit human structures and natural ecosystems (Keeley *et al.*, 2013). Munro and Holdgate (1991) describe the ability of urban precincts to influence the sustainability of a city, while Chiesura (2004) explains the integral role of water within a precinct's effort to achieve such sustainability. Natural assets (urban parks, forests and greenbelts) and their components (water and trees) have also been shown to add value (be it environmental or economic) to urban areas (Chiesura, 2004).

In light of the above, this research aims to address the concept of 'value.' Philosophically, the term, 'value' is argued to '*carry us into all areas of human life*' (Edel, 1953: 198). In other words, there is no all-encompassing definition of 'value' because it straddles a number of fields (Hartmann, 1932). For this research, 'value' is explicitly defined, according to the field that it connects to – in other words, 'value' can be expressed in economic (financial), social, ecological, physical (aesthetic) or political terms.

2.6 Value capture

Many factors influence the value of land or property. A private landowner, for example may fund improvements to the land, thereby increasing its value. Macroeconomic changes such as growth in surrounding populations or changes to more microeconomic factors such as neighbourhood activity may have an impact on the value of land or

property. Changes in planning and land-use regulations, public investment in infrastructure and the provision of public services also influence the value of land and associated properties (Hong & Brubaker, 2010; Ingram & Hong, 2012). Value capture has been described as the process of extracting the incremental value that accumulates to a property, following some form of public investment (or the latter changes referred to above) (McGaffin *et al.*, 2014).

Ingram and Hong (2012) describe how the fiscal crisis in 2012 stimulated interest in new revenue sources, including capturing land value increases created by public investment in infrastructure. It is an efficient revenue source because it prevents the public from undervaluing the public goods in question. In other words, the recipients of infrastructure are required to pay part of the investment costs (Ingram & Hong, 2012). Consequently, in this research, value capture does not address privately created value but rather the incremental value accumulated following some form of public investment or action.

According to Hong and Brubaker (2010), land value can be determined according to a variety of factors including:

- public investment in infrastructure and social services
- changes in land use regulations
- population growth and economic development
- private investment that increases land value
- the original productivity of the land.

The value of land is thus a result of both public and private investment and action, thereby clarifying who should capture what (Hong & Brubaker, 2010; Ingram & Hong, 2012). McGaffin *et al.* (2014) extend this notion by asserting that the value capture process should incorporate four elements: value creation, the calculation of the incremental value created, the capturing of this value and the ensuing distribution of the funds from the captured value.

2.6.1 Value creation

Value creation occurs when the introduction of infrastructure in a given place results in increased values to the land in proximity (Kemp & Mollard, 2011; McGaffin & Gavera, 2012). McGaffin and Gavera (2012) explain how value (in this context) is a function of income, so the provision of infrastructure should lead to increased spending in a particular location. Theoretically, increased spending leads to greater demand, which yields higher rentals and increased prices being paid, thus resulting in higher residual land values (Brown-Luthango, 2011; Ingram & Hong, 2012; McGaffin & Gavera, 2012). In other words, increased spending can be attributed to value capture.

However, McGaffin *et al.* (2014) argue that favourable development conditions need to exist for value creation to be realised. For example, the provision of public infrastructure such as a transport interchange may prompt increased spending in the area but a poorly designed and managed retail centre nearby will not generate increased value in comparison to one that is located similarly and run more efficiently (Debrezion *et al.*, 2007). Other examples include poor urban management, as well as difficulties cementing zoning/development rights (McGaffin & Gavera, 2012). Consequently, public authorities may intervene to maximise value creation (McGaffin *et al.*, 2014)

2.6.2 Calculation of the additional value created

Conceptually, value capture creates numerous disputes and deliberations (Ingram & Hong, 2012). McGaffin *et al.* (2014) describe how difficulties arise when calculating the percentage of value increase and to what it is attributable. Furthermore, peripheral factors such as the state of the market or other, non-related developments such as positive externalities may increase value (McGaffin, 2011; Ingram & Hong, 2012). The question arises, therefore, as to what percentage of value is solely due to the infrastructure implemented by the state (RICS, 2002; Debrezion *et al.*, 2007).

Another contentious issue involves the various stakeholders' versus the state's infrastructure investment: even if the development opportunities created are attributable solely to the state's infrastructure investment, the value created is not (Bhana *et al.*, 2011; McGaffin *et al.*, 2014). To ensure that development opportunities (flowing from the state's investment) are maximised, factors including capital outlay, business and development risk, experience and expertise are required. In other words,

the skill and expertise of stakeholders responsible for the operations of a given development may determine success/profitability, not the original state investment (Cervero & Susantono, 1999; Debrezion *et al.*, 2007; McGaffin *et al.*, 2014). Furthermore, (Rodriguez and Mojica (2008) contend what degree of public investment is dubbed 'the average' and subsequently what can be expected in return for the use thereof.

Despite the availability of econometric models to calculate land value, the calculation itself is often a rough estimate (Barker, 2007; Case, 2007; Davis & Heathcote, 2007). A number of studies have been completed in North America and Europe, and more recently in South America and Asia, to determine whether the provision of transport infrastructure increases property values (Smith & Gihring, 2006). Similarly, Kemp and Mollard (2011) describe how water industries use connection and developer charging agreements to finance extensions to a given water supply network (Oualalou, 2012).

The findings of these studies have varied considerably, showing positive, negative or zero correlations. There has, however, been a generally positive correlation between the provision of transport infrastructure and the value of adjacent properties. The cases yielding negative correlations have been attributed to negative externalities such as noise and pollution (Rodriguez & Targa, 2004; Debrezion *et al.*, 2007; Du & Mulley, 2007; Rodriguez and Mojica, 2008; McGaffin, 2011). Moreover, Debrezion *et al.* (2007) argue how the development context and the method used can explain the differences in results.

2.6.3 Capturing the value

Value capture mechanisms have been described as a means of financing the cost of public improvement investments by capturing part of the incremental increase in land value (Smith & Gihring, 2006; Brown-Luthango, 2011; Kemp & Mollard, 2011; Ingram & Hong, 2012; McGaffin *et al.*, 2014). Local and international evidence advocates numerous benefits through the use of value capture instruments, which can be captured by households, developers, investors and the state (Bhana *et al.*, 2011; Brown-Luthango, 2011).

As previously mentioned, Ingram and Hong (2012) explain how value capture is an efficient revenue source that allows more flexible and discretionary spending to service underdeveloped regions in a city (Hickey-Tshangana, 2011; McGaffin *et al.*, 2014).

Lower income groups consequently acquire increased access to employment, amenities and services (McGaffin & Gavera, 2012), which is an obvious focus point for investment off the back of urban infrastructure's capacity to attract and retain people and their expenditure (McGaffin *et al.*, 2014).

However, it is important to understand the value capture mechanisms available, as well as the institutional or legal framework in which they are being implemented. For example, infrastructure provision is most likely capitalised in locations where market conditions are most advanced. In doing so, revenue generation can be maximised to cross-subsidise poorer areas. However, this is subject to policy implementation, which clearly marks how the funds should be used. In other words, there is the risk that value capture mechanisms will perpetuate inequalities already in existence within the city (McGaffin *et al.*, 2014).

Value capture mechanisms

Internationally, there are various value capture mechanisms (Ingram & Hong, 2012), although the label by which they are designated may vary depending on the legal, economic or institutional context in which they are applied. Chapter 1 highlights how, in South Africa, two broad value capture mechanisms have been described according to characteristics rather than label (McGaffin *et al.*, 2014). The first category aims to induce a social or use-related outcome, while the second facilitates income-generation. Social/use-related mechanisms benefit the community and hold a societal value (Brown, 1997; Smolka & Amborski, 2000; Ingram & Hong, 2012; McGaffin *et al.*, 2014). Income-generating mechanisms extract income from the increment value in the form of user charges or taxes to fund infrastructure or other developments (Fensham & Gleeson, 2003; Ingram & Hong, 2012; McGaffin *et al.*, 2014). Tables 2.7 and 2.8 provide examples of social/use-related and income-generating value capture mechanisms respectively.

Table 2.7: Social/Use-related mechanisms. (Source: adapted from McGaffin *et al.,* 2014)

Social/Use-related mechanisms	
Transit-oriented development (TOD)	TODs provide housing and jobs within walking distance of transport interchanges. The aim is to leverage mixed-use, private and municipal development to create a market for public transport and increase revenue streams (ADEC, 2010).
Zoning	Zoning determines the scale, location and type of development. This mechanism rewards developers by reducing the marginal cost of development.

Social/Use-related mechanisms	
	In return, developers are required to meet public objectives or provide public amenities (ADEC, 2010).
Inclusionary zoning	This mechanism allows for the incorporation of mixed-income communities through municipalities obliging developers to provide a percentage of affordable units in their projects (ADEC, 2010).
Air rights	Air rights enable development above public infrastructure in return for public amenities (Cervero & Murakami, 2009).
Land banking	This mechanism involves the holding of land near transport interchanges by local municipalities for a variable amount of time, based on its lease, sale or development (Bhana et al., 2011).
Joint development	Joint developments are public-private partnerships (PPP). Both parties contribute and share the cost and income from an associated development (ADEC, 2010).

Table 2.8: Income-generating mechanisms. (Source: adapted from McGaffin *et al.,* 2014)

Income-generating mechanisms	
Betterment taxes	For this research, betterment taxes are used to define a category of value capture taxes. In other words, *"any tax or charge on an increase in value resulting from some public action such as the issuing of development rights for the provision of infrastructure"* (McGaffin *et al.*, 2014: 379)
Business Improvement Districts (BIDs) or Central Improvement Districts (CIDs)	BIDs and CIDs oblige property owners within special zones to pay additional levies to finance additional services such as cleaning and security. The discrepancy between BIDs depends on the vehicle generating the revenue and for what the revenue is used (ADEC, 2010; Hickey-Tshangana, 2011).
Development charges	Development charges are levies enacted on developers for an effective change in land use rights. For example, the issuing of development permits or the point that a property is subdivided (Hickey-Tshangana, 2011; McGaffin *et al.*, 2014). The aim of a development charge is for developers to subscribe to the cost of additional municipal infrastructure, stemming from the intensified development resulting from these land use rights (ADEC, 2010).
Land Value Increment Taxes (LVITs) and Tax Increment Financing (TIF)	The premise behind LVITs and TIFs is that property values in an area increase off the back of public infrastructure investment, which subsequently increases the property rates collected from that area. Municipalities then ring-fence the additional revenue to fund the infrastructure in question (ADEC, 2010; Bhana *et al.*, 2011; McGaffin *et al.*, 2014).

The value capture mechanisms referred to in Tables 2.7 and 2.8 have been successfully implemented on an international scale to raise funds for public goods, as well as to generate more equitable and sustainable urban forms (Brown-Luthango, 2011). However, the income-generating mechanisms listed in Table 2.8 require further

exploration, as the key mechanisms used in South Africa are development charges and BIDs (McGaffin *et al.*, 2014). Moreover, Hickey-Tshangana (2011) and McGaffin *et al.* (2014) argued there is an increasing aspiration to use LVITs and TIF in the near future.

It is therefore important to evaluate key terms within these mechanisms to provide an in-depth depiction and understanding of the literature. LVITs can be explained in a step-by-step manner and thereby provide insight into ring-fencing and TIFs:

- Local municipalities can, by law, establish a special taxing district and value the associated properties both with and without infrastructure.
- Properties without infrastructure are referred to as 'before scenario' while properties with infrastructure are labelled 'after scenario.'
- The increment value is the difference between the two scenarios.
- A property is taxed according to these scenarios and the income earned on the 'before scenario' remains to be used to fund general municipal expenses, while the income earned on the 'after scenario' is ring-fenced to fund the related infrastructure (ADEC, 2010).

However, the time lag between the construction of and payment for the infrastructure, and increased property values presents a problem. TIFs can be used to resolve this problem whereby municipalities raise a public bond, based on the expected incremental income arising from their infrastructure expenditure.

The increment income earned is then ring-fenced to repay the bond (ADEC, 2010).

Summarising value capture mechanisms in South Africa

Development charges and BIDs are the key mechanisms utilised in South Africa, while interest in LVITs and TIF is increasing. However, the legal framework in South Africa limits the current and future use of value capture because of its unclear and inconsistent format. To this end, varying pieces of legislation attempt to determine what income-generating mechanisms may be established and how they can be used. The legislation applicable is dependent on whether the instrument is defined as a tax (levy or duty) or a user charge such as an administrative fee or tariff. The distinction between the two is that user charges follow the 'individual benefit principle' in terms of exact usage

whereas taxes generate revenues that benefit a group of beneficiaries (Hickey-Tshangana, 2011).

The problem arises because income-generating mechanisms do not clearly fall into a category of either a tax or a user charge. For example, *"development charges are usually levied against a landowner for a particular development and are used to finance infrastructure to provide services for that development. In this sense, they have user charge characteristics. However, the infrastructure may also benefit other areas and landowners and therefore the charges exhibit the characteristics of a tax"* (McGaffin *et al.*, 2014: 385).

2.6.4 Value distribution

The final element within the value capture process relates to how the value is distributed (McGaffin *et al.*, 2014). International practice has shown that successful implementation of value capture mechanisms is dependent on municipalities' ability to link the tax payment or development charge to the benefit received (Hickey-Tshangana, 2011). Consequently, a fundamental element of many value capture mechanisms is revenue ring-fencing (McGaffin *et al.*, 2014). McDonald and Smith (2004: 1470) define ring-fencing as the process whereby "*all incomes and expenditures associated with running a service is separated from other municipal functions… to reveal the full financial costs/surpluses of running a service and to identify areas of loss/gain…"*

Value capture mechanisms allow municipalities to cross-subsidise pro-poor developments (Brown-Luthango, 2011). For example, developers may access increased zoning rights on the basis that they contribute, through a development charge, towards the cost of additional infrastructure (ADEC, 2010). The revenue collected by the municipality can be ring-fenced to finance infrastructure provision to poorer nodes within a city (McGaffin & Gavera, 2012). However, pro-poor policies are required in these areas to avoid merely maximising opportunities where market conditions are favourable and perpetuating existing inequality patterns within a city. Moreover, ring-fencing can undermine democratic principles by virtue of the fact that parliament is meant to determine how these revenue streams are spent (Hickey-Tshangana, 2011; McGaffin *et al.*, 2014). In addition, these funds are not subject to the same requirements and scrutiny for justification in the annual budget process, which can result in a lack of transparency and accountability (Hickey-Tshangana, 2011).

The list below summarises certain pre-conditions for successful implementation and use of value capture:

- Policy objectives need to be clear and non-contradictory.
- All relevant stakeholders require an understanding of conducive market conditions, cycles and forces.
- The legal framework governing the implementation of value capture mechanisms should be explicit and finite by nature, with strong administrative systems in place. For example, valuation rolls, credit rating systems and revenue collection should fit within sound fiscal management.
- The discrepancy between taxes and user charges should be clarified and the respective policies required for the implementation should be in place.
- Healthy PPPs are for private parties to absorb some risk, while still being incentivised to partake in a development (McGaffin *et al.*, 2014).

2.7 Infrastructure investment in South Africa

South African cities are exposed to a triple challenge in terms of servicing and maintaining existing infrastructure and aspiring to incite economic growth through the provision of new infrastructure, whilst also seeking mechanisms to eradicate historic infrastructure backlogs inherited from the Apartheid era (Brown-Luthango, 2011). The focus on infrastructure investment originates in international trends, which attribute sustainable economic growth to considerable investment in infrastructure (World Bank, 2009). South Africa has, in recent years, placed significant emphasis on infrastructure upgrades and it is argued that such public investments stimulate land value increases, which can then be captured to finance the provision of infrastructure at a local level (Brown-Luthango, 2011; ACC, 2014).

Infrastructure investment and economic growth and their relationship have been the subject of notable academic research (Brown-Luthango, 2011). For example, infrastructure has been defined as "*the structural elements of an economy that facilitate the flow of goods and services between buyers and sellers."* (Ajulu & Motsamai, 2008: 1). Fedderke and Garlick (2008) broadly describe how infrastructure is a capital good and investment in such infrastructure is therefore capital expenditure with infrastructure

being the fundamental social capital that allows economic and social activities through the provision of facilities (for example transportation) in which community activities can occur. In their paper, Fedderke and Garlick (2008: 2) argue that infrastructure embraces *"at least some of the characteristics of a public good."* Moreover, the distinction is made between economic, social and institutional infrastructure.

Economic infrastructure refers to the physical assets that offer services used in production and ultimate consumption, such as water, electricity, transport and communications supply. Social infrastructure facilitates an adequately skilled and healthy workforce through assets such as health and education facilities. However, the classification is largely *ad hoc* in that many forms of infrastructure can be viewed as social or economic. For example, educational facilities assist in generating human capital, which holds an economic function. Institutional infrastructure supports these classifications by way of legal systems and capital markets (DBSA, 1998; Fedderke & Garlick, 2008; Brown-Luthango, 2011).

2.7.1 Overview of infrastructure investment in South Africa

Fedderke *et al.* (2006: 1042) completed an investigation examining the relationship between infrastructure and growth between 1875 and 2001, which concluded that infrastructure investment "*leads economic growth."* In South Africa, however, infrastructure investment has not led the level of economic growth required to meet the South African Government's aim of halving poverty and unemployment by 2014 (Brown-Luthango, 2011). To achieve such a goal, Kirsten and Davies (2008) predicted that the South African economy would need to grow by 4.5% between 2001 and 2009; and by 6% between 2010 and 2014. National Treasury allocated R416 billion to maintenance and infrastructure between 2004 and 2007, which subsequently increased to R568 billion between 2008 and 2011 (DBSA, 2008). Despite the African Economic Outlook (2016) indicating that the anticipated economic growth rates had not been achieved, the Government still approved infrastructure plans of R845 billion between 2012 and 2015 (McGaffin & Gavera, 2012).

Road infrastructure accounted for the highest portion of infrastructure expenditure, followed by electricity and water (DBSA, 2012). The contribution towards the majority of revenue sources for the nine municipalities are electricity (30%), property rates

(20%) and Regional Services Council (RSC) levies (17%) (Brown-Luthango, 2011). The removal of RSC levies in 2006 has placed increased strain on public finances, which has led to the opportunity to use value capture mechanisms (Brown-Luthango, 2011).

2.7.2 Public goods

Referring back to Fedderke and Garlick (2008) and their statement regarding infrastructure holding partial characteristics of a public good, it is important for the purposes of this research to provide some insight into the characteristics and features of public versus private goods in an economic context. Moreover, Ingram and Hong (2012) describe how capturing land value increases created by public investment in infrastructure is an efficient revenue source because it prevents the public from undervaluing the public goods in question – further encouraging the need to review public goods.

Public goods have been described as those that may be consumed by one individual, without reducing the availability to another and from which no one is excludable. In other words, pure public goods are indivisible, non-excludable and non rivalry (Kaul *et al.*, 1999; Myles, 2002). For example, an individual may benefit from a streetlight; that individual's consumption does not reduce the quantity available to another person and it is impossible to exclude specific individuals from using such goods. Similarly, services provided to citizens in Johannesburg by the South African National Defence Force (SANDF) cannot reduce the quantity of protection available to inhabitants of Cape Town (Black & Siebrits, 2008).

Pure public goods, however, rarely exist (Kaul *et al.*, 1999; Myles, 2002; Black & Siebrits, 2008). For example, the services offered by SANDF are rendered less effective the more people require protection, so it is contentious whether national defence is fully 'non-rival' at all levels of provision (Black & Siebrits, 2008). McGaffin (2014), citing Economics Online (2014), explains how the indivisible, non-rivalry and non-excludability criterion in case of streetlight consumption refers to community goods.

According to Kaul *et al.* (1999) and Black and Siebrits (2008), pure public goods can be categorised by being non-rivalry in terms of consumption and by no one being excludable. Society however, consumes both public and private goods so it is useful to determine the characteristics of private goods to understand the public good theory. A

private good involves buyers and sellers meeting through a price mechanism. In other words, private goods are excludable in that individuals state their preference for a good by paying for it. Moreover, consumption by one individual prevents another individual from consuming that good (Kaul *et al.*, 1999; Myles, 2002; Black & Siebrits, 2008).

In the case of pure public goods, the non-excludability characteristic incentivises the possibility of 'free riding.' Free riding occurs when individuals misrepresent their preference for a good through the expectation that a benefit may be enjoyed without having to pay for it (Black & Siebrits, 2008). The provision of public goods by the government can improve this inefficient market outcome, as government may enforce its coercive powers by imposing payment for public goods. However, it is unable to determine efficient prices as the government cannot define, with absolute certainty, consumer demand for such goods. Consequently, governments cover the cost of providing public goods by collecting taxes from consumers, thereby allowing consumers a direct stake in revealing their preference for public goods (Myles, 2002; Black & Siebrits, 2008; Ingram & Hong, 2012).

However, the government is not automatically responsible for producing public goods. The distinction between private and public goods therefore lies in the financing thereof (Black & Siebrits, 2008). For example, collective goods are those goods requiring economies of scale to be viable and therefore being so large that the pay-backs are often inter-generational, resulting in limited incentive/interest by the market to provide such goods, major water works being an example of this (McGaffin, 2014). There are therefore goods that possess both private and public good characteristics: mixed and merit goods.

Mixed goods

Mixed goods can be non-rivalry but excludable, or they can be rivalry and non-excludable. Tollgates are an example of the former in that they apply the exclusion principle through the requirement to pay to access a given highway but there is no rivalry in accessing the space. On the other hand, congested thoroughfares, for example, possess high levels of rivalry, owing to the competition for space but the exclusion principle cannot be implemented, as it would further aggravate congestion issues (Myles, 2002; Black & Siebrits, 2008).

Merit goods

Merit goods involve political factors in that the exclusion principle may be applied but the goods in question are regarded as so meritorious that they are provided through the national budget (Loomis, 1996; Kaul *et al.*, 1999; Mead, 2012). For example, health services can be regarded in this manner: not only do the individuals making use of these services benefit, other people and the surrounding community also benefit as a result (Black & Siebrits, 2008). These goods can be under-supplied by the market, as individuals place less value on them than society, such as the provision of public housing (McGaffin, 2014; Economics Online, 2016).

The identification of whether a public good is exclusionary or rivalry is important in value capture. According to Ingram and Hong (2012) value capture mechanisms lead to reliable revenue streams through tax or user charges to finance the provision of public goods. As such, the excludability or rivalry nature of a public good can determine how the value can be captured. *"The more of a private good it is, the easier it will be to capture it in the form of a tariff, the more public it is, the more one would need to look at a broader taxation method of collection"* (McGaffin, personal communication 2016, April 13).

Internationally, municipal budgets face constraints when it comes to funding urban green space (van Zoest & Hopman, 2014), the extent to which it is valued by the public (Schäffler and Swilling, 2013) and the opportunity cost of not investing in green infrastructure (Parikh, 2008; Schäffler & Swilling, 2013; Costa & Hoyer, 2014). To this end, van Zoest and Hopman (2014) discuss whether green infrastructure can fund itself by accounting for the ecosystem services and respective value that they produce. Section 2.5.5 reviewed the role of water in urban precincts in terms of green infrastructure. The following section reviews green infrastructure in light of its public good characteristics and how its value can be quantified.

2.7.3 Funding green infrastructure

As previously mentioned, there has been exploration into the funding of green spaces by accounting for the ecosystem services they produce (van Zoest & Hopman, 2014). Ecosystem services have been defined as the "*capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly*" (De Groot *et al.*, 2002: 394). They include diverse functions ranging from air purification

and psychological stress-reduction, to water retention. But in essence, ecosystem services involve all processes and things nature provides (Millennium Ecosystem Assessment, 2005). In other words, ecosystem services are categorised as benefits humans attain from ecosystem functions (De Groot *et al.*, 2002). Gómez-Baggethun *et al.* (2013) further classify urban ecosystem services (or GI) into four categories:

- Provisioning services (goods obtained from green spaces, including water and food)
- Regulating services (maintaining liveable environmental conditions through climate moderation)
- Cultural services (encouraging social cohesion or psychological behaviour through conducive environmental conditions)
- Habitat services (allowing for non-human life to survive).

Lachowycz and Jones (2013) argue how the psychological and health impact of urban green space is widely recognised in urban planning. In addition, GI is said to be a contributing factor to the economic success of cities (van Zoest & Hopman, 2014).

These GI benefits require substantial funding and so the economic importance of GI should be assessed in terms of the value it creates, the identification of beneficiaries (including 'free riders'), and the financial impact of GI to validate the viability of GI investment (van Zoest & Hopman, 2014). To this end, The Economics of Ecosystems and Biodiversity (TEEB) study aimed to design a tool to quantify the benefit of green space and highlight beneficiaries (businesses/users/residents) (TEEB, 2010). The tool assists the financing of GI in three ways (van Zoest & Hopman, 2014: 109):

- It informs decision-makers by explaining and quantifying GI's economic contribution.
- It highlights how funding stems from the principle that the polluter and beneficiary should pay.
- It aims to ensure that the planning and designing green spaces is done optimally to benefit local society.

This argument, particularly point two, supports the notion that public goods, such as urban parks, are considered external to the economic domain and lack price signals (van Zoest & Hopman, 2014) – thereby encouraging the use of value capture mechanisms.

In addition, van Zoest and Hopman (2014) argue similarly to McGaffin *et al.* (2014) in terms of infrastructure investment and value creation in maintaining that the viability or success of a development is subject to entrepreneurial risk. In other words, even if the development opportunities created are attributable solely to the state's infrastructure investment, the value created is not. Moreover, van Zoest and Hopman (2014: 113) argue that increasing pressure for sustainable urban areas necessitates a *"systematic change at the paradigm level"* which requires extensive urban strategy that can be utilised in urban precincts.

The increasing body of knowledge highlighting the economic impact of water infrastructure (within the construct of GI) has shown how investment in the water sector generates economic benefits that outweigh their costs (Stockholm International Water Institute (SIWI), 2005; TEEB, 2010; Schäffler & Swilling, 2013; van Zoest & Hopman, 2014). Research has shown that access to water and sanitation alleviates poverty and promotes human development (WWAP, 2015). These investments in water supply can be explained by cities' efforts to transition to the green economy – those who appreciate the value of water in maintaining ecosystem services and biodiversity (UNEP, 2011). The following therefore assesses the value of water in a sustainable real estate context.

2.8 The 'value' of water in a sustainable real estate context

As previously mentioned, the philosophical meaning behind 'value' reaches into many areas of human life (Hartmann, 1932). In this research, value is assessed in terms of the five dimensions of sustainable urban development: economic, ecological, social, physical and political value.

2.8.1 Economic value

Tagtow (1990) and Luttik (2000) address how natural elements such as water and trees can increase property values, thereby generating increased tax revenues. In other words, there is added economic value within cities that utilise sustainable, GI or WSUD strategies (Chiesura, 2004; Armitage *et al.*, 2014). For example, the use of SuDS can significantly reduce the use of potable water, thereby reducing water costs (Armitage *et al.*, 2014).

2.8.2 Ecological value

Coutts *et al.* (2012) describe water's ecological value within the construct of WSUD to improve outdoor human thermal comfort in urban areas; assist in retaining water through stormwater harvesting and reuse; reduce temperatures through improved evapotranspiration and surface cooling; and maximise urban climate conditions for existing vegetation and green spaces.

2.8.3 Social value

Green spaces can have a psychological impact on city urban dwellers by, for example, providing a sense of peace and tranquillity (Ulrich, 1984; Kaplan, 1985; Hartig *et al.*, 1991). It is further argued that these features may have a knock-on effect in terms of social value (Coley *et al.*, 1997) where use of outdoor spaces encourages social interaction and promotes social cohesion (Kuo *et al.*, 1998).

2.8.4 Physical (aesthetic) value

Water frontage and the preservation of natural features can add aesthetic value. For example the physical design of a drainage system may lead to a 'waterfront effect' (Armitage *et al.*, 2014) – meaning that property values can increase as a result of natural water bodies. It is the physical design or makeup, which influences the economic and ecological value (Pieterse, 2010).

2.8.5 Political value

Importantly, the previously identified dimensions where water may add 'value' also apply to municipalities. For example, green spaces may assist with air purification or reduce pollution, which benefits public authorities in terms of long-term maintenance (Chiesura, 2004). Moreover, the state benefits from increased tax revenues from increased property values where development makes obvious use of natural elements (Chiesura, 2004), a concept also referred to as 'value capture' (McGaffin *et al.*, 2014).

In light of van Zoest and Hopman's (2014: 113) statement that *"systematic change at the paradigm level"* is required to alleviate increasing pressure on urban areas, it is important to understand how urban strategy is a critical concept to this change and that it assists in the capturing of the aforementioned value. Facilities Management (FM) has

developed over time as a notion that is able to leverage best value for an organisation across a number of fields (Jensen, 2009). Consequently, to understand the emergence of FM and its ability to create value, it is essential to review the concept of FM as a whole.

2.9 Defining facilities management

The concept of facilities management (FM) developed as a consequence of increased business competition (Alexander, 1996). Just as the business environment has evolved over time, so too has the definition of FM (Amaratunga, 2000; Green & Price, 2000; British Institute of Facility Management (BIFM), 2016). Exponential changes in information and communication technology (ICT) and increased workforce independence has led to generational changes in the definition of FM (Alexander, 1994; Amaratunga, 2000). FM's evolutionary nature (Green & Price, 2000; Mudrak *et al.*, 2005; Grimshaw, 2007; Price *et al.*, 2009; British Institute of Facility Management (BIFM), 2016) and the way it straddles a constantly increasing range of disciplines (Nutt, 1999; Chotipanich, 2004; Michell, 2013; International Facilities Management Association (IFMA), 2016), make it a difficult concept to define. Instead, the literature portrays how FM has evolved over time and thus that a generational approach to its definition provides a more in-depth understanding of this multidimensional paradigm (Alexander, 1994; Tobi *et al.*, 2013).

Pathirage *et al.,* (2008) suggest that the concept of FM has developed over four generations. Initially, it was considered in terms of operations, which concentrated on the management and maintenance of a building, and viewed solely as an operating cost (Becker & Steele, 1990) with Price (2000) describing it as a concept to be managed to its lowest operating cost rather than its best value. The second generation viewed FM as *"the practice of coordinating the physical workplace with the people and the work of the organisation"* (Finch, 1992: 196). In other words, it regarded facilities as integral to the processes and the people functioning within them, by allowing FM activities to be a continuous process within an organisation (Amaratunga, 2000).

In the third generation, FM focused on resource management, aiming to manage supply chain issues relevant to FM functions. The focus on FM as an integrated resource management process meant understanding FM in a business context (Pathirage, Haigh, *et al.*, 2008). However, as contended by Then (1999: 462), an organisation's "*strategic*

intent must show the facilities dimensions in its strategic business plan." This represents the fourth generation of FM.

2.9.1 Strategic FM

Amaratunga and Baldry (2000) explain how the fourth generation of FM requires businesses to balance strategic and operational interactions. The strategic function in FM represents any improvement to the performance of an organisation by implementing value-adding tools in the achievement thereof (Grimshaw, 2003). In other words, tools adding value to the physical structure of a facility to enhance the performance of an organisation, remain adaptable and absorb increasing business competition (Alexander, 1996; Amaratunga & Baldry, 2004; Tolman & Parkkila, 2009). For example, Cardellino and Finch (2006) explain how innovation from a technological perspective as well as in terms of services can improve the performance of an organisation. From a technological standpoint, Barrett (2000) illustrates how implementing IT systems in a workplace could promote the performance of a business.

