IMPLEMENTATION GUIDELINE FOR MANAGED AQUIFER RECHARGE (MAR) IN COMBINATION WITH BLUE-GREEN INFRASTRUCTURE (BGI) AT LOCAL SETTLEMENT LEVEL

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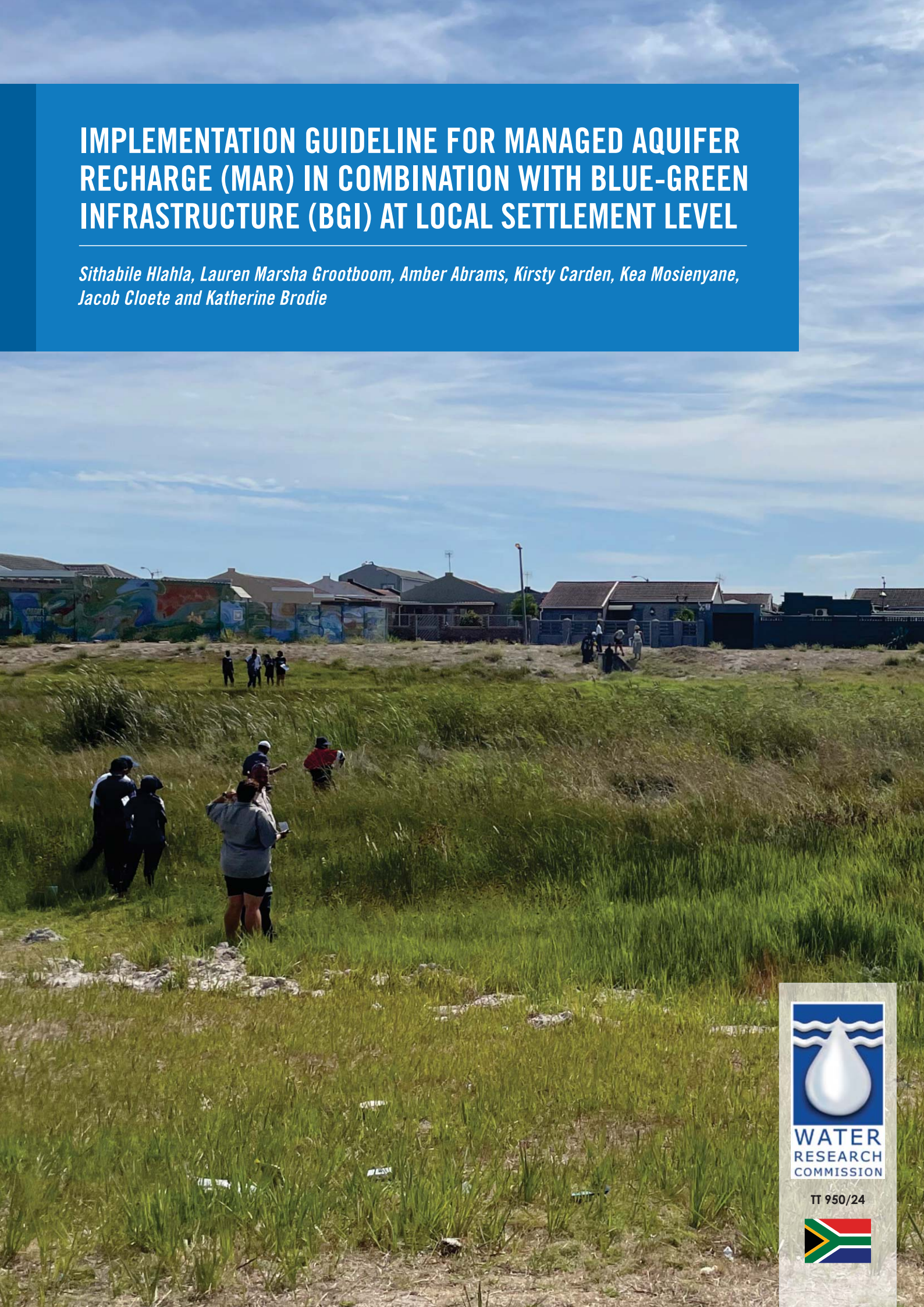

WATER RESEARCH COMMISSION

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IMPLEMENTATION GUIDELINE FOR MANAGED AQUIFER RECHARGE (MAR) IN COMBINATION WITH BLUE-GREEN INFRASTRUCTURE (BGI) AT LOCAL SETTLEMENT LEVEL

Report
to the Water Research Commission

by

Sithabile Hlahla, Lauren Marsha Grootboom, Amber Abrams, Kirsty Carden, Kea Mosienyane, Jacob Cloete and Katherine Brodie
Future Water Institute, University of Cape Town

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EXECUTIVE SUMMARY

BACKGROUND

Existing water resource management practices in many South African cities are not resilient to climate change impacts. These impacts, combined with the rapid rate of urbanisation in the country, have contributed to problems associated with water scarcity, flooding, and environmental degradation, thus adding to concerns about the resilience of conventional water infrastructure. This has necessitated the consideration of more adaptive urban water supply, sanitation and stormwater management systems that focus on diverse sources for water supply, improved water quality, flood protection, amenity and biodiversity. These include blue-green infrastructure (BGI) which can help to address some of the deficits of conventional urban water services provision. BGI comprises mostly nature-based approaches that can help cities to return urban rainfall-runoff processes to more natural hydrological cycle flows. This includes reducing runoff volumes and peak flows, replenishing groundwater through improved infiltration, mitigating urban heat and reducing pollutant loads. These various benefits offer both environmental and ecosystems value, as well as providing the potential to contribute to social, economic, aesthetic and amenity value.

BGI includes approaches such as water sensitive design (WSD) and sustainable drainage systems (SuDS), which can offer cities multifunctional and alternative ways to adapt to climate change. Although shifting to more resilient approaches is necessary, how such transformations can be realised remains unclear, as does their implementation, integration and management within existing urban governance structures, particularly in under-resourced, rapidly urbanising and inequitable settings. This project contributes to the need to build the evidence base for urban place-specific resilience-building initiatives, and the widening of state-of-the-art knowledge, by providing ethnographic and policy-focused research, and developing implementation guidelines based on a City of Cape Town (CoCT) demonstrative case study on managed aquifer recharge (MAR) in combination with BGI for stormwater recharge at local settlement level.

AIMS

The following were the aims of the project:

1. To scope, analyse, and synthesiSe current policy relating to the process of retrofitting stormwater ponds with BGI interventions to enhance MAR (Work Package 1; WP1).
2. To engage in in-depth research on the experiences of people living alongside such interventions to understand the in-situ barriers and facilitators to such interventions (Work Package 1; WP2).
3. To develop guidelines that provide comprehensive support at local settlement level for the implementation of stormwater pond retrofitting using BGI that is beneficial to local residents, whilst also contributing to the City of Cape Town's efforts with respect to MAR (WP2).

METHODOLOGY

The research process included three layered aspects: 1. A policy review (WP1); 2. Participant observation/interviews and surveys (WP2); and 3. Guideline drafting, development and testing (WP2). This work made use of an existing research site where researchers had been working since 2019 as part of the 'Pathways to water resilient South African cities (PaWS) projects (Phase 1 and 2). Some of the workshops and engagements undertaken as part of the PaWS projects, including some of the interviews, were drawn upon in this process and formed part of the contextual understanding used in our approach – as will be explained in detail in Chapter 2 of this report.

A total of 47 policies were identified through expert consultation, snowballing, and internet search. The policies identified included by-laws, handbooks, and guidelines. These policies were reviewed and categorised

according to goals, outcomes, strategies, key themes, and relevance of the policies to MAR-BGI. These were tabulated and a thematic analysis was conducted to draw out themes and patterns in the data.

The implementation guidelines on retrofitting stormwater ponds at local settlement level were developed through various engagements with the PaWS project team (who initiated a stormwater pond retrofit in Mitchells Plain, Cape Town), officials from the City of Cape Town, local residents, researchers involved in the pond experimentation, a local groundwater consultancy (Umvoto), and other organisations who have implemented various projects in local communities. The engagements included individual interviews, surveys, workshops, and field trips. The purpose of the engagements and consultations was to analyse the overall pond experimentation process, understand the local lived experiences associated with the retrofitting of a stormwater pond, as well as the implementation enablers and barriers, to enable those implementing such efforts in the future to have a favourable policy landscape alongside a guideline on how best to begin such a process.

CONCLUSIONS

Managed aquifer recharge (MAR) and BGI are still relatively new, with the concepts only emerging in policy in the City of Cape Town (and more broadly in South Africa) after 2010. As a result, significant policy coordination and collaboration between city departments that are linked to MAR in the context of BGI has yet to be developed.

The research has shown that retrofitting a stormwater pond at the local level for MAR requires careful alignment of relevant policy and legislation (and alignment across policy and legislation with the intention of creating an enabling environment); the identification of local stakeholders, and ongoing engagement with them; consultation with relevant experts; the development of a coalition around the proposed implementation aim(s); and the establishment of mechanisms for sustainability of the project, from governance to ongoing management and maintenance.

RECOMMENDATIONS

The following recommendations have been formulated:

- Policies related to water resource management in Cape Town need to be updated to include opportunities for an enabling environment around MAR-BGI interventions.
- Ongoing training and skills development on MAR-BGI opportunities, interventions and maintenance within government departments is required in order to capacitate national, provincial and local government officials.
- A budget needs to be allocated for the planning design, implementation and management/ maintenance of BGI.
- Policy coordination and collaboration between departments on urban water resilience and the transition to a water sensitive city is required – dedicated integration units or managers with budget line items to support such integration are necessary.
- There should be more interventions in stormwater ponds located in previously disadvantaged areas.
- The roles of external stakeholders and local residents/communities in any local intervention need to be clearly defined within policy; the practice and implementation of these interventions cannot become the sole responsibility of local residents without capital support or compensation.

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Reference Group	Affiliation
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Dr Anna Taylor	African Climate and Development Initiative
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ACRONYMS & ABBREVIATIONS

BGI	Blue-Green Infrastructure
CBOs	Community-based Organisations (CBOs)
CID	City Improvement Districts
CLO	Community Led Organisation
CoCT	City of Cape Town
ESS	Ecosystem services
MAR	Managed Aquifer Recharge
NbS	Nature-based solutions
PaWS	Pathways to water resilient South African cities
SoP	Standard operating procedure
SuDS	Sustainable Drainage Systems
SWH	Stormwater harvesting
WSC	Water sensitive city
WSD	Water sensitive design

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Climate change impacts and rapid urbanisation in South African cities contribute to problems associated with water scarcity (drought), flooding (lack of drainage) and environmental degradation (poor-quality runoff to local water bodies), highlighting widening concerns about the resilience of conventional water infrastructure in post-colonial cities plagued by stubborn infrastructure deficits (Carden et al., 2016; Mguni et al., 2022). Existing water resource management practices are generally not resilient to climate change impacts and this has necessitated a switch to more adaptive urban water supply, sanitation and stormwater management systems that focus on diverse sources for water supply, improved water quality, flood protection, amenity and biodiversity (Rodina, 2019; Nana, Coetzer & Vogel 2019). Water sensitive design (WSD) is a complementary approach to addressing some of the deficits of conventional urban water services provision (Armitage et al., 2014). This concept takes a total water cycle view through the integration of built water infrastructure with green infrastructure, often in a decentralised manner, with the ultimate aim of achieving a water sensitive city (WSC) – one that is resilient, liveable, productive and sustainable (Wong et al., 2013). The associated stormwater component of WSD is often referred to as Sustainable Drainage Systems (SuDS), although recent literature suggests 'Blue-Green Infrastructure' (BGI) is a more appropriate umbrella term (Stovin & Ashley, 2019).

BGI is defined as: "*an interconnected network of landscape components, both natural and designed, that includes open, green spaces and water bodies (ephemeral, intermittent and perennial) which provide multiple functions*" (Wild, Henneberry & Gill, 2017). BGI comprises mostly nature-based approaches that can reduce runoff volumes and peak flows, replenish groundwater through improved infiltration, mitigate urban heat and reduce pollutant loads, whilst helping to return urban rainfall-runoff processes to more natural hydrological cycle flows (Davis & Naumann, 2017). These various benefits offer both environmental and ecosystems value, as well as providing the potential to contribute to social, economic, aesthetic and amenity value (Fenner, 2017). The use of alternative water supply options such as rainwater/stormwater, groundwater, greywater and treated wastewater within a BGI approach allows cities to function as catchments, thus realising the value of water in all its competing uses. As such, BGI including WSD and SuDS can offer cities multifunctional and alternative ways to adapt to climate change (O'Donnell et al., 2021).

Although shifting to more resilient approaches is necessary, how such transformations could be realised remains unclear, as does their implementation, integration and management within existing urban governance structures, particularly in under-resourced, rapidly urbanising and inequitable settings (Mguni et al., 2015). This project contributes to the need to build the evidence base for place-specific resilience-building initiatives through engaging with existent physical and governance experimentation (Rauch & Morgenroth, 2013; WWAP, 2018; Kiparsky et al., 2013) to develop implementation guidelines for managed aquifer recharge (MAR) in combination with BGI (to facilitate the infiltration of stormwater) at local settlement level. Locally relevant 'best bets' and guidance directives were explored to determine how the possible multiple functions of stormwater ponds (including MAR) can be planned, designed, monitored, upscaled and aggregated in collaboration with key stakeholders (including city officials, technical specialists and local residents) to provide a wider range of water-related, amenity and liveability services. A key focus was unpacking how these ponds can be retrofitted, and designed, expanded and aggregated in collaboration with key local, city and civil society actors, as well as local residents to transform mono-functional, often degraded ponds into multifunctional, blue-green assets. The overall research question was "*What are the key implementation lessons learned when repurposing existing stormwater infrastructure to BGI with multiple functions to achieve water resilient South African cities?*"

Purposive urban experimentation with the physical reinvention and transformation of water systems provides a vehicle for the translation of long-term urban sustainability visions into actionable tasks and practices (Wirth

et al., 2018; Kiparsky et al., 2013). Alongside physical experimentation, governance research is especially important in understanding how such interventions might play out (Frantzeskaki, Bach & Mguni, 2018), while providing a space for enhanced water consciousness and the reconfiguration of capacities, resources and agency of various institutional, business and civil actors in support of transformative change (Bos & Brown, 2012; De Haan et al., 2015). This involves engaging with and addressing persistent socio-economic and environmental injustices – e.g. the legacy of Apartheid in South African cities (Mguni et al., 2022) – at both policy and local settlement levels. This project was proposed in the context of rapid urbanisation in South Africa, and rising water demand amid worsening water scarcity, contributing to the need for multifunctionality of open spaces like stormwater ponds in built-up urban areas – towards the realisation of more water sensitive cities (CoCT, 2019a).

The project was designed around ongoing research being undertaken as part of the Danida-funded 'Pathways to water resilient South African cities' (PaWS1) (DFC 18-M05-KU) (May 2019 – October 2022) and PaWS2 (October 2022 – ongoing) projects. These projects used physical experimentation aimed at exploring prospects for adding a water supply function (through stormwater harvesting linked to managed aquifer recharge and recovery) to flood attenuation ponds in Cape Town, whilst unpacking related local and city level governance aspects required to facilitate such water sensitive transitions. The research has found that there is a general lack of skills in design and engineering, monitoring, management, as well as enforcing policy instruments pertaining to multifunctional WSD approaches in South Africa. This, therefore, necessitates the development of an implementation guideline. The identification and process of repurposing an existing stormwater pond in Cape Town also provided a platform for initiating engagement with residents in the vicinity, pointing to exciting future possibilities for collaboration between city departments and civil society as a way of raising awareness and improving the sustainability of such transformations. At the same time, this research enabled the team to track to what extent the current CoCT policy environment caters for such interventions. It was found that job roles, department boundaries and budgetary constraints all imposed limitations such that coordination, power to make change, and budgets to support such change across city departments were lacking.

The Research, Development and Innovation (RDI) Roadmap[1] co-hosted by the Water Research Commission (WRC) and the Department of Science, Technology and Innovation (DSTI) prioritises water quality and the unlocking of water supply alternatives such as groundwater and stormwater. Several large cities in South Africa have the potential to make use of MAR through existing stormwater ponds that were originally designed for flood control (Okedi et al., 2017); however, there remains a need to understand and provide guidance on how these can be transformed into BGI with multiple functions (including MAR) in ways that address resilience building and socio-economic concerns, as well as the environmental injustice that is a legacy of 'green apartheid' (i.e. the unequal distribution of green infrastructure across income and race geographies) in South African cities (Venter et al., 2020). Enabling emergent transitions towards water sensitive futures will also contribute to the achievement of several of the United Nations' Sustainable Development Goals (SDGs) by supporting efforts to increase access to water and integrated management of water resources (SDG6) and the national priority to reduce urban water demand in surrounding regions, as well as contributing to SDG11 on achieving urban resilience through participatory planning and ensuring access to blue-green infrastructure. The project also contributes to SDG13 on climate adaptation by making the natural and built environments more resilient climate change impacts.

1.2 PROJECT AIMS

The following were the aims of the project:

1. To scope, analyse, and synthesise current policy relating to the process of retrofitting stormwater ponds with BGI interventions to enhance MAR.

[1] https://www.sawaterroadmap.co.za/

2. To engage in in-depth research on the experiences of people living alongside such interventions to understand the in-situ barriers and facilitators to such interventions.
3. To develop guidelines that provide comprehensive guidance, at local settlement level, for the implementation of stormwater pond retrofitting using BGI that is beneficial to the local residents, while also contributing to the City of Cape Town's (CoCT) efforts of MAR.

1.3 SCOPE AND LIMITATIONS

The scope of this project is specific to a stormwater retrofit with BGI for MAR at a local scale, based on learnings from a pond retrofit in Mitchell's Plain, Cape Town. However, the learnings and experiences may be applicable to other BGI interventions, including those without a focus on MAR.

The scope of the policy review was primarily limited to policies relevant to MAR-BGI in the Western Cape/CoCT context. While a significant number of policies (47) were reviewed, it is acknowledged that the review may still have not included some relevant policies. This is because the policy landscape is always changing, and policies themselves are often living documents. When conducting searches for policies at intervals, it is not always possible to be immediately informed about the publication of a new policy or the amendment of an existing one. Moreover, due to the limited time frame of this project, the focus of analysis was limited to the years in which the review was planned (search conducted in 2022 and re-run in May 2023), therefore, policies emerging after June 2023 were not included.

Over the course of the project, the project leadership changed twice (both in respect of the original applicant, and then the project leader in year 1 left UCT for longer-term contracts elsewhere) which resulted in some delays.

1.4 SUMMARY OF PROJECT OUTPUTS

The project commenced in April 2022 and two main outputs were produced – a final research report and the MAR-BGI implementation guideline (both of which reflect the findings of the policy review). Three Reference Group meetings were held; in August 2022, July 2023, and March 2024. The project consisted of two work packages (WP1 and WP2) running concurrently; WP1 included the policy review, while WP2 focused on the development of the implementation guideline, which provides research-based guidance on planning, siting, implementing and managing BGI (using a stormwater retrofit case study as the basis for the guideline) in sites of MAR at local settlement level, through social engagement activities with relevant stakeholders from the selected local community and the City of Cape Town (CoCT).

CHAPTER 2: WORK PACKAGE 1 – POLICY REVIEW RESULTS AND DISCUSSION

Work Package 1 (WP1) included mapping and analysing relevant policies, which, in turn, provided an understanding of the policy landscape, and an assessment of where policy gaps exist. In order to facilitate the mainstreaming and implementation of BGI approaches into water resource management practices, it is necessary to move beyond physical experimentation towards the interrogation of existing governance structures, cultures and practices in a manner that can highlight policy windows for the anchoring of insights gained in the policy processes as well as outscaling possibilities. Therefore, as a start, the research set out to investigate how implementation, integration, and management of BGI approaches has been addressed within water-related policy in Cape Town, South Africa. In the context of this study, a 'policy' refers to a set of principles, or regulations created by an individual, a group, or a government, to influence behaviour, direct decision-making, and accomplish certain objectives.

The review process occurred between July 2022 and August 2023 and commenced with a meeting in July 2022 with relevant City of Cape Town (CoCT) officials, University of Cape Town (UCT) researchers (specifically the 'Pathways to water resilient South African cities (PaWS1)' research project team), and other key stakeholders who work in City departments affiliated to stormwater management in some way. During that initial meeting, five key policies relating to stormwater were identified. These were the Cape Town Water Strategy (2019); Cape Town Resilience Strategy (2019); CoCT Integrated Development Plan 2017 – 2022 (2016); Municipal Spatial Development Framework (2018); and the Environmental Strategy for the City of Cape Town (2017). Following this, other policies were identified by drawing on this initial list. This snowballing technique was useful as MAR-BGI is a niche topic in the South African urban space and not many policies address it directly. The policies identified included by-laws, handbooks, and guidelines. Alongside this effort, there was engagement and consultation with other researchers from UCT, including a Future Water affiliated PhD student who studied stormwater management sites and who had also identified relevant policies as part of an exercise to benchmark the City's readiness for a water sensitive city transition. Recommendations from her extensive literature and policy review were also included. In addition, keywords were used to search the UCT library (https://lib.uct.ac.za) and the CoCT website (https://www.capetown.gov.za) for relevant policies. The keywords were selected based on literature and included "blue-green infrastructure"; "stormwater"; "managed aquifer recharge"; "water sensitive design"; and "stormwater management".

The project team initially identified 48 policies. These were reviewed further by the team of research assistants (RAs), and given the length of the policies and the limited time to review them, a keyword search within the policies was employed to identify sections of the text relevant to MAR and BGI. The initial list of keywords was later increased as the research assistants identified other words or phrases that are associated with MAR-BGI, for example, 'nature-based interventions'; and 'rehabilitation'. In addition, attention was paid to how stormwater infrastructure was described, and terms such as 'assets', or 'biodiversity assets' were used, thus adding to the keywords. Therefore, the final list of keywords included: 'artificial recharge'; 'managed aquifer recharge'; 'groundwater'; 'nature-based'; 'nature-based solutions'; 'green infrastructure'; 'blue infrastructure'; 'blue-green infrastructure'; 'storm water', 'stormwater'; 'stormwater harvesting'; 'rainwater'; 'flood water'; 'water sensitive urban design'; 'rehabilitation'; 'mixed-land use'; 'stormwater assets'; 'biodiversity assets'; 'wetland'; 'multi-functional'; 'water sensitive city'; 'ecological infrastructure'; and 'restoration'.

Upon further screening of the policies, five were removed because they did not address BGI directly, therefore, leaving 43 policies remaining. The results of the review were presented to a WRC advisory group in July 2023, and CoCT members suggested four further policies that should be considered for inclusion. These policies were then added and reviewed, bringing the total number of reviewed policies to 47. The policies are listed in **Table 2.1**. The policy dates ranged from 1997 to 2023 (see **Figure 2.1**), and the majority were developed at local level by the CoCT, while two were developed at the provincial level and six at national (**Table 2.1**). One of the project's research assistants (RAs) was assigned the role of quality control for all relevant policies that

had already been reviewed by other RAs, thus ensuring that the format of policy analysis was standardised. This also enhanced the quality of review, given the changes in the project team, that occurred as a consequence of research students as RAs graduating and taking on full-time employment. Following this, the policies were reviewed and categorised according to the goals, outcomes, strategies, key themes, and relevance of the policies to MAR-BGI (see **Appendices A and B**). These were tabulated and a thematic analysis was conducted to identify key themes and patterns in the data.

Table 2.1: List of policies reviewed

Policy document and date of publication	Governance Level
National Water Act (1997)	National
Water Services Act (1997)	National
CoCT Catchment, Stormwater and River Management Strategy 2002 -2007 (2002)	Local - CoCT
Cultural Heritage Strategy (2005)	Local - CoCT
Stormwater Management By-law (2005)	Local - CoCT
Artificial Recharge Strategy (2007)	National
Water Conservation and Water Demand Management Strategy (2007)	Local - CoCT
Western Cape Water Supply System Reconciliation Strategy (2007)	Provincial – Western Cape
CoCT Green Building Guidelines Draft (2008)	Local - CoCT
Floodplain and River Corridor Management Policy (2009)	Local - CoCT
Local Biodiversity Strategy and Action Plan (LBSAP): 2019-2029 (2019)	Local - CoCT
Management of Urban Stormwater Impacts Policy (2009)	Local - CoCT
Treated Effluent By-law (2009)	Local - CoCT
Integrated Waste Management By-law (2010)	Local - CoCT
Public Parks By-law (2010)	Local - CoCT
Water By-law (2010)	Local - CoCT
Environmental Education, Awareness and Training Strategy (2011)	Local - CoCT
CoCT Smart Building Handbook (2012)	Local - CoCT
Densification Policy (2012)	Local - CoCT
District Plans and Environmental Management Frameworks (2012)	Local - CoCT
CoCT Asset Management Policy (2013)	Local - CoCT
CoCT Urban Design Policy (2013)	Local - CoCT
Wastewater and Industrial Effluent By- law (2013)	Local - CoCT
National Groundwater Strategy (2013)	National
Integrated Coastal Management Policy (2014)	Local - CoCT
The Cape Town Bioregional Plan (2015)	Local- CoCT
CoCT Coastal Management Programme (2014)	Provincial – Western Cape
City of Cape Town: Municipal Planning By-law (2015)	Local - CoCT
CoCT Tree Management Policy (2015)	Local - CoCT
Development Management Scheme (2015)	Local - CoCT
Park Development Policy (2015)	Local - CoCT
CoCT Integrated Development Plan 2017 – 2022 (2016)	Local - CoCT
Guidelines for the Installation of Alternative Water Systems (2016)	Local - CoCT
CoCT Climate Change Policy (2017)	Local - CoCT
Environmental Strategy for the CoCT (2017)	Local - CoCT
Water Services Development Plan 2017-2018- 2021/2022 (2017)	Local - CoCT
Water Amendment By-Law (2018)	Local- CoCT
Policy document and date of publication	**Governance Level**
Municipal Spatial Development Framework (2018)	Local- CoCT

Cape Town Water Strategy (2019)	Local - CoCT
Cape Town Resilience Strategy (2019)	Local - CoCT
National Water and Sanitation Master Plan (2019)	National
Strategic Plan (2020-2025) Western Cape Department of Human Settlements (2020)	Provincial
Human Settlement Strategy, 2021	Local - CoCT
Liveable Urban Waterways Implementation Framework (2021)	Local - CoCT
CoCT Urban Watercourses Guide (2022)	Local - CoCT
National Water Resources Strategy Third Edition (NWRS-3) (2023)	National
CoCT Design and Management Guidelines for a Safer City (undated)	Local (CoCT)

2.1 THEMES EMERGING FROM THE POLICIES

A total of 47 policies were reviewed through a snowballing methodology which helped to locate the connections between overlapping key themes in the emerging polices. To accommodate the changing language and jargon used in each policy, a few key themes were identified as prominent across the policies that were reviewed. Twenty-two key themes emerged and these are presented in **Table 2.2**.

Figure 2.1: Timeline of MAR-BGI- related policies

Table 2.2: Key themes

Key Theme	Name and publication date of Policy
Service Delivery	CoCT Asset Management Policy (2013) Development Management Scheme (2015) The Cape Town Bioregional Plan (2015) CoCT Tree Management Policy (2015)
Asset	CoCT Asset Management Policy (2013) Development Management Scheme (2015)
Stormwater	CoCT Asset Management Policy (2013) Stormwater Management By-law (2005)
	Densification Policy (2012) Development Management Scheme (2015) Integrated Coastal Management Policy (2014) National Groundwater Strategy (2013)
Infrastructure/Green Infrastructure	CoCT Asset Management Policy (2013) Densification Policy (2012) Water Conservation and Water Demand Management Strategy (2007) CoCT Urban Watercourses Guide (2022) National Groundwater Strategy (2013)
Stormwater Infrastructure	Development Management Scheme (2015) The Cape Town Bioregional Plan (2015) CoCT Green Building Guidelines Draft (2008) CoCT Smart Living Handbook (2023) National Water Master Plan (2018)
Ecological Spaces	Densification Policy (2012) National Groundwater Strategy (2013) The Cape Town Bioregional Plan (2015) (Endangered species protection and biodiversity cultivation) CoCT Smart Living Handbook (2023) CoCT Urban Watercourses Guide (2022) National Water Master Plan (2018) District Plans and Environmental Management Frameworks (2012) Local Biodiversity Strategy and Action Plan (LBSAP): 2019-2029 (2019) Floodplain and River Corridor Management Policy (2009) National Groundwater Strategy (2013)
Development site	Development Management Scheme (2015) District Plans and Environmental Management Frameworks (2012) CoCT Urban Watercourses Guide (2022)
Storm Surge	Integrated Coastal Management Policy (2014)
Multifunctional Space (Open Space)	Integrated Coastal Management Policy (2014) Local Biodiversity Strategy and Action Plan (LBSAP) 2019-2029 (2019) Densification Policy (2012) CoCT Urban Watercourses Guide (2022) CoCT Design and Management Guidelines for a Safer City (undated) Strategic Plan (2020-2025) Western Cape Department of Human Settlements (2020) National Groundwater Strategy (2013)

Community & Recreation	Parks Development Policy (2015) District Plans and Environmental Management Frameworks (2012) National Groundwater Strategy (2013) Cultural Heritage Strategy (2005) Water Services Development Plan 2017/2018–2021/2022 (2017) CoCT Design and Management Guidelines for a Safer City (undated) Environmental Strategy for the CoCT (2017) (Cultural Heritage) National Groundwater Strategy (2013)
Water security	CoCT Tree Management Policy (2015) Environmental Strategy for the CoCT (2017) National Groundwater Strategy (2013)
Biodiversity	District Plans and Environmental Management Frameworks (2012)
Water resilience	Cape Town Water Strategy (2019) Environmental Strategy for the CoCT (2017)
Departmental collaboration and Stakeholder engagement	CoCT Tree Management Policy (2015) Liveable Urban Waterway Framework Implementation (2021) CoCT Urban Watercourses Guide (2022) National Groundwater Strategy (2013)
Wetlands	Local Biodiversity Strategy and Action Plan (LBSAP): 2019-2029 (2019) District Plans and Environmental Management Frameworks (2012) National Groundwater Strategy (2013)
Water	Local Biodiversity Strategy and Action Plan (LBSAP): 2019-2029 (2019) National Water Act (1997) Artificial Recharge Strategy (2007) Water By-law (2010), with Water Amendment By-Law (2018) Cape Town Water Strategy (2019) CoCT Urban Watercourses Guide (2022) CoCT Smart Living Handbook (2023) CoCT Green Building Guidelines Draft (2008) National Water Master Plan (2018)
Legislative and Departmental overlaps	Integrated Coastal Management Policy (2014) Liveable Urban Waterway Framework Implementation (2021) National Groundwater Strategy (2013)
Social and Economic Upliftment/ Green economy	Floodplain and River Corridor Management Policy (2009) Water Services Development Plan 2017/2018 – 2021/2022 (2017) National Water Master Plan (2018) Environmental Strategy for the CoCT (2017) (Green economy) Municipal Spatial Development Framework (2018) Local Biodiversity Strategy and Action Plan (LBSAP) 2019-2029 (2019) Cape Town Water Strategy (2019) CoCT Smart Living Handbook (2023) CoCT Green Building Guidelines Draft (2008) CoCT Design and Management Guidelines for a Safer City (undated) National Groundwater Strategy (2013)
Environmental Stability	Floodplain and River Corridor Management Policy (2009) Integrated Waste Management By-law (2010) Environmental Education, Awareness and Training Strategy (2011) CoCT Integrated Development Plan 2017-2022 (2016) Environmental Strategy for the CoCT (2017) Municipal Spatial Development Framework, (2018) CoCT Smart Living Handbook (2023)

	CoCT Green Building Guidelines Draft (2008)
Cultural and Natural Heritage	Municipal Spatial Development Framework (2018) Cultural Heritage Strategy (2005) Water Services Development Plan 2017/2018 – 2021/2022 (2017) Environmental Strategy for the CoCT (2017) (Cultural Heritage)

2.2 GENERAL POLICY FINDINGS IN RESPECT OF MAR-BGI

Many of the policies reviewed do not directly mention BGI or MAR; however, they discuss some aspects that relate to MAR and BGI directly or indirectly, such as aquifers, groundwater, stormwater and multifunctional spaces. For example, the National Groundwater Strategy (2013) notes that water is an increasingly scarce resource and aquifers are experiencing increasing threats from pollution as a consequence of urbanisation, industrial development, agricultural activities and mining enterprises. Varying degrees of vulnerability to these impacts can be distinguished according to the depth of the water table, soil permeability and conditions at the land surface (DWS, 2013). The threats to these spaces are not linear and, thus, a multifunctional approach to aquifer systems, such as being investigated as part of this WRC **Implementation Guideline for Managed Aquifer Recharge (MAR) in combination with Blue-Green Infrastructure (BGI) at local settlement level** project (referred to as the MAR-BGI project, henceforth), has significance to realising the national policy goals that aim to protect aquifers (DWS, 2013).

The National Groundwater Strategy (2013) makes it clear that aquifers are natural assets that form part of the ecological infrastructure of a country. Aquifers are very complex common pool (open access) resources, and it is important to conserve and protect them in order to maintain a set of uses for groundwater (DWS, 2013). This, again, highlights the importance of projects like the MAR-BGI project in protecting these spaces. The Strategy also specifically notes the presence (and use) of aquifer systems in Cape Town, especially along the coast (e.g. the Atlantis Aquifer); however, there is no mention of the Cape Flats Aquifer system where the case study stormwater pond retrofit used to develop the implementation guidelines, is located. This gap creates an entry point for the MAR-BGI project.

The National Groundwater Strategy (2013) states that artificial recharge is an appropriate approach in situations where much of the natural recharge has already been captured by abstraction and natural discharge has been depleted; in particular, in situations where this discharge plays a critical role, e.g. in preventing seawater ingress in coastal aquifers. This also highlights and reinforces the importance of this project or similar BGI initiatives.

Other policies make reference to aquifers and these include the National Water Act (RSA, 1997); Artificial Recharge Strategy (DWAF, 2007); Water Conservation and Water Demand Management Strategy 2007 (CoCT, 2007); Integrated Coastal Management Policy (CoCT, 2014); Environmental Strategy for the CoCT 2017 (CoCT, 2017a); CoCT Integrated Development Plan 2017 – 2022 (CoCT, 2016a); Water Services Development Plan 2017/2018 – 2021/2022 (CoCT, 2017b); and the Cape Town Water Strategy (CoCT, 2019a). The Artificial Recharge Strategy (2007) makes the most direct reference relevant to the MAR-BGI project as it is aimed at creating an enabling environment for implementing artificial recharge. The Strategy asserts that it is important for any artificial recharge project to follow the normal water supply project development stages of planning, design, authorisation, and implementation; i.e. Pre-feasibility Stage >Feasibility Stage >Implementation Stage >Operation and Maintenance Stage (DWAF, 2007).

The Integrated Waste Management By-law (2010) and the National Groundwater Strategy (2013) both discuss the importance of protecting multifunctional spaces through interdisciplinary stakeholder engagement (CoCT,

2010a). The Densification Policy (2012) notes that stormwater infrastructure is prioritised as essential to the ecological space in communities even in developmental contexts (CoCT, 2012a). The policy also states that densification cannot happen close to a stormwater or water facility, and should not be supported where water, wastewater and stormwater capacity are reaching points of absolute constraint, and where the cost implications of rectifying the situation are too high for the private sector, or are not provided for in the City's capital budget (CoCT, 2012a).

A more direct mention of BGI is found in the CoCT Integrated Development Plan (IDP) 2017 – 2022 (CoCT, 2016a). The document also mentions green infrastructure, groundwater, and natural assets. The Resource Efficiency and Security priority section within the IDP states that, "*Cape Town's environment, including its natural resources, landscapes, ecosystems and green infrastructure, form the basis of the city's economy and plays a crucial role in building resilience*" (CoCT, 2016b). "*Natural resources in this context refers to basic resources such as water, renewable energy, water purification, flood prevention and mitigation, coastal buffers, the recharge of aquifers and soil production. The City recognises that Cape Town's natural resources are increasingly at risk of depletion and degradation, and aims to ensure their proper management and, therefore, their continued availability*" (CoCT, 2016b). The CoCT hopes to achieve this through promoting resource efficiency, diversifying resource consumption and sourcing, managing and protecting green infrastructure, and restoring key ecosystem services where needed.

2.3 POLICY COORDINATION AND DEPARTMENTAL COLLABORATION

The information presented in the policies is often compartmentalised and only speaks to specific mandates within the associated department. Given the fact that many departments have their own mandates to complete and have competing mandates, it is not a surprise that silos exist, especially within the affiliated stormwater infrastructure departments such as Roads and Transport, and Parks and Recreation. The Water Services Development Plan 2017/2018 – 2021/2022 (CoCT, 2017b) notes that the principal challenge for the city's Department of Water and Sanitation is that of maintaining an existing water and sanitation service for the city whilst also providing water-based services for an ever-increasing number of households in a sustainable way. This has to be achieved in the context of providing basic needs, ensuring economic growth, maintaining ageing infrastructure, limiting negative environmental impact, managing water resource scarcity, and consolidating a transformed metro administrative infrastructure (CoCT, 2017b). It is assumed that many departments within the City's administrative structures are facing similar challenges, but there is no mention of actual collaboration taking place between departments. The need for collaboration between departments is, however, noted in many of the reviewed policies. For example, the National Groundwater Strategy (2013) states that it is necessary to establish formal cross-sector collaboration to enhance sustainable utilisation of groundwater. Moreover, the importance of establishing partnerships with key external partners involved in Cape Town's strategic water source catchments, is also noted (DWS, 2013).

The importance of managing multifunctional spaces through interdisciplinary stakeholder engagement is also highlighted in the National Groundwater Strategy (2013). The Strategy states that an important principle of integrated land, water and environment management is that policy coordination should be initiated at national level with the respective institutions tasked with working through all levels to align and harmonise such policies towards more sustainable groundwater utilisation. While emphasis is placed on this being a priority of national government, municipal departments and local-level legislature are noted as significant in supporting and achieving these national goals. The Strategy also calls for the establishment of formal cross-sector collaboration to enhance sustainable utilisation of the resource.

