City-level law and governance of water security in South Africa

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Steenkamp RM *Water Resilience for South African cities: Solutions in Law?* (Presentation at the British High Commission in South Africa and PwC "Urban Dialogues" Webinar 21 October 2021)

Steenkamp RM *Select Issues in South African Law: Access to Water* (Guest lecture provided for the NWU Faculty of Law post-graduate module: LLMO 885 - Local Government and Environmental Law 07 October 2021)

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ABSTRACT

South African cities are experiencing significant water challenges owing to urbanisation, climate change, and a confluence of social, economic, political, technical, and governance problems. These challenges are significantly impacting the provision of urban water services, exacerbating flood and drought risks, and compromising the health of aquatic ecosystems. Hence, cities are expected to engage in proactive planning, preparation, and response measures to address a multitude of threats and challenges to water, to be resilient, sustainable, and secure.

The concept of water security emerges as an essential framework to address diverse and pressing water-related challenges in an integrated manner. This study provides an in-depth analysis of the concept of water security in its generality, and its specific application to urban areas, which is known as urban water security. Through this analysis, the study defines urban water security within the context of South African cities and delineates five dimensions of urban water security which cities may need to take on board in local law, policy, and governance responses. The study evaluates law and governance frameworks according to the following dimensions: access to water and sanitation, the protection of urban aquatic ecosystems (both freshwater and coastal), urban flood and drought risk management, as well as water as a socio-economic good (sustainability).

This study draws on a range of sources applicable to urban (local government) law and development, water law, and environmental and climate change law. The premise of this study is that municipalities have a crucial role to play in achieving water security, by making use of the legal powers and mandates available to them. Through a desktop legal doctrinal and socio-legal analysis, this study appraises the international, African regional, and South African legal frameworks on urban water security. It assesses these legal frameworks for water security and unpacks the extent to which they delineate a role for local government to address water security. From the study it is evident that the role of local government

concerning urban water security, although fragmented, arises from the constitutional, environmental, climate change and water legal frameworks.

The study establishes that this delineated role of local government in addressing water security can be executed through the adoption and implementation of a range of law and governance instruments, including by-laws, strategies, plans, and policies. The study assesses the extent to which municipalities are currently addressing water security through their law and governance instruments by evaluating three selected cities (Durban, Cape Town and Johannesburg) as case studies. The three cases of Cape Town, Durban and Johannesburg are illustrations of how cities can innovatively address water security concerns based on their legislatively defined powers and authorities and based on their duty to act on issues relevant to exercising their constitutionally awarded powers and responsibilities. While cognisant that water security in these three cities still requires a lot more work. The discussion suggests that the three major metropolitan municipalities, also South Africa's three biggest cities, are playing a significant role in setting and influencing the direction of both local and national law and the policy agenda on water security. The study asserts that cities can go above and beyond what is required by law and policy concerning water security through the adoption and implementation of integrated and coordinated policy and regulatory instruments.

Keywords: Water security, local government law, urban governance, water law, environmental law, climate change, South Africa, urban water management

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LIST OF ABBREVIATIONS

ACHPR	African Commission on Human and Peoples Rights
ACRWC	African Charter on the Rights and Welfare of the Child
AMCOW	African Ministers' Council on Water
AU	African Union
BMP	Biodiversity Management Plan
C40	C40 Cities Climate Leadership Group
CAP	Climate Action Plan
CBD	Convention on Biological Diversity
CCRIP	Climate Change Response Implementation Plan
CER	Centre for Environmental Rights
CESCR	Committee on Economic, Social and Cultural Rights
CMA	Catchment Management Agency
COGTA	Department of Co-operative Governance and Traditional Affairs
CSIR	Council for Scientific and Industrial Research
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries, and the Environment
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction

DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EWS	Early Warning System(s)
FAO	United Nations Food and Agriculture Organisation
FISC	Fire and Invasive Species Control Programme
GG	Government Gazette
GHGs	Greenhouse Gases
GWP	Global Water Partnership
HDR	Human Development Report
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICLEI	Local Governments for Sustainability (formerly International Council for Local Environmental Initiatives)
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IUDF	Integrated Urban Development Framework
IUWM	Integrated Urban Water Management
IWRM	Integrated Water Resources Management
LBSAP	Local Biodiversity Strategy and Action Plan
LHWP	Lesotho Highlands Water Project

LTAS	Long-term Adaptation Scenarios
MDG	Millennium Development Goal
MDMF	Municipal Disaster Management Framework
MFMA	Municipal Finance Management Act 56 of 2003
NBA	National Biodiversity Assessment
NBF	National Biodiversity Framework
NBSAP	National Biodiversity Strategy and Action Plan
NCCAS	National Climate Change Adaptation Strategy
NCCRP	National Climate Change Response Policy
NCRVAF	National Climate Risk and Vulnerability Assessment Framework
NDP	National Development Plan
NEMA	National Environmental Management Act 107 of 1998
NGO	Non-governmental Organisation
NPC	National Planning Commission
NSSD	National Strategy for Sustainable Development and Action Plan
NUA	New Urban Agenda
NWA	National Water Act 36 of 1998
NWRS	National Water Resource Strategy
NWSF	National Water Security Framework

NWSMP	National Water and Sanitation Master Plan
OECD	Organisation for Economic Co-operation and Development
PELJ	Potchefstroom Electronic Law Journal
RECIEL	Review of European Community and International Environmental Law
SACN	South African Cities Network
SADC	Southern African Development Community
SAJELP	South African Journal of Environmental Law and Policy
SALGA	South African Local Government Association
SANS	South African National Standards
SARChI CLES	South African Research Chair in Cities, Law and Environmental Sustainability
SDBIP	Service Delivery and Budget Implementation Plan
SDG	Sustainable Development Goal(s)
SES	Social-Ecological System(s)
SIWI	Stockholm International Water Institute
SUDS	Sustainable Urban Drainage Systems
UN	United Nations
UN GA	United Nations General Assembly
UN-Habitat	United Nations Human Settlements Programme
UN-Water	United Nations Water

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNTF-HS	United Nations Trust Fund for Human Security
WC/WDM	Water Conservation and Water Demand Management
WDM	Water Demand Management
WEF	Water-Energy-Food
WHO	World Health Organisation
WRC	Water Research Commission
WSA	Water Services Authority
WSP	Water Services Provider
WSUD	Water-Sensitive Urban Design
WSUM	Water-Sensitive Urban Management
WSUP	Water-Sensitive Urban Planning
WWAP	United Nations World Water Assessment Programme
WWC	World Water Council

1 INTRODUCTION

1.1 Background and problem statement

The world today faces existential threats to water systems in the form of intensifying floods and droughts, vulnerabilities in the water-energy-food (WEF) nexus, the pollution and degradation of aquatic ecosystems, the unsustainable use of water resources, fragmented and weak systems of governance, and the growing impacts of climate change.[1] Human activities are a major contributor to these threats, as is evident in the significant withdrawal of water from surface and ground water sources, the discharge of untreated wastewater into water sources, and the expansion of impermeable surfaces.[2] These activities reduce the ability of water systems to cope with hazards and risks, affecting the resilience of urban infrastructure, services and networks, making both the urban environment and the people particularly vulnerable and susceptible to risk.[3]

Due to factors such as urbanisation, the over-consumption of natural resources and industrialisation, cities significantly impact on the hydrological cycle, affecting water access, quality, and availability in urban areas.[4] In its chapter on cities, settlements, and infrastructure, the IPCC confirms that cities will be hotspots of hazards derived from climate change, which could intensify pre-existing pressures linked to poverty, informality, inequality, and governance.[5] It is also predicted that the impacts of climate change might be increasing the rate of urbanisation, with urbanisation also

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1 Gleick and Iceland *Water, Security and Conflict* 3-4; Gober *Building Resilience for Uncertain Water Futures* 1; World Economic Forum *The Global Risks Report 2020* 1-31; Axworthy and Sandford "The Global Water Crisis: Framing The Issue" 3.

2 Pereira and Freitas 2017 *Contexto Internacional* 521; Aboelnga *et al* 2019 *Resources* 3-4; Rockström *et al* 2014 *Ecohydrology* 1252-1254.

3 Gleick and Iceland *Water, Security and Conflict* 4; Sandford "Will the Next Wars Be Fought Over Water?" 13.

4 OECD *Water Governance in African Cities* 14-15; Goonetilleke *et al Sustainable Urban Water Environment: Climate, Pollution and Adaptation* 5-7; Gleick and Iceland *Water, Security and Conflict* 4; Sandford "Will the Next Wars Be Fought Over Water?" 13; Kim "Strategies for Sustainable Water Security: Diversification, Decentralization, and Integration" 151; McDonald 2014 *Global Environmental Change* 97.

5 Dodman *et al* "Cities, Settlements and Key Infrastructure" 921.

simultaneously exacerbating the exposure and vulnerability of urban systems to future climate situations.[6]

It is notable that Africa is expected to host a substantial proportion of the world's future population,[7] with major growth occurring in metropolitan areas and secondary cities.[8] As of 2020, the urban population in South Africa exceeds 67 per cent.[9] South African cities are already facing a myriad of water-related challenges with the added pressure of responding to overall sustainability and local economic development. The use and demand for water from industrial operations like agriculture, mining and hydraulic fracturing (fracking), the mismanagement of funds, collapsing or non-functional municipal wastewater systems, and infrastructural and technical inefficiencies are all placing South Africa's water resources under immense pressure.[10] Moreover, economic inequalities, and the legacy of state-led racial discrimination that deprived many of adequate access to public amenities, are all aggravating existing water challenges in the country.[11]

Despite municipalities having made important strides in improving access to water supply since 1994, several informal settlements in South African urban areas are still not adequately serviced, and where water treatment, delivery infrastructure and services are in place they are often deteriorating.[12] The COVID-19 outbreak has further highlighted the water and sanitation crisis in (South) African cities, and also worsened inequalities, especially for informal settlement residents who rely on public toilets and

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6 Dodman *et al* "Cities, Settlements and Key Infrastructure" 921-922.