There have been marked changes in the relationship between businesses and their assets and stakeholders, over the last three decades (Reich, 1991). Alexander (1994; 1996) suggests how FM should therefore be positioned as a cross-disciplinary activity to ensure management skills are relayed across multiple boundaries. In the same vein, Grimshaw (2003) described how facility managers are required to determine the importance of a business, its users and its assets separately to achieve strategic FM. Moreover, the nature of FM differs according to the location of a business, its function, industry and potential future direction (Langston & Lauge-Kristensen, 2002). Strategic FM, therefore, needs to appreciate the diversity of the different businesses and their need for different strategies (Grimshaw, 2004). In addition, while FM is relevant to all aspects of property, the management structure and culture within organisations will differ. The IFMA adopts this approach and defines FM as "*a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology"* (IFMA, 2016: 1).

2.9.2 The generic FM value map

As highlighted above, this evolution involved a shift from FM as a cost cutting function to it becoming a strategic management function, thereby laying the platform for research

into FM as a value-adding discipline (Jensen, 2009; Jensen *et al.*, 2012). Figure 2.3 portrays how the management of an organisation's resources can be utilised to leverage best value and create core competencies to satisfy numerous stakeholders (Jensen, 2009).

The generic FM Value Map can be broken down to include five key 'sections', namely:

1 Resources (Input)
2 Processes (Plan-Do-Check-Act)
3 Provisions (Output)
4 Impact (Outcome)
5 Stakeholders.

Facilities management

Each section is divided into various sub-sections with FM being described in this framework as playing a role within the resources, processes and provisions levels. In other words, if one views the structure of this framework, FM utilises certain resources as inputs to a process, building up to numerous provisions as outputs. These provisions can ultimately, as an outcome, affect the core business and general surroundings, which may benefit various stakeholders (Jensen, 2010).

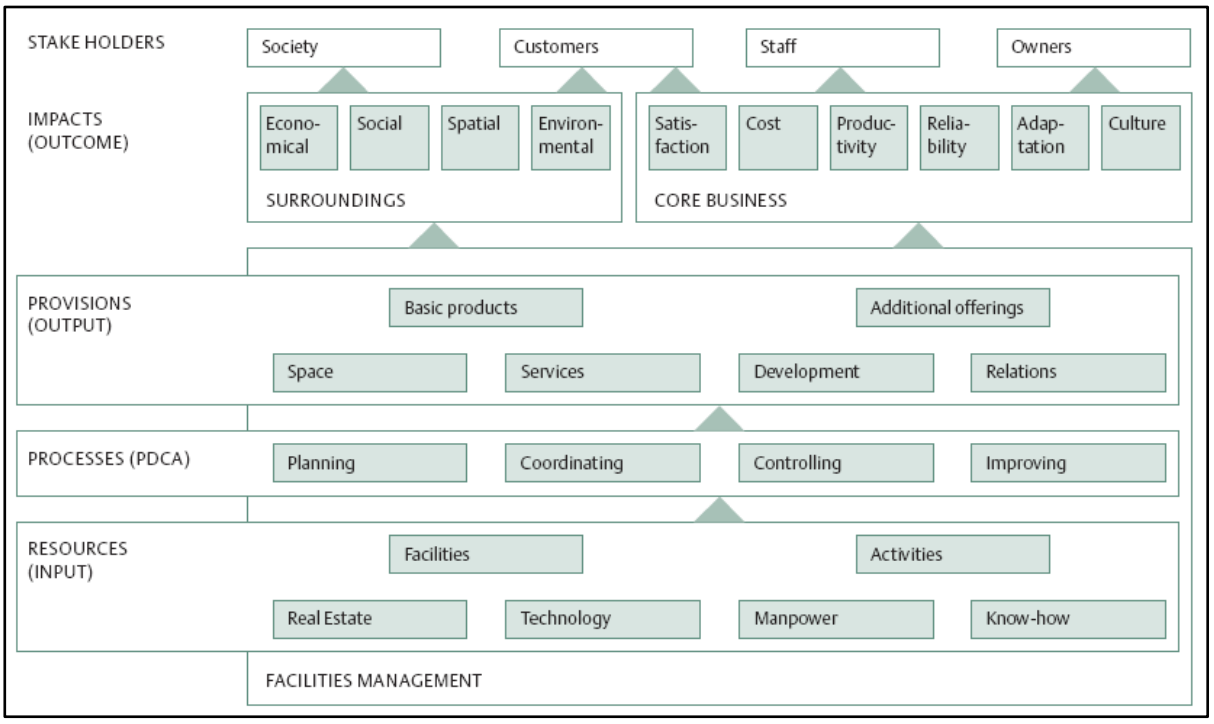


Figure 2.3: Generic FM value map, Level 1 and 2 (Source: Jensen, 2009: 6)

Jensen (2009), citing de Vries *et al.* (2008) argues that Figure 2.3 portrays how a facility may be viewed holistically, as well as how it adds value to the core business and stakeholders of an organisation. Thus, the strategic functions of FM, responding to increased business pressure among others, can be underpinned by the concept of value as opposed to the archetypical notion, which considers FM an operational function (Jensen *et al.*, 2012).

In the same way that business competition has increased exponentially over the years, urban areas have been under increased pressure (Roberts, 2004), making macro-level issues including the management of public infrastructure and its associated services an integral concept to the future of FM (Roberts, 2004; Tobi *et al.*, 2013), which also introduces the notion of 'urban FM'.

2.9.3 Urban FM

Michell (2010) highlighted how FM principles can be adapted from a micro-scale (focusing on individual buildings), to a macro-scale (focusing on urban precincts). Although urban FM was conceptualised over two decades ago by Melvin (1992), and Roberts (2004) and Alexander (2006) developed the literature, until Michell (2013), there has been no major literature contribution into the field of urban FM.

Efficient and effective management of urban areas and the associated infrastructure have been facing increased pressure (Michell, 2013). The cost of operating public facilities and their associated services keeps increasing (Ngowi & Mselle, 1998; Alexander & Brown, 2006; Alexander & McShane, 2006), which has made public facilities a key issue for FM (Tobi *et al.*, 2013).

The management of public infrastructure and its related services was introduced by Roberts (2004). Nutt (2004), Roberts (2004) and Tobi *et al.* (2013) agree that including FM strategies in the management of public infrastructure and its related services is one of the key elements to the future of FM. Urban FM therefore arose from the incorporation of FM into the management of public infrastructure. Urban FM is an extension of the need to reinvest in community facilities (Roberts, 2004). Moreover, it is a flexible platform through which the public and private sector can work together to benefit the community at an urban precinct scale (Michell, 2013). Since FM is an

emerging concept, facility managers should use FM principles – space, place and people -- – utilised within the private sector and implement them at the urban precinct scale Michell (2013). In doing so, facility managers may be able to leverage the value required through for example, the best use of infrastructure and services (Haynes *et al.*, 2011).

However, for facility managers to achieve FM principles at an urban scale, there needs to be a shift in thought from a micro to a macro level (Roberts, 2004; Michell, 2010; Haynes *et al.*, 2011; Tobi *et al.*, 2013). This shift can be achieved by prioritising public interests and moving away from traditional FM hierarchies to an open type of network (Tobi *et al.*, 2013). At a micro level, the physical infrastructure of a building needs to be maintained to assist and support the social processes between a building and its users. At a macro level, this concept is also true for an urban precinct.

The development of precincts sits alongside the notion of a mixed-use environment, whereby living and working facilities are linked (Cunha & Selada, 2007). Precincts are deliberately located to form a distinct part of a city to enable the collaboration of urban design, technology, and real estate development (Yigitcanlar *et al.*, 2008). For example, The physical infrastructure of an urban precinct is vital in aiding the sustainability of cities and the spatial experience of the urban precinct users (Michell, 2013). Sustainable FM is thus the integration of FM and sustainability (Shah, 2007). Meng (2014), argues how FM assists businesses achieve their 'triple bottom line' responsibilities through appropriate use of resources, while Michell (2013: 1) argues that to achieve sustainability of urban precincts, the underlying principles of FM: "*space, place and people*" must be implemented.

2.10 Towards a theoretical framework for WSUD, value capture and sustainable urban development

The previous sections highlighted the relationship between WSUD and sustainable urban development, as well as WSUD and value. The researcher proposes that what is lacking in the literature is a managerial framework to connect these concepts together. Boyle (2016) argues how sustainable urban development should draw on the management principles of FM and more specifically urban FM to assess and develop the sustainability of specifically located communities and cities. It is within this context that it is proposed that urban FM provides a basis for the creation of a managerial framework

that can assist in leveraging best value in the achievement of urban precincts, using an adaptation of Jensen's (2009) value map.

2.11 Conclusion

This chapter provided a critical review of the literature relevant to the research. An in-depth examination of UWM was undertaken, followed by a discussion on the integrated response to water management in achieving a WSC. WSUD was then explored in a South African context highlighting the relationship between the built environment and sustainable development. The next section introduced the role of water in an urban precinct and explored its value. Finally, the influence of urban FM was unpacked, thereby highlighting the relationship between sustainable urban development, WSUD and value. The principles of FM and more specifically urban FM, can assist in providing the managerial framework that ties these concepts together.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The previous chapter provided the theoretical basis of UWM, WSUD, value capture and urban FM through an analysis of the existing literature. It created the conceptual link between these concepts as to how value can be created through WSUD. The following chapter provides the methodological approach utilised in this study, together with its justification. It includes an evaluation of the philosophical issues within this paradigm, which prompted the research method and techniques used to collect and analyse the data. The chapter concludes with a discussion on the ethical concerns and associated limitations of the study.

3.2 Philosophical underpinnings of knowledge

Research philosophy has been described as the development of research knowledge, the research background and its nature (Saunders *et al.*, 2007). A given research philosophy is said to represent the manner by which data should be collected, investigated and used (Cohen *et al.*, 2007). As such, the researcher should investigate the philosophical underpinnings that relate qualitative and quantitative research, thereby providing a detailed understanding for the researcher from an ontological, epistemological and axiological perspective (Denzin & Lincoln, 2005).

The ontological, epistemological and axiological drivers and assumptions that direct an investigation (either implicitly or explicitly) are encompassed by the research philosophy (Kagioglou *et al.*, 2000; Denzin and Lincoln, 2005; Buchanan and Bryman, 2007). In other words, the choice of an appropriate research methodology and research technique is intrinsic in the research philosophy. Ontological assumptions explain 'what' knowledge is important as well as the nature of reality. Epistemology refers to the relationship between the researcher and knowledge – 'how' the researcher acquired and accepted research. Axiological assumptions refer to the value of knowledge (Burrell & Morgan, 1979).

The literature on research in the social sciences field reflects that the research philosophy is characterised by the subjective-objective debate (Morgan and Smircich, 1980; Bryman, 1984; Denzin & Lincoln, 2005). Vischer (2008) echoed this theory and

argued how all user-centred theories of the built environment are placed within the 'continuum' of this subjectivist-objectivist approach, or more specifically on a continuum that ranges between environmental determinism and social constructivism.

As shown in Figure 3.1, it is argued that a researcher should conduct a deterministic or social constructivist approach in the field of natural sciences (Burrell & Morgan, 1979; Easterby-Smith *et al.*, 2012). These research paradigm approaches have been described as polar opposites, holding various philosophical positions between them (Holden & Lynch, 2004). As previously mentioned, researchers should establish the philosophical underpinnings that relate qualitative and quantitative research: the deterministic view is commonly referred to as a quantitative method, while the social constructivist method is relatable to a qualitative approach (Pathirage, *et al.*, 2008).

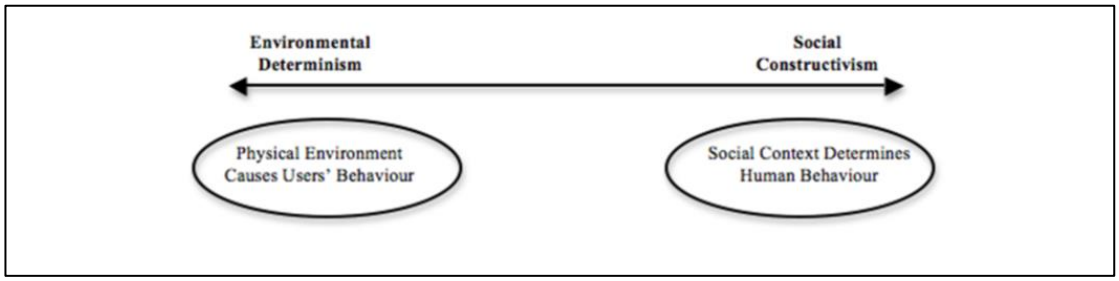


Figure 3.1: User-centred theories of the built environment (Source: Vischer, 2008: 232)

The deterministic approach dominates scientific inquiry for the study of natural sciences and considers the social world externally. In other words, the researcher should be independent from what is being observed and the social world is measured objectively (Cooper & Schindler, 2006). Researchers collect data from a large social sample but the investigator's beliefs have no influence over the research study (Morgan & Smircich, 1980).

Social constructivism originated from the view that reality is not exterior and objective but rather that it is socially constructed (Vischer, 2008). This approach aims to extend the general understanding of a given situation by supporting human interest as the main driver. For example, it aims to comprehend the inherent relationships and intricacies that exist between the participants within the problem context. As such, a theoretical abstraction of the whole situation can be ascertained, thereby providing enhanced richness and understanding of the data obtained (Bryman, 1984; Robson, 2002; Denzin & Lincoln, 2005; Pathirage *et al.*, 2008; Kasi, 2009; Easterby-Smith *et al.*, 2012). The use

of empirical evidence may however result in overly intricate conclusions and ultimately in data that is too in-depth (Eisenhardt, 1989).

Consequently, the applicability of these two philosophical approaches within the natural science field may be contestable (Krantz, 1995). As a result, the research question should be revisited to establish the most appropriate and well-suited research paradigm – thereby shaping the research method and filtering irrelevant material (Flyvbjerg, 2006; Bryman, 2007).

3.3 Selecting a philosophical approach by revisiting the research question

According to Blaikie (2000) and Bryman (2004), the philosophical approach selected is directly influenced by the research question.

In the preceding chapter, the theoretical framework established the role of urban FM in highlighting the relationship between WSUD, sustainable urban development and value. It also highlighted how this value can be captured. The objectives of the research are therefore to determine whether these principles should form part of an urban FM-aligned strategy, which reveals the relationship between these principles for sustainable urban precincts. Thereafter, the identification of the value created through WSUD was determined.

It is widely accepted that the dominant methodology utilised when conducting research within the FM field is quantitative, relying on deterministic and measured outputs (Ratcliffe, 2000; Michell, 2010). However, Michell (2010) argues there is a failure within this paradigm to recognise the social processes, human attitudes and behaviours that influence FM. Easterby-Smith *et al.* (2012) concur that a quantitative methodology lacks the ability to consider how human behaviour impacts the physical environment (Easterby-Smith *et al.*, 2002; Hillier, 2008; Vischer, 2008). Qualitative research allows for a deeper and more personalised understanding of the data, which is only obtainable through comprehending the intricacies and relationships among the participants within the problem (Bryman, 1984; Michell, 2010).

Qualitative research straddles numerous methodologies, namely: action research, ethnography, phenomenology, social network analysis, participative observation, grounded theory and case studies (Bickman and Rog, 2009). Case study research is

"highly relevant to an industry that is project driven and made up of many different types of organisations and businesses" (Proverbs & Gameson, 2008: 99). An urban precinct is made up of many businesses and organisations so, for the purpose of answering the research question, a qualitative or social constructivist philosophy is adopted, utilising a case study methodology (Meneghetti & Chinese, 2002).

3.4 Defining a case study

A case study has been described as a research strategy that supports a specific set of variables within an investigation (Benbasat *et al.*, 1987; Eisenhardt, 1989; Yin, 1994). In other words, contextual conditions are applicable to the phenomenon of a study; and the case study is the first-hand analysis of these conditions (Yin, 1994). According to Benbasat *et al.* (1987), no standard definition exists for a case study. Previously, however, he had deduced the following definition, based on the recognition of overlap existing in numerous authors' work (Benbasat, 1984: 370):

> *"A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations). The boundaries of the phenomenon are not clearly evident at the outset of the research and no experimental control or manipulation is used."*

The definition cited above grew out of an existing similarity in the literature (Stone, 1978; Benbasat, 1984; Yin, 1984; Bonoma, 1985; Kaplan, 1986). It is argued that case study research contributes to the overall knowledge base, as there is a high probability of generating new and testable information. This is especially evident when the different data sources (an advantage of case study research) converge to yield results that coincide with one another (Eisenhardt, 1989; Yin, 1994; Creswell & Miller, 2000; Proverbs & Gameson, 2008) although the concomitant number of data collection strategies is disadvantageous and can result in a lack of understanding of how to process the data obtained (Eisenhardt, 1989; Yin, 2003; Proverbs & Gameson, 2008). In spite of this, case study research's multiple levels of analysis within a single or multiple study, renders it particularly beneficial if the research question has been accurately designed and modified to pertain to the research topic (Flyvbjerg, 2006; Bryman, 2007).

3.4.1 Why the V&A Waterfront and Century City

The research question requires specific information into the relationship between WSUD, sustainable urban development and value; and what role urban FM can play in leveraging the best value for this relationship for urban precincts in South Africa. The greater Cape Town region has a limited number of privately owned precincts. The research required easily available and accessible precincts to conduct this investigation and so the V&A Waterfront and Century City were selected as the most appropriate for the investigation based on their location, relationship and uniqueness in terms of water. Additional grounds for the decision included the University of Cape Town's (UCT) good working relationships with the executives at both the V&A Waterfront and Century City which enabled access to possible information.

3.5 Research methods

3.5.1 Interviews

Interviews allow researchers to attain an in-depth understanding of the phenomenon in question, as they provide a flexible platform ranging from highly structured to open-ended interviews (Alvesson, 2003; Haigh, 2008; Qu & Dumay, 2011). The research interview has been described as one of the most fundamental data collection methods in qualitative research and is often used in case study research (Qu & Dumay, 2011). Moreover, interviews are a popular method of gathering data in the built environment industry (Haigh, 2008). The interviewer is responsible for guiding the direction of the interview, ensuring the conversation remains relevant (Kvale, 1996). To ensure good quality data is collected, the interviewer is required to listen attentively, while drawing on relevant expertise or knowledge, thereby guiding informative questions that can be used for data analysis (Patton, 2009; Qu & Dumay, 2011).

Interviews, in terms of structure and implementation, are recommended to follow a four-step guideline (King, 2004). Firstly, questions should be designed according to the individual circumstances of the participants, thereby stimulating an effective response. Secondly, the interviewer should prepare guidelines for the topics to be covered. Following this, key participants and their corresponding confidentiality considerations are identified and selected. Finally, the interviews take place followed by analysis of the

data. Denzin and Lincoln (2005) stress how implications can arise when the interviewee is unreliable or biased towards personal experience, resulting in impressionistic data. As such, it is argued that a concise and appropriate interview method is required to maximise the quality of data to be obtained (Rubin & Rubin, 1995; Qu & Dumay, 2011).

Alvesson (2003) describes three appropriate interview methods namely: structured interviews, unstructured interviews and semi-structured interviews.

Structured interviews

Structured or fixed-response interviews involve a pre-established set of questions that may not be altered during the interview, thereby limiting the response categories when answered (Fontana & Frey, 1994; Haigh, 2008; Qu & Dumay, 2011). As a result, the ultimate reliability of the results and conclusions are ensured by standardising the questions and answers (Punch, 2005; Haigh, 2008). However, this method has been criticised as leading to a certain degree of generalisation (Eisenhardt, 1989). Moreover, Doyle (2004) has argued how bias may incur due to the active role taken by the interviewer although it has been argued that the quantifiable nature of this method lends itself to quantifiable studies (Haigh, 2008).

Unstructured interviews

Unstructured or open-ended interviews involve less strictly formulated questions thereby allowing for increased flexibility through a free-flowing conversation between interviewer and interviewee. The free-flowing, conversational nature of this method means the participant is relaxed and the interview is non-standardised (Hannabuss, 1996; Haigh, 2008). Interviewers are not required to compile a rigid set of questions but rather aim to gather data through informal conversation and observation (Fontana & Frey, 1994; Punch, 2005). This method takes into consideration the complexity of human nature and behaviour, resulting in a variety of interpretations (Berg, 1998; Punch, 2005). The flexibility inherent in this method allows new themes within the data to emerge, thereby improving the theory for qualitative studies (Eisenhardt, 1989). However, Alvesson and Deetz (2000) argue that there may be an imbalance of personal power between interviewer and interviewee, which means the research outcome may be manipulated by the participant in a more powerful position.

It is accepted that the interview may be guided by a loosely designed set of questions called an *aide memoire* or agenda (Minichiello *et al.*, 1990; Briggs, 2000; McCann & Clarke, 2005; Zhang & Wildemuth, 2009). It acts as a broad guide to the aspects to be covered during the interview, as opposed to concrete questions, which encourages open-endedness and flexibility (Burgess, 1984). When used in unstructured interviews, *aide memoires* allow for a certain degree of consistency, but do not direct the order of conversation, as would be the case within a structured interview (Zhang & Wildemuth, 2009). This dissertation used an *aide memoire.*

Semi-structured interviews

Alvesson and Deetz (2000) have described how semi-structured interviews are the most common of all qualitative research methods. They cover various broadly defined topics, applying both unstructured and structured interview techniques (Lindlof & Taylor, 2002). These broadly defined topics are derived from the literature in advance to guide the interview process (Saunders *et al.*, 2007). The questions should guide the interviewee along a given topic, allowing the interviewer to probe an area that may appear unclear (Grix, 2001; Lindlof & Taylor, 2002; Qu & Dumay, 2011). The popularity of semi-structured interviews for qualitative research is largely due to their flexibility, ability to uncover hidden aspects of human behaviour (Kvale & Brinkmann, 2009). However, Qu and Dumay (2011) explain how this method requires more care and planning when it comes to structuring the questions and interpreting expressions and answers. Semi-structured interviews were used in this dissertation.

Figure 3.2 contextualises the distinction between the types of interviews used in this dissertation.

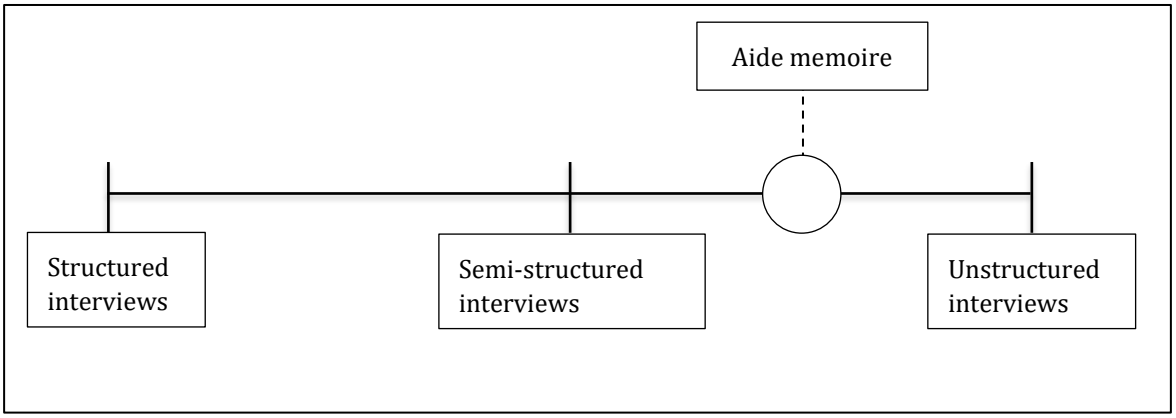


Figure 3.2: Distinguishing between different types of interviews

3.5.2 Photographic evidence

Visual media has been accepted as a powerful tool because it is easily cemented in an individual's memory (Anderson, 1990; Mitchell, 1994). An array of social phenomena is difficult to communicate through language (Rorty, 1979; Bryman & Bell, 2007). For example, photographic evidence, which provides insight to the research, can be utilised to most effectively portray certain intangible concepts (Harper, 2002; Atkinson & Delamont, 2005; Bryman & Bell, 2007). Bell and Davison (2012) further describe how visual research such as graphs and pictures highlight the significance and understanding of theoretical research. Despite the benefits of improved communication whereby visual components may act as a common language and incorporate a high degree of social interaction, issues may arise when the visual component is treated as a direct representation of an object being assessed (Bryman & Bell, 2007; Bell & Davison, 2012). In other words, visual media should be presented in conjunction with theoretical data and linguistic material for it to result in the most effective outcome (Brown *et al.*, 2010).

3.5.3 Documentary evidence

Documentary evidence plays an essential role in both cross-validating existing data and providing new data in case study research (Yin, 2003; Denzin & Lincoln, 2005). Case studies have been criticised for their lack of reliability and as a result, researchers require multiple data evidence to obtain reliable results (Noor, 2008). Documentary evidence is used in combination with other research methods, allowing for the triangulation of the data (Denzin, 1970; Denzin & Lincoln, 2005; Noor, 2008). It can be used to track the credibility of interviews, to form new interview questions and to stimulate further investigation where contradictions between interviews and documents occur (Yin, 1994; Angrosino & Mays de Perez, 2000; Goldstein & Reiboldt, 2004; Bowen, 2009). Moreover, documentary evidence may be both unpublished and published material including Acts of Parliament and policy documents (Bryman & Bell, 2007). Bowen (2009) argues that the ethical requirement for valid data requires triangulation of data.

3.6 Data sampling strategies

Robson (2002) describes purposeful sampling, theoretical sampling and convenience sampling as the most common types of data sampling strategies.

According to Palinkas *et al.* (2015: 534), purposeful sampling involves the identifying and selecting "*individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest.*" In other words, the sample is selected based on the relationship between the individual's personal experience and exposure to the phenomenon in question (Fossey *et al.*, 2002; Morse, 2007).

Samples that are selected in light of a pattern arising from the data analysis are referred to as theoretical sampling (Fossey *et al.*, 2002). The patterns need to be explored, classifying the appropriate sample to the pattern. Interaction between individuals is essential to attain in-depth information on a given topic (Gibbs, 1997).

In convenience sampling, the selected sample is chosen according to its accessibility and proximity to the researcher (Morse, 2007). According to Eisenhardt (1989) the sample size can be restricted by time and money under the convenience sampling method. This, together with the characteristics mentioned by Morse (2007), can influence the quality of research (Hood, 2007).

The selected case studies are justified based on purposeful and convenience sampling methods.

3.6.1 Purposeful sampling

The research question requires the case studies to have a certain level of knowledge relating to green building, particularly WSUD and sustainable urban development. In this regard, purposeful sampling was utilised at two levels, namely the selection of each case study and the selection of interviewees. Both case studies show particular interest in terms of their water-related strategies and display a high degree of consciousness when it comes to sustainability. Thus, purposeful sampling was utilised in the selection of the respective cases. In addition, the interviewees were selected according to their specific insight and knowledge surrounding the research question. The candidates chosen for interviews for both case studies were selected based on this insight and thus, purposeful sampling was utilised.

3.6.2 Convenience sampling

Both case studies were easily accessible to the researcher and are situated within close proximity. The case studies were also chosen based on the interviewees willingness to participate in the research, as well as the good working relationship that the executives hold with UCT. Thus, convenience sampling was utilised at two levels, including the selection of the case study as well as the selection of interviewees.

3.6.3 Collecting the data

The process of gathering data not only provides depth to the research in terms of the question at hand, but also offers insight into previous relatable topics (Ryan *et al.*, 2007). At a given point in time, the researcher will reach theoretical saturation, which effectively marks the point where no new material emerges and the research process comes to an end (Parahoo, 2006).

Data collection took place between 1 June and 24 October 2016, with the primary source of data collection being interviews, supported by numerous internal policy documents and photographic evidence. For this case study, unstructured and semi-structured interviews were utilised for which participants were selected according to their involvement with key facets of the case study under the convenience sampling method. The interviews are attached as Appendix A.

The unstructured and semi-structured interviews lasted between 60 and 90 minutes, during which participants answered a list of pre-determined questions or guidelines. Interviewees were also able to identify additional potential participants who could provide insight to the case. This method allows for a degree of fluidity and flexibility, which allows new findings to be discovered and may necessitate alteration of research plans in response to the findings (Bryman, 1984). Moreover, the participants provided photographic and documentary evidence to support their answers and lend credibility to the interview.

3.6.4 Interview sampling

Prior to the interview commencing, the researcher obtained consent from the participants to record the discussion. A Dictaphone was used in the interview and the material later transcribed verbatim by the researcher. References have been made to the

relevant excerpts in Chapter Four and a randomly selected transcript is provided in Appendix B.

Interviewees were required to have an association with the built environment or the case study itself, so candidate interviewees were selected from The Victoria and Alfred Waterfront and Century City. As a result, theoretical saturation was reached after seven interviews. It is important to highlight at this point the critical nature of purposeful sampling. Each of the interviewees had intricate and in-depth knowledge of the respective cases, and held senior positions in their field. There was therefore good reason to hold longer, more detailed interviews with fewer candidates, as opposed to short interviews with less-knowledgeable candidates.

3.6.5 Research question defended

The research questions are case-specific and are directly linked to the phenomenon at hand. Interview questions have been described as a method of researching closure within a case study and as such, the questions are highly linked to the literature – thereby providing conclusive grounds to support the evidence found (Eisenhardt, 1989). Consequently, each question is linked to and defended by the literature, which is shown in Appendix D.

3.7 Ethical issues

Ethical issues are synonymous with professionalism, which has been described as the ethical use of information extracted from interviewees (Duffy, 1991; Alexander, 1994). According to Koocher and Keith-Spiegel (1998), ethics evaluates behaviour in terms of right and wrong, according to particular rules or values. Kitchener and Anderson (2000) describe ethics as a division of philosophy concerning peoples' actions, judgments regarding those actions and rules for defending those actions. This is in line with Grimshaw (2001: 43), who defines ethics as:

> *"…the philosophical study of moral value of human conduct and the rules that govern it."*

Grimshaw (2001) argues how ethical issues should be aligned with moral codes and business practices. Alexander (2003) agrees with this notion by recognising the importance of both professional and ethical standards.

When it comes to performing ethical research, ethics establishes enforcement mechanisms that guide researchers. For example, ethics regulates research by playing the fundamental role of minimising negative influence on participants/ collaborators and the general public (Aguinis & Henle, 2002; Bryman & Cassell, 2006). Bryman (2007) expands on this by explaining that research questions are required to be of an ethically acceptable standard to the interviewee.

In the case of breaching ethical codes, there is seldom a simple remedy and as a result, the industry has accepted certain rules that protect interviewees (Stake, 2005), for example, all data connecting the interviewees to their responses should be deleted (Bell & Bryman, 2007) to protect the participants and their opinions as such information may be of public interest (Flyvbjerg, 2006).

Generic coding has been used for each interviewee to ensure anonymity. The abbreviation 'RN' (Respondent Number) was used in this research, followed by a two-digit number to indicate the order in which interviews were conducted.

3.8 Data analysis

Yin (1994) describes how qualitative research enables data collection from a variety of sources. Qualitative data analysis is the process of transforming data into meaningful findings through practical sorting and organisation (Miles & Huberman, 1994; Thorne, 2000).

A straightforward conceptual framework has been developed to analyse data through pattern-matching. Pattern-matching, as an analytical technique is one of the most appropriate for case study analysis, as it compares an observed pattern with a predicted one. Numerous pieces of information from a particular case can be assessed in relation to a theoretical proposition and if the patterns correspond, the results can assist the internal validity of that case (Yin, 1994). Figure 3.3 depicts the pattern-matching process.