The Cape Town Water Strategy (CoCT, 2019a) notes that the national Department of Water and Sanitation (DWS) and CoCT need to work collaboratively, and build stronger relationships between key stakeholders by sharing expertise, information, infrastructure and finances to ensure better planning and cost-effective investments in water supply and water resilience. The CoCT Catchment, Stormwater and River Management

Strategy 2002-2007 (CoCT, 2002) emphasises the need for an integrated and coordinated catchment-based planning approach founded on solid understanding of local needs and values, given the strong interrelationship between human health, the environment and development.

Feedback from CoCT officials during various workshops that were undertaken as part of Work Package 2 confirms that implementation of policies and programmes across departments is challenging, and in some cases, mechanisms to collaborate across departments are lacking within CoCT. For example, the maintenance of stormwater ponds, according to policy, is the responsibility of numerous departments, however, these spaces are prioritised differently by each department, in silos, with very little opportunity for collaboration. Having integrated plans across departments is also difficult because departments have different (and sometimes conflicting) mandates, budgets, sources of funding (funding is often ring-fenced), priorities and political heads (thus political will differs across contexts/departments). The policies mostly allow for implementation but synchronising and integration at a more tactical and operational level is often difficult, even if – as appears to be the case with the CoCT – departments themselves are well-equipped with the skills to design, manage and maintain BGI. The only drawback is the difficulties the City has with managing the various plans and programmes in an integrated manner across different CoCT departments. In particular, the policy review efforts highlight the need for 'joined-up' maintenance and management activities across different City departments.

2.4 COMMUNITY ENGAGEMENT

The National Groundwater Strategy (2013) asserts that engaging with community, as well as implementing projects that aim to facilitate the protection of multifunctional spaces as a protective asset from an interdisciplinary perspective, are both essential in achieving multifunctionality in different spaces. It is, therefore, important to support and strengthen the participation of local communities in improving the management of water and sanitation services, including stormwater. Community engagement and community ownership, as key factors for the success of BGI interventions, are noted throughout the strategy. This is of significance to the goals and purpose of the MAR-BGI project.

The CoCT Catchment, Stormwater and River Management Strategy 2002-2007 (CoCT, 2002) also calls for the involvement of communities and other stakeholders in the management of river systems through catchment forums. This includes efforts to promote other beneficial uses of stormwater and river systems through educational programmes and capacity building initiatives. The Cape Town Water Strategy (CoCT, 2019a) highlights citizenship and 'customer' (i.e. water users) engagement as essential in establishing wise use of water resources; while the Environmental Strategy for the CoCT (2017) (CoCT, 2017a)) aims to enable citizens to engage with the city on an ongoing basis on ways to improve implementation of the City's environmental principles.

The Environmental Strategy (2017) (CoCT, 2017a)) notes the importance of having a 'bottom-up' approach. This speaks to the importance of local policy that not only protects these resources but speaks the same legislative language as the surrounding communities. This will uplift local community water and environmental assets, while highlighting the importance of community ownership and multipurpose benefits which include environmental, economic and social benefits for the community. The Strategy also states that it is critical to change perceptions about groundwater in the whole municipal sector. Municipalities should be encouraged to make more use of local non-governmental organisations (NGOs) to assist in empowering grassroots organisations/people (e.g. adopt a borehole approach). It is also important to align groundwater finance mechanisms, i.e., in appropriate settings, economic incentives should be provided to encourage groundwater conservation, in particular, artificial recharge of aquifers. This will not only ensure environmental benefits but also promote increased economic opportunity for communities (DWS, 2013). The training and empowering of the relevant ward councillors in these communities is also encouraged.

2.5 CHALLENGES IN IMPLEMENTING MAR-BGI INTERVENTIONS

Several challenges in addressing and implementing MAR-BGI interventions were identified during the policy review. As mentioned earlier, very few policies even mention MAR and BGI, let alone address them directly. The policies tend to focus on terms such as aquifers, groundwater, stormwater and multifunctional/multi-use spaces. If one only focuses narrowly on these terms, there is a risk of limiting how useful the policies can be for MAR-BGI interventions. Relatedly, language of policies has been changing over time; for example, artificial recharge started receiving direct attention in 2007 with the Artificial Recharge Strategy (2007), and specific mention of green infrastructure is not apparent until 2016 – in policies such as the Environmental Strategy for the CoCT (2017) and CoCT's Integrated Development Plan 2017 – 2022 (2016). This indicates a need to update some critical policies.

While there are legislative and departmental overlaps within the policies, the relevant departments do not have the capacity to address certain issues or protect certain spaces. They acknowledge their inability in their policies and suggest other policies and departments that are mandated to do this. However, those departments and policies tend to delegate even further. As a result, finding a policy that can specifically help to address MAR-BGI is challenging.

Some policies discuss the need for certain actions and regulations to achieve ideal scenarios, however, many of these policies do not explain how these ideal conditions can be achieved. For example, the CoCT Tree Management Policy (CoCT, 2015b) mentions that trees have a role to play in stormwater and water demand management, but it does not provide any more details regarding this. The policy goes on to state that this is one of the key focal points for creating environmental awareness, also without expanding on this. The policies, do, however, mention some internal and external stakeholders who can assist with ensuring that these actions are taken to fulfil the goals of the departments. For example, the Tree Management Policy identifies various departments within CoCT that can assist with fulfilling the goals of the policy in relation to issues surrounding stormwater and infrastructure. For example:

A) Roads & Stormwater – Service level agreements with City Parks with respect to trees planted in road reserves, and the management of trees in rivers and other stormwater catchment areas
B) Water Demand Management – Management of trees within water catchment areas. Regulation of the use of water for the management and maintenance of trees
C) Human Settlements, Urbanisation and Human Settlements Development & Delivery – Planning to plant trees and create landscapes in human settlements (inclusive of road reserves) (CoCT, 2015b).

Departmental budgetary constraints continue to present a challenge as noted in the Densification Policy (2012) which states that the CoCT does not have the budget to support densification "where water, wastewater and stormwater capacity are reaching points of absolute constraint, and the cost implications of rectifying the situation are too high for the private sector". The need for external stakeholders to co-operate with state actors in their day-to-day actions is also discussed in the policies; these types of partnerships appear to be necessary to ensure that MAR-BGI interventions are functioning at an optimal level. This is only discussed in more recent documents, however, it is a requirement that stakeholders are informed of their role in ensuring the management of these interventions. Unfortunately, the nature of the role stakeholders can play is generally not discussed in detail, nor are their responsibilities. There is also no mention of standard memoranda of agreements (MOAs) or processes involved to support and/or remunerate local stakeholders for such management and other stewardship activities.

The Floodplain and River Corridor Management Policy (2009) highlights the challenges by climate change uncertainties for the management of major drainage systems. It also notes that within the confines of the Cape Town Metropolitan Area (and as would be the case in other urban areas around the country), the pressure to develop is significant and requires careful management to avoid developing in high flood risk areas, to protect the environmental integrity of aquatic resources.

Another finding from the policy review process is the reality that the language and jargon used tends to change across different policies. It is important, therefore, when reviewing the policies, to understand the difference in language which tends to categorise the MAR-BGI project differently across policies. If only contextualised through the keyword, “stormwater”, then most policies do not support the MAR-BGI efforts; however, if the changing temporal, contextual and spatial realities are kept in mind, i.e., considering BGI efforts as emergent infrastructures that could replace other ways of design and implementation, policy language can be selected that works to support MAR-BGI efforts. This is best done by deconstructing the language of the policy. Deconstructing the language of policy not only allows for the recognition of the specific significance of the policies alongside MAR-BGI concepts, but also allows for ways to slot the project into the larger meaning of each policy. A narrow contextualisation of the MAR-BGI effort through its alignment with stormwater in policy might face challenges, but when thinking more broadly or thinking with MAR-BGI as multi-use spaces, natural assets or mixed-use infrastructure, it broadens the scope for policy alignment and creates more opportunities to insert MAR-BGI into existent policy imperatives, ensuring that these projects have significance to these policies.

2.6 FACILITATORS AND OPPORTUNITIES TO IMPLEMENT MAR-BGI INTERVENTIONS

Several facilitators to implementing MAR-BGI interventions were identified in the policies, as follows:

- Policies such as the National Groundwater Strategy 2013 acknowledge that aquifers, especially vulnerable aquifers, have not been well protected or managed in the country, resulting in serious degradation of these important resources. The Strategy also acknowledges the failure of previous legislation in addressing these issues and calls for this to be addressed, thus, noting the importance of protecting spaces and projects that involve MAR-BGI.

- Stormwater infrastructure is often prioritised as essential for multiple functions within ecological spaces in local areas and for the purpose or protecting heritage within communities such as found on the Cape Flats, for example. Stormwater and wetlands are often recognised as prime assets in Cape Town’s landscape which need to be protected under the relevant policy conditions. This can help facilitate MAR-BGI projects and provide social, environmental and economic benefits to local communities.

- The concept of a Water Sensitive City (WSC) – including approaches such as Water Sensitive Design (WSD) and Sustainable Drainage Systems (SuDS) – has become more prominent in CoCT policies in recent years. A WSC provides room to diversify water resources and infrastructure, not necessarily only for supply purposes. A WSC “*makes optimal use of stormwater and urban waterways for the purposes of flood control, aquifer recharge, water re-use and recreation, and that is based on sound ecological principles. Principles of a WSC include; protecting natural systems, water quality, integrate stormwater treatment with the landscape and adding value while minimising costs*” (CoCT, 2017). The concept, thus, encapsulates MAR-BGI interventions. Policies such as the Floodplain and River Corridor Management Policy (2009), Environmental Management Framework (2012), Environmental Strategy (2017), Water Services Development Plan (2017/2018) and associated District Plans, and the Cape Town Water Strategy (2019a) all include discussion on a vision of a WSC, providing opportunities for MAR-BGI projects.

- Many policies, such as the National Groundwater Strategy (2013), acknowledge the inequality and spatial disparity that still occurs as a legacy of Apartheid and other factors in environmental planning, where the effects of policy and infrastructure failure is experienced the most. For example, the heavy rainfall experienced in Cape Town, in September 2023, resulted in extreme flooding in the townships and peri-urban areas whereas areas in the central Cape Town District remained largely unaffected. This is a clear indication of a need for infrastructural interventions in stormwater spaces in previously

disadvantaged areas. These interventions need to be integrated across departments such as housing, roads, solid waste and water and sanitation.

- MAR-BGI concepts have started appearing in multiple policies, meaning that different projects related to these concepts are being implemented. For example, green infrastructure is a term used in recent policies such as the CoCT Environmental Strategy (2017) and Integrated Development Plan (2017–2022), where natural functional ecosystems provide the most efficient and cost-effective buffers to environmental hazards. Hence, environmentally sensitive technologies, and soft engineering approaches that emphasise restoration and rehabilitation of natural systems need to be developed and implemented. This also presents an opportunity for climate change mitigation via various policies that aim to protect the environment, including wetlands, and watercourses.

- Within various policies, there is a strong emphasis on Cape Town and/or the Western Cape's landscapes, ecosystems, and natural biodiversity (e.g. the fynbos biome). This indicates that policy-makers have a significant environmental and green-focused vision, specifically in the Western Cape where the natural environment forms the backbone of the city's economy. Natural resources and ecosystem services include the provision of basic resources such as water, renewable energy, water purification, flood prevention and mitigation, coastal buffers, the recharge of aquifers and soil production. The CoCT recognises that Cape Town's natural resources are increasingly at risk of depletion and degradation, and action needs to be taken to ensure their adequate management and, therefore, their continued availability.

- Within the MAR-BGI project, when contextualised as per the policy jargon, it becomes clear that stormwater ponds are increasingly seen as protected infrastructural spaces. The CoCT's Densification Policy (2012) mentions that densification should not be supported where water, wastewater and stormwater capacity are reaching points of absolute constraint, and the cost implications of rectifying the situation are too high for the private sector, or are not provided for in the City's capital budget. This emphasises the importance of protecting these spaces, therefore, as the City does not have the budget to rectify any damage to them. This is a specifically important connection between the CoCT policies and the MAR-BGI project.

- The CoCT policies prioritise natural assets which tend to have multi-purpose benefits. These are often categorised as protective ecological spaces. The Densification Policy (2012) recognises stormwater ponds as assets and protected ecological space – thus the policy is protective of MAR-BGI interventions. The policies also prioritise partnerships with key external stakeholders involved in Cape Town's strategic water source catchments. This finds significant relevance with the MAR-BGI project as it has similar goals in aligning external stakeholders to water projects such as the stormwater pond retrofitting as part of PaWS.

- The need for external stakeholders to co-operate with state actors in their day-to-day actions is noted to ensure that MAR-BGI interventions are functioning at an optimal level.

- Both the District Plans and the Environmental Management Framework (2012) are key to local management and development of stormwater systems, aquifers, wetlands. For Mitchells Plain and Khayelitsha specifically, the Kuils River system is mentioned as a key river to be protected; therefore, integrating other water bodies into district plans is pivotal.

- The National Water Act (1997) stipulates that a National Water Strategy must be established to provide a framework for the protection, use, development, conservation, management, and control of water resources at national, regional and catchment scale, in well-defined water management areas. Cape Town's water policy contextualises this at a municipal level and identifies ways that the city's water

resources can be protected, used and developed. There is an opportunity to extend this framework to less “defined” water management areas such as the stormwater pond in Mitchells Plain.

- Even though there are numerous legislative and departmental overlaps within the policies, the relevant departments acknowledge that they do not always have the financial or human capacity to address certain issues relating to stormwater systems. This acknowledgment indicates a willingness to address MAR-BGI interventions and with the appropriate knowledge, funding and capacity, MAR-BGI-related projects can be implemented.

- The policies acknowledge the need for community engagement and community ownership/ stewardship of different interventions. This is of significance to the goals and purpose of the MAR-BGI project.

2.7 CONCLUSIONS FROM POLICY REVIEW

The study set out to explore policy relating to the process of retrofitting stormwater ponds with BGI interventions to enhance MAR. It was found that within South African policies, MAR and BGI are still relatively new concepts that emerged in policy after 2010. As a result, there has been very little policy coordination and collaboration between government departments that are linked to MAR-BGI. However, the need for such collaboration is acknowledged within policy, as well as the challenges in working together in a holistic manner. This is largely because departments already have their own, often conflicting, mandates to fulfil, and have different budget allocations, sources of funding (sources of funding cannot be mixed), priorities and political heads. This also makes synchronising efforts, aligning priorities and integration, at a more tactical level, difficult.

CHAPTER 3: WORK PACKAGE 2 – IMPLEMENTATION GUIDELINE

Work Package 2 (WP2) focused on identifying and documenting community BGI-needs and related concerns during the repurposing of the case study pond in Mitchells Plain, whilst also exploring the emergent benefits, experiences, and outcomes of those living nearby these modified ponds. The goal of this work package was to develop an implementation guideline on retrofitting a stormwater pond at local settlement level. WP2 is linked with WP1 in terms of facilitating policy experimentation throughout the project at both pond and South African city scale through workshops and consultations to understand the lived experience, so that those implementing such efforts in the future have a favourable policy landscape alongside a guideline on how best to begin such a process. WP1 included mapping and analysing relevant policies, which, in turn, also provided an understanding of the policy landscape, and where gaps exist. WP2 concentrated on facilitating engagement activities with local residents, researchers involved in the pond experimentation, and CoCT officials in an effort to engage with and analyse the overall pond experimentation process (undertaken as part of the PaWS1 project) and to understand implementation enablers and barriers.

The 'Implementation Guideline for Managed Aquifer Recharge (MAR) in combination with blue-green infrastructure (BGI) at local settlement level' is presented as a separate document. The purpose of the guideline is to provide research-based guidance on planning, designing and implementing BGI in sites of MAR at local settlement level, using experiences from a stormwater retrofit case study; i.e. the Danida-funded project undertaken by the 'Pathways to Water Resilient South African Cities (PaWS)' research team in Mitchells Plain, Cape Town since 2019. This chapter provides a brief overview of the case study and methods used to develop the guideline. It is important to note that the guideline/toolkit has been developed to be generic and flexible enough to be used on other restoration, retrofit, or intervention sites.

There are a total of six guidelines:

- Guideline 1 addresses the need for an initial scoping process before pursuing any MAR-BGI project. This process includes identifying local stakeholders, some basic understanding of technical needs, and the importance of scoping the local context before confirming site locations and beginning any coalition building process.

- Guideline 2 provides practical guidance and key considerations for the development of coalition/s around the proposed implementation aim.

- Guideline 3 outlines some of the relevant policy and legislation, and highlights the fact that current policies may have gaps regarding the incorporation of BGI initiatives into existent programs, practices and policies. It is always important to ensure that all projects align with, and do not work against local by-laws, legislation and programming.

- Guideline 4 addresses critical pinch points for consideration from experts involved in processes of implementing BGI in the context of MAR. Critical reflection points are provided for proposed implementation sites, along with key consideration related to the larger system within which the site is situated.

- Guideline 5 outlines key considerations in building engagement process and planning MAR-BGI efforts.

- Guideline 6 provides resources and tools in establishing mechanisms for sustainability of the project, from governance to management and maintenance planning.

3.1 CASE STUDY

The PaWS project provides an ideal case for on-site experimentation and demonstration of how to combine various repurposing landscape designs with specific ecosystem services and community BGI needs whilst activating and empowering local stakeholders with respect to the different governance arrangements required for collaborative management of stormwater ponds retrofitted for multifunctionality. The project draws on social learning processes and transition management methodology (Bos et al., 2013; Frantzeskaki, Bach & Mguni, 2018; Scholz & Methner, 2020), as it is postulated that momentum for transformation towards resilient cities with a stronger BGI approach can be facilitated by experimentation and co-learning with local stakeholders, in terms of both physical and policy aspects. At the same time, the project relied on standard social science methods including participant observation, interviews and workshops to inform the case study and assist with the development of the guidelines.

The stormwater pond selected for this project (**Figure 3.1)** is located in the suburb of Mitchells Plain, Cape Town – in a mostly working class (low to middle-income) neighbourhood in an area of Cape Town known as the 'Cape Flats' that overlies one of the main aquifers in the city (the Cape Flats Aquifer, CFA). The area has a long history of limited municipal support and infrastructural development. The 'School pond' is the study area for the PaWS1 (May 2019 – October 2022) and PaWS2 (November 2022 – ongoing) projects, where hands-on experiments and arena activities (including workshops) related to the investigation of multi-functional BGI are being undertaken. See **Figure 3.1** for an image of the site, that also highlights the pond retrofitting (physical) activities that took place during the period 2021 to 2023.

Figure 3.1: A view of the 'School Pond' site, Mitchells Plain (Image Credit: C. T. Tanyanyiwa)

The PaWS project includes experimentation around multiple functions/use for stormwater infrastructure; the site includes implementation of a number of engineered interventions (berms, weirs, etc) to increase infiltration of stormwater for MAR, while also exploring the potential to make the space an amenity for local residents. This MAR-BGI project links to the in-progress PaWS project experimentation, by drawing on lessons learned at the site, and building on existent engagement and relations to develop local-level guidance for the outscaling of such BGI interventions across the City.

Flood alleviation infrastructures such as stormwater detention ponds are integral components of urban drainage systems globally and some can be repurposed for stormwater harvesting (SWH) using MAR (Davis & Naumann, 2017). These ponds can also form part of an improved and extended BGI network that provides cities with a broad set of ecosystem services (ESS) and the adaptation potential to combat various climate-induced and anthropogenic water stresses such as drought, pollution, flooding, and urban 'heat-island' effects (Armitage et al., 2014; Fisher-Jeffes et al., 2017; Breuste et al., 2015). The use of an intentionally transdisciplinary SuDS approach also emphasises issues of amenity and local biodiversity, thus simultaneously addressing urban liveability, environmental and social justice, and declining urban biodiversity (Davis & Naumann, 2017); all top concerns for South African cities.

3.2 ACTIVITIES WITHIN WP2

The ethnographic and process research relevant to this work package piggy-backs on efforts by the PaWS1 and PaWS2 research teams. In many instances, MAR-BGI research assistants joined PaWS activities and were participant observers. In some cases, during these workshops, interactions or activities for PaWS MAR-BGI researchers included asking residents about their experiences in the project. Table 3.1 outlines the various PaWS activities where MAR-BGI researchers took part, and/or where data relevant to MAR-BGI efforts was gathered. Below the table, descriptions of some of the activities are provided.

Table 3.1: MAR-BGI and PaWS activities where MAR-BGI researchers were involved

Date	Activity	Conceptual framing issue / link
March-November 2022	• Mural painting process (explaining role of stormwater ponds in a blue-green city) • Several events to engage residents, including visual harvesting	Researchers along with the community and artists discussed what they understand about the pond, what was envisioned and how it could contribute to the community
May 2022	• Site meeting to discuss ongoing maintenance and management needs	Reframing community and researcher agency around maintenance needs after the construction
May-June 2022	• Ongoing interviews and participant observation with users of the pond and adjacent households (signed consent)	Determining existing and 'changed' perceptions of pond space and local agency; empowering local residents
June 2022	• Permission obtained from residents surrounding / adjacent to pond for mural. Application submitted to CoCT (and approved) for public art permit	Permission from local residents
June-July 2022	• Two workshops held with CoCT officials and other stakeholders to discuss multifunctional stormwater ponds as part of a water sensitive city transition; and how to operationalise a landscape management plan	Considering how a repurposed multifunctional pond can be maintained in a way that supports and links community efforts with the work of relevant different city departments; potentially through 'Friends of...' groups
August 2022	• Presented project at Sub-Council Meeting	Multifunctionality requires support from local councillors and residents
September 2022	• Presented project to Western Cape Sustainable Water Management Plan steering committee meeting	Support from Western Cape Government – opportunities for outscaling
September 2022	• Participation at International Water Association (IWA) World Water Congress (Copenhagen)	Showcasing project, planning phase 2
October 2022	• Presented research to CoCT's Urban Catalytic Investment Unit	Building comparative case studies of NbS / BGI implementations; stormwater master planning (POA)
November 2022	• Mural launch event at the pond and benches / picnic tables installed (x2)	Engagement with local residents
December 2022	• Advisory Board meeting	Defining research direction, funding and permissions for Phase 2
February 2023	• Presented at Water and Sanitation Innovation Indaba, CoCT	Project as an intervention best case
February 2023	• Two new monitoring wells installed at the pond site	Ongoing water quality monitoring
February- July 2023	• Meetings with Fynbos Life and preparation for planting of fynbos demonstration garden at the pond	Highlighting multifunctionality in respect of biodiversity protection
March 2023	• Meeting with CoCT officials (UCIU, SWM, Env, Parks & Rec) to discuss City's needs regarding the development of a best practice toolkit for these types of BGI	Highlighting leverage points for cross scale (residents and officials) maintenance and management functions (of multifunctional ponds)
March 2023	• Meeting on planned landscaping with relevant CoCT officials	Seeking permission, checking about process and signage
April 2023	• Mole barrier trial section at the pond – together with local team of workers	Management and maintenance
April 2023	• Site visits (seed harvesting initiatives) to Goewerneur St Park in Welgemoed and Penhill Estate with Ashton Mouton from CoCT – Parks & Rec	Assessing similar cases for Compendium

Date	• Activity	Conceptual framing issue / link
May 2023	• Interviews with mole barrier construction team; Community engagement meeting and plant workshop (project team and residents plus Denisha Anand)	Introducing planting plan to residents and stakeholders; gathering local knowledge
May 2023	• Site visits to City stormwater sites with potential for multifunctionality; visit to Mosselbank River conservation team	Assessing similar cases for compendium
June 2023	• POA site visits with UCIU	Assessing similar cases for compendium
June 2023	• Developed draft maintenance plan for pond retrofit	For workshopping with local residents and City officials
June 2023	• Presented project at Confluency conference, UCT	Arts-based approaches as part of multifunctionality
July - Sept 2023	• Planting of fynbos demonstration garden and installation of signage	Demonstrating multifunctionality
August 2023	• Inspection of mole barrier work and planting together with Barry Lewis – committed to engaging Denisha Anand on facilitating community organisation / manifesto meeting	Agreement with residents about repairs needed and ongoing maintenance activities and responsibilities
August 2023	• Meeting at pond with CoCT (Biodiv, Parks & Rec), Denisha, SEED (Ophelia), Mrs Amien (school)	Ongoing maintenance and management of multifunctional pond space
September 2023	• Presented project at Fynbos Life Fair, Muizenberg	Role of biodiversity in multifunctional open space
October 2023	• Site visit to pond with Rosenburg Water Forum delegates	Multifunctional open space – links to urban resilience
October to December 2023	• Biannual mowing process – engagement with CoCT and residents about where / what to mow	Maintenance / management of the pond space
November 2023	• Community meeting – reimagining Fulham Rd pond	Visioning and forming a local committee
November 2023	• Complaints about the benches, leading to their removal from the pond (via WhatsApp group) • Lauren Grootboom presented twice at the 7th WISA-YWP Conference in Stellenbosch from 8-10 November 2023; titles of presentations as follows: *Linking policy to local BGI interventions: An analysis of associated policy in Cape Town, South Africa*; and *Linking local engagement to BGI interventions: Lived experiences of communities in repurposing a stormwater pond in Mitchell's Plain, Cape Town, South Africa.* See **Appendix O** for Abstracts	Determining community values – context-based
December 2023	• Presented at IWA WDCE in Kigali, Rwanda	Local-level management models for blue-green open space
February 2024	• Workshopped Draft Implementation Guideline with PaWS Team	The aim of the workshop was to gain insights to improve the guidelines
March 2024	• Workshopped Draft Implementation Guideline with WRC Reference Group	The aim of the workshop was to gain insights to improve the guidelines

Date	Activity	Conceptual framing issue / link
April 2024	• Workshopped Draft Implementation Guideline with Ezemvelo and AgriWise Services (Browns Farm); Friends of the Liesbeek ;the Mosselbank River Conservation Team; and the CoCT Urban Planning and Design Department.	The aim of the workshop was to explore how blue-green infrastructure projects are being implemented and managed locally. Key questions included: • What has worked for the participants' projects? What were the key considerations? • What could have been done better? • Who in the City would project implementors connect with? (Map key contacts at city, province level, local NGOs, CBOs, community and neighbourhood leadership). (Provide possible contacts) • What barriers and facilitators have the projects encountered? • Were coalitions formed? If yes, how were coalitions built with relevant residents/communities and the City? • Are there any city mechanisms to support such collaboration? (Both city and implementors) • What plans are in place to ensure sustainability of the projects? • Are there city mechanisms to support project sustainability? • How does this track into the emerging BGI Master Plan? And the water sensitive transition (urban liveable waterways programs)? What does the Master Plan understand of these locally driven efforts? What space/support is made for them? • Are there plans to scale up the projects at the local level? Are there City support mechanisms to assist with scale up? Does this link to the BGI Master Plan? And water sensitive cities.
August 2024	• The MAR-BGI project tea, submitted an abstract to the 12th International Symposium on Managed Aquifer Recharge which will be held in Stellenbosch, South Africa from 28 April to 2 May 2025. The title for the abstract is D*eveloping a local implementation guideline for managed aquifer recharge in combination with blue-green infrastructure,* See **Appendix P** for Abstract.	

3.2.1 Workshops with CoCT

The MAR-BGI project team joined the PaWS1 project team in hosting two workshops with CoCT officials that have a role to play in managing the pond site. One workshop was held with CoCT at Edith Stephens Wetland Park in Cape Town in July 2022, and another on structuring a policy guideline in March 2023. The workshop that was hosted at the Edith Stevens Wetland Park started with participants meeting at the 'School pond' site to contextualise and have first-hand experience of the PaWS project. Participants included officials from City departments such as Stormwater Management, Bulk Water, Recreation and Parks, Environmental Management, Resilience, and the Urban Catalytic Investment Unit. During this workshop, officials and academics were seated in groups to discuss topics, such as the challenges of implementing any work done on site, what type of maintenance is necessary for the site and how such maintenance would be implemented and by whom, the best ways forward across departments for activating the space and co-operating across departments, as well as discussion on policies related to the site and stormwater ponds, in general. The site visit and the workshop provided good initial engagement opportunities for the MAR-BGI project team to see and contextualise the site, to meet relevant CoCT officials, and to observe and listen to the challenges and opportunities associated with the site.

3.3 WORKSHOPS WITH LOCAL RESIDENTS

The project team also joined the PaWS1 team in various workshops and/or interviews with local residents in Mitchells Plain. These workshops included:

- A co-design and visual harvesting workshop held in May 2022, where local residents were invited to join the PaWS team and artists in a workshop process to understand how local residents would want the efforts in the stormwater space represented in visual form on pond-facing walls in the form of a mural.
- The process leading up to the mural painting, which involved engaging residents of the neighbourhood through discussions about the mural's content, and the actual painting of the mural.
- Community interactions and activities that were conducted concurrently, including pond clean-up days and several events centred around painting the mural.

These workshops provided MAR-BGI project members an opportunity to begin to understand who the active local residents are, and who is interested in engaging in ongoing pond stewardship activities. The workshop also helped to identify key considerations that residents might have gleaned from the efforts of PaWS1, to enable WRC-BGI project members to see possible facilitators for implementation. The workshops culminated in the painting of the mural (**Figure 3.2**).

Similarly, insights regarding locals' interest in the project as well as their knowledge, perception and attitudes about the intervention were also obtained from a previous workshop (March 2022) that was held at the nearby Edith Stevens Wetland Park with residents from the pond site. This workshop aimed to develop an understanding of local indigenous plants with residents and tried to build momentum among local youth to raise interest in the different possibilities for using plants. The different workshops involved a broad mix of members that reflected the diversity (gender and age) of the local community.

Figure 3.2: Mural workshop (a; b) ; School Pond mural (c)

In 2023, the PaWS team also engaged in planting activities with local residents, and a plant knowledge sharing workshop. Similarly, a seed broadcasting event in 2024 brought together local residents and biodiversity branch staff. This event also represents project member efforts to bring together Parks and Recreation, and the Biodiversity branch within CoCT. Other similar efforts to bring together officials, and residents include meetings todetermine how best to address the emergent endangered plant species; and with ward counsellors and local residents around pond management plans.

3.3.1 Interviews

As part of the PaWS1 project, semi-structured interviews were conducted with the local residents living in the vicinity of the site. PaWS1 team members shared these interviews with the MAR-BGI project team. Within the interviews, the MAR-BGI team looked for emerging themes that informed future surveys, interviews and workshops with the community. Key themes that emerged included ‘amenity’ interviews (as named by the PaWS1 team). These refer to memories of the site prior to interventions, and how it was used, as well as imaginings of what the site could look like and who should be allowed to use it. Another theme that recurred

were discussions about responsibility and ownership. An additional six interviews were undertaken by the MAR-BGI team between September 2022 and October 2023. See **Appendices C and D** for complete list of questions and summary of the interviews. See **Appendix E** for informed consent form for participation in the interviews.

3.3.2 Research team workshops

On the 5 May 2023, the MAR-BGI team hosted an interview and sensemaking workshop with the PaWS1 and PaWS2 project teams. This was focused on understanding the process of retrofitting the stormwater pond in Mitchells Plain, Cape Town, which helped with developing the implementation guideline. Questions included the following:

- Site selection – How was the site identified?
- Who did the research team get in touch with?
- What was the research team's buy-in into the community?
- Was type of community engagement was there with the intervention?
- What barriers and challenges were encountered with the implementation process and community involvement, as well as opportunities?
- Are there future plans to retrofit other ponds?

See **Appendix F** for the complete list of questions and Appendix G for the responses.

The project team workshopped the Draft Implementation Guideline with the PaWS team in February 2024 and with the WRC Reference Group in March 2024. During the Reference Group meeting, it was agreed that one workshop should be held with different civic organisations, in order to explore how blue-green infrastructure projects are being implemented and managed locally. This workshop was held in April 2024 with three different local registered civic organisations: Ezemvelo and AgriWise Services (Browns Farm); Friends of the Liesbeek; the Mosselbank River Conservation Team; and the CoCT Urban Planning and Design Department. Ezemvelo and AgriWise Services (Browns Farm); Friends of the Liesbeek; the Mosselbank River Conservation Team presented their individual projects on work being undertaken in local communities and insights were gained from these and incorporated into the guideline. See **Appendix H** for the invitation to the workshop; **Appendix I** for the Workshop Agenda; **Appendix J** for an overview of the projects presented by the three civic organisations; and **Appendices K-M** for workshop responses regarding Stakeholder engagement; Resource requirements; and Setting up Civics, Coalitions and City Mechanisms, respectively. all of which are factors that are addressed in the Guideline.

3.3.3 Expert consultations

Aside from the consultations with stormwater pond researchers and experts in relevant research fields, as well as city officials already described above and as part of the policy review methods, the project team also met with CoCT consultants. A meeting was held with the CoCT's groundwater consultants, Umvoto, on the 6th of September 2023, to gather their insights on some of the associated factors for decision-making around MAR in urban areas. The meeting was extremely helpful in providing guidance for the development of the implementation guideline, with some key points with respect to the following (see **Appendix N** for meeting notes):

- Criteria for selecting suitable sites from MAR-BGI
- Consideration of water quality aspects
- Consideration of local groundwater initiatives and/or programmes
- Maintenance and management considerations (technical) for MAR-BGI schemes
- Local engagement
- Decision-making factors beyond hydrogeology aspects; e.g. safety and security, etc.

The semi-structured interviews and workshops were used to develop a guideline that is illustrative of best-practice (or lessons learned) on how to foster engagement, enhance local stewardship of the ponds, and engage people in a meaningful way about BGI's impact on the environment, and the benefits of multifunctional BGI to their wellbeing. The guideline maps stakeholders relevant to the retrofitting of a pond whilst also exploring the needs, organizational contexts, institutional capacities, and resources of local stakeholders/residents.

CHAPTER 4: CONCLUSIONS & RECOMMENDATIONS

4.1 CONCLUSIONS

Existing water resource management practices in South Africa are not resilient to climate change impacts and this is necessitating a transformation to more adaptive urban water supply, sanitation and stormwater management systems. Upscaled, retrofitted blue-green infrastructure (BGI), as part of a water sensitive design (WSD) approach, can be used to increase water supply and improve liveability in South African cities that are plagued by infrastructure deficits, inequitable access to urban services and green space, and resource constraints. The 'Implementation Guideline for Managed Aquifer Recharge (MAR) in combination with Blue-Green Infrastructure (BGI) at local settlement level (MAR-BGI)' project provides guidance on how a shift to more resilient water management approaches can be realised at a local settlement level.

The project started by interrogating existing water-related policies and programmes in the City of Cape Town (CoCT), South Africa, with a focus on how BGI and MAR approaches are being addressed in local and national government. The policy review found that the existing urban governance structures in the City are starting to incorporate BGI principles, although the implementation of policies and programmes across departments is challenging. Moreover, departmental silos exist, as evidenced by different departments having different priorities, mandates, budgets, sources of funding and political will- making policy coordination and collaboration difficult.

The implementation guideline has highlighted the importance of scoping the local context of the area where BGI interventions are planned and implemented; ensuring buy-in for the project by encouraging civic engagement and organisation and making sure that the planned intervention meets local needs; ensuring the availability of funds; adhering to relevant legislation, policies and programmes; seeking expert advice; and employing mechanisms to ensure the sustainability of the project beyond initial implementation. When implementing place-specific resilience-building initiatives such as the retrofitting of a stormwater pond while linking MAR and BGI at a local level, it is important to not only include local government, academics, researchers, and the private sector, but to also involve the local residents as the success of such initiatives hinges on their approval and support. Creating a sense of ownership for the project within the community will ensure its sustainability long after the project ends.

4.2 RECOMMENDATIONS

The overall research question for the MAR-BGI Project was "What are the key implementation lessons learned when repurposing existing stormwater infrastructure to BGI with multiple functions to achieve water resilient South African cities?" Based on these lessons, the following recommendations are made:

- Policies related to water resource management in Cape Town need to be updated to include opportunities for an enabling environment around MAR-BGI interventions.
- Ongoing training and skills development on MAR-BGI opportunities, interventions and maintenance within government departments is required in order to capacitate national, provincial and local government officials.
- A budget needs to be allocated for the planning design, implementation and management/ maintenance of BGI.
- Policy coordination and collaboration between departments on urban water resilience and the transition to a water sensitive city is required – dedicated integration units or managers with budget line items to support such integration are necessary.
- There should be more interventions in stormwater ponds located in previously disadvantaged areas.

- The roles of external stakeholders and local residents/ communities in any local intervention need to be clearly defined within policy; the practice and implementation of these interventions cannot become the sole responsibility of local residents without capital support or compensation.