7 UN-Habitat *World Cities Report 2022: Envisioning the Future of Cities* 14; United Nations *Population 2030: Demographic Challenges and Opportunities for Sustainable Development Planning* 37.

8 OECD *Water Governance in African Cities* 33.

9 O'Neill 2022 https://www.statista.com/statistics/455931/urbanization-in-south-africa/.

10 Water Research Commission (WRC) *Global Series: Water Resilient Cities* 2; Carden and Armitage 2013 *Water SA* 345. Du Plessis 2022 https://theconversation.com/south-africa-has-had-lots-of-rain-and-most-dams-are-full-but-water-crisis-threat-persists-178788; Bwapwa 2018 *Environmental Management and Sustainable Development* 14-15.

11 Swart and Adams "Water Services Provision and the Protection of Water Resources" 445; Enqvist and Ziervogel 2019 *Wiley Interdisciplinary Reviews: Water* 2.

12 Department of Environmental Affairs (DEA) *South Africa's First Annual Climate Change Report* 48; OECD *Water Governance in African Cities* 20, 22.

water sources for basic hygiene.[13] Likewise, the health and well-being of the urban population, as well as their ability to survive and thrive, are all intrinsically linked to water.

Many localities in South Africa experience difficulties in relation to either water resources (ecosystems) or water services (drinking water and wastewater), or to both.[14] The country's freshwater ecosystems are significantly at risk due to the high rates at which they are exploited and impacted by human activities both inside and beyond their catchments.[15] Furthermore, the pollution of water resources, the inadequate treatment of wastewater, the spread of water-borne diseases, and the deterioration of ecosystems pose significant risks to water security generally as it pertains to ecosystem integrity, as well as particularly to human health and well-being. Moreover, several cities have been impacted by severe droughts, resulting in intermittent water supply and water restrictions,[16] the most prominent being the multi-year drought in Cape Town (2015-2019)[17] and the current drought in Gqeberha (Port Elizabeth) from 2021 onwards.[18] Periods of droughts with erratic water supply may also become more regular in other cities such as in Johannesburg, even though the major dams supplying the Municipality are full.[19] In many cases the effect of South Africa's energy crisis also impacts on the

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13 OECD *Water Governance in African Cities* 38; World Health Organisation (WHO) 2020 https://www.who.int/emergencies/diseases/novel-coronavirus-2019.

14 Muller *et al Water Security in South Africa* 7; South African Cities Network (SACN) *State of Water in Cities: Analysis of Water Resource and its Management in Cities* 45, 46.

15 DEA *South Africa Environment Outlook 2016* 331.

16 Vogel and Olivier 2019 *Regional Environmental Change* 1561.

17 Sinclair-Smith and Winter "Water Demand Management in Cape Town: Managing Water Security in a Changing Climate" 126.

18 Nqonji 2021 https://www.sabcnews.com/sabcnews/water-day-zero-fast-approaching-for-eastern-cape-municipality/; Business Tech 2022 https://businesstech.co.za/news/business/579614/one-of-south-africas-major-cities-is-facing-a-water-day-zero-at-the-end-of-may-business-chamber-warns/.

19 Engelbrecht and Monteiro 2021 *South African Journal of Science* 2; Haffajee 2022 https://bit.ly/3CvnRBc; Evans 2022 https://www.dailymaverick.co.za/article/2022-10-12-urgent-steps-need-to-be-taken-if-gauteng-is-to-avoid-running-out-of-water-soon/.

ability of municipalities to meet their water service duties, as is evident from the effects of load-shedding on water infrastructure and service provision.[20]

Cities are also particularly vulnerable to severe flooding and storm-surges owing both to climate change and to poor planning and land-use management.[21] In April 2022 eThekwini experienced one of its worst instances of flooding and landslides, resulting in harm to infrastructure, agriculture, property and human health and well-being.[22] These threats to water security pose significant barriers to the achievement of human security and sustainable socio-economic development in cities.[23] All these concerns position water security at the heart of several socio-economic and fundamental rights, to which many municipalities must respond as part of their developmental imperatives. The increased frequency of references to water security in law and policy and the increased volume of academic writing on the topic suggest that water issues may best be dealt with in a holistic and integrated framework.[24] For this reason, the concept of water security has gained prominence as a conceptual and normative framework for addressing the wide scope of water-related concerns.[25]

1.2 The notion of water security

The concept of human security suggests the need to adopt a mode of comprehending risks and vulnerabilities that challenges the traditional notion of security.[26] The state is conventionally seen as the trustee to protect the natural environment and to regulate

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20 Crisp 2022 https://www.engineeringnews.co.za/article/load-shedding-spells-trouble-for-water-supply-2022-07-22/rep_id:4136; Patrick 2022 https://www.news24.com/news24/southafrica/news/load-shedding-likely-to-have-impact-on-water-supply-in-joburg-says-water-utility-20220919.

21 Van der Berg 2018 *SAJELP* 89; United Nations *Global Assessment Report on Disaster Risk Reduction* 40; Tingsanchali 2012 *Procedia Engineering* 26; Le Roux 2021 https://issafrica.org/iss-today/urban-south-africa-is-ill-prepared-for-the-coming-climate-change-storm.

22 Mwai 2022 https://www.bbc.com/news/61107685.

23 UN-WWAP *Global Trends in Water-Related Disasters: An Insight for Policymakers* 3; Dodman *et al* "Cities, Settlements and Key Infrastructure" 937.

24 See Aboelnga *et al* 2019 *Resources* 1-19; Cook and Bakker 2012 *Global Environmental Change* 94-102.

25 Naidoo *et al* 2016 *Water SA* 456.

26 Newell "Green Security" 49; Newman 2022 *Global Society* 433.

people's exploitation thereof.[27] Human security, conversely, suggests a move away from a focus on the state towards societal well-being measured by human welfare.[28] Human security encompasses overall human well-being,[29] and emphasises transformational development and a safe and secure environment for all people.[30] In this context, Leaning and Arie describe human security as "an underlying condition for sustainable human development."[31] Thus, water security, with water as a productive input and protection against the vulnerabilities associated with uncertainty in water flows, is one of the keys to human development.[32]

The United Nations Trust Fund for Human Security (UNTF-HS) sees the advancement of human security as a means of strengthening states' resilience to climate change impacts and persistent poverty.[33] In the age of the Anthropocene[34] humans are modifying the water system on a global scale without a thorough understanding of the system and the system's response to change, thereby affecting the social and environmental dimensions of human security.[35] In the same way that the Anthropocene is changing the global water system,[36] it simultaneously challenges conventional water management approaches.[37] Human security forces recognition of humans as part of the environment, affecting and being affected by things in a single realm that dissolves the

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27 Harrington and Shearing *Security in the Anthropocene: Reflections on Safety and Care* 33.
28 Ferreira and Henk 2009 *Armed Forces & Society* 502; Newman 2022 *Global Society* 440.
29 UNDP *Human Development Report 1994* 30-31.
30 Ferreira and Henk 2009 *Armed Forces & Society* 502.
31 Leaning and Arie *Human Security in Crisis and Transition* 37; Behnassi and McGlade *Environmental Change and Human Security in Africa and the Middle East* viii.
32 UNDP *Human Development Report 2006: Beyond Scarcity–Power, Poverty and the Global Water Crisis* 133.
33 United Nations *Human Security Handbook* 5.
34 The Anthropocene is a new geological epoch in which humans play a leading role in subverting the Earth System; in other words, humans are changing the physical framework that regulates its major processes - Crutzen "The Anthropocene" 13; Kotzé 2014 *Journal of Energy & Natural Resources Law* 121, 131-132; Kotzé 2014 *The Anthropocene Review* 256.
35 Vörösmarty, Pahl-Wostl and Bhaduri 2013 *Current Opinion in Environmental Sustainability* 1-4. Also see Chapter 2.
36 Cosgrove and Loucks 2015 *Water Resources Research* 4824.
37 Pereira and Freitas 2017 *Contexto Internacional* 530. Also see more on this in Chapter 2.

natural-social dyad, which Harrington and Shearing[38] describe as being exactly what the Anthropocene requires. This all-encompassing view of human security intends to inspire new methods of cross-sectoral collaboration and coordinated policy responses.[39] Hence, human security cannot be attained in isolation from the interconnected challenges of the Anthropocene era.

