AN INVESTIGATION INTO THE STRATEGIC FACILITIES MANAGEMENT CONTINGENCIES IMPLEMENTED BY COMMERCIAL (OFFICE) PROPERTY OWNERS IN RESPONSE TO DROUGHT RISKS IN CAPE TOWN

by

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ABSTRACT

Water supply is of growing concern in both South Africa and globally due to climate change. Environmental, Social and Governance (ESG) is being encouraged as a result of climate change and reflects society's demands for organisations to make change that is sustainable for future generations. Water Management is one of the key factors relating to ESG and it was brought to the forefront in South Africa during the 2018 Drought. Strategic Facilities Management (Strategic FM) is recognised as the crucial link to ensure that organisations strategic goals are achieved through the management of facilities.

This research project focuses on three case studies within the commercial (office) property sector in Cape Town. A literature review was conducted and the respondents in each case study was interviewed to determine what strategic FM contingencies were implemented by property owners to mitigate the potential risk of drought.

The study revealed that property owners were relatively well prepared for the 2018 drought. Although the large majority of contingencies implemented were reactionary, most of them appeared to form part of the future plans or were part of various strategic risk plans and ESG objectives. The barriers and drivers to the implementation of Water Management Features and Initiatives (WMFIs) were explored and although one of the main barriers to implementing WMFIs was cost, the study highlighted that some cost effective measures were very affective at reducing water consumption.

The 2018 drought tested the drought resilience of Cape Town Property owners and fast tracked change which ultimately resulted in both commercial property owners and society to be more resilient against water supply problems.

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DAVID PORTER

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LIST OF ABBREVIATIONS

BIFM-	The British Institute for Facilities Management
CapEx-	Capital expenditures
CBD-	Central Business District
CO_2-	Carbon Dioxide
CoCT-	City of Cape Town
CREM-	Corporate Real Estate Management
CSR-	Corporate Social Responsibility
DoEaCC-	Department of Environment and Climate Change of New South Wales
ESG-	Environmental, Social, and Governance
FM-	Facilities Management
FMA-	Facility Management Association of Australia
GBCSA-	Green Building Council of South Africa
GBFIs-	Green Building Features and Initiatives
IFMA-	Facilities Management Association
JFMA-	Japan Facility Management Association
IPCC-	Intergovernmental Panel on Climate Change
ISO-	International Standards Organisation
IEQ-	Indoor Environment Quality
IT-	Information Technology
Mm/year-	Millimetres per year (mm/year)
RO-	Reverse Osmosis
SAFMA-	The South African Facilities Management Association
SFM-	Sustainable facilities management
SFP-	Strategic Facility Planning
TBL-	Triple bottom line
TaIC-	The Trade and Industry Chamber
WCG-	The Western Cape Government
WMFIs-	Water Management Features and Initiatives

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CHAPTER 1 - INTRODUCTION

1.1 INTRODUCTION

The purpose of this chapter is to provide an introduction to the concepts that are researched in this report. The investigation researched the contingencies implemented by commercial property owners as a reaction to climate change and the 2018 Cape Town drought. This chapter will form the foundation of the research topic and briefly provide an outline of drought, climate change, facilities management and green buildings.

An appropriate problem statement, research question, aims, outcomes, methodology and limitations of the research is outlined, with further elaboration in the body of the research paper. Lastly, the structure of this report is outlined.

1.2 BACKGROUND

1.2.1 Drought

Drought is a climate event over land characterised by a lower-than-average rainfall over a period of time and according to Dai (2011), it can be classified into three types or levels; meteorological, agricultural and hydrological droughts. A meteorological drought is caused by largescale atmospheric weather circulation patterns resulting in decreased rainfall, increased temperatures and evaporation (Dai, 2011). It precedes and causes other classified droughts. Agricultural drought refers to the low moisture content of soils and it results from a meteorological drought. Hydrological drought is a depletion of water supply, both in rivers dams and aquifers. This stage generally follows meteorological and agricultural droughts (Dai, 2011). Botai *et al.* (2017) state that there is a fourth type of drought being the socio-economic drought which becomes apparent when human activity is affected by a shortage of water supply. The socio-economic impacts of drought may increase as a result of changes in land use, land cover, and most importantly demand and use of water (Bates *et al.*, 2008).

1.2.2 Cape Town Drought

According to Ziervogel (2019) the drought in the Western Cape developed over a three year period between June 2015 – June 2018. This drought is described as the 2018 drought. Wolski (2018) states that rainfall between 2015 – 2017 was only 50 -75% of the long-term average and 2017 is recorded as being the lowest level of precipitation ever recorded in Cape Town. Towards the end of 2017, it was forecast that Cape Town could potentially run out of water, which was popularly termed "Day Zero" (Wolski *et al.*, 2018).

The drought in the Western Cape, Eastern and Northern Cape reached the socio-economic level and on the 13 February 2018 the Head of the National Disaster Management Centre, Dr Mmaphaka Tau reclassified the drought as a national disaster in terms of Section 23(3) of the Disaster Management Act 2002 (Act No. 57 of 2002) (Republic of South Africa, 2018). Thereafter on 13 March 2018 The Minister Of Cooperative Governance and Traditional Affairs, Dr Zweli Mkhize declared the drought a national state of disaster, in terms of Section 27 (1) of the Disaster Management Act 2002 (Act No. 57 of 2002) (Republic of South Africa, 2018). This declaration gave the national executive powers to, amongst other possible actions, release any available resources, take steps to prevent the escalation of the disaster and seek international assistance if required.

The City of Cape Town (CoCT) had gradually implemented water restrictions since the start of the drought in 2015 and Level 6B water restrictions were introduced on 1 February 2018 (CoCT, 2018a). Amongst other restrictions, residential restrictions include the use of 50 litres or less of water per person per day (CoCT, 2018a). As of 1 February 2018, commercial users were required to decrease their consumption by 45% calculated from the pre-drought period in 2015, this has resulted in owners looking at ways to implement measures to reduce water use (Basson *et al.*, 2018).

Droughts are becoming more frequent and extensive. This is a result of Climate Change, which will continue to add pressure to South Africa's future water resources (Mukheibir, 2017).

1.2.3 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) refers to climate change as any change in climate over a period of time, caused both naturally and as a result of human activity (IPCC, 2007). Global warming is currently occurring, which is caused by an increase in carbon dioxide (CO_2), methane and nitrous oxide at levels that scientists believe have not been apparent for the last 800 000 years (IPCC, 2014). Since the pre-industrial era, these greenhouse gases have increased substantially due to economic activity and population growth causing the earth to retain heat, where previously it would be absorbed back into space (IPCC, 2014).

The demand for electricity globally is expected to increase threefold by the year 2100 (Mukheibir, 2017). Burning fossil fuels to generate electricity is one of the main causes of greenhouse gas emissions. South Africa's emissions profile is not similar to that of developing countries, "In terms of global environmental impacts, South Africa is one of the most carbon-emission intensive countries in the world, with per capita CO_2 emissions higher than those of some European countries" (Mukheibir, 2017: 4).

According to Bates *et al.* (2008) recorded warming over several decades has been a direct link to changes in the global hydrological cycle. This has amongst other factors led to a change in precipitation patterns resulting in intensity and extremes; precipitation has increased over land in high Northern latitudes and a decrease has been found in Southern latitudes; and there has been an increase in extreme weather events. Bates *et al.* (2008) state that during the 21st century, the percentage of land surface experiencing an extreme drought is projected to increase, and continental interiors will have a tendency for drying in the summer months, especially at low and mid-latitudes.

According to Ziervogel *et al.* (2014: 606) "climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure, as well as its ecosystem services and biodiversity". To ensure sustainable development, water security and to reduce levels of poverty and inequality, there is a need to implement both reactionary and preventative

measures as a reaction to climate change. Firstly by reducing greenhouse gas emissions and secondly by adapting to changes as a result of global warming (Mukheibir, 2017).

The results of climate change have placed an emphasis on sustainable development, which has become a popular discourse in the facilities management sector (Elmualim *et al.*, 2010). Warren (2010) suggests that the risk of climate change in commercial buildings is significant and it should be addressed by all facilities managers.

1.2.4 Facilities Management

According to Amaratunga (2001: 55) facilities management (FM) "was discovered, not invented". The field of research and profession emerged with the introduction of computers and the need for organisations to reduce costs in the 1970s (Boyle, 2016). Historically FM basically included the management of property assets and their related services (Amaratunga, 2001). It has since evolved into a diverse and multi-faceted discipline with widely recognised definitional issues and contradictions (Grimshaw, 2003; Drion *et al.*, 2012b). The British Institute for Facilities Management (BIFM) recently adopted the definition of FM from the International Standards Organisation (ISO) which highlights its complexities. The ISO (2017: 1) defines FM as the "organisational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business".

Barrett (2000) developed a generic model of facilities management in 1995 that made a differentiation between operational FM and strategic FM. Operational FM includes the day-to-day management of building facilities, it is technically orientated and is seen to be reactive, whereas strategic FM includes a proactive approach and is focused on the future of the organisation (Barrett, 2000). Jack (1994) highlights this by suggesting that strategic implies planning to meet the organisational objectives over the long term.

Commercial buildings play a key role in creating economic activity for organisations and society in general (Warren, 2010). At a primary level commercial buildings provide a secure work environment, ensure security and act as a barrier against the elements (Douglas, 1996).

At an operational level, the role of the facilities manager is to ensure that the building's facilities continue to operate to ensure a conducive work environment. At a strategic level, the facilities manager should be implementing proactive measures that support the organisational objectives which may risk concerns related to natural disasters.

"Facilities management adds value, not only by increasing the economic viability but also by ensuring environmental and social benefits" (Alexander and Brown, 2006). Recently Junghans *et al.* (2014) suggested that there will be an increased focus on sustainability within the FM function. Therefore, green buildings as a form of addressing sustainability issues are becoming an increasingly important aspect of FM.

1.2.5 Green Buildings

According to Ellis (2009), the idea of sustainability has become more prominent in society as a result of public sentiment, technical advances and legislative pressure. The Green Building Council of South Africa defines a Green Building "as one that through design, construction and operation, reduces the negative effects development has on the environment" (GBCSA, 2019: 1). Water conservation is one of the key elements in Green Buildings. The real estate industry and specifically Green Buildings are at the forefront of this idea with a focus on sustainable development and operational efficiency (Ellis, 2009).

Green building features and initiatives (GBFIs) are initiatives and features of a building that can contribute to a Green Building rating (Nurick *et al.*, 2013). GBFIs can contribute to a Green Building rating (Nurick *et al.*, 2013). GBFIs can be found in both new buildings and retrofitting of existing properties, in addition to this they are found in both Green certified and uncertified buildings. (Nurick, Morris*, et al.*, 2015). An example of a feature would be the fitment of energy-efficient lighting, while a green initiative would be installing a shower facility, increasing consumption but encouraging users to walk, run or cycle which reduces the building's carbon footprint (Nurick, Morris*, et al.*, 2015).

Corporate Social Responsibility (CSR) is defined as the behaviours and actions of a company that in some way positively benefits society, they are not a legal requirement and fall outside

of the core business of the company (Mckenzie, 2015). CSR has resulted in a desire to go green which has been one of the leading factors affecting change in the sector (Ellis, 2009). CSR traditionally refers to a company's efforts towards being more socially responsible, while the focus of Environmental, Social, and Governance (ESG) incorporates social, environmental and governance factors into its overall business strategy (Gillan *et al.*, 2021).

There are both social and financial benefits realised from Green Buildings, however, the property industry has been reluctant to implement GBFIs because the benefits are disproportionate in relation to the initial capital expense (Nurick, Le Jeune*, et al.*, 2015). However Brown and Southworth (2008) suggest that Green Buildings are one of the most cost-effective measures available to reduce global greenhouse gas emissions. Climate change can be attributed to the 2018 drought experienced in Cape Town and Green Buildings are important because they reduce the impact of climate change going forward and mitigate the current effects of climate change. In addition to this, the Implementation of GBFIs is becoming a necessity.

1.2.6 Linking Facilities Management, Green Buildings and Drought

Droughts and other extreme weather events are increasing which will add pressure to South Africa's water supply (Mukheibir, 2017). In addition to this, there is a drive towards CRS and ESG factors that are becoming increasingly important within organisations. These two factors have resulted in a change of organisational objectives. The role of FM is to identify the organisational objectives and future risks and implement strategic plans that address these factors. The implementation of green building principles and GBFIs into strategic plans of an organisation will address the drive to satisfy CRS and ESG requirements and mitigate the risks of drought.

1.3 PROBLEM STATEMENT

The problem statement considered in this study can be stated as follows:

There is a lack of understanding on the strategic facilities management contingencies implemented by commercial (office) property in response to drought risks in Cape Town. Therefore, commercial property owners are not equipped to implement efficient strategic plans that address water supply risks in South Africa.

1.4 RESEARCH QUESTION

The research question that is discussed in this study is:

What strategic FM contingencies have commercial (office) property owners implemented to mitigate the potential risks of drought?

1.5 RESEARCH PROPOSITION

The research proposition of this study can be described as:

Property owners in the office sector have implemented strategic FM contingencies to address the risks of drought.

1.6 RESEARCH AIM

The aim of this research is as follows:

To establish the level of strategic FM contingencies made by commercial (office) property owners in response to drought conditions.

1.7 RESEARCH OBJECTIVES

The research objectives to be achieved are as follows:

i. Determine the strategic FM contingencies implemented by commercial (office) property owners in relation to drought.

ii. Establish if the strategic FM contingencies were preventative or reactionary to the 2018 drought.

iii. To establish the level of preparedness of property owners and whether there has been a strategic FM initiative, in the form of GBFIs, resulting in changes in direction to address future droughts or extreme weather events.

1.8 METHODOLOGY

A literature review has portrayed an understanding of the research topic. Factors investigated were; strategic FM, climate change, green buildings (new build, adaptation), green building features and initiatives (GBFIs) and water management.

Interview questions were formalised and conducted in a semi-structured interview process. The respondents were members responsible for strategic decisions of properties/portfolios located in Cape Town. The interviews were analysed, interpreted and thereafter conclusions and recommendations were be presented.

There is limited quantitative data relating to commercial property owners and the measures they have implemented as a reaction to the 2018 drought. Therefore, the research methodology took a qualitative approach and was founded on case study analysis.

1.9 RESEARCH LIMITATIONS

Green building practices and the impacts of global warming is largely focused on reducing carbon emissions and energy reduction and efficiency. Comparatively there is a lack of academic research globally and especially in the South African context that deals with water saving measures, specifically in relation to drought or urgent water supply events that are becoming ever more present due to climate change. South Africa not only is a risk of increased weather events as a result of climate change, but it also has to plan for other water supply concerns linked to poor maintenance and governance. Therefore given the lack of research in this field and the increased need to understand this topic, this research should contribute to a better understanding of contingencies used to mitigate the risks of water supply.

Another limitation is the fact that Cape Town is a relatively small area, and there are only a select few organisation that own large commercial (office) property portfolios. Therefore the sample pool is relatively small.

1.10 STRUCTURE OF RESEARCH REPORT

The structure of the research report is outlined below:

Chapter 2 consists of an in-depth literature review which will provide detail on the academic literature relating to the study, these include; drought, climate change, strategic facilities management, green buildings and water management.

Chapter 3 will outline the research methodology and approach of this research paper which will be supported by academic literature.

Chapter 4 will report on the findings from the case studies and provide an analysis of the data to address the research question, aim and objectives.

Chapter 5 will comment on the results determined in chapter four which will either support or refute the research proposition.

CHAPTER 2 - LITERATURE REVIEW

2.1 INTRODUCTION

This chapter comprises a critical analysis of the academic literature in relation to facilities management, green buildings and water management systems in commercial office buildings. The literature review commences with an overview of facilities management with a focus on Strategic and Sustainable Facilities management. Following this, green buildings and water management are discussed. Finally, a link between water management and sustainable facilities management is established.

2.2 FACILITIES MANAGEMENT

2.2.1 Facilities Management Background

The term Facilities Management (FM) emerged in the 1970s and surprisingly there are few studies that investigate the origin of the FM practice (Jensen, 2008; Drion *et al.*, 2012a). Nor and Azman (2014) acknowledge this however they suggest that FM practices far precede the prescribed dates where the term FM was established. FM functions formed part of management until the development of Information Technology (IT) and a rapidly changing business environment drove the necessity of a more organised management practice (Nor and Azman, 2014). It has since developed into a multi-faceted discipline that is constantly evolving (Grimshaw, 2003).

At a very basic level and traditionally FM was seen as the management of buildings and building services (Amaratunga, 2001). However the FM scope has evolved over the years to include; physical factors of the built space; the business and human concerns of facility purpose; financial factors; and the management structures which implement operations and procedures that are integrated across the physical, human and financial aspects of an organisation (Nutt, 1999). Moreover, FM not only seeks to increase economic viability but also by encouraging social and environmental benefits (Alexander and Brown, 2006).

The FM discipline has become increasingly important over the past few decades, which can be highlighted by the establishment of professional institutions internationally which include but are not limited to; The British Institute of Facilities Management (BIFM); International Facility Management Association (IFMA); Facility Management Association of Australia (FMA); and Japan Facility Management Association (JFMA). The South African Facilities Management Association (SAFMA) became a professional body in March 2013 (SAFMA, 2020).

2.2.2 Definition(s) of Facilities Management

Alexander (2003) argues that when professional bodies define FM they tend to highlight individual preferences. Nor and Azman (2014) agrees with this highlighting that FM definitions are both influenced by personal and organisational interest and include cultural differences as a factor that has an impact on FM definitions. Academic researchers have also developed FM definitions, like professional bodies they do not have a commonality which is crucial for the theoretical development of FM (Tay and Ooi, 2001). There is an ongoing debate around the definition of FM, however, there is consensus that FM has a serious identity crisis (Nutt, 2000; Yiu, 2008; Waheed and Fernie, 2009; Drion *et al.*, 2012a) and because the discipline of FM is constantly evolving the definition will only be temporarily and partially relevant (Waheed and Fernie, 2009).

The definitions have evolved over the years, initially focusing on the core aspects of the facility to incorporate broader non – core facilities of the organisation like people and the environment. An example of a dated definition comes from Becker (1990) who stated that "FM is responsible for coordinating all efforts relating to planning, designing and managing buildings and their systems, equipment and furniture to enhance the organisation's ability to compete successfully in a rapidly changing world" . This evolved into the inclusion of people's role with in the work place, where the International Facilities Management Association (IFMA) defined FM in 2003 as "the practice of coordinating the physical workplace with the people and work of the organisation; integrates the principles of business administration, architecture, and the behavioural and engineering sciences" (Nor and Azman, 2014: 4).

Currently one of the most quoted definitions of FM is from the IFMA which defines FM as “a profession that encompasses multiple disciplines to ensure functionality, comfort, safety and efficiency of the built environment by integrating people, place and technology” (IFMA, 2020: 1). Another frequently quoted definition is that from ISO (2017: 1) where FM is an “organisational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business” (ISO, 2017: 1). Brian and Brooks (2009) suggest that whichever definition used it should highlight the importance of integrative and symbiotic disciplines whose goal is to support the organisation and to help meet its business objectives.

Tucker (2012) suggests that for an organisation or business to exist, it must be able to house its business activities. Therefore buildings form an essential part of the foundation of any organisation. Business activities are essentially split into two categories core and non-core business activities. Core business activities are the organisation's service or product, in the case of commercial property owners, this would be providing space to tenants for rent (Tucker, 2012). However in order to deliver the core objectives effectively, they need to be supported by non-core activities (Tucker, 2012). Non-core business activities are services that are required to facilitate and support core business activities including, telephone/computer systems to make business possible, or catering services for employees. In the case of commercial property owners, this would include all facilities and operations in buildings that allow tenants to effectively occupy the property and are needed to support the long-term objectives of an organisation (property owner) (Tucker, 2012). FM is therefore a function within an organisation to facilitate the non-core services in support of the primary or core objectives of the organisation and effective implementation will result in the organisation having a competitive advantage (Chotipanich, 2004).

As previously mentioned, an organisation’s operational facilities were traditionally the primary focus for FM. These are related to day-to-day operations however FM has evolved to be more strategic in nature (Nutt, 2000). Tucker (2012) suggests that it is common to refer to ‘hard’ and ‘soft’ FM functions. ‘Hard’ refers to mechanical or building-related facilities, whereas ‘soft’ is identified as more management-focused services, which include strategic management and organisational and workplace behaviour. The FM function has over time

evolved to include both hard and soft, short and long-term facilities functions. This transition can be identified in more recent definitions and FM contributions to an organisation.

Chotipanich (2004) recognises two factors that position FM within an organisation. Firstly, internal factors include facility features, organisational characteristics and business sector. Secondly external factors including economic, environmental, social, legislative, local culture and context. These should all be taken into account when positioning a FM practice within an organisation, or when reviewing differences in the FM practice across different organisations. With such diversity, some organisations' FM functions would predominantly focus on operational or hard facilities, while others will be more balanced or weighted towards strategic function.

2.2.3 Strategic Facilities Management

Jensen *et al.* (2012: 202) suggest that the development of FM has the following four generations:

1. FM is merely considered as an overhead to be managed for minimum cost rather than optimum value.
2. FM as an integrated continuous process in relation to the organisation's individual business.
3. FM as resource management concentrating on managing supply chain issues associated with the FM functions.
4. FM as strategic management to ensure alignment between organisational structure, work processes and enabling physical environment according to the organisation’s strategic intent.

The above development in FM reflects an evolution from merely an operations or costs-based focus to include a strategic approach to FM (Jensen *et al.*, 2012). This has resulted in a proactive rather than a reactive approach to FM whereby corporate objectives/goals, future problems, scenarios and demands are identified in advance and contingency plans can be implemented and action can be taken in a proactive manner (Langston and Kristensen, 2002).

According to Jack (1994) ‘strategic’ implies planning to meet objectives over the long term and ‘facilities’ includes real estate and services provided for those that occupy them. Management is the professional and effective implementation of resources which are measurable and accountable (Jack, 1994). According to IFMA and RICS (2018: 8) strategic FM “Should move beyond merely managing buildings and assets, to leading on issues related to property search and disposal, the design of space, and the development and promotion of new working methods and technology, to create and deliver workplaces which enhance staff recruitment, retention, and overall success for the organisation”. In addition to this, it should focus on issues like operational sustainability, energy usage, safety and the well-being of those who use the facilities (IFMA and RICS, 2018).

Barrett (2000) developed a generic model for the FM practice that describes the relationship between the organisation, its core business, the external environment and the facilities department where both operational and strategic functions are addressed. Barrett (2000) suggests that FM needs to address all six links in Figure 2.1 to allow the FM function to continue to provide a high level of service operationally but will also address the organisation's strategic objectives. Links 1 – 3 are on an operational level, whereas 4 – 6 are at a strategic level.

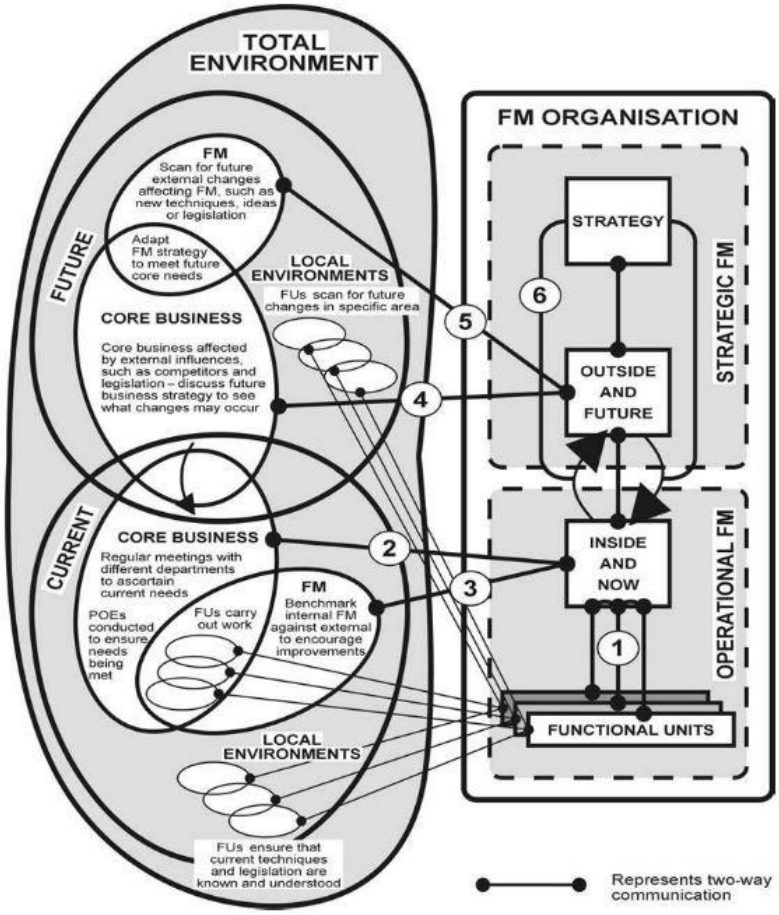

Figure 2.1 - Barrett's genetic Model (Barrett, 2000: 423)

The development of FM has evolved from solely relating to a property function to having a strategic focus and business function (Tucker, 2012). Lindholm (2008) notes the two factors in business strategy that affect shareholder value are revenue growth and profitability. These two facotrs should be incorporated into real estate strategies which manage operational decisions. Lindholm (2008) Identifies seven corporate real estate strategies that support core business strategies, these include:

1. Increasing the value of assets;
2. Promoting marketing and sales;
3. Increasing innovation;
4. Increasing employee satisfaction;
5. Increasing productivity;
6. Increasing flexibility; and

7. Reducing costs

The IFMA provides further insight into the role FM has to contribute to the organisation's profitability and business strategy, these include (IFMA, 2020);

- Impacting operational efficiencies
- Supporting productivity of facilities and personnel
- Managing risks to facilities and personnel
- Mitigating environmental impact
- Promoting sustainable tactics for long-term cost management
- Leveraging technological solutions
- Reducing or overcoming the effects of natural disasters
- Guaranteeing compliance
- Leveraging security

Strategic Facility Planning (SFP) is a process that can lead to improved and proactive delivery of services from a facility management organisation to its stakeholder, it recognises business planning outcomes have a direct effect on an organisation's needs and property assets (IFMA, 2009). It is therefore essential that FM functions have a very clear understanding of the strategic direction of the organisation and industry to ensure that there are resources to meet an organisation's strategic objectives (Tucker, 2012).