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APPENDIX A: POLICIES REVIEWED

Policy Document	Policy Goals and Instruments	Policy Strategies and outcomes	Key Themes/Summary Points	Connection/Overlaps and specific recommendations to MAR-BGI context
National Water Resource Strategy (2023)	1. Reducing water demand & increasing supply 2. Redistributing water for transformation 3. Managing water & sanitation services under a changing climate 4. Regulating the water & sanitation sector 5. Improving water quality 6. Protecting & restoring ecological infrastructure for the green economy 7. Creating effective water sector institutions 8. Promoting international cooperation 9. Building capacity for action 10. Ensuring financial sustainability 11. Managing data & information in line with 4IR and global knowledge 12. Enhancing & deploying research, development & innovation 13.Addressing legislative & policy gaps -The NWRS-3 sets out the strategy to ensure that water resources must be **protected, used, developed, managed and controlled sustainably and equitably**; that the Water and Sanitation Department must support development	**1.1. Purpose & Scope** The National Water Resources Strategy (NWRS) is the legal instrument for implementing and operationalising the National Water Act (NWA)(Act 36 of 1998). The NWRS sets out the strategies, objectives, plans, guidelines and procedures of the Minister, and the institutional arrangements relating to the protection, use, development, conservation, management and control of water resources within the framework of existing relevant government policy to achieve the purpose of the NWA and any compulsory national standards prescribed under section 9(1) of the Water	1. STRATEGIC IMPERATIVES -Global Sustainable Development Goals (SDGs) 2030 -South Africa's National Development Plan (NDP) 2030 -National Government Priority Outcomes 2. CONTEXT -Constitutional, Legislative and Policy Mandates -Principles -Water for Sustainable Growth and Development -Approach to the NWRS-3 - Overview of the NWRS-3 3. REDUCING WATER DEMAND - To ensure that all sectors use water efficiently and effectively to	**Chapter: 5 Increasing Water Supply** **5.1 Context and Current Challenges** Since groundwater levels are also running low, better management of aquifers must be done including weekly monitoring of water levels to ensure water availability for future use. -MAR BGI at the centre of this policy as monitoring MAR is significant to this policy Principles that guide water resource planning, infrastructure development and management are: Artificial Recharge (AR) and Management of Aquifer Recharge (MAR) and well fields must be implemented to ensure water demand is met and to properly monitor that

	and the elimination of poverty and inequality, and contribute to the economy and job creation. -It is important to note that the NWRS-3 focuses on achieving equity and redistribution and the goals of our Developmental State, we need to streamline our policies, legislation and strategies for both water resource management and water and sanitation services. **This National Water Resource Strategy 3 (NWRS-3) sets out how South Africa will achieve the following overarching goals:** • That water must be protected, used, developed, conserved, managed and controlled sustainably and equitably. • That water and sanitation must support development and the elimination of poverty and inequality. •That water and sanitation must contribute to the economy and job creation. The major focus of the NWRS-3 is **protection and equitable and sustainable access and use of water by all South Africans while sustaining our water resource.** Equity and redistribution	Services Act, 1997 (Act No. 108 of 1997). The compulsory standards that the Minister may from time to time prescribe relate to: •The Provision of water services; •The quality of water taken from or discharged into any water services works or water resource system; •The effective and sustainable use of water resources for water services; •The nature, Operation, Sustainability, Operational efficiency and economic viability of water services; •Requirements for persons who install and operate water services works, and •The construction and functioning of water services works and consumer installations. **The National Water Resource Strategy Third Edition (NWRS-3) builds on the National Water Resources Strategy editions 1 and 2,**	enhance existing WC/WDM programmes across all sectors. - To raise the importance and the need for a change of attitude and behaviour in terms of how water is treated and conserved by all South Africans through education and awareness programmes. -To ensure all water use sectors set water use efficiently improvement targets and implement programmatic WC/ WDM projects to achieve these set targets. -To align the water use authorisation process with WC/WDM priorities and encourage interventions to improve water use efficiency. -To strengthen capacity within the DWS and the water sector as a whole to implement WC/WDM programmes through institutional	groundwater is not being over abstracted and to avoid ecological infrastructure and integrity compromise. - The places MAR BGI at the centre of this policy as it recognises MAR as an important aspect to implement to the local water supply **5.4.1 Strategic Objective 1** To ensure reliable current and future water supply inclusive of the effects of climate change. Strengthen agreements for sharing of water and related benefits with co-basin states, including shared aquifers -MAR BGI as a multifunctional space creates room for this reality. **Chapter: 8 Regulating the Water & Sanitation Sector Water resource regulation** Recharge areas for groundwater and managed aquifer recharge is important.

	will be achieved through the authorisation process and other mechanisms and programmes, such as water allocation reform, financial support to emerging farmers and support to urban and rural local economic development initiatives.	**and the revision of the strategy, as prescribed in the NWA, has been undertaken with the purpose being to**: •Facilitate the proper management of the nation's water resources. •Provide a framework for the protection, use, development, conservation, management and control of water resources for the country as a whole. •Provide a framework within which water will be managed at local, regional, national or catchment level, in define water management areas. •Provide a framework for strengthening the regulation of the water and sanitation sector. •Provide information about all aspects of water resource management. •Identify water-related development opportunities and constraints. •Provide opportunities for the implementation of innovative technologies and solutions.	development, training and capacity building initiatives. 4. INCREASING WATER SUPPLY -To ensure reliable current and future water supply inclusive of the effects of climate change. -To maintain a long-term capital investment plan for the development of water resources infrastructure. -To ensure that water supply systems and infrastructure are operated, maintained and refurbished according to formal rules and guidelines in addition to operating Decision Support Systems (DSS) that are based on historical data, establish real-time operating systems to facilitate flood water harvesting, minimise system spillage losses, mitigate against risk of flooding damages, and also in preparation to regulate other emerging hydrological	-This again places MAR BGI at the centre as this policy recognises this as an important aspect to water resource regulation **Water & sanitation services regulation** Either the system should be changed to include groundwater quality for each region, and when it was a good rainy season quality can be set against that standard or otherwise water quality standards should be developed for fractured Karoo systems, fractured granite systems, Kalahari sand systems, primary aquifer systems, dolomite systems, WITS systems, TMG, Bushveld Igneous complex etc. - This places emphasis on MAR BGI as an important thus protected space. Th legislation makes room for recognising how this is important

			processes due to anticipated climate change. -To use water resources infrastructure, particularly major storage dams, to promote multi-purpose stakeholder use. 5. REDISTRIBUTING WATER FOR TRANSFORMATION -To redress race and gender imbalances. -To promote broad-based black economic empowerment. -To be fair, reasonable and consistent in providing access to water use -To reduce the administrative burden of water use authorisation. -To respond effectively to local, provincial and national planning initiatives. 6. MANAGING EFFECTIVE WATER & SANITATION SERVICES -To enable integrated planning of water supply and sanitation services.	to water and sanitation services. **Chapter: 12 Protecting Aquatic Ecosystems & Maintaining & Restoring Ecological Infrastructure** **6.4.3. Strategic Objective 3** Develop and maintain approaches for proactive protection of groundwater resources and aquifer-dependent ecosystems to secure a sustainable supply of water for human survival and socio-economic development, while maintaining essential groundwater environmental services. - This recognises the multifaceted benefits MAR has for the environment , human life and the socio-economic aspects of communities. **Chapter: 18 Addressing Legislative & Policy Gaps**

			-To ensure efficient, sustainable and safe water supply and sanitation service delivery. -To ensure financially sustainable water supply and sanitation services. -To enable acceleration of water supply and sanitation service delivery. - To effectively regulate water supply and sanitation services. -To ensure the principles of health, dignity and protection of the environment are upheld 7. REGULATING THE WATER & SANITATION SECTOR -To contribute to the achievement of government objectives of equity in water allocation and access to water for socio economic development, redressing the race and gender imbalances of the past and reducing poverty and inequality.	**18.3.3 Water Resource Management Policy Developments** **Integrated Water Quality Management Policy:** This policy intervention is aimed at consolidating all past policies on water quality that were segmented in nature. The deterioration of water quality in rivers, streams, dams, wetlands, estuaries, and aquifers impacts on the economy, on human health, and on aquatic ecosystems. It reduces the amount of water available for use because more water must be retained in the river systems to dilute the pollution to acceptable standards. -This policy recognises the important of MAR spaces but also how they are often neglected and thus need to be protected. It also recognises legislative overlaps with itself and other policies that recognise this. **NATIONAL GROUNDWATER STRATEGY THEMES THEME**

			-To effectively regulate the water sector to protect water resources and water users. -To protect resource quality and the integrity of water ecosystems. -To promote and progressively achieve compliance through incentives and effective compliance monitoring and enforcement. -To facilitate financially sustainable and well governed water and sanitation institutions. -To ensure water and sanitation infrastructure that is operated efficiently, is properly maintained and operated, poses negligible risk to public health and safety and remains fit for purpose for the full design economic lifespan. 8. MANAGING WATER & SANITATION UNDER A CHANGING CLIMATE -To improve and enhance water management and	**1:** Stakeholder-Driven Development & Implementation **OBJECTIVE:** To continuously improve stakeholder understanding & collectively agree on and work within an expanding framework of local level participative management & 'good groundwater governance' a. Involve stakeholders in local level aquifer management through appropriate -This is significant to MAR BGI as it stabilises the importance of stakeholder engagement within the project scope and guideline. **THEME 4: Groundwater Resource Protection** **OBJECTIVE:** To develop & maintain approaches for proactive protection of groundwater resources & aquifer-dependent ecosystems to secure

			sanitation for enhanced adaptive capacity. -To integrate climate change considerations into short, medium- and long-term water and sanitation planning processes. -To develop appropriate adaptation measures to maximise water security and resource protection under changing climate conditions. -To enhance internal capacity and provide resources for improved resilience to climate change impacts. -To increase awareness of and build capacity on climate change issues. -To ensure inter-linked climate and hydrological scenario projections representative of the complex inter-related natural systems. 9. PROMOTING INTERNATIONAL COOPERATION -To advance the African agenda through sustainable	a sustainable supply of water for human survival & socio-economic development, while maintaining essential groundwater environmental services **2. National assessment of the impact of pollution on groundwater resources** 2.2 Identification of main pollution pressures, different aquifer classes and vulnerability to pollution -As MAR BGI is contextualised as a protective space, this legislature thus states the importance of protecting these spaces from pollution. **3. Groundwater use verification & groundwater authorization** **3.2 Utilize the aquifer importance, vulnerability and stress condition as criteria for prioritisation** - This policy thus sees this as an important space that needs prioritisation .

			development by multilateral and bilateral cooperation in Africa. -To advance the water and sanitation agendas in the global system of governance and water and sanitation diplomacy in support of political and economic relations through multilateral cooperation. -To advance strategic global bilateral relations, particularly South-South and North-South relations. -To enhance technical and development cooperation regarding international resources. -To promote and facilitate the establishment of shared resources agreements and shared watercourse institutions for the management of share watercourses (including for aquifers that are transboundary but with no River Basin Organisations established). -To promote Research and Technology development,	**Theme 5: Sustainable Ground water Recourse Utilization** **4. National Capacity for Groundwater Governance** 4.2 District and Local municipalities must appoint hydrogeologists to manage their aquifers, if necessary in terms of appropriate regulation - Local and provincial government should be part of the process of ensuring these spaces remain kept and protected. Which is important to the MAR BGI context. **Themes 6: Appropriate institutions** **4. Appropriate Local Participative Management Institutions** 4.1 Develop, capacitate and support local management institutions, monitoring committees to collect data

			information exchange, capacity building and the application of appropriate technologies with partner countries in Africa and Globally. 10. IMPROVING WATER QUALITY -To harmonise policies and strategies to enable improved IWQM. -To undertake legislative reviews and amendments to effectively enable IWQM. -To improve IWQM related governance. -To formalise IWQM governance frameworks to support non governmental IWQM engagements. -To improve coordination of WQM planning -To strengthen IWQM regulation, compliance and enforcement. -To apply IWQM systems-based adaptive management processes. -To achieve fiscal support for IWQM.	and source management solutions, aquifer management committees and water user associations -This is important to MAR BGI as it recognises the importance of local stakeholders and coalition building in upholding these projects after implementation **THEME 9: Groundwater Resource Planning & Development** **1. Incorporate groundwater option into all water development plans (National, Regional and Local)** 1.3 Develop groundwater management plans at catchment and priority aquifer level **THEME 10: Information Management** **3. Integrated groundwater monitoring at the different levels (National, Regional and Local)** 3.1 Establish aquifer monitoring as an integral part

			-To develop pricing and incentives that support IWQM. To achieve the above strategic objective -To strengthen IWQM Monitoring and information management. -To build equitable water quality and IWQM capacity through education, training and communication. 11. PROTECTING AQUATIC ECOSYSTEMS & MAINTAINING & RESTORING ECOLOGICAL INFRASTRUCTURE -To ensure sustainable management of water resources through Resource Directed Measures (RDM) and Source Directed Controls (SDC). - To identify, protect and maintain freshwater ecosystems priority areas in good condition. - To rehabilitate and protect ecological	of aquifer management by all sectors 3.3 Integrate the groundwater monitoring with surface water monitoring and coordinate with the monitoring of ecosystems, including aquifer dependent ecosystems - MAR BGI again is prioritised. More so the importance of having a functional monitoring committee to ensure the implementation and sustainability of the project post implementation . **4. Groundwater Use and infrastructure Information** 4.4 Prioritise major and stressed aquifers 1.2 Participate in joint management of identified transboundary aquifer systems (TBAs) Develop aquifer management plans at local level, starting with the most vulnerable and most stressed Systems - The above places emphasis on the

			infrastructure, including Strategic Water Source areas. -To prevent pollution of water resources from point and non point source pollution by managing at source. -To create awareness among communities, business and decision makers about the value of water and ensure commitment to sustainable water use practices. 12. CREATING EFFECTIVE WATER SECTOR INSTITUTIONS -To establish catchment management agencies. -To determine the optimal configuration of water boards to manage bulk water supply and assist municipalities to perform their primary water and sanitation services mandate. -To conclude effective establishment of the National Water	important of prioritising these spaces. Joint management with stakeholder engagement is also an important aspect recognised by the policy. Finally the most vulnerable aquifers should be prioritised. Thus MAR BGI becomes centred by this policy based on its location, the historical context of the space and its multi purpose benefits for the environment, the economy and for human life itself.

			Resources Infrastructure Agency. -To conclude the process to restructure, transfer and/or disestablish a water user association or irrigation board. -To conclude the process to restructure, transfer and/or disestablish a water user association or irrigation board. -To conclude the establishment bodies established in terms of international agreements. -To finalise the governance arrangements of the Water Tribunal. -To establish the national appeal process. 13. COLLECTING DATA & ANALYSING & MANAGING INFORMATION FOR EFFECTIVE MONITORING, EVALUATING & REPORTING -To develop and maintain water and sanitation information systems and hydrological monitoring networks.	

			-To implement data management so as to collect, analyse, compile, maintain, disseminate and provide easy access to accurate, complete, up to date and relevant data. -To support decision-making, reduce and manage risks and deal with emerging climate change impacts. -To raise awareness of the importance of investing in the collection and management of high-quality water and sanitation related information. -To improve governance of monitoring and information management in the water and sanitation sector. -To develop and implement a water and sanitation monitoring plan at national, regional and local levels and ensure uninterrupted continuation of existing monitoring and assessment programmes. -To enhance quality assurance and auditing of data and information on all aspects of water and sanitation.	

			14.BUILDING CAPACITY FOR ACTION -To strengthen the strategic orientation and coordination capacity of the EWSETA and LGSETA to ensure a demand driven skills planning mechanism that caters for short, medium and long-term sector needs. - To develop a responsive skills development funding mechanism to avoid funding duplications and overlaps. -To facilitate quality assurance across all water sector occupational learning modes to ensure response and relevant skills. -To develop an inclusive strategy for the professionalization of water sector institutions and practitioners throughout the water value chain, including regulations, standards, professional registration and on-going development programmes such as mentoring, coaching,	

			seminars and CPD based short courses against critical occupations. -To develop an inclusive strategy for the professionalization of water sector institutions and practitioners throughout the water value chain, including regulations, standards, professional registration and on-going development programmes such as mentoring, coaching, seminars and CPD based short courses against critical occupations. -To strengthen partnerships for innovation between role players along the skills pipeline (schools, TVET colleges and HEIs), public and private providers, providers and workplaces, and between local and international providers (in areas where South Africa does not have the relevant expertise). -To ensure Compliance Monitoring and Enforcement (CME) in-house training.	

			15. ENSURING FINANCIAL SUSTAINABILITY -To fund every aspect of the NWRS-3 in terms of approved funding plans that are cost effective and fit for purpose (value engineering). -To reduce the amount of outstanding debt and financial losses to acceptable levels. -To monitor and report on financial regulation and governance. -To provide financial assistance to historically disadvantaged households, other water-based rural livelihoods and food security initiatives. -To produce a complete and accurate (approved) database of registered and licensed water users and billing information. -To revise norms and standards for tariff setting applicable to bulk and reticulated potable water and sanitation. -To provide financial assistance to historically	

			disadvantaged households, other water-based rural livelihoods and food security initiatives. -To produce a complete and accurate (approved) database of registered and licensed water users and billing information. -To promote investor confidence through the establishment of incentives for new investment in the water and sanitation sector. 16. ENHANCING & ENABLING DEPLOYMENT OF RESEARCH, DEVELOPMENT & INNOVATION -To promote investor confidence through the establishment of incentives for new investment in the water and sanitation sector. -To improve governance, planning and management of supply and delivery, and management of demand and use.	

			-To improve adequacy and performance of supply and demand infrastructure. -To improve operational performance and run water and sanitation as a sustainable “business”. -To reduce unintended losses and increase efficiency of productive use. -To improve performance of water pricing, monitoring, billing, metering and collection. 17. ADDRESSING LEGISLATIVE & POLICY GAPS -Emerging Legislative and Policy Issues -Policy Principles -Policy Objectives -Addressing Legislative and Policy Gaps -Amending Legislation -Developing New Policies -Effecting Institutional Reform -Achieving Redress and Equity -Implementing Sustainable Delivery Mechanisms	

			-Exploring Unconventional Gas Development	
CoCT Coastal Management Programme (2014)	**CHAPTER 2: INTEGRATED COASTAL MANAGEMENT POLICY** •Equitable and ease of public access to coastal areas and opportunities for the entire coastline. •City decisions regarding the coastline will include broad-based stakeholder engagement and public consultation processes. •Economic and social development opportunities will be optimised to the benefit of all residents. •Development must not degrade the coastal environment or reduce its ability to cope with climate change risks. •Natural heritage resources must be protected for future generations. •Strategic decisions will be made and measures implemented in order to reduce coastal risk from climate change effects. •All individuals must be responsible for their actions and avoid causing any negative impact on the coastal environment.	**CHAPTER 1: COASTAL ROLES AND RESPONSIBILITIES** Several principles guide the City's position towards defining and identifying coastal roles and responsibilities, including: •The management of coastal space must be determined by the primary function or purpose of that space. •The coastline is a shared responsibility and support from the relevant line departments to the lead department is critical. •Roles and responsibilities should be assigned wherever possible according to the key functional responsibility, mandate and capacity of City's departments. •Ongoing communication and coordination between departments must be entrenched through the establishment of a quarterly coastal coordination meeting.	**Structure of the City's CMP** The City's CMP follows a logical flow, and chapters are arranged according to: •policy and principles •institutional accountability and responsibility •legislative components •specific management and operational protocols. **Context of the City's CMP** **Section 4: Context** This section reflects on the importance of the coastline in terms of its contribution towards a sense of place, social well-being, recreation and livelihood perspective. **Section 5: Economic context** This section discusses the importance of the City's coastline to the wider economy, tourism, property values, economic growth and risk reduction.	

	CHAPTER 4 •the promotion of access to the coast •retention of private property rights •the promotion of increased degrees of integrated coastal management across multiple line departments within the City •to ensure that the socioeconomic opportunities that the coast currently provides are retained and enhanced into the future •to ensure the conservation of remaining functional coastal ecosystems. The City has defined clear management objectives for micro-scale access along the City's coastline, which are to: •Promote the enjoyment of the coastline on an equitable basis. •Ensure that access to the coast provides an informative and educational experience. •Ensure that access to the coastline is convenient. •Minimise negative impacts on the sensitive coastal environment. •Safeguard against the encroachment of private property onto coastal access land. A rapid planning review was undertaken with the intent to:	The following line departments are involved in water quality testing in the City: • Environmental Health: Monitors the quality of water and places health warning signs at closed beaches. • Stormwater and Sustainability: Coordinates and funds the coastal water quality monitoring programme. Any investigations of pollution issues will be carried out by this department. • Environmental Resource Management: Assists with coastal management advice and is responsible for the implementation of coastal management plans as required by the National Environmental Management: ICM Act (Act 24 of 2008). • Water and Sanitation: Scientific Services are responsible for collecting and analysing water quality samples. This is done in accordance with a service level agreement between Scientific Services and the	**Section 6: Physical context** This section provides a description of the City's coastline from a biophysical and process perspective, including a description of upwelling events, rocky shores, estuaries, dunes and sediment dynamics. **CHAPTER 1: COASTAL ROLES AND RESPONSIBILITIES** Cape Town's coastline is one if its greatest economic, social and environmental assets that contributes significantly to the City's tourism, recreation and industry sectors. **CHAPTER 3: COASTAL LAND POLICY: PURCHASE AND LEASING** The Coastal Land Policy reflects the City's clear intent to ensure that the coastline is managed, maintained and kept as a common asset that is accessible to all.	

	•Develop a concise synthesis of current strategy and policy imperatives that inform developments along the coast. •Identify key developmental challenges and opportunities experienced within the study area. •Define zones of development opportunity along the relevant section of the False Bay coastline. •Identify a set of guiding principles that should inform any development proposals along this stretch of coastline. •Undertake a detailed analysis of the local physical informants to development at identified zones of opportunity. Strategic Objective 1 Develop a joint Cooperative Marine and Environmental Law Enforcement Strategy between the City and relevant partners. This strategy will focus on marine poaching, legislative compliance and improved interagency cooperation. Strategic Objective 2 Establish a specialised City Marine and Environmental Law Enforcement Unit, which will be highly visible and will respond to any transgressions within the City's jurisdiction. Strategic Objective 3	Environmental Health Department. Amenities: •Sport, Recreation and Manages the City's beaches and places health warning signs at closed beaches. The Coastal Monitoring Programme is a GIS-based programme that aims to record and collate these biophysical changes along the City's coastline. This information will be used to both: •inform and guide the daily operations and decision-making within the City •inform higher-level strategic policy intents on how the City needs to respond and manage the coast, through the identification of risk.	**CHAPTER 4: COASTAL SET-BACK DELINEATION: METHOD AND PROCESS** While the City's coastline offers significant socioeconomic potential, paradoxically the coastline may also become a source of risk to the City. **CHAPTER 5: CITY OF CAPE TOWN COASTAL BY-LAW** A key chapter in the CMP is the proposed Coastal By-law. Due to the legal implications associated with adopting a by-law and for the purposes of public engagement in line with the City's Public Participation Guidelines, this chapter will be finalised through a separate process and only referenced as a future chapter in this public engagement process. **CHAPTER 6: COASTAL SPATIAL AND ECONOMIC DEVELOPMENT PLAN FOR THE CITY'S COAST**	

	Establish a coastal and marine hotline reporting number so that any transgressions or issues can be reported and responded to. Strategic Objective 4 Assess coastal infrastructure to determine any development requirements that may improve marine law enforcement and social opportunities along the coastline. Strategic Objective 5 Complete an assessment of regulatory coastal signage. The aim of the City's Coastal Risk Register is to: •Track and monitor all risk along the coastline. •Assign clear departmental responsibility for remedial action and ensure that these departments are aware of their responsibilities. •Clearly define the remedial action. •State whether there are appropriate legislative requirements regarding the remedial action. •Track the resolution of the risk. •Highlight any ongoing risk that is not addressed at appropriate City forum or committee meetings.		The City's Coastal Spatial and Economic Development Plan (CSEDP) outlines the City's drive to increase investment in its coastline. **CHAPTER 7: CITY OF CAPE TOWN ZONING SCHEME: GENERAL COASTAL OVERLAY ZONE** The City of Cape Town's General Coastal Overlay Zone provides specific land use requirements and regulations between the high water mark (as defined in the ICM Act) and the Coastal Urban Edge (as defined in the City of Cape Town's Spatial Development Framework). **CHAPTER 8: COASTAL ACCESS LAND** The City of Cape Town recognises the importance of promoting equitable, safe and environmentally sensitive access to the coastline for all abled and disabled citizens to enjoy, and	

	The City's vision and aims with this Blue Flag programme are to: •Ensure close alignment with the criteria and visions of the international Blue Flag programme. •Promote and facilitate community involvement. •Provide a safe and healthy environment. •Ensure the protection of the natural coastal environment. •Promote the City's coastline and its beaches as a major tourist attraction. •Promote the City's coastline as an important contributor to its economic prosperity. Current dune management within the City is informed by several guiding principles: •Regulate and avoid human interference in areas where dune systems remain functional. •Implement management interventions at sites where dune systems have been seriously altered. •Use exotic plant species and mechanical shaping to manage dunes in an already altered system. •Implement a slow but managed replacement of alien plant species with indigenous		as a means to further enhance the socio-economic value of our coastline. **CHAPTER 9: COASTAL DEVELOPMENT NODES** The City is committed to optimising coastal opportunities for all its communities and, where possible, restoring equity in coastal land ownership **CHAPTER 10: COASTAL AND SEA DEFENCE DECISION FRAMEWORK** Much of the City of Cape Town's extensive coastline has been developed with fixed infrastructure, thereby significantly restricting natural coastal processes from taking place unhindered. **CHAPTER 11: MARINE AND ENVIRONMENTAL LAW ENFORCEMENT STRATEGY** Marine and coastal law enforcement within the City is currently the responsibility of national government	

	plants in dune systems that are currently stabilised. •Mechanically remove excess sand build-up when necessary. The intention of the Coastal Signage Protocol is to: •Provide the City of Cape Town's beach users with visible, informative, consistent and well maintained coastal signage, which will enable users to make informed decisions regarding beach safety and behaviour. •Manage coastal signage in a manner that respects the integrity and aesthetics of the surrounding environment. •Be aligned to the City's brand guidelines. As such, the Coastal Cleaning Protocol is informed by the following guiding principles: •All beaches and rocky shores will primarily be managed as ecological systems. •The City's coastline is a valuable asset and will – to the best of the City's abilities – be kept free of waste material. •The coastline experiences varying degrees of user intensity, and will be managed accordingly.		**CHAPTER 12: COASTAL EMERGENCY PLANS** Cape Town has a highly dynamic, sensitive and rich coastal environment which contributes significantly to the city's economy **CHAPTER 13: LARGE MARINE ANIMAL STRANDING POLICY AND PROTOCOL** The City of Cape Town occasionally experiences strandings of large marine animals, which is addressed in more detail of Chapter 13 of the full CMP. **CHAPTER 14: COASTAL RISK REGISTER** Due to the extent of the City's coastline and a historical lack of clarity regarding departmental roles and responsibilities, the maintenance of public infrastructure along the City's coastline requires attention and action.	

	•Maintaining a clean coastal environment is a shared responsibility between City's line departments, external organisations and individual beach users. The Coastal Monitoring Programme is a GIS-based programme that aims to record and collate these biophysical changes along the City's coastline. This information will be used to both: •inform and guide the daily operations and decision-making within the City •inform higher-level strategic policy intents on how the City needs to respond and manage the coast, through the identification of risk. **CHAPTER 29: EVENTS POLICY** Cape Town has a strong track record as an events destination and has hosted major global events such as the 1995 Rugby World Cup, 2003 Cricket World Cup and 2010 FIFA World Cup. As such, management of Cape Town's coastline will be facilitated by engaging with the public and relevant stakeholders regarding:		**CHAPTER 15: MARINE ACCESS POINTS** The City's coastline provides opportunities and benefits to a wide range of users and suitable access to the marine environment is necessary for both recreational and commercial purposes. **CHAPTER 16: COASTAL RECREATIONAL USE ZONES** Coastal recreation is essential to the livelihoods and well-being of many of the City's inhabitants, and the coastline therefore serves as an important social and economic asset. **CHAPTER 17: SHARK SAFETY** Cape Town's coastline provides an environment where both humans and marine mammals interact in close proximity to one another. This interaction presents us with many benefits – such as a thriving tourism and recreation	

	•proposed coastal policies and by-laws •the City's CMP •any significant review or amendment of individual chapters of the City's CMP after its adoption (See Chapter 31) •any land use activity that requires an Environmental Impact Assessment, as required by the National Environmental Management Act (NEMA).		industry – yet it also creates certain risks to water users and to the marine environment. **CHAPTER 18: BLUE FLAG STRATEGY** The Blue Flag programme is an international award given to beaches and marinas that meet excellence in the areas of safety, water quality, amenities and environmental standards. South Africa is the first country outside of Europe to win Blue Flag certification for its beaches. Cape Town currently has eight beaches and two harbours that have received Blue Flag status for the 2013/2014 season **CHAPTER 19: TREK NETTING PROTOCOL** Due to increasing reports of conflict between trek netters and beach users, the City of Cape Town has established a Trek Netting Protocol which	

			aims to balance the needs of all beach users. **CHAPTER 20: DUNE MANAGEMENT** Cape Town's coastal dune systems are being compromised and transformed due to expanding urban development, which means that fewer dune systems in the City remain functional. The restriction of these dune systems to narrow belts through encroachment requires such systems to be actively managed. **CHAPTER 21: HELDERBERG MARINE PROTECTED AREA MANAGEMENT PLAN** The Helderberg Marine Protected Area (MPA) is situated on the north-eastern side of False Bay and falls within the jurisdiction of the City of Cape Town. It was proclaimed under the Marine Living Resources Act in 2000 as a no-take MPA and is managed in terms of	

			the National Environmental Management: Protected Areas Act. **CHAPTER 22: COASTAL CONSERVANCIES** The City has defined and identified various sites along the coastline as Coastal Conservancies. These sites reflect Cape Town's diverse coastal environment, and serve to protect these unique spaces from unconsidered urban development. **CHAPTER 23: ESTUARY MANAGEMENT PLANS** The National Environmental Management: Integrated Coastal Management Act, (Act 24 of 2008) (ICM Act) stipulates that all estuaries in South Africa must be managed in a coordinated and efficient manner, in accordance with a National Estuarine Management Protocol. **CHAPTER 24: WATER QUALITY MONITORING**	

			AND PUBLIC HEALTH PROTOCOL The City of Cape Town conducts regular water quality tests at specific beaches and tidal pools along its coastline. This testing is necessary to ensure that users of the City's beaches are not exposed to any health risks associated with polluted water and to make the necessary management interventions in case of poor water quality. **CHAPTER 25: COASTAL SIGNAGE PROTOCOL** Signage and information plays a key role in the coastal environment, where it is used to provide both general information to beach users as well as information about rules and regulations. **CHAPTER 26: COASTAL CLEANING PROTOCOL** The City has developed a Coastal Cleaning Protocol which specifies the principles,	

			responsibilities and procedures for beach cleaning along the coastline. **CHAPTER 27: COASTAL MONITORING PROGRAMME** The City of Cape Town's coastline is a harsh and dynamic environment, which is constantly undergoing change. This change can be either predictable or unpredictable, and similarly it can occur over both a short (seasonal) time scale or over longer and less defined periods of time. **CHAPTER 28: EDUCATION, AWARENESS AND TRAINING STRATEGY** The Environmental Resource Management Department is responsible for the organisation and coordination of the City's coastal education and awareness programmes. **CHAPTER 29: EVENTS POLICY**	

			Cape Town has a strong track record as an events destination and has hosted major global events such as the 1995 Rugby World Cup, 2003 Cricket World Cup and 2010 FIFA World Cup. **CHAPTER 30: COASTAL COMMITTEES** The Integrated Coastal Management Act (Act 24 of 2008) makes provision in section 42 for the option of establishing a Municipal Coastal Committee. As a result of Cape Town's variable and extensive coastline, however, the City has opted not to form such a Municipal Coastal Committee. **CHAPTER 31: MONITORING, EVALUATION AND REPORTING** According to section 49(d) of the Integrated Coastal Management Act (Act 24 of 2008), the Municipal Coastal Management Programme must include: '(d)	

			performance indicators to measure progress with the achievement of those objectives'	
National Water Act (1997)	Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management, and control of water resources. -Stipulates the establishment of a National Water Resource Strategy, a catchment management water strategy.	-Aim to meeting the basic human needs of' present and future generations: -Promoting equitable access to water; -Redressing the results of past racial and gender discrimination; -Promoting the efficient, sustainable and beneficial use of water in the public interest: -Social and economic development, -For growing demand for water use: -Protecting aquatics associated ecosystems and their biological diversity: -Reducing and preventing pollution and degradation of water resources meeting international obligations; promoting darn safely; -Managing floods and droughts,	-The National Water Act adopts water conservation as a key concept - Recognising that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water user There is a need to recognise that integrated management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate is a priority.	Mention of aquifer through the controlled activity regulation in Part 5, stating, "no intentional recharging of an aquifer with any waste or water containing waste may be undertaken" and therefore aquifer recharge or groundwater in relation to MAR or BGI was not particularly mentioned. However, the term's reliability, sustainability and conservation, as contained in these principles, provide the basis for pursuing artificial recharge as one of the means to meet the Nation's water supply and management objectives.