Water security seemingly forms part of a broad, developmental understanding of security that focuses on ensuring that individuals have numerous "freedoms".[40] These freedoms range from those underpinning traditional security such as peace and stability to the protection of human rights, reduced vulnerability, and enhanced measures for resilience and adaption to climate change and variability.[41] Water security generally refers to the capacity to reliably provide adequate water of the sufficient quality where and when people require it.[42] UN-Water defines water security as follows:

> The capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.[43]

The above definition implies that humans need to be protected against the multi-impact, multi-subject and multi-temporal environmental threats related to water.[44] Water security thus translates into the human capacity to simultaneously respond to various risks, vulnerabilities, insecurities, inequities, and policy challenges that societies and ecosystems face. The concept captures "complex and interconnected challenges"

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38 Harrington and Shearing *Security in the Anthropocene: Reflections on Safety and Care* 23.
39 Bosselmann "Good Governance" 381.
40 UNDP *Human Development Report 1994* 22; Behnassi and McGlade *Environmental Change and Human Security in Africa and the Middle East* viii.
41 UNDP *Human Development Report 1994* 22-44.
42 Sandford "The Human Face of Water Insecurity" 1-2.
43 UN-Water *Water Security and the Global Water Agenda* 1.
44 Khagram, Clark and Raad 2003 *Journal of Human Development* 294; UN-Water *Water Security and the Global Water Agenda* 1.

as well as highlighting the centrality of water in achieving a larger sense of development, human well-being, security, and sustainability.[45]

This study focuses specifically on water security in the context of urban areas. Notably, the scholarly discourse attributes different meanings to and understandings of water security.[46] As will be demonstrated below,[47] the concept of urban water security is multifaceted, including water availability, water supply security, ecosystem protection, and the management of public health risks and water disasters. With many of the delineated dimensions of urban water security linked to local government functions and responsibilities, both globally and in South Africa.[48]

Bearing the above in mind, the water crisis is increasingly being framed as a governance crisis.[49] Better water governance necessitates extensive co-operation, co-ordination, and communication. However, these are often lacking as cities experience difficulties with water governance and management. Specific challenges include fragmentation and complexities in water management, law, policymaking, and implementation, operational management, information and monitoring, and finance.[50] Achieving water security requires scientific, technical, political, financial, institutional, and legal interventions and innovations.[51] In essence, this includes strengthening institutions, enhancing water quality management, decreasing inequality, increasing infrastructure investments, and strengthening the climatic resilience of water and sanitation services.

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45 UN-Water *Water Security and the Global Water Agenda* v.

46 For an analysis of the growing use of the term "water security" see Aboelnga *et al* 2019 *Resources* 1-19; Brears *Urban Water Security*; Cook and Bakker 2012 *Global Environmental Change* 94-102; Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 1-14.

47 See Chapter 2.

48 See Chapters 2, 3 and 4.

49 Hill *Climate Change and Water Governance* 3; OECD 2022 https://www.oecd.org/about/impact/addressing-water-scarcity.htm; Water Partnership Programme (WPP) *Water Sector Governance in Africa* 3; Swatuk *et al* "Building Urban Water Resilience" 2; Hernández, Huitema and Dell' Angelo "Water Governance and Politics" 41.

50 Meissner and Du Plessis 2022 https://theconversation.com/south-africas-increasing-water-stress-requires-urgent-informed-actions-189659.

51 Gleick, Iceland and Trivedi *Ending Conflicts Over Water* 16.

This study discusses water security from an urban governance perspective with specific focus on the legal and institutional framework for water security in South Africa. For the purposes of this study, the term "city-level governance" is used interchangeably with "urban governance" and broadly refers to the exercise of political, social, economic, legislative, and administrative authority in the management of a municipality's affairs.[52] This study takes the view that cities can go beyond the immediate imperatives of water security provided in law and policy by adopting and actively implementing an integrated and coordinated approach to achieving water security.

1.3 International and African regional perspectives on city-level governance towards water security

Aspects of water security, as identified in this study,[53] are spread out across various international and African regional instruments. Notably, the right to water was initially read into instruments such as the *International Covenant on Civil and Political Rights* (1966),[54] and the *International Covenant on Economic, Social and Cultural Rights* (1966).[55] More recently international instruments have recognised the right to water which has influenced the adoption of the right into regional and national legal systems.[56] Furthermore, the human right to water was explicitly confirmed by the United Nations General Assembly (UN GA).[57] To which end, *General Comment 15 on the Right to Water* provides important reference points for water security, as it defines the normative content of the human right to water.[58]

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52 Nel, Du Plessis and Retief "Key Elements for Municipal Action" 2-14. See para 2.4.
53 See para 2.3 for the dimensions and Chapter 3 for an analysis of the instruments.
54 *International Covenant on Civil and Political Rights* (1966).
55 *International Covenant on Economic, Social and Cultural Rights* (1966) (ICESCR).
56 See paras 3.2 and 3.3 below.
57 *The Human Right to Water and Sanitation* UN GA Res 64/292 (2010).
58 Article 3 of the UN Committee on Economic, Social and Cultural Rights (CESCR) *General Comment No 15: The Right to Water* UN Doc E/C12/2002/11 (2003) (hereafter General Comment 15).

Some of the international law instruments speaking to the preservation of the natural environment include the *Convention on Biological Diversity* (1992), *Strategic Plan for Biodiversity 2011-2020* and its *Aichi Biodiversity Targets*, as well as *Agenda 21: Programme of Action for Sustainable Development* (1992). The study assesses the extent to which they delineate a role for local authorities in addressing the protection of urban aquatic ecosystems. Concerning water-related disasters and climate change, various international instruments acknowledge the role of sub-national governments in climate change mitigation and adaption, as well as in disaster risk reduction.[59] These instruments include the *Paris Agreement* (2015), *Sendai Framework for Disaster Risk Reduction* 2015-2030 (2015) (hereafter the *Sendai Framework*), *Transforming Our World: the 2030 Agenda for Sustainable Development* (hereafter *Agenda 2030*), the *New Urban Agenda* (2016), and their respective implementation plans and frameworks.[60]

The issue of urban water security is a pressing concern, and the African region has only a few instruments that adequately address this problem. These instruments comprise a variety of documents, including the *African Charter on Human and Peoples' Rights* (1982) and the African Union *Agenda 2063: The Future We Want* (2015), along with its *First Ten-Year Implementation Plan for 2014-2023*.[61] In addition, several specific water sectoral instruments also exist, such as the *Abuja Declaration on Water: A Key to Sustainable Development in Africa* (2002), *Africa Water Vision for 2025: Equitable and Sustainable Use of Water for Socioeconomic Development* (2009) and the *Guidelines on the Right to Water in Africa* (2019). This study also discusses the *African Convention on the Conservation of Nature and Natural Resources* (2003) and the *African Climate Change and Resilient Development Strategy and Action Plan* (2022–2032) (2022).

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59 See para 3.2 below.

60 *Transforming Our World: The 2030 Agenda for Sustainable Development* (2015) (hereafter *Agenda 2030*); *Sendai Framework for Disaster Risk Reduction 2015-2030* UN Doc A/RES/69/283 (2015) (*Sendai Framework*); *New Urban Agenda* (2016) (*New Urban Agenda*).

61 *Agenda 2063: The Africa We Want* (2015) (hereafter *Agenda 2063*); *Agenda 2063: First Ten-year Implementation Plan 2014-2023* (2015) (hereafter *Agenda 2063 First Implementation Plan*).

Overall, these documents represent a vital aspect of the ongoing efforts to address the challenges of urban water security in the region.

African heads of state have also adopted commitments to fast-track the achievement of water and sanitation goals in Africa through the African Union (AU) and the African Ministers' Council on Water (AMCOW).[62] A number of declarations and commitments are relevant as they emphasise the importance of addressing water issues: the *Sharm El-Sheikh Commitments on Water and Sanitation* (2008), the *eThekwini Declaration and AfricaSan Action Plan* (2008), and the *Dakar Declaration* (2014).[63] These instruments collectively confirm the commitment of African heads of state for the provision of water and sanitation services and to addressing the priority areas of biodiversity conservation, sustainable use of water, and natural resource management.[64]

This study relies on international and regional instruments for the limited purpose of distilling or clarifying the role of sub-national governments in addressing the dimensions of water security.

1.4 South African law perspectives on city-level law and governance towards water security

The *Constitution of the Republic of South Africa*, 1996 (the *Constitution*) entrenches the right to access to sufficient water and the right to an environment that is not harmful to human health and well-being. [65] Consequently, in addition to everyone having the right to access to water, they also have the right a) to access to an environment (water resources) that must not be harmful to their health or well-being, and b) to having this water resource protected.[66]

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62 AMCOW 2016 https://bit.ly/3N9BFoD.

63 *Sharm El-Sheikh Commitments on Water and Sanitation* (2008); *eThekwini Declaration and AfricaSan Action Plan* (2008); *Dakar Declaration* (2014).

64 See para 3.3 below.

65 Sections 27(1)(b) and 24 of the *Constitution*.

66 Kotzé and Bates 2012 *Water Law Review* 238.

The *Constitution* guarantees local government the right to govern, on its own, the local affairs of its community and to structure and manage its administration subject to national and provincial legislation.[67] The *Constitution*, as well as local government laws and policy,[68] assign significant functions, duties and responsibilities to local government to the advancement of the promotion and protection of both environmental and socio-economic rights to meet the basic needs of its community.[69] As part of their post-apartheid developmental mandate, municipalities must strive within their financial and administrative capacity to ensure the sustainable provision of services to communities and to improve the quality of life of their residents.[70] Furthermore, local government exercises both legislative and executive authority concerning matters such as water and sanitation services restricted to potable water supply systems, municipal planning, municipal health services, stormwater management systems, as well as domestic sewage and wastewater disposal systems.[71] All of these functional areas are linked to water security.