Risk management is one of the key aspects of strategic facilities management, and generally, the following risks should be taken into consideration, these can include but are not limited to operational, financial, environmental and social risks (IFMA and RICS, 2018). When assessing risks the FM team should understand the repercussions and strategically prepare to ensure the least amount of negative impact towards an organisation's operations and facilities (IFMA and RICS, 2018).

Alexander (1992) noted that strategic FM establishes important advantages for the organisation which include cost-effective initiatives, it can create a competitive edge and avoiding underutilised and redundant facilities.

2.2.4 Sustainable Facilities Management

In 2015, 196 parties including South Africa ratified the Paris Agreement and since then there has been a focus on climate change and global warming (Gholipour *et al.*, 2022). In CREM the overall goal of sustainability and slowing climate change effects relate to planning, design, construction and FM from a life cycle perspective (Collins *et al.*, 2019). FM has shifted focus to become more strategic with the adoption of maintenance and operational practices that consider social, environmental and economic benefits by engaging in sustainable development (Opoku and Lee, 2022). The global challenge of climate change and the growing necessity to move towards sustainability has resulted in not only going green in new developments but a need to maintain, retrofit and green existing buildings (Opoku and Lee, 2022).

Sustainable Facilities Management (SFM) "includes work to ensure the functionality of the built environment by integrating people, place, process and technology to sustain desired conditions, uses, products, values and services from long-term and ecological views"(Lee and Kang, 2013: 480).

2.2.5 Facilities Management Summary

The practice of FM has a relatively short history and given the drastic change in the organisational environment, society and the world over the past half a century, the identity and purpose of FM are constantly evolving. This is one of the factors that affect the debate surrounding the definition and purpose of the FM discipline between academics and professional bodies. What is clear is that FM has transformed from operations and cost-based management focusing on primary facilities, to have a strategic management function of non-core and soft facilities in support of the primary objectives of the organisation. The FM function has become an integral part of the organisation and in implementing sustainable agenda and green building measures.

2.3 GREEN BUILDINGS

According to Ellis (2009), the idea of sustainability has become more prominent in society as a result of public sentiment, technical advances and legislative pressure. The real estate industry and specifically the green building trend are at the forefront of this idea with a focus on sustainable development and operational efficiency (Ellis, 2009). Green building has increased as a response to mounting concerns about climate change in recent years (Nurick, Le Jeune*, et al.*, 2015). The Green Building Council of South Africa (GBCSA, 2017) defines a Green Building as one that through design, construction and operation, reduces the negative effects development has on the environment. Water conservation is one of the key elements in Green Buildings.

2.3.1 Green Buildings Features and Initiatives (GBFIs)

Green building features and initiatives (GBFIs) are initiatives and features of a building that can contribute to a Green Building rating (Nurick *et al.*, 2013). GBFIs can be found in both new buildings and retrofitting of existing properties, in addition to this they are found in both green certified and uncertified buildings (Nurick, Le Jeune*, et al.*, 2015). An example of a feature would be the fitment of energy-efficient lighting, while a green initiative would be installing a shower facility, increasing consumption but encouraging users to walk, run or cycle which reduces the building's carbon footprint (Nurick, Morris*, et al.*, 2015).

Expanding on the concept of GBFI the term Water Management Features and Initiatives (WMFIs) can be used to identify factors that specifically relate to water management. A number of water management features found in office buildings are listed and explained below:

- Toilets – According to Chanan *et al.* (2003), toilets account for a considerable portion of water usage in office buildings and if modified and efficient can substantially reduce water consumption. Water usage can be reduced to an average of less than 3 litres per flush.
- Urinals – Water use can be eliminated entirely with waterless systems, resulting in a use reduction of approximately 2.8 litres per flush (Chanan *et al.*, 2003).

- Taps – The installation of spray or flow reduction taps can reduce flow from 10 – 12 litres per minute to below 2.5.
- Shower heads – Efficient systems reduce flow from +11 litres per minute to below 5 litres per minute (Chanan *et al.*, 2003).
- Rain collection Systems
- Greywater treatment systems
- Monitoring and metering systems – leak detection and benchmarking
- Roof gardens – Water and wastewater management, helps with insulation (Chanan *et al.*, 2003).

Sheth (2017) identifies a number of other water-saving measures that could be implemented in green buildings, these include the efficient use of water during the construction phase where consumption can be reduced by up to 20% if managed effectively. Other measures include the installation of efficient appliances where efficient dishwashers and clothing washers could use up to 33% less water.

2.3.2 Green Building Rating Tools

The Green Star rating system was adopted by the GBCSA (GBCSA, 2022) as an objective measurement which is internationally recognised for green buildings in South Africa as well as Africa (GBCSA, 2022). The tool considers nine categories including; management, indoor environment quality, energy, transport, water, materials, land –use & ecology, emissions, innovation and socio-economic factors. The weighing of these categories varies depending on the building sector, but once applied they are collated on a scorecard to produce the final rating (GBCSA, 2022). The rating carries such significance that in order to be given a premium or A+ Building grade, which is the highest level, the said property requires a minimum four Star rating by the GBCSA (Rode, 2021).

The GBCSA provides various tools, best practice guidelines and a host of other resources to assist restate the industry. An example of this is the Energy and Water Performance Measurement Tool, which is used by the property industry to assess the efficiency of a building. This useful data can assist the property owner in making decisions in relation to

refurbishment or the need to sell the asset (GBCSA, 2022). In addition to this, the GBCSA has created a Net Zero/ Net Positive rating which can be applied to both new and existing buildings, where ratings in carbon, water, waste and ecology are scored on neutralising and redressing their respective impacts on the environment (GBCSA, 2022). The net Zero/Net Positive system has been used to fast-track the ultimate goal of complete market transformation (GBCSA, 2022).

The GBCSA (2017: 1) defines a Net Zero/Net Positive water building as "a building that is designed, constructed and operated to greatly reduce total water consumption, and then use recycled and reused water such that the amounts of water consumed is the same as the amounts of water that are produced (Net Zero), or if the water recycled/ produced is greater than the water consumed (Net Positive)". Although the GBCSA (2018) has created 5 levels of Net Zero / Net Positive water certification, levels 3 – 5 are defined but a metric has not been created to issue a certification at these levels because there is currently no market for it. These include Level 1: Base Building Consumption, Level 2: includes Base Building Consumption and Building Occupant Consumption, Level 3: Embodied Consumption, Level 4 Renovation Consumption and Level 5: Deconstruction Consumption (GBCSA, 2018). Level 2 Net Zero / Net Positive Water Certifications can be issued to both new builds or major refurbishment projects as well as existing buildings. The certification must be awarded to a new development/refurbishment within 2 years of practical and existing buildings after 12 consecutive months of operational consumption data is collected for submission (GBCSA, 2018).

The GBCSA (2018) created a preferred 4 step pathway to achieve a Net Zero / Net Positive water status. This is illustrated in figure 2:

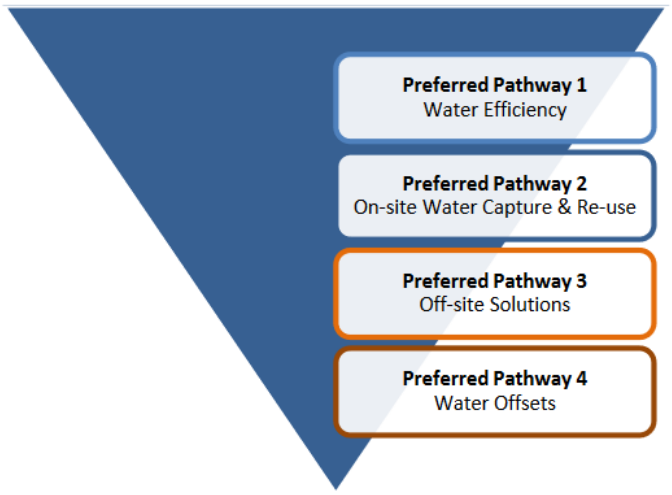

Figure 2.2 – The Preferred pathway to Net Zero / Net Positive (GBCSA, 2018: 23)

The pathway commences with Pathway 1 that commences with water efficiency, thereafter Pathway 2 establishes onsite water capture and re-use (GBCSA, 2018). Pathways 3 & 4 will only be available once it has been demonstrated that they have met 75% of the Onsite Water Checklist measures which includes 13 questions that are used to establish the efficiency of a building. The questions include the following (GBCSA, 2018: 24):

1. Does your project have all tap fittings with 6l/min flow rates or less? (either the fitting itself or flow restrictor)
2. Does your project have all shower fittings with 8l/min flow rates or less? (either the fitting itself or flow restrictor)
3. Does your project have all WCs with 3/6 litre flush systems?
4. Does your project have all urinals with flush capacities of less than 1l per urinal?
5. Does your project have PIR or timer controls on all tap fittings?
6. Does your project have drip irrigation (only applicable to projects with landscaping or gardens)?
7. Does your project have water efficient appliances, where applicable?
8. Does your project have an Air cooled AC System? (or cooling tower with using non-potable water)
9. Does your project have educational/awareness material targeting the User?
10. Does your project have water sub-meters?

11. Does your project have a BMS or other smart monitoring and control system or leak detection system for the projects water usage?
12. Does your site have onsite rainwater harvesting? How many litres?
13. Does your site have onsite greywater system? How many litres?

2.3.3 Existing Office Buildings

The Central Business District (CBD) precincts in almost all developed countries include dated high-rise office buildings (Reed and Wilkinson, 2005). Despite the demand for new buildings, they only make up between 1.5 – 2% of the current building stock in developed countries (Nguyen, 2017). At the current speed of development, it would take approximately 70 – 100 years to replace the current supply of buildings in cities of developed countries (Bullen, 2007).

Typically a building's life cycle is 100 years and they generally undergo a major refurbishment every 20 – 25 years (Reed and Wilkinson, 2008). Buildings can never have an infinite economic life, however, structural decline can be slowed by the implementation of maintenance programs. Maintenance forms part of the building work sequence in the building life cycle, followed by repair, replacement, refurbishment and redevelopment (Mansfield, 2002). If the work sequence is not followed buildings will ultimately become obsolescent resulting in a downturn of rental income and in turn this will have a negative impact on capital value the primary two sources of income for property owners (Reed and Wilkinson, 2005).

To halt the decline in building utility, interventions are required and these come in the form of renovations, retrofits, refurbishments, building conversions and adaptive reuses (Reed and Wilkinson, 2008). According to Nguyen (2017) these interventions should be accessed using the triple bottom line (TBL) approach, which includes:

- Economic sustainability: aiming to consume resources with more efficiency.
- Environment sustainability: aiming to avoid damaging impacts on the environment.
- Social sustainability: aiming to have reasonable effects in all phases for the requirements of people in the building process and to supply superior stages of contentment to clients, suppliers, employees and communities.

There are convincing environmental, social and economic reasons why property owners should look at GBFIs when refurbishing existing buildings (Reed and Wilkinson, 2008). Both the drivers and barriers affecting a change toward sustainability are outlined below.

2.3.3.1 Drivers affecting a change toward sustainability

There are three major role players in sustainability, these are governments, corporations and citizens (Lankoski, 2016) where corporations represent a considerable role in achieving sustainable development (Ashrafi *et al.*, 2018). One of the influences of sustainability within a corporation is Corporate Social Responsibility (CSR), which is defined as the behaviours and actions of a company that in some way positively benefits society, they are not a legal requirement and fall outside of the core business of the company (Mckenzie, 2015).

CSR traditionally refers to a company's efforts towards being more socially responsible, while Environmental, Social, and Governance (ESG) focus on how a company incorporates these three factors into its overall business strategy (Gillan *et al.*, 2021). According to Armstrong (2020), the term 'environment' in the context of ESG refers to a company's recognition of issues such as climate change, population growth, and its own potential negative impact on the environment. Meanwhile, the term 'social' encompasses elements of corporate social responsibility (CSR) within the overall ESG framework (Armstrong, 2020).

Ng *et al.* (2022) identify that there are a number of external factors that encourage CSR practices in organisations which can include normative social pressure. Social pressure is the shift in attitude towards sustainability which drives conformity to sustainable agenda, it creates competition and can ultimately influence profitability. Intimidation pressure is where rapidly changing societal expectations result in applied pressure to change practices to be more sustainable. Internal factors encouraging CSR are top management's commitment, where leaders within the organisation drive business strategy and ethics and are influenced by external pressures in addition to profit (Ng *et al.*, 2022). CSR has increased the need to become sustainable which has been one of the leading factors affecting change in the real estate sector (Ellis, 2009).

To highlight the impact of both CSR and ESG, Gillan *et al.* (2021) noted that 86% of the companies on the S&P500 released corporate responsibility or sustainability reports during 2018 which is drastically more than the under 20% reported in 2011. In addition to this, 300 mutual funds that had ESG mandates received $20 billion (USD) in investment which was four times that in 2018. Rapson *et al.* (2022) noted that ESG reporting on the Johannesburg Stock Exchange (JSE) had increased mirroring international trends. The JSE had recently release The Sustainability Disclosure Guidance and Climate Disclosure Guidance to inform JSE-Listed companies about best practice in ESG and climate disclosures (Rapson *et al.*, 2022).

Both the tenant and landlord have varying CSR/ESG requirements and a study recently found that tenants are the greater driver toward implementing sustainable solutions in properties, where landlords are interested in securing long-term tenants (Rameezdeen *et al.*, 2017). In addition to this, Oguntona *et al.* (2019) Identified tenants are demanding green initiatives for not only the environmental impact but also for occupancy costs.

A number of water restrictions were implemented during the 2018 drought and these can be identified as drivers toward the implementation of WMFIs (Basson *et al.*, 2018). According to Taing *et al.* (2019), the CoCT updated the water by-law which made significant adjustments to regulations that encourage diversification of water sources, water conservation and sustainability. The amendments were promulgated on 20 July 2018 and include the following which will directly affect commercial property owners (CoCT, 2018c; Welz, 2018):

- The municipality will provide one water meter to a property. The owner is required to meter different units, keep records and report high users to the authorities.
- For all new developments and where a renovation project triggers an approval process, owners are now required to submit a detailed plan for water conservation and demand management system or alternative water system installation that requires approval. The act defines an alternative to water as water that is not sourced municipal drinking water and includes grey water, rainwater, treated effluent, surface water and borehole, well point or spring water (CoCT, 2018c).
- There should be no cross-connection between potable and non-potable water.
- Toilets cisterns reduce their capacity from 9 litres per flush to 6 litres.
- Showerheads must have no more than 7 litres per minute, down from 9.5 litres.

- Urinals with automatic flushing systems should be replaced with waterless systems that are maintained or manual systems.

Between 1996 – 2020 water and electricity tariffs have increased by 1270% and 1120% respectively compared to an inflation rate of just 296% over the same period (Capes and Moolman, 2022). Part of the CoCT strategy in reducing water consumption is to use pricing as a deterrent, so one would assume this would (CoCT, 2019). Above inflation municipal services costs result in lower rental returns and ultimately result in lower capital values of properties.

GBCSA (2019) recently released a report which compared Green Star A-Grade office's financial performance to conventional (non-rated) buildings where; Green Star rated offices produced a total return of 11.6% compared to 8% and capital growth was 3.3% compared to -0.8%, respectively. This resulted in a lower discount rate, lower capitalisation rate, higher net income, higher growth and lower vacancy rate (GBCSA, 2019). Bond (2010) identified that a driver of green buildings was achieving a green rating given both the financial implications and organisation ESG/CSR agenda.

2.3.3.2 Barriers affecting a change toward sustainability

Nurick, Le Jeune*, et al.* (2015) suggests that one of the barriers to the adoption of green features is that the associated costs do not result in the required return on investment. However it is difficult to assess the performance of sustainable initiatives in relation to financial benefits over the long term (Nguyen, 2017). According to Nguyen (2017) another barrier to implementing green initiatives is that there is a lack of knowledge of sustainable new technologies. In addition to this Bond (2010) noted that there was a lack of skilled FM professionals that had the capability to ensure the high performance of properties. Bond (2010) identifies split incentives as a barrier to the implementation of green buildings, where landlords invest in green buildings but they do not see the financial benefit, whereas tenants enjoy a reduction in consumption and related costs and enjoy increased employee productivity.

2.3.4 Green Buildings Summary

The idea of sustainability has become more prominent in society as a result of public sentiment, technical advances and legislative pressure. GBFIs/WMFIs and sustainable agenda have increased in the real estate industry and have been driven by legislation, CSR/ESG and economic considerations. The barriers to implementing GBFIs include capital and operational costing and limited information about solutions. Water conservation is one of the key elements in Green Buildings and as a result of the drought and increased pressure on water supply restraints in South Africa are becoming increasingly important. The following section reviews the appropriate literature relating to water management in commercial (office) buildings.

2.4 WATER MANAGEMENT

The Western Cape Government (WCG) recently released its 2020 – 2021 property efficiency report, which benchmarked 37 buildings totalling 210 578m^2 against the private sector (WCG, 2022). The report focuses on four areas including energy and water consumption, space utilisation and occupancy cost (WCG, 2022). It was reported that water consumption reduced from 1.1 kL/m^2/pa in 2015/2016 to 0.54kL/m^2/pa in 2019/2020, this represents a 51% decrease in water consumption over the period. In the 2020/2021 period consumption was further reduced to 0.41kL/m^2/pa and this outperformed the industry benchmark of 0.85 kL/m^2/pa (WCG, 2022). It is however noted that COVID – 19 made a large impact to the efficiency of buildings given the reduced workforce during this time (WCG, 2022).

The CoCT released its water strategy in 2019 where it envisioned by 2040 the city will be water sensitive by optimising water resources which will improve resilience, and competitiveness and progress the lives of people (CoCT, 2019). The city includes 5 commitments being; safe access to water and sanitation; wise use; sufficient reliable water from diverse sources; shared benefits from regional water resources and being a water-sensitive city (CoCT, 2019). The plan is clear to change the way all stakeholders - people, organisations, institutions and government think about water, change/sustain usage habits and implement a diversified water resource mix as indicated in figure 2.3:

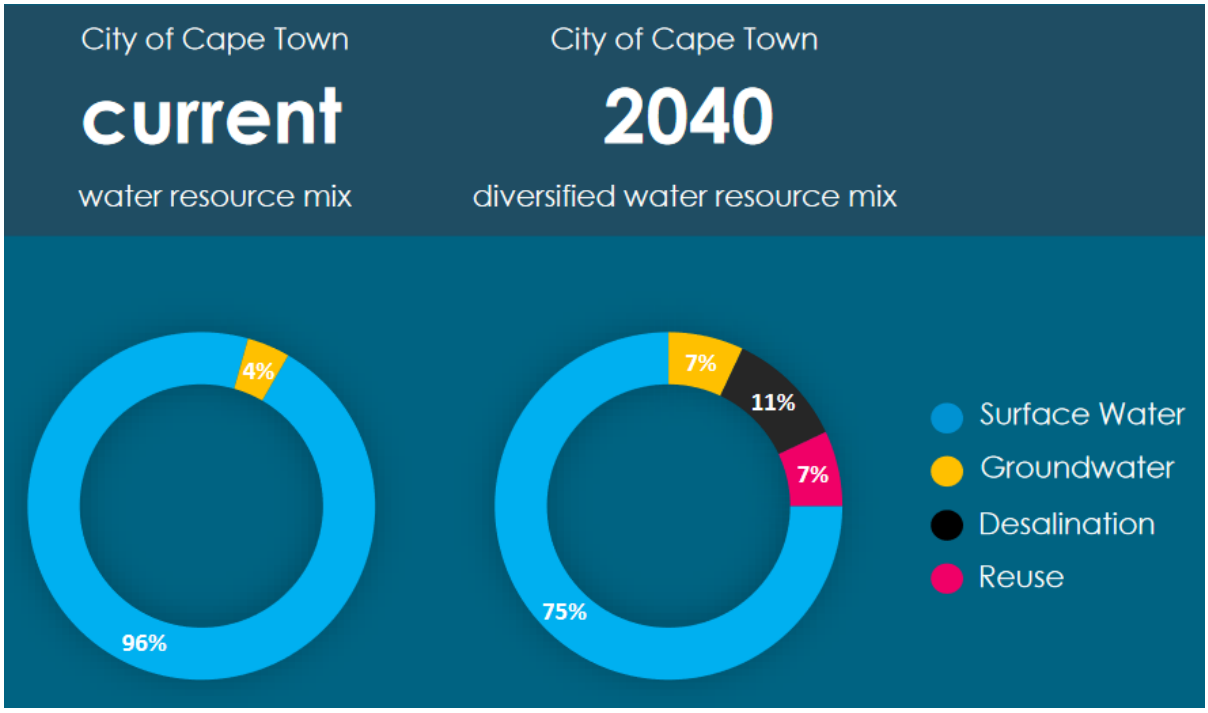

Figure 2.3 - Forecasted change to Cape Town's water supply (CoCT, 2021: 11)

According to Cook *et al.* (2014), the commercial property sector in Brisbane uses about 15% urban water supply. This compares to the CoCT's water usage where commercial consumption accounted for 14.6% of the total water use in the 2017/2018 period (CoCT, 2018b). A case study found that over 50% of water usage in a commercial property could be substituted by non-potable supplies (Chanan *et al.*, 2003). Figure 2.4 reflects the average water consumption in a commercial office building in Australia.

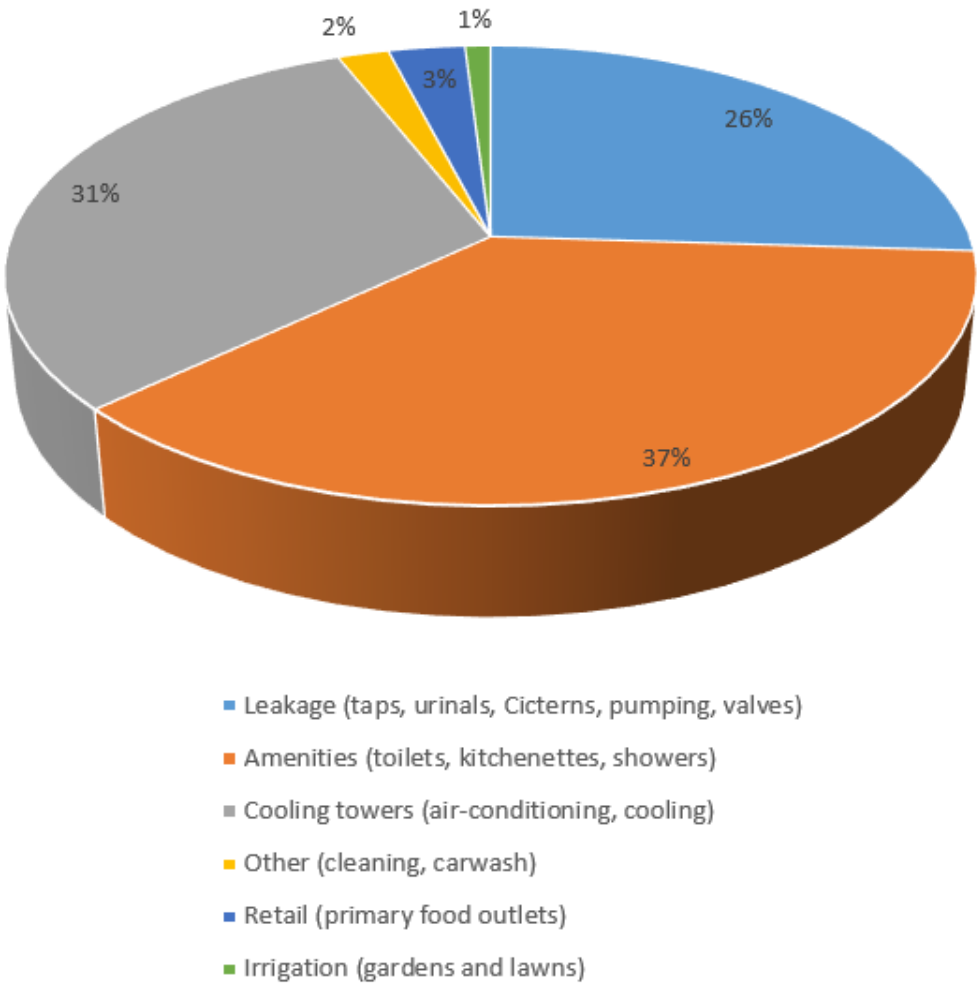

Figure 2.4 - Average water consumption in a commercial building (Quinn *et al.*, 2006)

These figures aligns with the Sustainable Property Guide produced by the Department of Environment and Climate Change of New South Wales (DoEaCC), where leakage accounted for 28% of water consumption in a typical commercial building (DoEaCC, 2009). Figure 2.4 identifies where the biggest opportunities are to potentially save water (TaIC, 2009).