Water Services Act (1997)	To provide for the rights of access to basic water supply and basic sanitation; to provide for the setting of national standards and of norms and standards for tariffs; to provide for water services development plans; to provide a regulatory framework for water services institutions and water services intermediaries; the accountability of water services providers; the promotion of effective water resource management and conservation.	This services act document is guided by equity and acknowledges that there is a duty on all spheres of Government to ensure that water supply services and sanitation services are provided in a manner which is efficient, equitable and sustainable; to adhere to the principles of co-operative government, that the interests of consumers and the broader goals of public policy must be promoted regarding water supply and sanitation.	Sets out the specific rights to people in South Africa regarding water provision	No direct mention or relevance to MAR/BGI
CoCT Catchment, Stormwater and River Management Strategy 2002 - 2007 (2002)	A paradigm shift in approach to stormwater and river management has developed over the past few years, based on the philosophy of integrated catchment management. Whilst the traditional role of stormwater management remains undiminished, namely, to minimise the impacts of flooding, more emphasis is now placed on the following: An integrated and co-ordinated catchment-based planning approach founded on good understanding of local needs and values. Decisions now incorporate water quantity,	-Effective stormwater drainage -Managed flood risks(for residential, industrial and commercial properties) -Improved water quality(surface, ground and coastal waters) Ecologically healthy rivers, vlei and wetlands -Multi-functional, sustainable use of river corridors and storm water drainage facilities	There are 6 focus areas: -Holistic Planning & Management -Relationship Management -Infrastructure Upgrading, Development & Maintenance -Public Safety, & Environmental Protection -Information Management -Regulatory	-Development of innovative infrastructure solutions that are cost effective, sustainable in terms of future maintenance requirements, environmentally sensitive and maximise social and amenity value. -Involvement of communities and other stakeholders in the management of river systems through catchment forums. This includes efforts to promote other beneficial uses of stormwater and river

	water quality and socio-economic considerations in support of broader city objectives. It is further recognised that there is strong interrelationship between human health, the environment and development.			systems through educational programmes and capacity building initiatives.
Cultural Heritage Strategy (2005)	The context of cultural heritage in the CCT □ Introduces the concept of "strategy". □ Fifteen Key policy principles □ Presents an institutional framework that will facilitate the effective and efficient implementation and management of the Cultural Heritage Strategy □ Recognises the importance and role of partnerships. □ Identifies the (seven) Strategic Objectives of the Cultural Heritage Strategy □ Defines the approach to each of the (seven) Strategic Objectives □ Identifies key performance indicators for the implementation of the strategy as a whole. □ Concludes with a mechanism for continual improvement through a cycle of review and revision for the Strategy. □ Includes Supplementary Report: Detailed Implementation Strategy, Management and Maintenance Plan for the City Owned heritage objects including	A heritage resource is defined as "any place or object of cultural significance." (NHRA). Intangible heritage is defined in the NHRA as "Nonmaterial heritage or non-material culture including traditions, oral history, ritual, ceremonies, language, popular memory and indigenous knowledge systems."	**2.5 Policies of principle** Policy 1: Access Policy 2: Archaeology Policy 3: Authenticity Policy 4: Community Participation Policy 5: Context and Scale Policy 6: Cultural diversity Policy 7: Cultural landscapes Policy 8: Development Policy 9: Environmental Sustainability Policy 10: Heritage, tourism, and economic growth Policy 11: Heritage significance Policy 12: Integration Policy 13: Interpretation Policy 14: Tangible and intangible heritage Policy 15: Urban regeneration	*Keyword search Storm Water: No Matches / Relation *Keyword search Water: No matches (The Policy does not relate to the MAR- BGI Project).

	the Arts, Antiques and Memorabilia Collection			
Stormwater Management By-law (2005)	- The Stormwater management By-Law of 2005 is meant to protect the storm water system within the City of Cape Town. The law defines storm water as water resulting front natural precipitation and/or the accumulation thereof and includes groundwater and spring water ordinarily conveyed by the stormwater system, as well as sea water within estuaries, but excludes water in a drinking water or wastewater reticulation system. At the heart of its many objectives, the By-Law seeks to regulate public or private activities that may damage, endanger, destroy the stormwater system or the operation thereof (https://urbanlex.unhabitat.org/law/5312)	-No one is allowed to discharge, or impose anything other than stormwater into the stormwater system (unless there is written permission) -No person is permitted to change the design, the use of or modify any aspect of the stormwater system which may cause an increase in flood risk -no person is permitted to reduce or obstruct the use of the stormwater system -No diversion, abstraction and draining of water from stormwater system	-Main goals of the By-Law is to protect the stormwater, to prevent flood risk, to provide management of stormwater systems on private land, provide guidelines on water pollution incidents, outlines the powers of the Council and offences and penalties to any party that does not abide by the By-Law	-By-Law seeks to protect stormwater systems which include groundwater -The Council may construct, expand, alter, or maintain any pipes, drains or any other structures related to the stormwater system (provision of infrastructure) -The Council may remove any damaging, obstruction that is damaging to the stormwater system
Artificial Recharge Strategy (2007)	-Development of national artificial recharge strategy on how to create an enabling environment for implementing artificial recharge via DWAF, WRC, CSIR, Groundwater Africa with collaboration from various feasibility studies such as Prince Albert Artificial Recharge Feasibility Study and Plettenberg Bay Artificial Recharge Feasibility Study, and the City of Cape Town Atlantis Water Resource Management Scheme. ARS is contextualised as a sub-strategy within the National Water Resources Strategy, where	The main vision for this strategy is to use natural sub-surface storage as part of Integrated Water Resource Management wherever technologically, economically, environmentally, and socially feasible. For this strategy to be effective, that is, for it to enable authorities to include artificial recharge as a feasible option when assessing, planning, and	-South Africa has one major established artificial recharge scheme, however, this technology is underutilised and together with proper groundwater management, artificial recharge can contribute significantly towards maximising the use and sustainability of available water resources. -DWAF intends to incorporate artificial recharge as part of	Section C.1 lists out the criteria for successful implementation of artificial recharge which are summarised: -The need for an artificial recharge scheme (A clearly defined need) -The source waters -Aquifer hydraulics -Water quality (including clogging)

	groundwater is an essential aspect of water management and storage. The aim of ARS is to provide a national strategy on how to create an enabling environment for implementing artificial recharge.	managing water resources, it will need to accomplish four critical objectives: -Awareness on artificial recharge -Inclusion of artificial recharge in water resource planning -Factors affecting the viability of artificial recharge schemes -Provide guidance on how to obtain approval from DWAF for implementing artificial recharge projects	water resource planning - both at the Water Resource Level and at the Water Services Level. This will mean incorporating artificial recharge within Catchment Management Strategies (CMSs) and the National Water Resource Strategy (NWRS); and at the Water Services Level, it will mean including artificial recharge in Integrated Development Plans, in Water Services Development Plans and in the various Water Conservation and Water Demand Management Strategies.	-The artificial recharge method and engineering issues The most efficient artificial recharge method to be used must be assessed based upon the site-specific conditions that include: The quality of the water used for recharge. The hydrogeological environment. Existing infrastructure and the costs of additional infrastructure required. The management and technical capacity needed to operate the scheme. 1. Environmental issues 2. Legal and regulatory issues 3. Economics 4. Management and technical capacity 5. Institutional arrangements C.2 It is important that artificial recharge projects follow the normal water supply project development stages of

				planning, design, authorisation and implementation. Pre-feasibility Stage >Feasibility Stage >Implementation Stage >Operation and Maintenance Stage
Western Cape Water Supply System Reconciliation Strategy (2007)				*Keyword search Storm Water: No Matches / Relation *Keyword search Water: No matches (The Policy does not relate to the MAR- BGI Project).
Water Conservation and Water Demand Management Strategy (2007)	-The purpose of the WC/WDM strategy is to ensure the long-term balance between available Water Resources and water demand, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage. This revised WC/WDM strategy seeks to overcome these challenges, build on experience gained and adapt to the city's approach in light of current socio-political, environmental and urban management imperatives. - The Water Conservation and Water Demand Management Strategy is a fundamental step in promoting water use efficiency and is consistent with the National Water Act (Act 36 of 1998) which	-To become leaders in the provision of equitable, sustainable, people-centred, affordable, and credible Water Services to all. -Guiding principles include contextualising water as both a social and economic good - DWA has recognised WDM initiatives as the first and foremost measures to reduce and sustain water demand. - The aim of achieving sustainable and affordable service delivery to low-income areas could be threatened if it is not implemented	-As a social good, well-managed water processes play an important part in ensuring the health, well-being, and dignity of vulnerable communities as well as in promoting social equity. As an economic good, broader societal benefits may be realised through the reallocation of water between urban uses. 1. the rehabilitation of wetlands Strategies include: Treated effluent distribution, communication, awareness, and educational drives,	*Need to check if artificial recharge or green infrastructure is included as per intention mentioned on the artificial recharge strategy *No direct link to Artificial Recharge The water situation in CCT requires that all possibilities of potential Water Resources be looked at. Although considerations for the conventional development of Water Resources are not part of this strategy, investigations into unconventional resources should be considered as part of the strategy. Such

	emphasises effective management of our water resources. WC/WDM should not be seen as punitive or restrictive but as a responsible approach that will contribute to our prosperity. -	- To avoid water shortages and ensure sustainable and affordable Water Services CCT has no choice but to implement a very comprehensive WC/WDM strategy	retrofit of water efficient shower heads, pressure reduction schemes and reduction of leakage in Emfuleni, and Gugulethu, reduction of non-revenue demand.	unconventional Water Resources include (but are not limited to) the following: 1. Iceberg harvesting 2. Sea water desalination Capturing storm water discharge into the sea. 3. Importation of water - Shipping of fresh water 4. Suppression of evaporation 5. Recharging of ground water aquifers The WC/WDM strategy developed aims to increase financial efficiency by reducing non–revenue demand, improving operation and maintenance and by postponing the need for large expensive infrastructure projects. -the rehabilitation of wetlands -community sustainability -Opportunity for intervention is through the infrastructure lens, where there can be direct mention of blue-green infrastructure as a way to maximise key infrastructure investment. The word

				infrastructure comes up over 20 times. Infrastructure stability, economic viable and optimise water use.
Floodplain and River Corridor Management Policy (2009)	-Balancing flood risk, ecological and socio-economic considerations in developments near watercourses and wetlands -Policy supports the Integrated Development Plan's objective to; Reduce the impact of flooding on community livelihoods and regional economies; Safeguard human health, protect natural aquatic environments, and improve and maintain recreational water quality - Limits or reduces exposure to flood risk by avoiding hazardous, uneconomic, or unwise use of floodplains, thereby protecting life, property, and community infrastructure - The "River Corridor" comprises the watercourse and/or associated wetlands (as applicable), the floodplain, the ecological buffer and the area required for specific aesthetic, recreational and/or socio-economic needs.	-Service outcomes include reducing the impact of flooding on people and properties, and of safeguarding human health, aquatic environments and improving and maintaining recreational water quality -Prioritizes the management of land use, development, or activity adjacent to watercourses and wetlands because; It is far more cost effective, in the long term, to develop in areas where the threat of flooding is infrequent; Climate change uncertainties pose significant challenges for the management of major drainage systems; Encroachments result in ecological degradation (and low quality of water); create a sense of place. -Within the confines of the Cape Town Metropolitan Area the pressure to develop is	- Within the confines of the Cape Town Metropolitan Area the pressure to develop is significant and requires careful management to avoid developing in high flood risk areas, to protect the environmental integrity of aquatic resources and to ensure that permitted development enhances the aesthetics and character of the adjacent watercourses / wetlands - A floodplain is defined as the area susceptible to inundation by the 100-year flood; In particular, obstruction to the free flow of water within the 20-year flood line area shall not be permitted. However, between the 50 and 100-year flood lines, some developments or activities may be permitted.	-All developments within these areas shall be planned and designed in accordance with best practice and the requirements and conditions laid down in this policy. E.g., Water Sensitive Urban Design principles, -A new approach is required where engineering, environmental and socio-economic elements are assessed and integrated as the vision for a particular watercourse or wetland system -Protects and enhances the intrinsic value and the environmental goods and services provided by watercourses, wetlands -Facilitates the beneficial integration of watercourses into the urban landscape by creating an aesthetically pleasing public resource which

		significant and requires careful management to avoid developing in high flood risk areas, to protect the environmental integrity of aquatic resources	-Watercourses and wetlands with their adjacent riparian areas and associated fauna and flora must be protected or “buffered” from the impacts of adjacent development or activity -Only land uses considered appropriate within the applicable floodplain and ecological buffer. In addition, geomorphological, maintenance as well as social and economic aspects must be considered	will ultimately allow for the social and economic upliftment of communities adjacent to watercourses and wetlands. -buffer areas can provide socio-economic benefits in the form public open space, opportunities for recreation and environmental education / awareness, and enhancement of waterway, visual and property values -An allowance of up to 10 m (measured from the top of bank or outer edge of the wetland) dependent on the current or future maintenance strategy for the watercourse / wetland must be made for maintenance access
Water By-law (2010), with Water Amendment By-Law (2018)	-Legal document outlining the usage of municipal drinking water and alternative water in CPT - The Water By-law seeks to reduce water wastage and provides for water conservation and demand management - From plumbing regulations to the installation of storage tanks, the By-law informs residents, property owners, plumbers, builders and built environment professionals about how they can go about using water generally, the use of certified	-Responsibilities of the City and of the public is established. E.g., 4. (1) The City may, from time to time, and in accordance with national policy, but subject to principles of sustainability and affordability, by public notice, determine the service levels it is able to provide to consumers. The City may in determining service levels differentiate between types of	- No unauthorised connection to the City’s water supply system; no selling of municipal water; No tampering with the City’s water supply system, meters, pipes or stopcocks in any way; no water waste; no alternative water can be used for drinking; no irrigation permitted between 9am-6pm; the City can cut off water	-Amendments made in 2018 to strengthen the resilience of built environment to the effects of water scarcity (Xanthea Limberg, 2018) -The City/ authorised official may restrict water when there is water scarcity

	materials and what measures need to be put in place under certain circumstances	consumers, geographical areas, and socio-economic areas. The City may provide communal water supply, a metered water connection etc. - New developments must install water conservation and demand management systems, or alternative water systems, and these must be approved by the city before development proceeds	supply if bills are not paid; Public hand wash basins should be fitted with demand-type taps, and public showers should be fitted with demand-type valves; Any member of the public must, on becoming aware of any emergency, imminent situation that requires immediate attention or a situation that may give rise to the wastage of water or pollution, inform authorized official immediately; Landlords must now keep record of consumption for each residential unit	
Treated Effluent By-Law (2010)	To control and regulate treated effluent in the City of Cape Town; and to provide for matters connected therewith.	Various implementations and actions were proposed in order to increase the chances of reaching the goals of this by-law. They involved the proposed installation of various infrastructure and maintenance and good practices that should be employed by all external and internal stakeholders.	Themes that were discussed in terms of treated effluent were: general provisions regarding effluent; provisions relating to the supply of treated effluent; general treated effluent installation requirements; water quality; health and hygiene; plans approval procedure; installation by plumbers and good use practices.	The only statement made that connects with themes relating to MAR-BG is regarding the contamination of groundwater as it states: “All possible precautions should be taken to ensure that no surface or underground water is contaminated by the irrigation water, especially where the latter does not comply with the General Standard. Excessive irrigation must therefore be avoided, and the irrigation

				area protected against stormwater by means of suitable contours and screening walls.”
Public Parks By-Law (2010)	To regulate the admission of persons, animals, and vehicles to public parks; to provide for the use and enjoyment of public parks; to determine conduct that will not be permitted within public parks; and to provide for matters incidental thereto.	There are various regulations in place according to the by-law in order to reach the goals of the by-law that discuss the issues surrounding maximum number of persons, admission to and visiting a public park, entrance fees, dumping and littering, liquor and food, animals, use of public parks, trees in public parks, safety and order, water, vehicles, games, improper or indecent behaviour, powers of an authorised official, amendment, change and addition of a notice or pictogram and offences and penalties in public parks.	The by-law document discusses regulations within various relevant themes in relation to public parks in South Africa such as maximum number of persons, admission to and visiting a public park, entrance fees, dumping and littering, liquor and food, animals, use of public parks, trees in public parks, safety and order, water, vehicles, games, improper or indecent behaviour, powers of an authorised official, amendment, change and addition of a notice or pictogram and offences and penalties.	In terms of MAR-BGI and water related issues, the only relation in terms of this by-law is: No person may in a public park misuse, remove, pollute or contaminate any water source, water supply or wastewater; interfere with or obstruct the flow of any river or seasonal wetland; or drain or redirect any water from private land. The by-law also briefly mentions issues of dumping of physical waste, which this by-law prohibits, which could also be of relevance to certain open spaces that influence MAR as dumping is a frequent occurrence in open spaces around Cape Town.
Integrated Waste Management By-law (2010)	The main objectives of this by-law are: (a)regulate the collection, handling, storage, transport, recycling, treatment and disposal of waste;(b)to	-Reduce, reuse, recycle, recovery, waste minimisation by any waste holder	-The municipality has the responsibility to ensure that all waste generated within the municipal area is collected,	- The municipality must take reasonable steps to ensure that enough containers are provided for the discarding

	promote the pursuance of an integrated waste management approach;(c)to regulate the provision of municipal services by a service provider and commercial services by licensees; and(d)to enhance sustainable development.	-Required integrated waste management plans	disposed of or recovered in accordance with this by-law - Waste collection on a weekly basis by the municipality -Provides guidelines for different types of waste such as garden waste, building waste, bulky waste, industrial, health care and hazardous waste etc. -No littering or dumping allowed	of waste by the public on any premises to which the public has access. (39) - No person may dispose of waste in a manner likely to cause pollution of, or have an impact on, the environment or to be harmful to health.
Environmental Education, Awareness and Training Strategy (2011)	The City of Cape Town has committed to providing high quality coastal education, awareness and training programmes in accordance with the following general principles: • All products, lessons and events must be interactive, creative and fun • All information presented must be factually correct • All information, lessons and events must be language sensitive • All interventions must have a monitoring and evaluation plan in place For school learners: • Lessons must be well structured, including a suitable introduction and consolidation component	**Environmental education** is not confined to the classroom and not aimed only at children; despite the formal ring to the term 'education', it has life-long relevance to people from all walks of life. **Environmental awareness** involves communication campaigns for reaching various audiences, developing messages and selecting and/or producing the appropriate resources and media to reach these audiences. The aim of environmental awareness is to make people from all walks of	This document discusses the environmental education, awareness and training and the manner that they should be conducted in. It also discusses the relevant themes that are covered and addressed in creating awareness and the importance of the education in training.	No connections found.

	• Lessons must be aligned to the Western Cape Education Department's curriculum • Literacy and numeracy skills must be included in activities	life aware of specific environmental issues. **Training** is a particular form of education, aimed at developing specific skills, in relation to specific tasks which are often job-related.		
Densification Policy (2012)	**Terms and definitions** **Activity routes** are generally supported by a mix of land uses and higher-density urban development. **Local routes** characterised by continuous development, including centres or nodes, mixed land use, linear commercial and business developments, light industry, institutions, and social facilities. Activity streets are characterised by direct access and interrupted movement flows, especially at bus and taxi stops and traffic lights. **Amenity/ attraction areas** (urban, natural coastal) - social and institutional facility areas and heritage areas; (Finds relevance in the MAR-BGI project given its transdisciplinary focus. **Local/ neighbourhood** parks Small parks serving the immediate local community/neighbourhood (within walking distance), focused on informal recreation, including play equipment and kick-about areas.	**4. THE DENSIFICATION POLICY** The Densification Policy seeks to improve the city's sustainability and to enhance the quality of the built environment. • Support the development of mixed land uses, providing for vitality, opportunities, and integrated living environments. - When considering the MARBGI project as a mixed-use space this policy will find relevance as it would conceptualise the stormwater pond under this category.	**2.2 Forms of densification** A perimeter block enclosing an open space or courtyard. **2.3 Motivation for densification** Densification can contribute to the creation of good. **THE ASSESSMENT OF APPLICATIONS** Densification decisions should be guided by the density decision-making framework and be balanced by resource limitations and infrastructure availability. **Implementation of the densification policy framework: Key action areas** Ensure regulatory support: Parking policy. Responsible: T, R&SD Involved: SPUD & P&BDM 12 months	**Strategy/policy documents** Detailed issue/land-use-specific policy parameters that should determine land use decisions. Water, stormwater, wastewater, solid waste, and electricity master plans. - The policy specifically mentioned that densification cannot happen close to a stormwater or water facility. Therefor making the policy protective of the MAR-BGI space. - This is a direct mention relation to the MARBGI Project **Density priority zones** Zoning rights: Areas where zoning rights correlate with one of the following zones

	Mixed land use Area of existing or proposed horizontal and/or vertical integration of suitable and compatible residential and non-residential land uses within the same area or on the same parcel of land; - The storm water space functions as this, this definition is there for relevant to the MAR- BGI project. **Multifunctional** The combination of different yet compatible functions within one physical framework serve a variety of social and community groups, allowing for a wider range of facilities that reinforce one another in close proximity and offering greater access to potential users- This definition is particularly useful as the MARBGI project aims to have social, economic, and environmental benefits for the stakeholders involved. - These definitions although not having direct mention to a stormwater pond are all relevant to and conceptually connect with the aims of the MAR- BGI project. - Indirect relation to the MAR-BGI project **Acronyms** T, R&SD Transport, Roads & Stormwater Directorate		- The acronyms refer to the stormwater under the consideration of transport, roads and stormwater. - Therefor not directly implicating the MARBGI Project as this relates mostly to road use.	proposed by the new CTIZS: general residential zones 1–6; community zones 1–2; local business zones 1–2; general business zones 1–7, and mixed-use zones 1–3. Electricity, water, wastewater, and stormwater capacity should exist in these areas, or be planned within the next three years. Alternatively, where appropriate, the developer must be able to cover the cost of the required infrastructure upgrades. - This makes direct mention of the stormwater, therefor creating a correlation between the policy and MARBGI project - Stormwater infrastructure is prioritised as essential to the ecological space in communities even in developmental contexts. **5. THE ASSESSMENT OF APPLICATIONS** **All forms of densification** **Infrastructural capacity**

				Densification should not be supported. where water, wastewater, and stormwater capacity is reaching points of absolute constraint, and the cost implications of rectifying the situation are too high for the private sector, or are not provided for in the City's capital budget. - This relates significantly to the MAR-BGI and Stormwater pond. It highlights how densification should not be prioritised in spaces with storm water. Therefor protecting the MARBGI project from the processes of densification as per the policy. - This is a direct mention to stormwater and a significant consideration in the context of policy's

				applicable to the project. **Contextual informants** **Infrastructure** The capacity of the existing/planned bulk infrastructure services (water, wastewater/sewerage, electricity and stormwater) to accommodate increased service demands. Densification should not be supported where water, wastewater and stormwater capacity are reaching points of absolute constraint, and the cost implications of rectifying the situation are too high for the private sector or are not provided for in the City's capital budget. - This further makes direct mention to stormwater and by definition categorises stormwater spaces as protected infrastructure. The COCT does not have the budget to rectify any damage caused to these spaces therefor

				the cultivation and protection of these spaces remain relevant. - This is a direct mention of stormwater and finds particular significant with the MARBGI project.
Wastewater and Effluent By-Law (2013)	To repeal the Wastewater and Industrial Effluent By-law, 2006; to ensure consistency with national legislation; and to provide for matters concerned therewith.	This by-law document outlines the duties and prohibited acts relevant to all internal and external stakeholders. Various regulations are discussed within the scope of themes that are relevant to wastewater and industrial effluent such as duties of owners of property, permission to discharge industrial effluent, protection of municipal sewers, clearing of blocked private sewers, powers of authorised officials, transportation and disposal of wastewater or industrial effluent, acceptance of wastewater delivered by road transport mechanical food waste and other disposal units and charges in respect of industrial effluent.	This by-law lists all of the duties and prohibited acts of all internal and external stakeholders regarding the wastewater and effluent and the infrastructures that are relevant to the management thereof.	There was no specific mention to stormwater or stormwater infrastructure other than the excerpt below, which discusses the role of property owner in allowing of stormwater into a private sewer: No owner of property may allow: The ingress of groundwater or stormwater into a private sewer installation on his or her premises except with the written consent and written conditions of the council.

CoCT Asset Management Policy (2013)	The objective of this policy is to establish a framework for the accounting treatment and safeguarding of PPE, including the proper recognition, measurement, disposal and retirement thereof. As stipulated in the objectives these are the internal asset handling of the COCT and its asset management. These are the assets the policy considers: a) Infrastructure assets b) Community assets c) Intangible assets d) Heritage assets e) Investment assets f) Biological assets. 10 Disposal and Retirements The City may only dispose of assets that are not providing minimum levels of basic municipal services. b) Assets other than those utilised to provide minimum levels of basic services may be disposed of subject to Council approval or in terms of delegated authority	The functional responsibilities details the responsibility of various functionaries within the City regarding assets: This includes the roles stipulated to the City Manager, the Treasury Department, Supply Chain Management, Human Recourse Management and Other Departments. RECOGNITIONAND CLASSIFICATION OF ASSETS This section details how assets are valued to be included under the policies framework. **8 SAFEGUARDING** **Custody and Security** a) All barcoded assets shall be tracked by physical location through the Fixed Asset Register. b) A physical asset verification process (stock take) shall be performed every year and be conducted simultaneously throughout the City. **9.COMMUNICATIONOF CHANGES** All changes must be reported to the Treasury Department within 10 working days to	Definitions: Asset and PPE are prioritised throughout the policy.	7.1.4 Subsequent expenditure relating to PPE is capitalised if it is probable that future economic benefits or potential service delivery of the asset is enhanced in excess of the originally assessed standard of performance. -The COCT still has the mandate to ensure service delivery to the area and Storm Water pond itself. This point might overlap with the project. 7.2.1 Acquisitions of items that do not meet the definition of an asset must be recorded in the DIR depending on the nature and aggregate value of the item. The departmental inventory register is the responsibility of individual Departments. -If the Stormwater pond does not classify as an Asset or PPE it will therefore be bound to this stipulation. 7.3.1 An item shall be recognised as investment property if it meets the definition. Investment property is recorded at cost.

		maintain accuracy of the fixed asset register. 9.2 Departments must reconcile and motivate discrepancies between the fixed asset register and the physical inventory count results. These are the internal processes the COCT have to abide by when reconciling asset management.		-No direct reference to storm water systems however the COCT could value the pond as an investment property which will make it adhere to this clause. **8. SAFEGUARDING Custody and Security** If the COCT considers the pond a asses or PPE it will have to be safeguarded and therefor maintained through their efforts as stipulated above. **10. DISPOSALS AND RETIREMENTS** The City as the right to determine assets and decide on their disposal if they no longer serve the interest of the municipal structure. MAR - BGI if considered an asset or PPE would fall part of this category.
Integrated Coastal Management Policy (2014)	**STRATEGY COMPONENT** The key legislation that guides the management and protection of biodiversity in Cape Town is the **National Environmental Management Act 107 0f 1998 (NEMA)** and its subsidiaries	**3. Regulatory context** The following legislation, strategies and council policies are relevant to the Integrated Coastal Management Policy: National Water Act (36 of 1998)	**DEFINITIONS** - These definitions mention water and stormwater directly. - They are therefore included here as they could	**Background to Local Biodiversity Strategy and Action Plan (LBSAP)** It is also critical to align the invasive species control plans to biodiversity; fire; and water

	Biodiversity Act 10 of 2004 (NEMBA) and Protected Areas Act 57 of 2003 (NEMPAA). The management of wetlands is chiefly administered through **the National Water Act 36 of 1998.** - This policy speaks significantly to legislature that supports water infrastructure. - The legislature that supports water cultivation nationally. This could have overlaps with the MAR- BGI project, although not making direct reference to storm water it would still be considered in the national context. **The City's Environmental Strategy** Recognises and commits the City to conserving Cape Town's unique and globally important biodiversity (including terrestrial and freshwater ecosystems) for both present and future generations. - Legislature that protects water and water recourses regionally 1. Definitions - These are the definitions that mention water. Not storm-water specifically however make relation to water and will therefore be included in the policy and instruments. Coast: The inshore marine environment up to 500 metres seaward of the High-Water Mark, the interface between the marine		have a correlation between how CoCT conceptualises/ categorises the MAR-BGI project **VASCULAR PLANT** A division comprising plants that have vascular tissue (xylem and phloem) through which water and nutrients are transported. - These are the key concepts discussed throughout the legislature that conceptualize water. **SECTION 3. LEGISLATION, REGULATIONS AND BY-LAWS** The Conservation of Agriculture Resources Act (CARA) 43 of 1983, which was the first piece of legislation in South Africa to protect wetlands, through the integrated conservation of soil, water resources, and vegetation. - This legislature again has overlaps with the MAR- BGI project. A list of national legislation that has a bearing on	production management approaches under a programme of holistic restoration management goals which delivers optimal ecosystem services. - This could have relevance to the project especially if there are species that needs to be protected in the storm water pond The updated LBSAP incorporates the draft invasive species strategy that was a product of collaboration and input from different line departments/branches (Environmental Management (EMD), Bulk Water, Recreation and Parks, Human Settlements and Catchment and Stormwater Management, see Annexure A1 for a list of all line functions that were participated in LBSAP formulation). - Legislative overlaps therefor creating a connection between this policy and the MARBGI Stormwater pond Invasive species control is co-ordinated and undertaken by

	and terrestrial environments and the land directly exposed to coastal processes, tidal influence, and storm surges. Coastal zone: The area seaward of the Coastal Protection Zone boundary, the seashore, coastal waters, and the exclusive economic zone and includes any aspect of the environment on, in, under and above such area. Heritage sites: Material remains resulting from human activity older than 100 years. This includes wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, territorial waters or in the maritime cultural zone where such wrecks are older than 60 years. Archaeological sites also include any feature, structure or artefact associated with military history older than 75 years and includes the sites on which they are found. -Mentions water as a heritage site, however, does not relate to storm water or landlocked water. This refers to what is constituted as heritage. High Water Mark: The High-Water Mark as defined in section 1 of the Integrated Coastal Management Act 2009. -No specific relation to MAR- BGI project this refers to coastal water.		biodiversity protection includes the following: - **National Water Act 36 of 1998** **National Water Services Act 108 of 1997** A list of local By-laws that has a bearing on biodiversity protection includes the following:- **Recreational Water Use By-Law** The City has a rather depauperate fresh water fish fauna largely due to the lack of major river systems within our boundaries. Of the five indigenous species recorded, one is classified as vulnerable and a second species as locally extinct. **DEVELOP AND MAINTAIN RELEVANT POLICIES AND STRATEGIES TO ENSURE ALIGNMENT WITH RELEVANT INTERNATIONAL, NATIONAL, PROVINCIAL AND CITY OF CAPE TOWN LEGISLATION, POLICIES AND STRATEGIES.**	the Invasive Species Unit, in consultation with other line departments namely: Asset Management And Maintenance; Water And Sanitation; Recreation and Parks; Human Settlements; Property Management; and Solid Waste Management. - Legislative and departmental overlap which is instrumental to conceptualizing this project **INSTITUTIONAL FRAMEWORK** **City of Cape Town** In addition to the above, Biodiversity Management in the City is aligned to the following of the 11 priorities listed in the IDP. - Makes direct mention to aquifers as the protection of spaces like the MAR- BGI project. **Resource efficiency and security** Climate change mitigation and adaptation; Protected Area expansion; ecological

			KEYWORDS: LEGISLATION, POLICIES AND STRATEGIES - This highlights all the legislature that makes direct reference to water or the protection of storm water systems. This highlights all the legislature that makes direct reference to water or the protection of storm water systems. This highlights all the legislature that makes direct reference to water or the protection of stormwater systems. Increase the sustainability of the City BMB programmes, including the invasive species programme, through establishing and maintaining partnerships. Co-ordinate, in consultation with Bulk Water, invasive species control in the City Strategic Water Source Areas. - Mentions water, not storm water but is	restoration of Protected Areas; conservation of strategic water resources in catchments and aquifers. - Makes direct mention to aquifers as the protection of spaces like the MAR- BGI project. **Safe communities** Providing safe places for recreation; environmental education and play; reducing the negative effect of invasive alien vegetation on fire safety; improving the water quality of recreational waterbodies. - This finds specific relevance with the MAR- BGI project as a multi-purpose space for the community. - Therefor creating a connection between this project and this policy. **SECTION 3. LEGISLATION, REGULATIONS AND BY-LAWS** The National Water Act (36 of 1998) and the National Environmental Management Act (107 of 1998) became the

			significant when conceptualizing legislature nationally and regionally that protects water recourses. Maintain partnership with NRMP, Major grant funder – Working for Water, Working for Wetlands, Working for Ecosystems, and Working on Fire. - This does not make direct mention to storm water however could be significant when conceptualizing water bodies that may include the MAR- BGI project.	first pieces of legislation to balance human, environmental and economic interests for the purpose of sustainable development. Both these acts have a set of regulations which require Environmental Authorisation and/ or a Water Use Licence if a wetland is impacted during a development or through maintenance actions of the City. - Relevance to the MAR- BGI project as it too has multi-purpose benefits that would be considered with this legislature. **4.2 Ecological Context** **4.2.2 Fresh Water Ecosystems** In addition to its rich terrestrial biodiversity, Cape Town supports a variety of wetlands and rivers. Historically, a large proportion of lowland Cape Town was dotted with seasonal and perennial wetlands, interconnected via the groundwater system (Day

				1987). Low-lying areas of the Cape Flats that support marsh and floodplain wetlands are known locally as “vleis”. As a result of urbanisation, most of the vleis and rivers on the Cape Flats have been modified, with vlei either drained or converted to permanent water bodies (Freshwater Lake), and rivers channelized or fully canalised. Most seasonal wetlands fall into the Cape Lowland Freshwater Wetlands type. These are nested within the terrestrial vegetation types described above. **Cape Lowland Freshwater Wetlands** These wetlands occur on the Cape Flats and in landscape depressions and may be permanently or seasonally flooded areas. Soils may be fine sands, silts, or clays. Typically, the vegetation in the seasonal wetlands comprises restio, sedge or rush-beds as well as macro phytic vegetation embedded in permanent water bodies.

				Important species include Senecio halimifolius, Pennisetum macrourum, Triglochin bulbosa, Bolboschoenus maritimus and Juncus krausii. An endemic shrub species of seasonal marsh communities in the south is Passerina paludosa. - This is significant to the MAR - BGI project as it protects storm water especially in the Cape Flats which is where this project is based. This policy has significant relevance to this project. **4.1 Bioregional Context and Planning** **Pollution** A large part of the Cape Town lowlands comprises seasonal wetlands. These ecosystems and our rivers are all polluted to a greater or lesser extent via the stormwater system and failing sewerage systems. Nutrient enrichment of wetlands causes the loss of indigenous biota and the

				colonization by less sensitive and invasive species. - This makes direct mention to storm water therefore is essential to the MAR-BGI project. - This details the importance of protecting storm water spaces. **Hydrology** In recent years, borehole abstraction from the aquifers has intensified with potential impacts such as the lowering of water tables and loss of groundwater fed wetlands and mountain springs on which many plants and animals depend. - This mentions the significance of storm water spaces and the importance of cultivating such spaces. Establish partnerships with key external partners involved in the Cape Town's strategic water source catchments.

				- This could find relevance with the MAR-BGI project as it has similar goals in aligning external stakeholders to water projects that emphasis the nature of the policy. This project therefor finds specific significance with this policy. Determine and capture overall annual state of invasion on protected areas, biodiversity agreement sites, other city land and water bodies. - This has relevance with MAR- BGI as previous policies have considered the space a protective space. Given its location and multi-purpose use this would find significant relevance to this project. 6.5 Natural Coastal Processes, Fauna, and Flora These natural systems, besides their intrinsic value, form the foundation from which

				socio-economic systems benefit and community livelihoods are built while playing an essential role in mitigating and reducing risk to the City, its infrastructure as well as private property. Implement Estuary Management Plans that recognise and manage the vital contribution of estuaries to supporting the health of coastal ecosystems, water quality maintenance, the provision of marine species nurseries and the provision of protection against coastal erosion and storm surge damage. - This mentions storm surge in the context of the Statuary Management Plans - This could therefore be considered in in relation the stormwater pond as this regulation makes mention of this context. - The policy is however not specifically focusing on stormwater therefor considers in in relation to coastal storm-water.

				6.9 Coastal Safety and Security Although the City's jurisdiction is determined by the high-water mark, the City recognises that economic, recreational, environmental as well as illegal activities operate across these jurisdictional boundaries. - This speaks to the multi-functional space that a storm-water pond will provide. Therefor ensuring the city protects these spaces as it has multiple benefits. 8.1 Coastal Area Recognising that social, economic and ecosystem processes take place across the High Water Mark and given the need to ensure integrated management as well as proactive planning, the City intends to make an application, as allowed by the ICMA, for its area of responsibility to extend 500 metres seaward of the High Water Mark. Based on this understanding, the applicability of the City's

				By- law may extend up to 500 metres seaward of the High-Water Mark. - This again mentions the importance of protecting multifunctional spaces. The MAR-BGI project speaks to this nature. Although not coastal it still provides the same elements and therefor benefits.
Municipal Planning By-Law (2015)	The City intends to regulate and control municipal planning matters within the geographical area of the City.	There are no specific strategies proposed as the by-law discusses municipal regulations around new and already existing developments that are undergoing any sort of implementation.	This by-law lists all of the necessary requirements for the planning of developments and the necessary legislation behind each facet regarding new developments or renovations. It discusses aspects of municipal planning such as spatial planning, development planning, queries regarding applications in terms of new and already existing developments, decision maker, enforcer, and zonings.	In terms of regulations with regards to MAR-BGI specific aspects to municipal planning this by-law states: The following provisions shall apply with regard to site development plans: If the City considers it necessary, a stormwater impact assessment and/or stormwater. management plan may be required in conjunction with a site development plan, the extent of which shall be determined by the City depending on the magnitude of the development;

Parks Development Policy (2015)	This policy seeks to provide a framework to guide requests for new park development as well as upgrades to existing parks. The overarching aims of this policy are to develop parks that satisfactorily address the needs of communities and ensure the long-term sustainability of park developments, particularly in situations. where capital and operating resources are limited. This policy states that the CoCT seeks to provide facilities in its parks that - 1. are of a high quality 2. are safe and accessible. 3. are attractive and stimulating to users, especially children. 4. meet the varying needs of community and special interest groups, e.g., the physically challenged. This policy also acknowledges other possible outcomes of implementing a framework for future development in CoCT parks such as: 1. community pride and ownership 2. environments that are appreciated, protected and sustained for future	This policy aligns with various other strategies that are implemented by the city, thereby illustrating that should these strategies be efficiently implemented, the goals of the Parks Development Policy will be met. <u>Integrated Development Plan:</u> This policy falls under this strategy in terms of 'The Caring City' (which aims to provide access to community services) and 'The Inclusive City' (where everyone has a stake in the future and enjoys a sense of belonging, with parks allowing for greater integration) aspects of this strategy. <u>City Development Strategy and ONECAPE2040 agenda:</u> In this instance, the Settlement Transition is relevant because it aims to ensure the development of accessible neighbourhoods and communities that are provided with good public services and rich in opportunity for a good quality of life for all.	This policy discusses the asset lifecycle of a park, which consists of the planning; design and development as well as the management and maintenance of the park and the influence that specific role players have within these stages of the park's lifecycle. This policy also discusses the influence that the park may have on these respective role players as numerous can be proposed as a result of parks being developed.	There is only one instance in this policy where there is relevance towards MAR-BGI, with the desired outcomes of the policy stating: "environments that are appreciated, protected, and sustained for future generations by taking into consideration 'green' techniques and technologies, for example: types of permeable paving, low energy lighting options, play structures that generate energy, the re-use of water and harvested alien vegetation and recycled building materials", however there is no further mention of these green technologies and techniques.

	generations by taking into consideration 'green' techniques and technologies, for example: types of permeable paving, low energy lighting options, play structures that generate energy, the re-use of water and harvested alien vegetation and recycled building materials. 3. healthy individuals and communities by providing opportunities for informal sport and recreation and spaces that improve psychological wellbeing. 4. an increase in income streams via advertising, events, and sponsorships 5. economic opportunities via tourism, leased facilities or concessions. 6. Conservation of Cape Town's highly threatened natural heritage through stewardship or management agreements.	<u>Social Development Strategy:</u> The SDS describes the important role that parks can provide in creating inclusive communities, i.e. 'Promote and foster social interaction through recreational and active citizenship opportunities. <u>Cape Town Spatial Development Framework:</u> This framework views parks as both natural assets and destination places while encouraging integrated settlement patterns in the development of these parks and facilities in a manner that is equitable to the entire population. <u>Integrated Metropolitan Environmental Policy:</u> This policy discusses the necessity for adequate and well-distributed open spaces for recreation and sustaining biodiversity. <u>Urban Design Policy, 2013</u>		

		The Urban Design Policy guides and directs design considerations in respect of individual proposals so that the public environment is improved. The following objectives are relevant to the Parks Development Policy - • Objective 2: Ensure that development contributes to improved quality of the public realm and public space. • Objective 3: Ensure that developments contribute to the creation of safe and secure communities. • Objective 5: Promote development intensity, diversity and adaptability. • Objective 8: Development should protect, value, and enhance the natural environment through sustainable design.		