In fulfilling the state's mandate under section 27(2) of the *Constitution*,[72] the legal framework further ascribes the duties, rights and responsibilities of the various spheres of government concerning the use, development, management, control, and conservation of water.[73] This study will evaluate instruments such as the *National Water Act*,[74] the *Water Services Act*,[75] the *National Water Resources Strategy* (2013) (NWRS)

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67 Section 151(3) of the *Constitution*.

68 These laws and policy include the *White Paper on Local Government* (1998), the *Local Government: Municipal Structures Act* 117 of 1998 (*Municipal Structures Act*), and the *Local Government: Municipal Systems Act* 32 of 2000 (*Municipal Systems Act*).

69 This interpretation is based on a reading of the rights entrenched in the Bill of Rights with sections 7(2) and 8(1) of the *Constitution*. Naudé and Jansen van Rensburg 2007 *Public Administration and Development* 393-412; De Visser 2009 *CJLG* 11-12. Also see Chapter 4.

70 Sections 152 and 153 of the *Constitution*; section 23(1)(a) and (b) of the *Municipal Systems Act*.

71 Section 156(2) and Schedules 4B and 5B of the *Constitution*; section 11 of the *Municipal Systems Act*. See Chapter 4 of this study.

72 This mandate refers to taking reasonable legislative and other measures, within the state's available resources, to achieve the progressive realisation of this right.

73 See Chapter 4.

74 36 of 1998 (NWA).

75 108 of 1997 (*Water Services Act*).

and the *National Water and Sanitation Master Plan* (2018) (NWSMP).[76] The NWA regulates both the protection of water resources in addition to the quality of such water to meet basic human needs.[77] The *Water Services Act,* read with its Regulations, entrenches the right to access to a basic water supply and basic sanitation. This right of access to water and sanitation is essential to ensure sufficient access to water and an environment not harmful to human health or well-being. This study evaluates these instruments with the aim of determining what role they delineate for local government in addressing water security.

In its *National Development Plan 2030* (2012) (NDP), South Africa acknowledges the importance of human security for the country's development.[78] In turn the NDP outlines pressures on natural resources, and specifically water, migration and the spread of communicable diseases as being critical to the country's overall security.[79] The country's legal framework further recognises that achieving water security will require a significant paradigm shift.[80] This shift should acknowledge the limitations of water availability, address the real value of water, ensure equitable access to limited water resources, deliver reliable water and sanitation services to all, focus on demand management and alternative sources of water, consider the impacts of climate change and address declining raw water quality.[81] Subsequently, the *National Water Security Framework* (2020) (NWSF) responds to the question of the extent of the threat and the actions required in the short, medium and long term to mitigate or offset the threats to water security.[82] In this way the NWSF frames a national pathway to a water-secure

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76 See Chapter 4 of this study.
77 See section 1(xvii) and (xviii) of the *Water Services Act* which defines "reserve".
78 National Planning Commission (NPC) *National Development Plan 2030* 248.
79 NPC *National Development Plan 2030* 248, 250.
80 Department of Water and Sanitation (DWS) *National Water and Sanitation Master Plan Volume 1* 19.
81 DWS *National Water and Sanitation Master Plan Volume 1* 19.
82 NPC *National Water Security Framework for South Africa (2020)* iii.

country to enable inclusive economic growth, eradicate poverty and reduce inequality, in line with the NDP priorities.[83]

Following on policy developments in the climate change space is the *National Climate Change Adaptation Strategy* (2019) (NCCAS)[84] and the *Climate Change Bill* (B9-2022).[85] Both instruments explicitly acknowledge the role played by all spheres of government, especially the local, in addressing climate change.[86] District and metropolitan municipalities are to undertake a climate change needs and response assessment[87] and to adopt a climate change response implementation plan (CCRIP) informed by such an assessment. The assessment and plan will inform the municipal development planning processes and instruments.[88] In this light, climate change adaptation and mitigation will in future (once the Bill is adopted) become a crucial component of municipal planning.[89] The *Disaster Management Act*[90] finds application in its aim of addressing disaster risk reduction and management, as well as responses to disasters. According to the Act, municipalities need to conduct risk assessments, identify vulnerable communities and ecosystems, and to prepare a disaster management plan considering the aforementioned.[91]

South Africa's suite of environmental laws also acknowledge that local government has a significant role to play in regulating and protecting South Africa's biodiversity. These laws include the *National Environmental Management Act*,[92] in its broad applicability to the natural environment, as well as the *National Environmental Management: Protected*

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83 NPC *National Water Security Framework for South Africa (2020)* iii.
84 *National Climate Change Adaptation Strategy for South Africa* (2019) (NCCAS).
85 GN 1026 in GG 45299 of 11 October 2021 (*Climate Change Bill*).
86 Clause 2(a) of the *Climate Change Bill*; NCCAS 10.
87 Clause 15(1) (a) of the *Climate Change Bill*.
88 See clause 15(1) (d) and (e) of the *Climate Change Bill*.
89 See clause 15(3) (b) of the *Climate Change Bill*. At the time of conclusion of this study the Bill had not yet been enacted.
90 57 of 2002 (*Disaster Management Act*).
91 Section 53(1)(a) -(c) of the *Disaster Management Act*.
92 107 of 1998 (NEMA).

Areas Act,[93] the *National Environmental Management: Biodiversity Act*[94] and the *National Environmental Management: Integrated Coastal Management Act*.[95]

To assess how the legally relevant role of municipalities in addressing water security plays out, this study critically analyses the state of play in three selected cities,[96] Johannesburg, Cape Town and eThekwini.[97] Notwithstanding that different municipalities in South Africa have different administrative arrangements, these municipalities may provide valuable settings and insights for assessing the extent to which city-level law and governance currently promote water security in varying urban contexts.[98]

The point of departure of this study is that the links between service delivery, sustainable development, the environment and municipal governance in the South African legal framework makes it possible for municipalities to use their legally defined powers and mandate to adopt and implement law and governance instrumentation to optimise the attainment of water security. These instruments include by-laws, strategies, plans, and policies.[99]

1.5 Research question

This thesis seeks to answer the following central research question: *How do city-level law and governance responses in South Africa address water security, and to what extent can these responses be optimised at the local government level?*

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93 57 of 2003.
94 10 of 2004.
95 24 of 2008.
96 This study does not delve into the theoretical argument of what constitutes a "city". For a complete delineation of what a city is, see Van der Berg *Municipal Planning Law and Policy for Sustainable Cities in South Africa* 28-39.
97 The study's focus on cities as metropolitan-size geographical locations is due in part to it being conducted in the context of the research agenda of the South African Research Chair in Cities, Law and Environmental Sustainability (SARChI CLES). See SARChI CLES 2021 http://law.nwu.ac.za/sarchi-cles-chair/background-1.
98 See Chapter 5.
99 See Chapters 4 and 5 of this study.

1.6 Objectives

The main objective of this study is to critically explore how city-level law and governance responses in South Africa address water security and to further assess how these responses can be optimised at local government level. The subsidiary objectives are:

a) To identify, describe and evaluate the theories on, and definitions of water security as relevant to the South African urban context.

b) To establish, based on the theories and definitions above, constituent dimensions of urban water security as relevant for South Africa.

c) To explore international and African regional law and policy perspectives on the dimensions of urban water security to assist in defining the role of sub-national authorities (municipalities) in urban water security.

d) To explore South African law and policy on water security to assist in defining the role of municipalities in addressing the dimensions of water security.

e) To critically analyse specific city-level law and governance instruments (by-laws, policies, plans and strategies) pertaining to water security in Cape Town, eThekwini and Johannesburg.

f) To present findings on how city-level law and governance instruments in South Africa currently address water security and to make recommendations for the optimisation of these instruments.

1.7 Hypothesis

This study is based on the following central hypothesis:

City-level law and governance responses in South Africa are insufficiently tailored to address water security concerns but have the potential to be optimised through the adoption and implementation of integrated and coordinated policy and regulatory instruments.

1.8 Scope and limitations of study

The study is restricted to a legal perspective on city-level law and governance of water security in South Africa. While secondary sources from other academic disciplines such as economics, politics, and environmental studies are consulted, the main purpose of these sources are to enhance the researcher's knowledge about the topics under discussion.

In its assessment and delineation of urban water security dimensions, this study contributes to existing scholarship in the field by providing a legal scholarly perspective. The study illustrates how city-level law and governance, specifically, can contribute to the advancement of water security with reference to three selected case studies. Through illustrating the complex dynamics of urban water challenges, the study justifies why addressing water threats from an urban water security perspective is necessary. Consequently, the originality and significance of this research lies in its analysis of the conceptual understandings of water security and its application to the urban environment in South Africa.[100] Secondly, it lies in the evaluation of urban governance and water security from the perspective of international and African regional law and policy,[101] and its specific focus on the provisions of South African law and policy in defining a role for local government in addressing water security.[102]

The author acknowledges that more instruments exist at both international and regional levels, inclusive of case law, which speak to the dimensions of water security. However, the study is scoped to evaluate only instruments that delineate a role for local government in addressing water security. As a result, the evaluation excludes the consideration of laws and policies pertaining to the recognition of the right to water, for example, as they do not fall within the defined parameters of the study.

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100 Chapter 2 of this study.
101 Chapter 3 of this study.
102 Chapters 4 and 5 of this study.

While this study only made use of desktop analyses and doctrinal legal research methodology through the analysis and interpretation of legal and scholarly sources, the limitations of this methodology are acknowledged.[103] At this juncture it may be necessary to indicate that not all available local laws, policy, plans and strategies may have been evaluated, due in part to the unavailability of the information on the cities' websites. The instruments are thus currently not being made available to the public.