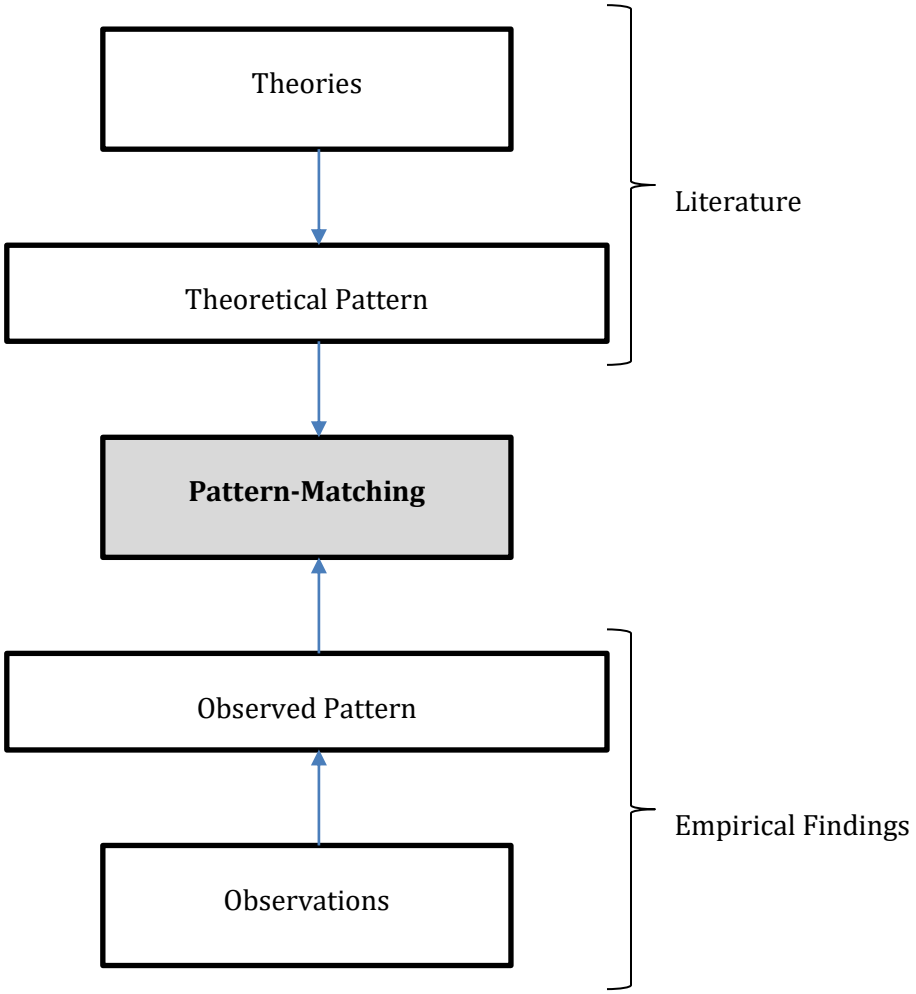


Figure 3.3: Pattern Matching Process (Source: adapted from: Trochim (1989))

The following patterns emerged from the literature:

Urban water management (UWM)

The management of water and water scarcity, particularly for developing economies like South Africa, has become an increasingly prevalent problem (Armitage *et al.,* 2013a). To uncover some of the problems facing South Africa's (and more specifically, Cape Town's) water sector, it was important to assess the case studies' approach to their management of water and thus, it was an important focus point in the interviews.

WSCs and WSUD

WSUD, which emerges from a city's effort to become more water-sensitive, is a relatively new concept in South Africa (Brown *et al.,* 2009). WSUD involves the integration of the entire urban water cycle, including stormwater, with urban design (Armitage *et al.,*

2013a). As such, the stormwater component of WSUD is an important feature in the WSUD process and the degree to which SuDS are implemented within the case studies arose as a key focus in the interviews.

WSUD and the built environment

The role of water in terms of sustainable urban development and the built environment has increasingly gained attention (Lamond *et al.,* 2014). WSUD is relatable to the five dimensions of sustainable urban development, namely, ecological, economic, social, physical and political sustainability. To analyse the pattern from the existing literature, this relationship needed to be ascertained in each case study.

Value capture

Value capture mechanisms can be used as an alternative source of financing to solve social issues, finance urban regeneration and manage the development of urban land (McGaffin *et al.,* 2014). It is important therefore, to assess firstly whether value is created through the implementation of WSUD and then whether the case studies are making use of value capture mechanisms.

The value of water in a sustainable real estate context

The role of water at an urban precinct level is a defining feature when it comes to the sustainability (Coutts *et al.,* 2012). Value, being an all-encompassing notion (Hartmann, 1932), was assessed according to the five dimensions of sustainable urban development. The interviews therefore focused on value in terms of these dimensions in a real estate context.

Facilities management

Strategic FM involves the implementation of value-adding tools to an organisation to improve its performance – in response to increasing pressures in business competition (Grimshaw, 2003). Similarly, increased pressure has been placed on urban areas and the management of public infrastructure. Michell (2010) highlights how FM principles can be utilised on a macro-scale, focusing on urban precincts, which introduces the concept of urban FM. Boyle (2016) argues how sustainable urban development should draw on

the management principles of urban FM to assess and develop the sustainability of urban precincts.

Chapter 4 compares the theoretical predictions to the empirical data. 'Literal replication' is achieved if the predictions match the empirical findings and 'theoretical replication' is achieved if the results are dissimilar (Yin, 1994). Patterns from the theoretical findings have been matched to the empirical findings (a copy of the coding framework or tree node structure used in this study can be found in Appendix C.)

Cross-case analysis was then utilised as a method of identifying similarities and differences between the case studies. Two cases were compared to determine whether urban FM can provide a strategy in showing the relationship between WSUD, sustainable urban development and value for urban precincts.

3.9 Limitations

The research method utilised relies on interviews a method for data collection, which is subject to personal opinion that could lead to bias and generalised forecasts (Denzin & Lincoln, 2005). To counter this and to prevent unreliable or skewed conclusions, the researcher is obliged to follow strict research protocols, which include, for example, ethical clearance and anonymity procedures. (Mills *et al.*, 2006).

3.10 Conclusion

This chapter established the theoretical underpinnings related to qualitative research to justify why this method of research was utilised. The chapter describes the ethical issues and limitations arising from this method.

This section provides a point of reference for both readers and researchers on how the information was collected, analysed and presented. The following chapter combines the data acquired from the research and offers the patterns relating to the urban FM-aligned model that can depict the relationship between WSUD, sustainable urban development and value for urban precincts.

CHAPTER 4 FINDINGS AND DATA ANALYSIS

4.1 Introduction

Chapter 3 justified the research methodology used in this study. This chapter provides the results determined through each of the data collection methods, thereby presenting how value is created through WSUD. In addition, the results detail how urban FM can assist in leveraging best value by highlighting the relationship between sustainable urban development, WSUD and value.

The chapter begins with a historical overview of UWM, followed by a breakdown of each case study, namely, the V&A Waterfront and Century City. Following this, the interviews from the case studies are analysed, presented and discussed under the various sub-headings identified as patterns in Chapter 2.

4.2 Urban water management (UWM) in South Africa

UWM, recognised as a pattern in Chapter 2, was clearly recognised and well understood in the empirical research where the interviews covered a range of issues from inherent problems facing South Africa's water sector, conventional UWM problems, to infrastructure and supply challenges in South Africa. UWM arose primarily due to the current water-related issues that South Africa faces and the resultant impact this has had on the case studies.

4.2.1 Inherent problems in South Africa's water sector

Table 2.2 highlighted some of the challenges facing South African water systems and indicated that developing cities need to place more emphasis on water, in an integrated manner (Carden, 2013; Costa & Hoyer, 2014). In a similar vein, RN006 describes institutional structures as 'a complete mess' in South Africa and that organisational change is required. RN003 offered a similar argument, describing how various municipality sectors are fragmented, particularly those that are water-related. RN003 went on to describe the existence of different agendas and budgets between departments, meaning that different departments hold opposing 'goals, aspirations and maintenance plans' (RN003). RN002 describes this as a 'huge barrier' and explained

how various departments have different reasons and incentives for completing or administering tasks.

Another key issue facing South Africa's water sector relates to the consumer mind-set (DWA, 2013). There is a disconnect between the perceived value of water in terms of what is available and consumption. RN003 highlighted this as a major problem:

> ***RN003:*** *"It is wrong that we use potable water to irrigate gardens and landscaping. I mean that is just crazy and yet that is what we do. That is the biggest waste of water."*

In other words, potable water is being consumed for activities for which it should not, which demonstrates the lack of understanding and value placed on potable water, particularly as South Africa is facing drought-stricken conditions (RN001). These drought-related issues have placed increased pressure on conventional UWM issues in South Africa (RN002).

4.2.2 Conventional UWM problems in South Africa

Efficient, sustainable and most importantly, integrated UWM is critical to the achievement of WSCs (Wong, 2014). In other words, it is argued that alternative, systems-based methodologies are required to address South Africa's water systems (Armitage *et al.*, 2014), that is Integrated Water Resource Management (IWRM) whereby water is managed with a balance between social and economic needs, and care for nature (Martínez-Santos *et al.*, 2014). RN002 agreed with this notion but took a practical approach, asking, for example:

> ***RN002:*** *"How much water was needed to produce one brick? Ok, and therefore how did it take to produce or build this building…"*

RN002 proceeded to explain the financial viability of buildings and the importance of using water in the most efficient manner, thereby highlighting the significance of balancing social, economic and environmental needs. RN001 agreed with this notion and argued that organisations cannot trade without water. However, RN001 kept referring back to the importance of water, within the natural environment, treating it in a sustainable manner (RN001). This brought to light several issues relating to conventional UWM in South Africa. For example, RN001 explained the importance of all shareholders understanding the role that water plays within a precinct – thereby

supporting the literature on the management of water in an integrated manner. Furthermore, RN001 described how a precinct impacts a city's infrastructure and that it is critical to assess how this impact can be minimised.

4.2.3 Infrastructure challenges in South Africa

Part of a precinct's role within a city is to release some of the pressure a city faces, such as infrastructure. For example, RN001 described how Cape Town's infrastructure is under constant pressures when it comes to its electricity, water, sewage, waste and road infrastructure. RN001 explained that a precinct should look at ways of 'reducing the impact of infrastructure' (RN001). It was made quite clear by RN001 that this should be high on the agenda of the precinct as not only would it improve relationships with city officials but it would also paint a good picture from a political standpoint. In this regard, it was argued how the constant upgrading in infrastructure creates jobs, which is directly aligned with what the city wants (RN001). Moreover, it is not just being done because it is the right thing for the precinct but it is the right thing for the city, as well.

Keeping the above in mind, RN002 explained more specifically the importance of water-related infrastructure within a city. RN002 described how introducing water elements into public space can benefit the city and its inhabitants in numerous ways. For example, creating an urban environment where people are encouraged to learn and engage with water-related infrastructure through creative designs. Quite clearly, RN002 was referring to the social component of water-related infrastructure, whereby people are attracted to water and their minds engage on a creative level.

In a similar vein, RN004 and RN005 argued that the correct design of water-related infrastructure leads property values and that 'water is lovely.' Despite the positive arguments relating to the importance of infrastructure in South Africa, all the respondents acknowledged the supply challenges, given the nature of current drought conditions. Moreover, the respondents supported the literature relating to lack of access to water and what it offers, over and above the basic human right.

4.3 Supply challenges in South Africa

RN001 explained that water supply is scarce and gave the example of using rain water, proposing that it simply is not possible to operate if it does not rain in a given year.

South Africa already faces diminished surface water resources, meaning that an increase in demand may lead to a supply deficit (DWA, 2013). The way water is consumed therefore becomes critical to the sustainable functioning of a precinct. For example, strategic thought needs placed on water consumption according to the nature of the building as well as the tenant (RN001; RN002). For example, retail tenants such as food stores are considered to be large water users and so require metering. On the other hand, a boutique clothing store demands much less water and therefore will not necessarily require a meter as its consumption will not significantly impact the overall water usage of the precinct (RN001). RN001 then referred to the nature of a building, for example commercial versus retail; commercial buildings require less landscaping and ultimately less water than for example, a shopping centre.

In other words, there should be strategic focus on water use and where it can be limited or reduced to unburden some of the supply challenges facing the precinct and ultimately South Africa (RN002). This can be taken further by looking at the way water is treated (DWA, RN004; 2013). So, consumption is one key area but the way water is stored and treated prior to its consumption is another area that can assist in the supply challenges facing a precinct's operations. For example, water-use for irrigation purposes can come from treated effluent, meaning it is cheaper for the precinct and it benefits the city (RN004).

RN004 highlighted the benefit of using treated waste water for irrigation, as opposed to what was mentioned previously regarding the use of potable water for such activities – it is a more sustainable way of using water. RN001 put forward a similar argument by explaining how rain water storage tanks are vital to operations, depending on the use of that stored water:

> ***RN001:*** *"So if you're only going to use water for irrigation, then maybe you don't need to go to such high levels in terms of filtration."*

RN001 is referring to rain water harvesting as a means of saving water and operating in a more sustainable manner. Both RN004 and RN001 speak to possible solutions that can be used country-wide as a means of minimising the consumption of water and limiting demand. The respondents supported the literature, highlighting how surface water is already diminished in South Africa and providing possible remedies for reducing demand.

4.4 Sustainable urban development and WSUD at the V&A Waterfront and Century City

Another key pattern from Chapter 2, highlighting the relationship between sustainable urban development and WSUD, is described below. There is a link between the ideals of sustainable urban development (ecological, economic, social, physical and political sustainability) and WSUD in terms of the operations and management of the V&A Waterfront and Century City, their visions and goals towards achieving a sustainable environment. RN001 explained how sustainability and long-term survival are synonymous and posed the question:

> ***RN001:*** *"How do we survive long term? It doesn't just say financially, it says we've got to be financially successful in terms of growing but is it in a responsible manner?"*

Sustainability is part of the V&A Waterfront's strategic vision and has been for the past 6 years (RN001). To this end, RN001 explained that while it is important for the V&A Waterfront to be doing the right thing for the planet, it needs to make business sense and it is not just about the greening. RN004 and RN005 had similar thoughts but referred to the importance of all of the shareholders when it comes to the sustainability of Century City:

> ***RN004:*** *"Sustainable development is of critical importance both from the developer's side, as well as ourselves who are managing and looking after both the property owners, as well as protecting their interests as the place gets further developed."*

RN005 took this notion further and explained how the social and environmental aspects, and the respective stakeholders should be involved in an interactive process, aiming to 'create a community.' In other words, Century City shares a similar outlook to the V&A Waterfront when it comes to sustainability and sustainable urban development.

Moreover, the all-encompassing notion of sustainable urban development was viewed similarly to WSUD. RN001 explained the importance of dealing with water in the most efficient manner possible in terms of reaching certain yields for shareholders while still adhering to certain design and aesthetic aspects when, for example, aiming to achieve a green-star rated building. Therefore, the V&A Waterfront's perspective towards WSUD considers not just the environment but also the aesthetic value and financial viability. Moreover, RN002 discussed in depth the social benefits of water in urban space. The

fact that the V&A Waterfront is surrounded by water ensures a sense of happiness and calm. Similarly, Century City operates entirely around its water system (RN004; RN005):

> ***RN005:*** *"It will affect property values and the whole sustainability of Century City depends on the water."*

RN004 and RN005 referred to the fact that 'water sells' and that their canal system at Century City is built to facilitate and encourage further sustainable development. Moreover, it was argued that the canal system should create amenity value for the stakeholders, not just financial viability. To this end, a critical feature, which encompasses the ideals of sustainable urban development and WSUD respectively is Intaka Island. Intaka Island is a 16 hectare wetland and bird sanctuary, situated in the heart of Century City (CCPOA, 2016):

> ***RN004:*** *"We have got a sixteen-hectare Nature Reserve built (within Century City) in Intaka Island and it is like, what is in New York, the Central Park or Hyde Park in London. It is the park of Century City…"*

Intaka Island is a "*unique example of nature conservation and urban development co-existing in harmony*" (CCPOA, 2016: 1). Not only does it hold environmental value, but it offers a place of harmony where people can enjoy what a natural water system has to offer: a place to relax and unwind (RN004; RN005; CCPOA, 2016).

As highlighted, both the V&A Waterfront and Century City understand the connectivity between sustainable urban development and WSUD. There is a strategic approach to sustainability but that no dimension is more important than the next. In other words, there is a focus on trying to achieve a balance between the five dimensions of sustainable urban development, whilst aspiring to WSUD – thereby supporting the literature relating sustainable urban development and WSUD.

Each of the dimensions of sustainable urban development can be unpacked – in terms of WSUD – and are discussed further. However, the V&A Waterfront and Century City are discussed independently from one another, starting with a brief history of each.

4.5 The V&A Waterfront

4.5.1 A brief history of the V&A Waterfront

Dutch ships sailing to the Far East, India and Eastern Africa utilised the V&A Waterfront as a stopover during the 1600s, which traces the history of the V&A Waterfront back four centuries (Van Zyl, 2013; V&A Waterfront, 2016b). In the 1800s, the Alfred Basin was formed – Cape Town's first functioning harbour (V&A Waterfront, 2016b). However, the discovery of gold and diamonds in the late 1800s and the concomitant influx of people drove the harbour to be extended into two basins, with the second named Victoria Basin (Van Zyl, 2013; V&A Waterfront, 2016b). In 1937, the South African Parliament approved development plans to extend the Victoria and Alfred Basins by 230ha. Despite construction commencing in 1938, the plans were only completed in 1945, having been delayed by World War II (V&A Waterfront, 2016b).

The 1970s, however, saw the harbour underutilised and, in a sense, neglected, despite the Victoria and Alfred Basins forming the basis for Cape Town's fishing industry (Van Zyl, 2013; V&A Waterfront, 2016b). To overcome this problem, in 1984, the Mayor of Cape Town envisioned the redevelopment of the existing Victoria and Alfred Basins, together with the surrounding docklands, into a mixed-use area (V&A Waterfront, 2016b). To this end, the Burggraaf Committee was established and proposals were put forward to enrich the area into a mixed-use environment (Van Zyl, 2013). The South African Government accepted the proposals in 1988 and the Victoria and Alfred (Pty) Ltd was established. This company was formed by the state-owned transport corporation, Transnet Ltd (V&A Waterfront, 2016b).

The Victoria and Alfred Waterfront (Pty) Ltd was established as a wholly-owned subsidiary to Transnet Ltd with the goal of achieving an environment where its users can live, work and play (RN001; Van Zyl, 2013). In 2006, the V&A Waterfront was sold to Dubai World and London Regional for R7 billion, but the financial crisis in 2008 crippled Dubai World and London Regional's investment and the V&A Waterfront was sold once again in 2011 (Muller, 2013) to Growthpoint Properties Ltd and the Public Investment Corporation (PIC) for R10 billion (RN001; Muller, 2013; Growthpoint Properties, 2016b).

Growthpoint embarked on setting the benchmark for the sustainability of its buildings, aiming to achieve high levels of accreditation in terms of the Green Building Council South Africa (GBCSA) (RN001; Growthpoint Properties, 2016a). Together with Growthpoint, the V&A Waterfront has invested R45 million into water savings, energy efficiency and waste recycling since 2008 – including numerous other greening initiatives across the precinct (V&A Waterfront, 2016a). Their efforts have resulted in various accolades, including Platinum status in 2015, in terms of the Heritage Environmental Certification (V&A Waterfront, 2016a). The following section focuses on the water components and features that have led WSUD, thereby creating value for the precinct.

4.5.2 Ecological sustainability at the V&A Waterfront

Ecological sustainability and more specifically, its relationship to WSUD arose as a consistent pattern throughout the research. It encompasses a wide range of factors, including energy efficiency, support for 'going green' and timing of green building features.

Protecting the environment, doing the right thing for the planet, greening buildings, operating efficiently, and so on – all terms that arose throughout the interview process – are synonymous with ecological sustainability. At its core, though, ecological sustainability refers to the way urban production and consumption impact the natural environment. For example, the V&A Waterfront highlighted the following as part of its masterplan:

> ***RN001:*** *"We want to save water and electricity and carbon emissions need to reduce by 30%. And we use 2008 as our benchmark year because that's when we started with a lot of the initiatives so we also then say a new build must be at least 30% more efficient than any conventional building…"*

The above statement refers to production and consumption at the V&A Waterfront, thereby highlighting the importance of ecological sustainability. RN001 went on to point out specific resource-uses that can be minimised, such as a 30% reduction in water and electricity, and diverting between 80% and 85% of their waste from landfill by the end of 2017. As explained by RN001, the V&A Waterfront is aiming to achieve an

environment whereby it operates in an ecologically sustainable manner. One of the key factors in achieving ecological sustainability is becoming energy efficient.

Energy efficiency

The development of buildings and precincts and their operations is typically where most energy is consumed, so for this reason, it is important that precincts undertake energy saving initiatives. One of the initiatives undertaken by the V&A Waterfront is LED lighting:

> ***RN001:*** *"We install energy efficient lighting so now we are reducing our carbon footprint, its energy efficient."*

Not only is the V&A Waterfront saving energy through its lighting but it is (has) installing (installed) solar panels on roofs to generate additional megawatts of energy back into the precinct operations. Moreover, the companies that it purchases these products from are South African based – thereby encouraging local business and employment (RN001). There is a clear objective to becoming more energy efficient. One of the key areas where the V&A Waterfront aims to save electricity (and water), thereby operating more efficiently, is by using seawater for its cooling system (RN001; RN002; RN003).

Support for 'going green'

It has been indicated throughout both case studies how 'going green' has positive knock-on effects. As previously mentioned, a balance is needed among the five dimensions of sustainable urban development, because small changes, such as green initiatives can have a spill-over effect onto other areas, over and above just protecting the environment. RN001 put it simply by stating:

> ***RN001:*** *"… last year, had we not done the energy efficiency stuff, we would have paid almost R10 million more on our electricity bill."*

Quite clearly, installing more energy efficient lighting carries an automatic benefit – it is cheaper to operate. Moreover, RN001 referred to the positive public relations (PR) stemming from its greening initiatives by describing, for example, that the local and international accolades and awards that they have received could easily be valued at R5 million.

Significant political and social sustainability is achieved by implementing green initiatives, in addition to the financial viability. As such, the V&A Waterfront is constantly seeking ways to become innovative in this regard. Receiving Green Star Ratings from the GBCSA clearly supports the notion of 'going green'. RN002 explained the importance of remaining adaptive and coming up with innovative ideas. For example, buildings can 'score better' in terms of a GBCSA rating if they save more water, filter it to a greater level or reduce the amount of potable water expended through air conditioning systems. These examples refer to alternative solutions for water use and consumption in terms of the 'Green Star Ratings' from the GBCSA. The V&A Waterfront uses drip irrigation rather than spray irrigation to save water. It is equally effective but fits the criteria of supporting green solutions (RN001; RN002).

Despite the positive relationship expressed by the V&A Waterfront regarding its support for 'going green,' the timing of green building features is also critical to the achievement and success of ecological sustainability.

Timing of green building features

Numerous factors influence whether implementing a green building feature at a given point in time is appropriate. For example, new buildings versus existing buildings, lifecycle costing, type of features being implemented and what resources are available that satisfy shareholders (RN001). RN001 used lighting and permeable paving as examples, describing how a budget needs to be in place but in accordance with the product lifecycle. In other words, making the strategic decision to replace the LED lights at the end of their lifecycle (which could be in two years), despite having the budget to do it immediately. For the example of permeable paving, the SuDS example, RN001 described how new buildings make it easier to implement as it does not then require the process of lifting up whatever paving is currently in place, which is expensive and takes up too much time. RN002 spoke about the process of undergoing drainage tests to ensure that it is indeed the right solution. In this regard, trade-offs exist between certain solutions. For example, the V&A Waterfront uses both solar panels and roof gardens, meaning that:

> ***RN001:*** *"…might then say I want more solar but you have to then give up your roof garden so at some point you've got to make a decision, compromise and say which one you want to go for."*

RN001 is demonstrating the importance of deciding what is most appropriate, at what time, cost and with what resources.

A relationship between the timing of green building features and cost certainly exists – for example, ensuring it is financially viable and economically sustainable at a given point in time. The next section unpacks economic sustainability but before that, the case-specific factor is addressed, which is the use of seawater at the V&A Waterfront.

Use of seawater at the V&A Waterfront

The benefits of using seawater are realised primarily through electricity and water savings. The Atlantic Ocean offers naturally cool water ranging between 12 and 16 degrees Celsius, which can be used to moderate the temperature of the buildings because the cooling towers can reach temperatures of up to 23 degrees Celsius. This allows for increased efficiency both in terms of saving water and electricity (RN001). Another process that the V&A Waterfront has started to undertake is the pre-cooling of their buildings. In the summer months, it saves significant amounts of energy in terms of creating the ideal temperature in the buildings. In winter, RN001 argues that, together with the use of fresh air from outside, the pre-cooling process allows for a complete shutdown of the chilling units.

The long-term goal, according to RN001 is for all buildings within the precinct to operate on the seawater cooling strategy, as opposed to the older method of cooling towers. Moreover, the aim is to maximise the use of seawater as a natural asset, not just through its cooling strategy but also on a more social level. The V&A Waterfront has embarked on the notion of 'increasing the possibility of people touching the water.' In other words, RN001 described the importance of ensuring stakeholders interact with the water as much as possible. For example:

> ***RN001:*** *"…how do we activate the water? So, you'll see, we had stand up paddling, you have swimming in the canal, you have canoe polo, so there's a lot of different activities we bring in that then activates the space that's available."*

Social interaction is key to the 'liveability' of a given urban space and water can be the medium to activate that space (RN002).

The V&A Waterfront emphasises ecological sustainability in terms of the relationship between sustainable urban development and WSUD. However, as previously mentioned, whether it be WSUD or sustainable urban development, no dimension is more or less important to the functioning and operations of the respective precincts. In other words, economic, social, physical and political sustainability expressed equal levels of weight in terms of the research. Economic sustainability is discussed in the next section.

4.5.3 Economic sustainability at the V&A Waterfront

The next section, established as a pattern in Chapter 2, is economic sustainability, which covers: budget and financial issues; cost of 'going green' and financing infrastructure; and employment opportunities and contribution to GDP.

The V&A Waterfront needs to ensure it satisfies its shareholders in terms of financial viability and therefore economic sustainability (RN001; RN004):

> ***RN001:*** *"Financially, we've got certain yields which the shareholders are looking for… We can justify certain things to the shareholders in terms of long term viability, it might be costing us slightly more now but long term, these are the paybacks."*

In other words, long term objectives oblige the various precincts to operate viably and to a given return. This objective is carried out with the same focus as operating in a responsible manner, and with the environment in mind (RN001). Before these processes can be followed, it is important to understand what resources are available and at what cost. From there, the precinct can assess where it aims to be and how it will get there (RN001). Part of this involves looking at budget and financial issues.

Budget and financial issues

RN003 describes the risk associated with any investment. Clearly, financial burdens exist for big developments within each of the precincts. RN003 explained how it is a matter of who is willing to take the risk. The V&A Waterfront does not raise finance from the bank; rather, it submits feasibilities to its shareholders and looks to them for extra funding due to their size and ability (RN001).

In terms of obtaining a budget for these investments, RN001 argues how it is easy to acquire funding:

> ***RN001:*** *"You can always get funding if you can tell people where I've come from, what I've achieved and what its cost me…"*

It seems that when there is a business case for an investment that can be justified via an in-depth feasibility study, budget and financial issues are less of a burden. Various investments however hold different weights in terms of significance and ability to raise finance (RN001). For example, 'going green' carries a cost as many refurbishments or new builds require increased capital outlay upfront, but long-term, the benefits should justify the investment (RN002).

Cost of 'going green' and financing infrastructure

'Greening' buildings is an integral part of achieving the sustainability of a building (RN002). It must, however, also make business sense:

> ***RN001:*** *"So we wouldn't just do it if it was just purely green because in some cases green washing for example it's going to cost you more and doesn't make sense to the business long term."*

RN001 explained how certain solutions require technological upgrades, which may not be a timeous investment. In other words, it may be a better to wait until the technology required is cheaper, making it more profitable to carry out an upgrade or refurbishment, which ties in with the product lifecycle. Being aware of a product life cycle is critical for deciding on whether to go ahead with an investment or not. RN001 used water as another example, explaining how it costs the V&A Waterfront more or less based on water restrictions and drought conditions, which accordingly increases the cost of greening:

> ***RN001: "****But also its things like the environmental issues like droughts have a big impact because it makes business realise, wow, this is what it's costing me…"*

Similarly, energy restrictions have cost implications. The V&A Waterfront has, however, planned for this strategically and put certain measures in place, such as the use of seawater for air-conditioning and the LED lighting mentioned earlier.

Employment opportunities and contribution to the GDP

South Africa has a significant unemployment problem (RN001; RN004) leading to a number of social issues. The V&A Waterfront contributes substantially to employment within Cape Town:

> ***RN001:*** *"The V&A Waterfront employs roughly twenty thousand people, every single day."*

Creating jobs and drawing in customers adds significantly to South Africa's GDP. Less obvious factors such as the relationships that the V&A Waterfront holds with the South African Police Service, its waste programme, and that it purchases some of its products from local entrepreneurs also add value to South African GDP. Statistically, the V&A Waterfront has contributed over R260 billion to the South African economy and over 200 small businesses operate daily. This, together with the fact that it is the most visited tourist destination in South Africa, creates significant opportunity and value (RN001).

4.5.4 Social sustainability at the V&A Waterfront

Social sustainability, discussed in this section, includes factors such as social issues in South Africa, assisting in poverty-reduction and social awareness, community development, security and safety, and social inclusion. It is unsurprising that comprises so many factors given that social sustainability encompasses such a wide range of aspects. We live in a country that has a fragile and unique past so it is critical for social issues to be addressed (RN005).

Social issues in South Africa

South Africa faces many social issues, unemployment being one of them (RN001). The V&A Waterfront seeks to address such issues through sustainable job creation. On a macro level, the relationship with municipalities becomes easier when they can see what the precinct offers in terms of job creation and social cohesion. On a micro level, employees enjoy job security and the opportunity to work, given the constant development and redevelopment of buildings within the V&A Waterfront.

Moreover, there is no segregation. The V&A Waterfront encourages:

> ***RN001:*** *"all races, all sort of, across the spectrum in terms of economic well-being over here. Once again that talks to the social and economic on the political areas."*

Although the V&A Waterfront aims to achieve inclusivity and openness, it is important for the researcher to highlight that the V&A Waterfront, by nature, attracts upmarket clientele and consumers of a certain income-bracket (Coggin & Pieterse, 2012). Moreover, the case (Victoria and Alfred Waterfront v. Police Commissioner, Western Cape 2004) reflects how the V&A Waterfront is not a place for begging, as it would impact on their targeted consumers. The evidence suggests how beggars have been forcibly removed by the private policing and surveillance at the V&&A Waterfront.

Assisting in poverty-reduction and social awareness

One of the key relationships the V&A Waterfront holds is with the Haven Night Shelter, which assists with relocating and helping destitute people get off the streets. For example, the V&A Waterfront began a programme 4 years ago, whereby it pays for social workers to assist the homeless. In doing so, it has assisted over 250 people to get off the street, even if it meant paying for their bus fare to Port Elizabeth or Bloemfontein and connecting them with a social worker upon arrival (RN001).

The notion of creating an environment for anyone and everyone is epitomised by the V&A Waterfront (RN001; RN004). For example, the V&A Waterfront has no entry fee making it free to walk around and enjoy what the precinct has to offer, which is fundamental to creating a culture that welcomes people from all walks of life (RN001). Moreover, an in-depth tour is available, which informs customers about the heritage of the V&A Waterfront. For example, the V&A Waterfront is home to over 20 museums or historical sites.