		• Objective 9: Development should respect and enhance the heritage, character and unique identity of the city and its neighbourhoods.		
CoCT Tree Management Policy (2015)	The core focus of this policy is the management of trees that grow on City owned land throughout the metropolitan area. This includes City-owned land that is leased to individuals or groups. This policy excludes the management of trees that grow on private land unless it impacts on public places and public open spaces. This policy accounts for the managements related to the full life cycle of a tree, the conditions for tree removals and the appropriate selection of specific tree species and sites for planting these trees given the context of the space. This policy explains that both internal and external stakeholders hold a responsibility in reaching the goals set and that acknowledges that communication with other internal stakeholders (relevant city departments) is required in certain spaces	This policy aims to provide a uniform approach to the management of trees on municipal land within the City of Cape Town. The outcome of the implementation of a uniform and transversal policy for the management of trees within the City will be clustered around the following. three key components: The outcome of the implementation of this policy is centred around 3 main components which are: <u>NEW TREE PLANTING IN THE CITY:</u> This component refers to the need to continue planting indigenous, drought resistant vegetation. It also addresses the need for encourage	This policy focuses on the need to prioritise tree management in the City of Cape Town borders. It highlights the necessities of tree management from both state and non-state actors in numerous aspects such as planting, pruning, removal and general management of trees in the City of Cape Town borders. It explains the benefits of trees in an urban setting and why certain tree species should be planted.	The Integrated Metropolitan Environmental Policy (IMEP) related to this policy briefly mentions stormwater management, however there is no further detail to this relation: 3.5.1 "…they (trees) have a role to play in water demand management: the management of storm water and is one of the key focal points for creating environmental awareness." In terms of internal stakeholders such as the various departments within CoCT, it can be seen that numerous departments need to assist with regards to the goals of this policy in relation to issues surrounding stormwater and infrastructure, as can be seen in the below quotes taken from the policy in

	in management of trees within the relevant boundaries.	residents and new housing developments to plant trees wherever and whenever possible while also preserving our cultural landscapes and natural heritage. <u>A CITY–WIDE UNIFORM APPROACH TO TREE MANAGEMENT</u> This component addresses the need for both internal and external role players to reduce risks to tree maintenance. It explains the need to manage trees in a professional manner while also regulating the protection, planting and removal of trees using sound arboriculture practices. <u>REINFORCE THE IMPORTANCE AND VALUE OF TREES</u> This component highlights the need to create a greater awareness and understanding of the importance of trees and the benefits that come with having them in the city. It also discusses the need for partnerships in order to create		which these departments are named: “5.1.2.3 Roads & Stormwater - Service level agreements with City Parks with respect to trees planted in road reserves, and the management of trees in rivers and other stormwater catchment areas” “5.1.2.6 Water Demand Management - Management of trees within water catchment areas. Regulation of the use of water for the management and maintenance of trees” “5.1.2.7 Human Settlements, Urbanisation and Human Settlements Development & Delivery - Planning to plant trees and create landscapes in human settlements. (inclusive of road reserves)”

		a better understanding of this importance within the urban context.		
The Cape Town Bioregional Plan (2015)	The Bioregional Plan for the City of Cape Town Municipality (CCT) includes the Biodiversity Network (BioNet: a map of biodiversity priorities) and accompanying land-use planning and decision-making guidelines, to inform land-use planning, environmental assessments and authorisations and natural resources management to a range of sectors whose policies and decisions impact on biodiversity. The BioNet is a spatial plan that shows terrestrial and aquatic features that are critical for conserving biodiversity and maintaining ecosystem functioning. These are referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).		**Policy and Strategies** 2.1 Provincial Spatial Development Framework (PSDF) These core areas represent a national and/or provincial/regional resource in which the natural environment is able to provide a range of ecosystem services essential for sustainable life on earth and as such should be retained in their natural state. 2.2 Integrated Development Plan (IDP) This IDP includes the allocation of resources, not only to concentrate on the provision of fundamental municipal services, but in addition to the eradication of poverty, boost local economic development, create employment, and promote the process of reconstruction and development. 2.3 Cape Town Spatial Development Framework	2.6 Other Relevant City Policies and Strategies i) Management of Urban Stormwater Impacts Policy (2009) - Therefor relating to MAR-BGI as this policy is informed by the stormwater policy . **5 Developing the City of Cape Town Systematic Biodiversity Plan** 5.2 The Rivers and Wetlands Map As a result of urbanisation, most of the wetlands and rivers on the Cape Flats have been modified, with wetlands drained and the rivers canalized or channelized. Additionally, wetlands were historically saturated during the winter rainfall season only, but now receive urban stormwater and are constricted via weirs and canals and thus many have become permanently flooded systems. The development of a comprehensive wetlands map

			The CTSDF also contains urban and coastal edge lines which will inter alia support the preservation of biodiversity resources in the city. 2.4 Environmental Management Frameworks (EMFs) & District Spatial Development Plans (DSDPs) EMFs are intended to inform environmental assessment and management. The intention is that in the future, EMFs will help to streamline the environmental assessment process by geographically determining sensitive areas where certain activities require Environmental Authorisation (EA) and other less sensitive areas where authorisation is not required. 2.5 Integrated Metropolitan Environmental Policy (IMEP) ***IMEP: Year 2020 Vision:*** There will be a high expectation from the people of the authorities in respect of environmental management, monitoring, auditing, as well	for the CCT was recognised in 2006 as an urgent requirement both for planning purposes as well as management of the City's wetland resources. - The policy recognises stormwater and wetlands as a prime asset to Cape Town's landscape which is emphasised and protected under this policy. The endangered Western Leopard Toad survives in the transformed landscape of the Southern Suburbs. This species requires that local wetlands are conserved, and that open space is managed in an appropriate way (e.g. no waterway cleaning or mowing during breeding season and migration periods). This is managed through MOAs with the City Parks and Roads & Stormwater Departments - Stormwater ponds in the Southern Suburbs is there for protected by virtue of housing many endangered

			as accountability. Environmental issues and impact studies will be dealt with in a structured and efficient way, and impact studies will have ensured a better aesthetic and ecologically balanced City of Cape Town. Other Relevant City Policies and Strategies a) City of Cape Town Environmental Agenda 2009-2014 b) Biodiversity Strategy (2003) c) Local Biodiversity Strategy and Action Plan d) Framework for a Strategy and Action Plan for the Management of Invasive Alien Species in the City of Cape Town e) Coastal Zone Management Strategy f) Cultural Heritage Strategy g) Energy and Climate Change Strategy h) Environmental Education and Training Strategy	species, this could be the case for the MAR-BGI Stormwater pond which is situated in the same area. **10.2.1 Procedure for dealing with areas of potential impact within the City of Cape Town** The EMF/DSDP compilation process resulted in the identification of most of the potential areas of potential impact, but it is possible that more will come to light in future as further information becomes available and development pressures intensify. **Step 1:** Contact the ERMD District Environment & Heritage Management and Biodiversity Management branches and any other departments likely to be affected by or have a key interest in the project, e.g. the Roads and Stormwater Department. - Finding relevance with the MARBGI project as this policy

			i) Management of Urban Stormwater Impacts Policy (2009) j) City's Floodplain and River Corridor Management Policy (2009).	recognises stormwater ponds and policies as essential to the biodiversity cultivation with the COCT. 22.3 Threatened Species Management Plans This committee has successfully arranged Memoranda of Agreement, with City Parks, Catchment, Rivers and Stormwater Department and the Invasive Species Unit, to prevent damaging clearance activities during peak migration times. A Western Leopard Toad Management Plan currently is being drafted by the committee. **CCT, Floodplain and River Corridor Management Policy 2009.** Balancing flood risk, ecological and socio-economic considerations in developments near watercourses and wetlands. Catchment, Stormwater and River Management Branch. - MARBGI finds relevance in this policy as it is informed by

				stormwater and river management policy.
Development Management Scheme (2015)	**SCHEDULE 1** **STRUCTURE PLANS DEEMED TO BE A DISTRICT SPATIAL DEVELOPMENT FRAMEWORK** **SCHEDULE 2** **STRUCTURE PLANS DEEMED TO BE A LOCAL SPATIAL DEVELOPMENT FRAMEWORK** **SCHEDULE 3** **CITY OF CAPE TOWN DEVELOPMENT MANAGEMENT SCHEME** **DIVISION I: INTERPRETATION AND PROCEDURES** **CHAPTER 1 : DEFINITIONS AND INTERPRETATION** 1 Definitions in this development management scheme 2 Interpretation 3 Methods of measuring distances, heights and levels or the requirement to round up or down. 3A Approval of a ground level map 4 Interpretation of boundaries 5 Interpretation of category of use and zoning 6 Evasion of intent of the development management scheme			SCHEDULE 3 CITY OF CAPE TOWN DEVELOPMENT MANAGEMENT SCHEME (s 25(1)(a)) **1 Definitions in this development management scheme** '**stormwater**' means water resulting from natural processes, precipitation and/or the accumulation thereof, and includes groundwater and spring water ordinarily conveyed by the stormwater system, as well as sea water within estuaries, but excludes water in a drinking-water or waste-water reticulation system. '**stormwater system**' means constructed and natural facilities, including pipes, culverts and water courses, used or required for the management, collection, conveyance, temporary storage, control, monitoring, treatment, use and disposal of stormwater.

				- MARBGI specific relevance with this by law as it defines and conceptualises a stormwater pond as one of the key instruments of the policy. 'utility service' means a use or infrastructure that is required to provide engineering and associated services for the proper functioning of urban development and includes a water reservoir and purification works, electricity substation and transmission lines, stormwater retention facilities, and a waste-water pump station and treatment works, recycling facility, dumpsites and minor freestanding and rooftop base telecommunication station, but does not include road, wind turbine infrastructure or transport use; [Definition substituted by s. 25 (kk) of City of Cape Town: Municipal Planning Amendment By-Law, 2019]

				DIVISION III: GENERAL PROVISIONS CHAPTER 14.: GENERAL PROVISIONS **123 Site development plans** (2) The City may require some or all of the following information for a site development plan: (k) provisions for the supply of water, management of stormwater, and disposal of sewage and refuse. - This therefore has specific relevance to the MARBGI project (7) The following provisions shall apply with regard to site development plans: (c) If the City considers it necessary, a stormwater impact assessment and/or stormwater management plan may be required in conjunction with a site development plan, the extent of which shall be determined by the City depending on the magnitude of the development. - The CoCT would therefor recognise MARBGI as both as a development site, under the

				policy this is specifically protected as it is also under the stormwater infrastructure.
CoCT Integrated Development Plan 2017 – 2022 (2016)	This recognises Cape Town's critical environmental assets, its globally important biodiversity, and the significance of its 308 km coastline. The IDP also focuses on sustainable development and creating a resilient city, as envisaged in Goal 11 of the Sustainable Development Goals. The City's Environmental Strategy recognises and commits the City to conserving Cape Town's unique and globally important biodiversity (including terrestrial and freshwater ecosystems) for both present and future generations.	Focus areas- safe, inclusive, caring, opportunity and well-run city which are to be actualised through identifying 11 key priorities: • Positioning Cape Town as a forward-looking, globally competitive business city • Leveraging technology for progress • Economic inclusion • Resource efficiency and security • Safe communities • Excellence in basic service delivery • Mainstreaming basic service delivery to informal settlements and backyard dwellers • Dense and transit-oriented urban growth and development • An efficient, integrated transport system • Building integrated communities • Operational sustainability	The desired outcome is to establish a city that is more resource-efficient, more resource-secure, and increasingly resilient to economic, social, and environmental shocks produced by climate change. This list consists of a number of indicators linked to the 11 priorities, outlined above, that the City wishes to influence over the long term in order to evaluate the impact of its strategy. Indicator that directly addresses the resource efficiency and security priority Resource use per gross value added (GVA) This tracks use of natural key resources (including energy and water) in relation to the contribution of the Cape Town economy. The City has prioritised resource efficiency and security. The measure should give some indication of the	-There is a direct mention of the word green infrastructure, groundwater, natural assets. The Resource Efficiency and Security priority identifies "Cape Town's environment, including its natural resources, landscapes, ecosystems, and green infrastructure, forms the basis of the city's economy and plays a crucial role in building resilience. Natural resources include the provision of basic resources such as water, renewable energy, water purification, flood prevention and mitigation, coastal buffers, the recharge of aquifers and soil production. The City recognises that Cape town's natural resources are increasingly at risk of depletion and degradation, and action needs to be taken to ensure their proper management and, therefore, their continued availability."

			long-term impact of maintaining an appropriate balance between economic development and the preservation of the natural environment.	Under this Resource Efficiency and Security priority, “the City has made significant progress with water demand management and water conservation through the implementation of various programmes under its award-winning Water Demand Management Strategy. These include the integrated water leaks repair programme, pressure management, replacement of ageing infrastructure, and environmental education and communication” the City aims to achieve this through promoting resource efficiency, diversifying resource consumption and sourcing, managing and protecting green infrastructure, and restoring key ecosystem services where needed.
Guidelines for the Installation of Alternative Water Systems (2016)	-This is currently for small businesses and households as a guide to safely install and use alternative water systems	-Quality of a water source is key. The quality of an alternative water source, and how it is stored and managed,	-The City promotes the responsible use of alternative water sources so as to minimise the use of municipal	- Stormwater may not be harvested from the City’s stormwater drainage and river systems without permission

	- There are health and environmental risks associated with installation and use of alternative water systems therefore they need to be well managed and regulated. - Alternative water systems include greywater, rainwater, groundwater from boreholes, wellpoints or springs, surface water taken directly from streams/rivers and treated effluent (from the City's wastewater treatment works) and basement water -Specific guidelines for installation (licensing, detailed pre- and post-procedure) provided for each alternative water system	will determine where and how it can be used. With the relevant City permission (for plumbing installation compliance) and DWS authorisation (for the actual taking of the water) as well as some level of treatment, groundwater, greywater, surface etc may be used for various reasons. -Testing guidelines are provided in the policy -Prevention of any contamination with the municipal drinking water supply, as any possible contamination introduced by alternative water could affect the health of people in the home, office, neighbourhood. Thus, use of a RPZ valve back flow preventer should be installed as per the instructions on document.	drinking water from our dams, save money for consumers in the longer term, and increase water security. - City is not liable for any consequential damage or loss arising directly or indirectly from such water use. However, all water sector groups and individuals who abstract surface or groundwater must install electronic water-recording, monitoring or measuring devices. - The City's Water By-law specifies that no alternative water, whether treated or untreated (not even to SANS 241 standards), may be used for drinking, cooking (including food preparation) and body washing (ablution).	from the Catchment, Stormwater and River Management Branch of the City's Water and Sanitation Department. -Groundwater has to be well regulated, monitored and managed so as to avoid over-abstraction and protect against any contamination risk to the municipal drinking water supply system and a negative impact on the environment. - Since the use of groundwater is subject to the National Water Act 36 of 1998, consumers who wish to make use of groundwater resources need to apply and register for this use and obtain authorisation and/or licensing from DWS, as well as get approval from the City for the plumbing installation.
Water Services Development Plan 2017/2018 – 2021/2022 (2017)	Updated every 5 years, based on 2016 audit. It integrates technical planning with social, institutional, financial, and environmental planning. The report also aligns the capital expenditure with operational expenditure and maintenance	-Excellence in basic service delivery -mainstreaming basic service delivery to informal settlements and backyard dwellers -safe communities	-Water sensitive city	Policy does not directly implicate the MAR/BGI, but it mentions aspects of development through the following lens, -Managing water scarcity

	requirements. Looks at how to maintain an existing water and sanitation service for the city while also providing services for an ever-increasing number of households in a sustainable way. It also needs to occur in line with the City's new Organisational Development and Transformation Plan (ODTP) that includes 11 transformational priorities. The principal challenge for the Department is to maintain an existing water and sanitation service for the city while also providing services for an ever-increasing number of households in a sustainable way. This has to be achieved in the context of providing basic needs, ensuring economic growth, maintaining an ageing infrastructure, limiting negative environmental impact, managing water resource scarcity, and consolidating a transformed metro administrative infrastructure. It also needs to occur in line with the City's new Organisational Development and Transformation Plan (ODTP) that includes 10 transformational priorities. These priorities are: 1. Excellence in basic service delivery	-transit oriented development -leveraging technology -resource efficiency -building integrated communities -economic inclusion -operational sustainability Vision Statement: "To be a beacon in Africa through progressive realisation of Cape Town as a water sensitive city". Mission Statement: "Provide safe, reliable, sustainable, and affordable Water and Sanitation services to Cape Town. The Strategic Focus Areas to achieve our Mission and Vision: • Employee and Leadership Development • Infrastructure Stability • Water Resource Adequacy • Product Quality • Community Sustainability		-It is envisioned that Cape Town can progress to becoming a water sensitive city, where natural resources, such as rivers and groundwater sources, and engineered water services, such as water supply, wastewater, and stormwater services, are planned and managed in an integrated and holistic way that conserves and rehabilitate the natural environment. -Infrastructure investment creates an environment for economic growth and is important for sustainable growth. -Implementation of more augmentation schemes to augment the capacity of the WCWSS e.g. through Groundwater from the table mountain group aquifer, and Cape Flats Aquifer While this plan does not go into great detail regarding any MAR-BGI specific developments or implementations, but briefly

	2. Mainstreaming basic service delivery to informal settlements and backyard dwellers. 3. Safe Communities. 4. Transit Oriented Development. 5. Leveraging technology. 6. Positioning Cape Town as a forward-looking, globally competitive business City. 7. Resource efficiency. 8. Building integrated communities. 9. Economic Inclusion. 10. Operational Sustainability.	• Consumer Satisfaction • Operational Optimisation • Stakeholder Management and Support • Financial Viability • Operational Resilience		mentions the stormwater ingress programme as one of the city-wide projects that are being implemented to assist the overload in the sewer system, thereby contributing to the protection of the environment and prolonging infrastructural integrity. This project amongst 2 others that are aiding the burden of sewer overflow have been given a budget of R22.5 million. This plan envisions Cape Town becoming a water sensitive city, and mentions that both natural resources (rivers, groundwater etc.) and engineered resources such as wastewater and stormwater are planned and managed in order to realise benefits such as: • Be able to use urban water as a resource for drinking and non-drinking water supply. • Improve the health of Cape Town's rivers and waterways and improve liveability for communities

				through which these waterways flow. • Create opportunities for development around rivers and waterways. • Conserve and rehabilitate the natural environment. • Improve resilience of Cape Town's water supply service.
Environmental Strategy for the CoCT, 2017 (2017)	-Contributes significantly towards environmental (land, flora, fauna, water, atmosphere etc) sustainability by providing decision makers with an effective policy and governance framework for decision-making, management, and operational implementation where the environment is concerned, in conjunction with the (Economic Growth Strategy) EGS and (Social Development Strategy) SDS, and forms part of an overall sustainability model embedded in the Integrated Development Plan and City Development Strategy (Pg 10) -To enhance, protect and manage Cape Town's natural and cultural resources for	Environmental Strategy focuses on promoting the green economy, resource efficiency, low carbon development, and environmental protection, supports both the overall implementation of the EGS and the long-term desired Outcomes (Chapter 5) that include: 5.2.1. there is excellent air quality in all areas of Cape Town, and lung irritation and disease due to poor air quality are mitigated; 5.2.2. Cape Town's rivers and wetlands are	The 11 principles that guide the outcomes focus on resilience, mitigation, social and economic optimisation objectives that the city aspires to achieve in relation to the environment. Moreover, The ES is accompanied by an extensive Implementation Framework that has 4 focus areas. For this analysis, I have prioritised zooming into the relevant water-related (MAR-BGI) where water as a resource is	5.2.2. Cape Town's rivers and wetlands are well managed and where possible planned as cohesive corridors that are well-used recreational spaces and community assets that provide ongoing ecological service. 5.2.13. water conservation and water security technology are in place in all City operations, businesses and households, Cape Town's aquifers are well managed and conserved, and Sustainable Urban Drainage System (SUDS) controls and wastewater treatment and

	long term prosperity, in a way that optimises economic opportunities and promotes access and social well- being -Comprehensive embedded environmental goals in Cape Town, including marine, coastal, biodiversity, efficient and integrated public transport systems, national parks amongst others. ▪ Driven by 11 principles which are: 6.1. Long-term approach 6.2. Equity and Accessibility 6.3. Economic and Social Benefits 6.4. Resilience 6.5. Ecosystems Approach 6.6. Preventing, Minimising, and Mitigating Environmental Impacts 6.7. Resource Efficiency 6.8. Environmentally Sensitive and Low Impact Urban Design 6.9. Educated and Empowered Citizens 6.10. Protected Natural Heritage 6.11. Protected Cultural Heritage	well managed and where possible planned as cohesive corridors that are well-used recreational spaces and community assets that provide ongoing ecological services; 5.2.3. Cape Town's coastline and marine environment are of excellent ecological quality, free from pollution, accessible to all, provide a central role for recreation, and continue to contribute to Cape Town's economy; 5.2.4. the natural resource base, including biodiversity and the services provided by green municipal infrastructure, is restored, protected, and utilised sustainably; 5.2.5. the City actively drives and supports a green economy that results in expanded economic opportunities and more efficient production of goods and services, through improving resource efficiency, enhancing environmental resilience, and optimising the use of natural assets, while promoting social inclusivity; 5.2.6. the City understands and takes active	prioritised under each focus area. Implementation will focus on: 1)Natural Systems Planning and Management (via the Integrated Stormwater Management Strategy and Economic Optimisation) where the strategy will focus on the management of stormwater and promoting Water Sensitive Urban Design) 2)Resource management and efficiency (via the Western Cape Water Supply System Reconciliation Strategy) includes recommendations of interventions that need to be implemented or studied to ensure long term water supply. 3)Environmental quality management (via Management of Urban Stormwater Impacts Policy) to minimise the undesirable impacts of stormwater runoff from developed areas by introducing sustainable drainage principles to urban	recycling are optimised in a manner which promotes a Water Sensitive Urban Design philosophy and positions Cape Town as a leading example of a truly "Water Sensitive City"; 5.2.4. the natural resource base, including biodiversity and the services provided by green municipal infrastructure, is restored, protected and utilised sustainably. 5.2.5. the City actively drives and supports a green economy that results in expanded economic opportunities and more efficient production of goods and services, through improving resource efficiency, enhancing environmental resilience, and optimising the use of natural assets, while promoting social inclusivity. 6.5.4. recognise the interconnectedness and interdependence of ecosystems and their associated goods and services and ensure that negative cumulative and downstream impacts are prevented, or

		steps to reduce environmental risk; 5.2.9. all citizens have reasonable access to safe, well maintained and ecologically diverse natural open spaces such as nature reserves, national parks, large city parks and coastal areas; 5.2.18. all citizens know how to live in a more sustainable way and make environmentally and socially responsible choices. 6.9.4. enable citizens to engage with the city on an ongoing basis on ways to improve implementation of the City's environmental principles; 5.2.11. the City optimises the use of water-wise vegetation in all of its open spaces, including parks and road verges, in order to reduce water use and management costs, and where appropriate, the use of indigenous vegetation, in order to conserve natural heritage and contribute to the ecological integrity of Cape Town.	planning and stormwater management in the Cape Town metropolitan area, (approved 2009) 4)Heritage Management, where a sense of place is prioritised through naming policies, cultural heritage, tree management policy, outdoor advertising policies, public memorialisation etc) Four cross-cutting themes underlie the four strategic focus areas: 1.Enabling the green economy within Cape Town, focusing on, amongst others: low-carbon, resource efficient, and socially inclusive economic development, and reducing environmental risks and ecological scarcities. 2.Environmental compliance and law enforcement – in both the City's own operations and of business and external stakeholders - including defining the applicable legislation and enforcing the applicable regulations and legislation, as	where they cannot be prevented, minimised or mitigated; and 6.5.5. compare life cycle costs of ecological infrastructure and hard engineering infrastructure and promote the use of ecological infrastructure in place of hard engineering infrastructure where cost-effective and appropriate. Blue-Green Infrastructure Resilience: 6.4.2. recognise that natural functional ecosystems provide the most efficient and cost-effective buffers to natural environmental hazards; 6.4.6. prioritise environmental management and infrastructure development and maintenance approaches that emphasise soft engineering, and the restoration and rehabilitation of natural systems; 6.4.10. ensure that the city's natural resources and natural/semi-natural open spaces are managed according to best practice to improve resilience and optimal

			well as implementing proactive compliance and best practice measures. 3.Environmental education, awareness, and communication, with a focus on voluntary behaviour change. 4.Climate change, focusing on both adaptation and mitigation, and building a city that is resilient to climate change impacts.	functioning; 6.4.11. ensure an appropriate urban-natural interface that protects communities from natural hazards; and 6.4.12. ensure that climate change risk is considered in the management of natural resources and in the approval and implementation of developments. 6.9.5. lead by example in the implementation of resource efficient and environmentally sensitive technologies
Municipal Spatial Development Framework (2018)	The MSDF is a framework for long-term growth and development, including a spatial vision, policy parameters and development priorities that would help cape town achieve its desired spatial form and structure. Municipal Spatial Development Framework is being readjusted to fit into the new IDP.	MSDF needs to: -be an integral part of the IDP. -be consistent with prevailing legislation and policies of National Government, Province, and the City itself. -identify significant structuring and restructuring elements of the spatial form, now and into the future. -provide guidelines for the City's land use management system.	There are three priorities, 1. Spatial Priority 1: build an inclusive, integrated, vibrant city. 2. Spatial Priority 2: Manage urban growth and create a balance between urban development and environmental Protection.	The spatial priorities that are relevant to water regulation is the Spatial priority 2: Manage urban growth and create a balance between urban development and environmental protection. - make more efficient use of non-renewable resources, such as land, water and biodiversity, including protecting and maintaining existing surface and groundwater resources and

		-guide and support future economic growth and development priorities. - address the fragmented and inefficient regional and metropolitan spatial form that resulted from apartheid. -recognise the unique topography and ecological assets of Cape Town. -balance competing land use demands and sector priorities, such as housing and transport initiatives, environmental asset protection and infrastructure provision. -support a sustainable and resilient development path that determines what, where how and when development takes place; and -focus and optimise public and private operational and capital resources.	3. Spatial Priority 3: Plan for employment and improve accessibility as well as access to economic opportunities.	sustainably managing existing and future water supplies; • use the natural environment to support spatial justice by enhancing access for all citizens to a quality open space network, offering community, recreational, non-motorised transport and economic opportunities; • avoid or appropriately manage any negative development impact on natural resources, considering their finite nature and the costs relating to rehabilitating or mitigating degraded natural areas; • take into account biodiversity, aquatic resources and networks as well as agricultural areas when planning new development; and • actively pursue national biodiversity targets as well as those identified in the City's Bioregional Plan.
Local Biodiversity Strategy and Action Plan	1. Definitions These definitions mention water / stormwater therefor having relevance to the MAR – BGI project. These are the definitions that mention water. Not storm-	**3. Regulatory context** The following legislation, strategies and council policies are relevant to the Integrated Coastal Management Policy.	- A Local Biodiversity Strategy and Action Plan (LBSAP) is a guiding strategy, complemented by specific actions and adopted by local	**6.5 Natural Coastal Processes, Fauna and Flora** These natural systems, besides their intrinsic value, form the foundation from which

(LBSAP): 2019-2029 (2019)	water specifically however make relation to water and will therefore be included in the policy and Instruments. **Coast:** The inshore marine environment up to 500 metres seaward of the High-Water Mark, the interface between the marine and terrestrial environments and the land directly exposed to coastal processes, tidal influence and storm surges. - This relates to sea water - therefor not relating to MAR- BGI which is landlocked water. **Coastal zone:** The area seaward of the Coastal Protection Zone boundary, the seashore, coastal waters and the exclusive economic zone 3 Integrated Coastal Management Policy of the City of Cape Town, September 2014 and includes any aspect of the environment on, in, under and above such area. **Heritage sites:** Material remains resulting from human activity older than 100 years. This includes wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, territorial waters or in the maritime cultural zone where such wrecks are older than 60 years. - Mentions water as a heritage site, however does not relate to storm water or landlocked water. This	**National Water Act (36 of 1998)** - This relates to the legislation that provides a guiding principle for in terms of how this policy is constituted. Desired Outcome -Biodiversity in the City of Cape Town is conserved and restored where appropriate, has resulted in significant participation by, and has delivered opportunities and benefits to its present and future generations Strategic Objectives are: -Develop + maintain relevant policies and strategies to ensure alignment with relevant international, national and provincial legislation, policies and strategies -Secure formal conservation status, manage, maintain and restore identified and existing terrestrial and wetland priority sites -identify and enhance and optimise socio-economic benefits and opportunities that	governments to achieve optimal and realistic governance and management of biodiversity and ecosystem services. -An important part of the LBSAP is to align the various departments' invasive species control plans and to provide a mechanism for data collection to inform status reports and monitor progress - The management of biodiversity and invasive species should be regarded as a transversal programme requiring a multi-level, City-wide approach involving all departments responsible for planning and resource management in the City -Is an approach to sustainable development -City of Cape Town is a signatory to various international conventions such as UN Convention on Biological Diversity, UN Framework Convention on Climate Change, Convention on Wetlands (Ramsar Convention 1971; there are 6	socio-economic systems benefit and community livelihoods are built while playing an essential role in mitigating and reducing risk to the City, its infrastructure as well as private property. Implement Estuary Management Plans that recognise and manage the vital contribution of estuaries to supporting the health of coastal ecosystems, water quality. maintenance, the provision of marine species nurseries and the provision of protection against coastal erosion and storm surge damage. - This mentions storm surge in the context of the Statuary Management Plans - This could therefore be considered in in relation the stormwater pond as this regulation makes mention of this context.

	refers to what is constituted as heritage. **High Water Mark:** The High-Water Mark as defined in section 1 of the Integrated Coastal Management Act 2009. - No specific relation to MAR- BGI project this refers to coastal water. -Cape Town is rich in biodiversity, it is a hotspot of biodiversity located in the CFR and thus a need to combat extinction & endangerment of fauna + flora species is vital as these rich natural assets need to be effectively protected and managed in order to support and promote sustainable social and economic development in Cape Town. In the context of rapid urbanisation, climate change, financial crisis, conversion of natural habitat to agriculture, overexploitation of water and marine resources, invasive species, inappropriate fires, pollution, crime (14 species have been classified as extinct due to policy protection failure). -The LBSAP has been divided into two parts: the strategy component (Part 1) and the action plan 2019-2029 (Part 2). The strategy component, aligned to the City's Environmental Strategy, will replace the Biodiversity Strategy approved in 2003 and the Framework for a Strategy and Action plan for the Management of Invasive Species in the City approved in	are ecologically sustainable, focusing particularly on the provision of green jobs and skills development programmes -Significantly reduce the threat posed by invasive species to Cape Town's natural, economic and social assets -Increase communication efforts to enrich people's knowledge of our local biodiversity -Ensure effective and efficient management of the Environmental Management's Biodiversity Management Branch, which leads + coordinates the LBSAP -Align with IDP for example (economic inclusion goals, resource efficiency and security, safe communities, operational sustainability,	Ramsar sites in the Western Cape that provide the City with a great opportunity to ensure that this reserve benefits and educates the local community on biodiversity issues), World Heritage Convention, Sustainable Development Goals, National Biodiversity Strategy + Action Plan, National Invasive Species Strategy, the Constitution (everyone has the right to an environment that is not harmful to their health) Action Plan includes: -Increasing partnerships with research institutions, align city by laws, policies to international, national and provincial levels, reviews,	- The policy is however not specifically focusing on stormwater therefor considers in in relation to coastal storm-water. **6.9 Coastal Safety and Security** Although the City's jurisdiction is determined by the high-water mark, the City recognises that economic, recreational, environmental as well as illegal activities operate across these jurisdictional boundaries. - This speaks to the multi-functional space that a storm-water pond will provide. Therefor ensuring the city protects these spaces as it has multiple benefits. **8.1 Coastal Area** Recognising that social, economic and ecosystem processes take place across the High Water Mark and given the need to ensure integrated management as well as proactive planning, the

	2009. The LBSAP also includes the updated targets for 2022 as aligned to the City's 5-year IDP (2017-2022). Visions are: -To be a city that leads by example in the protection and enhancement of biodiversity. -To be a City within which biodiversity plays an important role, where present and future generations benefit from a healthy and vibrant biodiversity. -To be a City that actively protects its biological wealth and prioritises long term responsibility over short-term gains			City intends to make an application, as allowed by the ICMA, for its area of responsibility to extend 500 metres seaward of the High-Water Mark. - This again mentions the importance of protecting multifunctional spaces. The MAR-BGI project speaks to this nature. Although not coastal it still provides the same elements and therefor benefits. -The Cape Action Plan for the Environment (CAPE) identified the key threats and root causes of biodiversity losses that need to be addressed to conserve the floral kingdom; establish an effective reserve network, enhance off-reserve conservation, and support bioregional planning. strengthen and enhance institutions, policies, laws, co-operative governance, and community participation; and develop methods to

				ensure sustainable yields, promote compliance with laws, integrate biodiversity concerns into catchment management and promote sustainable eco-tourism. -There is a biodiversity crisis in Cape Town lowlands (Cape Flats), with only extremely small areas of lowland vegetation formally conserved, for many vegetation types it is too late to achieve the necessary conservation targets for adequate conservation - Cape Town supports a variety of wetlands and rivers. Historically, a large proportion of lowland Cape Town was dotted with seasonal and perennial wetlands, interconnected via the groundwater system. -The guiding principles for this are: No ecology without equity – no equity without ecology, Best management practice; The importance of both biodiversity pattern and ecological processes;

				Promotion of biodiversity as an asset in all communities -Implementation of biodiversity Network (BioNet) action plan includes assisting City Parks with their Biodiversity Agreement sites; ensure EMPs are completed and pursue title deed restrictions; identify new Biodiversity Agreement sites and ensure their conservation; Co-ordinate catchment management, in consultation with Bulk Water, with a focus on the Strategic Water source Areas for the city -
Cape Town Water Strategy (2019)	-Developed in the context of severe drought from 2015-2017 by establishing a new relationship with water; establishing a new thinking & seeing water as finite; water is key for growth and future water supply as CT is vulnerable to climate uncertainty. -CTWS aims to improve water resilience and improving the quality of life of all by outlining practical steps to improve the quantity and quality of water and sanitation services provided to all people, particularly those living in informal settlements.	- By 2040, Cape Town will be a water-sensitive city that optimises and integrates the management of water resources to improve resilience, competitiveness, and liveability for the prosperity of its people: -Increase in water supply by building new infrastructure and investing in diverse water sources such as desalination, reuse, and groundwater	- Better management of stormwater, rivers and waterways in the city will reduce flood risk. Cost-effective, secure water provision provides an essential foundation for economic growth and job creation. -Cape Town gets its water from rain-fed dams. Even though the City will invest in alternative water sources, rain-fed dams will still supply	-Commitment 3: Increasing resilience through developing new, diverse supplies of water including groundwater. (current water supply is 96% surface and 4% ground and they aim to increase supply from groundwater to 7% in 2040, other sources being desalination (11%), reuse (7%), surface (75%). Under the new water programme, cost, adaptability, scaling and

	-Goals achieved through five commitments: 1. Safe Access to Water & Sanitation 2. Wise Use 3. Sufficient, reliable water from diverse sources 4. Shared benefits from regional water resources 5. A Water Sensitive City	-Water tariff to ensure wise use of water (the more you use the more you pay), the establishment of pressure management zones, night-flow monitoring, water leak detection and reducing non-revenue water. Wise use also through outreach and educational campaigns in schools & the public -Team effort through stakeholder collaborations and users Principles include: 1. Water is life. 2. Grow inclusivity and trust (shared benefits and costs fairly) 3. Build capability. 4. Work together and across boundaries. 5. Be fluid like water (adaptive approach to increase resilience) 6. Water is all around us (rehabilitation of urban pathways) 7. Work with nature. 8. When it rains, slow, store and repurpose.	more than three quarters of Cape Town's water in ten years' time. -Best-case plan developed by considering climate change and rainfall unreliability and increasing the current level of assurance from 98% to 99.5%, improved water management and use -Citizenship and customer engagement is essential in establishing wise use - Water tariffs will decrease from the high levels imposed in 2018. Poor households will continue to receive a subsidy. -DWS and City of Cape Town to work collaboratively, build stronger relationships between the key stakeholders by sharing expertise, information, infrastructure, and finances to ensure better planning and cost-effective investments	timing will be prioritised when selecting new projects. -Through the committed programme, the City has identified Cape Flats aquifer, Table Mountain Aquifer, and Atlantis programme as part of the committed new water programme. At the Cape Flats Aquifer, The scheme will include artificial recharge of the aquifer by injecting high-standard treated effluent, as well as a seawater intrusion barrier. The water abstracted from the aquifer will require further treatment prior to injection into the water supply system. DWS has imposed licencing and an Environmental committee as well as quality monitoring control. Commitment 5: A Water Sensitive City - actively facilitating the transition of Cape Town over time into a water-sensitive city with diverse water resources, diversified infrastructure and one that makes optimal use of

		9. The future could shock us. 10. Watering the green economy		stormwater and urban waterways for the purposes of flood control, aquifer recharge, water reuse and recreation, and that is based on sound ecological principles. Principles of a water sensitive city include protecting natural systems, water quality, integrate stormwater treatment with the landscape and adding value while minimising costs
Liveable Urban Waterway Framework Implementation (2021)	The purpose of this document is to: i.) Create a framework to embed the Liveable Urban Waterway (LUW) ethos into waterway policy, planning, rehabilitation, and management. ii.) Establish a programme for the implementation of LUW projects. It achieves this by providing an enabling structure for the development and implementation of the LUW Programme	This document outlines workstreams in order to reach the goals identified: **Workstream 1 Implementation Framework –** This workstream is about developing the LUW Implementation Framework and supporting documentation and obtaining approval and signoff from key stakeholders. **Workstream 2 Communication and Engagement –** This workstream is about developing a stakeholder map and communication plan, and		**3.2.3 Water Sensitive Design and Green Infrastructure** Water Sensitive Design (WSD) and green infrastructure are used to mimic the natural hydrological cycle (pre-development hydrology) through several sequential interventions which links water bodies and green corridors in design processes (Armitage et al., 2014). If designed using WSD and green infrastructure principles, a project will have multiple benefits that could include increased biodiversity, temperature cooling, public space amenity, carbon sinks

		then incrementally implementing the plan. **Workstream 3 Case Study Compendium –** This workstream is about researching and developing a compendium of case studies that showcase liveable waterways. **Workstream 4 Monitoring Framework –** This workstream is about developing a programme level monitoring framework and then supporting the implementation of the monitoring as the programme unfolds **Workstream 5 Demonstration Projects –** This workstream is about planning and then implementing the three demonstration projects. **Workstream 6 Project Pipeline –** This workstream is about developing a pipeline of possible projects, and then incrementally planning and implementing the projects. **Workstream 7 Learning Lab –** This workstream is about embedding a philosophy of continuous improvement and		and active recreation among others. Sustainable Drainage Systems (SUDS) are a subset of WSD and can be used to slow, store, infiltrate and reuse stormwater. LUW projects will reconnect the natural water cycle and allow for storage to reduce peak runoff and allow groundwater infiltration or stormwater harvesting, where feasible. **Provide a range of ecosystem services, economic and social benefits –** Liveable urban waterways are green infrastructure and use natural processes to treat water, store water, reduce flooding, improve biodiversity, trap sediments, recycle nutrients, reduce heat, and assimilate carbon. They may provide jobs, food and materials, or the water can be abstracted for use. **Indicator – no. of additional ecosystem services, economic or social benefits provided.** **Design with Nature**

		reflective learning. The implementation of effective benefits monitoring will be crucial for this workstream, as will the establishment of a community of practice in the form of a River Protection Partnership. **Workstream 8 Governance –** This workstream is about setting up the governance structures and then using these structures to oversee implementation.		Liveable Urban Waterways projects must use green infrastructure and WSD approaches to design with nature using water as a main design informant. Design with nature describes an ecologically sound approach to the planning and design of communities where design considers both the ecology and character of the landscape, and importantly allows us to live with the powerful forces and flows of nature, rather than fighting against them (McHarg, 1969). Cities that develop in a manner sensitive to natural processes are more resilient, sustainable, and efficient. **Green Infrastructure Programme –** The Green Infrastructure Programme aim is to protect and enhance Cape Town's existing natural environmental assets, as well as promote and create new green infrastructure assets. The programme aims to: i.) Be an informant to land-use planning and decision making.

				ii.) Become an approach that is integrated with traditional methods, to improve the impacts of urbanization. iii.) Develop best practice guidelines in support of green infrastructure. iv.) Identify and map the city's green infrastructure assets and sites. v.) Incorporate green infrastructure principles and approaches into City policies and by-laws. vi.) Promote and implement projects to protect, enhance or create green infrastructure. vii.) Promote the reconnection of people and nature to endorse health and wellbeing. The LUW Programme, and particularly the LUW projects, will be in effect an implementation mechanism of the Green Infrastructure Programme.
CoCT Urban Watercourses Guide (2022)	The principles contained in this document are meant to guide property owners, City officials, designers, developers, architects, planners, and community members in managing and improving our green	Numerous guidelines are outlined in ensuring sustainable development through environmentally conscious actions and the use of green	This document proposed interventions that need to be considered when building new developments or renovating already existing	To achieve the optimal functioning and integrity of our watercourses, we must ensure that watercourses, along with the activities and development

	infrastructure collectively and sustainably to create safe, contextually appropriate environments.	infrastructure to be implemented in new developments. Guideline 1: Adhere to relevant legislation and policies. Guideline 2: Planning process considerations for development adjacent to watercourses. Guideline 3: Develop appropriately adjacent to watercourses to reduce the impact of flooding on people and property. Guideline 4: Responsible watercourse bed and/or bank modification and stabilisation. Guideline 5: Prevent pollution of watercourses to enable healthy ecological functioning and a safe watercourse with improved water quality. Guideline 6: Establish a buffer adjacent to the watercourse to protect the watercourse and enhance the resilience of the ecosystem.	developments. It outlines various methods and implementation guidelines that should be considered by all stakeholders in order to ensure that the ecological processes and health of the urban watercourses remain as natural as possible even with human presence, while also ensuring that nearby populations do not experience adverse scenarios due to being within close proximity of these watercourses.	that impact on them, are well managed. The City has specific requirements relating to developments or building in a floodplain and/or flood- prone area. These may include requirements for preparation of a site development plan, a stormwater management plan, and/or a landscape masterplan, as well as designation of flood lines, specialist studies in relation to buffer areas, determination of potential upstream or downstream flood levels or hazards, etc. When the capacity of a watercourse channel is exceeded, the adjacent land may be flooded. The extent and nature of development within the floodplain must therefore be carefully managed to reduce the consequential negative impacts on people or property in the floodplain and downstream and/or upstream. Potential impacts on people, property and infrastructure

		Guideline 7: Invasive plant species in or adjacent to a watercourse need to be controlled and/or removed and destroyed. Guideline 8: Plant locally indigenous species that are appropriate to the particular area and watercourse. Guideline 9: Be aware of fauna that live in or use watercourses and limit potential impacts on them. Guideline 10: Improve the amenity value of urban watercourses. Guideline 11: Work with your community to help improve and maintain your watercourse.		must be considered when considering development or settlement adjacent to a watercourse. (importance placed on potential flood risks due on properties close to watercourses and various levels of flood line areas in a given spaces and nearby areas.) Any proposed development below the 1:100-year floodline must be supported by are port from a suitably qualified and registered professional engineer to demonstrate and ensure, firstly, that any new structure can withstand the forces and effects of floodwaters and secondly, that the activity and/or development will not increase flood hazards for other upstream or downstream property owners or adversely affect flood behaviour. The professional will need to map the applicable flood lines and indicate where in relation to these the proposed development is to be located.