This thesis also did not include empirical research, in part due to the constraints caused by the COVID-19 pandemic. The researcher recognises that engagement with relevant stakeholders, municipal officials, and experts to identify locally specific and pertinent issues and solutions in the selected cities related to the dimensions of urban water security may have been a meaningful contribution to assessing exactly how municipalities can advance the achievement of water security. In addition, it must be noted that it is beyond the scope of a study of this nature to comment on the successful implementation of the existing law and policy responses in the selected cities. Hence, while more interpretation on the practical implementation of the cities' instruments is desired, such an evaluation falls outside of the scope of this study.

1.9 Research methodology

This study makes use of both doctrinal legal research as well as socio-legal research methods[104] to evaluate to what extent city-level law and governance instruments address water security and the extent to which these can be optimised. The use of the doctrinal legal research method excludes assessments or measurements of the implementation of the law and governance responses. This thesis will therefore not pronounce on matters concerning the implementation of the law beyond saying that it is desirable. The research method involves a desk-based literature review of

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103 See para 1.9.

104 Hutchinson 2015 *Erasmus Law Review* 130-138.

international, African regional and South African law and policy (primary sources).[105] The primary sources consulted include international and regional treaties, conventions, declarations, action plans, and ministerial statements. In the South African context, this study reviews sources of law,[106] comprising of the *Constitution*, national legislation and regulations, by-laws, case law, and local environmental governance instrumentation such as sector plans, planning instruments, strategies, and executive policies.[107]

The materials consulted in this study include primary and secondary sources applicable to urban (local government) law and development, water law, environmental and climate change law. The socio-legal methodology finds application in that the study further draws on secondary sources from both law and other disciplines across the social and natural sciences. These sources include scholarly publications such as books, chapters, journal articles, and theses and dissertations, as well as relevant academic outputs published in newspapers, non-legal journals, blogs, and online publications.[108]

The literature review focuses on a combination of a) establishing the meaning of key concepts such as "urban water security", b) critically examining the nexus between city-level (urban) law and governance and water security created in terms of international, regional, and national legal frameworks, and c) evaluating how three South African cities currently respond to water security in their city-level law and governance (by-laws, policies, plans and strategies).

City-level law and governance in this study refers to the measures or responses through which municipalities have given effect to their responsibilities and duties as outlined in the national law and policy framework. These responses refer to specific instruments that municipalities are legally empowered to adopt and implement, which include by-

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105 See Venter *Legal Research: Purpose, Planning and Publication* 73.

106 See Du Plessis, Raboshakga and Kotzé "Sources of Law and Legal Authority" 199-234.

107 See Fuo 2013 *PELJ* 1-45; Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-1-3-86.

108 Venter *Legal Research: Purpose, Planning and Publication* 80, 84.

laws, local policies, plans and strategies.[109] This study focuses on three South African cities namely Cape Town, eThekwini, and Johannesburg. These cities all face water insecurity albeit to different degrees. Some of the challenges they face include rapid urbanisation, severe flash floods and prolonged periods of drought, as well as water pollution and the destruction of aquatic ecosystems.[110]

The City of Cape Town, eThekwini, and the City of Johannesburg also represent the three largest municipalities in South Africa,[111] with significant population growth and urbanisation, as well as their water insecurities and specific climate change risk profiles. Hence, they serve as valuable contributions to this study to gain an understanding of the planning for urban water security within rapidly expanding urban contexts. All three cities are classified as category A municipalities and are empowered institutionally, legislatively, politically, and fiscally to create relevant laws and policies on water security.[112]

Accordingly, the study evaluates the selected cities based on their respective water insecurity and climate change risk profiles, the role they play in the provision of basic services and infrastructure that contribute to water security, and their pro-activeness in drafting and implementing local laws and policy for the avoidance of new, and the reduction of existing, threats to water security. The information collection for the city-specific insights relies on publicly available by-laws, policies, plans, and strategies sourced from official government websites and law databases.

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109 See Chapter 5.

110 See paras 5.2, 5.3 and 5.4.

111 Galal 2022 https://www.statista.com/statistics/1127496/largest-cities-in-south-africa/; Duffin 2022 https://www.statista.com/statistics/671778/top-10-largest-municipalities-in-south-africa/.

112 The categories of municipalities as envisaged in section 155(1) of the *Constitution* are delineated based on their executive and legislative authority. Also see sections 2-11 of the *Municipal Structures Act*.

1.10 Study outline

Considering the background and contextualisation of the primary research question provided in this introductory chapter, this study follows with Chapter 2 which explores the theories and perspectives on, and definitions of water security as relevant in the urban context. The chapter provides a basis for understanding water security and identifies generic constituent dimensions of *urban* water security which cities may need to take on board in local law, policy, and governance responses.

Chapter 3 explores international and African regional law and policy perspectives on the dimensions of urban water security to help define the role of sub-national authorities such as municipalities in urban water security.

Chapter 4 offers an investigation into the law and policy on water security in South Africa. This analysis garners insight into the provisions in South African law and policy perspectives on the dimensions of urban water security to assist in defining the role of South African municipalities in addressing water security.

Chapter 5 considers the laws and policies of three South African cities and assesses how they have addressed water security in their by-laws, policies, and planning instruments with a view to determining whether the measures used in these municipalities address threats to water security measured against the dimensions identified in Chapter 2.

Chapter 6 provides a synthesis of the findings on how city-level law and governance responses in South Africa currently address threats to water security and offers recommendations as to how these responses can be optimised. Some observations are made concerning remaining areas of research in this field.

2 WATER SECURITY IN THE SOUTH AFRICAN URBAN CONTEXT

2.1 Introduction

Considering the complexity and interconnectedness of the prevailing water challenges, it is increasingly expected of cities to take concrete actions to adapt to the risks associated with access to water, rising sea levels, floods, droughts, water pollution and other natural and anthropogenic disasters.[113] Achieving water security, as this chapter will show, is not a static goal.[114] It is instead an ever-changing continuum that alters with the alterations in the challenges it addresses, both non-climatic and climatic.[115] Urban water security is threatened by non-climatic threats such as population growth and demographic changes, rapid urbanisation, and an increasing demand for energy and food.[116] The climatic challenges to achieving urban water security include the intensifying impacts of climate change on water quality and quantity and the extensive socio-economic risks related to climate change.[117]

There is such a considerable quantity of literature on the trajectory of the historical development of the concept of security that it is impossible to offer a full account of all the views, critiques, and definitions in this study.[118] This chapter focuses instead on definitions of water security and limits the application of these theories and definitions to the urban context. The development of the security concept will be discussed briefly, including an analysis of human security as giving rise to the concept of water security. The chapter then discusses the theories on and definitions of water security as relevant

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113 Dodman *et al* "Cities, Settlements and Key Infrastructure" 942-961; UN-Habitat *Trends in Urban Resilience* 3.

114 Brears *Urban Water Security* 25.

115 Brears *Urban Water Security* 25; Caretta *et al* "Water" 563-564.

116 Brears *Urban Water Security* 25; Pereira and Freitas 2017 *Contexto Internacional* 521-523; Aboelnga *et al* 2019 *Resources* 3-4.

117 Brears *Urban Water Security* 25; Dodman *et al* "Cities, Settlements and Key Infrastructure" 921, 926, 934-936.

118 See for example: Commission on Human Security (CHS) *Human Security Now, Protecting and Empowering People*; Gierzewski 2017 *Security Dimensions* 51-66; Nef *Human Security and Mutual Vulnerability*; Gasper and Gómez 2015 *Contemporary Politics* 100-116; Ferreira and Henk 2009 *Armed Forces and Society* 501-525; Kolodziej *Security and International Relations*.

to the South African urban context. This theoretical excursus provides a basis for understanding water security and distilling the generic constituent dimensions of urban water security, which cities may need to take on board in relevant local law, policy, and governance. Finally, the chapter probes into established governance and management approaches to urban water security.

2.2 Contextualising water in the security paradigm

2.2.1 The development of the security concept

The need for water security challenges governments worldwide.[119] According to the Global Water Partnership (GWP),[120] water security promotes environmental protection and social justice, and helps mitigate poor water management. This all-encompassing nature of water security makes the link between water and security concerns significantly more complex, as well as linking water security to many other security concepts.[121] To describe urban water security, one must therefore first comprehend the scope of the "security" concept. However, finding a common and widely accepted description of security has proved to be a challenging task. Security can denote safety from violence or coercive threats, or protection from torture or genocide, or more relevant here, some may see a security threat as environmental and societal damage or potential damage caused by climate change.[122] Regardless, security is widely accepted as dealing with threats, risks, and crises.[123] It is suggested that security is about what

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119 Aboelnga *et al* 2019 *Resources* 1-19; Brears *Urban Water Security*; Cook and Bakker 2012 *Global Environmental Change* 94-102; Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 1-14; Mason and Calow *Water Security*.

120 Global Water Partnership (GWP) *Assessing Water Security with Appropriate Indicators* 1.

121 Spring and Brauch "Securitizing Water" 175. Also see Zeitoun "The Web of Water Security" which offers a conceptual tool linking water security to security areas such as climate, energy, food and community security.