The Trade and Industry Chamber (TaIC, 2009) released a stakeholder accord on water conservation in the commercial sector in South Africa. It described the four types of water in commercial buildings, which include; potable water - which is fit for human consumption; grey water - which is water discharged from bathrooms including washbasins, showers and baths; black water, which is water used in urinals and toilets, and finally; stormwater/rainwater – which is accumulated on site and either discharged via the

stormwater system or stored and reused in the building water cycle (TaIC, 2009). According to Gleick *et al.* (2003), user water needs can be met with varying water qualities. Chanan *et al.* (2003) suggest that sustainable water management programs are based on the principles of the Water Quality Cascade with end users, where water sources and their associated quality and risk are matched to end users. Figure 2.5 reflects this relationship:

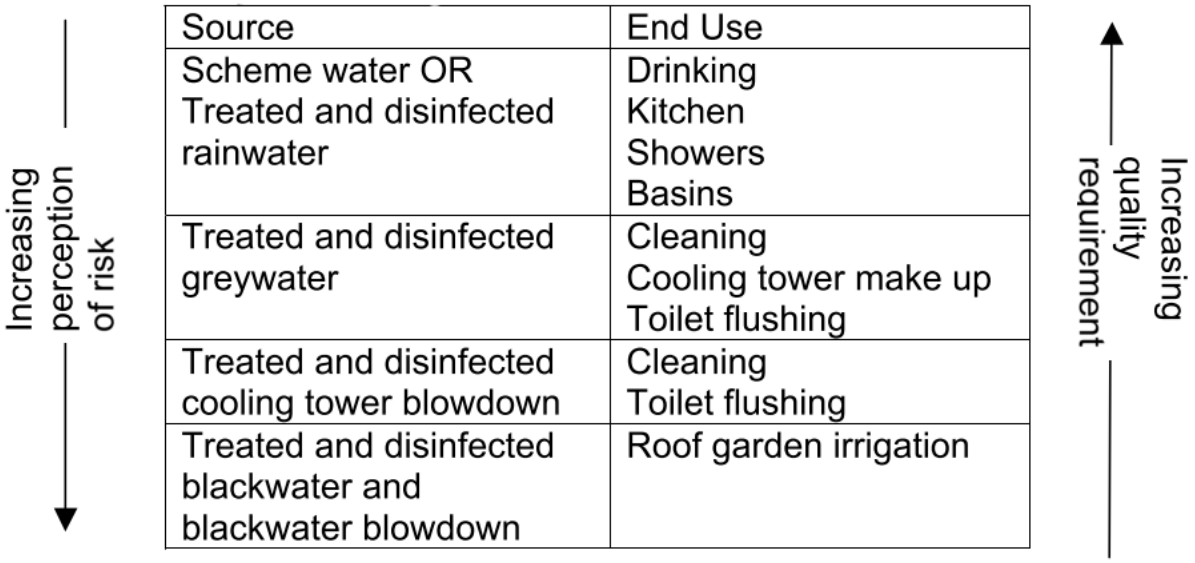

Figure 2.5 - Water quality cascade with end users (Chanan *et al.*, 2003: 3)

Potable water resources should therefore be reserved as far as possible for drinking, kitchen, shower and basin consumption. Introducing grey water and rain collection systems could reduce the reliability of Municipal supply and substantially reduce costs. Chamber (2009) illustrates the key components of a water management system of a typical commercial site in Figure 2.6.

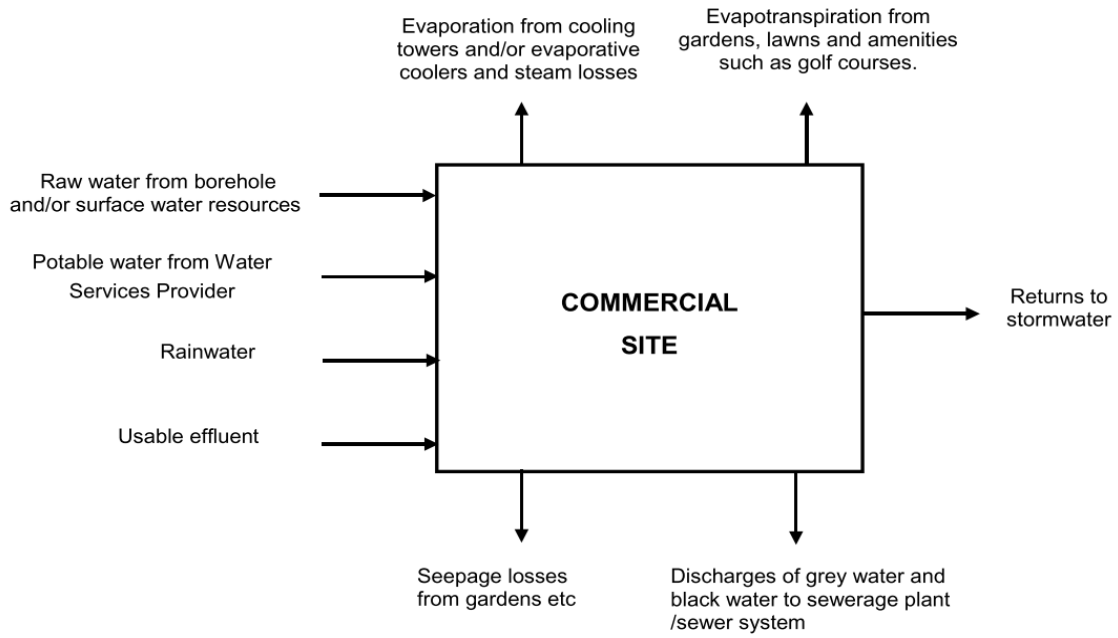

Figure 2.6 - Water management system on a commercial site (Chamber, 2009: 5)

DoEaCC (2009) provide a ten step guide on water consumption reduction.

Step 1 – Measure baseline performance

Understand the current water system, various supplies and demands and thereafter implement the means to measure consumption (DoEaCC, 2009). Understanding consumption in the foundation to change, helps identify potential leaks and areas where consumption could be reduced. Absolute water use is the sum of all water sources used by the property and water use intensity is the absolute water use divided by the building floor area (TaIC, 2009).

Step 2 – Benchmark performance

Understand how your building or portfolio performs against industry benchmarks, this will help identify saving opportunities and understand performance compared to competitors (DoEaCC, 2009).

Step 3 – Set Performance targets

Water consumption targets should parallel the organisation's sustainable goals and should be achievable and practical (DoEaCC, 2009).

Step 4 – Develop a water action plan

The water action plan should include short-term opportunities (generally within 3 years), which include building maintenance and operational procedures; medium-term solutions (between 3 – 5 years) and long-term opportunities (+5 years) will include more CapEx-heavy installations (DoEaCC, 2009). The plan should identify responsibilities and have an achievable timeframe.

Step 5 – Collect Data and monitor performance

Review existing water monitoring and data management systems and assess if any improvements are required to accurately collect data, including separate meters for tenants and key identified portions of the property like cold and hot water supplies, cooling towers and outdoor areas and water features (DoEaCC, 2009).

Step 6 – Update building maintenance and operational procedures

Reviewing operational and maintenance procedures to ensure that water-saving measures are included in everyday activities. This includes maintenance of equipment and fixtures and fittings and ensuring leaks are attended to (DoEaCC, 2009).

Step 7 – Integrate water management into contracts

Examine contracts with contractors and service providers and make provisions that promote water consumption, these can include subcontractors using their own water sources, or the use of waterless solutions (DoEaCC, 2009).

Step 8 - Report performance monthly

Ensure that monthly reporting is accessed against performance targets and investigate unusual events to identify water wastage risk which includes leaks (DoEaCC, 2009).

Step 9 – Engage with tenants

Communicate with tenants on their consumption and make recommendations as to how they can reduce water savings. Include them in the process and report on how you are improving the property (DoEaCC, 2009).

Step 10 – Review Performance

Review the water use trends and assess how you have performed against your performance targets. Question if there is more that can be done and how can further water consumption reduction be realised in the next 12 months.

2.5 LINKING STRATEGIC FACILITIES MANAGEMENT TO WATER MANAGEMENT

Strategic FM must have a clear understanding of the organisation's strategic goals and ensure that the resources are available to meet these objectives (Tucker, 2012). In recent years there has been a dramatic increase in ESG requirements which emphasise sustainability (Gillan *et al.*, 2021). This has resulted in sustainability being a prominent objective in many organisations, specifically organisations that are involved in property ownership.

Climate change and the risks associated with commercial buildings have emphasized sustainable development (Warren, 2010). Basson *et al.* (2018) identified that as a result of the 2018 drought property owners were looking for ways to reduce water consumption. This was a priority for both the reduction of cost, importantly for the sustainability of Cape Town and the ability for properties to continue to be occupied and produce income as intended. Strategic objectives of organisations that own properties have changed drastically considering the development of climate change and ESG agenda more recently and the 2018 drought brought water management to the forefront.

A review of a number of listed property funds websites and financial reports emphasises the importance of sustainability, and green star-rated buildings, which include both energy and water-related initiatives (Growthpoint, 2023) (Spear, 2023) (Redefine, 2023). It is clear that sustainability, specifically water conservation during the 2018 drought period, became one of the primary objectives of property owners in Cape Town. Although water reduction measures are not as emphasised today, it is clear that it is still an area of focus along with an ESG agenda.

2.6 CHAPTER SUMMARY

Water supply is of growing concern in both in South Africa and globally due to climate change. This was emphasised by the 2018 drought which created awareness and drove a change which focused on the importance of the implementation of efficient water practises. The drought lead to changes in legislation and coupled with the increase in importance of ESG globally which included green building practices has resulted in a strategic shift in thinking and a need for organisations to become more water efficient. Strategic FM is the driving force behind the implementation of systems, plans and projects required to meet the organisational objectives. Water Management systems and various WMFIs are the cornerstones of water reduction and are the tools that strategic FM uses to get closer to a Net Zero / Net Positive scenario which would ultimately limit the risk associated with water supply concerns.

CHAPTER 3 – METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the research method used for collecting qualitative data, including its justification and how it aligns with the research question and propositions presented in Chapter 1.

3.2 RESEARCH METHOD

There are many different definitions of research, however, Amaratunga *et al.* (2002) identify that there appears to be agreement that research is a process of enquiry and investigation, that is methodical and systematic and ultimately increases knowledge. There are two schools of thought in research, these are the positivistic and interpretivist paradigms. The positivistic paradigm takes a scientific stance, it focuses on data without being influenced by human bias and is objective (Alharahsheh and Pius, 2020). The interpretivist paradigm was developed through a critique of the positivistic paradigm with a subjective perspective (Alharahsheh and Pius, 2020). The interpretivist paradigm considers variables within a subjective context which is influenced by different cultures, environments and circumstances (Alharahsheh and Pius, 2020).

Quantitative research forms part of the positivistic paradigm. Hammarberg *et al.* (2016) identify that quantitative methods research factual data that is needed to answer the research questions. It reduces data to numbers to allow for statistical analysis where social or psychological factors are an objective reality which can be measured and ultimately predicted (Gelo *et al.*, 2008). Qualitative research falls under the interpretivist paradigm which studies an individual's subjective experiences and associated meanings (Starman, 2013). Qualitative research methods are actioned when research questions relate to experiences or actions and they are studied from the viewpoint of the participant (Hammarberg *et al.*, 2016). Qualitative

research collects data in a non-numerical form and views social or psychological factors as constructed and subjective (Gelo *et al.*, 2008).

3.2.1 Case Study

The case study is believed to be the first type of qualitative research however there may also be a combination of both quantitative and qualitative approaches in case study research (Starman, 2013). Crowe *et al.* (2011) state that quantitative case study data collection can be collected from multiple sources of evidence, including questionnaires, audits or analysis of routinely collected data. Qualitative techniques include observations, focus groups and interviews (Crowe *et al.*, 2011).

The case study is used in research when the researcher requires an in-depth and multi-faceted understanding of a complex issue or event or practice in a natural environment (Crowe *et al.*, 2011). According to Yin (2003), case study research should be used when: The research is answering how and why questions; the behaviour of those involved cannot be manipulated; the contextual conditions are relevant to the research, and; the boundaries are not clear between the phenomenon and the context.

3.2.2 Multiple Case Studies

When reviewing case studies as a potential research method the researcher must identify if it is prudent to use a single case study or if a richer understanding of the phenomenon will be gained by conducting multiple case studies (Baxter and Jack, 2008). According to Amaratunga and Baldry (2001), case study research design can use single or multiple cases, where the use of multiple cases can result in stronger results where themes are supported in results. If the research is questioning a unique or extreme situation, then a holistic single case study would be appropriate (Yin, 2003). However, if the researcher is comparing various cases or the study aims to identify parallel themes in the research results then a multiple-case study design would be an appropriate selection (Yin, 2003). A multiple case study will allow the researcher to analyse the data within each case study and across various case studies (Baxter and Jack, 2008). According to Gustafsson (2017), multiple case studies enable the researcher to identify similarities and differences in the various cases, and they can provide support for contrasting

results or similar findings. In addition to this multiple case studies provides empirical evidence that allows for theory building and verification (Amaratunga and Baldry, 2001).

3.2.3 Limitations and Credibility of Case Study Research

According to Amaratunga and Baldry (2001), some of the criticisms of case study research include that there is a lack of rigour and excessive bias. However, the evidence collected from multiple case studies is considered to be more robust (Amaratunga and Baldry, 2001). Flyvbjerg (2006: 1) suggests that there are five misunderstandings related to case-study research, these include:

1. Theoretical knowledge is more valuable than practical knowledge;
2. One cannot generalise from a single case, therefore the single case study cannot contribute to scientific development;
3. The case study is most useful for generating hypotheses, while other methods are more suitable for hypotheses testing and theory building;
4. The case study contains a bias toward verification; and
5. It is often difficult to summarise specific case studies.

Flyvbjerg (2006) debunks these perceptions but rather identifies several basic elements to ensure case study research is credible and valid. These include the following: The research question and proposition are clearly defined and substantiated; a case study is an appropriate method for the research question; sampling strategies have been correctly applied for the case study; systematic data collection and management, and; the data is analysed correctly (Flyvbjerg, 2006).

Yin (1994) states that four design tests need to be passed for a research study to be validated. These include; construct validity – where the correct operational measures are established for concepts being studied; internal validity – where a causal relationship is established; external validity - where the domain in which the study's results can be generalised; and, reliability – that the operations of the study can be repeated resulting in the same outcomes.

3.2.4 Justification of Research Method and Cases

A qualitative case study method has been adopted for the purposes of this research. This is because the research question relates to subjective actions taken by organisations as a response to the 2018 drought in Cape Town. Multiple case studies have been proven to be stronger or more reliable compared to single case analysis. In addition to this, thematic analysis was used to analyse the qualitative data across the multiple case studies.

3.2.5 Sampling

There are three broad approaches to selecting a sample in qualitative case study research which often overlap, these include convenience, judgement and theoretical sampling (Marshall, 1996). Theoretical sampling, although unrelated to this study, is the process of selecting subjects to support emerging theories drawn from previous studies (Marshall, 1996). Convenience sampling is selecting the most accessible subjects and is seen as the least rigorous sampling technique (Marshall, 1996). Purposive sampling, also known as judgemental sampling, is believed to be the most common sampling method (Marshall, 1996). This is where the researcher actively chooses the subject who is most likely to provide data to answer the research question (Marshall, 1996).

The subject group of this research study is relatively small, being 'large' commercial office property owners in the Cape Town CBD. Purposive or judgmental sampling was used because the case studies identified were those who own large commercial property portfolios in Cape Town and were affected by the 2018 drought. Furthermore, there was a duality between purposive and convenience sampling as both sampling techniques were used because although a number of organisations were asked to take part in this research project, but only those that were available and accessible to the researcher took part in the study. Executives and upper management were targeted as respondents for the research. The respondents all understood the strategic objectives of the organisation and had oversite of the operations thereof.

3.3. UNIT OF ANALYSIS

Huberman and Miles (1994) and Yin (2003) suggest that the unit of analysis and the case study are identical. However according to Grünbaum (2007) the concept of the unit of analysis has not been sufficiently clarified and there is a lack of differentiation between the case study and the unit of analysis. Kumar (2018) suggests that there are a number of categories of unit of analysis which include individuals, groups, organisation, social artefacts and interactions. Kumar (2018) states that identifying the correct unit of analysis is the key element the research process and when the unit of analysis is not clearly identified the researcher cannot define a research problem and execute the research process effectively.

Gerring and McDermott (2007) identify that a case study is an in-depth analysis focused on one or more units, aiming to uncover characteristics shared with a larger category of units that are likely similar but not identical. The unit of analysis can be understood as the entity that is being analysed in a research in the research question (Dolma, 2010). The research question in this report is what strategic FM contingencies have commercial (office) property owners implemented to mitigate the potential risks of drought? The unit of analysis in the research project is therefore companies that own commercial (office) properties in Cape Town and were affected by the 2018 drought.

3.4 DATA COLLECTION TECHNIQUE

According to Barrett and Twycross (2018), a common characteristic of qualitative studies is collecting data through interviews, which provide a direct and simple method of acquiring in-depth and abundant information concerning a specific subject. Lopez and Whitehead (2013) state that interviews in qualitative research can be unstructured, semi-structured and occasionally structured. The type of interview used will be impacted by the research question, the approach of the researcher and the characteristics of the participants (Barrett and Twycross, 2018). Interviews can be held face to face and telephonically or online which has become more popular in recent years given time constraints and geographical barriers (Lopez and Whitehead, 2013).

There are several challenges relating to interviews including their time-consuming nature, where interviews are required to be recorded and then transcribed and analysed (Barrett and Twycross, 2018). The outcome of interviews and the associated quality of data is very much dependent on the ability of the interviewer (Lopez and Whitehead, 2013). However interviews allow the researcher the opportunity to gather data from the perspective of the participant (Lopez and Whitehead, 2013).

3.4.1 Unstructured and Structured Interviews

Unstructured interviews are not predetermined, interviews are designed to be informal and conversational with a focus on allowing the participants to express themselves in a natural and telling way (Lopez and Whitehead, 2013). According to Barrett and Twycross (2018) a discussion will normally revolve around a single question with the interviewer and interviewee shaping the conversation as opposed to having a prewritten interview schedule. This interview method is appropriate when participants are expected to describe their life or experiences (Barrett and Twycross, 2018).

Structured interviews are not very common in qualitative research, they follow a set list of questions which remain open-ended and are often started with 'how', where', 'why' or 'when' (Lopez and Whitehead, 2013). This distinguishes them from quantitative interviews which only ask closed questions (Lopez and Whitehead, 2013).

3.4.2 Semi-structured Interviews

According to Barrett and Twycross (2018), a carefully crafted semi-structured interview should make sure that important information is captured while also providing room for participants to express their unique perspectives and individuality. Lopez and Whitehead (2013) state that semi-structured interviews have a guide providing a set of themes for discussion and questions are designed to ensure the research questions and objectives are covered in depth. However, unlike structured interviews, there is the ability to ask questions in any order and ask the following questions in seeking clarification or elaboration of answers (Lopez and Whitehead, 2013).

3.4.3 Justification of Data Collection Technique

Semi-structured interviews have been selected as the data collection technique for this research. Unlike structured and unstructured interviews, this interview method allows for discussion and allows the interviewer to ask for further elaboration and seek clarity to ensure that the research question and objectives are properly addressed (Lopez and Whitehead, 2013).

3.5 ETHICAL CONSIDERATIONS

When conducting Semi-structured interviews in case study research of organisations, a number of ethical concerns need to be considered. McGregor (2023) lists some of the ethical concerns considered as part of this research being; Informed Consent - the researcher should obtain signed and informed consent to conduct a study from both the interviewee and the organisation; Confidentiality - the scope of confidentiality should be explained and clarify if the organisation's identity will be revealed or kept anonymous; Data Security - clarity on how the data will be collected, stored and used; and Handling of Findings and Results - confirmation ahead of time with the organisation and the interviewee what the findings/results will be used for.

Before the data collection process of this research project commenced, ethics clearance was approved by the University of Cape Town Ethics committee, attached as Annexure B. Ethics clearance submission included the research proposal, an information sheet and consent form (Annexure C) outlining some of the ethical considerations which was to be sent to the participants, and list of research questions. Ethics Clearance was approved by the University. This process mitigated the ethical risk in this research project.

The information sheet and consent form was sent to the participants, the information sheet presented an overview of the research topic, explained the project and outlined some of the ethical considerations of this project. These included information relating to informed consent, confidentiality, Data collection and security and outlined the handing of findings and results. The researcher did not continue without the signed consent from the participants and all ethical risks were considered.

3.6 INTERVIEW DESIGN

Data for this research was collected from participants from three organisations by using the semi-structured interview technique. The questions used in the interview were sourced from the academic literature. The interview design and questions were structured to allow the participant to answer questions on behalf of their respective organisations. The participants roles within the organisation for each case vary, however all participants where involved with strategic decision make within their respective organisations and they had a high level of knowledge relating to the research topic. Each interview lasted between 45 – 60min and they were recorded over an online video platform, with prior consent of the participant.

The following questions emerged from the literature review which was applied to each of the case studies during the semi-structured interview process. Table 3.1 comprises the semi-structured interview question, reasoning and corresponding source from the literature.