> ***RN001:*** *"You can go on a self-guided historical tour and you can go to all the historical buildings and it will tell you this was the port captains building or this was a prison. Or, you can pay and get a guided tour to these sites. We don't want to lose the authenticity."*

RN001 is referring to maintaining the culture and heritage that exists within the Waterfront. It wants to adapt and evolve but not forget about it came from and who was important in the discovery and moulding of the V&A Waterfront as it is today.

Community development

The V&A Waterfront emphasises community development and upliftment. For example, it wants to be perceived as the 'neighbourhood of the city' (RN001). To this end, RN001 described the importance of creating its own unique culture through certain events, allowing buskers to perform daily, and encouraging the community to involve themselves in what the V&A Waterfront has to offer.

Security and safety

It is vitally important for precincts to be safe places. Social sustainability includes a sense of feeling safe and secure in a given environment. The V&A Waterfront has elected to refer to this as 'feeling comfortable' rather than calling it safe:

> ***RN001:*** *"It's about calling it comfortable. Because comfortable means I can go and sit and read my book or I can run around with my kids and I know the lighting is fine, its clean, the landscaping is looked after, there's directional signage plus its safe."*

It takes it beyond the meaning of the word safety as it encompasses other key attributes. The security and safety components are however ever-present. For example, the V&A Waterfront has over a thousand cameras, hundreds of security guards and response vehicles (RN001):

Social inclusion

Social inclusion is critical to achieving social sustainability within a precinct. It is important to create an environment which is both liveable and enjoyable, activating as much space as possible (RN001; RN002; RN004). For example, at the V&A Waterfront, they consistently ask:

> ***RN001:*** *"How do we activate those spaces between the building and make it more liveable and make it more enjoyable so how do we increase our green space?"*

The V&A Waterfront also activate spaces by making them interactive. For example, it has moved away from providing fixed benches in certain areas. Instead, it provides chairs, which have increased social interaction as it can accommodate varying sizes of groups or families (RN001). Another example it introduced was a life-sized chess set, which customers interact with, stop and view the once dormant space. A lot of what has been mentioned ties in with the next component of physical design and the physical nature of

spaces within a precinct. In other words, trying to create an environment which is physically sustainable.

4.5.5 Physical sustainability at the V&A Waterfront

Physical sustainability, one of the identified patterns, is discussed in this section covering issues such as, design and efficiency, water supply infrastructure and transport. According to RN002 , physical sustainability refers to factors such as design and urban planning or how things have actually been laid out and positioned within an urban space. RN001 explains how it is important to design a space that takes into account more than just the pressures exerted currently on water and electricity and that there needs to be some connectivity and functionality with transport and movement (RN004).

Design and efficiency

The V&A Waterfront aims to follow as efficient a design pattern as possible, in terms of both operations, movement and flow (RN001; RN004); for example, implementing the most efficient taps in a new building to save water or retrofitting an existing building to allow for an adaptable design. Adaption is as important as design, as the precincts need to be designed or retrofitted to be as efficient as possible. RN001 described some of the factors considered when designing a new or existing building to its best use. When factoring flow and movement, the V&A Waterfront aims to activate open space. For example, it encourages cycling to work, providing bicycle stations, running routes and motorcycle space to reduce congestion, not only to better the environment but also to enhance the liveability and flow within the precinct. (RN001).

Water supply infrastructure

The V&A Waterfront is primarily concerned with 'saving resources and generating supply.' For example, RN001 described the importance of finding ways to save scarce resources like water through, for example, rainwater harvesting, and the necessity of understanding how much water is being stored, as it needs to be circulated on a regular basis to avoid rotting and ultimately dumping the water. It is thus important to understand what the water is going to be used for and to what level it needs to be filtered:

> ***RN001:*** *"So if you're only going to use it for irrigation, then maybe you don't need to go to such high levels in terms of filtration, um, if you're going to use it for potable water then clearly there's a bit more focus on filtration."*

It is essential to understand what the water is to be used for and at what scale. RN001 mentioned that the type of building and its tenants need to be considered. So, in terms of a strategy, the V&A Waterfront aims to reduce usage by 30%, as well as generate supply:

> ***RN001:*** *"We will say how do we generate maybe at least in the short term, 5% of our water through boreholes and grey water."*

This is an important factor because there is a strategy across the entire precinct. In other words, they undertake a macro viewpoint, as opposed to just a building-level scale. RN001 took this further and described how they use black and grey water. It was explained that although they reached high levels of water quality, the council bylaws limit them in terms of their provision to kitchens. Nonetheless, water supply infrastructure is vital to the sustainable operations of the precinct (RN001).

Transport

Transport and physical sustainability hold a high-level relationship as movement and flow are key to the achievement. For example, the V&A Waterfront is able to ensure that 40% of its stakeholders use of public transport, thereby minimising congestion, as well as the impact on the environment. However, RN001 explained how it is important to remain adaptable in terms of the design; and that by next year, they want that number to reach 60%. They have also encouraged energy-efficient cars by providing plug-points for electrical vehicles, with ample space provided for bicycles and upgraded walkways to encourage healthy active living.

4.5.6 Political sustainability at the V&A Waterfront

Political sustainability refers to the fifth and final dimension recognised as a pattern in Chapter 2. It includes aspects such as: a lack of government pressure on water-use and local government relationships.

The manner in which urban space is governed and controlled is of vital importance when it comes to sustainable urban development (RN002). For example, the political

influence of how space is governed in the long term becomes a critical factor of sustainability (RN002).

Moreover, it is important for urban precincts to address factors on politicians' agendas. (RN001). RN001 explains how discussions and relationships become easier when politicians can actively view how the precinct is participating in job-creation or energy-reduction, etc. Moreover, RN003 describes how water has indeed become a key focus on politicians' agendas:

> ***RN003:*** *"Politically water has become a big issue and will become even bigger issue in the future."*

However, the interview process established how a lack of government pressure and, at times legal limitations preventing certain water-related issues (RN006).

A lack of government pressures on water-use

According to RN002, no pressure has been placed on developers or developments in terms of water-usage and consumption. RN003 provides similar insight but adds that different government departments hold different agendas and generally, buildings are only required to follow safety precautions such as holding enough water to control potential fires. RN001 argued differently and explained how the V&A Waterfront initiated water restrictions from March 2016. This is in line with the respondents' outlooks on government departments being fragmented and unclear (RN001; RN002; RN006).

Private versus public ownership and investment

The V&A Waterfront is owned by the PIC and Growthpoint (RN001). They explained that, in order for their precinct to run effectively, there needs to be a good relationship between the local municipality and the precinct itself (RN001).

The stakeholders involved in the ownership of the precinct play a crucial role in its functioning; and good and healthy relationships should exist if the precinct is to be politically sustainable. This section takes this concept further and highlights the role that facilities management can play in the achievement of sustainable urban development (Boyle, 2016).

4.5.7 Facilities management at the V&A Waterfront

It is critical for a business to have a vision, as well as a strategy aligning with that vision (RN001). Facilities management (urban FM in particular), including strategic decisions; the key resources for the management of a precinct; space, place and people; and macro-level thinking are discussed in the sections below as key components for achieving or fulfilling certain sustainable urban development objectives at the V&A Waterfront.

Strategic decisions

The long-term sustainability of the business and the satisfaction of shareholders are key indicators when it comes to the strategic decisions involved with the V&A Waterfront - in other words, the consideration of future events. However, RN001 indicated the varying strategies of the long and short term:

> ***RN001:*** *"So what are we going to do for the next 25 years… and what are we doing for the next 3 years and the next 5 years. But it's the masterplan that governs how we are going to develop, how much bulk, where we going to, etc."*

As reflected above, there is an overarching 'masterplan' that governs both the short- and long-term objectives. It is within this masterplan that strategic decisions are developed and the V&A Waterfront has implemented many strategic decisions, primarily focused on sustainability, within the precinct. For example, the V&A Waterfront wanted to increase social interaction and therefore social sustainability within the precinct. RN001 explained the clear focus on activating certain space and strategically forcing people to stop, slow down and allow for increased social interaction. In doing so, the V&A Waterfront aims to become a 'comfortable space' (RN001). In addition, a strategic focus has been placed on water.

Strategic focus on water

Strategically, the V&A Waterfront has placed increased emphasis on its management of water, because of the drought conditions facing South Africa (RN001). RN001 describes the V&A Waterfront's focus on measurement and performance:

> ***RN001:*** *"Can I measure where I am and where I want to go and then can I measure my success, because you can always get funding if you can tell people where I've come from, what I've achieved and what its cost me."*

Numerous SuDS are implemented at various levels of the precinct. For example, roof gardens are utilised according to the nature of the building and type of roof, although this is dependent on the age of the building, whether it is a new-build or a retrofit and what balance of sustainable solutions aim to be achieved:

> ***RN001:*** *"So if you're doing a new build, then one needs to have a look to say now, I want to put solar on that roof, I want to put some of my equipment on because instead of water cooled, I have air cooled chillers, so where do I put that equipment versus doing a roof garden. Or can I do a bit of both."*

It was argued, however, that capturing of stormwater can create problems, particularly in parking garages, which are a good source of rainwater harvesting. The problem is that oil and sediment is also collected with the stormwater so there needs to be strategy around the level of filtering, in accordance with the future-use of that water:

It also important to find an efficient balance of water harvesting as, in some years, there is not sufficient rainfall. As such, the V&A Waterfront makes use of borehole water and seepage coming down from the mountain which then becomes a matter of what can be used at what time of year (RN001). Various yield tests are done on the quality of the borehole water to establish what it can be used for.

It is important to keep in mind that these SuDS or sustainable solutions need to be implemented, principally, at a strategic level (RN002), as things can become operationally inefficient without the correct strategic approach. For example, permeable paving is used at the V&A Waterfront but it was indicated through the interviews that it is important to understand the strategic advantages and disadvantages of implementing such strategy. In other words, it may not be the best solution to opt for permeable paving, for example, particularly for retrofits (RN001; RN002).

Use of seawater at the V&A Waterfront

The V&A Waterfront has the added benefit of being able to utilise the naturally cooled seawater (RN001). In doing so, it is able to undertake seawater cooling which allows its chiller systems to operate more efficiently. It has been able to achieve a 40% saving on its cooling systems, which is in line with their overall masterplan to reduce water and electricity usage.

Part of the strategy involves getting as many buildings in the precinct as possible on the seawater cooling, depending on the short or long term objectives (RN001). By seawater cooling, RN001 refers to the pre-cooling of the chiller systems. Another strategy implemented is running the naturally cooled seawater through the piping in the buildings to lower the temperature before operating the chillers. By doing so, in winter months, the buildings can run entirely off natural ventilation and cooling, without recourse to the chiller systems (RN001).

4.5.8 Jensen's value map

Key resources for the management of a precinct

Operations cannot continue without water (RN002). It is a fundamental, value-adding input for the strategic outlook of a given precinct (RN006):

> ***RN006:*** *"The availability of water, your quality of water, I think those are probably the critical ones, your demand for water and the adaptability of that demand."*

As mentioned, RN006 is referring to the key resources required for a precinct's operations. Quite obviously, demand for water within a precinct is a critical factor as precincts are required to respond to changes in market forces (RN004) .

RN002 agrees with this notion, stating:

> ***RN002:*** *"So I mean, the businesses aren't going to function without energy and water… So, you can't really function without it."*

RN002 takes the concept further and refers to technology and people as key inputs to a precinct's operations and describes how these factors 'piggy back' off water and energy. In other words, the primary inputs include water and energy. The V&A Waterfront agreed that water and energy are critical factors to the operation of the precinct, but that it is critical to have the right people in place, and educated accordingly (RN001). For example, employees at the V&A Waterfront are required to understand and be aware of the holistic water strategy that is being implemented; additionally, understanding the SuDS technologies and ICT has been added to its staff performance criteria(RN001). It was then described how its strategies in terms of water, energy and sustainability can be implemented under one vision. RN001 highlighted the importance of performance indicators – be it for the people or the infrastructure in place:

> ***RN001:*** *"So you'll see things like all the things that we sort of strive for in terms of water or energy or anything is all included in certain staffs' key performance areas. So what systems have I got in place so if its water, have I got enough meters in place, can I measure where I am and where I want to go and then can I measure my success."*

Transport is another key component to managing a precinct. Transport was discussed under physical sustainability in the previous section but it is still important to highlight it as a critical input to a precinct's management. The movement of people in and out of the V&A Waterfront is vital to the flow of the precinct and so use of public transport networks within the precinct and the surrounding areas is fundamental to its success (RN001).

Another key resource to the management of the V&A Waterfront is ICT – technological upgrades and services are vital to the success of operations. For example, security at the V&A Waterfront is monitored through CCTV, 24 hours a day (RN001). Furthermore, innovative ideas from a construction perspective are being rolled out that are fundamental to the V&A Waterfront. For example, it has introduced electronic car ports for electric cars – an initiative that represents its commitment to future technologies. SuDS technology is apparent in the V&A Waterfront and forms the basis for its sustainability agendas. In relation to the literature therefore, the key resources, over and above those outlined in Jensen's value map (2009), include water, electricity, ICT, SuDS and transport (RN001).

Processes

RN001 described how the processes to achieve a certain outcome require a holistic strategic development plan, which can be implemented on a macro-scale. It is important for the V&A Waterfront to remain adaptable in this regard, so the implementation of long-term and short-term objectives is key to the V&A Waterfront's success. It was indicated quite clearly that unambiguous and straightforward planning is required to coordinate a long-term plan (RN001).

The next section is critical to achieving sustainability, in particular, for urban precincts. Macro-level thinking forms part of the foundation for urban FM and is therefore imperative to the V&A Waterfront.

Macro-level thinking

The V&A Waterfront is made up of several precincts which are generally managed on a macro scale (RN001), although RN001 emphasised that both micro-level and macro-level management is required, under the holistic vision of the 'masterplan.' In other words, there must be a connection between the various sub-precincts, for example, the V&A Waterfront has a general strategy for landscaping but it is equally important that buildings are managed effectively on a micro-scale to achieve successful macro-level management (RN001).

Provisions (output)

The following section refers to the provisions or the output that comes about from the resources and processes taking place within the precinct. According to Jensen's value map, basic products, space, services, additional offerings, development and relations are the key outputs (Jensen, 2009). The case study however brought to light additional 'provisions' on an urban precinct scale (RN001). For the V&A Waterfront, it is important to activate the spaces between the buildings – a process known as 'place-making.' The space is mixed-used with emphasis on space, place and people and making use of the green and blue infrastructure available to the precinct is of critical importance (RN001).

Space, place and people

The V&A Waterfront has strategically engaged in what it refers to as 'place making', a concept that aims to activate the space between the buildings and make the precinct more liveable (RN001). In doing so, it incorporates green space and socially-inclusive areas to connect the nexus of space, place and people. For example:

> ***RN001:*** *"There's a 5km and a 2.5km running route around the waterfront and that takes you on to the boardwalk and you can use those spaces which maybe you couldn't before."*

Another example, which can be seen in Figure 4.1, shows the V&A Waterfront embarking on various initiatives to increase social activity, provide more amenities and activities, and ultimately increase the period of time people spend at the precinct (RN001). It depicts the *before and after* representation of 'place making' initiatives

whereby the chess board showed on the right of the picture aims to increase social interaction.

Figure 4.1: Place-making strategy (Source: Devenish (2014))

Space, place and people are all key factors for the V&A Waterfront in terms of its effort to become more sustainable (RN001).

Impacts (outcome)

RN001 described how the impact on the overall precinct should be in line with the ideals of sustainable urban development. Each dimension has been already been explained in terms of its ability to be achieved and its importance for the core business. The research highlights that each dimension of sustainable urban development and its impact on the core business are inextricably linked.

Stakeholders

The only real disparity from the literature here is the importance of maintaining a good relationship with the public sector. It has been discussed under public versus private ownership and investment but it is important for the sake of this research to highlight that healthy, functioning relationships are required to implement potential value capture mechanisms (RN007). It has been revealed that the V&A Waterfront does not make use of such mechanisms but there is scope to do so, particularly income-generating mechanisms such as a TIF (RN007).

Section 4.6 unpacks the second case study, Century City. It provides a brief history of Century City before delivering the sustainable urban development dimensions in relation to WSUD.

4.6 Century City

4.6.1 A brief history of Century City

Development at Century City began in 1997, whereby a 250 hectare 'wasteland' situated parallel to the N1 in Cape Town was rezoned from residential to mixed-use development (Century City, 2013b). The area was largely covered by alien vegetation, marsh and degraded wetland (RN004; Intaka Island, 2016c). Prior to any development, an environmental impact assessment (EIA) recommended that a 'multi-purpose nature reserve be created at the centre of Century City' (Intaka Island, 2016c), with Intaka Island as the result. It consists of a 16-hectare wetland and bird sanctuary, whereby nature conservation and urban development can co-exist in harmony (Intaka Island, 2016b).

The site was previously owned by the Cape Town developer, Monex (RN003; RN004; Century City, 2013b). The developer realised that the land required rezoning from the previously unsustainable residential housing zone to mixed used, including commercial, residential leisure and retail rights (RN004; Century City, 2013b).

Ratanga Junction opened in 1998, followed 2 years later by Canal Walk Shopping Centre. At that time, Ratanga Junction was overcapitalised, which created heavy losses and the subsequent demise of Monex developers (RN005; Century City, 2013b). Rabie Property Group acquired the remaining land and property rights in 2004, and invested roughly R21 billion over the past decade (Century City, 2015). For a full photographic timeline of development, refer to Appendix F. No zoning rights need to be ascribed to particular parcels of land. In other words, the bulk has already been zoned by the previous developer and the environmental assessments approved, which ensures that Rabie developers can build according to its vision and requirements. To ensure the developer's vision is met, an overarching management body (the Century City Property Owners' Association) was established as a macro-managing body (Century City, 2015).

4.6.2 Century City Property Owners Association (CCPOA)

The CCPOA functions as a 'mini municipality' and is wholly responsible for Century City's management. It is a non-profit company, responsible for numerous services such as stormwater management and the maintenance of canals and water quality. Owning a

property within Century City confers automatic membership of the CCPOA (Century City, 2013a). It functions via a monthly levy system, payable in accordance with one of three respective levies:

- A general levy: payable by all owners on a pro rata basis according to the square meterage of floor space, excluding parking, or based on the number of residential units owned.
- A precinct levy: payable by owners within a precinct who seek additional, ongoing services within the precinct from the CCPOA (e.g. additional security).
- A special levy: payable by precinct owners who seek additional one-off projects within the precinct (Century City, 2013a: 1).

For a detailed analysis of levies payable, refer to Appendix G, 'A snapshot of Levies Payable from the Memorandum of Incorporation of CCPOA' (CCPOA, 2013).

One of the key aspects relating to the history of Century City is that it was established post-Apartheid. In other words, the CCPOA, through its management and operations, is creating a unique culture in line with the ideals of sustainable urban development in that it can create its own culture and heritage on a greenfield site. Moreover, Century City's unique canal system enables it to follow WSUD features, which will be presented in the ensuing sections.

4.6.3 Ecological sustainability at Century City

Ecological sustainability, more specifically the relationship it has with WSUD, developed as a consistent pattern throughout the research. Here, it encompasses a wide range of factors, including energy efficiency, support for 'going green' and timing of green building features**.** Moreover, case-specific factors are discussed, including the benefits of natural water landscapes.

RN004 described the importance of operating efficiently, when it comes to the ecological environment – particularly regarding the substantial amount of natural capital Century City holds. RN002 agreed, explaining the importance of bringing the natural ecosystems back into a given space. For example, encouraging birds and ecosystems to form part of an urban space can add value and contribute to the natural capital of that space (RN002). In doing so, RN002 described how the creation of a tranquil environments can

occur, which in turn leads to psychological benefits, whereby people can find a stress-free environment from their daily routines and surround themselves by nature, relax and connect with the natural environment (RN002; RN004).

As explained by RN002 and RN004, Century City aims to achieve an environment whereby it operates in an ecologically sustainable manner. One of the key factors in achieving ecological sustainability is becoming energy efficient.

Energy efficiency

Century City, has a strategic plan of '*turning green into gold'* (Century City, 2015: 12). Through their relationship with the GBCSA, Century City has replaced its lights with LEDs, which use 74% less electricity (Century City, 2015). The slogan, 'turning green into gold' stems from the fact that the new lighting system will pay for itself in the next 2 years through electricity cost reductions. In other words, it is financially feasible to install a more environmentally-friendly lighting scheme.

This, together with other characteristics of the precinct such as the implementation of various SuDS options such as green roofs demonstrate Century City's Support for 'going green.'

Support for 'going green'

Century City has a long-standing relationship with the GBCSA and its support for 'going green' is reflected in many of its operations. For example, Century City is home to Aurecon, South Africa's first Five Star Green Rated building (RN004; RN005; Century City, 2015). Aurecon, as well as other buildings within the precinct, make use of numerous SuDS technology, including rainwater harvesting, treated effluent for the cooling towers, and dual flush toilets (Maree, 2011). Its commitment to 'greening buildings' is further demonstrated by its canal system (RN003; RN004; RN005) and its use of treated effluent for irrigation – a key feature, not only for existing buildings but for new buildings, too. Developers benefit from these features in that they receive automatic points from the GBCSA (RN004).

> ***RN004:*** *"Here a person coming to do a building in Century City automatically the green issues like treated effluent for irrigation, like the transport infrastructure and the accessibility to retail so they get a whole lot of points."*

RN004 is explaining how, just by developing within Century City, buildings are already receiving 'points' in terms of the GBCSA. The precinct already offers a wide range of greening initiatives, so by tapping into its infrastructure, developers automatically benefit (RN005). Despite Century City's expressed support for 'going green,' the timing of green building features remains critical to the achievement and success of ecological sustainability.

Timing of green building features

Century City makes use of numerous SuDS technologies in the various zones within the precinct (RN004). However, although it is important to follow the correct procedure in terms of 'the new SuDS Policy', it is an expensive process, which needs to be as efficiently managed as possible (RN005). In other words, there is a budget to managing the cost of the SuDS technologies but it needs to be managed strategically:

> ***RN004:*** *"There is a cost to managing it and it is quite a substantial cost. We have got an annual budget specifically for looking after water quality so it is not something to be taken lightly. It is a huge asset and it has to be maintained and there is quite a bit of a cost to it."*

A relationship clearly exists between the timing of green building features and cost to ensure for example, that it is financially viable and economically sustainable at any given point in time. The next section unpacks economic sustainability after a consideration of water as a natural asset within Century City.

The benefits of natural water landscapes within Century City

The respondents went into detail when highlighting the benefits of being situated in an area surrounded by natural water landscapes. The entire precinct bases its operations around the region's natural water body (RN003; RN004; RN005).

> ***RN004:*** *"The whole sustainability of Century City depends on the water."*

The area is categorised as an '*ephemeral pan, which means it is dry in summer and wet in winter; it floods in winter, it is dry in summer*' (RN003) and so Century City uses retention ponds and a man-made canal system to control the quantity and quality of water on the site (RN003; RN004; RN005; RN006).

RN003: *"Then it goes into an overflow weir, into a big culvert, into a detention pond. So that then controls your water level. So the weirs control your levels."*

The 'weirs' RN003 refers to are man-made control systems that monitor the quantity of water flowing between the ponds and into the various 'cells' and ultimately through the canal system (RN003; RN005). RN004 went on to describe the value of these water systems in terms of numerous aspects including the fact that 'water sells' and that it is aesthetically pleasing to live or work near water features. Moreover, there is the functional value that the stormwater components control, as well as the social benefit for people who use the amenities associated with the canals (RN004). RN004 is referred to the numerous value-adding attributes of being situated in and around natural water landscapes – in this case, a natural wetland.

Another example is Intaka Island, a natural ecosystem that exists in harmony in and around development (Century City, 2015). It creates 'tremendous value' and adds to the overall sustainability of the precinct. In terms of ecological sustainability, the natural ecosystems that exist in conjunction with a natural wetland such as Intaka Island are a critical factor:

RN002: *"There's obviously a variety of benefits, the ecosystems you bring back into the space and sort of encouraging birds to kind of come back into the space."*

RN002 also described the functional benefits of natural wetlands:

RN002: *"There's huge value in that and then obviously, you can use those things like for stormwater purposes, for slowing your discharge rates down and you can use it for storing water if you want to recycle."*

RN006 however contended that in spite of natural ecosystems playing a crucial role, wildlife can contaminate the water and so part of the wetland's role is to naturally clean whatever excrement is associated with such wildlife (RN003).

Overall, however, RN004 and RN005 argued that there is substantial value added in terms of the ecologically sustainable features within Century City and that there is indeed a spill-over effect for economic sustainability.

4.6.4 Economic sustainability at Century City

Economic sustainability covers a range of issues including budget and financial issues; cost of 'going green' and financing infrastructure; and employment opportunities and contribution to GDP.

Budget and financial issues

A key factor benefitting Century City in terms of its potential financial constraints is that the development rights had been approved upfront:

> ***RN004:*** *"… the development model in Century City is that there are development rights, which were approved upfront for 1 250 000m of development …"*

Developers are not required to go through the expensive and lengthy process of obtaining certain development rights. Instead, the original developer, Monex, obtained a number of these rights upfront, creating significant investment incentive (RN004; RN005). The current developer, Rabie, can enjoy an almost accelerated development process in terms of obtaining rights (RN004; RN005), although the costs associated with 'going green' remain.

Cost of 'going green' and financing infrastructure

Century City is unique in that water expenses vary compared to other cases (RN004), as water is not a problem for it and the costs lie firmly with the management and operation of its canal system (RN004; RN005). So, while century City has access to this major natural asset, the cost of management, restoration and operations comes at a high price and preventative measures are put in place to avoid major issues within their system. An example involved the appearance of carp into the wetland. These fish are bottom feeders and churn up all the nutrients, making the water appear dirty and contaminated, which required Century City to go to major lengths to remove the carp and clean the system (RN003; RN004; RN005; RN006).

Employment opportunities and contribution to GDP

South Africa is already constrained by unemployment (RN001; RN004). Century City contributes substantially to employment in Cape Town through its roughly sixty thousand people living, working and playing at the precinct every day (RN004). RN004

described how Century City has supported a wide range of initiatives to make life easier for employees such as introducing public transport routes and performance-related employment incentives, which in turn relates to the following section on social sustainability at Century City.

4.6.5 Social Sustainability at Century City

Social issues in South Africa

Century City is unique in that it does not share the same history as the rest of the country (RN004). It was developed post-apartheid so it is aiming to create its own heritage and culture:

> ***RN004:*** *"Because we have not got history which is positive as well because there is no legacy of apartheid here. We are using art; we are using sport; we are using activities to create our own history and culture and start building a heritage because we are starting from scratch."*

This is important in a South African context; as no previous unrest took place, it allows Century City to create its own culture according to the community it wish to develop and build. It should be noted, however, that Century City targets a fairly wealthy and somewhat exclusive market. Despite being developed 'post-apartheid,' this does not unequivocally suggest that it addresses the social and economic inequality that exists in South Africa.

Assisting with poverty-reduction and social awareness

Century City aims to create a culture that caters for all walks of life. It aims to create a sense of community and in doing so, it has uplifted surrounding areas. For example, an area called Summer Greens, an immediately neighbouring community, has benefited from the precinct (RN004); another community called Sandrift, a low-income area, has also experienced positive spill-over effects from Century City (RN004; RN005). This is relatable to, for example, the positive externalities that occur because of the precinct's success.

RN004 is highlighting the benefits of creating a place that is socially sustainable and encouraging of community involvement. Century City also aims to influence its customers in a positive manner.

Community development

Century City 'are not just building, they are building a community' (RN005). Century City encourages education through its schools and education programmes surrounding Intaka Island, as well as the general community through numerous events within the precinct. Its aim is to improve community development by implementing various strategies, including sports events.

> ***RN005:*** *"We started the canoe club, we started a running club, athletics club, we had touch rugby leagues and whatever to get people out of their offices or out of their residences and to start creating the spirit and community feeling."*

All these initiatives assist with Century City's aim to build its own community within the precinct (RN004). Moreover, it was argued how water creates a sense of calm and tranquillity, which positively affects customers, employees and residents within the precinct. People are encouraged to get involved and enjoy the amenities the precinct offers, which in turn leads to security, safety and social inclusion, which are further described in the following section.

Security, safety and social inclusion

Century City operates with extreme focus on safety and security, maintaining a 24-hour CCTV surveillance hub, as well as having people on the ground:

> ***RN004:*** *"You have to have people on the ground as well. So we have now got that balance between using technology, maximising our use of technology but having foot, bicycle patrols and having a rapid response as well to get that balance."*

As a result, people feel safe to enjoy the precinct, which encourages social inclusion. Century City's aim is to maximise social inclusion by activating its amenities such as their canals. RN004 argues that it forces people to remove themselves from the monotony of working environments and engage their minds. Social interaction is pivotal to achieving a precinct with an inclusive nature.

4.6.6 Physical sustainability at Century City

Century City's physical design and layout is conducive to a free-flowing environment. Moreover, it is built to achieve the highest degree of efficiency when it comes to hard infrastructure such as water and electricity (RN004). However, at the same time, there

should be some connectivity and functionality with transport and movement to ensure a higher value is created than the cost of installing such infrastructure. This section includes design and efficiency, water supply infrastructure and transport.

Design and efficiency

Century City's design is geared towards efficiency (RN004). It has been built with numerous walkways, transport routes and sustainable solutions to ensure efficiency (Century City, 2015). It also has Intaka Island where customers can simply enjoy nature, alongside their daily routines (RN004). RN003 explains how the entire water system in Century City has been designed in an integrated manner, following a SUDS policy:

> ***RN003:*** *"So we have done that but also these weirs other than creating that cascading visual and noise effect and what not, you can pick up in there the silt and stuff that enters the system."*

This refers to the integrated canal system that provides numerous benefits including the aesthetically pleasing design and sustainable technology involved in cleaning the water. This leads into the following section on the water supply infrastructure.

Water supply infrastructure

Century City is unique in that the entire precinct is located on a wetland (RN006; RN007). In other words, there is an abundance of water that needs to be filtered to the appropriate level for its different uses, for example, treated effluent is used for irrigation while numerous SuDS are implemented at building level and at macro-level scales (RN003; RN006). RN003 highlighted an example explaining how water is cleaned through the canal system and then circulated:

> ***RN003:*** *"Now the water falling on the roof, everything goes into the canal system. Then we build silt traps; we have designed silt traps to pick up silt and rubbish, you know, and that is meant to get cleaned."*

However, despite the significant advantages that come with the water supply infrastructure, RN004 explained the serious costs of managing it, which are largely because of the aesthetic value created through this infrastructure. People want it to be clean and look pleasing, which necessitates the constant filtering and cleaning of the water (RN005).

Transport

Century City prides itself on accessibility and mobility. It has a railway station and public transport interchanges, including four My City Bus routes and 94 Golden Arrow bus trips coming into the interchange daily. Furthermore, 134 mini bus taxis pay to use the public interchange. Not only is Century City easily accessible but it is also affordable. The public transport systems allow stakeholders the opportunity to get in and out of Century City with ease, thereby enhancing flow and movement, which are key factors to physical sustainability. Political sustainability is discussed as the fifth element making up the five dimensions of sustainable urban development.

4.6.7 Political sustainability at Century City

Political sustainability refers to the fifth and final dimension that was recognised as a pattern in Chapter 2. The key component in this section is private versus public ownership and investment.