				Fencing below the 1:50-year flood line should be visually permeable from ground level and must not adversely affect the free flow of water (e.g. palisade-type fencing). This is to allow for the uninterrupted movement of water and fauna, and debris (in flood situations). Fences crossing watercourse are discouraged. No live electric fencing security wires are allowed at ground level. Hard or impervious areas alongside a watercourse should be reduced unless they form part of a formal walkway or non-motorised transport (NMT) route that has been correctly located and designed. Hard or impervious areas should be minimised, and pervious and vegetated surfaces maximised to encourage infiltration and groundwater recharge and reduce the rate and volume of stormwater runoff. An accelerated flow of stormwater into watercourses could

				exacerbate flooding and erosion. All hardened surfaces within the 1:100-year flood line should ideally be permeable. It is encouraged that buildings and developments face onto natural space and interface positively with the watercourse – to both assist with passive surveillance and safety, as well as to facilitate better amenity value of the watercourse (e.g. Use of fencing along boundaries of watercourses rather than solid walls to have a view of the watercourse) Development and hard surfacing reduce infiltration and increase the volume and rate of runoff. Runoff that enters the watercourse could be carrying pollution and sediment, which may detrimentally affect the watercourse. To ensure that a watercourse is not polluted by contaminated runoff, it can be intercepted and cleaned before entering a watercourse. An example is to introduce

				sustainable urban drainage system (SUDS) elements, such as a bioswale or filter strip, to aid infiltration and water treatment. Development and hard surfacing reduce infiltration and increase the volume and rate of runoff. Runoff that enters the watercourse could be carrying pollution and sediment, which may detrimentally affect the watercourse. It is important that unsuitable substances (e.g. fats and oils) and foreign objects (e.g. rags, cloth and sand) are not disposed of into the sewerage system, as these can cause blockages, resulting in sewer overflows, which then can flow into the stormwater drains, which discharge to watercourses. The guideline also emphasises how there is a need from everyone to ensure they don't litter (both liquid and physical) at all. Establish a buffer adjacent to the watercourse to protect the watercourse and enhance the

				resilience of the ecosystem. Watercourses need to be protected from the impacts of urban activities and infrastructure, or other developments, if they are to continue to provide habitats and services for humans. Buffers provide opportunity for stormwater infiltration and treatment, and offer space for natural flood events, thereby helping protect urban infrastructure from the effects of flooding. They are important for riparian ecosystems and provide habitats for species of plants and animals, including reptiles, crustaceans, insects, amphibians, birds, and small mammals. Well-vegetated buffers can assist with stream bank stabilisation and protection from erosion. Buffers can also provide the opportunity for a range of societal benefits, such as public green open space that can be used for appropriate low-impact recreational activities.

				Improve the amenity value of urban watercourses. Watercourses can be attractive and multifunctional features in an urban area, places of beauty, and of recreational amenity and value. They offer opportunities for education, for play, and for communities to connect in green open spaces. Guideline 11: Work with your community to help improve and maintain your watercourse. There are many examples of communities working together and with other stakeholders to help enhance and improve the watercourse and adjacent open public space in their area, making them into valued community assets where people gather to recreate and enjoy green open space. Public awareness and accountability about how development and activities can influence the quality of water and the physical integrity of the instream and riparian environment are all important.

				This will help ensure that the condition of the watercourse can be maintained and/or improved.
CoCT Smart Living Handbook (2023)	This handbook is divided into six chapters: Water, Waste, Environment, Transport, Energy and Heritage. Each chapter discusses the various issues regarding the issues of the resource being discussed and how each individual plays a role in determining the sustainability of each respective resource at an individual and household level. Each chapter provides the following information: • The key challenges relating to the resource. • What the City is doing to manage the resource or issue. • What you can do in your home to help conserve the resource. • Contacts and information sources, and steps for implementation.	This handbook discusses the tips that each individual should consider in their everyday practices in order to reduce resource consumption and waste output. The envisioned outcome of this handbook is to promote sustainable development in a practical way by having all residents make smarter choices in considering their everyday actions that have an effect on the environment and local population due to their specific resource consumption and waste output.	The handbook is divided into six chapters with each chapters discussing how people can make practical choices with their everyday actions in order to promote sustainability. These six chapters are water, waste, environment, transport, energy, and heritage. Each section discusses the specific measures that citizens can employ at a household level in order to make decisions that look out for the best interests of the environment and larger population and in doing so, ensures a greater chance of a sustainable lifestyle.	In relation to MAR-BGI, this guideline highlights issues that arise and can be avoided regarding the stormwater management system. The 2 main issues that were highlighted were regarding the disturbance and blocking of stormwater from entering the stormwater system due to physical pollution such as dumping and chemicals or other forms of waste entering the stormwater system as this results in the stormwater being contaminated. The guideline proposes numerous ways that citizens can prevent these issues from arising, such as pouring waste into the sink or toilet so that this waste enters the sewer system and not the stormwater system. Some examples from the guideline are listed below.

				“Environmentally friendly detergents, soaps and shampoos must be used in the washing machine if this water is to be reused. This prevents harmful chemicals from entering and contaminating the stormwater or surface water systems.” “If possible, wash your vehicle on a permeable surface. (grass or dirt), away from any surface water, so that the water does not run off hard surfaces (driveways, roads, and pavements) into stormwater systems. The runoff may contain oils, dirt, and hazardous chemicals, which are harmful to water systems and the environment.” “Rainwater and any other water flowing in our streets goes into the stormwater system, and eventually flows to our rivers and catchments before flowing into the ocean (illustrated below right). Being a water-sensitive city includes looking after our

				sewer and stormwater systems." Dumping rubbish into a plumbing system not designed for foreign waste causes sewer blockages and overflows. This affects us all. An overflowing sewer runs into our stormwater drains and contaminates our rivers, streams, and canals. The contaminated water poses a threat to our health and the environment." "Pour any dirty (polluted) wastewater down the sink or toilet so that it ends up in the sewer system, not the stormwater system."
CoCT Green Buildings Guideline (2008)	The aim of the guideline is to promote resource efficient construction of new or renovated buildings in Cape Town to minimise the negative environmental impacts of the built environment. The overarching goal of this document in general is sustainability.	This guideline is a draft but will be incorporated into design manuals and legislations in future projects to ensure the implementation of green buildings. The guideline suggests numerous strategies that developers should take into	The guideline discusses the construction and renovations of buildings and how certain criteria should be met in order to minimise negative environmental impacts that result from these renovations or constructions.	3.4.2.1 Stormwater control Hard surfacing in urban environments increases the volume and speed of stormwater contributing to water contamination, flooding, and removal of topsoil, which is washed into the sea. Design surface drainage to slow down stormwater and facilitate

		consideration when building/renovating such as energy, water, and waste in order to minimise environmental and social impacts in the area and surrounds.	The themes that were prioritised in this document that need to be considered when building or renovating are sustainable resource management in terms of water and energy usage and waste. The guideline also proposes guidelines for waste minimisation and human health considerations that need to consider in developments. These guidelines cover not only the construction and operational stages of the development, but also the design phase as sustainable measures such as site selection and possible economic impacts need to be assessed while also establishing a knowledgeable team.	recharging of the ground water. Where space allows, channel stormwater to retention ponds and soak-aways where it can seep into the ground. Replace hard surfaces with permeable paving on pathways and parking areas. This can be attractively planted in the spaces between the pavers, and helps to mitigate the urban 'heat island' effect. Mulch garden beds (spread a layer of bark or other organic material over the soil) to prevent evaporation and a hard and impermeable crust developing on the soil, which makes it harder for plants to grow. 3.4.2.3 Rainwater harvesting Harvesting rainwater for household use, saves using potable water on tasks that do not specifically require it, such as gardening, cleaning, or flushing toilets. To set up a simple system harvest water from the roof via a gutter down-pipe leading into

				an enclosed plastic or ferro-cement tank. A mesh over the top of the downpipe keeps leaves out. Silt will still enter the rain tank. To prevent this being a problem locate the tap from the tank at least 50 mm above the bottom. Raise the tank about 300 mm above the ground in order to provide a little pressure.
National Water and Sanitation Master Plan (2019)	Water and Sanitation Management: -Reducing demand and increasing supply -Redistribution for transformation -Managing effective water services and sanitation -Regulating water and sanitation -Improving raw water quality -Protecting and restoring ecological infrastructure Enabling Environment: -Creating effective institutions -Managing data and information -Building capacity for action -Ensuring financial sustainability -Legislation -Enhancing research, development, and innovation.	This Call to Action of the National Water and Sanitation Master Plan (NW&SMP) is a concise summation of the top priority issues confronting the water and sanitation sector at this time and which seeks to rally all water sector stakeholders in South Africa to work together in order to ensure that the country gets ahead of the curve in relation to both current and future challenges. This includes ensuring that by 2030 and beyond South Africa has a sufficient reserve of supply to take it safely into the future, that accelerated progress towards meeting		The South African water sector is in decline with highly vulnerable municipalities characterised by declining levels of service, a continued increase in customer dissatisfaction, rising levels of unpaid bills and aging infrastructure. The NW&SMP: Call to Action has identified priority challenges and the critical actions that must be implemented to address the current crisis in the water sector and to achieve the constitutional and legal mandate given to the sector. *The Call to Action prioritises the actions that will deliver the*

		Constitutional imperatives is made and that service delivery commitments, such as meeting Sustainable Development Goal 6: *Ensure access to water and sanitation for all* is achieved.		*greatest impact with limited resources, with a focus on reducing water demand, increasing supply, ensuring universal and reliable water supply and sanitation, protecting infrastructure through effective asset management, improving raw water quality, and ensuring equity in access to water.* All water institutions (and private owners where relevant) must take responsibility to operate and maintain water related infrastructure according to the set norms and standards. Ageing infrastructure has led to a significant backlog in infrastructure renewals, estimated at R 332 billion of which about R 125 billion is critical. Proper life-cycle asset management is required to address the backlog and to reinstate sustainable financing of renewals from depreciation charges deposited into Capital Renewal Reserves. However, most institutions have depleted these reserves and currently

				only about R12 billion per annum is allocated to renewal of infrastructure, which is about 1% of the capital invested. The key themes identified in relation to MAR-BGI, which is more relevant to urban infrastructure, is the discussion for the need to upgrade infrastructure, as current urban water infrastructure is frequently identified as 'ageing' throughout the policy. The discussion primarily focuses on the need to upgrade current infrastructure, and the financial capabilities and limitation related. There is no major discussion regarding blue or green infrastructure. The National Water and Sanitation Master Plan has identified major goals or 'targets' in relation to the UN SDGs that DWS are trying to meet. These targets and their relevant indicators are listed as follows: <u>Target 6.1:</u> <u>By 2030, achieve universal and equitable access to safe</u>

				and affordable drinking water for all. · Indicator: Proportion of population using safely managed drinking water services Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations. Indicator: Change in the extent of water-related ecosystems over time Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. Indicator: Proportion of wastewater safely treated; Proportion of bodies of water

				with good ambient water quality Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure. sustainable withdrawals and supply of freshwater to address water scarcity and substantially. reduce the number of people suffering from water scarcity. Indicator: Change in water-use efficiency over time; Level of water stress: freshwater withdrawal as a proportion of available freshwater resources Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate. Indicator: Degree of integrated water resources management implementation (0-100); Proportion of transboundary basin area with an operational arrangement for water cooperation Target 6.6: By 2020, protect and restore

				water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. Target 6.A: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies. Indicator: Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan Target 6.B: Support and strengthen the participation of local communities in improving water and sanitation management. Indicator: proportion of local administrative units with established and operational policies and procedures for participation of local

				communities in water and sanitation management. While the DWS Master Plan mentions groundwater and MAR, there is no proposed solution to issued surrounding quality and quantity of groundwater and MAR. The ideal solution proposed is through better management of these resources, as the policy mentions that the resources themselves are sometimes seen as inefficient, but this policy mentions that this is due to poor management programmes.
Design and Management Guidelines for a Safer City (undated)	Intent: These guidelines focus on situational crime, and the intent is to encourage good design, sound public management and community involvement in order to facilitate the development of a safe environment: Where people experience less crime and violence. 1. Where criminal activity is easily detected. 2. Which is less at risk of vandalism; and 3. Where perceptions of safety and personal security are increased.	COMMUNITY SAFETY AUDITS During a community safety audit, the indicators of crime are agreed with the stakeholders; the types of crime prevalent in the area are identified; specific locations and crime hot spots are identified and mapped, and the shadow areas not ordinarily identified are made visible. THREE CRIME FACTORS		Consolidate and define ecological areas and open spaces. Fragmented and poorly defined open spaces, whether parks or natural or ecological areas, often attract anti- social activity and become dangerous. This is particularly challenging when dealing with systems of green open spaces, including large parks, sports facilities, river systems, wetland areas, stormwater

	This approach emphasises that improved safety cannot be achieved by individuals acting in isolation. Improving safety is a collective responsibility best achieved through partnerships. This approach is also based on a rich body of theory, research and practice, which focuses specifically on crime prevention through environmental design (CPTED). The main emphasis is on the design and management of the physical and spatial environment within which crimes are committed. More specifically, the guidelines seek to improve safety within the public environment, namely public streets, parks, and open spaces. Intended Audience: The guidelines are intended to assist a range of stakeholders with an interest in working towards creating safer environments. These include: • individual property owners. •facility/building management teams. • local communities. • managing agents of CIDs. • neighbourhood watch teams. • homeowners' associations. • developers and designers. • officials implementing projects or strategies. • officials advising applicants and developers on development applications.	Research suggests that there are three factors that influence the nature and level of crime in an area (Clarke, Eck & Newman, 2005). These are as follows: • Crime generators - places where crime is more likely, primarily due to a high number of people present, and where levels of anonymity are high (e.g. a shopping centre or public transport interchange) • Crime attractors - activities that may increase the prevalence of crime, such as gangs or drugs • Crime enablers/deterrents - circumstances that determine people's level of control in a space, such as the presence (or absence) of law enforcement officers or "eyes on the street" Locations that exhibit the greatest overlap between these three factors are generally where levels of safety are compromised, and crime is more likely to occur. MAPPING AND SPATIAL PATTERNS		facilities and conservation areas. In planning new neighbourhoods, open spaces should therefore be consolidated into well-defined networks of interrelated spaces that are overlooked by development. *ISOLATED WETLANDS IN LOW INCOME AREAS NEIGHBOURHOODS AND IN INFORMAL SETTLEMENTS BECOME DANGEROUS AND POLLUTED ENVIRONMENTS. WHERE APPROPRIATE THESE WETLANDS COULD BE FILLED IN AND STORMWATER MANAGED MORE EFFECTIVELY WITH THE USE OF HARD ENGINEERING SOLUTIONS, PROVIDED THE NECESSARY ENVIRONMENTAL PROCESSES ARE FOLLOWED.* Use visually permeable fences.

	• officials assessing development applications; and • politicians and decision-makers approving development applications. A City-wide Approach It may seem self-evident to most people, but the nature of crime varies greatly depending on where it happens within the city. Crimes that occur in public open spaces, city centres, residential suburbs, low-income and informal settlements differ in terms of type and intensity, and thus require different responses. This does not mean that the principles or objectives of how to address the problem necessarily need to change, but rather that the manner in which the principles are applied will need to be tailored to the specifics of the location. Therefore, it is important for any intervention that seeks to improve levels of safety to be sensitive to the type of crime as well as the underlying urban, social and economic factors, so that interventions can be directed and targeted.	When crime is mapped, three spatial patterns can be identified. Crime can either be: 1. point-related (hot spots). 2. line-related (along movement routes); or 3. area related. PLANNING INTERVENTIONS Once the neighbourhood or site has been analysed, the issues and types of crime have been identified and the risks assessed, interventions need to be planned, designed, and developed to tackle specific issues. When resources are scarce, it is advisable not to try and address all issues at once. Interventions are most successful when they target one or more of the “factors” noted previously. It is useful to prioritise projects on this basis so as to deal with the root causes of the problem. IMPLEMENTING PROJECTS AND INITIATIVES There is no “quick fix” or standard solution for improving safety. The types of projects and interventions will vary		To create a safe city, the right to a safe public environment overrides the right to privacy. Therefore, when fencing an open space – whether a private garden, park, or ecological area – select a fencing type that allows people to see into and out of the space. This ensures that criminal activity, perpetrators of crime and other illegal activity can be seen, and action can be taken immediately. The design and selection of fencing materials around open spaces and ecological areas should also take into consideration the need for small animals and insects to move between and within biodiversity areas. Stormwater may also dam up behind a kicker wall or be directed into areas where it could create problems. Consult the City’s Boundary Walls and Fences Policy for more information. Engage all relevant stakeholders and City line

		depending on the scale of the problem and the ability of communities and individuals to contribute or undertake projects. Even if resources are limited, the compounding impact of many small actions by individual stakeholders may make a very positive difference to the levels of safety. Where high-level support is required, communities are encouraged to approach their ward councillors with the ideas and initiatives that emerge from their participative planning process and community safety audits. If proposals are well structured and rationally argued, it is much easier for the City to respond and mobilise resources. POST-IMPLEMENTATION It is not enough to implement a safety project. Projects and neighbourhoods need to be looked after and cared for. In any neighbourhood, different role-players are responsible for different aspects of urban management. Issues need to		departments to ensure buy-in during the design process. When intervening in the public realm, it is important that all public stakeholders and line departments who will play a role in the construction and post-implementation management are engaged in the design process. This also ensures that those responsible for safety and security, law enforcement, maintenance and management can make meaningful and practical contributions to the design process. Key stakeholders in this process include the departments of Environmental Resource Management, City Parks and Roads and Stormwater, who are largely responsible for the city's public spaces, but may also include the police, private security companies, CID management teams and other, community-based organisations. *HARD ENGINEERING SOLUTIONS FOR STORM WATER MANAGEMENT ARE*

		be recorded and reported through the correct channels and followed up with action. It is important that all these role-players play their part and are held accountable for their responsibilities. This is to avoid the “broken window” theory, which suggests that if small signs of neglect are not promptly addressed, they become catalytic for further negative actions, which lead to a steady downward spiral within an area, with negative implications for perceptions of crime and safety.		*UNATTRACTIVE AND MAKE IT DIFFICULT TO CLEAN AND MAINTAIN WATER COURSES.* Safety Tip: Case Study of Roads *If road verges are not maintained or planted, the street looks unkept and wind blows sand into the road which can block the storm water system*
Strategic Plan (2020-2025) Western Cape Department of Human Settlements (2020)	To facilitate the creation of sustainable human settlements and improved quality of household life.	• Adequate housing and improved quality living environments • Spatial transformation through multi-programme integration in priority development areas • Security of Tenure • Functional, Efficient and integrated Government • Improved expenditure outcomes		No direct mention of MAR-BGI relevant concepts/themes.

		• Improved sector capacity • Improved programme performance projects • Responsive policies		
National Groundwater Strategy (2013)	1. Definitions - These are the definitions and abbreviations that have conceptual overlaps with the MAR-BGI project **TBA- Transboundary aquifers** **Integrated Water Resource Management** Integration must take place at three effective levels, integration within the hydrological cycle (the physical processes), integration across land and water, across catchments and aquifers (spatial integration), and integration across the overall social and economic fabric from national to local level. Importantly, there needs to be coordination with the macro-policies of other sectors – such as agriculture, energy, health, urban and industrial development, and the environment. **Using Ground Water Buffer** Groundwater resources development can in most aquifers go beyond intercepting part or all of the natural flux provided by aquifer recharge. **LOCAL HYDROGEOLOGIST**		1.1 Purpose and Scope of this Strategy Local and world-wide experience has shown that the development of effective approaches for the management of precious underground water resources will require a long-term process through which viable national, regional, and local institutional systems can evolve. management of precious underground water resources will require a long-term process through which viable national, regional and local institutional systems can evolve. This is in line with the direction of the DWA Functional Management Committee 2/2011 to establish a national strategy by:	These changes present a major challenge for the resource which occurs mainly in hard rock aquifers in which yields are limited and a water sector which had treated it largely as an emergency water supply by drilling boreholes during drought emergencies. Its sustainable utilization by many different role players at thousands of locations will require a very unique approach. - Emphasis placed of the importance of MAR-BGI spaces but also having a unique approach to facilitating and ensuring the long-term sustainability of said spaces. The national monitoring networks already indicate that Karst aquifers and coastal aquifers, the country's major aquifers, are under pressure in many locations through over-

	Because of the urgency in this regard, the Groundwater Division had an initiative of groundwater consultancies. “Adopting a municipality” and providing a free service to get the municipal groundwater management in order. REGIONAL AND INTERNATIONAL PARTNERSHIPS - Here the keyword search aquifer has been used to locate correlations between the MAR-BGI project and the NGS Policy **Sharing Knowledge** Groundwater has been the Cinderella of water resources in many parts across the globe. **Objectives** **Principles** Actively participate in and grow. appropriate regional and international partnerships towards groundwater resource understanding and optimal utilization, including transboundary resource management. Sharing knowledge and experience across boundaries have the potential to accelerate. our learning processes significantly. It improves efficiency, stimulates development. and reduces the probability of making. wrong decisions.		Clarifying and drafting roles and responsibilities of the wider sectors in relation to groundwater management, water security, future exploration, transboundary aquifers, etc. **Poor Aquifers** Poor aquifers occur mainly in the dry northern and western parts of the country. The generally low borehole yields of poorer quality are, however, still of critical importance to small rural communities. STRATEGIC ACTIONS **VALUATION OF GROUNDWATER RESOURCES** Focused development work on groundwater resource and source valuation and assessments should continue until it has become standard practice in groundwater resource. planning and implementation at all levels, for example in	abstraction, declining water levels and water quality degradation. - This notes the reality of not only water being an increasingly scare recourse but noting importantly how aquifer are even more scare - Thus, placing importance on projects like MAR-BGI that can protect these spaces **Goal 6: Water and Sanitation in the Sustainable Development Goals (SDGs)*** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. Support and strengthen the participation of local communities in improving water and sanitation management. - Protects vulnerable spaces like storm water infrastructure. Thus, this policy finds significance with the MARBGI project which as the same goals. - Emphasis on community engagement and community

	Through the UNESCO-ISARM programme, in support of the SADC Groundwater Management Programme, transboundary aquifers were identified in the region The Southern Africa Hydrogeological Map and Atlas project further expanded on this work (SADC, 2010). Over time, the local action level will fully unfold and will mirror every strategy theme presently required at the national / regional facilitation level and will convert strategies into actions. This is illustrated in the Strategy.		exploration drilling, characterisation of aquifer potential and pre-feasibility and feasibility studies. **GROUNDWATER NORMS AND STANDARDS** As a basis for integrated and cooperative management of groundwater resources, a clear and widely understood national groundwater policy which lays down norms and standards to guide regional and local groundwater management practices should be developed and systematically implemented. - Importance of having a Ground water strategy GROUNDWATER USE AUTHORIZATION This was seen as critical during the provincial consultation. Guidance provided here included: Water use authorization needs to be used as starting point for coordination of various resource management activities.	ownership is noted and remains prevalent throughout the policy. This is significance to the goals and purpose of the MAR-BGI project. - Emphasis on Nat Gov paying closer attention to aquifer spaces and ensuring the protection of said spaces **Table 4-1: Aquifer Systems in South Africa (after Parsons, 1995)** **Major Aquifers** 18 Primary aquifer systems along the coast. Rocks of the Table Mountain Group bordering the Cape coast - Notes the presence of Aquifer systems in the Cape however no mention of ones in the Cape Flats or previously disadvantaged spaces in Cape Town - This creates a significant gap and creates significance entry space for the MAR-BGI project to locate itself in. **Integrated Water Resource Management** Principle 2 of the fundamental principles underpinning the

			Develop and maintain approaches for proactive. protection of groundwater resources and aquifer-dependent ecosystems to secure a sustainable supply of water. for human survival and socio-economic development, while maintaining essential groundwater environmental services. In South Africa's situation of widespread and highly localised groundwater occurrence and use, it will be physically and economically impossible to protect all groundwater resources to the same degree. For effective and focused intervention, a differentiated protection approach is necessary, based on the vulnerability – and regional, as well as local importance – of aquifers. The special nature of groundwater must be recognised in implementing policy. Impacts	National Water Act, 1998 declares groundwater fully subject to national control and part of IWRM, which is the vision of the Act. - Aquifer system protection is under the protection of national legislature - This includes land and water integration with a multifunctional approach in ensuring economic, environmental, and social benefits for the stakeholders involved - Community engagement and protection from an interdisciplinary perspective is essential is achieving multifunctionality of said spaces - This creates signification correlations and overlaps with this policy and the MAR-BGI project with mirriong objectives and outcomes. **6.2 Groundwater governance** Appropriate governance is particularly important for groundwater, a very complex

			on groundwater are often long term and irreversible. The precautionary principle must therefore be strictly applied when making decisions about groundwater resources. **Water Resources Institutional Development** **-** Places emphasis on the importance of all 3 tiers of government, national, regional and local being in charge of protecting these recourses. District / Local Municipalities have started to appoint/contract hydrogeologists to manage water supplies from groundwater and shared aquifers. - Local municipal participation and legislative engagement	common pool (open access) resource. Determining who is implicated and who should be involved in conserving and protecting aquifers to maintain a set of groundwater uses is a key challenge for groundwater governance. Principles -This notes the departmental and legislative overlaps between nation, regional and local government. - While emphasis is placed on this being a priority of national government municipal and local legislature and departments are noted as significant in achieving these national goals. - Therefor creating overlap and correlation with MAR-BGI project. **It is clear that aquifers are natural assets. They form part of the ecological infrastructure of a country.** And the values of these assets theoretically appear on a country's natural resources balance sheet.

				- The policy recognises aquifers as a natural asset part of ecological infrastructure - This creates further correlation between the policy and MAR-BGI project which recognizes the project as an asset too. Therefor speaking to its significance and needed protection. **POLICY COORDINATION** In terms of the important principle of integrated land, water and environment management, policy coordination should be initiated at national level with the respective institutions to ultimately work through to all levels to align and harmonise such policies towards more sustainable groundwater utilisation. - Emphasis on legislative overlaps is essential noting the importance of having multiple systems in place to protect these spaces. **AQUIFER MANAGEMENT** Aquifer management, including drawing up water-sharing agreements, using

				conceptual and numerical models, monitoring, regular assessment, and adaptive management needs to be implemented by aquifer management committees in identified priority aquifers, based on appropriate guidelines and regulations. - Notes the importance of stakeholder engagement not just conceptualizing these spaces as state owned or only a priority of the state - Therefor noting the importance of multifunction of stakeholder engagement **PROTECTION OF GROUNDWATER SOURCES FOR DOMESTIC SUPPLY** Groundwater sources for domestic use should receive the highest protection priority with measures such as: • Minimum requirements regarding borehole construction. • Wellhead protection zoning. • Site-specific protection of the aquifer (recharge zones) itself, where necessary.

				• Certain aquifers/areas need to be classified as no-go areas. This is becoming critical in the light of possible hydraulic fracturing for shale gas exploration. - This notes the importance and therefor protection of said spaces like the MAR-BGI project - These spaces remain of significance even at the national level which brings importance to the role of the MAR-BGI project **CROSS-SECTOR COLLABORATION** Establish formal cross-sector collaboration to enhance sustainable utilization of the resource. -Importance of multifunctional spaces through inter-disciplinary stakeholder engagement remains a significant point of this policy. - This relates significantly to MAR-BGI which aims to promote and uphold these ideals . **Vulnerable Aquifers**

				Groundwater resources are commonly vulnerable to pollution, which may degrade their quality. - Protection from environmental decay and pollution - Therefor bringing significance to the importance of protecting environmental assets Artificial recharge is obviously an appropriate approach in situations where a lot of the natural recharge has already been captured by abstraction and natural discharge has been depleted, in particular in for situations where this discharge plays a critical role, e.g. preventing seawater ingress in coastal aquifers. - This policy thus places emphasis and importance on artificial rechargers like MARBGI project - Therefor noting it as a vulnerable aquifer thus protected by this legislature **CURRENT CHALLENGES** No special management/protection attention has been given to the

				country's most vulnerable aquifers, the dolomitic aquifer systems and the coastal aquifers. Serious degradation of these important resources has taken place. -Notes the depletion of aquifer systems throughout SA due to the lack of protection and attention given by previous legislature. - Thus noting the importance of protecting spaces and projects like MAR-BGI who capture these ideals. **STRATERGIES/ ACTIONS ALIGN GROUNDWATER FINANCE** In appropriate settings provide economic incentives to encourage groundwater conservation, in particular artificial recharge of aquifers. - Not only ensure environmental benefits but also promoting increased economic opportunity for communities. -Again, finding increased significance with the MAR-BGI project which aims to uphold these ideals.

				Characteristics of Groundwater Resources Aquifers are experiencing an increasing threat of pollution from urbanization, industrial development, agricultural activities and mining enterprises. Varying degrees of vulnerability to these impacts can be distinguished according to the depth of the water table, soil permeability and conditions at the land surface. - The threats to these spaces are not linear and thus a multifunction approach to aquifer systems like the MAR-BGI project has significance in realizing these national policy goals - Again, finding increased significance with the policy and the MAR-BGI project **GROUNDWATER USE INFORMATION** • Prioritise major and stressed aquifers. • Implement legal regulations regarding capturing of information on the NGA

				- Could be classified and defined by this policy as a major and stressed aquifer thus needs to be protected. **CURRENT CHALLENGES** Before 1994, South Africa had been in international isolation, because of Apartheid. The water sector has not yet fully responded to the opportunities offered by international collaboration. - This therefor notes the importance of protecting aquifer infrastructure more so in spaces that have previously been disadvantaged due to the Apartheid system. - MARBGI location therefor becomes of significance in this case **ROLL-OUT OF LOCAL ACTION** A key comment during the provincial consultations was that the strategy framework to achieve local actions appears very top-down. - The policy notes the importance of having a bottom-up approach as well. Which speaks to the

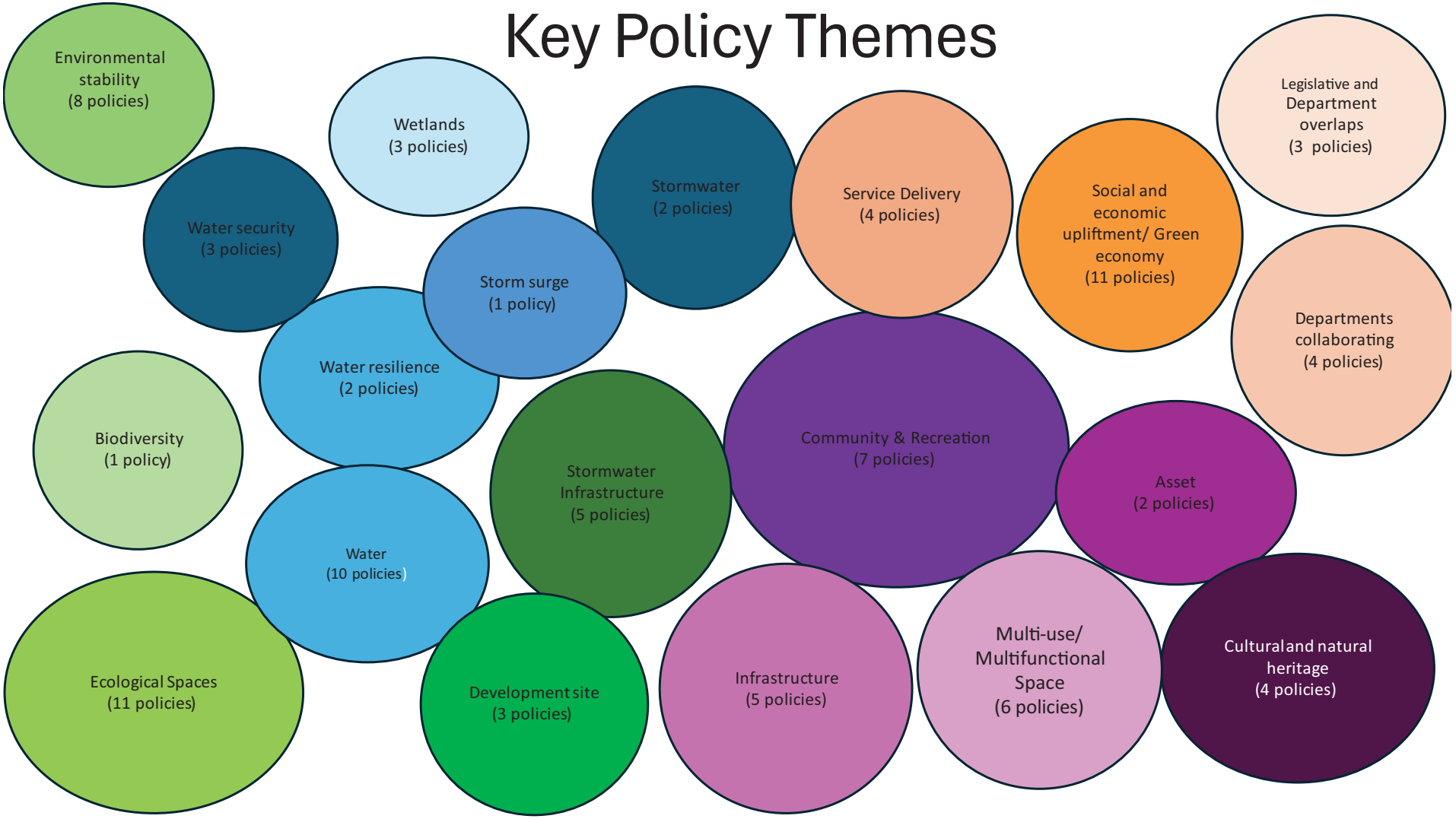
				importance of not only local policy that protects these recourses but ensuring they speak the same legislative language. - legislative overlaps **CATCHMENT MANAGEMENT AGENCIES** CMAs are the first line of IWRM roll-out in South Africa and need to play this role for groundwater too. • As a trigger for all local action, each CMA, as highest priority, needs to develop a groundwater management plan for its catchment with the full involvement of the relevant stakeholders. - Community and stakeholder engagement is to be protected in the process - Again, providing further significance and correlation between the policy and MAR-BGI project **AQUIFER MANAGEMENT** Aquifers are the resource unit for local action. - This recognizes the importance of the implementation of said structures at the local level

				that recognize and speak to uplifting local community water and environmental assets - Emphasis is placed on grassroots initiatives that aim to conceptualize this reality. This therefor has significance correlation and overlap with the MAR-BGI project. It will be critical to change perceptions about groundwater in the whole municipal sector. Buy-in in individual municipalities should be achieved through the training and empowering of the respective councillors. - Emphasis on stakeholder and community engagement in project which is an aim of the MSR BGI project Municipalities should be encouraged to make much more use of local NGOs in order to empower grassroots people (e.g. adopt a borehole approach). - Emphasis on stakeholder and community engagement in project which is an aim of the MAR-BGI project

				- This is also giving significance to the importance of community ownership and having multipurpose benefits which include environmental, economic and social benefits for the community. **ACTION BY MUNICIPALITIES** Local government is responsible for a sustainable water service provision, including from local groundwater resources. -Emphasis on COCT involvement As groundwater is quintessentially a local resource, much of the effort to apply the governance framework and ensure management in line with policy goals rests with local government bodies and decentralized agencies in close cooperation with local stakeholders. - Emphasis on the importance of policy over la and legislative collaboration at the local level to ensure more support is provided to MARBGI initiatives

				from a COCT and policy perspective. District / Local Municipalities have started to appoint/contract hydrogeologists to manage water supplies from groundwater and shared aquifers. - Local municipal participation and legislative engagement

APPENDIX B: POLICY THEMES



APPENDIX C: INTERVIEW QUESTIONS

1. **Ownership**

Who owns School Pond?
Who is responsible for the management of the pond?
What do you see your role as a resident of the area in relation to the pond? (do you want outsiders using your pond)?
Is there a sense of ownership from the community.
Who should manage the site – CoCT, residents etc.