3.6.1 Interview Questions

Question 1:
How long have you been with X organisation and what is your current position?
Reason and source of question:
Establish if the participant has adequate knowledge of the company.
Question 2:
Prior to the 2018 drought, please explain the organisation's strategic approach to green buildings, drought risks and specifically water management?
Reason and source of question:
The question was asked to understand the strategic intent and approach to green buildings' drought risks and water management of the company before the drought. It allows the researcher to have base information and assess changes in strategic direction as a result of the 2018 drought. Langston and Kristensen (2002) argue that a strategic approach to

facilities management has resulted in a proactive approach rather than a reactive approach to FM.
Question 3:
Water management features include consumption-reducing fixtures and systems, like taps, urinals, showerheads and toilets, rain collection systems, grey water systems, tenant education, monitoring and metering systems etc. What water management features and initiatives were in place before the 2018 drought?
Reason and source of question:
This question is designed to understand what WMFIs were in place prior to the 2018 drought. It establishes a base to understand if the behaviour has changed. A number of WMFIs have been listed by Chanan et al. (2003).
Question 4:
Do you believe the organisation had adequate contingency or risk plans in place to deal with the 2018 Cape Town drought?
Reason and source of question:
To identify if the organisation was sufficiently prepared for the 2018 drought. Risk management is one of the key aspects of strategic facilities management. When assessing risks the FM team should understand the repercussions and strategically prepare to ensure the least amount of negative impact towards an organisation's operations and facilities (IFMA and RICS, 2018).
Question 5:
What unplanned or reactive contingencies were implemented during the 2018 drought? Please elaborate.
Reason and source of question:
The question is designed to identify what emergency or reactive measures were implemented by organisations in reaction to the drought. Taing et al. (2019) identify that in response to the drought, the CoCT updated the water by law and made significate changes to the regulations which would force a reduction in water consumption.
Question 6:

Since the 2018 drought has the organisation's strategic approach to green buildings, drought risks and specifically WMFIs changed? Please elaborate.
Reason and source of question:
Following Question 2, this question is designed to understand if the strategic direction of the organisation has changed. Langston and Kristensen (2002) argue that a strategic approach to facilities management has resulted in a proactive approach rather than a reactive approach to FM.
Question 7:
Since the 2018 drought which additional water management features and initiatives have been introduced in your office buildings in Cape Town?
Reason and source of question:
Following question 3, the question is designed to establish what WMFI's have been introduced after the 2018 drought. A number of WMFIs have been listed by Chanan et al. (2003).
Question 8:
When refurbishing or upgrading existing buildings, what strategic measures are being implemented to mitigate the risks of drought?
Reason and source of question:
New buildings with new technology only make up about 1.5 – 2% of the current building stock in developed countries (Nguyen, 2017). Toward the end of a property life cycle, the usefulness of a building decline. Interventions are required and these come in the form of renovations, retrofits, refurbishments, building conversions and adaptive reuses (Reed and Wilkinson, 2008). Given the large number of older buildings found in Cape Town, establishing what strategic measures are being implemented in refurbishments is important in understanding how strategic objectives have changed as a result of the drought.
Question 9:
What are the main factors that drive the implementation of green building practices and specifically that of water management features and initiatives, and have these changed since the 2018 drought?
Reason and source of question:

The question was asked to understand the drivers that cause the use of WMFIs and what role the 2018 drought had behaviour? Some of the drivers of sustainability include corporate social responsibility, Legislation and financial (refer to 2.2.5 above).
Question 10:
What are the main barriers to implementing green building initiatives, specifically water management features and initiatives?
Reason and source of question:
The question was asked to understand the barriers preventing the implementation of WMFIs. Some of the barriers include the high capital cost of installations, the property owner's return on investment and a lack of knowledge of solutions (refer to 2.2.6 above).
Question 11:
Does your organisation use water monitoring/metering systems, is the data used for benchmarking and were these introduced before the drought?
Reason and source of question:
This question is designed to see if water consumption has reduced as a result of the water management contingencies implemented by the organisation. The CoCT recorded a 51% decrease in consumption between 2015/2016 to 2019/2020 (WCG, 2022). The GBCSA (2022) provides a water performance measurement tool, which benchmarks water efficiency.
Question 12:
Has the organisation's water consumption decreased since the drought, if so by how much? And are you planning on a further reduction in consumption over the next 5 years?
Reason and source of question:
The CoCT recorded a 51% decrease in consumption between 2015/2016 to 2019/2020 (WCG, 2022). The GBCSA (2022) provides a water performance measurement tool, which benchmarks water efficiency. The question also understands how effective the measures implemented have been in reducing consumption and establishes if there has been a permanent change in the behaviour and strategic direction of the organisations.
Question 13:
Do you believe that your organisation is adequately prepared for another drought or other water supply concerns in South Africa?

Reason and source of question:
Following question 4, the question establishes if the organisation is better prepared for another drought. Did the drought change the strategic direction of the organisation and are they better prepared for the future? Checking if there is a proactive rather than a reactive approach to FM to cater to future risks (Langston and Kristensen, 2002).

Table 3.1 Interview Questions

3.6.2 Case Study Anonymity Coding

Three organisations took part in this case study research project. The identity of the organisations and the participants has been kept confidential. To simplify the understanding and interpretation of the information related to each organisation and interviewee, coding has been established. CS1's transcript is attached as annexure B. Tables 3.2 & 3.3 show the coding structure and respondent labelling, respectively.

3.6.3 Coding Structure

CS1	*R*	*x*	*y*

The key to respondent labelling
CS1 = Case Study Number

R = Respondent
x = Position in the organisation and respondent number
y = Size of the Portfolio

Table 3.2 - Coding Structure

3.6.4 Respondent Labelling

Respondent Label	Position in the company	Size of Commercial portfolio
$CS1R^{AM1}{}_{b}$	Asset manager 1	b
$CS1R^{AM2}{}_{b}$	Asset manager 2	b
$CS1R^{PM1}{}_{b}$	Property manager 1	b
$CS2R^{COO}{}_{c}$	Chief Operations Officer (COO)	c
$CS3R^{OD}{}_{c}$	Operations Director (OD)	c
Key For portfolio size in Cape Town		
a = 0 - 49 999m² b = 50 000 - 99 999m² c = + 100 000m²		

Table 3.3 - Respondent Labelling

3.7 DATA ANALYSIS METHOD

3.7.1 Thematic Analysis

Thematic analysis is a method by a researcher to identify, analyse, organise and report themes within a data set (Braun and Clarke, 2006). According to Joffe (2012) the goal of a thematic analysis is to identify the most important themes of meanings in the data, including emotional, mental, and symbolic aspects. Braun and Clarke (2012) outline a six-phase process toward thematic analysis. Phase 1 involves familiarising yourself with the data, this involves reading or listening/reviewing the data repeatedly. Braun and Clarke (2012) note that unlike surface reading like that of a novel, the researcher is expected to read the words actively, analytically and critically. Phase 2 is that of generating initial codes, whereby the researcher begins systematic analysis of the data. Labels (codes) are allocated for a feature of the data that relates to the research topic (Braun and Clarke, 2012). Phase 3 comprises searching for themes, where codes start shifting toward themes. A theme highlights something important

about the data which is connected to the research question (Braun and Clarke, 2006). According to Braun and Clarke (2012), this stage reviews coded data to identify similar themes that overlap. Phase 4 is a recursive process where developing themes are reviewed in relation to the coded data and the whole data set. During this phase questions need to be raised to establish if the data a theme how strong or relevant the theme is and if there is enough meaningful data to support the theme (Braun and Clarke, 2012). Phase 5 involves defining and naming themes, where one needs to be able to clearly describe what is unique and specific about each theme. Phase 6 is the production of a research report. According to Braun and Clarke (2012), the purpose of this phase is to provide context to the research and allow it to become a compelling story about the data which is based on the analysis.

According to Attride-Stirling (2001) applying thematic networks is a common and simple way of organising a thematic analysis of qualitative data, it seeks to first identify basic themes which are grouped to form organising themes which thereafter create global themes. Figure 3.1 reflects these theme relationships.

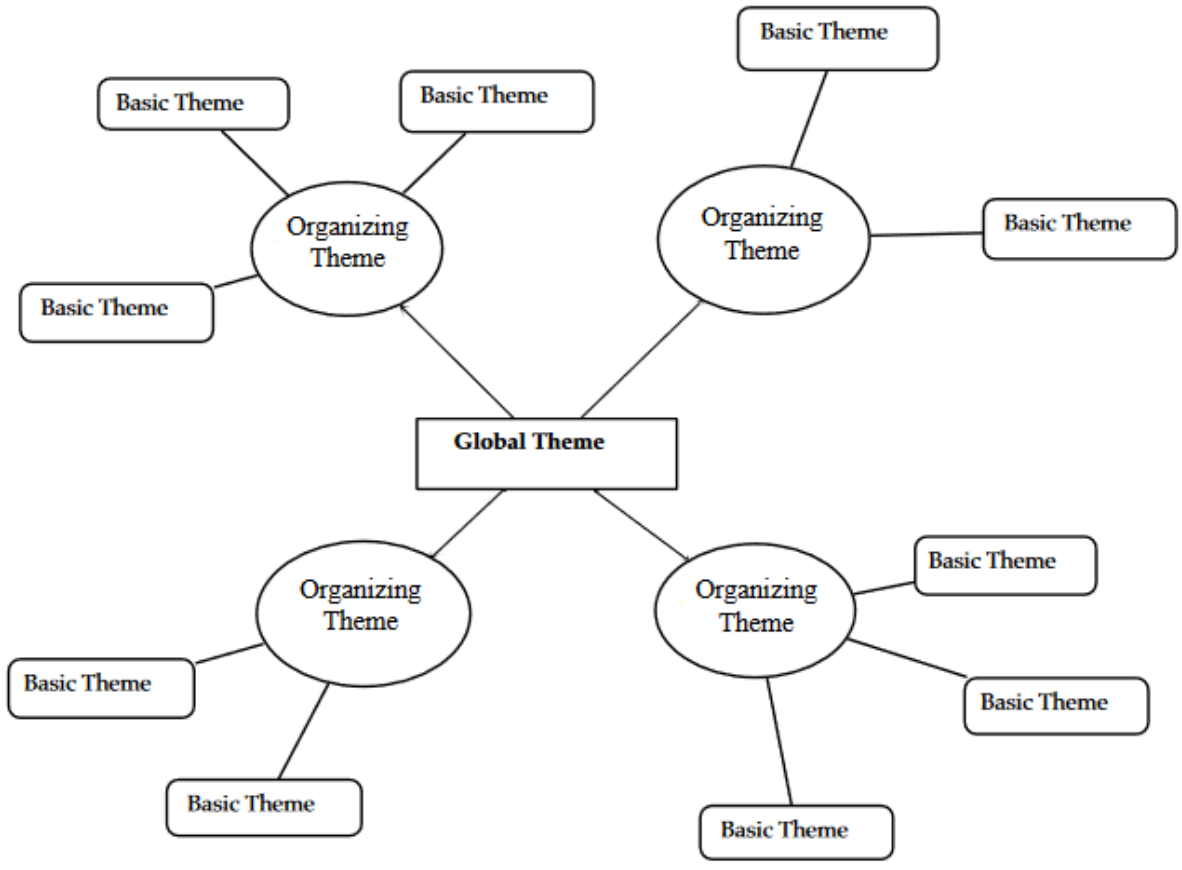

Figure 3.1 - Structure of a thematic network (Attride-Stirling, 2001: 388)

According to Attride-Stirling (2001), there are three steps in analyses employing thematic networks. Firstly, the reduction and breakdown of text (A); secondly, the exploration of text (B); and thirdly the integration of the explored text (C). At each stage, a more abstract level of analysis takes place and can be broken down into a total of six steps (Attride-Stirling, 2001).

3.7.2 Computer-Assisted Qualitative Data Analysis

Computer Assisted Qualitative Data Analysis (CAQDAS) systems are computer-assisted programs that will facilitate or assist with data analysis (Liamputtong, 2009). They allow the researcher to process and organise data efficiently and faster than compared with manual techniques, however, they are currently unable to help analyse data sets (Liamputtong, 2009). Some of these software systems include ATLAS.ti, MAXQDA and NVIVo. NVIVo was utilised to assist the researcher with coding and thematic analysis in this research project.

3.7.3 Cross-case Analysis

Yin (2003) states that there is no set procedure when conducting a cross-case analysis. Cruzes *et al.* (2015) suggest that a cross-case analysis is a technique used to evaluate similarities and differences in the events, activities and processes that are being assessed in case studies. Some of the strengths of a cross-case analysis include; that it is a highly systematic method; it allows for the inclusion of different evidence types; and it could be utilised for theory building, in contrast, it can be viewed as unnecessary (Cruzes *et al.*, 2015).

Once the semi-structured interviews were completed, the interview transcripts were thematically analysed. Themes across the case studies were compared by cross-case analysis where similarities and differences were identified.

3.8 DATA CREDIBILITY AND RELIABILITY

According to Huberman and Miles (1994) certain standards must be met in order to guarantee that a research study is objective, reliable, and valid.

3.8.1 Objectivity

To ensure objectivity, as outlined by Huberman and Miles (1994) the chosen research methods and procedures were thoroughly explained and described, the conclusions have been closely connected to the data gathered, and all methods and procedures used have been recorded and transcribed (Annexure A) for review purposes.

3.8.2 Reliability

To guarantee that the research study was reliable the interview questions were developed and based on the reviewed literature (Huberman and Miles, 1994). The participants were given consent forms that explained the reason for the study (Annexure C) and the agreed on the date and interview time which were all held remotely at approximately the same date (Huberman and Miles, 1994). The cases were coded to maintain the anonymity of the participants, and importantly participant's knowledge level was considered to be sufficient (Huberman and Miles, 1994).

3.8.3 Internal Validity

As outlined by Huberman and Miles (1994), the research conducted is an accurate and comprehensive examination of the subject matter within the local context and the data presented has been directly connected to the related literature. The findings are internally coherent.

3.8.2 External Validity

In terms of the criteria outlined by Huberman and Miles (1994) to ensure external validity, the different cases were fully described to allow for appropriate comparisons. The scope and limitations have been outlined to permit reasonable generalisation, and the research finding has expanded the current literature and opened up possibilities for further research (Huberman and Miles, 1994).

3.9 SUMMARY OF CHAPTER

This chapter discussed the use of the qualitative case study method as the research methodology for this project. Both purposive and convenience sampling were employed to identify participants. The data collection technique used was semi-structured interviews, and the data sets were analysed thematically, which served as the foundation for cross-case analysis. It is acknowledged that the research is objective, reliable, and has undergone both internal and external validation.

CHAPTER 4 – FINDINGS AND ANALYSIS

4.1 INTRODUCTION

This chapter will offer a summary of the organisations that were selected for the three case studies. Case study 1 included three interviewees including two asset managers and a property manager. Case studies 2 and 3's interviewees included a Chief Operations officer and Operations director, respectively. In total, there were five interviewees and four of them were directly involved with their respective organisation's strategic decision-making and to an extent the implementation thereof.

The semi-structured interviews were recorded and the researcher used thematic analysis to identify, organise and record themes within a data. The Themes identified were, Strategy towards WMFIs, WMFIs Implemented, Drought Preparedness, Benchmarking & Consumption and Drivers & Barriers of WMFIs, each theme included a number of subthemes. The findings and themes of the semi-structured interviews is presented and summarised and thereafter a critical cross-case analysis is conducted to highlight the differences and similarities between the three cases studies.

4.2 CASE STUDY 1 (CS1)

CS1 is an independently owned property investment fund. Its focus is on redeveloping commercial (office) buildings, specifically in Cape Town. The group was established in 2016 and currently holds approximately +85 000m^2 of commercial (office) space in Cape Town. Their approach is to acquire underperforming properties in well-located nodes and undertake redevelopment/refurbishment projects to meet the company's objectives of sustainable income and increase asset value. The management team has a hands-on approach to asset management and is directly involved with strategic direction and operations. Since inception, they have completed three large Environmental, Social and Governance (ESG) focused redevelopment projects in Cape Town's CBD. CS1 included three interviewees which included two asset managers and a property manager.

4.2.1 Strategic Approach to WMFIs

The group was established just before the drought and implemented an aggressive acquisition strategy, which ran into the drought period. According to CS1R$^{AM1}{}_b$ green building was a strategic focus for the group from the onset and they wanted their buildings to be certified with a four-star green rating. Among other greening elements, capex-heavy installations like grey water systems and groundwater collection were from the onset planned for when the group undertook to refurbish and retrofit properties. As noted by Reed and Wilkinson (2008) buildings undergo a major refurbishment every 20 – 25 years, which mitigates against the risk of obsolescence.

Consumption-reducing measures for both energy and water were required to meet the organisation's ESG objectives, which were of importance to CS1's executives and investors (CS1R$^{AM1}{}_b$). By implementing greening measures you create a competitive advantage, as lowering operational costs is more attractive to tenants (CS1R$^{AM1}{}_b$). CS1 purchased existing buildings which had few WMFIs actively in place.

"So, when we bought the buildings, there were very little to zero green building or water management initiatives going on. So, we started kind of from the beginning and when we bought them." (CS1R$^{AM1}_{b}$)

CS1R$^{AM1}_{b}$ noted that the transfer of these properties took place during the peak of the drought, and they had to act quickly and implement various emergency water consumption-reducing measures in a short space of time that did not necessarily form part of their long-term strategic plans.

Since the drought, CS1's strategic approach to green buildings and WMFIs has changed and there is a greater emphasis on water-saving installations. CS1R$^{AM1}_{b}$ said that CS1 previously when it came to tenant fit-outs, would accept tenants' requests for installation that would not be consumption-reducing. Whereas now they work with tenants highlighting green building practices and have insisted on consumption-saving installations. When it came to redeveloping properties, which is an area of focus for CS1, CS1R$^{AM1}_{b}$ confirmed that water consumption-reducing measures became more important.

"So, I think our thinking has definitely gotten stronger in terms of green building as we refurbish those buildings." (CS1R$^{AM1}_{b}$)

CS1R$^{AM2}_{b}$ stated that the strategic outlook for water management as a result of the drought has changed and noted that it is also important to implement water-saving strategies at properties located in areas not affected by the drought.

"I think you would relook at what you thought about years ago and is that still aligned to what could potentially happen going forward and what have we learned out of the drought in the Cape." CS1R$^{AM2}_{b}$

This aligns with Barrett (2000) generic model for the FM practice where the Strategic FM function has to identify external factors affecting FM, and change FM strategy to meet future core objectives. CS1R$^{AM2}_{b}$ said that the drought created "alternative solutions" to water-reducing measures that were previously not considered. Some water-saving measures were

previously known but not implemented, but the drought has resulted in more water-saving initiatives being introduced by property owners.

4.2.2 WMFIs

At the onset of the drought, CS1 had very little or no green building or water management initiatives in place ($CS1R^{AM1}{}_{b}$). Although CS1 had longer-term strategic plans in place to reduce water consumption, the majority of contingencies implemented were reactive in response to the drought and they were not necessarily capital-intensive. It was implementing change to day-to-day operations, changing habits which in turn reduced historic patterns.

4.2.2.1 Fixtures: Taps, Showerheads, Urinals & Toilets

$CS1R^{AM1}{}_{b}$ stated that during the drought, where possible they installed consumption-reducing taps. Larger capex-intensive installations, like waterless urinals, toilets, and showerheads are being planned for when buildings are redeveloped ($CS1R^{AM1}{}_{b}$). As a result of the drought CS1 actively removed or deactivated various fixtures to encourage lower consumption during the drought. $CS1R^{AM1}{}_{b}$ mentioned that some of the toilets were closed off, so there were not as many toilets to flush on tenanted floors and closed-off bathrooms on vacant floors. $CS1^{PM1}{}_{b}$ noted that they limited the number of hand basins.

In addition to this $CS1R^{AM1}{}_{b}$ noted that when construction was underway they closed off or locked taps that were not needed otherwise water disappeared. Sheth (2017) noted that if managed effectively water consumption during the construction phase could be reduced by as much as 20%.

4.2.2.2 Alternative water sources, collection, storage and grey water systems

According to $CS1R^{AM2}{}_{b}$ JoJo storage tanks were installed during the drought and rainwater was collected from the roof. In addition to this, $CS1R^{AM2}{}_{b}$ stated that there were risk plans in place to procure outside water from a third party which could be delivered to the property, however, this was not implemented. As above, larger capital-intensive projects like greywater

systems, and collection systems are in the planning stages and will be implemented in due course when buildings undergo redevelopment ($CS1R^{AM2}{}_{b}$). According to $CS1R^{AM1}{}_{b}$ a system that is in the planning stages is to connect to an underground stream and run this supply as usable grey water throughout a 32-storey building.

4.2.2.3 Metering systems and monitoring

According to $CS1^{AM2}{}_{b}$ the only notable WMFIs installed at the properties prior to the 2018 drought was that of metering systems. However, $CS1R^{AM1}{}_{b}$ stated that they were not being managed correctly and measures were implemented to ensure that they were utilised properly. This can be linked to Bond (2010) who identified that there was a lack of skilled managers who could monitor consumption and ensure that buildings are run efficiently.

$CS1^{AM2}{}_{b}$ noted that part of the on boarding process included a utility audit, which would ensure everything was metered correctly and consumption was in line with industry norms. $CS1^{AM1}{}_{b}$ and $CS1^{AM2}{}_{b}$ confirmed that during the drought they implemented better management and reporting systems when approaching utilising metering systems. $CS1^{AM1}{}_{b}$ suggested that previously, they would report on a monthly basis and consider the amount of Rands spent as opposed to the number of kilolitres used. However monthly reporting changed to daily reporting which focused on consumption.

"I think we improved the checks, I mean, we've improved the reporting. It's still the same metering systems that we've always used. I think we've just got better at managing them and analysing the reporting on them. So now our reports daily water consumption and average monthly water consumption whereas before we would just kind of look at the amount of Rands that we spend rather than the kilolitres that we use." ($CS1R^{AM1}{}_{b}$)

$CS1^{AM1}{}_{b}$ and $CS1^{AM2}{}_{b}$ both highlighted the importance of daily reporting to assist in leak detection, where if there was a spike in consumption the problem could be identified and remedied quickly. In addition to daily reporting $CS1^{PM1}{}_{b}$ emphasized the importance of undertaking regular property inspections, where one can pick up on leaking fixtures, which

can be urgently attended to. These smaller leaks may not be picked up on through consumption reporting. The importance of leak detection has been identified as an important part of integrating a water management plan (DoEaCC, 2009).

4.2.2.4 Tenant engagement and education

$CS1R^{AM2}{}_b$ said that they displayed water-saving notices around the building, which created awareness for both tenants and visitors to the buildings. $CS1R^{AM1}{}_b$ and $CS1R^{AM2}{}_b$ highlight the importance of tenant education, consultation and communication around green building and water-saving measures.

"So, it is just again about the education of making people think twice about leaving the tap running while they wash their hands." ($CS1R^{AM2}{}_b$).

$CS1R^{PM1}{}_b$ noted that discussions around water-saving measures with existing tenants are taking place, however, new formal measures are being implemented when their existing leases are up for renewal. $CS1R^{AM2}{}_b$ supported this and said that both energy and water-saving clauses are included in new lease agreements. As a result of the drought, CS1 is a lot more driven to ensure water-saving features are installed with new tenant installations and these form part of the lease negations ($CS1^{AM1}{}_b$). The DoEaCC (2009) identified that tenant engagement was an important aspect of a water management plan.

4.2.2.5 Other notable WMFIs

According to $CS1R^{AM1}{}_b$ a water management feature which was implemented during the drought was that of a waterless carwash business which was established during the drought. This feature would encourage tenants/visitors to reduce consumption elsewhere by opting to use the waterless features at the property.

4.2.3 Drought Preparedness

$CS1R^{AM2}{}_{b}$ believes that CS1 was adequately prepared for the drought because long-term water savings is part of general property management, and you need to have adequate backup plans in place should you face water supply issues. According to $CS1R^{AM2}{}_{b,}$ risk plans were in place, like having an emergency contact to deliver a water tank so there is some form of water supply to the building. There simply needed to be actioned. Risk management has been identified in the literature as being an important part of strategic FM (IFMA, 2009). However, $CS1R^{AM2}{}_{b}$ stated there were elements of the unknown which were not planned for.

Commenting on being prepared for another drought, $CS1R^{AM2}{}_{b}$ stated that CS1 knows what works and those measures can be implemented very quickly. They either have the equipment or plans in place, or they know how to procure them quickly and efficiently. Lessons have been taken from the drought and the experience has resulted in being more prepared for future droughts and water supply issues in South Africa. When commenting on whether CS1 was adequately prepared for another drought of future water supply issues, $CS1R^{AM2}{}_{b}$ said the following:

"Yes. We are South Africans. We make a plan. No, I mean we've got the, we've been through it all. So, we either got the stuff or we know what we need to get and I think I think people's responses to potential water problems would be a lot quicker and more efficient. And, you know, then first round, first round we were all scurrying. Second time around, you know what works so you can do those things very, very quickly. Literally like within days you can implement stuff. Whereas I think previously everybody was sort of, you know, first working it out." ($CS1R^{AM2}{}_{b}$)

4.2.4 Benchmarking and Future Consumption

$CS1^{AM2}{}_{b}$ stated that together with their utility meter service providers they have benchmarking data, and they could assess consumption performance on a per square meterage basis. In addition to this $CS1^{AM1}{}_{b}$ noted that they benchmark against the

requirements needed for four and five-star graded buildings, but the focus was weighted towards energy consumption rather than water consumption.

CS1$^{AM1}{}_{b}$ recorded that the group had seen "big drops" in water consumption as a result of the drought, however, they did not have detailed amounts. Commenting on current consumption and future consumption, CS1$^{AM2}{}_{b}$ noted that during the past five years, the COVID-19 pandemic affected the level of consumption in the buildings and therefore it was difficult to benchmark or compare this data. But going forward CS1$^{AM1}{}_{b}$ noted that CS1 wanted to maintain the level recorded at "the exit drought consumption" levels.

4.2.5 Barriers and Drivers to WMFIs

4.2.5.1 Barriers

Costing is one of the main barriers to implementing WMFIs. CS1R$^{AM1}{}_{b}$ stated that it is easier to introduce WMFIs when undertaking a new development, but when you are trying to retrofit an old building the original infrastructure is not optimal for newer installations. CS1R$^{AM2}{}_{b}$ also indicated that it can be a "catch-22". If you install a pump system and filtration system, your water consumption may be lowered, but the systems would need the energy to run and be connected to a generator. This would both increase electrical consumption and increase maintenance and future capital replacement costs. Nurick, Le Jeune*, et al.* (2015) identified that one of the prominent barriers to implementing green features is that the associated costs do not result in the required return on investment.

CS1R$^{AM1}{}_{b}$ identified another barrier being that there were not enough practical solutions available in the industry which correlates with Nguyen (2017) who identified that there is a lack of knowledge of sustainable new technologies.