122 Kolodziej *Security and International Relations* 1.

123 UNDP *Human Development Report 2016: Human Development for Everyone* 8.

should be secured, whether at the level of the state, individual, cultural groups, the environment or the planet itself.[124]

According to Brauch and Scheffran,[125] security is a societal value, a political goal and an instrument aimed at protection, risk reduction, certainty, predictability, reliability, trust, and confidence. This view sees security more as having to do with an assurance of the protection of a person or community's protection against any threats to their well-being. Kolodziej[126] asserts that security involves exchanges between humans and their agents. These agents - states, international organisations, associations, corporations, and others – are often prepared to use violence, threats and coercive intimidation to obtain their desired outcomes. From this perspective, having the state as the normative referent object, that is the subject to be secured, seems to be one of the best methods to protect other referent objects.[127] In this regard, a state may fear the loss of its territorial integrity and its national independence and therefore seek to attain security against the loss of these values by using force as a primary instrument, often unilaterally.[128]

Notably, concepts of security were previously discussed in isolation, in separate areas of concern such as health care, economics or environmental science.[129] This resulted in a fragmented and incoherent approach to addressing the complex interrelationship between different security challenges and various forms of human insecurity.[130] The reality for many societies was that the traditional understanding of security had limited bearing on people's actual daily lives and the vulnerabilities that they faced.[131] The

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124 Buzan and Hansen *The Evolution of International Security Studies* 10.
125 Brauch and Scheffran "Introduction: Climate Change, Human Security, and Violent Conflict in the Anthropocene" 3.
126 Kolodziej *Security and International Relations* 23.
127 Buzan and Hansen *The Evolution of International Security Studies* 11; Booth "Global Security" 12.
128 Nieberg 2013 http://www.bpb.de/gesellschaft/migration/kurxdossiers/164896/human-security; Khong 2001 *Global Governance* 232.
129 Lautensach and Lautensach 2012 *Sustainability* 1063.
130 Lautensach and Lautensach 2012 *Sustainability* 1063.
131 Zondi 2017 *Strategic Review for Southern Africa* 186.

traditional understanding of security did not consider the more prevalent social and economic threats to human welfare.[132] A shift in the focus of the threats identified in the international arena from war to poverty also required a shift in the understanding of security matters. Today security matters link to people, their social systems and their environments more broadly.[133] The concept of security has developed to apply to the different objects and entities to be secured and now includes many new threats and insecurities. Hence, human security brings together the many threats, fears, and uncertainties of the present with a strong recognition of the agency of the future.[134]

The Human Development Report (HDR) published in 1994, held that "the world can never be at peace unless people have security in their daily lives."[135] This was the perspective from which a new understanding of security developed, because "the search for human security lies in development." This statement signalled the birth of the notion of human security.[136] The HDR acknowledged the "need to focus on attaining greater societal resilience and improved environmental conditions."[137] It emphasised two main aspects of human security: first, safety from chronic threats such as hunger and disease, and second, protection from sudden and harmful disruptions in the patterns of daily life - whether in homes, in jobs, or communities.[138]

2.2.2 Human security: a new paradigm for security

The HDR considered the threats to human security, and human values, in seven representative categories: economic, political, health, food, personal, community, and environmental.[139] In this system of categorisation, human security refers to overall

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132 Zondi 2017 *Strategic Review for Southern Africa* 186.
133 Behnassi and McGlade *Environmental Change and Human Security in Africa and the Middle East* viii.
134 Sygna, O'Brien and Wolf *A Changing Environment for Human Security* 3.
135 UNDP *Human Development Report 1994* 1.
136 UNDP *Human Development Report 1994* 4; Gierzewski 2017 *Security Dimensions* 52.
137 UNDP *Human Development Report 1994* 22-24; Behnassi and McGlade *Environmental Change and Human Security in Africa and the Middle East* viii.
138 UNDP *Human Development Report 1994* 23.
139 UNDP *Human Development Report 1994* 24-25.

human well-being, where "the threats to human security are no longer just personal or local or national",[140] and where the human becomes a legitimate subject of security - ceasing to be treated solely as an object to protect.[141]

The HDR explains that economic security refers to possession of an assured basic income for individuals, usually from productive and remunerative work, or in the last resort from some publicly financed safety net.[142] In this context the normative content concerning the human right to water entails both physical and economic access to water, with the latter necessitating that water must be affordable for all.[143] Political security concerns the guarantee of several rights, such as the right to representation, to participate and to disagree, but in particular the right to have a real chance to make effective changes in the laws and regulations of social and political life.[144] Protecting, respecting and developing the human right to water and sanitation therefore involves both preserving the amount and quality of water resources as well as ensuring the participation of all users (citizens, communities, NGOs, economic sectors, amongst others) in the economic and emancipative possibilities provided by the management of water as a resource.[145]

Health security entails the possession of guaranteed minimum protection from diseases and unhealthy lifestyles and covers many different issues. These include access to safe water, living in a safe environment, access to health services, access to safe and affordable family planning and basic support during pregnancy and delivery, the prevention of diseases such as HIV/AIDS, and access to knowledge as to how to live a healthy life.[146] There are many different infectious water-borne diseases, including gastroenteritis, amoebiasis, salmonellosis, dysentery, cholera, typhoid fever and

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140 UNDP *Human Development Report 1994* 30-31.
141 Gierzewski 2017 *Security Dimensions* 54; Kaldor "Human Security" 86-87.
142 UNDP *Human Development Report 1994* 25-26.
143 General Comment No 15 para 12(c)(ii).
144 Nef *Human Security and Mutual Vulnerability* 18.
145 Nef *Human Security and Mutual Vulnerability* 18.
146 UNDP *Human Development Report 1994* 27-28.

hepatitis.[147] Diarrhoea is a common first symptom of these diseases which can become a major health hazard in regions without well-managed sanitation, and where faecal material and untreated sewage gets into the water supplies. The COVID-19 pandemic is also placing increasing emphasis on the connection between water and health, in that the provision of safe water, sanitation and hygiene is imperative to ensure human health and well-being during all infectious disease outbreaks.[148] COVID-19 further intersects with all the dimensions of human security, while simultaneously highlighting inequalities and existing structural insecurities.[149]

The United Nations Food and Agriculture Organisation (FAO) defines food security as the assurance that all people, continuously, have ready access to sufficient, safe, and nutritious food.[150] Accordingly, Antonelli, Laio and Tamea[151] indicate that food availability depends chiefly on environmental resources, climatic conditions, and agricultural practices, with water resources as a common denominator. The authors state that major concerns arise about food security in countries with limited water resources since large volumes of water are required to produce food commodities.[152] The principal challenge when seeking to address food security in the urban context is how the food system and the four pillars of food security intersect, enable, or constrain the urban food system and the outcomes that this process generates.[153]

Personal security has to do with protecting people from physical violence, whether perpetrated by individuals or the states.[154] Recent studies have linked water with wars,

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147 World Wildlife Fund- South Africa *Water Facts & Futures: Rethinking South Africa's Water Future* 54.

148 Cooper *Water Security Beyond Covid-19* 2; Newman 2022 *Global Society* 431.

149 Newman 2022 *Global Society* 445.

150 FAO 2008 http://www.foodsec.org/docs/concepts_guide.pdf.

151 Antonelli, Laio and Tamea "Water Resources, Food Security and the Role of Virtual Water Trade in the MENA Region" 199.

152 Antonelli, Laio and Tamea "Water Resources, Food Security and the Role of Virtual Water Trade in the MENA Region" 199.

153 The four pillars of food security include food availability, food access, utilisation and stability. Battersby and Haysom "Linking Urban Food Security, Urban Food Systems, Poverty, and Urbanisation" 58.

154 UNDP *Human Development Report 1994* 31-32.

social conflicts, and other threats of violence in especially African countries.[155] These linkages are particularly prominent owing to the conflicts between different categories of water uses and interests in water resources (economic versus conservation for example).[156]

Roe[157] describes societal (community) security as a concept which concerns the maintenance of a collective identity, including protection from the loss of traditional values. Notably, many groups in society such as children, women, minority groups, people with disabilities, indigenous peoples, asylum-seekers, and refugees and displaced persons still disproportionately experience issues difficulty in gaining physical access to water resources.[158]

Environmental security entails the protection of people from the insecurities related to accessing water, pollution, or global warming.[159] From this perspective, it is imperative to ensure both the protection and the conservation of water resources, *inter alia*, through ensuring the environmental integrity of the ecosystem and protecting socio-ecological systems, as well as protecting humans from the impacts of climate change in the form of droughts and floods, for example.[160]

Against the background of these dimensions of human security, the concept of human security, as it is now understood, presumably also addresses human insecurity in all its varieties. Gasper and Gómez[161] state that the notion of human security can advance two general positive responses to human insecurity, namely the perception of an intensively

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155 Aboelnga *Assessment Framework for Urban Water Security* 13; Detges 2016 *Journal of Peace Research*; Hollo "Introduction: The Concept and Traditions of Water Management Law" 1.

156 Hollo "Introduction: The Concept and Traditions of Water Management Law" 1.

157 Roe "Societal Security" 178.

158 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 24. UN-Water *Eliminating Discrimination and Inequalities in Access to Water and Sanitation* 15-18.

159 UNDP *Human Development Report 1994* 28-29.

160 Also see *UN-Water Policy Brief: Climate Change and Water* 4; UN-Water *Water Security and the Global Water Agenda* 5.