2. **Perceived importance**

Do you experience the effects of flooding in winter?
Does/ will the pond help with this?

3. **Awareness – important for tomorrow**

Is awareness important in implementing these ponds?
is mural useful to illustrate why the pond is there?
what other ways can awareness be built? – a CoCT sign?
Is mural painting a good activity for building awareness?

4. **Current activities – aesthetic, soccer, dog walking**

What is pond currently used for?
What is your feeling towards the pond's usage currently?
Why is there a 'lack of activity'? – could this be improved with better seating, a garden, picnic benches, trees, outdoor gym, play equipment, short cut, pathway.
Do people acknowledge vs use pond?
Has site improved in anyway. Has your usage of the site changed in connection with this improvement?

5. **Challenges: illegal dumping and many others**

What challenges do you see in relation to the pond?
How should we solve them?
Should it be fenced?
Who is illegally dumping?
What would local residents like to see changed?

6. **Pond pilot project**

How do you feel about your pond being a pilot project, that others will learn from? – bearing in mind that not one size fits all – very context and community specific. What do community residents think about this – is it possible, will management differ?
How do you suggest this be implemented elsewhere? Is it possible, it is worth it?

7. **Research process – maybe.**

How do residents feel included in project, high expectations. Manage expectations.

APPENDIX D: LOCAL RESIDENT INTERVIEW SUMMARY

Future Water Interviews and Site Visits

Date	Notes
21/09/22	Mostly observations
15/10/22	One official interview
29/10/22	5 people were interviewed
26/11/22	Mural launch
22/03/23	Observations and recorded a conversation with longstanding community member
08/07/23	Planting day
30/08/23	Foot traffic was considered
02/09/23	Interviewed a longstanding community member

Notes from 30th August 2023 and 02 September 2023 Interviews

There was a considerable amount of foot traffic on Wednesday than on Saturday morning. The demographics of people passing by included mostly youths, and I saw a young boy playing with a dog on the site. We noticed that the pond is used as a pathway for those crossing over to the other side. I talked to an older man from Siqalo, a nearby place who wants work and is willing to work at the site. He also asked me what the team is planning to do with the garden and showed interest in working (paid work I assume). Another woman from Siqalo did not have time to be interviewed and another passerby from Samora who just passes by and says he is not connected to the space and does not want to speak for the space. He also noted that because it was winter, perhaps people did not use the pond as much due to the cold. Later on, I talked to Dylan who was born in the area and next to the site about changes taking place and he tells me that the site was filled with water in the past. He also saw that the team planted and did a mural, but he was not active in them. He just passes by back and forth.

Additionally on the 2nd, some responses from a longstanding member of the community were there after the planting and the benches, not much has happened. It has been relatively quiet except for the kids that play on the pond. They feel that the pond belongs to the community, but they are not involved as the community lacks interest, passion, and awareness. They feel that one way to increase awareness is to host an event, or maybe give away gifts or have entertainment to attract them or to be more involved on WhatsApp.
We walked around on the site, and we observed a growing number of tadpoles and frogs that filled the soundscape. There were signs of an active biodiversity.

Notes from 22/03/2023 (from voice recording)

Interview Responses 2023 30 /08/2023

1. Do you know anything about the pond:
- I know that it's a wetland and been here for years without houses being built on the land, so I assumed that it's not environmentally friendly.

2. Do you think the pond has significance for the community?
- Wetlands play a huge role in the community with absorbing and purifying the water. I learnt that in school but am not sure about this one.

3. What activities is the pond used for?
- I haven't seen any activities in and around the pond.
4. Do you think it provides social or cultural benefits for the community?
- No not that I know of I just know that it is here.
5. Do you have any safety concerns regarding the pond?
- Yes, whether it is safe for people to build on. People normally bring their kids to the pond so they come with their parents so there aren't any concerns regarding their safety. I don't know if it is safe for dogs though. I give it 7/10 for being safe.
6. Are you aware of the project UCT is doing around the pond.

- No, I would love to know. I would definitely be keen to partake I the space if you guys are doing anything around here. It's just been there since I've been here. I would love for it to become something better,

7. Has your perception of the pond changed in the years you've been staying here?

- No.

8. What would motivate you to be involved in the space?

- I don't know because there is already a park here so I don't know what you could do to perhaps make the space better. But I would be keen to participate depending on what it is.

9. Does the community have shared responsibility of the space?

- No and they don't take pride it in because it doesn't belong to anyone. Only the dogs come here and use it as a playground.

10. Do you think at initiative that could help women and children would be good for the community?

- Yes, I think it would be, I think what would be great is a section for the dogs to come and play to make it cleaner and safer for them cause it's their space originally.

11. Do you think the mural art makes the community more interested in the space?

- Yes, it makes it look beautiful. I read it every day but I never knew it was informative I thought it was just for aesthetics. If there would be more education around the pond and its importance, I would be more interested in participating.

12. What do you think you would want form this space for yourself?

- Not a public gym cause there's one here. Maybe somewhere I can take pictures with trees and flowers so I can come here and take pictures. I would come every day.

13. Have you seen any benefits since this space has been here since UCTs involvement?

- I noticed about a month ago they were doing something with planting here that was the first time I ever saw someone doing something with the pond. I think you should keep it up I would come and get involved if there is any future planting planned.

14. What other initiatives would you like to see in this space that would make you want to be more involved here?

- You can make a place where we can come and use the Wi-Fi. There are women in the community that make food like Koeksisters and people braai meat so perhaps to have a day where they can sell their things here that would be great for them and the community as well.

15. Do you know of any barriers that could exist?

No, I think the community will enjoy people interacting with the space more like the lady only sells on Sundays, but she'll now want to sell koeksisters everyday which helps her a lot so yes, I think that would be great for the community.

Interview Questions for Local Community Members from 2022 responses.

1. Ownership:

There seems to be a consensus from residents that maintenance is the responsibility of the CoCT and not with residents. Residents note that maintenance is often lacking from the CoCT.

1. From speaking to residents at mural painting, launch and site visits, there seems to be an affinity to the school pond, and desire to see the area improved for all users (children, pets, property prices, having something nice to look at). Mural events were always accompanied by a happy atmosphere. However, some residents understand the community should be responsible in maintaining the pond and some showed willingness to co-operate and help with the cleaning, especially those that live in front of the pond feel that they must take care of their surroundings.

2. Perceived importance:

A few residents noted that previously the pond became flooded, and this had decreased following the implementation of the retention pond. Despite this, some residents were unaware of the purpose of the pond. Improved signage and events such as the mural launch should improve awareness. There did not appear to be a connection between building resilience against flooding and the pond's function.

3. Awareness:

Nearly all the residents we spoke to like the mural. Residents enjoyed the process of watching the mural develop over time, as well as participating in the process. Mural painting and the launch provided opportunities to speak to residents about the purpose of the mural. The mural provided an excellent launch

pad to building awareness. Our team was able to refer to the mural as an easy gateway into speaking about the pond.

4. Current activities – aesthetic, soccer, dog walking

The pond is currently used as a thoroughfare, dog park, playground and for soccer matches. Residents felt the area could be improved, through better maintenance, seating, a garden, and a playground. Residents desired to see the area improved. They did note that the area's usage potential has improved since the pond's retrofit.

5. Challenges: illegal dumping and many others
   - One resident was opposed to adding seating to the pond, as it would attract outsiders who would use the area for drug use, dumping and criminal activity.
   - The long grass on the pond obscures vision of the pond, making it unsafe for children to play by themselves. Residents were glad the pond did not have any trees or infrastructure that obstructs vision across the area.
   - Dumping. Despite the implementation of the pond, dumping is still problematic. Several rubbish bags filled with litter are collected at each event at the pond. Residents maintain these are from outsiders, hence hesitancy towards improving the pond to the point of attracting outsiders.
   - Sustainability of the project. Residents noted that the PaWS project was a major driver in improving the pond. Given the existing problem of dumping which is often only collected in conjunction with the PaWS team, the future of the project without the PaWS team may be questionable. There needs to be a continued team of residents from the area who are willing to mobilize to the community to consistently maintain the area.
   - No residents mentioned the pond should be fenced.
   - Residents desired to see the pond become aesthetically pleasing and well used, as this would improve property prices.

6. Pond pilot project

Residents were happy for the pond project to be a pilot project for others to learn from. They did note that lessons learnt from this area would differ in different locations and communities. They suggested improving signage in future projects.

When I think of the residents at Rondevlei, I am amazed at their hospitality and willingness to share their space with outsiders such as the PaWS and MAR-BGI Team. Residents who participated in the mural events seemed so invested in the pond for their neighbourhood. I also felt safe in the neighbourhood. Residents mentioned this was a safe area, and the circular set up of the pond allowed everyone to see out and keep an eye out on any suspicious activity.

This project aligns well with existing literature and CoCT policy. What stands out to me from the Cape Town Resilience Strategy is the emphasis on improving resident education and encouraging participation and co-ownership of projects and the power of the collective effort of stakeholders towards a common goal, such as in the 2015-18 drought. I believe this project embodies much of this collective stakeholder power and participation from stakeholders.

1) Amenities Interviews Summary

The Paws team arranged some questions to ask residents about amenities at the site. Below is the summary of the 6 interviews:

Themes for the amenities interview at the pond in Mitchell's Plain

1. Knowledge of what a stormwater pond is.

-3 yes responses, 3 no responses

-There was an average general knowledge of a stormwater pond as a function to collect rainwater to prevent flooding and general knowledge of the pond in Mitchell's Plain

2. Memories of the pond

-There were a lot of bushes in the area and fewer houses

-Some residents used to quad bike, ride bikes around the bush area

-Lots of birds used to come, migratory birds, frogs
-People used to bring dogs there
-Some residents remember playing around the field when they were younger
-Memories associated with the neighbourhood watch being formed and the pond used as a site to watch (then and now)
-Memories for one of the residents is recently as a labourer on the retrofitting project, working on the sandbags along the pond
-There was a lot of water

3. Use of space currently and interaction with the pond
-Few people come in the mornings and evenings with their dogs
-Sand dumping incident
-Some children play on the flat area, soccer on the flat side
-Use of bin in the pond area, currently being used by people that walk by to dispose of litter, bin causes people to dump.
-Not a lot of activity in the area
-Walk through the pond to go to the shops, as a shortcut etc
-Space for the kids, the birds, and the fish
-One resident who lives closer uses it as space to look at when he's outside

4. Future imagination of space
-Lots of greenery, nature, trees
-Benches and ducks
-Close it up and have a gate to ensure safety and cleanliness
-" More trees to make it proper for the people".
-A park to keep children busy
-Flowers
-Take a walk and eat there on Sundays
-Birdwatching
-The space should be made beautiful to look at

5. Appearance of pond currently
-High weeds and tall grass that sometimes prevents children from playing
-Dumping happens sometimes, generally considered a somewhat clean space
-Community monitors dumping because they do not want their property values to go Down

6. Other visitors
-Residents prefer if there were no outside visitors
-People are generally from Mitchell's Plain, faces are familiar
-They also say that if more people will come if there are more trees

7. Safety
-Generally perceived as a safe space, nothing major has happened
-Deemed safe by residents, solid neighbourhood watch in the area
-Quiet area

8. Value to community
-Pond has potential to increase the value of the properties nearby
-Asset to the community as a green space
-Note, when people talk about value added, it is mostly through a potential lens, or once there is a change in implementation, for example a green park, benches or recreational.

areas are included, then the pond will have a stronger added value.
-One resident mentioned that the pond has value as it prevents clogging up of water, and prevents flooding and water going in one direction. This allows for the children to have some space to play as flooding is prevented.

9. Responsibility, maintenance, who should have a say
-Residents should have a majority of the say in what happens to the space
-Currently the community monitors the space so that there is minimum dumping
-City of Cape Town comes occasionally to clean and have meetings, but cleaning is infrequent. CoCT is also inconsistent with cutting of weeds.
-There is a general willingness from the community (respondents) to help with improvements, for example a willingness to clean up litter.
-Proximity to the pond allows for a sense of responsibility to some of the residents. They even thought of planting their own plants and cleaning up.
-Managing conflict of use by confronting neighbours that dump on the other side of the pond. Dumping is currently sorted out by the community.
-Preparedness to water plants from a respondent if a pipe is installed.
-Community is vital. There were plants that were planted before, but they did not survive. as they were not being watered since the community was not involved. Therefore, community is vital in keeping the pond alive to avoid repeating past failed projects.
-People around the pond should be involved since they live there.
-Consistency in maintenance is vital to the look and liveliness of the space.

2) Previous Questions

Themes and new questions for the community:

Water Resilience & Water Security:

- What does water security mean to you?
- Do you think the pond has specific importance for the community and local efforts around water safety and security?
- How do you think this community contributes to water resilience and security? What are some of the things you can do to contribute to water security?
- Do you experience the effects of flooding in winter?
- What are you doing to protect water resources? What does the community do to protect these resources?
- Do you know about the pond? Provide details...

Community and recreation:

- What activities do you use this pond for?
- Do you think the pond provides you with any social and/ or cultural benefits within the community?
- Do they provide access to the space by making sure it is safe and the space is functional?

Service Delivery Infrastructure / CoCT (City of Cape Town) Interventions/ Stakeholder engagement:

- Has CoCT done anything in this space from what you have seen?
- Are you aware of any efforts in place by the CoCT to ensure water safety and accessibility to space?
- In your opinion does CoCT partake in (ecologically) protecting the space and ensuring that it is functional?

Multifunctional Space:

- Are you aware of the MAR (Managed Aquifer Recharge) BGI (Blue Green Infrastructure) project and UCT (University of Cape Town) initiative?
- Are you aware of the (Future Water/UCT) community engagement activities that have taken place at the pond (mural, planting day)?
- Have you been approached (by UCT) to assist or partake in the activities within the space?
- What is your perception of a multifunctional space around the pond? (Has anything going on at the pond with the research project changed your engagement with the space or perception of the space?
- Do you think this initiative would better your engagement with the space?
- Would you partake in any activities around the space that have social or economic benefits for you? (What would motivate you to participate and be active in the pond)
- Who is responsible for managing the pond?
- What do you see as your role as a resident of the area in relation to the pond? (Do you want outsiders using your pond)?
- Is there a sense of responsibility to protect the space from the community.
- Who should manage the site? (CoCT, local residents etc)
- Would you want to be part of the process to help with how these implemented initiatives can be maintained and/or amplified in space?
- Has the community been approached by either the CoCT or the UCT Team about becoming custodians of the space and pond once the project has ended?
- Do you think this intervention will benefit previously disadvantaged groups for social and economic upliftment of the space, for example, women and disadvantaged youth?
- What barriers and challenges have you encountered with the implementation of the project?
- Are you aware of the benefits of the interventions that have been made in the pond?

Feedback:

- What other ways can awareness be built? For example, a CoCT sign?
- What did you think about the mural activity, planting days and environmental awareness? Were you informed of that? What do you think is the best way to keep people engaged when activities are planned?
- Decision making process and awareness— how would you have liked to be informed about the changes taking place in the pond?
- Is mural painting a good activity for building awareness, is the mural useful to illustrate why the pond is there?
- What are your needs regarding this project?
- What other partnerships/initiatives would you like to see around the pond?

Challenges

- What challenges have you experienced in relation to the pond?
- How would you solve them?

APPENDIX E: INFORMED CONSENT FORM

Implementation guideline for managed aquifer recharge (MAR) in combination with blue-green infrastructure (BGI) at local settlement level

Informed Voluntary Consent to Participate in a Research Study

Research team: A/Prof. Kirsty Carden, Dr Amber Abrams, Dr Sithabile Hlahla, Kea Mosienyane, Jake Cloete, Lauren Grootboom

You are invited to participate as an interested and affected person in a research study by the University of Cape Town. The ultimate aim of this study is to develop an implementation guideline linking MAR and BGI approaches to, and interventions for, stormwater ponds at local settlement level. The study is focussed on an existing stormwater pond in Mitchell's Plain that has been retrofitted and designed in collaboration with local residents and City of Cape Town officials to become a multifunctional blue-green asset. This study aims to find out what the key implementation lessons are when the existing stormwater pond was repurposed to BGI with multiple functions to achieve water resilient South African cities.

Procedures
Your participation will involve being interviewed by one of the researchers of this project. Participation in this research is completely voluntary and you can stop the interview process at any time. By signing this consent form, you give the researcher permission to record the interview.

Risks
There are no potentially harmful risks related to your participation in this study.

Disclaimer/Withdrawal
Your participation is completely voluntary; you may refuse to participate, and you may withdraw at any time without having to state a reason and without any prejudice or penalty against you. Should you choose to withdraw, the researcher commits not to use any of the information you have provided without your signed consent. Note that the researcher may also withdraw you from the study at any time.

Confidentiality
All information collected in this study will be kept private in that you will not be identified by name.

What signing this form means
By signing this consent form, you agree to participate in this research study. The aim, procedures to be used, as well as the potential risks and benefits of your participation have been explained verbally to you in detail, using this form. Refusal to participate in or withdrawal from this study at any time will have no effect on you in any way. You are free to contact Sithabile Hlahla (hlhsit002@myuct.ac.za), to ask questions or request further information, at any time during this research.

I agree to participate in this research (please circle)	Yes No	
Participant Name	Signature	Date:
Researcher name	Signature	Date:

APPENDIX F: QUESTIONS FOR SENSEMAKING WORKSHOP WITH PaWS1 AND PaWS2 PROJECT TEAM (05 MAY 2023)

The MAR-BGI application builds on a current Danida- funded 'Pathways to water resilient South African cities (PaWS1)' project (DFC 18-M05-KU) which is due for completion in mid-2023. The PaWS1 project has used physical experimentation aimed at exploring prospects for adding a water supply function (through stormwater harvesting linked to managed aquifer recharge and recovery) to flood attenuation ponds in Cape Town, whilst unpacking related local level and city level governance aspects required to facilitate such water sensitive transitions.

1. What are your project goals for PAWS (incl. PaWS 1 and 2).
2. Have your project goals for PAWS1 been met?
    a. How have your goals changed from PAWS 1 to PAWS2?
    b. What lessons did you learn that you carried into your proposal for PAWS2?
3. Our understanding of your project is that you retrofitted the stormwater pond in Mitchells Plain. Why did choose this specific intervention? Did you explore other options?
4. Why did you choose Mitchells Plain (most important considerations) and why this area in this space?
    a. Can you describe the area before you implemented any interventions (i.e. the retrofit)?
5. After the completion of the PaWS 2 project, do you have any plans in place to monitor the space?
6. What is the level of city government involvement in the project?
    a. Do local policies address such multi-functional spaces and what impacts are these local-level policies having on the development of such multi-functional spaces?
7. Are there any other stakeholders involved in the project? If yes, who?
8. What are the perceived benefits of the intervention to the residents?
9. Have the residents been actively involved in the project?
    a. How did you initiate contact with the residents? Or what was your buy-in into the community?
    b. How have you incentivized the community's involvement in the project? (some have stated that they do not know anything about the pond)
    c. What forms of community engagement have taken place so far?
        i. Have they been successful?
        ii. If they have not been successful, why do you think this is the case?
    d. Has their level of participation changed over the duration of the project? Are they still interested?
    e. Do you think the local residents will continue to be involved in managing the space after you stop working there?
10. Have you considered the social and cultural capital within the community and how these can be maintained and/or amplified in the space?
11. How does the PaWS team conceptualize ownership of the pond and who did you ask for permission to make changes to the pond?
    a. Have you engaged with the community so that they can be custodians of the space instead of the city?
12. How can the intervention benefit previously disadvantaged groups for their social and economic upliftment from the space, for example, women and disadvantaged youth?
13. What barriers and challenges have you encountered with implementation and the involvement of the residents?
14. What opportunities exist for the multifunctionality of ponds? Or for repurposing the pond?
15. Do you think your intervention can be implemented in other areas or upscaled?
    a. What changes would you make to implement the project in other areas?
16. Knowing what you know now, what would you have done differently, and can you still make these changes?

APPENDIX G: RESPONSES TO QUESTIONS ASKED AT SENSEMAKING WORKSHOP WITH PAWS1 AND PAWS2

Questions	Responses
What were the goals of PaWS project	• Water security during the 2015-2018 drought drove the intent behind the project. Finding ways to make cities more resilient, that is transitioning cities to be more water resilient in the future through stormwater infrastructure. Experimentation has been a big aspect of this project. • There was a missing opportunity where city of CPT has about 800 stormwater ponds which are mostly diarulect , only to reduce massive flooding and they do nothing else and they are sitting on a highly potentially effective aquifer, and the team was interested to see possibilities to do some sort of managed aquifer recharge in Cape Town. (Incentive then caused negotiations to organise funding for the proposal) •
Site selection - How did they identify the site?	• Wanted ponds that were situated over the Cape Flats Aquifer due to importance of MAR. • Wanted it to be in a less affluent area. At the same time, safety and security is a big issue. • Once we got permissions, CoCT groundwater consultants identified some ponds that they trusted us with. • The ponds had to meet specific criteria (could not be too close to their monitoring wells, too close to injection wells) and we then got a list that fell into 2 areas. • We looked at the ponds in the southern region and they were all swamps. Eastern region: ponds were rated and then 2 ideal ponds were identified (current and another site). • The school one was more promising because of the school as it was seen as an access point.
Who did they get in touch with?	• Contacted the school by calling and introducing the project. Then from there, a first workshop was arranged where the principal managed to invite other members of the community. The site is very specific in that it is next to a school. So that was the initial contact. • Access is not complete access, you negotiate it every time you go there, you always build it. There is no one entry point

	that becomes the sole entry point into the whole area. You must try and work on building relations each time
Who were the stakeholders?	• The CoCT (Parks and Recreation, Stormwater) • Homeowners' association • The school • Fybnbos The NGO (Plantropologist) / Consulting role for COCT • UCT MAR-BGI Project • Community / Local Residence • Potentially (Local business) • Umvoto ? (Consultants on Aquifer research) • Different residence groups, Community watch • General neighbourhood group • Mosque attendees at the school • People who walk through or drew things from the space. • Drop ff for contraband. • Artist group from the neighbourhood • Caitlynn (Fynbos Life)
What was their buy-in into the community	• In 2019 we looked at doing workshops in the space seeing who walks through it and set up space to community buy in • We created the Community Pond Group on WhatsApp for those who have a say who want to be involved in the pond. • The process was largely word of mouth with workshops around asking people what they want to know about it. Followed by a series of workshops • Covid was a barrier in bringing people together and to avoid a spread the project stalled for a year. July 2021 means more public events and harvesting workshops to see the sustainable space • There were stepwise efforts to get buy in • We also asked for requested and people who have specific objections to give them a space to voice any form of resistance. • After Covid there was some resistance on us bring external crews to bring about these interventions • It has been very place spaced on who is there and want to buy in
Community engagement with intervention?	• Addressing the school as a social meeting pint • Respecting the religious aspects and rights of the school through negotiation • We draw on the local capacity of the community to draw n what needs to be done within the site. • For mobilisation we use those social networks to find caterers, manual labour, people willing to move equipment around. • We use local resources as far as possible. Recognising we need to pay for services without drawing on capital without paying.

	• We want to use/ maintain the social capital within the community to sustain the project • We decided to employ local residence for the construction crew. Three women were saying the woman and the youth need to be prioritised with the construction and facilitation of this space. • The focus was on youth and women in the construction process so there were a lot of job opportunities created around the space
Barriers and challenges encountered with implementation and community involvement, as well as opportunities	• Balancing the very loud voices with the ones we don't get to hear that often • We are missing the people who don't pitch up , we haven't expanded in the neighbourhood around to ask questions • Often speaking to individuals was difficult as there were a lot of different people (EG 2 Mr Zane's) • Feedback sometimes getting mixed with certain voices and opinions not coming through. • It is often also a strategy for people to not get involved because they don't want to engage with the dynamics at play as there are many. • The moles (Running the space) • The people were concerned with who were the people implementing in the space • There were racial barriers and backlog, people see some as a particular body who is not allowed to have access to the space. • The social , governance and financial challenges are things that actually make or break the project.
Future plans to retrofit other ponds	• We want to ensure the community is engaged and have ownership after the project. The budget is based on the time however we are struggling to know how the CoCT might take over after t have buy in that can facilitate the economic sustainability of the space • The next few years would be to do this • There wont be on particular space, it is costly and takes time so we will have interventions in different spaces for those specific community needs • To best case example to the CoCT to find the best way to scale the project • There is a keen interest to scale up but the budget currently done not allow on this project. • The CoCT needs to take ownership of the space as it if their space and they need to facilitate that.

	• Possible co creation with the COCT. Once the job is done properly from our side we essentially become redundant.

Thematic Analysis of the Paws Team Responses:

1. Goals and Objectives

- Water resilient cities
- Reduce massive flooding
- Managed aquifer recharge in Cape Town
-

2. Site Selection
- Cape Flats Aquifier
- Less affluent areas
- Southern and Eastern region
- School as an access point

3. Community engagement
- School
- Community based workshops
- No sole entry point
- Building community relations

4. Stakeholder engagement
- Government
- Community
- University
- Consultation Groups

5. Community Buy-In
- Workshops
- WhatsApp Community Group
- Internal sourcing or resources
- School as community meeting point
- Mobilisation social networks
- Local employment
- Youth and Women community engagement

6. Barriers and Challenges
- Silenced voices
- Limited physical engagement
- Community social dynamics
- Racial barriers
- Social, governance and funding

7. Future Plans
- Community ownership
- Economic sustainability

- Community needs based
- Co creation with CoCT

APPENDIX H: INVITATION TO A WORKSHOP TO DISCUSS GUIDELINES FOR LOCAL SETTLEMENT LEVEL MANAGED AQUIFER RECHARGE (MAR) IN COMBINATION WITH BLUE-GREEN INFRASTRUCTURE

RE: **Invitation to a Workshop to discuss Guidelines for local settlement level managed aquifer recharge (MAR) in combination with blue-green infrastructure**

The Future Water Institute is currently working on a Water Research Commission Project, '***Implementation Guideline for Managed Aquifer Recharge (MAR) in combination with Blue-Green Infrastructure (BGI) at Local Settlement Level'***. One of the objectives of the project is to develop guidelines for the local-level stewardship of stormwater infrastructure that has been retrofitted for multiple uses. The project is currently in its final reporting phase, and due for completion in June this year. The project team has developed a draft Implementation Guideline document based on experience gleaned from a stormwater pond retrofit project undertaken as part of the 'Pathways to Water Resilient South African Cities (PaWS)' project in Mitchells Plain, Cape Town. The Guideline currently comprises six sections (see below for an outline of the different guideline sections) and we would like to workshop these with relevant stakeholders:

Guideline 1 outlines relevant policy and legislation.

Guideline 2 addresses the need for an initial scoping process before pursuing a project. This process includes identifying local stakeholders, some basic understanding of technical needs, and the importance of scoping the local context before confirming site locations and beginning any coalition building process.

Guideline 3 addresses critical pinch points for consideration by experts involved in processes of implementing BGI in the context of MAR.

Guideline 4 provides practical guidance and key considerations for the development of a coalition around the proposed implementation aim.

Guideline 5 outlines key considerations in building the engagement process and planning efforts.

Guideline 6 provides resources and tools in establishing mechanisms for sustainability of the project, from governance to management planning.

In particular, we would like to understand how blue-green infrastructure projects are being implemented; what has worked; what could be/have been done better; how the process of building coalitions with the relevant residents / community and the City unfolded; and how to ensure the sustainability and scalability of such projects at local level.

The workshop will be held, in-person, on **Thursday 04 April**, at **UCT in the Snape 4A venue in the Snape Building on upper campus**, from 9am to 12pm, followed by a light lunch. We very much hope that you are able to participate and share your experiences. Please let us know by **Thursday 28 March** whether you are interested in attending; an outline agenda will follow shortly.

APPENDIX I: AGENDA FOR FINAL WORKSHOP

FUTURE WATER WORKSHOP: IMPLEMENTATION GUIDELINE FOR MANAGED AQUIFER RECHARGE (MAR) IN COMBINATION WITH BLUE-GREEN INFRASTRUCTURE (BGI) AT LOCAL SETTLEMENT LEVEL'

Date: 04 April 2024
Venue: Snape 4A venue in the Snape Building on upper campus, UCT
Time: 09:00-12:00

AGENDA

AIM	A workshop to explore how blue-green infrastructure projects are being implemented and managed locally.	
PROGRAMME	09.00-09.15	Welcome and Introduction to PaWS and MAR-BGI Projects
	09.15-10.00	Introductions from participants and brief overview of their respective projects (**Motivation, Process**) - Ezemvelo - Liesbeek - Mosselbank
	10.00-10.20	Brief overview of MAR-BGI Guidelines 1-6
	10.20-10.30	Tea break
	10.30-12.00	Discussion • What has worked for the participants' projects? What were the key considerations? (**Mapping**) • What could have been done better? • Who in the City would project implementors connect with? (**Map key contacts at city, province level, local NGOs, CBOs, community, and neighbourhood leadership**). (Provide possible contacts) • What barriers and facilitators have the projects encountered? • Were coalitions formed? If yes, how were coalitions built with relevant residents/communities and the City? • Are there any city mechanisms to support such collaboration? (**Both city and implementors**) • What plans are in place to ensure sustainability of the projects? • Are there city mechanisms to support project sustainability? • How does this track into the emerging BGI Master Plan? And the water sensitive transition (urban liveable waterways programs)? What does the Master Plan understand of these locally driven efforts? What space/support is made for them? • Are there plans to scale up the projects at the local level? Are there City support mechanisms to assist with scale up? Does this link to the BGI Master Plan? And water sensitive cities.
	12.00-13.00	Lunch

APPENDIX J: OVERVIEW OF PROJECTS PRESENTED AT APRIL 2024 WORKSHOP

Ezemvelo and agri-wise services– Browns Farm
Thanduxolo Xokoza

- Ezemvelo is a project based in Browns Farm, Phillipi Cape Town. One of their main focus areas is the detention pond at Intsebenziswano Secondary School where they are also using a part of the school property for urban agriculture. Thando mentioned that there does not appear to be an outlet at this pond (**ACTION** – check drawings and/or whether this pond is on Jessica's database). The detention pond has been fenced (by the City on request from the school – largely for safety reasons) – but this has meant that it no longer is maintained or cleaned by the City (**ACTION** – Is there any way that FW could follow this up with the City?)
- Some of the facilitators within the project include teaching the community about the importance of the pond where the project is located. They have a vision for the pond, which includes dividing it into sections for different uses, building a perimeter walking / running track, using it for educational (biodiversity etc.) purposes, etc.
- Approaching the business owners who have a vested interest in the environment from an economic perspective creates more facilitators and engagement with the project.
- The PEP (Presidential Employment Program) also provided great insight and helps provide labour while bringing the community into the project (food gardening, recycling / upcycling etc.). This was done as part of the Philippi Economic Development Initiative (PEDI) - https://www.pedi.org.za/
- The ward councillors are politically driven and not environmentally conscious, however once you enter through a business-related context they tend to engage or find interests in the project.
- While the ward councillors remain resistant to being environmentally conscious politics continue to interfere with the needs of the environment. For example, Thando is a member of the ward committee, and runs environmental actions through his contracting business.
- The fencing around the ponds creates a significant barrier when it comes to cleaning up the community however are eager to help with the clean-up process. At the Siyahlahla pond in the nearby informal settlement, local residents were involved in cleaning activities – mainly on a voluntary basis (food parcels were distributed) over a 6 week period.

Interactive Mapping session – Thando Ezemvelo

Stakeholder Engagement Mapping session

Friends of the Liesbeek
Jesslena Suri & Nick Fordyce

- Friends of the Lisbeek is one of the oldest friends' groups in Cape Town, currently being 33 years old. Nick mentioned that FoL benefitted from having people like Kevin Winter as part of the committee over this time.
- The motto of the project is located in thinking globally but acting locally as a community-based strategy.
- The site choice was chosen strategically with a berm along the banks of the river to prevent from flooding during the rainy season. This helps with the aim of reconnecting the grass plein with the river by connecting the floodplain to the river.
- The plant selection for the plants that were placed in the site include plants that are on the red list, plants that are indigenous to the space as well as some colonized plants. A comprehensive plant list has been established (50+ species). Report on the process is currently being written. Useful site in this regard is PlantsZAfrica - https://pza.sanbi.org/
- Planting of the rehabilitated wetland was started in May 2022, and took place over several planting days. While some plants have not been able to grow past the initial planting the ones that have grown and adjusted to the environment will be planted in the site on a continuous basis. Lessons learnt have included not planting too many different species; allows for easier maintenance. Key objective is to keep kikuyu out.
- The City of Cape Town has been an engaged stakeholder throughout the project in various capacities. While they have provided no financial support for project implementation, they have supported in providing excavation and scrappers as infrastructure support.
- The CoCT has also been present with the support of a ward councillor as well as for civic engagement with aid of the community to create a multifunctional space. Thinking about putting in soccer posts adjacent to the site – bringing people into the space allows for increased local involvement. Also considering park Run options.
- The legislation utilised includes the City by Law on Stormwater Management and the Urban Watercourse Guideline which drives civic organisational change, as well ast he Roads Department for providing departmental support.
- No water use license was applied for in the case of the wetland upgrade, as existing 'authorisations' were still valid (through agreed maintenance and management plans, MMPs). This should be checked in other areas though.
- Some of the barriers around the project include flooding of the river after planting, the algae from the river after flooding and the eminent need for funding to ensure the long-term maintenance of the space (how to bring money into the project for ongoing maintenance wages).
- Some of the facilitators encountered include the help from the CoCT (no direct funding support) with transportation, the provision of 2000 nursery plants as well as the communal based planting days which gains significant traction around Mandela Day.
- The ecological benefits of the increased rainfall have filled the pond with clearer water and the survival of certain species after the rainfall has led to the development of a more comprehensive species list and the CoCT's encouragement of planting more of these species in the space.
- The sponsorships for the project have included relying on personal relationships and while dealing with the constant fluctuations in funding. The project has also relied on corporate sponsorships which have to remain open to changes in the initial layout.
- Some of the partnerships include the COCT for the registration of the NPO and assistance with grant availability from the grant and aid ward as they don't allocate funding to NPOs anymore.
- Some of the barriers encountered with the COCT exist with the Catchment manager as they do not talk to each other, and their boundaries often don't cross water catchments. While there are significant silos that exists with the legislature as well as within the departments themselves, the Water Use License needed by the CoCT and the legislation being spatially divided.
- Important to have a well-articulated concept for your space, an initial proposal, and a draft budget.

- May need a MoU with the City and/or other partners.