4.2.5.2 Drivers

The main driver is having a competitive advantage. CS1R$^{AM1}{}_{b}$ noted when WMFIs are implemented, the recovery cost is less for tenants and ultimately, they will pay lower gross rentals compared to competition. This ultimately leads to a more profitable building which

has a direct impact on value. This aligns with Alexander (1992) who notes that strategic FM establishes important advantages for the organisation which includes cost-effective initiatives and creating a competitive advantage. Alexander (1992) also identified that by implementing strategic FM functions the organisation can avoid underutilised and redundant facilities. Refurbishing underperforming and dated properties with an emphasis on green building is part of CS1 organisational strategy, this has been identified as a driver to the implementation of WMFIs.

Tenant's and the organisation's CSR/ESG requirements were identified as a driver to encourage the implementation of WMFIs. $CS1R^{AM2}{}_{b}$ suggested that if a tenant has Green objectives, then when they are considering leasing options, they will make sure that Green initiatives are implemented.

Both $CS1R^{AM2}{}_{b}$ & $CS1R^{AM1}{}_{b}$ confirmed that their Green Building consultants would ensure that they are compliant with any new legislation revolving around water consumption and new requirements when undertaking redevelopments. In addition to this, they were driven to achieve a 4-star green building rating which correlates with Bond (2010) who identified this as a driver towards implementing sustainable practices.

4.2.6 Other Notable Outcomes

$CS1R^{PM1}{}_{b}$ pointed out that it was an "individual responsibility", where everyone who lived in Cape Town had a collective responsibility to change behaviour and save water where possible. $CS1R^{AM2}{}_{b}$ mentioned that it is important to keep water-saving habits at the forefront of one's mind as we never know when to expect future water supply issues. This highlights the importance of continued tenant education and communication. $CS1R^{AM2}{}_{b}$ pointed out how the Municipality and Province are acting and securing different water supplies. This highlights Lankoski (2016) suggestion that there are three major role players in sustainability, these are governments, corporations and citizens. Where the organisation or corporate in this case CS1, represent a considerable role in achieving sustainable development (Ashrafi *et al.*, 2018).

CS1 made it clear that relatively low-cost contingencies were very effective in reducing water consumption. During the drought, the measures implemented were not cost-intensive and they were effective, these included improved reporting systems, tenant education/communication, installations of consumption-reducing taps and where possible stopping or blocking access to sanitary installations that were not required.

4.2.7 CS1 Summary

CS1 was established just before the drought and part of their strategy was to turn around dated existing buildings which included green initiatives ultimately applying for a 4-star green building rating. They had to assess the status of the properties being transferred during the drought and implement quick contingencies to reduce water consumption and ensure water security. Contingencies implemented as a result of the drought included the installation of consumption-reducing taps and JoJo tanks which harvested rainwater. In addition to this, they improved the reporting and management of the metering systems and undertook regular property inspections. This allowed them to identify problematic areas and establish and implement contingencies to reduce consumption. Finally, tenant communication and education formed a large part of their strategy to educate and continue the good habits created by the 2018 drought.

CS1 appeared to be well prepared for the drought and as a result, water consumption was reduced meaningfully, and they intend to maintain the exit drought levels of consumption. They indicated that they were better prepared for another drought or other water supply issues in South Africa, predominately due to having lived through the drought and given that they intend to undertake larger retrofitting projects to their portfolio. These include larger capital-intensive WMFIs like greywater systems, collection systems and reverse osmosis plants.

CS1 indicated that the emphasis on WMFIs has increased when considering the organisations greening agenda, however, energy consumption was still the priority. The identified drivers for WMFIs include competitive advantage and corporate social responsibility both from an

executive, investor and tenant perspective. The main barriers are summaries as being, cost implications and the availability of practical solutions.

4.3 CASE STUDY 2 (CS2)

CS2 is a real estate investment fund (REIT) listed on the Johannesburg stock exchange (JSE). It focuses on properties located in the Western Cape and specifically Cape Town. It has a total lettable area of +450 000m^2, of which commercial office space in Cape Town makes up approximately 132 000m^2. The organisation's asset management functions are overseen by the executive team, this direct approach attempts to maximise value and generate growth.

4.3.1 Strategic Approach to WMFIs

Prior to the drought, CS2R$^{COO}_{c}$ noted that Green initiatives were a prominent part of the group's strategy. CS2 started focusing on the green agenda around the date of their listing on the JSE in 2016 and it gained momentum thereafter. ESG is one of the primary strategic objectives of the organisation.

"I think there's obviously a lot of pressure with ESG, throughout portfolios and businesses. So, you know we're a listed company we're very mindful of attending to those needs". (CS2R$^{COO}_{c}$)

CS2 had already installed a number of capital-intensive WMFIs prior to the drought, as strategic plans to meet the ESG requirements were in place. When the drought started, CS2R$^{COO}_{c}$ stated that their implementation plans and water-saving measures were accelerated. Part of their risk plans included having the executive team meet with the facilities managers and reviewed every building and identified both small ("low hanging fruit") and bigger interventions that could reduce water consumption (CS2R$^{COO}_{c}$).

CS2R$^{COO}_{c}$ confirmed that since the drought, CS2's strategy has shifted where they are more water conscious. Particularly when the organisation is considering new acquisitions, there is a heightened focus on what WMFIs are currently installed and what could be implemented to enhance consumption-reducing measures. However, the focus has shifted away from water, back to energy giving the reoccurrence of load shedding, but WMFIs remain front of mind (CS2R$^{COO}_{c}$). They are however mindful of tenant installations and redevelopments and are more water conscious compared to their approach prior to the drought. CS2R$^{COO}_{c}$ noted

that they do not intend to install WMFIs in the smaller properties that are earmarked to be sold.

4.3.2 WMFIs

At the onset of the drought, CS2 had WMFIs in place and there were a number of projects in the pipeline. These included metering systems and a number of reverse osmosis (RO) or filtration plants, in some cases, rainwater was collected, and boreholes were installed, water was stored in tanks and plumbed into the water supply system. As stated above a number of consumption-reducing plans were in place and the onset of the drought accelerated the implementation of these ($CS2R^{COO}_{c}$).

4.3.2.1 Fixtures: Taps, Showerheads, Urinals & Toilets

$CS2R^{COO}_{c}$ noted that during the initial phases of the drought CS2 installed consumption-reducing taps ("misters"), they disabled flush masters and installed waterless urinals ("lily domes") to reduce consumption. Excess taps that could be used for washing cars were closed off or replaced with lower consumption fixtures and the number of available hand basins and other ablution facilities were reduced or blocked off.

4.3.2.2 Alternative water sources, collection, storage and grey water systems

Prior to the drought, $CS2R^{COO}_{c}$ confirmed that they had two filtration plants at their properties, however because of the drought they installed another four across the portfolio. These sourced water from both rain collection systems and boreholes. The boreholes were all drilled during the drought and although they formed part of long-term planning, the drought accelerated their installation in addition to the filtration plants ($CS2R^{COO}_{c}$).

CS2 purchased an additional 107 ten thousand litre JoJo tanks that were distributed amongst the 30 properties. According to $CS2R^{COO}_{c,}$ these were either donated to the tenants, who on occasion paid for the connection and used to supply the building if required. If the property did not have the luxury of an additional water supply in the form of a rainwater collection

system or borehole, CS2R$^{COO}_{c}$ mentioned that they purchased a water truck which would collect filtrated water from the other properties and delivered it to those that required it.

4.3.2.3 Metering systems and monitoring

According to CS2R$^{COO}_{c}$ metering and monitoring systems were in place before the drought and consumption was always measured on a monthly basis. CS2R$^{COO}_{c}$ suggested that monitoring of these systems intensified during the drought to improve leak detection and pick up wasteful and in some cases illegal consumption by tenants. Leak detection has been identified as an important aspect of water management plans (DoEaCC, 2009) and can account for up to 26% of water consumption in commercial buildings (Quinn *et al.*, 2006). This allowed them to action a quick response they could buy reducing overall water consumption. Interestingly CS2R$^{COO}_{c}$ noted that they were also monitoring the systems to establish where they were making savings.

"So we were monitoring our meter reading on a monthly basis to see where the spikes were, where we were making savings and we actually picked it up but hold on we've got increases here where we shouldn't be having it and managed to catch the guys out on camera and sort of get that to an end." (CS2R$^{COO}_{c}$)

Although consumption was recorded on a monthly basis, onsite building managers were conducting regular inspections and monitoring the status on a daily basis. They would pick up leaks or unnecessary wastage.

According to CS2R$^{COO}_{c}$ CS2 outsources its meter reading, and they find monthly reporting sufficient for their needs. It was noted that CS2 has been approached by a number of suppliers who have tried to encourage the installation of smart meters that enjoy day-to-day software control. However, they believe that the monthly meter reading is adequate and meets their requirements.

4.3.2.4 Tenant engagement and education

When it comes to tenant education and engagement CS2R$^{COO}_{c}$ stated that they installed signage in all their properties that emphasise water-saving measures which affect both tenants and their respective visiting clients. In addition to this, CS2 works closely with tenants to meet their ESG goals which include efficient water installations and other green initiatives. CS2R$^{COO}_{c}$ noted that one of their larger tenants in Blackheath was part of the catalyst to the Capex intensive WMFIs installations completed prior to the drought.

4.3.2.5 Other notable WMFIs

According to CS2R$^{COO}_{c,}$ they avoid car washes that use water supply, and they encourage "soft or dry washes". During the drought, CS2 cut back on air-con plants where for certain periods (during cool weather) the chiller systems were switched off and they only allowed fresh air to be circulated in the buildings. This was managed on a day-to-day basis (CS2R$^{COO}_{c}$). According to TaIC (2009) aircon cooling towers can use up to 31% of a commercial building's water supply, which if deactivated can drastically reduce consumption.

4.3.3 Drought Preparedness

CS2R$^{COO}_{c}$ stated that CS2 was well prepared for the 2018 drought, largely due to the fact that various water-reducing measures were already introduced across the portfolio, and they had adequate risk plans in place, which allowed them to implement contingency plans quickly.

"But in terms of getting sort of boreholes installed, RO plants installed the suppliers were there, they were eager to help. And I think as long as you had the funding available, it was pretty fairly easily accessible." (CS2R$^{COO}_{c}$)

When commenting on the preparedness of CS2 for another drought or other water supply issues in South Africa, CS2R$^{COO}_{c}$ confirmed that he believed that they were adequately prepared. This was a result of the fact that they have implemented large-scale projects to

reduce water consumption, and they remain active and in place. They are therefore better prepared when comparing their status to the previous drought.

4.3.4 Benchmarking and Future Consumption

$CS2R^{COO}_{c}$ noted that CS2 does not have a benchmarking programme, their meter reading companies provide them with a monthly report, and they provide consumption data for the previous month, three months and twelve months, respectively. CS2, therefore, benchmark against their own or previous consumption.

When questioned on previous and projected water consumption, $CS2R^{COO}_{c}$ stated that CS2 do not look at that detail. Water consumption reduced during the drought and $CS2R^{COO}_{c}$ believed that it remains at the same levels currently. CS2 vacancies have remained relatively low (currently 6.3%) and any further reduction in consumption would be accounted for in the vacancy level.

"So, usage is actually reduced based on vacancy and not you know the like I say the water saving measures, mitigation measures that were in place that we installed between 2018 and 2020 are still there, so we'll reap the benefits of those savings". ($CS2R^{COO}_{c}$)

4.3.5 Barriers and Drivers to WMFIs

4.3.5.1 Barriers

$CS2R^{COO}_{c}$ established that the predominant barrier to implementing WMFIs is purely cost. There is only a certain amount of capital available in an income fund and the majority of that capital is generally allocated towards acquisitions to grow the portfolio.

"I think in terms of, the technology is there, the suppliers are there, the willingness is there, but it's always it's a financial balancing act." ($CS2R^{COO}_{c}$)

In addition to this, on the operations and expense side of things, ($CS2R^{COO}_{c}$) noted that the maintenance and operational expense of RO and filtration plants exceed any savings from the

city of Cape Town water tariff. Additional electricity consumption, filters, chemicals and maintenance costs all need to be considered as additional costs that can be allocated to the landlord.

"So, it creates an additional cost in fact, to a landlord to have those systems in place and it almost becomes a pure sort of ESG play." ($CS2R^{COO}_{c}$)

Regulatory barriers are another factor that works against the implementation of WMFIs. $CS2R^{COO}_{c}$ explained that numerous hurdles needed to be overcome during the drought when obtaining water licencing for their operations which could take up to a year at the time, despite the city calling for these initiatives.

4.3.5.2 Drivers

Both CS2's and tenant's organisational EGS objectives were identified as a major driver in implementing WMFIs according to $CS2R^{COO}_{c.}$ In addition to this $CS2R^{COO}_{c}$ noted that the risks of water supply were here to stay so they need to implement as many consumption-reducing measures as they can, to mitigate this risk. Interestingly $CS2R^{COO}_{c}$ stated that regulations were not a driver that affected the implementation of WMFIs.

4.3.6 Other Notable Outcomes

$CS2R^{COO}_{c}$ implied that CS2's behaviour has ultimately changed as a result of the drought, where water-saving measures have continued and "it's become a way of life".

4.3.7 CS2 Summary

One of CS2's core objectives was a focus on ESG, given that they are a listed company, and this is of extreme importance to their shareholders and the industry in general. CS2 had implemented a number of WMFIs prior to the drought as a result of their ESG agenda. These included some capital-intensive OR and filtration plants. However, the drought accelerated their plans to implement further WMFIs. The WMFIs implemented as a result of the drought

include the installation of consumption-reducing taps, disabled flush masters and installed waterless urinals, blocked off various taps which were identified as risks and reduced access where possible to hand basins and other ablution facilities. CS2 went on a drive to install water collection, storage and filtration plants which included; distributing a large number of JoJo tanks, installing boreholes, and RO and filtrations systems. In addition to this, they purchased a water truck which would supply buildings without the benefit of some of these installations with water.

Metering systems remained in place during the drought, however, they were monitored more carefully and building managers were encouraged to undertake more regular inspections. Tenant communication was implemented but not a priority, however, they did and continue to partner with tenants to meet their ESG requirements with larger capex-intensive projects. Where possible, chillers were only turned on where required.

CS2 was well prepared prior to the drought as they had a number of WMFIs in place. Existing plans were accelerated and implemented, suppliers were ready and provided the funds were available they took action. CS2 believes that it is better prepared for another drought, or other supply problems in South Africa due to the large-scale implementation of WMFIs measures which continue to remain in operation.

CS2 indicated that the emphasis on WMFIs has increased as a result of the drought, however, there has been a shift back to energy saving given the re-emergence of load shedding. The identified drivers for WMFIs include landlord/investor and tenant ESG objectives and risk mitigation. Barriers include capital and running costs and Regulatory challenges with licencing.

4.4 CASE STUDY 3 (CS3)

CS3 is a privately owned property group which holds a substantial portfolio in the Western Cape. The portfolio includes residential, commercial, retail and industrial holdings. The group does not openly report on the size of the portfolio, however, a deeds search of a number of the holding companies and trusts indicated that the commercial component is in excess of 100 000m^2. The group's majority shareholders have direct management functions and the majority of the asset management, property management and maintenance functions are handled in-house. The operations director was interviewed as part of the case study.

4.4.1 Strategic Approach to WMFIs

CS3R$^{OD}_{c}$ said that before the drought CS3 had no strategic approach to reduce water consumption, it was a relatively small expense and they were satisfied provided they were able to collect the recoveries from their tenants and they were able to manage their leaks effectively. As water tariffs increased, so did the need to recover those tariffs from tenants. The majority of the commercial portfolio consisted of older buildings which included older plumbing installations and very few had separate meters installed in different sections (CS3R$^{OD}_{c}$). The systems were dated, in some of the high-rise buildings they would include only one supply line and in order to repair a leak the entire building's supply would be turned off. CS3R$^{OD}_{c}$ stated that if sections were not metered, recoveries would take place on a participation quota percentage.

CS3R$^{OD}_{c}$ explained that since the drought water saving initiatives have become increasingly important in strategic decisions. The cost of water and associated municipal costs have increased substantially and CS3R$^{OD}_{c}$ stated that as a result of this, it WMFIs had gained more attention from the group. This was partly driven by tenants who wanted to see the actual amount of water consumption by their respective sections, and they were resisting the previous method of water expense recovery. CS3R$^{OD}_{c}$ noted that as the City of Cape Town's water tariffs increase, their strategy focused more towards water-saving measures.

In addition to this WMFIs form part of their considerations when purchasing new properties. These factors are reviewed with all new acquisitions and when considering refurbishing property, CS3 intends to install consumption-reducing sanitary ware. However, CS3R$^{OD}_{c}$ noted that larger capital-intensive projects like grey water and filtrations systems were not something that the group was currently considering.

4.4.2 WMFIs

CS3R$^{OD}_{c}$ described how CS3 had very few WMFIs installed in their commercial portfolio before the 2018 drought, however, they had basic metering systems and they ensured that they detected leaks and recovered the appropriate recoveries from tenants. The drought and associated requirements from tenants resulted in CS3 implementing various measures to monitor and ultimately reduce consumption. The majority of these were as a reaction to the drought.

4.4.2.1 Fixtures: Taps, Showerheads, Urinals & Toilets

During the drought, CS3R$^{OD}_{c}$ noted that CS3 started installing consumption-reducing taps (aerators) and in some cases, lower-pressure shower fittings were installed. CS3 did not drive to replace toilets, however, during the drought and subsequent years, when a toilet needed to be replaced, CS3 opted to install a more efficient Geberit system. CS3R$^{OD}_{c}$ said that if it was viable from a costing perspective, CS3 would install waterless urinals and other sanitary ware, but this did not actively take place. In addition to these, CS3 identified taps that were at risk of unnecessary consumption, and they would remove these fittings.

4.4.2.2 Alternative water sources, collection, storage and grey water systems

CS3 did not see the need to source water alternatively, they did not install JoJo tanks, rain and groundwater collection systems or any form of filtration systems. In addition to this, they do not see this as a requirement going forward (CS3R$^{OD}_{c}$).

4.4.2.3 Metering systems and monitoring

Prior to the drought, CS3R$^{OD}_{c}$ stated that if a property had a meter, they would read it and ensure that it was recovered, however, CS3 did not allocate further resources to install additional meters. During the drought, as costs increased, and tenant pressures mounted CS3 went on a drive to install water meters throughout their portfolio (CS3R$^{OD}_{c}$). CS3R$^{OD}_{c}$ noted that when acquiring new properties, one of the main WMFIs they inspect is the water metering and investigate the implementation of water meters (if not already installed). Installing new metering systems and ensuring that recoveries are made to tenants correctly had the greatest impact on reducing water consumption.

4.4.2.4 Tenant engagement and education

CS3R$^{OD}_{c}$ installed notices and distributed flyers which educated tenants and visitors of the drought implications asking users to please be considerate when using water. CS3R$^{OD}_{c}$ mentioned that this activity was heightened at their properties with public spaces and retail centres. When questioned about tenant education, CS3R$^{OD}_{c}$ stated that they found that the most effective tenant education is the bill (recovery of water expenses). It was noted that since the drought, any form of tenant education regarding water-saving measures has stopped.

"No, we've stopped that completely. We found the best educator is the actual bill" (CS3R$^{OD}_{c}$).

4.4.2.5 Other notable WMFIs

One of the first reactive contingencies implemented by CS3 according to CS3R$^{OD}_{c}$ was a reduction in irrigation and as the requirements changed from a regulatory perspective as did the behaviour of CS3.

"Well, it tiered down, you know, they first said it was only on a Monday and Thursday and such hours. So we kept in step with what Council wanted us to do until it went to zero and then we simply removed all irrigation from site by remove, I mean, if there was a hosepipe,

we would remove it or we would blank off a tap or we would, you know, close down the irrigation system itself so that it won't go on to auto." ($CS3R^{OD}_{c}$)

Another WMFI implemented during the drought was staff training. Given the size of the portfolio, CS3 employs a number of caretakers, cleaners and building managers that are insourced and $CS3R^{OD}_{c}$ noted that staff training relating to water-saving measures was actioned during the drought. Bond (2010) identified a lack of skill among managers when it came to implementing green building measures and CS3 addresses this by providing appropriate training and education.

4.4.3 Drought Preparedness

$CS3R^{OD}_{c}$ was unsure if CS3 was well prepared for the 2018 drought. It was noted that they were pleased that day zero was never reached, however, the organisation was not too concerned about reaching day zero and their responsibility was associated with the common area, and it was implied that tenants were responsible for their own spaces.

"It's a difficult question because from a commercial point of view, it's a multi-tenant building, so most of the commercial buildings dealt with common area toilets so, you know, we thankful we never got to a day zero where there was no water but, you know, we weren't too concerned with regards to if there was a day zero how we would deal with the tenants because it wasn't common area. So, it's a difficult question to think on now, but, not sure." ($CS3R^{OD}_{c}$)

$CS3R^{OD}_{c}$ acknowledged that they came through the drought and the measures implemented seemed sufficient. It was stated that they were more prepared for future droughts or water supply issues in South Africa, as they have enough resources in place to deal with shortages in the future. In reply to the question $CS3R^{OD}_{c}$ did note that it was a difficult question to answer and asked, "is anyone ready?".

4.4.4 Benchmarking and Future Consumption

$CS3R^{OD}_{c}$ stated that they do not benchmark their consumption against any form of external sources. They however benchmark consumption against their own portfolio. According to $CS3R^{OD}_{c}$ CS3 uses month-to-month, month-to-year and 12-month analysis which they believe provides sufficient oversight.

4.4.5 Barriers and Drivers to WMFIs

4.4.5.1 Barriers

$CS3R^{OD}_{c}$ stated that the main barrier to the implementation of WMFIs was that there was no financial return on the capex-heavy installations. According to $CS3R^{OD}_{c}$ since the drought, the tenant's social pressures to reduce consumption had decreased. It was further noted that there is inadequate knowledge and solutions available of WMFIs and consumption-reducing measures.

"There's no return on it and the fact that the drought is "over" the social call for it has also diminished. So, there's no necessary pressure from a tenant. You know, listen, I see you got old urinals here when are you sorting it out, that's kind of fallen to the waist sides." ($CS3R^{OD}_{c}$)

4.4.5.2 Drivers

$CS3R^{OD}_{c}$ identified regulations as a driver that influenced the implementation of WMFIs, they indicated that they strictly followed the municipal requirements as they got more progressive during the drought. Tenant cost and tenant CSR objectives were also flagged as drivers of the installation of WMFIs. Given the increases in Municipal water and sewage tariffs, CS3 wanted to ensure that they recovered these expenses from tenants sufficiently which increases their return on investment. Oguntona *et al.* (2019) Identified tenants are demanding green initiatives for not only the environmental impact but also occupancy cost.

4.4.6 Other Notable Outcomes

$CS3_R{}^{OD}{}_c$ recorded that subsequent to the drought and with the onset of Covid-19, a number of tenants requested that the taps (aerators) be replaced with heavier flow fixtures to be more sanitary. The tenant found the lower pressure fixtures to not effectively wash hands. However, $CS3R^{OD}{}_c$ noted that in some cases they agreed to these requests.

Prior to the drought, $CS3R^{OD}{}_c$ explained that they did not recover water and sewerage expenses from their residential tenants. As a result of the drought, their objective was to be efficient at recovering expenses given the associated increase in tariffs, CS3 installed water meters and started recovering these expenses from tenants during the drought. This resulted in very large consumption savings, in some cases as much as 70%.

You won't believe it we've had, more on our residential which I know is not applicable now, but we've had in certain instances where the consumption to the building would be reduced by about 60 to 70%." ($CS3R^{OD}{}_c$)

4.4.7 CS3 Summary

CS3 had limited green objectives prior to the 2018 drought. CS3's commercial portfolio was made up of predominantly old buildings with dated installations. When considering the strategic intention of WMFIs prior to the 2018 drought CS3's main objective was to ensure efficient recoveries of services and ensure that there were no leaks. As a result of the drought, CS3 went on a drive to install better metering systems which allowed for efficient recoveries. In addition to this, they installed consumption-reducing fixtures and block off various water supplies that were at risk of being abused. Irrigation systems were torn down in line with regulations and in addition to this CS3 provided tenant and staff education and training relating to the drought, however, this has since ended.

CS3 was unsure if it was well prepared for the 2018 drought but they believe that they are better prepared for future droughts or other water supply concerns. This is a result of the WMFIs implemented during the 2018 drought. They have seen a large reduction in

consumption and believe that the most effective method to reduce consumption was to efficiently recover these expenses from their tenants. However, since the drought, CS3 has become more water conscious and they intend to install further WMFIs when it makes financial sense to do so, and it factored in when considering new acquisitions.

The identified drivers for the implementation of WMFIs include the ability to recover costs from tenants, regulatory implications and tenant's cost objectives and social requirements. However, it was noted that the social pressure aspect had reduced since the 2018 drought. The main barriers identified include costs and the implications of a return on investment to the landlord and the lack of solutions and information.