161 Gasper and Gómez 2015 *Contemporary Politics* 112; Gasper and Gómez *Evolution of Thinking and Research on Human and Personal Security 1994-2013* 3, 7, 11.

interconnected and shared global system, and the ability to think sensitively about how other people live their lives. Hence, human security sets out to avoid "in-silo" securitisation and insists upon a contextually and interconnected understanding of security.[162] The Commission on Human Security (CHS) provides that there are two sets of dynamics associated with this new paradigm: [163]

> First, human security is needed in response to the complexity and the interrelatedness of both old and new security threats - from chronic and persistent poverty to ethnic violence, human trafficking, climate change, health pandemics, international terrorism, and sudden economic and financial downturns. Such threats tend to acquire transnational dimensions and move beyond traditional notions of security that focus on external military aggressions alone. Second, human security is required as a comprehensive approach that utilises a wide range of new opportunities to tackle such threats in an integrated manner.

According to the CHS, one cannot confront the threats to human security through conventional mechanisms alone. Instead, new understandings are needed that acknowledge the linkages between development, human rights, and national security.[164]

What is obvious in the various definitions of human security given above is that the concept focuses on two main goals: protection and empowerment.[165] The protection afforded to human security refers to "strategies, set up by states, international agencies, NGOs and the private sector to shield people from menaces."[166] This protection represents the laws, governance arrangements and institutions required to protect people from critical and pervasive threats. [167] In the view of the CHS, protection implies a "top-down" approach, which recognises that people face threats beyond their control that lead to them requiring protection in a systematic, comprehensive and preventative way.[168] On the other hand, the CHS sees empowerment as "strategies that

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162 Morrissey 2019 *Geoforum* 2.
163 CHS *Human Security Now* 4.
164 CHS *Human Security Now* 4.
165 Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 8.
166 CHS *Human Security Now* 10.
167 Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 8.
168 CHS *Human Security Now* 10; Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 8.

enable people to develop their resilience to difficult situations."[169] These strategies suggest the need to adopt a "bottom-up" approach, which aims at developing the capabilities of individuals and communities to make informed decisions and to act on their behalf.[170] In this bottom-up approach, the threats to human security are most effectively dealt with at the local level.

In the context of Southern Africa, Zondi[171] identifies the key features of human security as encompassing the pursuit of economic growth, improved access to resources, and access to essential public services, political empowerment, and institutional support for the purposes of enhancing human well-being. Seemingly, many factors contribute to human (in)security, ranging from infrastructural, institutional, and political, to financial factors, many of which lie outside the sector. Ferreira and Henk[172] point out that a fundamental redefinition of security in South Africa was inevitable following the first democratic elections in 1994. They add that this concept stressed the social, political, and economic empowerment of disadvantaged communities, and addressed educational, environmental, and developmental issues essential to the quality of life.[173] Water security can be considered as such an essential issue.

Salim, Anziani-Vente and Madsen[174] claim that an insecure supply of clean water and safe access to fresh water and sanitation flags the dangers of economic disruption, social tension, and even conflict over water resources at both the domestic and international levels. The discussion on global (environmental security) must therefore consider the interconnected nature of the world, especially since evidence exists that

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169 CHS *Human Security Now* 10; Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 8.

170 CHS *Human Security Now* 10; Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 8.

171 Zondi 2017 *Strategic Review for Southern Africa* 187-188.

172 Ferreira and Henk 2009 *Armed Forces & Society* 517.

173 Ferreira and Henk 2009 *Armed Forces & Society* 517.

174 Salim, Anziani-Vente and Madsen "Water Security: A Dynamic Multidisciplinary Vision from Theory to Practice" 29.

human society is dramatically changing how the earth system operates.[175] Consequently, water is a leading subject of analysis in discussions about (environmental) security, primarily to preserve ecosystem services and to safeguard the biological and hydrological cycles, as well as the ecosphere.[176]

Water is a multi-dimensional issue and essential in achieving human security. Many individual securities need to be met to achieve human security.[177] These include *inter alia* a good level of health and well-being, adequate and safe food, a secure and healthy environment, a secure livelihood, and the protection and fulfilment of fundamental rights and liberties.[178] Water is required for ensuring that these securities are met, from access to water at the individual or community level to the peaceful sharing and management of transboundary water resources across political boundaries at national and regional levels.[179]

Based on the overarching concept of human security, water security forms part of a broad, developmental form of security that focuses on ensuring that individuals have numerous "freedoms".[180] Gleick and Iceland[181] reason that water has played a key role in human security throughout history. According to these authors, pressures over water continue to grow, partly because of population growth, widespread environmental degradation, rising consumption (especially in the Global South), and climate change.[182] Given this understanding of the matter, water security is essential for every single category or dimension of human security, and without it, none of the other dimensions are attainable. Thus, water security, is key to human development and overall security.

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175 Dalby 2013 *The RUSI Journal* 40.
176 Spring and Brauch "Securitizing Water" 175.
177 UN-Water *Water Security and the Global Water Agenda* 5.
178 UN-Water *Water Security and the Global Water Agenda* 5; UNDP *Human Development Report 1994* 30-31.
179 UN-Water *Water Security and the Global Water Agenda* 5.
180 UNDP *Human Development Report 1994* 22; Behnassi and McGlade *Environmental Change and Human Security in Africa and the Middle East* viii.
181 Gleick and Iceland *Water, Security and Conflict* 2.
182 Gleick and Iceland *Water, Security and Conflict* 3.

2.3 Definitions and dimensions of urban water security

2.3.1 Defining urban water security

Urban areas face several challenges concerning water management, particularly in relation to providing sustainable water services for all and at an affordable cost and responding to extreme climatic conditions.[183] Achieving water security in urban environments has particular relevance as cities already include more than half of the world's population and consequently the highest concentration of socio-economic activities.[184] Being both vulnerable and contributing to water insecurities, cities are well-placed to contribute to achieving water security in their localities.

There are many definitions of water security. As a result, most of the scholarship aims at defining and populating dimensions or indicators to capture the distinctive features of water security, including indicators of water scarcity, water stress, water poverty, risk and sustainability.[185] The first comprehensive definition of water security was proposed in the *Ministerial Declaration of The Hague on Water Security* (*Hague Declaration*), which defines water security as:

> ensuring that freshwater, coastal, and related ecosystems are protected and improved; that sustainable development and political stability are promoted, that every person has access to enough safe water at an affordable cost to lead a healthy and productive life and that the vulnerable are protected from the risks of water-related hazards.[186]

Then there is the widely accepted definition of water security offered by UN-Water:

> the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and

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183 Ray and Shaw "Defining Urban Water Insecurity: Concepts and Relevance" 1.

184 Nazemi and Madani 2018 *Sustainable Cities and Society* 926.

185 See for example Pereira and Freitas 2017 *Contexto Internacional*; Aboelnga *et al* 2019 *Resources* 1-19; Brears *Urban Water Security*; Cook and Bakker 2012 *Global Environmental Change* 94-102; Allan, Kenway and Head 2018 *Urban Water Journal* 899-910; Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 1-14.

186 *Ministerial Declaration of The Hague on Water Security in the 21st Century* (2000) para 2. World Water Council 2021 https://www.worldwatercouncil.org/fr/la-haye-2000.

> water-related disasters, and for preserving ecosystems in a climate of peace and political stability.[187]

Both definitions shed light on various dimensions of water security, including the importance of adequate access to water, acceptable water quality, ecological integrity of water resources, and resilience against water-related disasters.[188] They also underscore the interplay between water security and traditional security, in that political stability and peace are preconditions for water security.[189] The *Hague Declaration* also brings vulnerability into the water security context, arguably highlighting the importance of ensuring that factors such as gender, race, age, and ability do not compromise the adaptive capacity of urban populations.

Van Beek and Lincklaen Arriens[190] discuss water security in a slightly different manner by categorising water security in terms of the following "dimensions" - social equity, environmental sustainability, and economic efficiency. They add that the economic dimension of water security includes increasing water productivity and conservation in all water-using sectors and sharing its economic, social and environmental benefits in managing transboundary rivers, lakes and aquifers.[191] The social dimension of water security entails ensuring equitable access to water services and resources for all through implementing robust policies and legal frameworks at all levels and building resilience in communities in the face of extreme water events.[192] This categorisation adds a law and governance component to water security which was absent from earlier conceptualisations. Finally, they state that the environmental dimension of water

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187 UN-Water *Water Security and the Global Water Agenda* 1.
188 UN-Water *Water Security and the Global Water Agenda* 5.
189 See para 2.2.2 above.
190 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 12-13.
191 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 12.
192 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 13. See the discussion in para 2.4 below on the law, governance, and management dimension to urban water security.

security entails managing water sustainably as part of a green economy and restoring ecosystem services in river basins to improve river health, for example.[193]

In a comparable manner to the previous authors, but expanding slightly, Hoekstra, Buurman and Van Ginkel,[194] analyse water security in terms of four outcomes: an increase in welfare, enhancing social equity, moving towards long-term sustainability, and reducing water-related risks. In terms of "welfare", the authors state different water system services, such as the supply of water, could be measured in terms of their relative contribution to urban welfare.[195] From this perspective, "urban water security" essentially comes down to increasing the benefits of water in a city (protecting water sources and ecosystem services), as well as reducing or avoiding damage associated with water (or an absence of sufficient water) in the city.[196] The expansion of this welfare focus, to include equity and sustainability, suggests a "developmental focus" on water security.[197]

The developmental focus on water security seeks to improve water security over time and typically seeks outcomes in the form of goals and targets, through a combination of policies, reforms and investment projects.[198] Water security is therefore related to developmental aspects such as food security, energy generation, and poverty reduction. Additionally, reducing water-related risks forms part of the "risk-based approach" to water security, which entails managing risks and reducing the community's vulnerability to shocks resulting from climate variability and water-related disasters.[199] Managing risks such as water shortage and scarcity, inadequate quality, excess water (floods),

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193 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 13.
194 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 3.
195 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 5; Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 13.
196 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 3.
197 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 3; Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 13.
198 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 13.
199 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 3; Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 13.

and inadequate access to safe water services would primarily fall under the "risk-based approach" for water security. It is generally suggested that these two approaches should be pursued simultaneously and in a balanced manner, seeing that they are complementary.[200]

The broader conceptualisation of water security recognises universal dependency on water as a fundamental form of natural capital, in a way that acknowledges both an environmental dimension (protecting the resource for present and future generations)[201] and a developmental one (providing access to sufficient water to permit all to fulfil their capabilities).[202] Water security is thus well-placed in the sustainability paradigm as the concept integrates and balances governance, environmental, economic, and social interests. Honkonen,[203] notably argues that inherent in the definitions of water security is the dichotomy between human needs and vulnerability on the one hand, and sustainability and the protection of ecosystems, on the other. Due to the existence of this dichotomy, approaches to addressing environmental issues are often anthropocentric in nature.[204] In this instance the human becomes the entity to be protected from threats and risks to the environment such as water scarcity, water-related disasters, and water pollution for example. However, to address the full scope of threats to water security, governments need to harmonise the anthropocentric and ecocentric views of water.