Interactive Recourse Requirement mapping session

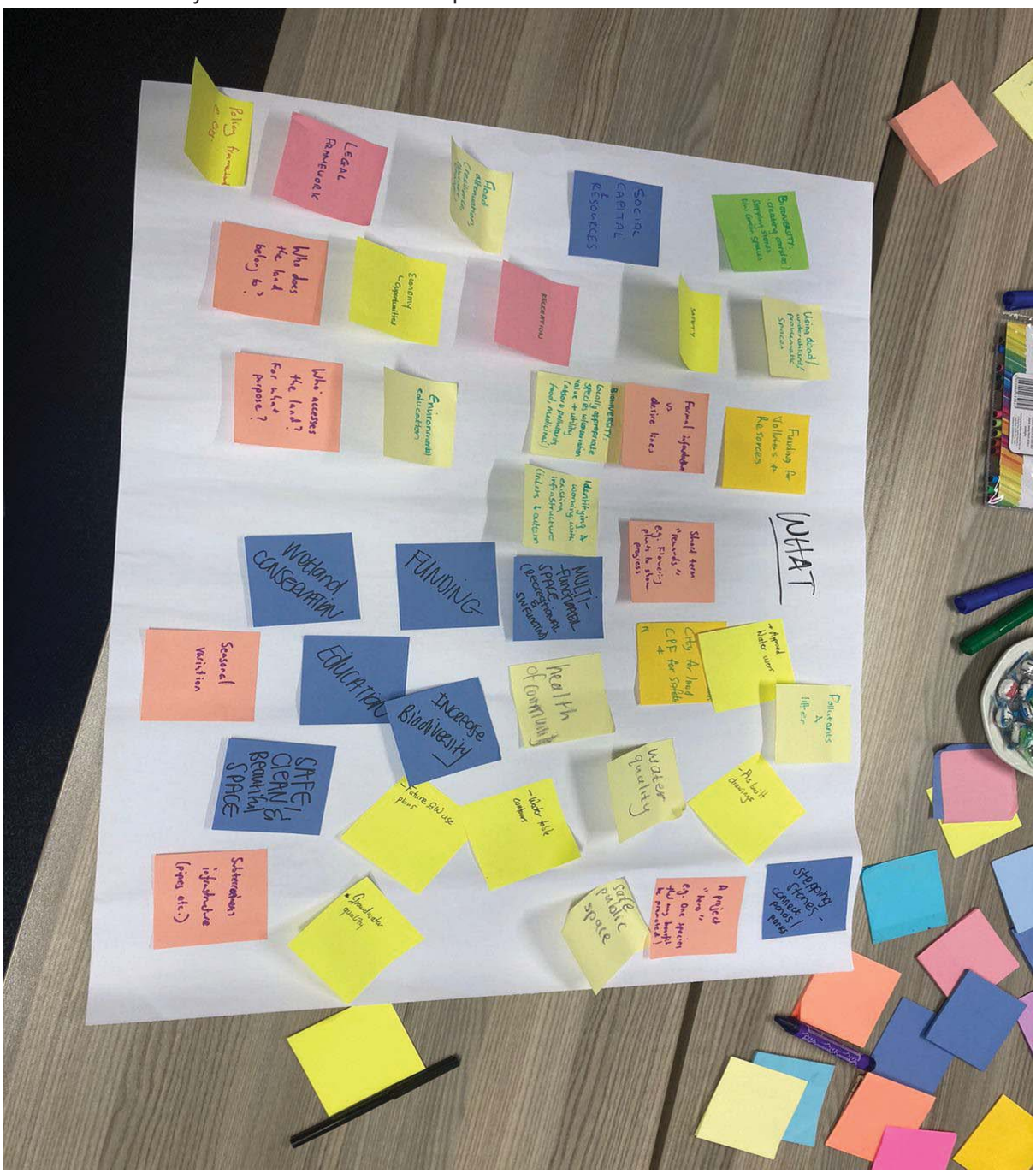
Resourse requirement and Stakeholder engagement session (Friends of the Liesbeek, Ezemvelo, Mosselbank Projects, Mosselbank River Conservation Team)

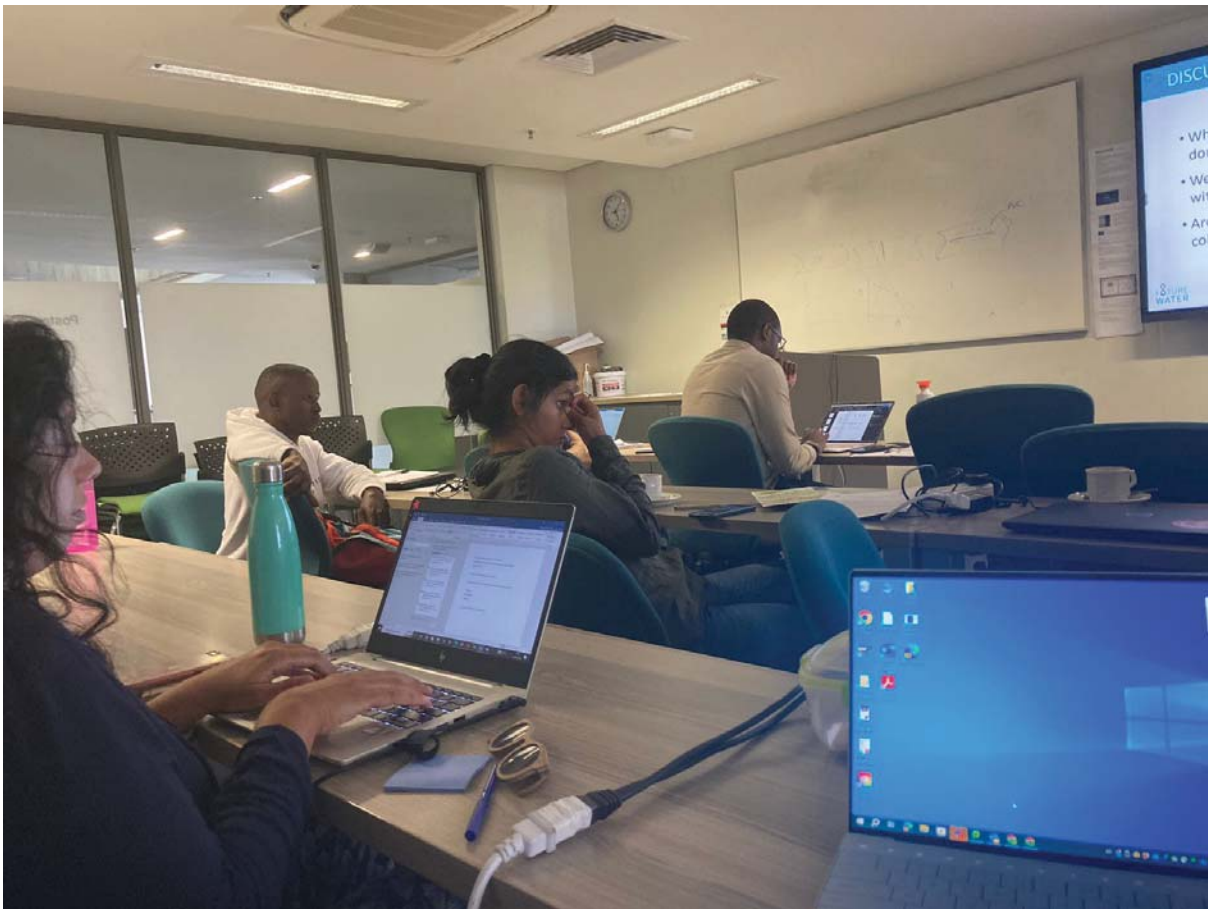
Danielle Cronje

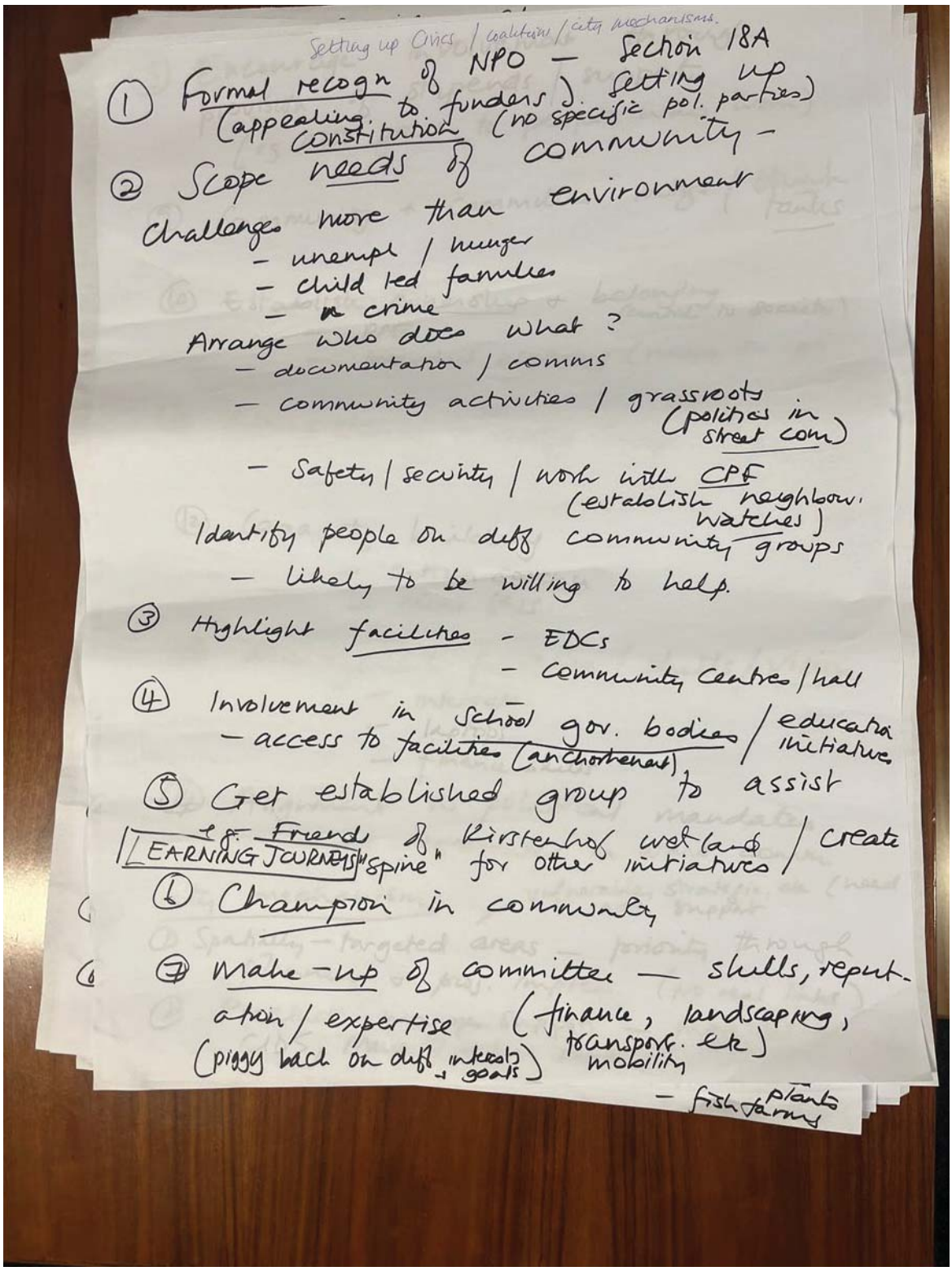
- The Mosselbank River Conservation Team is a community low-cost / mixed use housing project located in the Greenville Area within the Durbanville Community. The project was established in 2016, the conservation team in 2017 with the project officially being registered in 2021.
- The environmental authorisation for the housing scheme included rehabilitation of the river as well as an environmental education programme. The MRCT want to set up a long-term programme together with the City. Appointed VULA Environmental to do the initial work and implement the conservation plan.
- This included creating low valley wetland areas, erosion control measures, planting, seeding, weeding, alien clearing and conservation projects.
- Departments involved – Parks and Rec, Stormwater Management, Biodiversity / Environmental Management – all have different philosophies about landscaping (and maintenance).
- The project currently has no corporate funding and actively engages both the community at large as well as local farmers within the area for project support.
- Some of the barriers around the project include fires, vandalism, theft, drug use as well as copper extraction which affects the project directly. Some of the external issues which include the ongoing housing crises as well as illegal dumping also contribute as significant barriers to the project which relates directly for the need for increased environmental education within the community.
- While the site is strategically significant for the project there remains a need for alien plant clearing, excavation, erosion control, more planting, seeding and weeding as it remains a sensitive conservation site.
- Some of the barriers encountered with the CoCT include the silos that exists within the departments as well as the legislature. In order for the projects to get departmental approval they need to be as low maintenance as possible as with this project the City couldn't find where the projects sit departmentally therefor making the handover process last 5 years to handover to the City.
- Some of the project barriers include flooding of the pond which dispersed further into the wetlands, the fencing around the pound, and incidents of drowning which require different methods of landscaping. The pond is also significantly overgrown with alien plants and the cattle grazing which results in the loss of a lot of the vegetation around the pond.
- Some of the facilitators that have aided the project include community engagement which has largely been on a volunteering basis and is largely women led (local team lead by Elizabeth Maans started in 2016). The volunteers assist with clean up around the pond, provide labour, facilitate community soup kitchens, and assist as part of the maintenance team as the project relies significantly on the knowledge that exists within the team.
- Funding proposal through CTEET / Nature Connect for PPE and branded clothing – gave the group a sense of ownership and purpose. Registered as NPO in 2021 – from 5 people to around 21 people at present (all volunteers).
- The is filled with very diverse wildlife, animals, and ecology. Some of the educational activities around the pond include tree planting, conservation, ecology education and is focused on reconnecting and being value based. Through the Nature Connect initiatives and the Eco Kids initiative the children become part of the activities around the pond. There are also activities centred around recycling as well as imparting scientific knowledge into the community at large.
- The community engagement activities around the pond are centred around engagement with schools, with the core team, the Senior Hub walks, local ECD centres, NGOs in the area that focus on initiative around abuse and nature, the Wildflower stepping stones project and maintaining an active presence on social media, newspapers and having active engagement on the website.
- Funding for the project has largely been through approaching possible funders to invest in the project by taking them on site visits, clean ups and having constant networking engagements that make them conscious of the needs and importance of the project. Funding has been

received through Pam Golding and the Mayor who has engaged through the website and aided the project significantly.

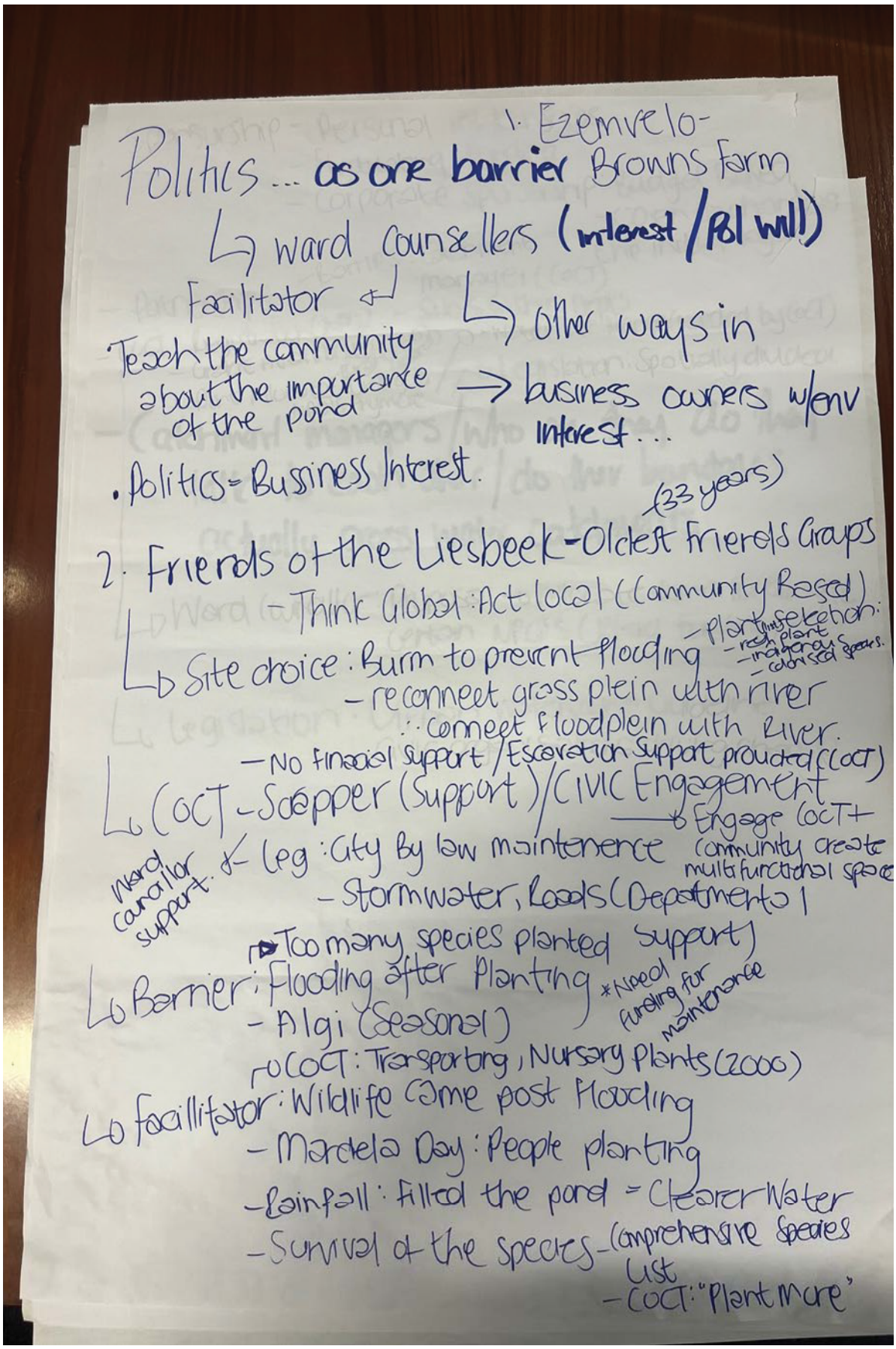
- MCRT has 2 main objectives: 1) Maintenance of river corridor (VULA team); includes seed collecting and litter clean ups; and 2) Environmental Education – with a focus on 'big' days (like World Water Day etc.), youth clubs (Mosselbank River Wanderers), upcycling, mini-SASS etc.
- Social media presence is crucial, as are articles in local press etc.
- Still need to register Friends of group now that the system is handed back to the City.
- Check for indemnity issues with river clean ups.







Coalition Building



Project Overview

APPENDIX K: APRIL 2024 WORKSHOP RESPONSES REGARDING STAKEHOLDER ENGAGEMENT

Who	Organisation Type	Connection to MAR-BGI	Overlaps	Guideline Parallels / Overlaps
Farmers	Land and Agriculture	N/A	• Stakeholder Engagement • Resource allocation	Guideline 1
Property owners	Private / Public Organisations	Yes	• Reaching out to neighbouring property owners within the community. • Future property investors drawn into the community due to the MAR-BGI space.	Guideline 1 Guideline 4 Guideline 6
Asset and Landowner **Municipal Asset owner**	Private Organisations Local Government: CoCT Community members	Yes	• Community members being invested in the changes around the neighbourhood. • Local business owners • Community members see the space as an asset	Guideline 1 Guideline 3 Guideline 4 Guideline 6
Schools **ECD's** **Youth Groups**	Public Organisations Private Organisation	Yes	• The schools, ECD's and local youth groups taking a vested interest in the space due to its multifunctional use. • The school as an entry point to the community	Guideline 1 Guideline 2 Guideline 5 Guideline 6

Community Members **Community Leaders** **Residence Passionate and Invested in the project**	Community	Yes	• The community at the centre of the MAR-BGI intervention • Longevity: Community ownership	Guideline 1 Guideline 2 Guideline 5 Guideline 6
Department of Social Services (NGO Registration) **Department of Water and Sanitation**	Government (National)	Yes	• Departmental and legislative overlaps	Guideline 2 Guideline 3
Social Networks of Care **Other NGO's in the area** **The Wildlife and Environment Society of South Africa** **Nature Connect** **Botanical Society of South Africa (BOTSOC)** **Civic Groups**	NGO's	Yes	• Stakeholder relations and coalition building • Parallel interests in the project • Access to varied skill sets	Guideline 2 Guideline 3 Guideline 4
Storm Water Catchment **Parks and Recreation** **Bulk Water**	City of Cape Town	Yes	• Relevant departments and legislature that directly impacts, overlaps, or	

Public Engagement (Community Engagement Team) **Solid Waste** **Environmental Management** **Landscape Architecture** **Property Management** **Roads Infrastructure Management**			correlates with MAR-BGI	
SAN Parks	National Government	Yes	• MARBGI sits in a multifunctional space. • Future collaboration with coalitions and stakeholder engagement	Guideline 2 Guideline 4
Local Ward Councillors **Supportive Politician** **Sub Committees** **Street Committee**	Political Parties	Yes	• Coalitions building • Access into the communities • Access into state assistance and compliance	Guideline 3 Guideline 4 Guideline 5 Guideline 6
Fynbos life **Local Nurseries**	Forestry and Conservation NGO	Yes	• Environmental education • Planting Days	

Law Enforcement **SAPS** **Neighbourhood Watch (NHW)** **Community Policing Forum (CPF)**	Law Enforcement Safety and Security	Yes	• Protection of the space as an asset • Protection of the community members who engage with the space	Guideline 2 Guideline 4 Guideline 6
Plastics SA	Business (Plastic Supplies)	N/A		Guideline 2 Guideline 5 Guideline 6
Local Businesses Sponsorship **Business forums**	Local Business	Yes	• Investment, support and representation during and post implementation • Economic opportunities for local business around the MAR-BGI site	Guideline 2 Guideline 5 Guideline 6
Community Improvement District **OBSID** **GSCID** **CCID**	NPO	Yes	• Assist in site and project maintenance and management after implementation	Guideline 2 Guideline 5 Guideline 6
CSRM	Education Training and Development	Yes	• Coalition building and teaching the community sustainable practices to	Guideline 2 Guideline 4

			maintaining the space post implementation	Guideline 5 Guideline 6

APPENDIX L: APRIL 2024 WORKSHOP RESPONSES REGARDING RESOURCE REQUIREMENTS

What	Resource Type	Connection to MAR-BGI	Overlaps	MAR-BGI Guideline connection
Funding **Funding for Volunteers and resources** **Economic Opportunities**	Financial	Yes	• Funding for projects is essential to cover the cost, resource requirements and maintenance of the project. • This has correlation with MAR-BGI as it is a core requirement for the project. • Long term sustainability	Guideline 1 Guideline 2 Guideline 4 Guideline 5 Guideline 6
Education **Environmental education** **Seasonal Variation**	Education and Training	Yes	• Environmental education for the community and coalition to understand the importance of the space and the sustainability thereof. • Education on the space and environment from the community as they know their spaces	Guideline 2 Guideline 4 Guideline 6
Safe and Clean Space **Safety** **CoCT**	Safety and Security	Yes	• To ensure the space remains accessible and functional during the research	Guideline 1 Guideline 2

CPF for safety **Safe public spaces**			process for access into the space. • As a multifunctional space to ensure safety of the community and other stakeholders when engaging with the space.	Guideline 3 Guideline 4 Guideline 6
Increased Biodiversity **Biodiversity (Creating Corridors)** **Stepping Stones between green spaces**	Green Spaces	Yes	• The protection of the ecological space the cultivating the biodiversity remains at the centre of the project during and post implementation	Guideline 1 Guideline 4 Guideline 6
Groundwater Quality **Future Ground Water plans** **Wetland Conservation** **Approved Water users** **Water Quality** **Flood attenuation** **(Resilience to climate change)** **Water table contours**	Water	Yes	• Water remains a key resource in all the projects including access, use and protection of water sources • This also contributes to having WSC in Cape Town	Guideline 1 Guideline 2 Guideline 3 Guideline 4
Multifunctional Spaces **Stepping stones (connection to pond)**	Spaces	Yes	• These contribute to sustaining the space and making it increasingly accessible to the public.	Guideline 1 Guideline 4 Guideline 6

Recreational Spaces **Using Dead/ underutilised/ problematic spaces**			• Having a multifunctional space is an asset to the communities.	
Project 'Hero' **Volunteers** **Resources** **Health of the community**	Social Capital	Yes	• The community remain at the centre of the project as contribute to the social capital of these spaces. • Centering the project with the community interests at the forefront ensures long term success post the implementation phase.	Guideline 1 Guideline 2 Guideline 4 Guideline 5 Guideline 6
Built Drawings **Formal Infrastructure vs Desire lines** **Identifying / working with existing infrastructure** **Subterrestrial Infrastructure (Pipes)** **Future Groundwater Use plans**	Infrastructure	Yes	• Important for understanding the technical and geographic elements of the space	Guideline 1 Guideline 2 Guideline 4 Guideline 6

Flowering plants (short term records) **Locally appropriate species** **Conservation value of species (Absorb pollutants, food, medicinal)**	Plants	Yes	• Should be centred around the conservation of the space as well as the community. • Involving the community in this process is essential. • Communal planting days	Guideline 1 Guideline 2 Guideline 4 Guideline 5 Guideline 6
Pollutants and Litter	Sustainability	Yes	• Sustainability of the space	Guideline 1 Guideline 6
Legal Framework **Policy Framework (Nat, Reg, Local)**	Research	Yes	• Policy and legal analysis help understand how the project is connected to the larger goals and policy alignment set out by the government. • Also helps in finding gaps within the policies and effective mechanisms to slot the project into the policy guidelines	Guideline 3
Land Ownership **Land Access** **Land Use/ Purpose** **Seasonal Variation**	Land	Yes	• This remains important for all stages of the project. • Understanding the access and ownership initially and post	Guideline 1 Guideline 2 Guideline 3 Guideline 4

			implementation returning the ownership to the community • Also making sure there is long term sustainability of the project	Guideline 6

APPENDIX M: APRIL 2024 WORKSHOP RESPONSES REGARDING SETTING UP CIVICS, COALITIONS & CITY MECHANISMS

1. Formal Recognition of NPO
    - Appealing to funders
    - Section 18A Constitution
    - Setting up (No specific political parties)

2. Scope needs of the community
   Challenge more than the environment.
    - Unemployment/hunger
    - Child led families.
    - Crime

   Arrange who does what.
    - Documentation / comms
    - Community activities /Grassroots (Politics in Street Committee)
    - Safety/ Security/ Work with CPF (Establish Neighbourhood Watches)

   Identify people on duty community groups.
   -Likely to be willing to help

3. Highlight Facilities
    - EDC's
    - Community Centres / Hall

4. Involvement in School Governing Bodies/ Educational Initiatives
    - Access to facilities (uncoherent*)

5. Get established group to assist.
    - E.g Friends of Kirstenbosch Wetland/ Create spine for other initiatives.

6. Champion in the community

7. Make- up of committee.
    - Skills / reputation/ expertise (finance, landscaping, transport, mobility
    - Piggyback on different interests of goals.

8. Encourage involvement through provision of stipends/ support.
    - (e.g. R350 grant to people who work)

9. Community + community meetings
    - Think Tanks

10. Establish ownership + Belonging (council to society)
    - PPE

- Branded Clothing (Name on it)

11. Consistency
    - Doing things regularly

12. Capacity Building
    - Citizen
    - Mini SASS

13. Management Functions / Skills/ Vision
    - Internet
    - Laptops
    - Finance skills

14. Alignment to political mandates
    - Represented in Ward Committee

City Mechanisms

1. Spatially
    - Targeted areas (vulnerable strategic, etc need additional support)
    - Planning and project implementation (no red lines)

2. Precinct Management Support
    - Mayoral priority, CIDS, Mayoral Urban Renewal
3. EDP
    - Working to identity groups working on river corridors
    - Identify City mechanisms in place to support this
    - Collectives around river management /name groups/living together (Andrew McD)
    - Also, catchment level around setting up catchment management forums (Zeekovlei, Dieprivier)
    - Thinking about the governance of these
    - Updating catchment management guides for the CoCT

Sustainability

(Funding)

1. Enterprise / Business along rivers pay a levy
2. PVT Funding
3. Declining City Funding
4. EPWP short contract/ Job seeker/ NPO has to be recognised as vendor
5. Co-operatives/ business Cost
6. Consider ways to make money
    - Vegetables
    - Medicinal plants
    - Fish Farm
7. Water services charges in place supposed to go to BOCMA
    - Ringfence some money for NbS
    - Greater Cape Town Water Fund
    - Green Bonds Model

8. Look for short- term rewards/ impacts

   (To sell to funders)

   - Role of marketing, building narrative to slow tangible evidence
   - Data collection/ monitoring/ evidence is essential
   - Funding for maintenance

9. Green Infrastructure gets updated

   – Ask Joanne about hacking?

10. Urban Catalytic Investment Unit

    - Identify starting point for scaling and sustainability SWM (still internal) at local level
    - Identify local anchors
    -
    -

APPENDIX N: MEETING WITH UMVOTO TO DISCUSS MAR POLICY AND DECISION-MAKING

4 September 2023

Present

Luke Towers	Umvoto
David McGibbon	Umvoto
Amber Abrams	Future Water, UCT
Kirsty Carden	Future Water, UCT

Discussion

The discussion was framed around a number of questions, meant to inform the MAR-BGI guideline document as well as the toolkit proposed for the PaWS project, as follows:

1. What are the criteria for selecting suitable sites from MAR-BGI ?
    - Start with a feasibility assessment of the aquifer to understand its full extent – thickness (e.g. CFA is 50m thick in places), geology, flow properties, infiltration rates, source water, receiving environment (land use), quantity, quality, assurance of supply, historic practices (dumping etc) etc.
    - Two main components to understand – source water vs. receiving environment. From a source perspective, land cover and land use are important, as are quantity of water, assurance of supply (for MAR) and the quality of the water. In terms of the receiving environment, consideration should be given to the space available (for infiltration or injection), groundwater levels, potential for recharging the aquifer – does it allow for this, flow paths, what criteria set the end uses, and the predicted impact on baseline water quality from the proposed recharge.
    - Noted that treated effluent is a 'stable', consistent source of supply (as opposed to stormwater) – monitoring is challenged with stormwater, especially through the first flush.
    - Note to consider with stormwater that it can introduce poor quality water to the aquifer so have to be cognizant of this . . .
    - Noted that Atlantis is an integrated stormwater system, but that there are challenges with monitoring and control of poor-quality stormwater. They are currently refurbishing the last pond, planting phragmites and installing riprap in an effort to improve quality. The final effluent from Wesfleur WWTW is very good quality (consistently gets highest Green Drop scores) but can still cause infiltration issues. Illegal discharges to the stormwater system are a major problem. Constructed wetlands are a useful way to keep process optimised and improve quality.
    - Awareness-raising amongst local stakeholders is critical, with engagement of community-based organisations to assist with maintenance (with institutional support from the City). Important that people are incentivised in some way to stay involved (numbers / attitude / buy-in) – "*the visual appeal of green space is not enough of a hook when challenges stack up*". Ongoing maintenance of BGI is "*a full-time job*" (Luke). Community meetings would benefit from attendance of someone from the City – to hold them accountable also. Community-based monitoring committee in place
    - The transversal meetings that the City convenes (e.g. Atlantis Aquifer Management committee) are internal City meetings that have limited success as they often get sidetracked or postponed. "Hardest part are the City silos".
    - Tool for assessing feasibility of MAR – developed by Ricky Murray (see website) – MAR.CO.ZA

2. Are there any no go areas?
    - From a water quality perspective, certain areas are considered unsuitable, i.e. Swartklip (ammunitions), solid waste disposal sites, cemeteries, existing wastewater treatment works, etc. Agricultural areas are not necessarily avoided, e.g. PHA. Previous uses of the land need to be considered.

- Water in the CFA is considered to be largely inert but there are areas where the chemistry changes.
- Atlantis – major ion chemistry is being changed with recharge over time; leaching aquifer of calcareous material.
- Need to take cognisance of geochemical process of introducing different chemistry water and the resultant rock interactions.
- Also, seasonal variation in introducing water, particularly in shallow areas.

3. What needs to be checked for in terms of local groundwater initiatives / programmes?
    - Difficult to get good data on this but can use estimates of local abstractions (e.g. 8mm/ha/d in the PHA) to model against estimated volume per land area ('every dam as a borehole').
    - Groundtruthing – 1km radius look for signs of boreholes (e.g. stained walls)
4. What recommendations do you have for maintenance and management considerations, from a technical perspective – i.e., clogging, sediment, etc.?
    - "monitoring is how to make groundwater visible".
    - Ensure that ponds can still infiltrate over time – sludge scraping and disposal (Atlantis)
    - Have to maintain vadose zone so that water can continue to move through; wet and dry cycles are very important in this regard (positive for stormwater MAR)
    - Main issues are sediment / silt, oil, and litter – Atlantis currently constructing traps for these.
    - Solid waste management is very important – need to 'train' stormwater cleaning teams on how to dispose of the stuff they clear.
    - CFA has lots of illegal connections which add to maintenance challenge (including sewage to stormwater)
    - Monitoring forum
5. What about local engagement options?
    - People often suspicious about sharing details of groundwater use.
    - Need to find ways to bring communities into discussions – e.g. use Fulham Rd pond to highlight connections to groundwater / emphasise water cycle.
    - Monitoring committees can be set up – e.g. with farmers in the PHA, or through using formal EIA processes.
    - Strandfontein – community observant to drilling, inform ward councillors, have put flyers under peoples' doors.
    - Umvoto Foundation – murals, mosaics, clean ups etc.
    - Lotus River – groundwater info
    - Edith Stevens – community training on water quality, connection with schools, speak to women in the area.
    - Community engagement meetings can quite quickly get derailed on other issues; ward councillors should be involved.
    - Rural areas – headmen, community members, councillors, farmers – challenge getting messages across. Use CLOs (payment with food parcels) as facilitators.
6. What are your experiences around decision-making factors beyond the hydrogeology, e.g., safety and security, others?
    - Bringing people in in different ways. Kuils River

APPENDIX O: ABSTRACTS FOR 7TH WISA YOUNG WATER PROFESSIONALS CONFERENCE

ABSTRACT 1

Linking policy to local BGI interventions: An analysis of associated policy in Cape Town, South Africa

Authors: Keamogetse Mosienyane; Jacob Cloete; Lauren Grootboom; Sithabile Hlahla, Amber Abrams, Kirsty Carden

Presenter: Lauren Grootboom

The importance of transitioning to water sensitive and resilient cities is increasingly acknowledged across South Africa, especially due to rapid urbanization, rising water demand and water scarcity. Interventions such as Blue-Green Infrastructure (BGI) provide alternative pathways to address urban water management and climate challenges. An ongoing project by the Future Water Institute at UCT, 'Implementation guideline for managed aquifer recharge (MAR) in combination with blue-green infrastructure at local settlement level', aims to develop an implementation guideline for BGI interventions that support MAR in urban areas. As part of the project, a review of policies, strategies and guidelines relating to BGI in the City of Cape Town (CoCT) was conducted. A total of 52 documents were analysed and these ranged from 1997 to 2023.

Themes emerging from the review include water sensitivity, green spaces, infrastructure, community, and recreation. BGI features more prominently in recent (post 2010) policies, where it is seen as a tool to mitigate climate change, boost the green economy, enhance multifunctionality, and contribute to water sensitive design (WSD) - thus indicating a need to update older policies to incorporate interventions that focus on multifunctional aspects. Additionally, there is evidence of silos within CoCT departments, with little mention of actual collaboration and often compartmentalized policies. The main challenge lies in the implementation of integrated water management approaches, such as WSD, as departments have different budgetary and/or operational priorities. However, numerous policies identify ways in which water resources can be protected, used, and developed. This creates opportunities for the integration of MAR and BGI into policy and programs. This project, thus, proposes the development of implementation guidelines, supported by a policy review, as a means of aligning departmental goals regarding BGI interventions and the utilization of multifunctional spaces to integrate benefits for different stakeholders in urban contexts.

ABSTRACT 2

Linking local engagement to BGI interventions: Lived experiences of communities in repurposing a stormwater pond in Mitchell's Plain, Cape Town, South Africa

Authors: Keamogetse Mosienyane; Jacob Cloete; Lauren Grootboom; Sithabile Hlahla, Amber Abrams, Kirsty Carden

Presenter: Lauren Grootboom

Transitioning to water sensitive and resilient cities is increasingly important across South Africa due to rapid urbanisation, rising water demand and water scarcity. Interventions such as Blue-Green Infrastructure (BGI) provide alternative pathways to address urban water management and climate challenges. An ongoing project by UCT's Future Water Institute, 'Implementation guideline for managed aquifer recharge (MAR) in combination with blue-green infrastructure at local settlement level', aims to develop an implementation guideline for BGI interventions that support MAR in urban areas. The project includes ethnographic fieldwork to explore the engagement and lived experiences of communities alongside BGI implementation at a stormwater pond in Mitchell's Plain, Cape Town.

Semi-structured interviews and workshops (e.g., mural painting, planting days and environmental education) at the pond were used to engage residents and facilitate entry into the community to repurpose the pond. Our research process indicates growing interest in the space, including in local management of the multi-functional pond, where some residents believe the repurposed pond is an asset to the community, while supporting CoCTs intended purpose of stormwater management. For example, some residents utilise the space for recreation such as walking dogs, playing soccer, and resting, while others raise the benefit of access to green

space. However, barriers regarding community involvement in implementation of BGI include managing expectations (e.g., around funding, and management); land-use conflict; ownership; governance; and the socio-economic power dynamics amongst and between residents and other stakeholders.

Community engagement is a key component of developing multi-functional water management practices that benefit local populations. It is important to recognise that the implementation of BGI interventions requires consistent collaboration and resident involvement from the beginning. This can better facilitate local empowerment in promoting water sensitive cities and promotes a sense of ownership for local urban residents.

APPENDIX P: ABSTRACT FOR THE 12TH INTERNATIONAL SYMPOSIUM ON MANAGED AQUIFER RECHARGE

Developing a local implementation guideline for managed aquifer recharge in combination with blue-green infrastructure

Hlahla, S[1]., Abrams, A[1]., Grootboom, L[1]., Carden, K.[1]

[1]Future Water Institute

THEME 8: Awareness, Education and training on MAR

Abstract

Existing water management practices in many South African cities are not resilient to climate change impacts, which combined with rapid urbanisation, have contributed to issues of water scarcity, flooding, and environmental degradation. A transition to more adaptive urban water supply, sanitation and stormwater management systems is necessary. Blue-green infrastructure (BGI), paired with managed aquifer recharge (MAR), can facilitate such a transition by addressing some challenges of conventional ('hard') infrastructure while improving groundwater infiltration. However, how such a transition can be implemented, integrated and managed within existing urban governance structures is not clear, particularly in under-resourced and inequitable settings. To provide such guidance, UCT's Future Water Institute developed an 'Implementation guideline for managed aquifer recharge in combination with BGI at local settlement level', funded by the SAWater Research Commission. The project used experiences on planning, designing and implementing BGI in sites of MAR from a stormwater retrofit case study in Mitchells Plain, Cape Town (the Pathways to Water Resilient South African Cities project). Although based on a case study, the guideline is generic and applicable to a range of BGI options associated with MAR. The document consists of six individual guidelines: 1. Scoping the local context (including local government priorities); 2. Encouraging civic engagement/organisation/coalitions and adhering to legislation, policies and programs; 3. Critical appraisal of planned implementation; 4. Facilitating engagement; and 5. Formalising local involvement. The guideline is meant for stakeholders involved in the design, implementation/construction, maintenance, management of MAR BGI, including local residents, residents' groups, consultants or interested stakeholders, city improvement districts, community-based organisations, or ward councillors. The presentation will focus on the processes undertaken to develop the guideline and lessons learned, including how to communicate MAR science, and engage local residents to raise awareness, understanding and ongoing stewardship of such projects.