4.5 CROSS-CASE STUDY ANALYSIS

The findings are discussed in relation to the recurring themes that emerged in all three cases. This is examined in relation to the literature reviewed in Chapter 2. The main themes, subthemes and summary of the cross case analysis is outlined in Table 4.1.

The major themes that arose from the interviews were: (1) Strategic approach to WMFIs, (2) WMFIs, implemented, (3) Drought preparedness, (4) Benchmarking and consumption, and (5) Drivers and barriers to WMFIs.

4.5.1 Strategic Approach to WMFIs

Strategic facilities management ensures alignment of the organisation's operations and facilities with the organisation's strategic intent (Jensen *et al.*, 2012). CS1 and CS2 are strategically aligned with green building practices and specifically water-saving measures as opposed to CS3 where environmental and social factors did not significantly form part of the organisation's strategic objectives. CS1 and CS2 have a sense of CSR and/or report on ESG practises which is expected by their investors/shareholders. They are aligned in terms of a general greening strategy, however, they were in very different stages of ownership during the 2018 drought. Where CS1 was a new organisation and their strategy was to acquire older buildings, which required refurbishment/upgrading including the installation of WMFIs. Whereas CS2 owned properties for some years where various greening projects (including WMFIs) had been implemented. During the 2018 drought, water conservation was at the forefront and both CS1 and CS2 accelerated water consumption-reducing projects as well as implemented a host of reactionary contingencies and risk plans in response to water supply concerns.

CS3's actions in response to the drought were not strategic from a green building point of view which was unlike CS1 and CS2. Their main strategy toward water was to ensure there were no leaks and to recover as much utility cost as possible from tenants. Reducing costs and maximising income and subsequent value seemed to be the main business strategy of CS3. This aligns to some corporate real estate strategies that support core business strategies

increasing the value of assets and reducing costs (Lindholm, 2008). Unlike the other two cases, CS3 is privately owned and they do not have to conform to investor or social pressures, which is one of the main drivers toward CSR and ESG practices in organisations (Ng *et al.*, 2022).

As a result of the 2018 drought and predominantly the increase in Municipal cost, CS3 confirmed that their strategy had become more water focused. This aligns to CS1 and CS2, which confirmed that consumption-reducing strategies had become increasingly important since the 2018 drought. However, it is important to note that all three cases confirmed that although water is still important, load shedding had meant a shift back towards energy concerns.

Barrett (2000) generic model for the FM practice suggests that the Strategic FM function must adapt to changes affecting FM to meet the future core needs of the organisation. Water conservation and the implementation of WMFIs have, across all three cases, increased in importance on an organisational strategic level. However, it was clear that organisational objectives or strategy differ particularly between CS3 and the other two cases. Chotipanich (2004) Identified factors that position FM and their actions/responses within an organisation. All three case studies have different ownership structures, and different organisational objectives and strategies and this can be seen in the varying responses offered by the interview respondents.

4.5.2 WMFIs

The only case that had implemented notable WMFIs before the 2018 drought was CS2. These included boreholes, filtration plants, and rainwater collection systems installed across their portfolio. All cases had metering systems installed, however, in some cases, they were poorly managed or of inferior quality.

4.5.2.1 Fixtures: Taps, Showerheads, Urinals & Toilets

All three cases confirmed that they installed consumption-reducing taps and closed off taps that were at risk of wasteful consumption or were accessible to the public unnecessarily. CS2

disabled flush masters and installed waterless urinals and did not make changes to toilets or showerheads, and that some ablution facilities were closed off to avoid consumption. CS1 stated that larger capital-intensive projects including the replacement of toilets and urinals, would only commence with future planned refurbishments. CS3 noted that in some cases low-pressure shower fitting were installed and that when toilets needed to be replaced, they installed efficient Geberit systems which they continue to do.

All three cases to some extent installed forms consumption-reducing fixtures and those that were identified at relatively low cost appeared to be effective and their use still continues to this day. These measures are also highlighted in the Onsite Water Checklist developed by the GBCSA and should be implemented going forward.

4.5.2.2 Alternative water sources, collection, storage and grey water systems

CS3 did not install any form of alternative water-sourcing, reuse or collection systems and they confirmed that they do not see this as a requirement going forward. CS1 and CS2 both installed JoJo tanks which harvested rainwater from the roofs. CS2 also harvested water from boreholes and where necessary and financially viable installed filtration plants. In addition to this CS2 purchased a water truck with the intention of collecting water from the properties with filtrated borehole water and distributing it to buildings in their portfolio that required additional supply. CS1 ensured that they have access to water distributors if the day came when the water ran dry. CS1 noted that capital-intensive greywater projects were in the planning phase and would be installed during refurbishment projects across the portfolio.

Unlike the installation of consumption reducing fixtures or the deactivation of fixtures, the ability of alternative water-sourcing, reuse, filtering or collection systems to be adopted by all property owners as a consumption reducing measure is restricted by the cost implications. This especially applies to larger and more complex installations, which appear to be mainly driven by ESG and CSR agenda and not as an effective and financially sound investment. However simple collection systems into JoJo tanks appears to be relatively effective.

4.5.2.3 Metering systems and monitoring

According to Chamber (2009), metering and monitoring are essential in a number of stages of a water management plan, which include assessing the base level of consumption, benchmarking and reporting. Prior to the drought, CS2 had metering and monitoring systems installed that were accessed on a monthly basis. However, monitoring intensified during the drought and building managers were instructed to conduct regular inspections and assess consumption on a daily basis. This ensured that leaks were kept to an absolute minimum, action was taken quickly to prevent water loss and tenant's consumption was monitored.
CS1's properties had metering systems, however, their reporting systems were poor at the onset of the 2018 drought. CS1 drastically improved reporting and monitoring to ensure that water consumption was managed efficiently. They focused on consumption as opposed to the cost of water and monthly reporting was changed to daily reporting. Like CS2, CS1 implemented regular onsite property inspections to pick up on leaking fixtures and unnecessary consumption. Leak detection is an important facet of a water management plan (DoEaCC, 2009) and can account for up to 26% of water consumption (Quinn *et al.*, 2006).

Although the CS3 portfolio included metering systems, they identified that various buildings were not metered sufficiently where some buildings (with multiple tenants) only had one water meter. CS3 went on an intentional drive to install water meters to ensure that water consumption was allocated correctly and that recoveries were appropriately recovered.

All three cases noted the importance of metering systems in the drive to reduce water consumption. This was deeded to be the most successful WMFI and the implementation of a water metering system appears to be the most cost effective and best performing measure to reduce consumption. Efficient leak prevention can reduce consumption in a building substaintially, where leaks can account for up to 26% of water used in a commercial building (TaIC, 2009).

4.5.2.4 Tenant engagement and education

All three cases confirmed that they engaged with the tenants and or clients/visitors relating to the importance of saving water. These measures commonly included posters and flyers that were distributed during the drought, warning of restrictions and encouraging the use of water sparingly. CS1 and CS2 both highlighted the importance of tenant education and working together with them to collectively save water and meet either party's ESG objectives. CS1 noted that formal measures to reduce water consumption were being introduced into new lease agreements.

4.5.2.5 Other notable WMFIs

Both CS1 and CS2 mentioned the use of waterless car washes that are implemented at their properties. CS2 noted that they switched off chiller plants to air-conditioning systems and only flushed fresh air through buildings.

During the 2018 drought, regulatory restrictions were implemented that included a reduction in irrigation (CoCT, 2018a). CS3 noted this as part of their consumption-reducing measures, where at the height of the drought irrigation systems were deactivated or completely uninstalled. CS3 Also noted staff training as an important initiative in water reduction.

4.5.3 Drought Preparedness

Risk management is one of the key aspects of strategic facilities management, which include operational, financial, environmental and social risks (IFMA and RICS, 2018). CS2 appeared to be the most prepared for the 2018 drought. Strong ESG organisation objectives resulted in large-scale water consumption-reducing systems being installed at various properties prior to the drought. CS2 noted that they had adequate risk plans in place that allowed them to act quickly and implement contingencies quickly to further reduce water consumption. CS1 suggested that they were prepared for the drought, however, given the nature of their portfolio they were in an inferior position when compared to CS2. CS3 confirmed that they

too were prepared for the 2018 drought, however, the interviews suggest that they were the least prepared given their drive towards water consumption-saving measures prior to the drought and the fact that the greening agenda did not appear to form part of their organisation's objectives. Having stated that they implemented sufficient measures to avoid damage.

All three cases confirm that they believe that they are adequately prepared for another drought or other water supply concerns in South Africa. This is largely due to the fact that they have learnt from the experiences of the 2018 drought, and measures have already been introduced and continue to be implemented that result in efficient use of water. In addition to this WMFIs will continue to be implemented across all cases which will heighten resilience against drought in the future.

4.5.4 Benchmarking and Future Consumption

The DoEaCC (2009) identified that benchmarking against the industry is an important tool in water management that helps property owners identify performance and saving opportunities. Both CS2 and CS3 stated that they only benchmark against their own portfolios. This was a surprising finding given that the GBCSA (2022) makes the Energy and Water Performance Measurement Tool available to property owners, which includes benchmarking and best practice guidelines which can be used by the property owners to assess the efficiency of a building or portfolio. CS1 stated that their utility meter service provider has benchmarking data that they utilise, and they benchmark against the requirements needed for four- and five-star green rated buildings.

All three case studies confirmed that they had experienced large consumption savings as a result of the drought and implementation of various WMFIs. Both CS1 and CS2 noted that consumption levels have remained the same since the drought and they aim to keep it at that level. CS3 recorded that they are still seeing a large reduction in consumption.

4.5.5 Barriers and Drivers to WMFIs

4.5.5.1 Drivers

CS1 stated that the main driver for the implementation of WMFIs was a competitive advantage. Firstly, the recovery cost is reduced for the tenant, which will result in lower gross rentals to tenants making the building more attractive as an accommodation option which will result in a lower vacancy level. In turn, this leads to a higher return on investment, resulting in a higher asset value. CS1 and CS2 noted that both tenant and owner ESG/CSR objectives are both drivers for the implementation of WMFIs.

CS2 identified that water supply risks were here to stay in South Africa, and this acted as a driver for the implementation of WMFIs to mitigate this risk.

CS1 and CS2 both stated that regulations were not a driver for the implementation of WMFIs, however, CS3 confirmed that regulatory requirements were one of the prominent drivers in the implementation of WMFIs. In addition to this CS3 also identified tenant driver ESG/CSR objectives and tenant costs as a driver for WMFIs

4.5.5.2 Barriers

All three cases identified cost as the main barrier to the implementation of WMFIs. This includes both the capital cost as well as associated running maintenance expenses. CS2 specifically noted that the cost of maintenance and operational expenses to RO and filtration plants exceed any savings made from not acquiring water from the municipal source. CS1 identified the difficulties in retrofitting existing buildings with new systems as complex and extremely costly compared to greenfield developments. Additionally, CS1 identified the fact that there were not enough practical solutions to reducing consumption.

Furthermore, CS2 identified regulatory constraints as one of the main barriers to implementing WMFIs. There were various red tape and waiting periods to be issued various licences for boreholes, filtrations plants and the right to distribute water to alternative

properties using a water truck. This was a surprising finding, given the Municipality's drive to encourage water saving.

4.5.6 Notable Findings

The data showed that the most effective WMFIs appeared to be those that had relatively low capital expense. Metering, monitoring and the reporting thereof were highlighted by all three cases as having a substantial impact on consumption. Not only could you monitor the consumption of tenants and ensure that you make the relevant recoveries, but you could very importantly identify and rectify leaks, which when prevented made a notable difference in consumption. Another relatively low-cost but effective WMFI was the installation of consumption-reducing taps and deactivation of various unnecessary fixtures. Tenant communication and education were also identified as being very effective in reducing water consumption. According to the data, these relatively low-cost measures had the greatest return in terms of water saving.

The onset of the 2018 drought obviously resulting in water saving measures being implemented by all three cases, however it is interesting to note that the main driver for the installation of WMFI was ESG agenda. In all three cases this was seen as the primary driver where tenants pressured action and ESG was enrooted in the organisational strategies of both CS1 & CS2. In clear opposition to this is the fact that the main barrier was seen to be cost. This implies that the market may not necessary be implementing WMFIs for value purposes and rather to adhere to the current demands associated with ESG agenda. However it is clear that those who have implemented WMFIs, despite the cost or value implications are far more prepared that not. Therefore those who value ESG agenda in their respective organisational objectives are better prepared for water supply issues.

4.6 CROSS CASE ANALYSIS SUMMARY

The table 4.1 depicts a summary of the cross case analysis. The recurring themes were identified and subthemes were listed.

	Strategy towards WMFIs	WMFIs implemented	Drought preparedness	Benchmarking & consumption	Barriers & drivers of WMFIs
CS1	**Prior to drought** - green rating, competitive advantage and CSR/ESG. **After drought** - as before but more water focused	Taps, JoJo tanks, improved reporting, tenant education, leak detection, property inspections, waterless car wash, closing off fixtures	**Prior to drought** - prepared (planning in process). **After drought** - more prepared	Supplier and GBCSA benchmarking. Retained low levels of consumption after the drought	**Drivers**- Landlord CSR/ESG, Tenant CSR/ESG, competitive advantage. **Barriers** - capital costs, running costs, limited solutions
CS2	**Prior to drought** - CSR/ESG, green rating and risk mitigation. **After drought** - as before but more water focused	Taps, JoJo tanks, waterless urinals, RO & filtration systems, water truck, boreholes, chillers, closing off fixtures, tenant education, property inspections	**Prior to drought** - prepared (systems implemented, planning). **After drought** - more prepared	Owner benchmarking. Retained low levels of consumption after the drought	**Drivers**- Landlord CSR/ESG, Tenant CSR/ESG, risk mitigation. **Barriers** - capital costs, running costs, regulation
CS3	**Prior to drought** - recoveries and leaks. **After drought** - as before but more water focused	Metering systems, staff education, taps, toilets, showerheads, irrigation systems, tenant education, closing off fixtures	**Prior to drought** - not prepared. **After drought** - more prepared	Owner benchmarking. Retained low levels of consumption after the drought	**Drivers**- Tenant CSR/ESG, tenant costs, regulatory, recoveries. **Barriers** - Capital costs, limited solutions

Table 4.1 - Cross Case Analysis Summary

4.7 FINDINGS FLOWCHART

Figure 4.1 reflects a flowchart that links the findings to literature analysed in chapter 2 of this research project. It is clear that there is a notable alignment of the data and literature in this research project. The literature highlighted the need for a clear understanding by the Strategic FM function of the organisational objectives, which are influenced by TBL objectives. There were correlations in the data to the literature when reviewing the drivers and barriers to the implementation of WMFIs. Strategic FM contingencies were implemented as a response to the 2018 drought and as a result thereof the organisations are better prepared for future droughts or water supply constraints in South Africa.

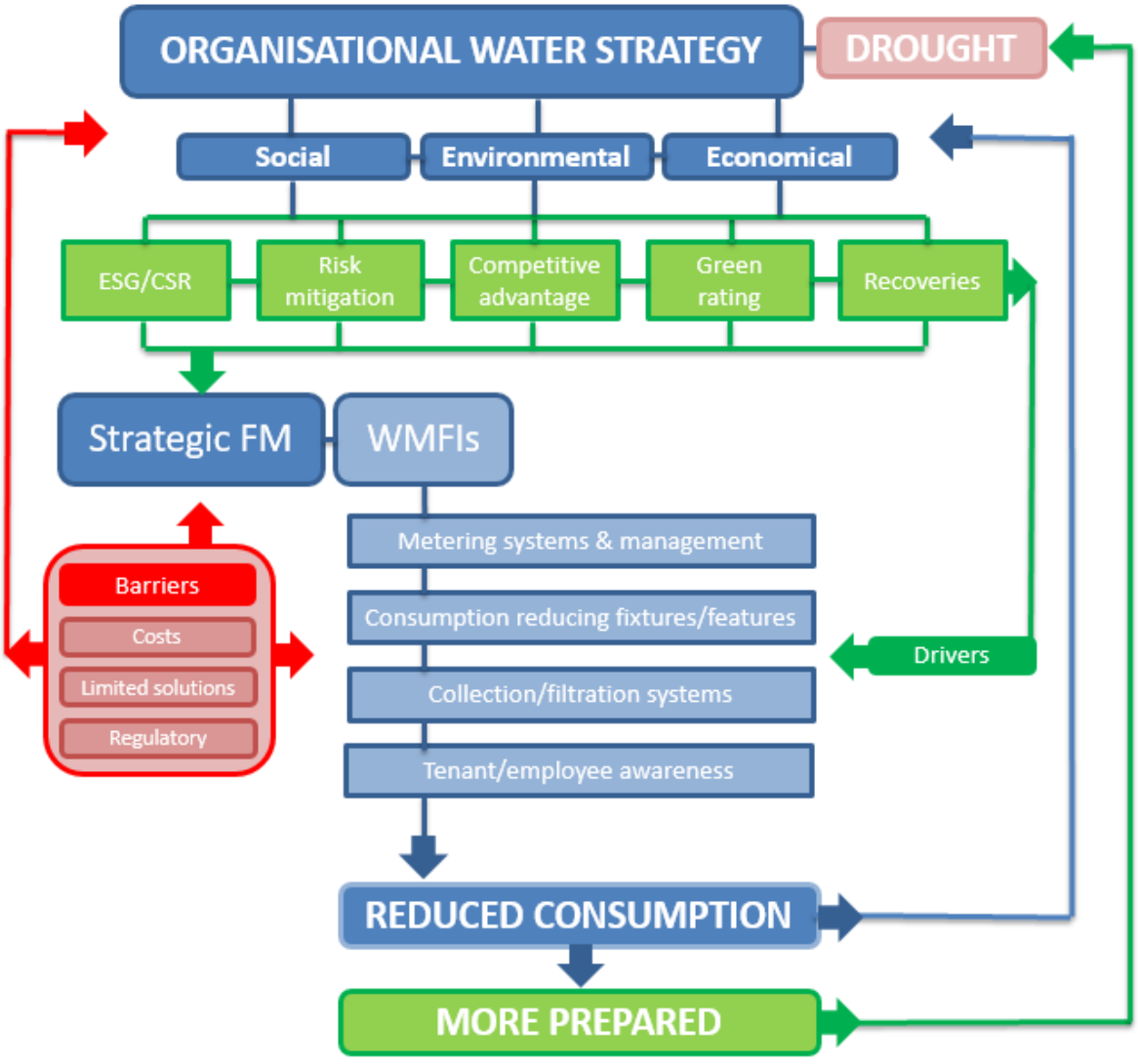

Figure 4.1 – Findings Flowchart

4.8 CONCLUSION

This chapter presented and discussed the data gathered from the three semi-structured interviews conducted in this research. The data was analysed using thematic analysis and underlying themes were extracted and discussed. Subsequently, a cross-case analysis was conducted, and key findings were represented where differences and similarities were highlighted in each case. These findings are further discussed in Chapter 5 in relation to the research objectives, problem statement, research question and proposition.

CHAPTER 5 – RESEARCH CONCLUSION

5.1 INTRODUCTION

The purpose of this research project was to investigate the strategic FM contingencies implemented by commercial (office) property owners as a result of the 2018 drought in Cape Town. This was achieved by conducting semi-structured interviews with three cases who are large commercial property owners in Cape Town. This chapter summarises the main findings of the research which will include a discussion of the research problem statement and question proposition.

The problem statement presented in Chapter 1, was stated as:

There is a lack of understanding on the strategic facilities management contingencies implemented by commercial (office) property in response to drought risks in Cape Town. Therefore, commercial property owners are not equipped to implement efficient strategic plans that address water supply risks in South Africa.

The research question guiding this study is:

What strategic FM contingencies have commercial (office) property owners implemented to mitigate the potential risks of drought?

The proposition to be supported or refuted stipulated in Chapter 1:

Property owners in the office sector have implemented strategic FM contingencies to address the risks of drought.

The research method selected to undertake this paper was multiple case study analysis. A review of the literature resulted in the formalisation of interview questions that were asked in semi-structured interviews. This chapter will present and discuss the findings in relation to the research question. The research proposition guiding the research will be reviewed and

the research objectives will be re-examined. Based on research findings the research proposition will be refuted or supported and conclusions and recommendations for future research will be outlined.

5.2 ACHIEVEMENT OF THE RESEARCH OBJECTIVES

The objectives of this research study are to:

i. Determine the strategic FM contingencies implemented by commercial (office) property owners in relation (response) to the 2018 drought.
ii. Establish if the strategic FM contingencies were preventative and/or reactionary to the 2018 drought.
iii. To establish the level of preparedness of property owners and whether there have been strategic FM initiatives, in the form of WMFIs, resulting in a change in direction to address future droughts or other water supply risks in South Africa.

Objective (i), the strategic FM function and WMFIs (contingencies) were examined through the analysis of the literature. The data collected through semi-structured interviews showed that commercial property owners implemented a number of contingencies as a result of the 2018 drought in Cape Town. Core business strategies affecting the FM function included, ESG/CSR agenda, cost saving, higher occupancy and increased return on investment. The findings established that the following strategic FM contingencies were implemented:

- Consumption-reducing fixtures were installed, including taps, showerheads, urinals and toilets. Taps were identified as being the prominent installation.
- Water collection and grey water systems were installed, these included rain (via roofing) and borehole water collections which were stored in JoJo tanks and used to supply buildings. In addition, and in some cases, these filtration plants were installed, and a water truck was purchased to transport the water supply.
- Waterless car washing facilities were encouraged and installed.

- Tenant communication and engagement in relation to water-saving measures and the status of the drought were initiated. In some cases, this results in changes to lease agreements
- Air conditioner chillers were deactivated.
- In some cases, metering systems were installed and there was a drastic change in reporting and monitoring of consumption figures across all cases.
- Increased building inspections and leak detection.
- Staff training in relation to drought and water-saving measures.
- Various fixtures and facilities using water were deactivated and switched off.

Objective (ii), the majority of the strategic FM contingencies implemented as a result of the 2018 drought were reactionary. The data showed that CS2 had large-scale preventative measures in place to lower water consumption. All three case studies implemented varying forms of metering and monitoring systems prior to the 2018 drought, however, these systems and the reporting/monitoring thereof were vastly improved as a result of the drought. Some consumption-reducing measures and plans were fast-tracked as a result of the drought.

Objective (iii), there was overwhelming data that suggested that commercial property owners have strategically changed direction to focus more on water-saving measures, to reduce consumption and be more prepared for droughts or other water supply risks in South Africa. The vast majority of WMFIs installed during the drought remain in place and more emphasis is placed on water management when considering refurbishment as well as new acquisitions. Although cases were varying in degree of preparedness for the 2018 drought, the data shows that the actions taken during the drought have resulted in property owners being substantially more prepared for future droughts and other water supply risks in South Africa.

5.3 FINDINGS OF THE RESEARCH QUESTION

The research question asked at the onset of this study was:

What strategic FM contingencies have commercial (office) property owners implemented to mitigate the potential risks of drought?

The data showed that a number of strategic FM contingencies were implemented by property owners to mitigate the potential risks of drought. These include the installation of consumption-reducing fixers, deactivation of unnecessary fixtures and services, installation metering systems and improved reporting and monitoring systems, tenant education and engagement, water collection, storage and filtration systems.

The majority of the measures taken during the drought remain in place, however, some have been removed or discontinued. In cases where water pressure was too low, these fixtures were deactivation or replaced and fixtures or services that were deactivated were reinstated, including irrigation and car washing facilities. Large components of tenant/client education and engagement have subsequently fallen away since the 2018 drought.

The large majority of the contingencies implemented should be on-going and long term. These should be implemented elsewhere because of their level of effectiveness in relation to cost and their ability to reduce risk and aid in preventing future water supply constraints. These include the following, listed in order of effectiveness. Firstly, the implementation of water metering systems and improved monitoring. Secondly, the installation of consumption reducing fixtures, mainly cost effective taps and the deactivation of unnecessary fixtures and lastly continued tenant education and awareness. Thereafter and when it becomes financially viable or required, commercial property owners should work towards the installation of harvesting, collection, filtration, and grey water systems.

In response to a drought and assuming the above has been implemented, the contingencies that should be affected include the deactivation of unnecessary fixtures and services like car washing facilities and irrigation systems. In addition to this there should be an increase in a tenant and client education which ensures a change in behaviour.

5.4 SUPPORT/REFUTE THE PROPOSITION

The research aims to address the following proposition:

Property owners in the office sector have implemented strategic FM contingencies to address the risks of drought.

The research proposition is fully supported. The data found that CS1 had implemented various strategic FM contingencies in the form of WMFIs to mitigate the risk of drought prior to the 2018 drought. CS2 had strategic plans in place to implement WMFIs over the medium term, however they were forced to speed up plans as a reaction to the 2018 Drought. CS3 was the least prepared and their response to the drought and the implementation of WMFIs was reactionary. However, the data showed that all three cases have now implemented strategic contingencies in the form of WMFIs to address the risks of drought and future water supply risks in South Africa.