Private versus public ownership and investment

Century City is run and managed by the Century City Property Owners' Association (CCPOA) (RN004; Century City, 2015). Century City, however requires all property owners to pay levies towards the CCPOA to arrange services and provisions within the precinct (RN004). It was argued that a good relationship with the local municipality is also beneficial as the city has now recognised the canal system at Century City as part of the overall stormwater system in that region(RN005).

The stakeholders involved in ownership of the precinct play a crucial role in its functioning. Good and healthy relationships need to exist if the Century City is to be politically sustainable. The following section extends this concept and highlights the role that facilities management has in the achievement of sustainable urban development.

4.6.8 Facilities management at Century City

Strategic decisions

Century City implements high-level strategic decisions, primarily based on sustainable development (RN004). Its focus is to become the top mixed-use urban environment, both incorporating its short-term objectives and bearing in mind that it is a long-term

process. RN004 regards sustainable development critically important, with one of the success factors being that the developer, Rabie Property Group, is there for the long-term:

> ***RN004:*** *"One looks at the big picture as opposed to some developers who come in and rezone an erf, put up a block of flats or a building and then run away and look for the next opportunity. So they are in for the long haul."*

The respondents mentioned that sustainability requires holistic-level thinking. In other words, a focus on the economic benefit of an initiative is not enough. Instead, the developer, the stakeholders, and so on must look at the other influencing factors such as environmental and social:

> ***RN005:*** *"It is critically important that you cannot look at economic in isolation. One has to look at the social side, look at the environmental side, one has got to look at everything else so they are interactive."*

This is evident in the following section which highlights the importance of water as an asset water for Century City and that it requires intense management and maintenance.

Strategic focus on water at Century City and its canal system

Development at Century City would not have been possible without the construction of the canals and retention ponds, depicted in Figure 4.1 (CCPOA, 2016). Not only do they act as SuDS, allowing for suitable drainage and therefore development, but they also act as a mechanism for stormwater run-off (Intaka Island, 2016a). The constructed wetland and seasonal saltpans are predominantly used for conservation but in recent years have also proved beneficial to Century City for environmental leisure and education (RN004). The major asset of its canal systems, which operate according to its new SuDS policy, holds tremendous value (RN004).

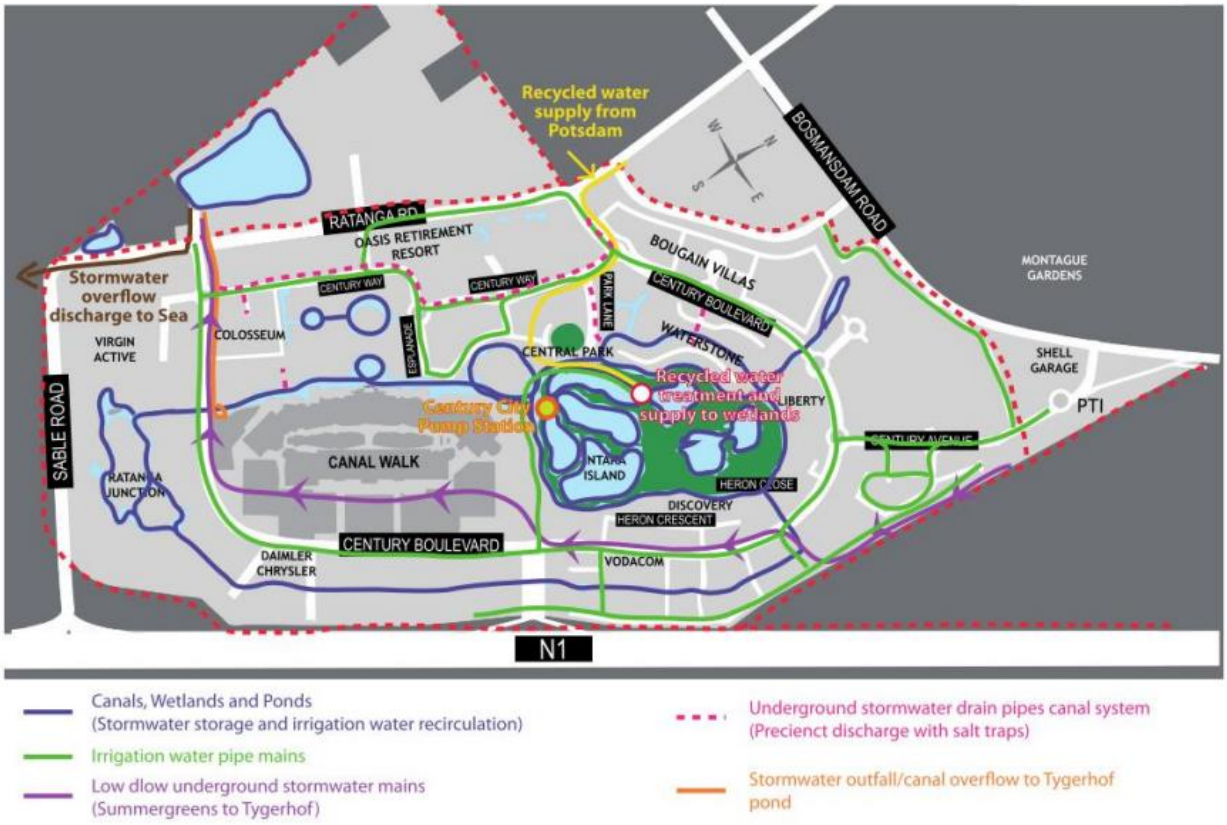


Figure 4.2: Century City Water System (Source: Century City (2016: 3))

The City of Cape Town has also recognised its value:

> ***RN004:*** *"So the city has recognised that our canal system is part of the storm water system."*

Moreover, the entire system is an example of a SuDS (RN003). The 8 kilometres comprising the canal systems within Century City are fundamental to the functioning and operations of the precinct (Planning Partners, 2005e). Primarily, stormwater is reticulated around the precinct and wetlands but upon overflow, water is discharged into the municipal system – not only placing less pressure on these systems, but also keeping the precinct green and aesthetically pleasing (RN004; RN006).

Century City has however faced various problems in managing its canal systems. Firstly, an invasive carp that had been appeared in the system started digging up the bottom of the canals, making them brown and unattractive looking. Century City removed 22 tons of fish in 6 weeks to improve visibility and allow plants to grow again. This, however, then led to the problem of overgrowth within the system, which required it to 'mow the canals' to allow the aquatic plants to function properly as part of the ecosystem.

> ***RN004:*** *"We had to go out and buy an aquatic weed harvester from United States of America. By mowing it you are cutting the grass and you are taking nutrients out of the system and making it a healthy system."*

RN004 explained that although water is an important asset for the precinct, it is an expensive one that needs to be managed strategically and in the most sustainable manner. A further problem faced by Century City was the quality of water coming in from the upstream catchment, feeding into the natural wetland:

> ***RN006:*** *"They didn't have any control of the upstream catchment and the river coming in there, it gets a lot of sewage and a lot of litter and particularly sewage."*

Century City has access to treated effluent from the Potsdam Waste Water Treatment Works, which reduces consumption of potable water by the buildings' occupants. Moreover, it was discovered that Century City sits on a naturally high water table that fills the canals, which alleviates the issue of bringing in highly polluted water from upstream. In addition, this environmental intervention increases biodiversity, as it includes the addition of bio filters to the canal to maintain water quality.

4.6.9 Jensen's value map

Key resources in the management of a precinct

RN004 highlighted three key resources that attract people to Century City. The first is that it is a secure environment; the second is its location in relation to the CBD and other surrounding neighbourhoods; and the third and most important factor relates to the ecological components, particularly water (RN004; RN005). In other words, both green and blue infrastructure play a critical role in Century City's operations, which includes the importance of transport. Transport was covered in the previous section but RN004 emphasised its significance when it comes to the flow and movement of people within the precinct. The technology components including ICT and SuDS were highlighted as 'critical' and that Century City provides 'cutting edge' technology in for example, its communication networks. In addition, it was explained that there needs to be a balance between manpower and technology but that each carries equal weight in terms of the importance of operations (RN005).

Processes

The literature highlights four key processes, namely planning, coordinating, controlling and improving (Jensen, 2009). Century City referred to the importance of adaptability and flexibility in its overall masterplan (RN004). The development rights had been achieved upfront and the time-lag of achieving such rights was therefore avoided, in turn incentivising development according to market demand (RN005). In this regard, it is important to view the 'big picture' and have long-term, achievable objectives. The next section is critical to the achievement of sustainability, in particular for urban precincts. Macro-level thinking forms part of the foundation for urban FM and is therefore an imperative for Century City.

Macro-level thinking

Century City embraces macro-level thinking, as part of its aim to achieve an 'intelligent city' that takes into consideration the precinct as a whole, managed entirely by the CCPOA (Planning Partners, 2005c; 2005b; Century City, 2015). In saying that, any precinct planning must also be within the development framework, allowing for easier micro-management should market forces change (Planning Partners, 2005b). Century City encompasses all that is mixed-use or rather multi-use and aimed at becoming an integrated environment, including the greening components, such as Intaka Island where people can 'work, stay, shop and play' (RN004; Planning Partners, 2005a; Century City, 2015).

Provisions (output)

RN004 spoke about the importance of a mixed-use site that incorporates and activates as much of its space as possible. RN002 referred to the ecosystem services that result from the constructed wetland within Century City and how there is added value when it comes to this component, over and above the following factors, which include, space, place and people.

Space, place and people

Century City is a prime example of activating the space between buildings, embracing a concept referred to as 'new urbanism' and place making (Planning Partners, 2005d; Century City, 2015). The goal is to achieve a positive relationship between buildings and

public areas, incorporating transport networks and the canal system. Intaka Island epitomises this concept and provides the perfect example of green space to encourage social interaction, education and community development:

> ***RN005:*** *"…and we realised that the value of this (Intaka Island) as an environmental education asset is tremendous and far bigger than just Century City."*

Intaka Island represents all that Century City aims to achieve in terms of sustainable solutions, or rather the 'urban lung' – providing recreation and psychological well-being for people living in urban areas, as well as examples of WSUD and SuDS (Planning Partners, 2005d; Century City, 2015). Figure 4.3 shows a few of the sustainable solutions utilised within Intaka Island.

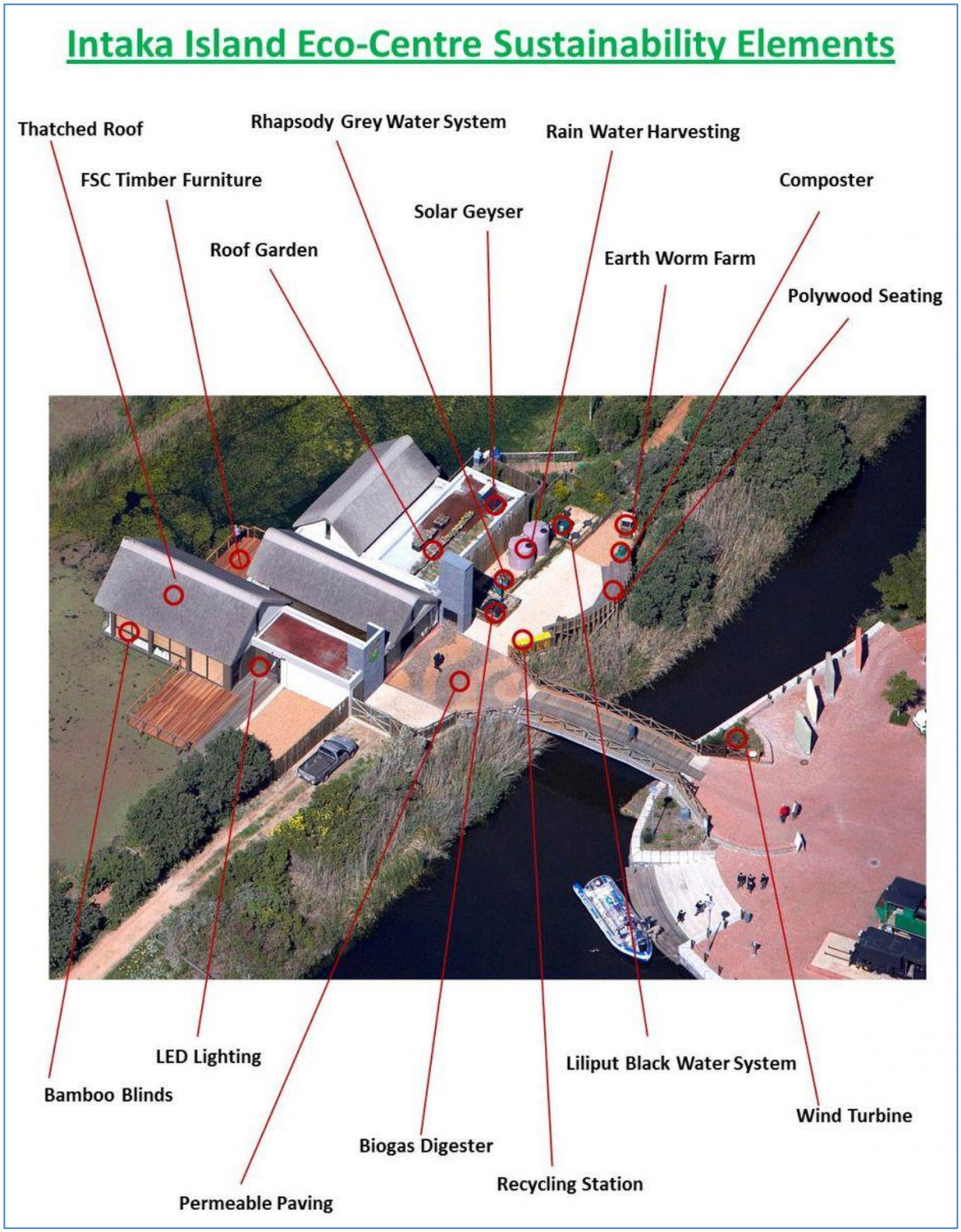


Figure 4.3: Intaka Island Eco-Centre Sustainability Elements (Source: Intaka Island (2016a)

Space, place and people are key factors for Century City's efforts to become more sustainable (RN004).

Impacts (outcome)

Century City aims to achieve sustainable urban development in terms of its immediate surroundings and in doing so, implements the ideals of WSUD. These concepts have been explained in the preceding sections but a further factor highlighted by RN004 was the importance of having a positive impact on surrounding neighbourhoods.

Stakeholders

Similarly to the V&A Waterfront, Century City has good relationships with the public sector, which is reflected, for example, in its use of treated effluent water pumped from the Potsdam Waste Water Treatment Works. It is used for all irrigation and so the City of Cape Town's water restrictions are not enforceable on Century City members (Century City, 2016), meaning all those stakeholders forming part of the CCPOA (see Appendix G).

The implementation of WSUD and sustainable urban development creates value. This value, attributable to the relationship between these two concepts, is discussed in the following section.

4.7 Defining value

Highlighted as a pattern in Chapter 2, value has five dimensions, namely economic or financial value, ecological value, social value, physical or aesthetic value, and political value. RN001 defined value as the long-term sustainability of the business and described sustainability as being made up of the abovementioned five dimensions. Similarly, RN002 broke down 'value', in terms of WSUD:

> ***RN002:*** *"It's definitely a combination but you could break it up into like Rand value, there could be monetary value for different stakeholders… Um, then ah definitely from a social perspective, there could be, there's a lot of value in terms of social cohesion."*

In this statement, RN002 is referring to economic and social value, explaining that there is indeed social value in implementing WSUD features and initiatives. Furthermore, RN002 and RN006 defined value according to the environment and how healthy a given ecosystem is, which refers to the ecological aspects synonymous with implementation of WSUD features. Moreover, RN002 described an example of a water-sensitive space in Australia as a space that can creates and hold value:

> ***RN002:*** *"There is like a public space and there's a play area for kids and they've done the whole thing with different water elements and they can play around, like take a bucket of water and take it up and lift it and kids are actually learning. But it's actually a massive play area."*

The latter part of the statement refers to innovative design and aesthetic value. The space RN002 is describing holds not only aesthetically pleasing value but educational value, too. RN004 and RN005 agree with but take it further by describing how the community can benefit from sustainable features according to the functionality of what has actually been implemented.

As can be seen, the term value encompasses a wide-range of characteristics attributable to the five dimensions of sustainable urban development. The following sections break down each dimension in terms of WSUD and use case-specific examples of the existing relationship between value and WSUD.

4.7.1 Ecological value

The implementation of green roofs, a SuDS, at the V&A Waterfront is a prime example of protecting the environment but creating additional uses for water, stormwater run-off is reduced and buildings operate more efficiently. Century City uses treated effluent for irrigation, thereby reducing water usage and operating more efficiently (RN001; RN005)

4.7.2 Economic value

Seawater cooling at the V&A Waterfront improves energy efficiency, thereby creating increased financial viability (RN001). Century City's entire precinct is based on its water systems. RN004 described how water sells and that property values increase on that basis.

4.7.3 Social value

The amenity value of being located near or on water is unparalleled (RN005). It has been shown to increase social interaction, activity and cohesion as well as being a place for tranquillity and calm in everyday life.

4.7.4 Physical value

Designing systems according to WSUD allows other dimensions of sustainable urban development to be achieved (RN002). RN003 expands on this by describing how developers achieve better returns on properties that have been designed according to WSUD features, thereby highlighting the relationship between economic and physical sustainability.

4.7.5 Political value

Both the V&A Waterfront and Century city explained the political value in what they aim to achieve. RN001 described how, at the V&A Waterfront, they are acting in the best interest of the local municipality by implementing water-sensitive features and that it makes for healthier and easier governmental relationships. RN004 described how local municipalities recognise that the Century City canal system forms part of the local water system and that values its contribution.

However, despite both the V&A Waterfront and Century City displaying good relationships with local government, neither precinct makes use of value capture mechanisms.

4.8 Value capture

Neither the V&A Waterfront nor Century City make use of value capture mechanisms (RN007). RN007, however, argues that there is indeed scope for value capture mechanisms in a South African context. Value capture is therefore discussed in the ensuing section, following the pattern from Chapter 2.

4.8.1 Sources of municipal revenue

The rapidly urbanising nature of South Africa's cities has necessitated infrastructure growth, particularly in poverty-stricken cities. However, funding this infrastructure requires alternative financing solutions and value capture could be a viable option (RN007). Broadly speaking, RN007 described how municipalities are funded by their own revenue sources and national transfers, which include equitable shares and grants. Own revenue sources include service charges (water and electricity), property taxes, borrowing (municipal bonds), fuel levies and fines. Property rates are important

because not only are they the largest source of revenue but they can also be allocated according to municipal priorities, unlike revenues from service charges. National transfers are based on municipal responsibilities and take the form of equitable share transfer and conditional grants.

4.8.2 Municipal expenditure

Two items comprise municipal expenditure: operating expenditure and capital expenditure. Operating expenditure includes bulk purchases such as water and electricity, funded largely by property rates and service charges. Capital expenditure includes the provision of new infrastructure such as water, sewage and road infrastructure, funded from national and provincial transfers, internally generated revenue and municipal borrowing (RN007). However, various infrastructure challenges complicate how municipal revenue is spent.

4.8.3 Infrastructure challenges

The nature of the infrastructure RN007 refers to below requires substantial capital outlay; it includes long repayment periods and has to be delivered to scale:

> ***RN007:*** *"They (the private sector) are not that interested, because the infrastructure tends to have to be built at scale, often servicing a broad community and it's expensive – you want the economies at scale. So, it's often hugely capital intensive which requires very long repayment periods."*

There is a mismatch between this form of delivery and the nature of property development, which includes shorter repayment periods at a smaller scale. As such, the state has traditionally provided this infrastructure, recouping the capital and operational costs through property taxes, user tariffs and development contributions. The second infrastructure challenge is that municipalities are under pressure to relieve segregation, low densities and urban sprawl to bring about more equitable and integrated cities. As mentioned above, municipalities finance their operating and capital expenditure from internally generated revenues, including property taxes. This source of revenue is contingent on the performance of local property markets:

> ***RN007:*** *"Is it really the city's role to be playing the market and to be taking on the market risk with quite frankly tax payers money. It's not their game… The private*

investors should be much better placed to actually assess what's going to happen to the market."

These infrastructure challenges, among others, have stimulated interest around other public finance channels such as value capture mechanisms.

4.8.4 Value capture defined

RN007 describes value capture as the sharing of increased value that results from some form of public investment, but where public and private partners are involved:

> ***RN007:*** *"How is it that the public is able to extract some value that gets created through its own investment although that value may be partially created by the private player as well? So, generally speaking, you have to have a private and a public party involved."*

RN007 argues that value should be created in the first place and to do so, some form of partnership arrangement should be involved.

Public-private partnerships

RN007 asserts that value capture mechanisms cannot operate efficiently without public-private partnerships, because there is too much uncertainty and partnerships allow for improved negotiations, etc.

> ***RN007:*** *"You don't know what is going to happen in the future, neither party does. The markets turn and all kinds of things happen. In order to negotiate and navigate that uncertainty, you need to be in a partnership. Navigating that uncertainty is critical and I think partnerships really help."*

Factors for the successful implementation of value capture mechanisms

RN007 argued that supply and demand factors lead the successful implementation of value capture mechanisms. On the supply side, it is important that other development conditions, over and above the infrastructure, are in place, for example, the land availability and the development rights. On the demand side, there needs to be a demand for the space.

> ***RN007:*** *"If nobody is taking up that space, you are going to have high vacancies, you're going to have flat rentals and when you have flat rentals, you're have no value increase."*

Other factors include improvements to the existing funding instruments in place, as well as clear and unambiguous objectives from both public and private parties involved. Moreover, it is argued how, upon the use of income-generating mechanisms, it is important to distinguish between whether the income is collected as a tax or as a user charge.

4.8.5 Income-generating value capture mechanisms

In South Africa, development contributions – fees that developers pay to connect to bulk infrastructure – have been the main form of value capture mechanism but historically, they have been implemented haphazardly in South African cities. As such, National Treasury is trying to standardise a transparent and comprehensive set of guidelines. Another income-generating value capture mechanism that is gaining increasing interest in South Africa is tax increment financing (TIF).

RN007 kept referring to the value versus cost equation; in other words, there needs to be some form of value created off the back of the infrastructure put in place and that value should be greater than the cost. RN007 agreed that there is indeed scope for value capture mechanisms, particularly income-generating mechanisms, but that value creation is key.

4.9 Cross-case analysis

4.9.1 Urban water management

Both the V&A Waterfront and Century City acknowledged how South Africa is currently undergoing a drought and highlighted the importance of managing water-related infrastructure in the most efficient manner possible. Table 2.2 in Chapter 2 underlines the challenges facing South African water systems, and both case studies stressed the importance of dealing with these challenges from an urban precinct perspective. In doing so, the cases agreed with the literature, which calls for a more integrated response to managing water-related issues, and more efficient and sustainable use of water resources in urban areas (Armitage *et al.,* 2013a). As such, the challenges highlighted in

Table 2.2 can be considered and assessed according to the case studies. Each of the challenges is indicated below (DWA, 2013a), with corresponding responses from the V&A Waterfront and Century City.

- Surface water resources are almost fully accounted for, indicating that an increase in demand could result in a supply deficit.
- Increasing demand is creating a growing burden on wastewater.
- There is a lack of water treatment, which is resulting in increased pressure on surface and wastewater.

The V&A Waterfront expressed quite clearly how water supply is scarce, indicating that strategic thought is required when it comes to its management of water sources. For example, it assesses its buildings and tenants according to water-usage; it implements rain water harvesting and other SuDS technologies; it makes use of borehole water as well as seawater to minimise its impact on supply infrastructure. Moreover, it explicitly regards water as a key resource for its precinct operations – meaning it cannot trade without water.

Century City agreed that water sources are scarce in South Africa but the supply of treated effluent from the Potsdam Waste Water Treatment Works is available to the project and assists in reducing the consumption of potable water by the buildings' occupants. Through this, the precinct can use treated effluent for irrigation purposes, both replenishing the local high water table and increasing biodiversity with the inclusion of additional bio filters added to the canal to maintain water quality. However, it also indicated that although water is a major asset to the precinct and that all operations rely on the availability of water sources, it is a significant maintenance cost, which requires particular strategic thought.

South Africa has fragmented institutional structures

Both cases argued how institutional structures provide a significant barrier to the management of water in South Africa, largely due to their fragmented nature, thereby agreeing with the literature. However, the V&A Waterfront and Century City emphasised the importance of maintaining good relationships with the public sector, whether in

alleviating some of the infrastructure difficulties facing local municipalities or through its contributions to social issues such as employment.

The perceived value of water is disregarded, both socially and economically

The literature indicated a general disregard for the perceived value of water, both economically and socially. While the interviews indicated that some households lack the understanding and importance of potable water, both the case studies displayed the opposite view. Both the V&A Waterfront and Century City place high value on water, be it the economic or social value. In fact, they indicated water is a key resource for operations and they aim to implement numerous strategies, including SuDS technologies to make the most of their water resources. In other words, both cases placed high value on water.

4.9.2 WSCs and WSUD

Both the V&A Waterfront and Century City acknowledged their role in the City's efforts to become more water-sensitive, thereby agreeing with the literature. The literature argues that urban landscapes and the built environment need to identify not only the most viable option for managing water supply and water quality, but also the link between urban design, place making and liveability (Ashely *et al.,* 2013). In this regard, the V&A Waterfront and Century City place significant emphasis on sustainability, sustainable urban development and WSUD, particularly when it comes to their implementation of SuDS – the stormwater component of WSUD. Tables 2.3, 2.4 and 2.5 in Chapter 2 highlight and provide examples of the various SuDS options at different intervention points, namely source controls, local controls and regional controls (Armitage *et al.,* 2013a).

The V&A Waterfront and Century City make use of the following SuDS technology to manage their water supply and water quality, as well as improve their urban design, place-making and liveability.

Table 4.1: SuDs technology used by the V&A Waterfront and Century City

The V&A Waterfront	
Intervention Point	**SuDS option**
Source Control	Green roofs

	Rainwater harvesting
	Permeable paving
	The use of seawater for natural cooling
Local Control	N/A
Regional Control	N/A
Century City	
Intervention Point	**SuDS option**
Source Control	Rainwater harvesting
Local Control	N/A
Regional Control	Detention Ponds
	Constructed Wetland

Among other examples, the V&A Waterfront and Century City make use of the SuDS options highlighted in Table 4.1 to improve urban design, place-making and liveability. For example, both case studies highlighted the importance of activating spaces that incorporate water and discussed how they are able to minimise the impact of water-use on the city and alleviate some of the water-related infrastructure pressures.

4.9.3 WSUD and the built environment

Both cases attributed the role of water and WSUD to sustainable urban development and more specifically, its impact on the ecological, economic, social, physical and political dimensions, which were highlighted in the literature. WSUD is directly correlated to these dimensions, which therefore agrees with the literature in Chapter 2.

Ecologically, the V&A Waterfront described how it wants to increase water savings by 30%. It implements numerous green building features, including SuDS technologies, as well as making use of seawater for natural cooling. In doing so, it highlighted water as a key resource in its sustainability strategy. Century City highlighted its access to water as natural capital and indicated the importance of using water in an ecologically sustainable manner. For example, its entire canal system is an example of SuDS technology that demonstrates benefits from an ecological perspective.

From an economic or financial perspective, the V&A Waterfront indicated how something like permeable paving should only be implemented if it shows benefit from a financial perspective. In other words, although it is important to protect the

environment, it needs to make business sense. Similarly, Century City expressed that water is a major asset that needs to managed to the most efficient cost as it can be an expensive asset and so implementation of certain features must be cost-effective.

The social dimension related to water was equally important to both case studies'. The V&A Waterfront highlighted the significance of increasing social interaction through maximising the use of water and activating the space it occupies. Century City showed similar sentiments and referred to the tranquillity and calm that water brings to its customers, employees and residents.

From a physical design perspective, water plays a crucial role within both case studies. Being located in and around water means that water should be incorporated wherever possible. The V&A Waterfront implements, for example, a macro-strategy when it comes to its landscaping and use of water to maintain it. Century City's entire operations rely on water infrastructure and it is designed accordingly.

Both cases described how their relationships with public authorities are critical to their operations. In other words, the political component is vital in achieving sustainable urban development, particularly when it comes to WSUD. For example, it was argued that as the V&A Waterfront implements water-saving strategies and creates an environment which is water-sensitive, its relationships with public officials become easier and more conducive. Century City also has good relationships with the public sector through for example the Potsdam Wastewater Treatment Works facility. Century City benefits the city through its canal system and use of treated effluent.

4.9.4 Value capture

A key finding of this research was that neither the V&A Waterfront nor Century City make use of value capture mechanisms, despite there being scope to implement income-generating mechanisms such as a TIF. Moreover, the interviews indicated that public/private partnerships are a key factor in the implementation of successful value capture mechanisms, which is interesting because both cases displayed positive relations with the public sector. It therefore begs the question as to whether future development could make use of such mechanisms – particularly development that requires economies of scale.

4.9.5 The value of water in a sustainable real estate context

As explained in section 4.7, both cases attributed value to the five dimensions of sustainable urban development. The literature argued how the definition of value reaches into many areas of human life (Hartman, 1932), so value was defined in terms of these dimensions and it was highlighted that water indeed creates value when assessed accordingly. The case studies reflected the same argument as the pattern highlighted in section 2.8 in the literature review.

4.9.6 Facilities management

Boyle (2016) argues how sustainable urban development should draw on FM management principles, more specifically urban FM principles, to assess and develop the sustainability of specifically located communities and cities. In both case studies, strategic decisions and strategic focus on water emerged as key areas of emphasis, as did water being a key resource for the management and operations of the precincts. Moreover, space, place and people, and macro-level thought materialised as critical to FM within the cases. The literature described fourth generation FM as strategic and offering a value-adding discipline. It arose in response to increased business competition and urban FM is argued to have emerged in a similar fashion, as the future to FM for urban areas and its associated infrastructure. However, Michell (2013) argues how a shift in thought from a micro-level, building perspective to a macro-level, precinct perspective is required.

4.10 Conclusion

This chapter presented the information collected as part of the V&A Waterfront and Century City case studies. Documentation, photographic evidence and interviews assisted the investigation into WSUD, value and urban FM. The chapter matched the theoretical patterns identified in Chapter 2 and highlighted the need for an urban FM-aligned managerial framework that reveals the relationship between WSUD, sustainable urban development and value. It also showed there is scope for value capture mechanisms in other cases but that none are used in the case studies in this research.

CHAPTER 5 TOWARDS AN URBAN FM-ALIGNED FRAMEWORK SHOWING HOW VALUE IS CREATED THROUGH WSUD

5.1 Introduction

The preceding chapters investigated the existing literature within the field of UWM, WSUD, sustainable urban development, value, urban FM and value capture, and laid the foundation upon which the problem area and research question could be based. The research methodology and justification for using multiple case studies were then discussed. Chapter 4 outlined the patterns identified in Chapter 2, which were applied throughout the data collection process.

This chapter provides conclusions drawn from the existing literature in Chapter 2, together with the patterns identified and reviewed in Chapter 4. It is argued that an urban FM-aligned managerial framework can depict the relationship between WSUD, sustainable urban development and value, after which the research objectives are revisited and corroborated, in addition to presenting how the research question was answered. Lastly, this chapter outlines the implications of the research for the built environment.

5.2 Critical discussion of the patterns drawn from the theoretical framework

This section explains the patterns identified in Chapter 2 and how they arose through the respective case studies. The patterns are listed as follows: UWM; the relationship between sustainable urban development, WSUD and value at the V&A Waterfront and Century City; value capture and FM.

5.2.1 Urban water management

A number of patterns exist when considering UWM in the context of the case studies namely: conventional UWM challenges, infrastructure challenges and supply challenges. Each of these concepts is discussed below.

Conventional UWM challenges

The literature highlights how the planet is facing a '*global water crisis*', caused not only by water shortages but also by a lack of understanding of water management systems

(WaterAid, 2015: 1). Moreover, it has previously been put forward by Mays (2009), and Tejada-Guibert and Zandaryaa (2010) that these problems are especially prevalent in developing countries such as South Africa. Both the V&A Waterfront and Century City recognise how institutional structures present a barrier to the South African water sector, particularly considering its inherent drought conditions. Both case studies, however, display advanced levels of expertise when it comes to water management, having received numerous accolades through the GBCSA. It could however be argued that the V&A Waterfront and Century City are required to address water challenges facing South Africa, given the fact that they are both large consumers of the precious resource. In other words, it makes business sense for both the case studies to implement water-savings initiatives so as to limit the impact water has on their triple bottom line.

A further challenge, highlighted particularly by the Department of Water Affairs (DWA) (2013a), is the general disregard, both socially and economically, when it comes to the perceived value of water in South Africa. The V&A Waterfront agreed, arguing how socially, it has to be a leader and try to sway consumer mindsets when it comes to the way water is treated.

Infrastructure challenges

The literature highlighted how South Africa has low levels of infrastructure to deal with existing UWM challenges, particularly in the face of rapidly urbanising economies (DWA, 2013a; Armitage *et al.*, 2014). The V&A Waterfront described how it is part of its role, as a precinct in an urban area, to release some of the pressures currently facing South Africa's infrastructure pressures relating to water, electricity, sewage and waste. Century City described the value its canal system provides as part of the local municipal water system. Moreover, both the V&A Waterfront and Century City described their important role of ensuring as many people as possible use public transport, thereby alleviating some infrastructure pressure.

Supply challenges

The literature described how surface water resources are almost fully accounted for, meaning that increases in demand could lead to a supply deficit (DWA, 2013a). The V&A Waterfront highlighted that this is at the top of its agenda and that it has put measures in place to ensure it has supply when, for example, there is insufficient rain in a given

year. Century City is fortunate to be located on a high water table, so its primary concern is the maintenance of its canal system. For example, it uses treated effluent for irrigation, thereby helping the city. Cape Town in particular is facing extreme challenges with dam levels at an all-time low. It should therefore be argued that both precincts should be looking toward even more innovative ideas that can limit their use of water and ultimately work with the public sector to ease future challenges.

5.2.2 The relationship between sustainable urban development, WSUD and value at the V&A Waterfront and Century City

A relationship exists between sustainable urban development, WSUD and value – identifiable through five key patterns in the literature. In other words, the five dimensions of sustainable urban development are relatable to WSUD, which holds value through the same dimensions, namely: ecological, economic, social, physical and political. Keeping this in mind, the literature highlights the importance of 'water sensitivity' in terms of WSUD. Armitage *et al.* (2014) therefore define water sensitivity and hence WSUD based on five principles, each relating to one of the aforementioned dimensions, each of which is discussed below.

Ecological

The literature describes ecological sustainability as including those natural resources, such as water, that endure pressure from local societies. This makes the management of these resources critical to the achievement of this dimension (Pieterse, 2010). The literature highlighting the relationship between this definition and WSUD describes South Africa as water-scarce (Ranchod *et al.*, 2015).

The V&A Waterfront constantly strives to reduce its impact on the environment and remains particularly cognisant of its use of resources such as water and electricity. For example, it uses seawater, as opposed to freshwater for its cooling systems and it has implemented numerous energy efficient strategies. Century City's entire precinct operates around the notion of SuDS and it too aims to reduce its impact on the environment. These strategies follow the description by Coutts *et al.* (2012) of the ecological value of water within the construct of WSUD. In this regard, the V&A Waterfront make use of green roofs thereby reducing stormwater runoff and increasing

water reuse, while Century City sees value from operating more efficiently due to its use of treated effluent for irrigation.

Economic

The literature describes economic sustainability as the maintenance of capital (Goodland & Daly, 1996). Allen (2001) describes it as the local economy's ability to sustain itself, without damaging the resource base upon which it depends. The literature highlighting the relationship between the definition and WSUD describes water as having economic value, which can be recognised either as natural capital or as an economic good, as well as natural ecosystems providing valuable goods and services (Cullet, 2014).

The V&A Waterfront and Century City strive to achieve financial viability and therefore economic sustainability in the long term. Taking Allen's (2001) definition further, the author is describing the importance of being able to sustain a precinct, for example, economically, whilst remaining within budgetary constraints. The V&A Waterfront referred to the timing of implementing green features according to their life cycle costing, while Century City described the equal importance of water as an asset versus the cost implications of sustaining it. In addition, the introduction of green infrastructure within the precincts saw financial benefits through, for example, reduced energy costs at the V&A Waterfront or increased property values at Century City. There is a clear indication of operating sustainably and profitably but within certain budgetary constraints, in line with Tagtow (1990), Luttik (2000) and Chiesura (2004) describing the economic value of water within the construct of WSUD.

Social

The literature describes social sustainability as encompassing social equity and sustainability of a community (Dempsey *et al.*, 2012). The literature highlighting the relationship between this definition and WSUD refers to access to basic potable water as a basic human right (Mokonyane, 2015).

Both the V&A Waterfront and Century City aim to increase the sense of community that exists within the precincts. The V&A Waterfront refers to itself as the neighbourhood of the city while Century City strives for community development and uplift, including the

surrounding areas. Moreover, both precincts have implemented ways of increasing social inclusion. For example, the V&A Waterfront aims to implement place-making strategies, trying to increase the possibility of touching water, while Century City develops its community by introducing sports clubs such as the canoe club. These features follow Kuo *et al.* (1998) who describe the social value of water within the construct of WSUD whereby the value of being located near water is said to be unparalleled.

Physical

The literature describes physical sustainability as the structure and layout of the built environment and how the design of urban space can influence the preceding dimensions of sustainable urban development. The literature highlighting the relationship between this definition and WSUD describes water as responsible for sustaining all life, development and the broader environment (Pieterse, 2010).

Designing precincts sustainably and with water sensitive design elements in mind adds to the aesthetic value of the precinct. The V&A Waterfront has incorporated numerous green building features that are not only water-sensitive but 'green' in general, thereby improving the preceding dimensions' impact on the precinct, Similarly, Century City designs parts of its infrastructure around the natural water body, creating a waterfront effect. This is in line with Armitage *et al.* (2014) who argue that property values can increase off the back of aesthetically pleasing or well-designed infrastructure.

Political

The literature describes this dimension as the governing framework covering the other four dimensions (Allen, 2001). In other words, how the other dimensions interact with one another, including all stakeholders involved in the process. The literature highlighting the relationship between this definition and WSUD describes all stakeholders at various levels as being involved in the management of water, in a participatory manner (Brown, 2011; Simelane, 2015).

The V&A Waterfront's primary aim is to achieve targets for its stakeholders. Moreover, it was argued how relationships with local government are particularly important when it comes to the achievement of the other dimensions. For example, if there is the potential

for further development, the V&A Waterfront prides itself on the fact that it will be implementing features within that development that are right for the city – thereby allowing for easier conversations with governing bodies. Century City enjoys the benefit of increased property values as a result of being located near water features. This increases tax revenues, which benefits the state (Chiesura, 2004). Green spaces such as those identified at the V&A Waterfront and Century City add value in terms of the previously mentioned dimensions, yet neither the V&A Waterfront nor Century City make use of value capture mechanisms, which could introduce an entirely new element of value to these value-adding attributes.

5.2.3 Value capture

Value capture refers to the process of extracting the incremental value that accumulates to a property following some form of public investment (McGaffin *et al.*, 2014). Interestingly, neither the V&A Waterfront nor Century City makes use of value capture as a means of creating value. However, scope was found for such mechanisms for other developments in South Africa, particularly income-generating value capture mechanisms. It should also be highlighted that the nature of value capture mechanism require economies of scale and, if the private sector entered into such mechanisms without the support of the public sector, it would detract from the feasibility of a given project. In other words, private sector organisations require a specific return on their investment in order to take on a project and make it viable. This section is revisited in section 5.7 which presents recommendations for further research.

5.2.4 Facilities management

The literature describes how the fourth generation of FM, strategic FM, represents improvements to an organisation through value-adding tools (Grimshaw, 2003). Organisations can increase their performance and therefore remain adaptable in the increasingly competitive environment (Alexander, 1996; Amaratunga & Baldry, 2004; Tolman & Parkkila, 2009). Two primary examples that were not only highlighted in the literature but also in the case studies were innovation (Cardellino & Finch, 2006) and improvements in IT (Barrett, 2000). The V&A Waterfront implements innovative greening strategies that add value to the precinct operations. For example, the combination of solar panels and green roofs allow for a balance between the

improvement of energy efficiency and water-use. Century City replaced its lighting systems with LED lighting, as well as upgrading its IT infrastructure, which is said to add significant value (RN004) to its operations and functionality.

The degree to which these initiatives add value represent what was argued in the literature in Jensen's (2009) Value Map. It highlights how businesses or in this case, precincts have moved away from cost-cutting initiatives to value-adding prospects, according to their available resources. Furthermore, the literature describes how businesses are required to remain adaptable in the long-term, thereby highlighting the importance of pre-empting future events (Langston & Lauge-Kristensen, 2002). The V&A Waterfront and Century City base themselves on an overarching masterplan or 'big picture' – ensuring that sustainability and sustainable operations remain at the helm, both plan for imminent change and thus remain adaptable to their immediate surroundings and competitive environment.

Similarly, the literature describes that just as there has been increasing pressure in business competition, there has also been increased pressure on the management of public infrastructure and associated services (Tobi *et al.*, 2013). The case studies incorporate the notion of mixed-use environments forming a distinct part of the city (Yigitcanlar *et al.*, 2008) and that management of resources is imperative to the functioning and sustainability of the city in which they are located (Michell, 2013). Moreover, Boyle (2016) argues that sustainable urban development should draw on the management principles of FM and more specifically urban FM to assess and develop the sustainability of these specifically located areas.

Urban FM

The literature describes urban FM as a flexible platform through which the public and private sector can work together to benefit the community at an urban precinct scale (Michell, 2013). In doing so, the underlying principles of FM, space, place and people should be utilised by the private sector at the precinct level. The V&A Waterfront implements strategies such as place-making, which aim to make the precinct more 'liveable' by activating the space between the buildings and making it a place where people can live, work and play. In a similar fashion, Century City subscribes to the mantra of 'work, play, shop and stay' and implements a variety of community

development initiatives from sports clubs to the greening of urban spaces. Both precincts therefore put into practice the underlying principles of FM, but on an urban scale, thereby making them more sustainable.

5.3 The creation of an urban FM-aligned framework showing the relationship between WSUD, sustainable urban development and value

Referring to the research overview in Chapter 1, there is a relationship between WSUD, sustainable urban development and value (see Figure 1.4). The research has uncovered that value is created through WSUD when considered through five dimensions of sustainable urban development; and further, there is scope to capture that value through various value capture mechanisms. It was established that what is missing in the literature is a managerial framework that shows this relationship and it is argued that an adaption of Jensen's value map, on an urban scale, could provide this managerial framework, showing how value can be achieved for urban precincts. Each section of Jensen's value map is broken down, including the key components that arose from the interviews.

Jensen (2009) broke down the FM value map into five key sections, namely resources, processes, provisions, impact and stakeholders. FM is said to play a role within the resources, processes and provisions levels. The following argues how urban FM utilises certain resources as inputs to a process, building up to numerous provisions as outputs, which ultimately leads to WSUD, sustainable urban development and value, which therefore benefits various stakeholders.

5.3.1 Resources

The case studies indicated how infrastructure should be viewed as a key resource, particularly water-related infrastructure; in other words, blue and green infrastructure, which straddles water and energy as key components. Moreover, both case studies highlighted SuDS and ICT as critical components within the technology section of Jensen's vale map. When it comes to manpower and know-how, the case studies revealed how education is a key element and that a balance between technology and manpower is critical. In other words, the introduction of innovative technological measures is important but one cannot overlook the role of humans. Physically having

feet on the ground to monitor and inspect various aspects relating to the infrastructure within the precincts is of equal importance.

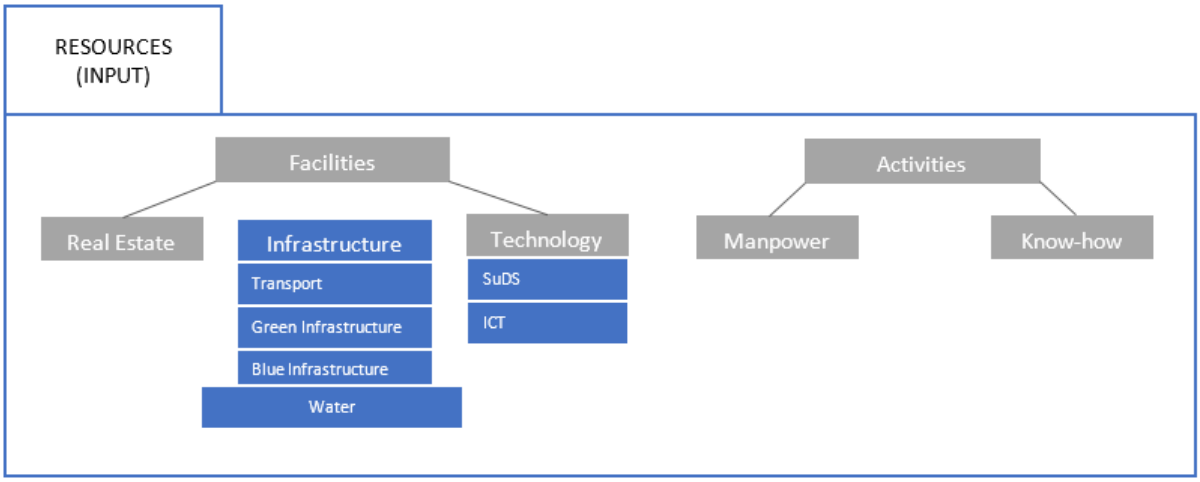


Figure 5.1: Resources input

5.3.2 Processes

Two key features emerged from the case studies making up the processes component of Jensen's value map: adaptability and macro-level thinking. It was indicated how long-term goals, under a general masterplan need to be adaptable according to short-term objectives. In doing so, the other factors making up the processes component can be achieved. Adaptability is critical to the sustainability of precincts and falls within the construct of sustainable urban development. Similarly, urban FM describes how macro-level thought is required at a precinct level, if sustainability is to be achieved. The researcher therefore proposes that the processes that take place within the respective precincts need to remain adaptable in order to, for example, improve or plan efficiently and in accordance with an overall masterplan.

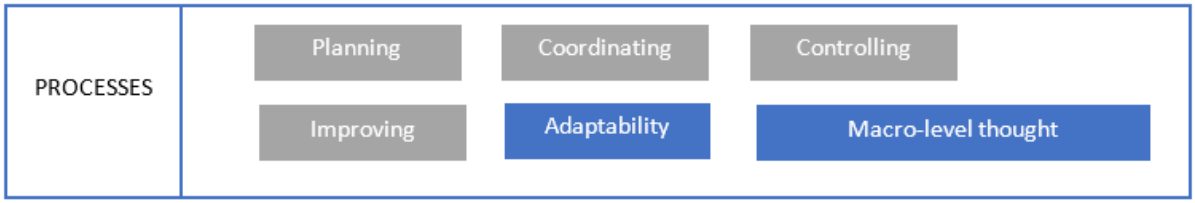


Figure 5.2: Processes

5.3.3 Provisions (output)

The key elements under this section relate to the space in which the precinct is operating. It was indicated how a mixed-use environment needs to be created with space, place and people at the helm. In doing so, the green and blue infrastructure can be maximised, as well as the services provided. Both cases offer a mixed-use environment and strive to activate spaces within the precinct to make it operate more sustainably. The notion of a mixed-use environment is critical in terms of what the precincts are providing. Space, place and people make up the fundamentals of urban FM and are aligned with the creation of mixed use space. Hence, both case studies aim to create such an environment, thereby providing more sustainable end products.

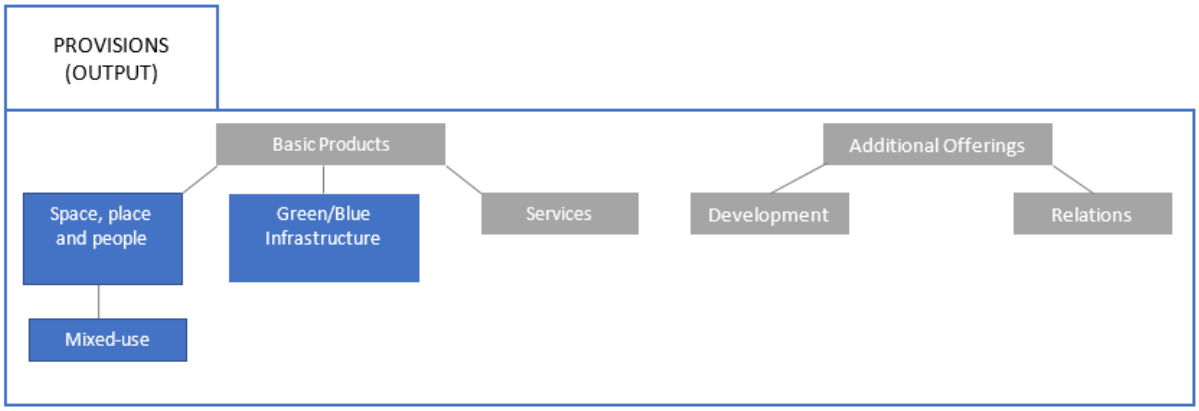


Figure 5.3: Provisions (outcome)

5.3.4 Impacts (outcome)

The outcome of the previous elements can create an environment that is sustainable in an urban context. The relationship between sustainable urban development and WSUD has already been established and Figure 5.4 highlights this relationship in creating value for the precinct and its surroundings. As such, Figure 5.4 agrees with the literature highlighting the relationship between sustainable urban development and WSUD (Chiesura, 2004). The researcher is proposing that the resources, processes and provisions ultimately impact the core business or precinct through five dimensions, which impact on the overall satisfaction, productivity, adaption, cost, reliability and culture of the precinct.

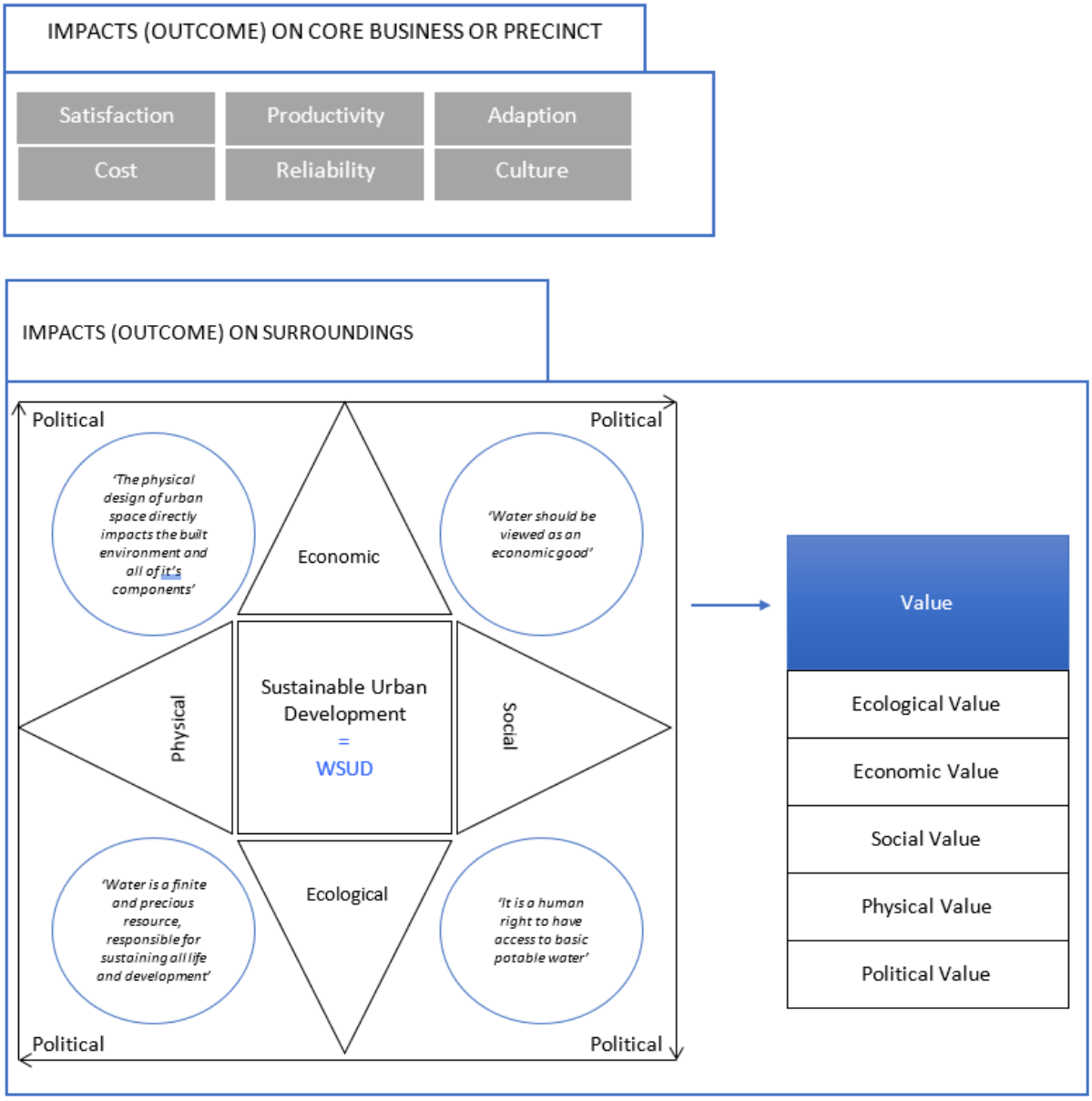


Figure 5.4: Impacts (outcome)

5.3.5 Stakeholders

Both the cases indicated the importance of having good and healthy relationships with the public sector and the interviews established how public/private partnerships are critical to the successful implementation of value capture mechanisms. Moreover, it was argued in both cases that good relationships with the public sector allow for easier development and operations. This agrees with the literature, which argues how urban FM is a flexible platform through which the public and private sector can work together to benefit the community at an urban precinct scale (Michell, 2013). This is a key consideration for value capture as it has previously been explained how significant

economies of scale are required for value capture to be successful. Private and public sectors should cooperate in a way that the value created through the previously identified dimensions can be captured in the long term.

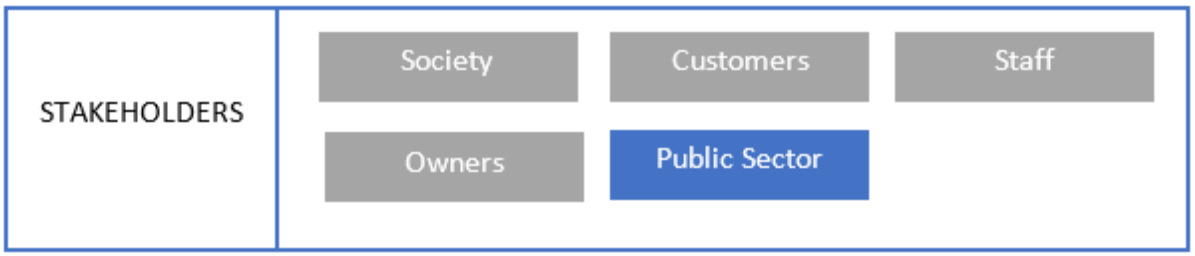


Figure 5.5: Stakeholders

5.4 Revisiting the research objectives

The objectives defined in Chapter 1 have been achieved through the case studies. This section outlines how each objective has been achieved.

5.4.1 Identify the principles of WSUD, sustainable urban development, value, value capture and urban FM

An in-depth review of the literature was conducted to gain a significant and comprehensive understanding of WSUD. This meant delving into the characteristics that are fundamental precursors to WSUD, which therefore shed light on sustainable urban development and value. Despite not being utilised in the case studies, value capture has proved its worth and is discussed in section 5.7 under recommendations for future research. Hence, the objective has been achieved.

5.4.2 Establish the relationship between WSUD, sustainable urban development and value

The research highlighted the relationship that exists between WSUD, sustainable urban development and value. It was established that the key principles of FM can be translated to a macro scale and utilised at urban precinct level. The cases supported this assertion and an urban FM-aligned managerial framework showing the relationship between WSUD, sustainable urban development and value was proposed. Hence, the objective has been achieved.

5.4.3 Determine whether the principles identified above form part of an urban FM-aligned managerial framework for WSUD, sustainable urban development and value

Previous research highlights five dimensions of sustainable urban development. The research outlined the relationship between these dimensions, WSUD and value. This relationship can act as a proxy for urban precincts in South Africa and despite slight nuances that will exist in other developments, the cases supported the model and hence the objective has been achieved. However, the use of value capture is said to be applicable for future cases and provides the grounds for future recommended research.

5.4.4 Identify the value created through WSUD

Through an exhaustive review of the literature, it has been established that value is created through five dimensions in terms of WSUD. Each value-adding attribute is relatable to the sustainability dimension and the case studies supported this notion using urban FM principles. As such, the objective has been met.

5.5 Restating the research question

The research question posed by the researcher at the outset was:

> *Can urban FM provide a managerial framework that reflects the relationship between WSUD, sustainable urban development and value for urban precincts?*

The literature suggested both the global and the South African significance of WSUD. However, despite recognising the relationship between WSUD, sustainable urban development and value, it was established that there is no managerial framework that connects these concepts together for South African precincts. The extensive research uncovered an urban FM-aligned managerial framework that can show this relationship for urban precincts and hence, the research question has been answered.

The research proposition stated at the outset of this study was:

> *The relationship between WSUD and sustainable urban development creates value and urban FM can provide a managerial framework which ties these concepts together for the sustainability of urban precincts.*

To show the relationship that exists between WSUD, sustainable urban development and value for urban precincts in South Africa, it was identified that the underlying principles of FM, and urban FM in particular, hold significant importance for the establishment thereof. The principles of space, place and people are critical to this relationship in showing how value is created through WSUD. As such, the research proposition has been supported by the case studies.

5.6 Reflection on the reliability and validity of the data

Qualitative research is influenced by social participation and the results of the varying studies are said to be a reflective of differing and objective opinions and thoughts (Miles & Huberman, 1994). To this end, it is not possible to include every detail and all the nuances of all the information collected but Wolcott (1990) argues that the data presented cannot be misleading in any way. Miles and Huberman (1994: 227) proceed to argue that to assess the legitimacy and reliability of the research, 'confirmability, reliability and credibility' should be considered.

According to Miles and Huberman (1994), confirmability ensures the researcher has separated pre-determined and biased assumptions from the interpretation of the actual data that has been gathered. In this regard, the researcher should, to the best of his or her ability present the data in the most efficient manner for it to be scrutinised according to the topics covered and the conditions of the investigation (Schwandt & Halpern, 1998). To this end, it is noted that all research procedures and protocols have been undertaken throughout the investigatory process.

Reliability is synonymous with consistency whereby all information collected should be identical in nature (Goetz & LeCompte, 1984; Smith & Robbins, 1984). To this end, Goetz and LeCompte (1984) argue how particular procedures should be put in place to ensure the accuracy and uniformity of the data. In this regard, the researcher has warranted the accuracy of the data through ethical clearance, reputable interviewees and consistent data analysis. Credibility is described by Miles and Huberman (1994) as allowing for the findings within the research to be easily understood by the researcher and the reader. To this end, the conclusions drawn from the research are backed by the data sources utilised.

Another key concept relates to external validity and this refers to whether or not the study can be generalised (Lincoln & Guba, 1985). Importantly, two case studies exclude generalisations in terms of the findings from the V&A Waterfront and Century City respectively but generalisations can indeed be drawn from the existing theoretical knowledge base presented on WSUD, sustainable urban development and urban FM.

5.7 Recommendations for further research

As previously discovered from the respective case studies, neither the V&A Waterfront or Century City make use of value capture mechanisms for the creation of value. However, it was found in the data collection process that value capture mechanisms could play an integral role in the said value creation and therefore capturing of value for urban precincts in South Africa.

Theoretically, the infrastructure (or more specifically, green infrastructure) required to assist in the achievement of WSUD or a WSC can be provided by local government and it is this state investment that creates the additional value (Luttik, 2000; McGaffin *et al.*, 2014). However, as found in Chapter 4, successful implementation of value capture mechanisms relies on certain prerequisites; firstly, the establishment of a healthy partnership between the public and private sectors should exist, in other words, both parties need to work towards a common goal to maximise the value potential of a given development/precinct. The V&A Waterfront is a privately-owned Pty Limited company with two key shareholders: Growthpoint Properties and the PIC. The CCPOA, on the other hand, is responsible for the management of the entire Century City precinct and all property owners within the precinct automatically become members of this non-profit company (Century City, 2013b). No investment in infrastructure has been carried out by local government that created additional value to the case studies whereby that additional value was captured by the state in partnership with the owners.

Another key characteristic for the successful implementation of value capture mechanisms is favourable development conditions (McGaffin *et al.*, 2014). For example, RN007 (2016) explained how, theoretically, the provision of infrastructure should elicit increased spending in a given location, which in turn leads to greater demand, thereby yielding higher rentals and increased prices being paid – that is higher residual land values and the creation of additional value off the back of that infrastructure. However, a

poorly designed and managed retail centre in that location will not generate the equivalent increase in value (if anything) compared to a well-run and efficiently operated centre, which demonstrates that it requires good management and understanding of market conditions.

Another key characteristic of value capture relates to the type of 'good' or infrastructure being provided. In other words, public goods, as referred to in Chapter 2, are those that can be consumed by one individual without reducing availability to another and from which no one is excludable. In other words, pure public goods are indivisible, non-rivalry and non-excludable (Kaul *et al.*, 1999; Myles, 2002). RN007 (2016) explained that a lot of the infrastructure that value capture is associated with is built to scale. For example, the provision of an entire transport interchange requires economies of scale and often services the broad community. It is difficult to exclude anyone from making use of that infrastructure. Furthermore, the capital outlay required is too large for private investors and the payback period tends to be too long for them to see sufficient returns. Development contributions therefore arise as a value capture technique. Development contributions in this case refer to the fees charged by the local municipality for the extra infrastructure needed because of a given development.

Another form of income-generating value capture mechanisms particularly relevant in South Africa is TIFs. RN007 (2016) placed specific emphasis on the use of such mechanisms in areas like eThekwini in Durban. The respondent explained how there is scope to redevelop some of the sugar cane fields north of Durban but to do so, enormous infrastructure is required. TIFs are explained in detail in Chapter 2 but the recommendation for further research relates to this notion, specifically whether the state can finance infrastructure for large-scale developments using TIFs. A particularly relevant case study, directly related to water infrastructure, is the Two Rivers Urban Park Project (TRUP) in Cape Town (Western Cape Government, 2016).

The TRUP is at vision stage with all stakeholders in agreement and a high level of public participation and engagement. It aims to fit a similar mould to the V&A Waterfront and Century City in terms of its live-work-play model, encompassing a mixed-use environment of recreational, residential and commercial opportunities. It is located at the confluence of the Black and Liesbeek Rivers, roughly five kilometres from the city centre (Western Cape Government, 2016).