5.5 SUMMARY

The research has shown that commercial property owners implemented a number of strategic FM contingencies as a result of the drought. It outlined how water reduction measures are becoming increasingly important and the drought has resulted in a change in strategy and outlook toward water supply concerns. The relevant academic literature on green buildings, strategic facilitates the management and WMFIs in the South African context is extremely limiting. However relevant literature relating to green buildings, Strategic FM has been used as a basis for this research project.

The data showed that property owners were relatively well prepared for the 2018 drought. Although the large majority of contingencies implemented were reactionary, most of them appeared to form part of the future plans or were part of various strategic risk plans. The interviewees noted that the major barriers to the implementation of WMFIs are cost and a lack of understanding or limited practical solutions. The prominent drivers identified for the implementation of WMFIs included ESG/CSR agenda from both a landlord and tenant perspective.

It was established that relatively low-cost WMFIs had a large impact on the reduction of water consumption and that levels of consumption were still at approximate levels compared to the peak of the drought. This highlights the effectiveness of the measures taken by property owners in response to the drought and will in turn act towards preventing future water supply problems. The change in strategy toward WMFIs and the measures taken as a result of the drought has made commercial property owners in Cape Town better prepared for the future.

5.6 RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the above outcomes and conclusions, the following recommendations for further research are advised:

- **Further research required in the field of WFMIs.**

  There is limited availability of literature relating to green building and specifically WMFIs in South Africa. The term WMFIs was developed in this research, and emerged from the term GBFIs, which is expressed in the literature. However, the concept of WMFIs needs to be expanded and reviewed in future research projects. In addition to this better understanding of the relationship between strategic FM and water-saving measures, and thus more academic research is required in both a South African and international context.

- **Quantitative study on effectiveness of various WMFIs.**

  The data found that there was a vast reduction in water consumption as a result of the implementation of WMFIs. However, notably a major barrier to the implementation water saving measures was cost. Nguyen (2017) identified that it is difficult to assess the performance of sustainable initiatives in relation to financial benefits. Therefore, quantitative studies addressing the level of reduction between different WMFIs would be extremely beneficial in decision-making when addressing the water consumption-reducing agenda within the South African context. This would also prove the assumption taken from this study that relatively affordable WMFIs can be very effective in reducing overall consumption.

- **Conduct similar research in other municipalities in South Africa.**

  The case studies and their associated properties were located in Cape Town; however, other provinces have recently experienced drought concerns and further research would be required to support the outcomes of this research project.

- **Study on the implementation of these outcomes on other geographical areas nationally and internationally.**

  It would be of interest to establish if the lessons taken from the 2018 drought in Cape Town can be implemented in other parts of the country or the rest of the world.

5.7 RECOMMENDATIONS FOR STAKEHOLDERS

Based on the above outcomes and conclusions, the following recommendations stakeholders are advised:

- **Government and lawmakers**

  - The CoCT (2018c) have implemented that laws list specific requirements in terms of planning of new developments and consumption in the district. This can be adopted by other municipalities in South Africa.

  - Lawmakers should consider tax incentives that encourage the implementation of WMFIs considering that the main barrier in adopting WMFIs is that of cost.

  - Lawmakers should consider implementing legislation that sets water consumption targets within reason and considering what is financially feasible and practical.

  - National Government, Provinces and Municipalities should ensure that the current water infrastructure is maintained. New infrastructure is planned and actioned in line with growth of the population and taking into account climate change and future

water requirements for the nation. This would mitigate the risks of water supply concerns in the future.

- **Property Owners and Organisations**

The research was clear that those organisations that adopted ESG objectives were better prepared for the 2018 drought. Owners and organisation should ensure that becoming water efficient forms part of their future strategies and drive towards getting a Net Zero / Net Positive certification with the GBCSA. Initially there are relatively cost but extremely effective measures, which form part of the certification, that can easily be implemented and include the following:

- The installation of metering systems and improved monitoring.
- The installation of consumption reducing fixtures, mainly taps.
- The deactivation of unnecessary fixtures.
- Tenant education and awareness.

Thereafter the following should be implemented and adopted when financially viable.

- The installation of water harvesting and systems, including rain and borehole installations.
- The installation of grey water and filtration systems

Should another drought event take place then the following measures should be implemented.

- Increase in Tenant education and awareness.
- The deactivation of unnecessary services including irrigation and car wash facilities.

- **Industrial designers, engineers and architects**

A barrier identified was a lack of practical solutions in implementing water saving initiatives and the cost associated with various WMFI was also identified as a major barrier.

- Old systems/fixtures should be redesigned to ensure that they are more cost effective.

- New systems, fixtures and technologies should be designed that are accessible and financially feasible to address the requirements needed to reduce water consumption.

REFERENCES

Alexander, K. (1992) Facilities Management Practice. *Facilities*, **10**(5), 11-18.

Alexander, K. (2003) A strategy for facilities management. *Facilities*, **21**(11-12), 269-274.

Alexander, K. and Brown, M. (2006) Community-based facilities management. *Facilities*.

Alharahsheh, H.H. and Pius, A. (2020) A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, **2**(3), 39-43.

Amaratunga, D. and Baldry, D. (2001) Case study methodology as a means of theory building: performance measurement in facilities management organisations. *Work study*.

Amaratunga, D., Baldry, D., Sarshar, M. and Newton, R. (2002) Quantitative and qualitative research in the built environment: application of "mixed" research approach. *Work study*.

Amaratunga, R.G. (2001) *Theory building in facilities management performance measurement: application of some core performance measurement and management principles*. University of Salford.

Armstrong, A. (2020) Ethics and ESG. *Australasian Accounting, Business and Finance Journal*, **14**(3), 6-17.

Ashrafi, M., Adams, M., Walker, T.R. and Magnan, G. (2018) How corporate social responsibility can be integrated into corporate sustainability: A theoretical review of their relationships. *International Journal of Sustainable Development & World Ecology*, **25**(8), 672-682.

Attride-Stirling, J. (2001) Thematic networks: an analytic tool for qualitative research. *Qualitative research*, **1**(3), 385-405.

Barrett, D. and Twycross, A. (2018) Data collection in qualitative research. In: Royal College of Nursing, 63-64.

Barrett, P. (2000) Achieving strategic facilities management through strong relationships. *Facilities*, **18**(10/11/12), 421-426.

Basson, L., Bronkhorst, S., Fordyce, N. and Pengelly, C. (2018) *Water – 2018 - Market Intelligence Report* [Online]. Green Cape. Available: https://www.green-cape.co.za/assets/Uploads/GreenCape-Water-MIR-FINAL-20180406.pdf [Accessed 9 September, 2018].

Bates, B., Kundzewicz, Z., Wu, S. and Palutikof, J. (2008) Climate change and water. Technical paper of the intergovernmental panel on climate change, IPCC secretariat, Geneva. *Climate Change Policy with a Renewed Environmental Ethic*, **21**, 85-101.

Baxter, P. and Jack, S. (2008) Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, **13**(4), 544-559.

Becker, F. (1990) The total workplace: facilities management and the elastic organization. In: New York: Van Nostrand Reinhold.

Bond, S. (2010) Best of the best in green design: drivers and barriers to sustainable development in Australia.

Botai, C.M., Botai, J.O., de Wit, J.P., Ncongwane, K.P. and Adeola, A.M. (2017) Drought characteristics over the Western Cape Province, South Africa. *Water*, **9**(11), 876.

Boyle, L. (2016) *Urban Facilities Management as a systemic process to achieve urban sustainability in South Africa*. Master's Dissertation. University of Cape Town.

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative research in psychology*, **3**(2), 77-101.

Braun, V. and Clarke, V. (2012) *Thematic analysis*. American Psychological Association.

Brian, A. and Brooks, A. (2009) Total facilities management. *Total facilities management third edition*, 33.

Brown, M.A. and Southworth, F. (2008) Mitigating climate change through green buildings and smart growth. *Environment and Planning A*, **40**(3), 653-675.

Bullen, P.A. (2007) Adaptive reuse and sustainability of commercial buildings. *Facilities*.

Capes, M. and Moolman, S. (2022) *The Price of Water and Electricity in South Africa: A Tale of Two Tragedies* [Online]. Available: https://poweroptimal.com/the-price-of-water-and-electricity-in-south-africa-a-tale-of-two-tragedies/#chapter2 [Accessed 30 May 2022.
Chamber, T.a.I. (2009) guideline for baseline water use determination and target setting in the commercial sector SAWC G2.
Chanan, V., White, S., Howe, C. and Jha, M. (2003) Sustainable water management in commercial office buildings. *In*, *Innovations in Water: Ozwater Convention & Exhibition, Perth*, 6-10.
Chotipanich, S. (2004) Positioning facility management. *Facilities*, **22**(13/14), 364-372.
CoCT (2018a) *Think Water* [Online]. Available: http://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-water-and-sanitation-services/make-water-saving-a-way-of-life [Accessed 8 September, 2018].
CoCT (2018b) *Water Services and the Cpae Town Urban Water Cycle*.
CoCT (2018c) *Water amendment By-Law 2018*.
CoCT (2019) *OUR SHARED WATER FUTURE, CAPE TOWN'S WATER STRATEGY* [Online]. Available: https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Cape%20Town%20Water%20Strategy.pdf [Accessed 21 March 2022, 2022].
CoCT (2021) *Water reuse in Cape Town* [Online]. Website: City of Cape Town. Available: https://resource.capetown.gov.za/documentcentre/Documents/Graphics%20and%20educational%20material/Water%20Reuse%20-%20presentation%20for%20website%20-%20March%202021.pdf [Accessed 21/03/2022, 2022].
Collins, D., Haugen, T., Lindkvist, C. and Aamodt, C. (2019) Bridging the gap between sustainable FM and sustainable buildings–an exploratory study of six public buildings in Norway. *Facilities*.
Cook, S., Sharma, A.K. and Gurung, T.R. (2014) Evaluation of alternative water sources for commercial buildings: A case study in Brisbane, Australia. *Resources, Conservation and Recycling*, **89**, 86-93.
Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A. and Sheikh, A. (2011) The case study approach. *BMC medical research methodology*, **11**(1), 1-9.
Cruzes, D.S., Dybå, T., Runeson, P. and Höst, M. (2015) Case studies synthesis: a thematic, cross-case, and narrative synthesis worked example. *Empirical Software Engineering*, **20**(6), 1634-1665.
Dai, A. (2011) Drought under global warming: a review. *Wiley Interdisciplinary Reviews: Climate Change*, **2**(1), 45-65.
DoEaCC (2009) Sustainable Property Guide.
Dolma, S. (2010) The central role of the unit of analysis concept in research design. *İstanbul Üniversitesi İşletme Fakültesi Dergisi*, **39**(1), 169-174.
Douglas, J. (1996) Building performance and its relevance to facilities management. *Facilities*, **14**(3/4), 23-32.
Drion, B., Melissen, F. and Wood, R. (2012a) Facilities management: lost, or regained? *Facilities*.
Drion, B., Melissen, F. and Wood, R. (2012b) Facilities management: Lost, or regained? *Facilities*, **30**(5/6), 254-261.
Ellis, C.R. (2009) Who pays for green. *The economics of sustainable buildings*.
Elmualim, A., Shockley, D., Valle, R., Ludlow, G. and Shah, S. (2010) Barriers and commitment of facilities management profession to the sustainability agenda. *Building and environment*, **45**(1), 58-64.
Flyvbjerg, B. (2006) Five misunderstandings about case-study research. *Qualitative inquiry*, **12**(2), 219-245.
GBCSA (2017) *GBCSA – Net Zero/Net Positive Certification Scheme: Draft definitions and methodology for comment & Call for Pilot Projects* [Online]. Available: https://gbcsa.org.za/wp-content/uploads/2017/12/NET-ZERO-Draft-Definitions-for-Comment-Rev-1-2017-06-30-1-1.pdf [Accessed 11 September, 2018].

GBCSA (2018) *GBCSA – NET ZERO/NET POSITIVE CERTIFICATION* [Online]. Available: https://gbcsa.org.za/wp-content/uploads/2018/05/Net-Zero-Draft-Technical-Manual-Rev-2.pdf [Accessed 13 March 2022, 2022].
GBCSA (2019) *Green Building in South Africa - Guide to Costs and Trends 2019* [Online]. https://api.gbcsa.org.za/resources/download/859: Green Building Council South Africa. [Accessed 13 March 2022, 2022].
GBCSA (2022) *Energy Water Performance* [Online]. website: GBCSA. Available: https://gbcsa.org.za/certify/energy-water-performance/ [Accessed 13 March 2022, 2022].
Gelo, O., Braakmann, D. and Benetka, G. (2008) Quantitative and qualitative research: Beyond the debate. *Integrative psychological and behavioral science*, **42**(3), 266-290.
Gerring, J. and McDermott, R. (2007) An experimental template for case study research. *American Journal of Political Science*, **51**(3), 688-701.
Gholipour, H.F., Arjomandi, A. and Yam, S. (2022) Green property finance and CO2 emissions in the building industry. *Global Finance Journal*, **51**, 100696.
Gillan, S.L., Koch, A. and Starks, L.T. (2021) Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance*, **66**, 101889.
Gleick, P.H., Wolff, G.H. and Cushing, K.K. (2003) Waste not, want not: The potential for urban water conservation in California. In: Pacific Institute for Studies in Development, Environment, and Security ….
Grimshaw, R. (2003) FM: The professional interface. *Facilities*, **21**(3/4), 50-57.
Growthpoint (2023) *Sustainability* [Online]. Available: https://growthpoint.co.za/sustainability/.
Grünbaum, N.N. (2007) Identification of ambiguity in the case study research typology: what is a unit of analysis? *Qualitative Market Research: an international journal*, **10**(1), 78-97.
Gustafsson, J. (2017) Single case studies vs. multiple case studies: A comparative study. In.
Hammarberg, K., Kirkman, M. and de Lacey, S. (2016) Qualitative research methods: when to use them and how to judge them. *Human reproduction*, **31**(3), 498-501.
Huberman, A.M. and Miles, M.B. (1994) Data management and analysis methods.
IFMA (2009) *Strategic Facility Planning: A White Paper on Strategic Facility Planning* [Online]. www.ifma.org. 2022].
IFMA (2020) *What is Facility Management?* [Online]. www.ifma.org: International Facilities Managment Association. [Accessed 23/02/2020, 2020].
IFMA and RICS (2018) *Strategic FM Framework*
RICS guidance note, Global [Online]. https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/real-estate/strategic-fm-framework-1st-edition-rics.pdf. [Accessed 6 MArch 2022, 2022].
IPCC (2007) Climate change 2007: The physical science basis. *Agenda*, **6**(07), 333.
IPCC (2014) Climate Change 2014 Synthesis Report Summary for Policymakers. *Intergovernmental Panel on Climate Change* (1), 1-31.
ISO (2017) *Facility Management – Vocabulary* [Online]. Available: https://www.iso.org/obp/ui#iso:std:iso:41011:ed-1:v1:en:sec:3.1.1 [Accessed 6 May, 2018].
Jack, J. (1994) Strategic facilities management. *Property Management*.
Jensen, P.A. (2008) The origin and constitution of facilities management as an integrated corporate function. *Facilities*.
Jensen, P.A., van der Voordt, T., Coenen, C., von Felten, D., Lindholm, A.L., Balslev Nielsen, S., Riratanaphong, C. and Pfenninger, M. (2012) In search for the added value of FM: what we know and what we need to learn. *Facilities*, **30**(5/6), 199-217.
Joffe, H. (2012) Thematic Analysis. *Qualitative research methods in mental health and psychotherapy*, **1**, 210-223.
Junghans, A., Jensen, P.A., Andersen, P.D. and Rasmussen, B. (2014) Future research agenda for FM in the Nordic countries in Europe. *Facilities*.

Kumar, S. (2018) Understanding Different Issues of Unit of Analysis in a Business Research. *Journal of General Management Research*, **5**(2).
Langston, C. and Kristensen, R. (2002) Strategic Management of Built Facilities. In: Butterworth-Heinemann, Oxford.
Lankoski, L. (2016) Alternative conceptions of sustainability in a business context. *Journal of cleaner production*, **139**, 847-857.
Lee, S.Y. and Kang, M. (2013) Innovation characteristics and intention to adopt sustainable facilities management practices. *Ergonomics*, **56**(3), 480-491.
Liamputtong, P. (2009) Qualitative data analysis: conceptual and practical considerations. *Health promotion journal of Australia*, **20**(2), 133-139.
Lindholm, A.L. (2008) A constructive study on creating core business relevant CREM strategy and performance measures. *Facilities*, **26**(7/8), 343-358.
Lopez, V. and Whitehead, D. (2013) Sampling data and data collection in qualitative research. *Nursing & midwifery research: Methods and appraisal for evidence-based practice*, **123**, 140.
Mansfield, J.R. (2002) What's in a name? Complexities in the definition of "refurbishment". *Property Management*.
Marshall, M.N. (1996) Sampling for qualitative research. *Family practice*, **13**(6), 522-526.
McGregor, S.L. (2023) Ethical Considerations in Research about Organizations: Compendium of Strategies. *Ethics in Progress*, **14**(2), 4-23.
Mckenzie, R. (2015) The Role of the Green Property Indicator in the South African Listed Property Market.
Mukheibir, P. (2017) Possible climate change impacts on large hydroelectricity schemes in Southern Africa. *Journal of Energy in Southern Africa*, **18**(1), 4-9.
Ng, P.M., Wut, T.M., Lit, K.K. and Cheung, C.T. (2022) Drivers of corporate social responsibility and firm performance for sustainable development—An institutional theory approach. *Corporate Social Responsibility and Environmental Management*.
Nguyen, D.M. (2017) *Maintenance practices-improving sustainability performance of existing office buildings: an Australian case study*.
Nor, M. and Azman, N. (2014) Facility management history and evolution. *International Journal of Facility Management*, **5**(1).
Nurick, S., Morris, A. and Schofield, J. (2015) An Investigation into the Strategic Importance of GBFIs within the Listed Property Market.
Nurick, S., Le Jeune, K., Dawber, E., Flowers, R. and Wilkinson, J. (2013) Incorporating GBFIs into Commercial Property Valuation. *In*, *European Real Estate Society 20th Annual Conference*.
Nurick, S., Le Jeune, K., Dawber, E., Flowers, R. and Wilkinson, J. (2015) Incorporating green building features and initiatives into commercial property valuation. *Journal of Sustainable Real Estate*, **7**(1), 21-40.
Nutt, B. (1999) Linking FM practice and research. *Facilities*.
Nutt, B. (2000) Four competing futures for facility management. *Facilities*.
Oguntona, O., Akinradewo, O., Ramorwalo, D., Aigbavboa, C. and Thwala, W. (2019) Benefits and drivers of implementing green building projects in South Africa. *In*, *Journal of Physics: Conference Series*. IOP Publishing, Vol. 1378, 032038.
Opoku, A. and Lee, J.Y. (2022) The Future of Facilities Management: Managing Facilities for Sustainable Development. *Sustainability*, **14**(3), 1705.
Quinn, R., Bannister, P., Munzinger, M. and Bloomfield, C. (2006) Water efficiency guide: office and public buildings. *Australian Government, Department of the Environment and Heritage, Australia.[Online]*.
Rameezdeen, R., Zuo, J. and Stevens, J. (2017) Practices, drivers and barriers of implementing green leases: lessons from South Australia. *Journal of Corporate Real Estate*.
Rapson, G., Novotny, P.-A. and Zobolo, N. (2022) *ESG: Reporting & Disclosure in a new era for Companies* [Online]. Available: https://www.webberwentzel.com/News/Pages/esg-

reporting-and-disclosure-in-a-new-era-for-companies.aspx [Accessed 28 January 2024, 2024].
Redefine (2023) *ESG Strategy* [Online]. Available: https://www.redefine.co.za/about-us/esg/strategy.
Reed, R.G. and Wilkinson, S.J. (2005) The increasing importance of sustainability for building ownership. *Journal of Corporate Real Estate*, **7**(4), 339-350.
Reed, R.G. and Wilkinson, S.J. (2008) The business case for incorporating sustainability in office buildings: the adaptive reuse of existing buildings. *In*, *PRRES 2008: Investing in Sustainable Real Estate Environment: Proceedings of the 14th Annual Conference of the Pacific Rim Real Estate Society*. Pacific Rim Real Estate Society, 1-18.
Republic of South Africa (2018) *Declaration of a National State of Disaster*. Government Gazette.
Rode (2021) *Rode's Report 2021:4*. Rode & Associates
SAFMA (2020). [Accessed 22 March 2020, 2020].
Sheth, D. (2017) Water efficient technologies for green buildings. *Int. J. Eng. Innov. Sci. Res. ISSN*, **1**, 5-10.
Spear (2023) *Investor Communications* [Online]. Available: https://spearprop.co.za/investor-communications/.
Starman, A.B. (2013) The case study as a type of qualitative research. *Journal of Contemporary Educational Studies/Sodobna Pedagogika*, **64**(1).
TaIC (2009) Guideline for base water use determination and Target Setting in the Commercial Sector - SAWC G2, 1 - 41.
Taing, L., Chang, C., Pan, S. and Armitage, N. (2019) Towards a water secure future: reflections on Cape Town's Day Zero crisis. *Urban Water Journal*, **16**(7), 530-536.
Tay, L. and Ooi, J.T. (2001) Facilities management: a "Jack of all trades"? *Facilities*.
Tucker, M. (2012) Sustainable facilities management.
Waheed, Z. and Fernie, S. (2009) Knowledge based facilities management. *Facilities*.
Warren, C.M.J. (2010) The facilities manager preparing for climate change related disaster. *Facilities*, **28**(11/12), 502-513.
WCG (2022) *Property Efficiency Report 2020/21*. https://www.westerncape.gov.za/tpw/property-efficiency-report-10th-edition:
Welz, D. (2018) *THE CITY OF CAPE TOWN'S DRAFT WATER AMENDMENT BY-LAW OF 2017* [Online]. Available: https://www.miltons.law.za/the-city-of-cape-towns-draft-water-amendment-by-law-of-2017/ [Accessed 22 march 2022, 2022].
Wolski, P. (2018) *What Cape Town learned from its drought* [Online]. Available: https://thebulletin.org/2018/04/what-cape-town-learned-from-its-drought/ [Accessed 9 September, 2018].
Wolski, P., Jack, C., Conradie, S., Hall, A., Hewitson, B. and New, M. (2018) Attributing 2015-2017 drought in Western Cape, South Africa. *In*, *EGU General Assembly Conference Abstracts*, Vol. 20, 13705.
Yin, K. (1994) Case Study Research: Design and Methods Sage Publications Inc: USA.
Yin, R.K. (2003) Design and methods. *Case study research*, **3**(9.2).
Yiu, C.Y. (2008) A conceptual link among facilities management, strategic management and project management. *Facilities*.
Ziervogel, G. (2019) Unpacking the Cape Town drought: lessons learned. *Cities support programme| Climate resilience paper. African Centre for Cities, Febraury*.
Ziervogel, G., New, M., Archer van Garderen, E., Midgley, G., Taylor, A., Hamann, R., Stuart-Hill, S., Myers, J. and Warburton, M. (2014) Climate change impacts and adaptation in South Africa. *Wiley Interdisciplinary Reviews: Climate Change*, **5**(5), 605-620.

ANNEXURE A – CASE STUDY 1 TRANSCRIPT

CASE STUDY 1 (CS1) interview script

Researcher: Just a reminder that the interview is being recorded and no personal questions will be asked. Obviously, your identities and that of (CS1 organisation) would also be kept confidential so no one will have sight of that information. It will just be numbered and referenced accordingly with the random lettering etcetera. Just each of you. How long have you been with (CS1 organisation) and what is your current role? ($CS1R^{AM1}{}_{b}$).

$CS1R^{AM1}{}_{b}$: I've been at (CS1 organisation) since 20, since the beginning of (CS1 organisation), 2016.

Researcher: Ok.

$CS1R^{AM1}{}_{b}$: As an asset manager and an acquisition binder.

Researcher: Cool. ($CS1R^{AM2}{}_{b}$).

$CS1R^{AM2}{}_{b}$: So, I'm ($CS1R^{AM2}{}_{b}$) and I've been with (CS1 organisation) a year and a half and I'm also an asset manager.

Researcher: OK, awesome and ($CS1R^{AM3}{}_{b}$). Is it ($CS1R^{AM3}{}_{b}$)? Is it?

$CS1R^{PM1}{}_{b}$: I'm the property manager with Rennie Knight Frank on behalf of (CS1 organisation), and I've been with the portfolio for four years.

Researcher: Awesome, man. Thank you so much. And, approximately, in Cape Town, how

big is your, eh, the office space, just approximately, in terms of square meterage under management.