The researcher proposes that an urban FM-aligned framework could guide the development process of the TRUP Project whereby the relationship between WSUD, sustainable urban development and value can be maximised. In doing so, the use of value capture mechanisms should be utilised to maximise the value created from the site.

5.8 Concluding remarks

In conclusion, the intention of this study is to show how value is created through WSUD, using the V&A Waterfront and Century City as case studies. Through an extensive review of the literature, together with the data collected from the case studies, it has been shown how the relationship exists between WSUD, sustainable urban development and value. Moreover, it has been shown how urban FM provides the managerial framework that ties these concepts together. The implementation of value capture mechanisms for future projects should be tested and further research is therefore required to assess its applicability in a South African context. However, it has been established firstly that there is an opportunity for value capture mechanisms in South Africa, and secondly that the case studies utilised in the study highlight how WSUD creates value for the sustainability of urban precincts in achieving more sustainable cities.

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APPENDIX A: INTERVIEW OUTLINE

General

1 What is your role/involvement/ affiliation to the V&A Waterfront?

2 What is the driving force behind changes, upgrades or the provision of new services?

(a) Who is responsible for maintenance, improvement and upgrading of services?

(b) Where does the funding come from for services such as security, marketing/ HR, landscaping, maintenance upgrading and cleanliness?

3 How do buildings interact with users and with the services and amenities provided within the Waterfront?

4 Is there a strategic vision for the precinct and its management and has it changed over time? If so, explain.

5 To what extent is sustainable development on the agenda?

   (a) Ecological

   (b) Social

   (c) Economic

   (d) Physical

   (e) Political

(each of the five dimensions will be defined according to Pieterse, 2010)

ACCORDING TO MY TENTATIVE MODEL

Resources

1 What do you consider to be your fundamental resources when it comes to sustainability of the V&A Waterfront and the core business? For example, what facilities and activities are most essential in their management?

2 What emphasis does the V&A Waterfront place on green infrastructure?

   (a) Where does transport come in, in this regard?

3 How important is technology in terms of the operations of the V&A Waterfront?

   (a) For example, ICT and SuDS?

(SuDS will be explained if interviewee is unaware of the term)

4 How important is manpower and know-how when it comes to the daily activities and running of the V&A Waterfront?

   (a) For example, the use of green building initiatives or SuDS?

   (b) Or the further example of the use of seawater?

5 What outside relationships does the V&A Waterfront hold? For example, the GBCSA or the Water Research Commission? In other words, what outside pressures are placed on service providers?

Processes

1 Has there been a strategic development plan in the V&A Waterfront?

   (a) How was it created?

   (b) How was it coordinated or who is responsible for this vision?

   (c) How was/ is adaptability or sustainability incorporated in this vision. For example, pre-empting certain setbacks such as electricity and water restrictions?

Provisions

1 How has the design/ layout of the V&A waterfront been adapted to enable a sustainable precinct?

2 How does the V&A Waterfront address a mixed-use environment, which focusses on space, place and people aspects such as:

   - access to amenities
   - community development
   - safe places
   - culture and heritage
   - indoor environmental quality (ventilation, lighting, noise levels, sound absorption, zoned control areas)

3 How has green infrastructure assisted in achieving the aforementioned qualities?

   (a) For example, what ecosystem services have stemmed from the implementation of such infrastructure?

4 What additional offerings does the V&A waterfront provide, in terms of:

(a) Economic Prosperity:

(i) To what degree does the V&A Waterfront contribute to employment opportunities with respect to construction?

(ii) Does the V&A Waterfront implement sustainable practices and if so, what impact has this had on your return?

(b) In your opinion, how does the V&A Waterfront benefit the surrounding community?

(c) Are there incentive programs within the V&A Waterfront to encourage sustainable practices? For example, are Growthpoint and the PIC placing pressure on this?

Water

1 What is your strategy when it comes to water use/ implementation?

2 Are you aware of the terms WSUD?

(a) If so, to what degree has the implementation of WSD features influenced the operations of the V&A precinct?

(i) Financially (economically)

(ii) Aesthetically (physically) and or socially?

3 Has there been any local governmental pressure placed on the functioning of this urban precinct to operate more efficiently when it comes to water use/ consumption- given the state of South Africa's water shortages?

(a) For example, from the GBCSA or the National Water Resources Strategy?

Value creation/addition

1 How would you define value?

2 How do you think water/ WSUD/ SuDS add value towards the V&A precinct in terms of sustainability, efficiency, stakeholder satisfaction?

APPENDIX B: RANDOMLY SELECTED TRANSCRIPT

INTERVIEWER: Okay so basically, I am looking at water sensitive and design and how value is created through water sensitive and design and I am using the Waterfront and Century City as my cases and basically, so far, I have been able to highlight the relationship between water sensitive and design and sustainable urban development and there's a relationship between sustainable urban development and value. So, I have basically created like a relationship between value and water sensitive and design.

RN007: Water sensitive and design leads to urban sustainability…

INTERVIEWER: Yes, well, there's a relationship between the two.

RN007: Then there's a relationship between that and the value.

INTERVIEWER: Exactly and then what I have done is I have attributed water sensitive urban design through five dimensions of sustainable urban development. So, the five dimensions are the classic Pieterse ones like ecological, economic, social, political and physical. So through my interviews, I have been able to and one of the key things that came out of my first proposal is how are you going to define value in terms of my research. That it was one of the key things and I remember everyone was saying, how are you going to define it and then it tied into the whole urban FM argument as well with Kathy Michelle and how she said how Urban FM can enhance what leverage value. So I have created that link between water sensitive and design and sustainable urban development and then what is lacking is a managerial framework which is able to connect these concepts together and Urban FM is the basis for the creation of this like connection, if you can see what I am trying to…

RN007: So are you saying that the Urban FM kind of joins those two and that is the link through?

INTERVIEWER: Yes, exactly. So that is what my research is about.

RN007: Okay so that is your conceptual framework?

INTERVIEWER: Yes but now with value capture, there are a few questions I need to ask you obviously because we had that email conversation and that's why I have written a case study conversation because I am not necessarily sure that value capture fits into my

cases as a concept. But what I am looking to do and this was one of Francois' recommendations, at the end of my research was to perhaps advise future projects whether it's local municipality projects or others on how they should go about those developments. So, for example, like the urban park project maybe giving some advice, like if the government was to invest in water infrastructure, what value capture mechanisms could they use and would they be appropriate and then tie that whole concept in with what I find here from Urban FM. Does that make sense?

RN007: It does. You put the concepts together which is cool but you've got to have a very clear diagram that clearly illustrates that because these are big concepts that contain a lot of things and even Urban FM has got a whole massive animal value capture, big animal. So this thing is obviously a big animal.

INTERVIEWER: So the majority of what I've spent time on has been value and this relationship here is what I have spent most of my time on but in terms of the actual concept of value capture, I haven't interviewed anyone who is… I've only had one person who has vaguely heard and understood the concept because all the people who I have interviewed has been like facility managers at the waterfront and I have interviewed Chris Blackshaw from CCPOA and Manfred Braun from the Green Building counsel, who is the only one who has sort of had an idea about value capture but he was seeing it more from an investment perspective. He didn't really understand it from a local government, capturing the actual value for a purpose, if you know what I mean. So that is why I wanted to speak to you. I've got a few questions, obviously, some for research purposes and then some for just my own understanding.

RN007: Okay well maybe let's go through your questions. I mean I've got some ideas and if we don't cover them in the questions, then we can illustrate them afterwards.

INTERVIEWER: Cool okay well my first questions is can you describe or define value capture?

RN007: Value capture is, and there are different definitions, my definition of value capture is the sharing of value or sharing of increase value that results from some form of public investment. So general speaking and that is a distinction because if you think about it, I mean any, take a shopping centre, no public sector, just a completely private development, okay. What the shopping centres do, by them putting in investment within

the shopping centres, the owner of the shopping centre, often they have like shows and displays and whatever else right, they increase the turnovers in the shopping centre and because they're on turnover clauses, they are able to extract more value out of that. So that is the traditional one and that is private capturing value from another private player. So it's the owner who is private capturing the value from the private enterprise in that shop and that is value for value and they are extracting that value out through higher rentals. Value capture in the more traditional sense is more saying where you have a public and a private partner. Historically that is generally the kind of defining point between them saying, how is it that the public is able to extract some value that gets created through its own investment although that value may be partially created by the private player as well. So generally speaking, you've got to have a private and public party involved.

INTERVIEWER: Okay but then I will skip to the fifth question since we're talking about it. How important are public and private partnerships for the implementation of value capture?

RN007: I think it's critical. I think the word partnerships, although it's a cliché and it's over used and it's, I don't think value capture can really work particularly well when you don't have a partnership type of relationship. When it's regulated or obligated, I don't think you're going to get a particularly positive outcome because and we will possibly speak about this a bit later on, there are different aspects to value capture and you need both parties to be working together to maximise each one of those aspects. The key part of this whole thing is that you've got to create the value in the first place and if you don't have a partnership arrangement to do that, you're never going to maximise the value potential on the site and that is where it's particularly important. And then when you're extracting the value out, if you have an acrimonious type of relationship, you almost have to litigate to get your value out but if you're in a partnership arrangement then that is part of the agreement and value can flow a lot easier. So I think partnership is critical. Sorry there's another part, a lot of these projects, there's a time frame involved here. Very few of them are short term. Anything relating to property infrastructure etcetera, you're generally talking about a relative long period of time which means there's a high degree of uncertainty. You don't know what is going to happen in the future, neither party does. The markets turn and all kinds of things happen. In order to negotiate and

navigate that uncertainty, you need to be in a partnership. So navigating that uncertainty is critical and I think partnerships really help.

INTERVIEWER: I remember when we had a discussion before, I remember you speaking about past luck who passing on risk and who's going to absorb the risk for something and you can't do that without partnerships.

RN007: Exactly and you may have to renegotiate and restructure that risk as time goes on because new information comes to light. So you need a partnership to be able to do that because what you negotiate and sign up front for year one may be very different to what you're doing in year five, ten or fifteen because the context has changed. Now if you have a very ridged relationship or a very contractual relationship or a very, you know, acrimonious relationship between the individual or the entity involved, you can't negotiate that space particularly efficiently. You don't want to be negotiating that space through the courts, you know what I mean? It's a silly way of operating and if you can avoid it that is what you want to avoid.

INTERVIEWER: Okay cool, that makes sense and before we go onto my case study just a couple of theoretical questions, what value capture mechanisms have been utilized in South Africa, if any?

RN007: Generally speaking, your value capture mechanisms are split into two broad types, okay so it's what we call the use type. So I think in South Africa, in terms of that, I think there has been some where…

INTERVIEWER: Use in income?

RN007: The use is more where is there is some sort of developmental outcome. So, for instance, there's a drastic need in South Africa to identify our cities, for instance. Right so there has been a move there where people have said where, you know I know for instance, around some of the GauTrain Stations and things like that, they have managed to get increase densities on the back of the infrastructure that has gone in because, for instance, your parking ratios are lower because of the public transport and hence you can build up higher usable space going forward. So there has been some of that, that happened and then on the income side, really only development contributions have been the main form of value capture in South Africa. So development contribution, basically

it's your fee to tap into the, or to connect into your bulk infrastructure. Historically in South Africa, development contributions have been done in quite a hap hazard way and in a very different way through out different cities in South Africa. So it's been quite a confusing space and been quite poorly done in most cases. So in many cases, the state hasn't recouped its money like it should have and other times they have made it quite onerous as the developers has struggled a bit. National treasury at the moment in the cities are trying to standardize that now and have a set of guidelines that actually says, how do we do this on a more systematic transparent, transparent and kind off comprehensive way but it is a form that is understood in South Africa. If you talk to people about value capture, they probably won't know what you are talking about but if you talk to them about development contributions they probably will. So your average developer will know what this is, okay. Importantly your DCs pay for your capital infrastructure.

INTERVIEWER: Sorry, what do we mean by that again?

RN007: In other words, they pay for the hard infrastructure, the pipes in the ground, the roads as opposed to the operating side of the infrastructure. So really what happens is, infrastructure and this is probably quite an important point for you, for the most part is a public good and a key to finding feature public good is really to two things. One is the ability to exclude people and the ability to sub divide it or divide it up. It must be bit invisible. Big bulk infrastructure is often very difficult to say to somebody; we're going to build a portion of Steenbras Dam. You either build the whole dam or nothing, there's no in between and the same thing is it's quite difficult to exclude people from a lot of it as well. So that's the one thing, it's a public. So your private sector tends to not be that interested and another reason why they are not that interested is that it tends to have to be built at scale, often servicing a broad community and also to achieve because it's expensive, you want the economies at scale so you've got to do it at scale. So it's often hugely capital intensive which requires very long repayment periods. You don't pay this off in five years or ten years, you need fifty years to pay it off or a hundred years to frikking pay this thing off. No private payers stick around hundred years to get their money back. So the state says right, we're going to be here for the next hundred years, we will put this thing in and we will slowly extract our money back and that extraction comes in the form of development contributions. So say you're tapping into this thing,

you pay to tap it and it's meant to be a proportionate basis. In other words, if your development is going to consume, I don't know five percent of the capacity of that pipe then you must pay five percent towards the cost of it, that's the theory. It doesn't quite work out like that but that's the idea. Often people say that property taxes are a form of value capture. I'm less inclined to go along with that in the sense that your property tax is generally paid for your operating expenses, so the maintenance. So think about infrastructure, there are three streams, the pipe gets paid for by development contributions, the maintenance of the pipe is done out of property taxes and what flows through the pipe, the water, the electricity or whatever is done through tariffs. So you pay for everything and you consume x kilolitres of water, you pay x rand. So that's where your funding comes from, that capital operational and that is what is going through. I think DCs here are a value capture. I'm not convinced that your property taxes are the value capture per se, even maintenance. There's a debate around this. So let me say, this is then what people would argue and fair enough.

INTERVIEWER: I can definitely see both arguments because you've just spoken about how it's capital infrastructure and the only other way I would see it if your property value is increasing off the back of an investment, your rates increase. Your property tax should increase then, as a result.

RN007: They do and that's under a normal scenario, right? Now you come along and you say, we are going to put in a specific piece of capital infrastructure to unlock the development, in other words the infrastructure isn't there, we need it to unlock a piece of land or development to do something and that increases your property value, okay over and above what it would have been. So in other words, what we are saying is that, let me give you an example, existing infrastructure capacity can accommodate single residential houses. The residual land value of that, as a result is x, okay and then you say, okay, we're going to put in some massive types of infrastructure, okay and that means you can actually build Sea Point flats on that same piece of land, substantially different value as a result, okay because that value goes up, the property taxes on that thing is going to go up a hell of a lot higher. So basically you have your normal property taxes that are increasing with inflation and what you do is you have a point here where you put that infrastructure in and you get an exponential change that happens, right, what attacks increment finance instrument does which is a value capture instrument. Hang on

leave this as is and that is your normal property taxes going towards the maintenance of the infrastructure. This portion, this increase, this increment increase, okay, the portion that has been created because of that infrastructure that got put in, we are ring fencing that. We're using this and this is a cash flow that kind of flows in over time, right and that cash flow, we're going to use to repay a bond. We're going to go to the capital markets, float a bond and we're going to say we're going to repay the bond holders so the bond holders are going to pay a whole lot of money to us for the bond and it's becoming a dog's breakfast. We are going to use the funds from the bond to pay for that infrastructure and you repay the bond through that increment tax that gets generated but at a certain point in time, that bond is paid off. This then, this entire portion here, goes into the general property tax but it's 25 or 30 years later etc, going forward. So what they have done is they are saying that, to me, there, property tax is a value capture and that's your tax increment and that has been used a lot in places like the US. So we're just in the process now, the City of Jo'burg is doing feasibility on one and Ethekwini are looking very seriously at using one to unlock a whole lot of land. So we presented it at a conference this year and that stimulated a whole lot of interest around particularly the Ethekwini stuff. The Jo'burg guys have been doing it for a while.

INTERVIEWER: Where is Ethekwini?

RN007: Durban. It's all the Tongaat, Hugaard, the sugar cane fields to the north of Durban. They are basically going to redevelop all of those but they can't because they have got no infrastructure or the scale of the infrastructure that is needed to go in there is large scale stuff. So the city doesn't have the budget to go and say, we will put it in first and we will wait fifty years for you okes to give it back to us, DCs. It's billions. So what they are going to do is they will say right, put the infrastructure in but we're going to fund it from a bond and then we'll say, right, the incremental value generates profit.

INTERVIEWER: What are the rights in terms of the bond holders and their payments? Does that make sense? Surely there will be a time?

RN007: Yes so often what will happen and usually the infrastructure and it might be billions but it's often likely phased. So what they will do is there might be bonds and charges, okay but the first charge, what the city will say, we will fund it up front from our

capital budget but we want that capital budget to be repaid as soon as the bond gets launched.

INTERVIEWER: And that is why it's ring fenced?

RN007: Well no, the capital budget pays for the infrastructure. The infrastructure then starts to create that value and there is an increment property tax increase which is ring fenced which they used to pay the bond and the income from the bond is used to plough back into the budget because they have used money out of the budget to pay for the thing. You're right, the municipality sometimes plays a bit of a cash flow role, okay, an interim while trying to deal with the cash flow. But in terms of the right of the bond holders, I mean you asked a really interesting question and that's the big issue in South Africa at the moment is ideally what you want is for this thing to be seen as what you call off balance sheet because the city wants to say, this funding, we will ring fence it so nobody can touch it but the bond holders. So all of it is going to go to the bond holders but the bond holders cannot have recourse back to the city. Let's say this development, the value increase doesn't quite materialize. We put in all this infrastructure, either you've been too optimistic or the market might turn or a variety of things can happen and you don't see the value increase that you expected. Just want to see where we're at… What the point I was trying to make and this is… I don't know if it's important for you but what is important is that there is a counter argument here. This is complicated, why doesn't the city float a municipal bond, we've been doing those for years, the market understand them. So why doesn't the City of Jo'burg or the City of Cape Town go to the market puts out a bond and the bond holders get paid back from general revenue that comes into the city, property taxes, tariff, whatever it is, it gets put into a big pot and they pay out the bond holders. Bond holders quite like these things because your revenue source is quite diversified and City of Cape Town is probably not going anywhere in a hurry. So they are saying, why go through this whole thing if you can go and float a normal municipal bond and carry on, put the infrastructure in and you are going to get money coming back into the system from higher taxes. There are two arguments against that. The one is that the city can only borrow so much as like a loan to value ratio and as soon as they start to hit the upper end of a certain and once they are the gearing level because it's basically what it is, it's a gearing, the rating agency is suddenly starting to get nervous. And if the rating agency give a credit rating to the

municipalities, like we have in South Africa, like we have a sovereign rating, the higher your gearing level, the worse your rating. The worse your rating, the more expensive your borrowing becomes. Market is saying that you've got to pay me a premium because it depends on how you are rated. So a lot of the municipalities are saying that we have maxed out on our borrowing capacity on what they call a general obligation municipal bond. In other words, the obligation to pay the bond holders are going to come from the general pot, if you can put it like that. So what the guys are saying, we go through this route and we say that this is not on the balance sheet of the municipality because all we're doing is ring fencing that and we're saying those funds will pay off the bond. So what it is you actually pass some of the risk onto the bond holder now because if this thing doesn't materialize. So let's say the property rate increase doesn't materialize as expected, well the bond holders take the hit. So if there is no obligation for the city to cover the short fall then it's off the balance sheet and it doesn't get added to the gearing ratio. At the moment in South Africa, the guys are saying they are not too sure whether the market would be happy with the appetite to just take the risk only on this increment because in places like the States and that it is. So saying probably to start with, there is probably going to be a bit of a hybrid model where they will ring fence and then they will guarantee a portion of it or something and some of that stays on the book as part of the hearing but that is one of the reasons why you would do this, is to take it off the balance sheet. The argument that I have also been making, well I like the tiff is that if the city went and finance all this infrastructure, they are taking a market risk that property value is going to materialize as a result of it, okay which would then result in higher taxes and they would recoup the money back in. What I am saying is it really the city's role to be playing the market and to be taking on the market risk with quite frankly tax payers money. It's not their game and what I am saying is that the bond holders are taking on some of that risk. The private investors, you're investing and there is a risk associated with that investment. They should be much better placed to actually assess what's going to happen to the market whether that infrastructure is going to result in high property values and I think you will get much better due diligence on these projects when these okes are going to have to take some of the can on the process. I like the idea of a tiff versus a general obligation bond etcetera. It takes some of the gearing off the balance sheet and you put the market risk onto the investors which I think it's where it

needs to be sitting and I think your level of due diligence will be higher as a result but that the thing about tiffs.

INTERVIEWER: You're right and if I had to ask then, if I am trying to relate it to my topic, if you look at the 2 private owned, if you look at growth points, would they be taking on the risk of the bond holder?

RN007: No, so if you take growth point as part owner of the VNA in other words, no, so they would be the developer in this case. They are the developer and then what they are doing is they go into the city and they are saying… It's like massive scale infrastructure refined for the VNA and let's say they are going to build the ocean liner terminus or something. I don't know how many gazillions that thing will cost but it's going to be something ridiculous and they might then say, okay let's see if we can structure according to a tiff.

INTERVIEWER: The benefit for the developer is obviously the opportunity to do that?

RN007: Let's say there is a whole lot of infrastructure that required to do, let's say an ocean liner terminus but the ocean liner terminus is going to increase the foot traffic through the VNA hundred-fold, let's say whatever which then increases their retail turn overs etcetera and if the retail turn over goes up, the property value goes up and that's the thing about it. You're capitalizing on your income stream and if your income stream goes up, you have a greater value and if you have a greater value, you've got to pay more property taxes and that would be an example, not really a good one but one of them within the VNA.

INTERVIEWER: That makes a lot of sense. My next two questions basically were also theoretical. So if we've explained some of it already, it's fine. What are the key foundations for the success for implementation of value capturing mechanisms and I think one of them is definitely a functioning partnership, you've spoken about that? I mean there are probably a whole lot of things.

RN007: I think you can probably split it down to supply and demand side factors. So I think on the supply side, you have to have your other development conditions have to be in place over and above the infrastructure. So yes, often putting infrastructure in is a key component or a key ingredient but if you don't have the land availability, the

development rights and those other key ingredients of the development from the supply side, you can put in all the infrastructure you like in the world, who cares. The infrastructure itself and I keep making the point, the infrastructure itself doesn't necessarily create the value, definitely not on its own. It's an ingredient to increasing that value, okay and so it's part of the package and it's an important part of the package, don't get me wrong I am not underplaying it but there is an notion, if we put in a infrastructure automatically land values are going to increase, nonsense.

INTERVIEWER: Yes, I remember using the example of the train station that you've got.

RN007: Exactly, there is no increase. So that is from the supply side. You need have the other development conditions need to be in place and on the supply side and this is probably the most important thing, there's got to be market demand for whatever use you are generating on that side. Again and this is where planners and a lot of public officials also make this mistake they will do the infrastructure and they will sometimes get the other parts right as well. They will make sure there are other development rights in place and they will help with that sort of stuff but if nobody is taking up that space, you are going to have high vacancies, you're going to have flat rentals and when you have flat rentals, you're have no value increase. It's not rocket science. It's logical stuff. It's common sense but often we just forget the common-sense stuff. You've got to have market demand and that is part of the problem why I don't think value capture is a panacea for all our infrastructure problems it will only work in certain parts of town where there is demand for that space. So you can go and do a waterfront in Khayelitsha. Well oakes, I am sorry, you can put in all the infrastructure you like. You can have all the land parcels available, you can have all the development rights sitting there, so what, you're not generating value there. Well, you're not going to generate sufficient value there. Is there market demand in that location for that particular property space and that's the key story and that is probably where the VNA and Century City have got it right. So although Century City had a rocky road to get there and there is a classic example but they had to put a lot of infrastructure in the ground to make that land developable and it was a swamp, it was a frikking swamp. And so they build a massive shopping centre on the back of that thing and that level of infrastructure we are putting around, we better generate a whole lot.

INTERVIEWER: So who put in the infrastructure?

RN007: Manex and where they went wrong in a sense is they put in one of their first big things was to do the shopping centre, Canal Walk and so now they are saying to get a return, we need to be charging rentals of x to get a return on our development costs. And a large part of the development costs were infrastructure and dealing with the water, if you think about it, dealing with water, access of the highways and those types of things. And they were saying therefore we need a property value of Y and to get that property value of Y, we need to be charging certain rentals. And at the time the rental was above market of what they are looking for and they had vacancies etcetera and that's why for a while Canal Walk kind of chugged along and the banks then got nervous and asked what was going on here. And then they sold out to high property which was Ccanal Walk and the rest of the land was sold to Rabie and those second guys bought it at, well I wouldn't say bought it at a discount but they were able to buy it at what the current market rentals could support. But it meant they wrote off an enormous amount of money towards the infrastructure costs, hundreds of millions off on that stuff and so to answer your question, you've got to have market to market. So that for me it's always a question mark is that yes we can pay the value capture gain and quite easily but is the value going to get generated on the back of this infrastructure, is it going to be sufficient to cover that because you can structure it?

INTERVIEWER: So you just do feasibilities?

RN007: Exactly and they key part of the feasibility is your market demands so what are people going to pay either in terms of outright sales or rentals on that land. And once you've got that, you've got a cash flow and once you've got a cash flow, you're capped it by the required rate of return and you've got a value. And then you ask the question, is the value greater than the cost to develop this thing. It's a very simple equation, value versus cost and I think a lot of these projects you're going to have the other way around where your cost is going to be greater than the value because the thing that worries me a little bit and I don't know the project well enough…

INTERVIEWER: Nor do I and I haven't looked at it.

RN007: I don't think that there's that much developable land because of the flood panes and everything else going in there so you're going to spend a bucket load of money sorting out this site but it will only generate so much in the gross lettable area. And so

that gross lettable area, the total value of that site is a combination of two things, it's how much of gross lettable area and then at what rate. Now is that an area where you're going to get high rentals etcetera and that's question mark but somebody needs to do that.

INTERVIEWER: So in a way and please stop me if I am completely wrong but I am just trying to make sure my head is in the right space. In a way it's the same thing as the developer taking on the risk of putting up a block of flats and he's doing it based on x rental and he takes on that risk. But with this, it's slightly more and obviously it's more complex because it's on such a massive scale or not? Because my biggest issue with the tourism park and trying to look at value capture mechanism and it comes up as one of my questions later on a building scale and a presync scale, it's such a huge track of land and they could be, you know you're looking at residential obviously. And so it's entirely mixed use but it's all following a river and the potential that cleaning up that river could create essential.

RN007: So the question is, what is the potential and that is the crux of the whole story… Everyone is saying if we fix the river and if we do that, we're going to create value and I think, yes you probably will; but how much? I mean think about it, from a value capturing point of view, okay, where are you going to get the income and what is going to happen is either the state has to go in there from its own budget and do a whole lot of infrastructure investment. If the state can do that from their budget, they've got to find that money and with so many competing needs in the city. How do you say, we have to do that versus putting in water and electricity to Khayelitsha? How do you justify it and there is a political question of how you allocate the existing budget, how the hell do we split it but we have got to put all this money in but what do you get back out of it and this is where you do get some value capture? You could say, well we get value capture in terms of a use in the sense that we get affordable housing into better located areas and yes, you could argue there was a bit of value capture out of that, that's fine and I have no problem. The question is how many is it and then you could say, could we have got the same number of affordable housing units done elsewhere for a lower cost in the city? So that is pushing it and the second thing you say, we can put all this infrastructure in and we will recoup it over time through rates. I want to say, that's great but what happens if the value that gets created is not that high and so you're not going to generate really that

many and substantially create rates out of this thing. And so it's just a burden on the tax payer because somebody else is going to have to pay for this thing because they are not going to recoup it off the rates base development or you say, let's do a tiff. Okay, again, great are you going to generate enough of a cash flow here to service a bond large enough to cover the cost of that infrastructure and that cash flow is going to be a function of value. So come back to my point, is sufficient value created on the site whether you do it straight through property taxes or whether you do it through a tiff structure. Or you do it through development contributions but again, your development contributions, your developer has to be able to afford to pay the development contributions and the only way you can afford to pay the development contributions, if they are generating sufficient value. So it keeps coming back to the same frikking starting point, do you generate value? It doesn't matter how you want to slice this financing, this is just financial engineering but you cannot get away from the fact you've got to have sufficient value to create it in the first place

INTERVIEWER: And that's why we had an email conversation and I asked about Century City and you had argued how this would be different to a property owner and maintaining their building to achieve high rentals. So, at the end of the day it's about taking on risk.

RN007: It is about taking on risk, absolutely. Somebody has taken on risk that the market will have enough appetite for that property that it will pay sufficient rentals to create that value. It's a function of size and do you unlock enough floor area and then what are people prepared to pay for the floor area. So it's a combination of the two and that generates your value and it generates your cash flow. So I am a little bit sceptical and again, it depends what the numbers are whether the capture mechanism will work in that department.

INTERVIEWER: And I supposed it depends what they decide to go for because I remember the last conversation I had with Francois when we decided not to use it for my case but there were basically three ways they were going to go. They were either going to go the ecological route where they were just going to clean it up and I suppose in that way, you would get a cleaner river and maybe residential housing, residential properties will benefit as a result. Or they were going to go the other route of taking it into the medical centre of South Africa with all those hospitals and the third route was

affordable housing. So it depends which route they want to take as well so that would create different feasibilities for each.

RN007: So you're right, it's land use type multiplied by the GLA multiplied by the rate the market will pay for those different options, affordable housing, health, conventional housing whatever you want to talk about, it depends what the option is.

INTERVIEWER: Again and this is where I might be completely ignorant because I don't really know enough about this but how else aside from value capture mechanisms, how else would they be able to fund putting in infrastructures there?

RN007: What I am going to send you, I am going to send you a paper. I outlined this a little bit on the one that we presented at Supoa is… So municipalities have really got four sources of funding. One is property taxes, two is tariffs, three is borrowing so there goes a market along with a fund etcetera and then four is national transfers ag and there is a little bit of other stuff sometimes they will sell off a piece of land and let me say five other and it's not going to be a major and it's not going to be consistent going from there. National transfers come from an equitable share and it's all the income taxes that we pay that go too National, they take a portion of that and they hand it back to the cities but it's depending on the size of the city and it's the need of the city etcetera. Ecuador share tends to be a city and it tends to be spent on 36 services, like you get your first x kilolitres of water for free and that stuff tends to get paid like that and then grants. Grants often come down and you get like a transport grant, housing grant and infrastructure grant and then there is obviously borrowing and we spoke about this but borrowings and there is a limit in terms of what you can do. Tariffs, this has to pay for the cost of bringing the water in, the power etcetera but sometimes a surplus is created. So, for instance electricity, they used to have surplus here. So you used to buy it cheap from Eskom and sell it more expensive to households and they used to make a surplus there. Sorry, what I need to do here is that you have got a capital budget with it and an operating budget and so your normal payments would go towards your operating budget but some of the surplus would be put into a capital budget there. Your grants and that generally were going that way although some of the free water and your property taxes were generally speaking went into your operating budget there. I will send you the paper and it explains it a little bit there.

INTERVIEWER: I was asking how they would do it, how would they fund it?