$CS1R^{AM2}{}_{b}$: It's about 85,000 square meters of office space.

Researcher: OK, cool.

$CS1R^{AM2}{}_{b}$: In the CBD.

Researcher: Alright great man, I know that you guys were established kind of during the drought. But during that drought can you please explain the organisations strategic approach to green buildings, to drought risks and specifically water management.

$CS1R^{AM1}{}_{b}$: Cool, I'll start. So, when we bought the buildings, there was very little to 0 green building or water management initiatives going on. So, we started kind of from the beginning and when we bought them, I think the drought had just happened.

$CS1R^{PM1}{}_{b}$: No, actually the draught was at the end of the draught.

$CS1R^{AM1}{}_{b}$: So, it was kind of in the draught when we bought them. So, we turned all of our taps, well I mean the immediate things that we did was turn all of our taps onto those like sprayer serrated, small sprayer systems. And then when we started redeveloping the buildings we put in, like, waterless urinals and made sure that all the new plumbing and stuff that we put in was water saving kind of sanitary way and everything. And then we started doing the formal green building. This was after the draught, but just general green building stuff to apply for four-star green rating. So, in our redevelopments, we use green materials wherever we can. We're doing consulting with all of the tenants to get them to be on board with our building greening and have got them to sign leases or are we just chatting to them in that process.

$CS1R^{PM1}{}_{b}$: No, its more small discussions at this point because they're existing pieces in place so as tenants are renewed, all these new leases, then we obviously engaged with them on

how to implement, you know, green building initiatives within their tenant space as part of their, as part of the building.

CS1R$^{AM1}_{b}$: And then for every new tenant that comes in, we give them LED lighting allowances, we put in motion sensor lighting to make sure that we're green, not do with water, but just energy saving. And then we busy looking at solar on the warehouse type buildings but not the office portfolio.

Researcher: So, from the onset were you fairly, was green building quite a big part of your strategy?

CS1R$^{AM1}_{b}$: Yeah, it was.

Researcher: OK.

CS1R$^{AM1}_{b}$: And I think we started off small like I say, like with the taps and the plumbing and then we got a waterless carwash guy that set up in the parking lot. So, all those small things that we could do to save water we did do and obviously JoJo tanks and all of that stuff we had and then the bigger things we either have implemented or in the process so there's a stream under the building. So, our plan is to tap into that stream and put it through all the plumbing to flush the toilets. But that's obviously involves a bit more CapEx and planning and costs. So that's in the planning stages at the moment.

Researcher: OK, cool. So, you you've kind of covered my question three. So first, the first question was to deal with strategy around the organization and then sorry, the second question and then the third question was what initiatives were in place during the drought or prior to the drought. So, you've expressed that there weren't many initiatives in place for water saving when you took the buildings on and during the drought. And then you sort of strategised to implement water saving measures, is that correct?

CS1R$^{AM1}_{b}$: Yeah.

Researcher: OK. And then you mentioned a few taps. So, these are the water saving fixtures and initiatives, taps, urinals, showerheads, toilets, water collection systems, grey water systems, tenant education, monitoring and metering systems.

$CS1R^{AM1}{}_{b}$: Yeah.

Researcher: The next question was what management features and initiatives were in place before the drought? But you've explained that there weren't too many of those in place before the drought. Where there metering systems before the draft? Obviously.

$CS1R^{AM2}{}_{b}$: Yes.

$CS1R^{AM1}{}_{b}$: Yeah, I mean there were water meters, but they won't being managed adequately.

Researcher: OK, great.

$CS1R^{AM2}{}_{b}$: So, when we took on the buildings, I assume we would have done like a utility audit to ensure that they were there and metered part of your take on of the building, but also with the green as a green initiative, something we didn't mention which isn't on your list is tenant communication. So, we put, you could put, like save water stickers and be mindful. So, it is just again about education of making people think twice about leaving the tap running while they wash their hands. So that was definitely implemented as well.

Researcher: OK, awesome.

$CS1R^{AM2}{}_{b}$: Oh yes, sorry. One more thing that was also implemented more on a consumable, operational level was sanitizer was provided instead of hand soap so that would reduce the amount of water people would use.

$CS1R^{AM1}{}_{b}$: And I think we also closed some of the toilets that we weren't using so that there weren't so many toilets available for flushing where we had vacancies or less usage on a floor, we shut some of the bathrooms.

$CS1R^{PM1}{}_{b}$: Or limiting the number of hand basins in a bathroom.

$CS1R^{AM1}{}_{b}$: Yeah.

Researcher: Oh, wow. Ok.

$CS1R^{AM2}{}_{b}$: And one step back as well on that lease audit you can say lease audit and leak detection. So, there's definitely pros. They then put in catch nets to try and determine if there are leaks. Otherwise, you wouldn't know that there's running water because it just looks like it's the same consumption every month that they put in little tests, where possible, to see if there's leak detection.

Researcher: OK, perfect.

$CS1R^{PM1}{}_{b}$: And we also do daily building checks in the buildings per say where they check, you know, various places within the buildings to ensure that there aren't any like a running toilet for example. You know, from one day to the next, believe it or not, you know, flush master can become a problem, or you know, something like that happens. And immediately to switch that particular area off or that toilet off until it's repaired so that's a daily thing that happens.

Researcher: OK. And do you sort of monitor that on a monthly basis with consumption as well, so you'll pick up if there's a leak that's not visible to the naked eye?

$CS1R^{PM1}{}_{b}$: Very much so, yeah.

Researcher: OK, awesome. OK. Do you believe that the organisation had an adequate contingency or risk plans in place to deal with the drought? So obviously you purchased the

portfolio during the drought. Do you think that at the onset you were well prepared for the drought? There's no right or wrong answer.

$CS1R^{AM2}{}_{b}$: So, I want to say yes. So even though I'm gonna say it's a drought and long-term water savings as in general property management, you need to have backup plans? So, what if the water is cut to a building so you do need to have an emergency contact to bring in a water tank so that there is some form of water at the building. So, you would then have to use a third party to bring in a water supply from another source if needed, so you do normally have that in a normal standard property management operation. But during the drought you would probably just make sure you have them on call type of thing.

Researcher: Yeah. OK. So, you were well prepared. You were well prepared for the drought. It seems that way from what you're saying. Were there any unplanned or reactive contingencies that were implemented during the drought that weren't planned for? So due to legislation or did you, was there anything that was a reaction to the drought that you implemented and wasn't necessarily part of the organizational strategy up front?

$CS1R^{AM1}{}_{b}$: I think all the immediate measures like the taps, and everything were a reaction. Because we didn't really know long term, I mean, now we could change those back to more water flowing out of those tabs. But those smaller things that were immediate were an immediate reaction, but most of the stuff is a longer-term strategy. But obviously we were just taking transfer of the building, so we were kind of figuring out what was going on in all of them and planning and reacting at the same time.

Researcher: OK. Really interesting, alright.

$CS1R^{AM2}{}_{b}$: I know some other landlords and they would apply, so obviously you could get fined if you went over a certain threshold of water consumption, so they would implement that to the tenants in order to get the tenants to react and be aware of the water consumption. So that's, it wasn't on (CS1 organisation), but it is something that a lot of landlords tried to apply, you know, you don't always win everything with every tenant.

Researcher: If I'm not mistaken, I think we had to reduce consumption by 45% in commercial buildings and then there were quite heavy fines, there was quite an incentive there. So, do you think since the drought, do you think that strategically your approach to green buildings, drought risks and specifically water management, do you think that that has changed as a result of the drought? If you were making strategic decisions five or six years ago would, as a result of the drought, would things change now if you change sort of direction when it comes to water management?

$CS1R^{AM1}{}_{b}$: I think in terms of, refurbishments and tenant (inaudible) and all those kinds of things we would, whereas before if a tenant wanted a whole bunch of showers with super strong flow we would kind of give it to them, but now we would relook at it from green building perspective and kind of say is that green and chat to them on the green side of things with you know, maybe we thought about that less before. So I think our thinking has definitely gotten stronger in terms of green building as we refurbish those buildings.

$CS1R^{AM2}{}_{b}$: And so. And I say on a Western Cape level. If the Western Cape was able to reduce the water consumption by 40% and everything could still operate, then it just shows that everybody should be looking at those, that sort of consumption and do water savings. So, it's more like a general not being wasteful. So, I think, from a, I was in Joburg at the time and Cape Town had the water challenges and restrictions, and that was definitely something that we even looked at applying on Joburg buildings, saying that if they can do it, you know it doesn't mean it's not gonna hit Joburg or another province.

Researcher: Yeah. Well, there are many water supply issues in South Africa that we gonna have to deal with, not only droughts in the future, so that’s kind of important.

$CS1R^{AM2}{}_{b}$: Exactly. So, I think that's maybe important that landlords looked at other buildings, not just those that were affected. So, I think in terms of strategy, yes, I think you would relook at what you thought about years ago and is that still aligned to what could potentially happen going forward and what have we learned out of the drought in the cape what small tweaks could you do in a new development or redevelopment? Like ($CS1R^{AM1}{}_{b}$)

said it's not really a cost thing, it's how could you actually tweak, day-to-day historic patterns or habits so that you can have the upside in the future.

Researcher: Yeah. OK. This question also you've answered quite a lot of it already, but if we could just maybe go through a few things here I've asked what additional water management features have been introduced to the buildings in Cape Town since the drought. So, the previous question was before, but you've answered quite a lot of those, but let's just go through them. So, taps, urinals, shower heads, you've introduced consumption reducing fixtures and fittings.

$CS1R^{AM1}{}_{b}$: I think the other thing on taps we didn't say was during construction before we would kind of, there would be taps around the building and water would get used. And then after the drought people started, we started making sure those tabs were locked in construction phase, otherwise water just disappeared in your construction phase.

Researcher: Just gets wasted. Ok. Alright, and then the monitoring and metering systems. Have you improved those?

$CS1R^{AM1}{}_{b}$: I think we improved the checks, I mean, we've improved the reporting. It's still the same metering systems that we've always used. I think we've just got better at managing them and analysing the reporting on them. So now our reports daily water consumption and average monthly water consumption whereas before we would just kind of look at the amount of Rands that we spend rather than the kilolitres that we use.

Researcher: And do you actually monitor that daily?

$CS1R^{AM1}{}_{b}$: Yeah. Yeah, average daily.

$CS1R^{AM2}{}_{b}$: Yeah.

$CS1R^{PM1}{}_{b}$: So, the reason, if you do, you know, when you check your water meters every day. If you consistently see that building has used, whatever it is five kilolitres, just a random

amount and then all of a sudden it was a weekend and then Monday morning it was like 12. What happened over the weekend? So, it immediately gives you insight, that something took place. You know, whether it be over the weekend or overnight or something like that. So, by doing those kind of things you are able to quickly detect any problems and rectify them. It's not like you only waiting until you know you either see the water trickling out somewhere or you look at the Council account and you go 'oh my word' what happened to the water consumption this week or this month. So yeah. And then that's part of those building checks that are done is that, you know, water meters are looked at because that immediately will tell you if there's increased consumption, which you don't want.

Researcher: Have you installed a rain collection systems or grey water systems in any of the buildings?

$CS1R^{AM1}{}_{b}$: Yeah, yeah, we have. We've got JoJo tanks.

Researcher: And how do you collect that? Is it rainwater that you collect?

$CS1R^{AM1}{}_{b}$: Yeah, yeah.

$CS1R^{AM2}{}_{b}$: Off the roof.

$CS1R^{AM1}{}_{b}$: Yeah.

Researcher: OK. And grey water systems? So, when you recycle non, so not toilet water but like showers and that and you recycle that to use to flush the toilet. So, are there any systems like that, that have been installed?

$CS1R^{AM1}{}_{b}$: Not installed yet because the buildings' plumbing and systems aren't going to be around forever it's kind of a planned phase like when we redo things then we'll put those more CapEx heavy strategies into place.

Researcher: Ok. Cool.

$CS1R^{AM2}{}_{b}$: It's also a catch 22. So, it's a water saving to use the filtration system but then you have a pump running the filtration system and then you have increased electricity consumption and then you need a backup that's gotta connect to your generator because it's gotta be pumping all the time. So I'm just saying there are pros and cons, but I think they're two fold and you asked about how did it change the property management and any responsible landlord would always have checks and balances in place to make sure that you are, again, leak detection, your tenants are consuming an average that's consistent and what the water shortages brought in was the add-ons like the rainwater and the tanks on the roof, which maybe landlords didn't consider. So I think it's more your, what do you call it, not add-ons but like alternative solutions were then proposed or presented and considered at the higher likelihood of being implemented where most landlords, I think, with their property management team, put in strict measures to manage basic water consumption, originally.

Researcher: The next question we've also gone over a bit. When refurbishing or upgrading existing buildings, what strategic methods are being implemented to mitigate the risks of drought? Do you wanna just summarise that quickly, ($CS1R^{AM1}{}_{b}$), cause we have gone over it?

$CS1R^{AM1}{}_{b}$: Yeah, I think we kind of said just fixtures and fittings, waterless urinals, making sure they're all water savvy sanitary wear and then if we're refurbishing plumbing or any kind of backup house systems, then making sure that we're implementing, like you said, grey water saving or attaching to JoJo tanks is the main thing.

Researcher: What are the main factors that drive the implementation of green building practices and specifically water management and features? So, what are the main factors that make you implement those changes?

$CS1R^{AM1}{}_{b}$: I'd say occupancy is, obviously the big one.

Researcher: Occupancy. So, you think that if you have these features, obviously if you have water available then you're more likely to be tenanted.

$CS1R^{AM1}{}_{b}$: No, cost of occupancy, so obviously if you have recycling of water then the cost of water is less if you're not using as much or if you have less water coming out your taps then tenants won't be paying for as much water so then you can compete with another building to say your total cost of occupancy if you come in our building will be less than if you go next door because of all these water saving initiatives that we have. And then the other part of it is just corporate social responsibility to ourselves and our investors.

Researcher: Yeah, and legislation, does that impact, I mean it must do with changes to the legislation.

$CS1R^{AM1}{}_{b}$: I don't know if there's any formal legislation that we are aware of or maybe we're just not aware of it because we're doing it all anyway.

Researcher: There are changes to legislation where you, if you do retrofits and it triggers a plan that needs to be approved, there are certain things that need to be in place before they will approve that.

$CS1R^{AM1}{}_{b}$: OK, we have green building consultants so they're kind of guide us on all the green stuff.

Researcher: OK, cool. And what are the main barriers for you in implementing these green building initiatives, specifically water management? You mentioned earlier the cost of doing so, are there other barriers that you experience?

$CS1R^{AM1}{}_{b}$: I think cost is the main one when you're doing a new building. Then it's easier to bring that stuff in, but when you're trying to retrofit on an old building and the infrastructure isn't made for those things specifically, then it's a bit harder to do than

starting from new. Like for example this building is 31 storeys that we are in to try and pump water around this whole building 31 storeys up with old plumbing pipes is tricky.

Researcher: Yeah. OK. So, cost implications is the main one. Do you think that there's enough knowledge out there or education on the sort of solutions that are available?

$CS1R^{AM1}{}_{b}$: I think there's too much literature and not enough practical solutions.

Researcher: Ok.

$CS1R^{AM2}{}_{b}$: You asked the question and got the answer.

$CS1R^{PM1}{}_{b}$: Also, you know, it's an individual responsibility. We've all, if you've lived in Cape Town and been through the drought. Why would you not continue to, you know, keep good water saving measures in place, whatever those things are, whether you use your shower water to flush the toilets or water your garden or whatever, those kinds of things. I think it's actually just keeping it in the foremost of people's minds that, you know, maybe we don't, it doesn't appear right now that you've got a water shortage, but it can happen at any time, so don't be complacent and I think that's the main thing, that people need to be aware that there is always that possibility that it can go wrong again.

Researcher: OK, perfect.

$CS1R^{AM2}{}_{b}$: But everything's education. So, like I think ($CS1R^{AM1}{}_{b}$) mentioned in the beginning, if we have a new tenant with a new lease, there is a clause on energy saving and we inform the tenant, we can't fine them or penalize them if they don't, but we explain that we would like the building and their efforts to be energy conscious and energy saving or green, more green.

Researcher: Is that focused on energy or water as well, water saving measures?

$CS1R^{AM2}{}_{b}$: Both.

Researcher: OK, that's really interesting.

$CS1R^{AM2}{}_{b}$: But you're only as good as that next person. So, if their, Mr CEO is a greenie, then yes, he will implement all these things. So, it is just communicating and making sure it's a talking topic when you're discussing the lease to understand what type of tenant are they.

Researcher: Perfect.

$CS1R^{PM1}{}_{b}$: It's called people's cultures.

Researcher: Yeah, different cultures for sure. You've mentioned that you use water monitoring and meter systems. Is this data used for benchmarking against the market?

$CS1R^{AM1}{}_{b}$: We do. I don't know if we did on such a detailed level, we just, while I guess we benchmark ourselves against like four star versus three star versus five star and I think we do have like an energy consumption more on the energy side than the water side at the moment.

$CS1R^{AM2}{}_{b}$: But you would have benchmarks on water consumption for an average office user of a certain square meterage and you definitely have benchmarks that we try and or our utility service providers and utility meter providers measure that against and that's how I say it's leak detection, so they'd go 'oh hold on', they're way above average. Why? So, there is a level of benchmarking.

Researcher: I'm sure your green consultants would also look into that, I'm sure.

$CS1R^{AM2}{}_{b}$: Yeah, that's true, the green consultants would, yeah.

Researcher: OK, great. And then has your organisation's water consumption decreased since the drought? If so, do you have any sort of guess as how much it's decreased and are you planning a further reduction in consumption over the next five years?

$CS1R^{AM1}{}_{b}$: It definitely has decreased. I mean, we got those graphs that show the big drops.

$CS1R^{AM2}{}_{b}$: Sorry ($CS1R^{AM1}{}_{b}$) I'm jumping in. What's difficult at the moment if you look at a 5 year gap, you've got Covid in the middle. So that's making it quite hard to benchmark going forward. But yes, there's definitely been a reduction and I think your level from the end of the drought has been retained. So that is the new benchmark is that that water consumption. And I think if we aim to just achieve that, we'd do really well and I think that's our plan going forward is to just retain that water consumption so obviously it would, it depends on your occupancy level, but overall, we aim to keep it to the exit drought consumption, if you could call it that.

Researcher: OK, cool man. And this is the last question. Do you believe that your organisation is adequately prepared for another drought or other water supply risks in South Africa?

$CS1R^{AM1}{}_{b}$: Yes. We are South Africans. We make a plan. No, I mean we've got the, we've been through it all. So, we either got the stuff or we know what we need to get.

Researcher: OK, cool man.

$CS1R^{PM1}{}_{b}$: Yeah, I think I think people's responses to potential water problems would be a lot more quicker and efficient. And, you know, then first round, first round we were all scurreling. Second time around, you know what works so you can do those things very, very quickly. Literally like within days you can implement stuff. Whereas I think previously everybody was sort of, you know, first working it out.

Researcher: Yeah, it's amazing how resilient we are as South Africans, all these testing things that get sent our way all the time.

$CS1R^{PM1}{}_{b}$: Tell me about it.

CS1R$^{AM2}_{b}$: True. Can I ask you a question?

Researcher: Go for it.

CS1R$^{AM2}_{b}$: What made you choose water saving as your topic?

Researcher: Uh, it was. Well, I started my master's in about 2016 and there was two years of coursework and then the thesis and then I had two children. So, at the time it was quite topical, and I've just dragged my feet a bit in getting it finished. But it's actually really interesting because there's actually a lot more information now than there was back then. So, it's interesting to see what people are doing and the measures that have been introduced, you know, as a result of the drought. I think it's topical and there's very little research on it. So, there's a lot of information out there on electricity consumption and reducing that. But in terms of water savings, it's quite a, there's not that much research on it and people tend to put it aside a bit, you know. But it's more and more in South Africa. I think it's going to become more of a problem with the supply issues. So not only droughts and climate change, but water supply issues in general I think is gonna become a lot more interesting, you know.

CS1R$^{AM2}_{b}$: Yeah. And I think that takes you back to the municipalities. So, I know, sorry, I'm going a bit deeper, but City of Cape Town was busy with three filtration plants or desalination plants. So, I don't know if you can just Google that and see what they're up to, but I was at a talk at the CID with the mayor and he had really cool facts about those three plants, how quickly they've been able to get one plant up and running. And the second one is like phase two and phase three. And so that just shows that even the municipality and the province is looking at different supplies of water specifically.

Researcher: Yeah. So, it's, we've obviously, this whole drought situation is government organizational and sort of your immediate individual people that we need to make a difference, you know, so it all plays a role, but it's quite interesting when if, if you want, I'll send you some information on some benchmarking stuff. I know that the Green Building Council actually has a tool that you can use and put your building data in and it shows you

what other funds are doing, et cetera, on the water and energy level, which is quite useful. If I come up with any new innovations in my research, I'll certainly let you guys know.

$CS1R^{AM2}{}_{b}$: Yes, please. We love being at the forefront.

Researcher: Thank you so much. I really appreciate your time.

$CS1R^{AM1}{}_{b}$: Thanks, David.

$CS1R^{AM2}{}_{b}$: Sure. Good luck.

Researcher: Thank you so much guys. I really appreciate your time. Have a lekker day.

$CS1R^{AM2}{}_{b}$: Alright.

$CS1R^{PM1}{}_{b}$: Thanks David.

$CS1R^{AM1}{}_{b}$: Thanks David.

ANNEXURE B – ETHICS APPROVAL

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

2022/10/26

EBE/00044/2022

RE: Research Ethics Committee Project Approval Letter

Dear David Porter,

Your application for ethics review of your project titled

An investigation into the strategic facilities management contingencies implemented by commercial (office) property owners in response to drought risks in Cape Town

has been reviewed and evaluated by the

Engineering & Built Environment Committee.

You may proceed with your research project titled:

An investigation into the strategic facilities management contingencies implemented by commercial (office) property owners in response to drought risks in Cape Town

Please note that should:

(i) any serious or adverse effects to participants occur and/or,

(ii) aspect(s) of your current project change and/or

(iii) any unforeseen events that might affect continued ethical acceptability of the project occur then you should immediately report this to the approving REC. You may be required to submit an amendment to this application, in order to determine whether the changed aspects increase the ethical risks of your project.

Based on the information supplied your application has been successful and is approved.

Please note the following additional conditions associated with this approval:

(i)

Regards,

Engineering & Built Environment Committee.

ANNEXURE C – INFORMATION SHEET AND CONSENT FORM

Information sheet and interview consent form – Masters Research Project

Introduction

My name is David Porter and I am conducting research towards a master's degree in Property Studies at UCT. The research title is '***An investigation into the strategic facilities management contingencies implemented by commercial (office) property owners in response to drought risks in Cape Town'***. I would like to invite you to participate in the project.

About the project

The research project will determine the measures implemented by commercial (office) property owners in reaction to the 2018 Cape Town drought. It will establish if contingencies were preventative or reactionary and question whether the organisations strategic approach to green buildings and specifically water management features and initiatives has changed as a result of the 2018 drought. I would like to interview you on behalf of your organisation as one of the case studies for this research project.

Participation is voluntary

You are not obligated to participate in this project. Your participation is entirely voluntary. The choice to participate is yours alone. If you choose not to participate, there will be no negative consequence. If you choose to participate, but wish to withdraw at any time, you will be free to do so without negative consequence. However, I would be grateful if you would assist me by allowing me to interview you.

Expectations from participations

I will only ask you a few questions regarding strategic facilities management and water management features and initiatives implemented as a result of the 2018 Drought. This should take 30 to 60 minutes. There is no financial obligation from the project or you as the participant. With your permission, I would record this interview and I need your consent to refer to this recording and any notes I may have taken for academic purposes including my project, academic conferences and possibly journal publications.

Benefits/risk or harm to participants

By participating in this research there will be no direct or indirect harm or risks to yourself or your organisation. There are no direct benefits, however your involvement will be invaluable to academic research which will a positively benefit to the property industry and society.

Sharing and use of data

Data generated from the interview will be synthesised and used to answer the research questions set for this master's project, it may be presented in conferences and published in journals.

Confidentiality and data management

The identity of you and your organisation will be kept confidential. In the research report you and your organisation will be allocated an anonymised code, which will not present any identifiable information.

Contact details of supervisor/institution

Saul Nurick – Senior Lecturer, Department of Construction Economics and Management
Contact details: 021 650 3443, sd.nurick@uct.ac.za

I ……, confirm the following:

1. I have read the information sheet provided by the researcher and thus understand the research projects aims and objectives.
2. I am participating in this research project voluntarily and understand that I may withdraw from the interview at any time if I so do wish.
3. I acknowledge and understand that confidentiality will be maintained.
4. I have been asked permission to record this interview and have given my permission.

Participant

Date ……

Signature of participant ……

Name of participant ……

Organisation of participant……