RN007: Okay so nine times out of ten, they would be relying on those grants. In this paper, you will see though, there is an increasing concern by National Treasury of the reliance of municipalities to fund their capital budget of grants. There's been this exponential rise. Like in the last ten years they used to fund about 40% of the capital budget but now they are funding 70% - 75% of capital budgets are coming from national grants. Two problems with that and the one is that it's normally conditional, you must spend it on transport, you must spend it on housing. So it doesn't give the municipality that much flexibility and so that's a problem and the other problem is National is running out of money. We're got an economy that is chugging along at 0% and tax revenues are going to be low. We just don't have the money anymore which is why National has been interested in value capture. Guys can you not find other ways of frikking doing this and that's why National Treasury and all those guys have been pushing saying that we need to explore this?

INTERVIEWER: So it is an option but it is…

RN007: I definitely think it is an option but I just need somebody to run those numbers to say it's going to cost us three billion to clean us this river but we are going to generate 500 million rand's worth of value and I am like sorry okes, you're not in the game. So until somebody can push those numbers and say how much value gets generated and what is the cost to generate that value and then if the one is more than the other then you can have a value capture discussion but I just haven't seen it.

INTERVIEWER: That is why I wish I could see an actual example with figures.

RN007: I am trying to think if I have got something, in terms of value capture point of view?

INTERVIEWER: Yes.

RN007: Look conceptionally it is no more difficult than what you're saying. You know how value gets, I mean how you calculate the value on property, you're just counting your cash flow so you are saying what the hell is the size of the cash flow? It's the size of the floor area multiplied by rent. Again, I sometimes think we complicate this. How

much floor area are you generating and how much is the market prepared to pay for this?

INTERVIEWER: Once you've got that, you have got value then you go to the engineers and ask them how much it's going to cost put the pipe on the ground. It's going to cost you x. Now are we continuing with this conversation or aren't we, depending on what the balance is between the two.

RN007: Yes, so there could be a tendency to over complicate this and at core it's no different than your shopping centre owner.

INTERVIEWER: Okay then just my last thing I wanted to ask and I don't know if I explained it properly in the email but basically what I was trying to say is and I think now it makes more sense but if you look at Century City and the way they function. The CCPOA, you could argue that the Century City Property Owners Association, like if you go on their website, they say the CCPOA charge levies to the property owners within Century City and they use those to fund things like water infrastructure and roads. And so what I was saying is the CCPOA is not the government, they are not the local municipality but if you look at it from a conceptual level, it could be seen as the same…

RN007: Is that levy a function of the value of the property?

INTERVIEWER: Yes.

RN007: What is the size of the levy? How is the levy calculated? That would be the question you should ask. I am assuming it would be done on a sectional title scheme. If I have a building of 1 000 square metres and somebody has got a building of 10 000 square metres, that person is going to pay ten times more what the levy is? What they are saying is that, yes, they can charge somebody that levy because the owner is generating income out of the building. The owner is going to have to pay that levy out of income from somewhere.

INTERVIEWER: But surely the levies would increase and if the levy that they are getting are being directed back into the water infrastructure and the roads, if that has a positive impact on Century City as a whole then they are going to pay more rental…

RN007: Century City, in a sense, is like a State…

INTERVIEWER: Yes and that is what I was trying to say in the email.

RN007: If you put it in the shoes of the state because in a sense, they are almost playing that role.

INTERVIEWER: Yes, well that certainly what it looked like on the…

RN007: Yes, well that's exactly that, let's say they clean up the water and prevent flooding and they make a nice environment and as a result, owners of office blocks, people want to be in Century City because of the ambiance and the aesthetics and everything else. They are prepared to pay R200 per square metre office rentals which results in value z. Your property owner is very happy to pay those levies because the aesthetic that is created by the water increased the rental, the rentals that can be charged which results in a higher value.

INTERVIEWER: So that is what I was trying to say in the email.

RN007: I see where you are coming from. So your CCPA…

INTERVIEWER: I don't know if I can but maybe that's one that I can argue that point after this discussion, I can argue the point and say…

RN007: So they are pulling out levies and that is how they are extracting values. You see what would be interesting to figure out but I want to see in the sense whether, do they extract more from levies than what it costs them to do the infrastructure? Because if it's a one for one relationship and in a sense to almost like a tariff where you're just paying the cost of me cleaning the river and I am charging you a fee to clear the river versus saying, I am actually extracting some of the upside of that clean river and I think you need to understand the difference between those to. Are they income generating and is there going to be a positive net income on that thing or is it just going to cost to clean the river or fix the flooding or whatever the hells they do?

INTERVIEWER: If it was that, would that just be a fee?

RN007: Yes, it's like having a gardening service that comes in once a month and you pay them a fee and they clear your garden type of thing.

INTERVIEWER: It's like the waterfront do, they outsource a lot of their stuff so you could argue that, that is just the same thing but if they are extracting more…

RN007: In other words, if the river costs you R10 per square metre and rentals go up higher R20 per square metre and they are able to extract R15 out let's say, they are making… In other words, they are getting a portion of the upside of the value and that's very important because it's not just a cost recovery.

INTERVIEWER: Yes if it's not just a cost recovery, it would mean that the property owners are willing to pay a premium on their rental based on the area but they only do that if…

RN007: I think it's quite clear, if the Property Owner Association or whatever, if they share in the value increase then it's a value capture. If it's purely a cost recovery mechanism, so their net position is zero…

INTERVIEWER: They share in the value increase.

RN007: Yes, versus cost recovery and that is probably your distinction.

INTERVIEWER: Just out of interest, do you know how to figure it out now?

RN007: Speak to him, have a conversation with him. If the levy thing or if it's just a way to and partially how you would figure it out, figuring out how the levies are calculated. So normally what you would do in a sectional title scheme, you'll do a budget for the year at the start of the year, okay we're going to have to paint the building, we're going to paint for a cleaning service, we have to have the lift serviced three times in the year and it's going to cost us R100 000 this year to manage the building etcetera. There are ten flats and let's say they are all equal size flats, I am then going to take the R100 000 and I am going to divide it by ten so everybody has got to pay R10 000 a year as a levy and because it's a well-maintained block, now that person is able to sell their flat for a higher amount, the body corporate don't see the higher amount. And that higher amount goes to the owner when they sell their flat, we don't extract anything off that versus saying hang on, your flat worth a million rand okay so now you've got to pay an x amount of that and let's say your flat is worth R1 200 000 where you're paying 10% on R1 200 000 and we are extracting value out of that and why did the flat go up in value, because it's well maintained, it's secure, nice garden and that is value capture.

RN007: I think the website will be able to answer that because they lay out pretty clearly what their role is and they call themselves a mini municipality so…

INTERVIEWER: I suspect they might have trouble getting away with extracting too much.

APPENDIX C: TREE NODE STRUCTURE

Level 1	Level 2	Level 3	Level 4	Level 5	Sources	References	Created On	Created By	Modified On	Modified By
Defining value					4	7	15 Aug 2016, 12:23:41 PM	GDM	26 Oct 2016, 8:16:07 AM	GDM
	Maximising value				2	4	11 Sep 2016, 1:55:46 PM	GDM	26 Oct 2016, 8:22:15 AM	GDM
	Value and WSUD				4	11	11 Aug 2016, 1:03:18 PM	GDM	03 Nov 2016, 2:00:39 PM	GDM
		Ecological Value			4	11	15 Aug 2016, 12:26:49 PM	GDM	26 Oct 2016, 8:22:15 AM	GDM
			Constraints associated with Ecological Value		1	4	26 Oct 2016, 8:17:29 AM	GDM	26 Oct 2016, 8:22:55 AM	GDM
				Development rights at Century City	2	2	08 Oct 2016, 11:36:39 AM	GDM	26 Oct 2016, 8:22:42 AM	GDM
		Economic value			3	4	15 Aug 2016, 12:25:55 PM	GDM	08 Oct 2016, 11:22:19 AM	GDM
		Physical Value			2	5	15 Aug 2016, 12:30:11 PM	GDM	11 Sep 2016, 2:20:18 PM	GDM
		Social Value			3	10	15 Aug 2016, 12:26:22 PM	GDM	31 Oct 2016, 11:57:20 AM	GDM
			Indicators of social value		1	2	15 Aug 2016, 12:27:25 PM	GDM	15 Aug 2016, 12:29:27 PM	GDM

Facilities Management					0	0	29 Nov 2016, 8:38:33 AM	GDM	12 Jan 2017, 12:07:16 PM	GDM
	Key resources to the management of a precinct				5	28	26 Oct 2016, 8:44:19 AM	GDM	12 Jan 2017, 12:06:38 PM	GDM
	Macro-level thinking				3	14	05 Aug 2016, 9:48:07 AM	GDM	09 Jan 2017, 1:06:21 PM	GDM
	Public relations				1	13	05 Aug 2016, 10:14:04 AM	GDM	29 Nov 2016, 11:30:51 AM	GDM
	Space, place and people				3	18	11 Aug 2016, 11:20:45 AM	GDM	07 Jan 2017, 1:27:10 PM	GDM
		Mixed-use developments			2	2	15 Aug 2016, 12:18:57 PM	GDM	08 Oct 2016, 10:48:38 AM	GDM
		Mixed-use environment			2	2	11 Aug 2016, 12:12:58 PM	GDM	08 Oct 2016, 10:48:38 AM	GDM
	Strategic decisions				3	27	05 Aug 2016, 9:31:35 AM	GDM	12 Jan 2017, 11:53:10 AM	GDM
		Strategic focus on water			4	38	05 Aug 2016, 9:44:15 AM	GDM	12 Jan 2017, 9:08:12 AM	GDM
			Natural water landscape at Century City		2	3	11 Sep 2016, 2:01:41 PM	GDM	08 Oct 2016, 11:01:16 AM	GDM
			Negative impacts of poorly managed constructed water		1	2	26 Oct 2016, 8:25:27 AM	GDM	26 Oct 2016, 8:26:36 AM	GDM

			body							
			Problems which Century City faced regarding their canal system		2	8	08 Oct 2016, 11:18:28 AM	GDM	26 Oct 2016, 8:31:12 AM	GDM
			Seasonal Wetlands		1	2	26 Oct 2016, 8:13:31 AM	GDM	26 Oct 2016, 8:13:56 AM	GDM
			Stakeholder interaction with water		4	4	11 Aug 2016, 11:23:29 AM	GDM	26 Oct 2016, 8:40:56 AM	GDM
			Storm water and it's challenges		3	5	06 Aug 2016, 12:50:06 PM	GDM	08 Oct 2016, 11:07:29 AM	GDM
			Strategic management at Century City		1	5	14 Sep 2016, 9:26:25 AM	GDM	08 Oct 2016, 11:10:46 AM	GDM
			Strategic water management		3	7	11 Sep 2016, 2:39:22 PM	GDM	26 Oct 2016, 8:40:56 AM	GDM
History of Century City					1	5	08 Oct 2016, 10:53:40 AM	GDM	08 Oct 2016, 11:39:41 AM	GDM
Sustainable urban development and WSUD					4	47	05 Aug 2016, 9:42:29 AM	GDM	04 Nov 2016, 4:26:57 PM	GDM
	Ecological Sustainability				3	17	05 Aug 2016, 9:41:39 AM	GDM	03 Nov 2016, 2:01:07 PM	GDM

		Energy efficiency			1	14	05 Aug 2016, 10:24:36 AM	GDM	11 Aug 2016, 12:45:13 PM	GDM
		Support for 'going green'			2	23	05 Aug 2016, 9:24:48 AM	GDM	16 Aug 2016, 10:11:08 AM	GDM
		The benefits of natural water landscapes			3	3	16 Aug 2016, 10:27:47 AM	GDM	08 Oct 2016, 11:01:16 AM	GDM
		The use of sea water			2	13	06 Aug 2016, 1:01:31 PM	GDM	16 Aug 2016, 9:25:50 AM	GDM
		Timing of green building features			1	8	06 Aug 2016, 12:35:27 PM	GDM	11 Aug 2016, 11:05:52 AM	GDM
	Economic Sustainability				4	18	05 Aug 2016, 10:06:12 AM	GDM	09 Nov 2016, 4:24:55 PM	GDM
		Budget and financial issues			3	17	05 Aug 2016, 9:38:53 AM	GDM	08 Oct 2016, 11:35:32 AM	GDM
		Cost of 'going green'			3	14	05 Aug 2016, 10:16:09 AM	GDM	08 Oct 2016, 11:15:36 AM	GDM
		Employment opportunities			2	7	05 Aug 2016, 10:33:44 AM	GDM	08 Oct 2016, 11:42:59 AM	GDM
		Encouraging entrepreneurship			1	2	11 Aug 2016, 12:12:16 PM	GDM	11 Aug 2016, 12:17:58 PM	GDM
		Financing infrastructure			3	7	05 Aug 2016, 9:58:07 AM	GDM	08 Oct 2016, 11:15:36 AM	GDM

		GDP contribution			2	6	05 Aug 2016, 10:36:44 AM	GDM	08 Oct 2016, 11:42:59 AM	GDM
	Green Star Rated buildings				3	8	11 Aug 2016, 11:06:24 AM	GDM	27 Nov 2016, 4:00:24 PM	GDM
		International accolades			1	2	11 Aug 2016, 10:46:28 AM	GDM	11 Aug 2016, 10:48:49 AM	GDM
	Innovation				3	12	05 Aug 2016, 9:54:38 AM	GDM	03 Nov 2016, 2:06:57 PM	GDM
		Innovative water features			2	3	11 Aug 2016, 12:53:37 PM	GDM	11 Sep 2016, 2:20:18 PM	GDM
		Technological changes			1	5	06 Aug 2016, 12:25:03 PM	GDM	11 Aug 2016, 12:45:13 PM	GDM
		Technology and improved management			3	7	16 Aug 2016, 10:23:36 AM	GDM	08 Oct 2016, 11:33:06 AM	GDM
	Key sustainable urban development indicators				2	11	15 Aug 2016, 12:12:43 PM	GDM	26 Oct 2016, 8:51:00 AM	GDM
	Physical Sustainability				3	11	15 Aug 2016, 12:11:22 PM	GDM	27 Nov 2016, 3:41:54 PM	GDM
		Constructed Wetland			3	4	11 Sep 2016, 1:54:47 PM	GDM	31 Oct 2016, 11:57:49 AM	GDM

		Costs of infrastructure			3	10	05 Aug 2016, 9:33:38 AM	GDM	08 Oct 2016, 11:35:32 AM	GDM
		Design and efficiency			4	26	06 Aug 2016, 12:17:05 PM	GDM	08 Oct 2016, 10:58:40 AM	GDM
		Public transport			1	2	05 Aug 2016, 10:19:27 AM	GDM	11 Aug 2016, 11:13:27 AM	GDM
		Transport within Century City			1	2	08 Oct 2016, 11:26:27 AM	GDM	08 Oct 2016, 11:29:14 AM	GDM
		Water supply infrastructure			2	15	05 Aug 2016, 9:32:59 AM	GDM	16 Aug 2016, 9:22:06 AM	GDM
	Political Sustainability				4	9	05 Aug 2016, 10:30:47 AM	GDM	26 Oct 2016, 9:10:10 AM	GDM
		A lack of local Government pressures on water-use			3	8	16 Aug 2016, 10:15:12 AM	GDM	26 Oct 2016, 9:10:10 AM	GDM
		Legal limitations preventing innovation in terms of the water strategy			2	2	11 Aug 2016, 12:52:36 PM	GDM	16 Aug 2016, 10:18:35 AM	GDM
		Local government pressures, focused on water			4	5	11 Aug 2016, 1:01:03 PM	GDM	08 Oct 2016, 11:07:29 AM	GDM

		Local Government relationship			3	9	05 Aug 2016, 10:29:51 AM	GDM	26 Oct 2016, 9:10:10 AM	GDM
		Private vs public ownership or investment			1	1	14 Sep 2016, 9:24:42 AM	GDM	14 Sep 2016, 9:25:29 AM	GDM
	Social Sustainability				1	14	05 Aug 2016, 10:07:01 AM	GDM	27 Nov 2016, 3:54:56 PM	GDM
		Assisting in poverty-reduction			1	1	11 Aug 2016, 12:20:51 PM	GDM	11 Aug 2016, 12:24:42 PM	GDM
		Community development			2	9	05 Aug 2016, 10:39:31 AM	GDM	08 Oct 2016, 11:44:33 AM	GDM
		Maintaining heritage			1	1	11 Aug 2016, 12:13:38 PM	GDM	11 Aug 2016, 12:18:53 PM	GDM
		Security and safety			1	4	11 Aug 2016, 12:19:20 PM	GDM	11 Aug 2016, 12:24:42 PM	GDM
		Social awareness			2	10	05 Aug 2016, 10:13:12 AM	GDM	11 Sep 2016, 2:30:49 PM	GDM
		Social inclusion			3	10	05 Aug 2016, 10:43:57 AM	GDM	08 Oct 2016, 11:37:55 AM	GDM
		Social issues in South Africa			2	9	05 Aug 2016, 10:21:32 AM	GDM	08 Oct 2016, 11:39:41 AM	GDM
	The importance of water				3	22	11 Aug 2016, 10:54:20 AM	GDM	16 Nov 2016, 9:17:51 AM	GDM

	Thinking in the long-term				1	20	05 Aug 2016, 9:29:59 AM	GDM	11 Aug 2016, 12:59:54 PM	GDM
	Water sensitive design				4	46	06 Aug 2016, 12:18:36 PM	GDM	26 Oct 2016, 8:37:49 AM	GDM
	WSUD at a precinct scale				1	1	26 Oct 2016, 9:05:44 AM	GDM	26 Oct 2016, 9:05:57 AM	GDM
Urban Water Management					2	7	16 Aug 2016, 10:25:00 AM	GDM	29 Nov 2016, 8:58:10 AM	GDM
	Conventional UWM problems				3	7	06 Aug 2016, 12:55:31 PM	GDM	04 Nov 2016, 12:00:34 PM	GDM
	Infrastructure challenges in South Africa				2	6	05 Aug 2016, 9:53:04 AM	GDM	11 Sep 2016, 2:41:56 PM	GDM
	Inherent problem facing South Africa's water sector				2	4	11 Sep 2016, 2:29:22 PM	GDM	26 Oct 2016, 9:10:10 AM	GDM
	Recent water-related issues				2	5	11 Aug 2016, 10:56:30 AM	GDM	16 Aug 2016, 10:18:35 AM	GDM
	Supply challenges in South Africa				2	4	05 Aug 2016, 9:36:17 AM	GDM	04 Nov 2016, 11:45:17 AM	GDM
		Water consumption according to the nature of a building			1	1	06 Aug 2016, 12:30:04 PM	GDM	06 Aug 2016, 12:30:18 PM	GDM

		Water consumption according to the tenant			3	5	06 Aug 2016, 12:32:30 PM	GDM	08 Oct 2016, 11:08:33 AM	GDM
		Water consumption within a building			3	10	06 Aug 2016, 12:27:05 PM	GDM	11 Sep 2016, 2:02:49 PM	GDM
		Water for irrigation at Century City			1	4	08 Oct 2016, 11:12:33 AM	GDM	08 Oct 2016, 11:29:14 AM	GDM
Value Capture					4	35	16 Aug 2016, 10:32:41 AM	GDM	16 Jan 2017, 9:13:13 AM	GDM
	Income-generating value capture mechanisms				1	3	26 Oct 2016, 11:09:33 AM	GDM	16 Jan 2017, 9:38:57 AM	GDM
		TIF			1	3	26 Oct 2016, 11:24:54 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM
	Infrastructure Challenges				1	6	16 Jan 2017, 8:22:29 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM
	Municipal Expenditure				1	1	16 Jan 2017, 7:46:34 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM
	Public finance streams				1	6	26 Oct 2016, 11:16:46 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM
	Sources of Municipal Revenue				1	1	16 Jan 2017, 7:45:46 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM

	Value Capture Defined				1	4	16 Jan 2017, 9:12:22 AM	GDM	16 Jan 2017, 9:20:12 AM	GDM
		Factors for the successful implementation of value capture mechanisms			1	9	27 Oct 2016, 9:01:39 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM
		Public-Private-Partnerships			1	5	26 Oct 2016, 11:01:23 AM	GDM	26 Oct 2016, 11:07:54 AM	GDM
	Value creation in terms of TRUP				1	5	27 Oct 2016, 9:11:39 AM	GDM	16 Jan 2017, 8:53:56 AM	GDM

APPENDIX D: DEFENDING INTERVIEW QUESTIONS

The questions for the semi-structured interviews were based on the theoretical framework in Chapter 2. The following table links the theoretical framework to the questions derived for the semi-structured interviews.

Question	Link back to the theoretical framework	Linking back to patterns matched in Chapter 2
What is the driving force behind changes, upgrades or the provision of new services? • Who is responsible for maintenance, improvement and upgrading of services? • Where does the funding come from for services such as security, marketing/ HR, landscaping, maintenance upgrading and cleanliness?	This relates to the first generation of FM (Alexander, 1994).	N/A
How do buildings interact with users and with the services and amenities provided within the precinct?	This relates to urban FM and the concepts of space, place and people (Michell, 2013)	FM
Is there a strategic vision for the precinct and its management and has it changed over time? If so, explain.	This relates to strategic FM (Grimshaw, 2003)	FM
To what extent is sustainable development on the agenda? • Ecological • Social • Economic • Physical • Political	This relates to the five dimensions of sustainable urban development (Pieterse, 2010)	Sustainable urban development
What do you consider to be your fundamental resources when it comes to sustainability of the precinct? For example, what facilities and activities are most essential in their management?	This relates to Jensen's value map and the section on resources (Jensen, 2009)	FM
What emphasis does the precinct place on Green infrastructure? Where does transport come in, in this regard?	This relates to Jensen's value map and the section on infrastructure (Jensen, 2009)	FM
How important is technology in terms of the operations of the precinct? For example, ICT and SuDS?	This relates to Jensen's value map and the section on technology. It also relates to WSUD and the stormwater component of SuDS	FM and WSUD/ SuDS
How important is manpower and know-how when it comes to the daily activities and running of the precinct? For example, the use of green building	This relates to Jensen's value map and the section on technology. It also relates to WSUD and the stormwater component of SuDS	FM and WSUD/ SuDS

initiatives or SuDS? Or the further example of the use of seawater?		
What outside relationships does the precinct hold? For example, the GBCSA or the Water Research Commission? In other words, what outside pressures are placed on service providers?	This relates to partnerships and institutional structures (Carden, 2013)	UWM
Has there been a strategic development plan?	This relates to facilities management	N/A
How has the design/ layout of the precinct been adapted to enable a sustainable precinct?	This relates to the physical dimension of sustainable urban development (Pieterse, 2010)	Sustainable urban development
How does the precinct address a mixed-use environment, which focusses on space, place and people aspects such as: Access to Amenities; Community development; Safe places; Culture and heritage; Indoor environmental quality (ventilation, lighting, noise levels, sound absorption, zoned control areas)	This relates to the social dimension of sustainable urban development (Pieterse, 2010). It also relates to the key principles of FM (Michell, 2013)	Sustainable urban development and FM
How has green infrastructure assisted in achieving the aforementioned qualities?	This relates to ecological sustainability (Pieterse, 2010)	Sustainable urban development
What additional offerings does the precinct provide, in terms of economic Prosperity: To what degree does the precinct contribute to employment opportunities with respect to construction	This relates to economic and social sustainability	Sustainable urban development
In your opinion, how does the precinct benefit the surrounding community?	This relates to social sustainability (Pieterse, 2010)	Sustainable urban development
What is your strategy when it comes to water use/ implementation	This relates to UWM (Carden, 2013)	UWM
Are you aware of the terms WSUD? If so, to what degree has the implementation of WSD features influenced the operations of the precinct? Financially (economically) Aesthetically (physically) and or socially	This relates to WSUD (Armitage *et al.,* 2013)	WSUD
How would you define value?	This relates to value and value capture (McGaffin, 2013)	Value and value capture
How do you think water/ WSUD/ SuDS add value towards the precinct in terms of sustainability, efficiency, stakeholder satisfaction?	This relates to value and value capture	Value

APPENDIX E: CONSENT FORM

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

CONSENT TO PARTICIPATE IN RESEARCH

Research Topic: An Investigation into how Value is Created through Water Sensitive Urban Design (WSUD):

To whom it may concern,

You are invited to participate in a Water Research Commission (WRC) research study conducted by an MPhil student at the University of Cape Town. Associate Professor François Viruly, Kathy Michell and Saul Nurick of the University of Cape Town supervise the research. The results will be presented to the department of Construction Economics and Management in a Master of Philosophy (MPhil) degree in Construction Economics and Management for 2016, in conjunction with the Urban Water Management (UWM) Research Unit.

If you have any queries regards the research, please feel free to contact the student:

Greg Mallett 082 094 4325 mllgre010@myuct.ac.za

Associate Professor François Viruly may also be contacted at: francois.viruly@uct.ac.za

Associate Professor Kathy Michell may be contacted at: kathy.michell@uct.ac.za

Saul Nurick may be contacted at: sd.nurick@uct.ac.za

Purpose of the Study

Little is known about how value is created through WSUD in achieving the sustainability of urban precincts. As a consequence, the integration of WSUD into the urban FM framework is required to leverage the required societal and economic value; and therefore, the long-term sustainability of urban precincts or cities.

Procedures

Your participation in this study is voluntary. Should you volunteer to participate in this study, please advise us as to the time and place that would be suitable for the semi-structured interview to be conducted. Should you wish to withdraw from the research or refuse to answer any questions you may do so without any consequences.

Potential benefits to the participant

Any findings of the research will be shared with you at your request.

Confidentiality

The information obtained in this research will be utilised solely for the purposes for this study. Therefore, every effort will be made to ensure confidentiality of your participation to avoid any identifying information connected to this study. The names of the participants and companies will not be included in the research and will be referred to as participant 1, 2, 3 etc. and company A, B, C etc. Any information recorded will only be released to the supervisor upon request and will be destroyed upon submission of the document.

Rights of research participant

Your consent may be withdrawn and at any time and your participation may be discontinued without any repercussions. The study has been reviewed by the University of Cape Town Research Ethics Board and has received ethics clearance and if you have any questions as to your rights as a participant please contact the Research Ethics Committee Chair Person:

Allan Cliff 021 650 5027 alan.cliff@uct.ac.za

Signature of research participant

I have read the information provided for this study for the analysis of:

"An Investigation into how Value is Created through Water Sensitive Urban Design (WSUD)"

I have been provided with a copy of this form as a point of reference. My questions have been answered to my satisfaction and I fully consent to participate in this study.

_____ _____

Name of Participant Position of Participant

_____ _____

Signature Date

APPENDIX F: YEAR ON YEAR PHOTOGRAPHIC TIMELINE

(Images obtained from www.ccpoa.co.za)


2001


2002


2003


2004


2005


2006


2007


2011


1990's
1999
2000
2003
2006
2009
2012
2015

APPENDIX G: A SNAPSHOT OF LEVIES PAYABLE

(extracted from the Memorandum of Incorporation of CCPOA at www.ccpoa.co.za)

7. LEVIES

7.1 The Directors may, from time to time, impose levies upon the members for the purpose of meeting all the expenses which the Directors have incurred, or which the Directors reasonably anticipate the Company will be put to by way of payment of all charges payable by the Company, and/or the services rendered to it, and/or for payment of all expenses necessarily or reasonably incurred in connection with the management of the Company, as well as by way of maintenance, repair, improvement and keeping in good order and condition such facilities as it is obliged to maintain and/or provide, and any other expenses reasonably incurred by the Company in the fulfilment of its duties. In calculating levies the Directors shall take into account income, if any, earned by the Company. The Developer shall not be obliged to pay levies on any undeveloped land.

7.2 It is specifically recorded herein that the levy structure imposed shall comprise three components, being: -

7.2.1 the general expenses incurred on the land relating to all owners;
7.2.2 the specific expenses relating to a particular Erf, unit or group or Erven on the land;
7.2.3 a special levy imposed for extraordinary items in terms of this Memorandum of Incorporation and the Rules.

7.3 Any amount due by a member by way of a levy shall be a debt due by him to the Company, which shall be paid monthly in advance on or before the 1st day of each month. Any levy not paid on the due date thereof shall bear interest at a rate as determined by the Directors from time to time. The obligation of a member to pay a levy shall, without prejudice to the Company's right to recover arrear levies and interest as may be due thereon, cease upon his ceasing to be a member of the Company. No levies paid by a member shall under any circumstances be repayable by the Company upon his ceasing to be a member. A member's successor in title to an Erf shall be liable, as from the date upon which he becomes a member pursuant to the transfer of that Erf into his name, to pay the levy attributable to that Erf. No member shall be entitled to transfer his Erf until the Company has certified that the member has as at the date of transfer fulfilled all his financial and other obligations to the Company.

7.4 In calculating the specific or special levy payable by each member, the Directors shall, as far as reasonably practical, and in their sole discretion assign those costs arising directly out of or directly attributable to the Erf, unit or group of Erven itself to the member owning such Erf or unit or group of Erven, provided that the Directors shall be entitled to grant rebates or to add premiums to members' levies as they may deem fit.

7.5 In calculating the general levy payable by each member, the Directors may, in their sole discretion, take the following factors into account: -

7.5.1 the proportion that the floor area of the particular Erf bears to the total floor area of the Development;
7.5.2 the purpose for which the particular Erf shall be used;
7.5.3 the proportion that the land area of the particular Erf or unit bears to the total and area of the Development;
7.5.4 the traffic flow generated by the particular Erf;
7.5.5 the proximity of the particular Erf to the wetland or canal; provided however that the Directors may consider any other factors which they in their sole discretion may deem relevant.

7.6 The Directors' decision in calculating, assigning and/or allocating the levy shall be final and binding on all members of the Company.

7.7 No member shall be entitled to any of the privileges of membership unless and until: -

7.7.1 he shall have paid all outstanding levies, of whatever nature, and other sum (if any) including interest thereon, which shall be due and payable to the Company in respect of his membership thereof; and
7.7.2 he shall have complied in every other aspect with all his obligations as imposed in the Agreement of Sale in terms of which the property was acquired, as well as by the Company in terms of this Memorandum or any other rules, regulations and/or guidelines issued by the Company.

Role of the CCPOA:

- Advancement of Century City as a quality development reflecting its aspirational lifestyle and ensuring investors, residents, business workers, shoppers and visitors perceive added value.
- General site security, site access control as well as monitoring and traffic control.

- Management of the Century City Transport Interchange which controls all public transport to Century City and the Internal Shuttle Bus.
- Storm water management, maintenance of the canals and water quality.
- The maintenance and landscaping of all public areas and the running of an on-site nursery.
- Planting, maintenance and environmental conservation of Intaka Island, our award-winning wetlands conservation area.
- Maintenance of all infrastructure including roads, bridges and guardhouses, street lighting and perimeter fencing.
- Formulation of and implementation of the Disaster Management Plan.
- Supply of treated effluent for irrigation purposes.
- Formulation of the Urban Design Framework endorsed through the actions of the Design Review Committee.
- Checking that contractors on site comply with the regulations governing them during construction.
- Marketing and management of the Century City brand.
- Sourcing, co-ordination and management of events.
- Internal marketing and communication with Century City community including property owners, tenants and residents.
- The full accounting and corporate governance function as required including levy administration and collection.

The CCPOA is funded via a monthly levy system comprising one or more of the following:

- A general levy: Payable by all owners on a pro rata basis based on the per square metre of floor space, excluding parking, or on the basis of the number of residential units owned.
- A precinct levy: Payable by owners within a particular precinct who seek additional, ongoing services within the precinct from the CCPOA (e.g. additional security) .
- A special levy: Payable by precinct owners who seek additional one-off projects within the precinct (e.g. brick paving).

Property owners at Century City have adopted the developer's vision of a 'new urbanist' lifestyle set in a safe, clean and attractive environment enhancing the quality of life, human spirit and comfort.