Discussion of water security is meant to convey the urgency of the water crisis at all levels of governance and inspire urgent action to ensure equitable access to water, prevent and minimise ecosystem degradation, provide wastewater, stormwater and sanitation services, protect the city from droughts and floods, and ensure access to

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200 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 13.
201 Honkonen 2016 *PELJ* 5.
202 Sandford *The Human Face of Water Insecurity* 2.
203 Honkonen 2016 *PELJ* 5.
204 See Kotzé 2014 *Journal of Energy & Natural Resources Law* 121-156. Also see Cliquet "Ecological Restoration as a Legal Duty in the Anthropocene" 67; De Lucia 2017 *Journal of Human Rights and the Environment* 181–202; McIntyre "Environmental Protection and the Ecosystem Approach" 139.

water for socio-economic development and livelihoods.[205] In this regard, although the broad definition of water security is applicable at both the national and local scales (the city level), it is necessary to focus on specific issues at each scale.[206] Likewise, at a national (government) level water security facilitates strong links with national goals on food security and energy security, making it necessary to clarify transboundary issues for countries that share water resources, for example.[207] However, applying the concept at the city or community level puts more emphasis on localised risks as well as individual water users and their unique social and environmental contexts.[208]

Moving on from consideration of general understandings of water security, it can be noted that urban water security differs from the more general notion of water security in that it applies to the territory of an urban area, a municipality, or an urban agglomeration, as Hoekstra, Buurman and van Ginkel submit.[209] The essence of an urban area is its high population density and its dependence on its hinterland for the supply of natural resources. Consequently, large urban areas typically cannot meet their water supply needs locally.[210] The term "urban water" encompasses all forms of water found in an urban setting, such as stormwater, rivers, wetlands, streams, wastewater, reservoirs, groundwater, aquifers and estuaries (coastal or inland areas will differ slightly in this regard).[211]

The broad definition of urban water introduces several uses of water and water services into the system that are specifically valid for urban water security, and not for water security at the household, state, or global level, which conjure a myriad of complex and

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205 Meissner *et al Understanding Water Security at Local Government Level in South Africa* 51-52.
206 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 20.
207 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 20.
208 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 20.
209 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 2.
210 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 2.
211 Government of Western Australia 2017 https://www.water.wa.gov.au/urban-water/urban-development/urban-water-management; Oral *et al* 2020 *Blue-Green Systems* 113; Tucci 2008 *Estudos Avançados* 100.

interrelated challenges.[212] This study views "water services" as including water supply services (potable and non-potable), sewage services (collection, treatment and disposal), drainage services (stormwater, groundwater, runoff and surface water), as well as irrigation services (for agriculture). The urban water system comprises of both the social structures (institutions for example) and the material infrastructure to: a) carry out water services, b) protect the system in its entirety against risk and hazards, and c) preserve the natural environment (aquatic ecosystems) in the city's boundary.[213] Water supply, wastewater collection and treatment, and flood protection infrastructure are all interrelated in these systems, as are the natural water resources and ecosystems they support.[214] In this regard, water security is largely linked to how cities grow and how water is managed (both naturally and through the built infrastructure).[215]

An urban water system functions as an integrated and complex network. The system consists of the infrastructure to carry out water services, the institutional framework for the utilisation and transformation of interconnected water processes, as well as the consumers, and the built and natural environment.[216] However, it is practice worldwide that water supply, sanitation, wastewater treatment, stormwater drainage, and solid waste management, regulation and planning are treated as isolated services in the urban context. [217] This also means that there is a range of authorities, with each guided by distinct policies and legislation, that oversee these water subsectors at the city level.[218] An extended, integrated and networked water system can be established in a city through the co-ordinated efforts of various government agencies and organisations.[219] This requires co-ordinated urban planning, good governance, and

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212 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 2.
213 Jensen and Khalis 2020 *PLoS One* 1.
214 Jensen and Khalis 2020 *PLoS One* 1.
215 Pereira and Freitas 2017 *Contexto Internacional* 531.
216 Romero-Lankao and Gnatz 2016 *Current Opinion in Environmental Sustainability* 47; Polonenko, Hamouda and Mohamed 2020 *Science of The Total Environment* 2.
217 Cosgrove and Loucks 2015 *Water Resources Research* 4834; Steyn *et al* "Water Security and South Africa" 33.
218 Cosgrove and Loucks 2015 *Water Resources Research* 4834.
219 Mitlin *et al Unaffordable and Undrinkable: Rethinking Urban Water Access in the Global South* 5.

substantial financial investment.[220] It is therefore necessary to understand and unpack the definitions and contexts of water security to identify the distinct yet interrelated dimensions of water security that cities need to address through local law and governance practices.

Urban water security further differs from water security in general due to its specific spatial and geographic scale. This places city governments in a unique position to address water-related issues at the local level. Additionally, factors such as social and economic circumstances, institutional governance arrangements and physical features of cities combine intricately, and all relate to the concept of urban water security.[221] City governments, for example, must provide essential infrastructure and services, and have a wide variety of responsibilities related to land use planning and development, which allows them to address various disaster risk factors as well.

Urban water security is understood as the ability of urban water actors to ensure the continued availability of water of sufficient quality and quantity and helping build communities and ecosystems that are resilient in the face of unpredictable global change.[222] Two important aspects of urban water security emanate from this definition, namely the sustainable availability of adequate quantities of water, and resilient urban areas and ecosystems.[223] The aspect of the sustainable availability of water deals with ensuring a balance between water availability for enhancing social equity, environmental protection and economic development.[224] The second aspect pertains to

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220 See De Carvalho, Carden and Armitage 2009 *Water SA* 144.

221 Lundqvist "When Minority Becomes Majority - Facilitating Water Security in Rapidly Growing Urban Systems in the South" 33; Jensen and Khalis 2020 *PLoS One* 1; Aboelnga *et al* 2019 *Resources* 5-6. Also see Brown, Keath and Wong 2009 *Water Science Technology* 847-855.

222 Romero-Lankao and Gnatz 2016 *Current Opinion in Environmental Sustainability* 47.

223 Romero-Lankao and Gnatz 2016 *Current Opinion in Environmental Sustainability* 47.

224 See Romero-Lankao and Gnatz 2016 *Current Opinion in Environmental Sustainability* 47; Du Plessis and Du Plessis "Striking the Sustainability Balance in South Africa" 415-417. See more on this in para 2.3.2.1 below.

achieving urban water resilience,[225] and in this context the aim is to improve urban water management, which primarily deals with climate change adaptation and disaster risk management. It is discernible that sustainability and resilience are both identified as goals of water security and will require consideration and integration into water management and governance.

Based on the definitions and conceptualisations of urban water security, it can be stated that urban water security commands a shift in how cities plan, manage, govern, and finance their water and urban systems. The scholarship in this field suggests that attaining urban water security requires:[226]

fulfilling all different urban-related water system services such as water consumption, treatment and distribution, wastewater collection, treatment, and discharge back to natural waters; [227]

addressing commercial and industrial demand for water, over and above human consumption; [228]

providing for equitable access to adequate quantities and an acceptable quality of water that is affordable;[229]

ensuring protection against water-related disasters and water pollution including risks and uncertainties relating to hazards, exposure, and vulnerability (also

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225 Urban water resilience, or resilient urban water management is discussed separately in para 2.4.2 below.

226 See for example Pereira and Freitas 2017 *Contexto Internacional*; Aboelnga *et al* 2019 *Resources* 1-19; Brears *Urban Water Security*; Cook and Bakker 2012 *Global Environmental Change* 94-102; Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 1-14.

227 Magnusson *Urban Water Security – Local Conditions and Regional Context* 21.

228 Magnusson *Urban Water Security – Local Conditions and Regional Context* 21.

229 Aboelnga *et al* 2019 *Resources* 2; Brown, Keath and Wong 2009 *Water Science Technology* 847-855.

considering climate change),[230] the latter including aspects of coping capability and resilience;[231] and

addressing social equity and environmental sustainability.[232]

The above suggests the functions of an urban water system seeks to be perform through water governance and management. Although the political and regulatory powers vary widely, cities are uniquely positioned to lead the way in addressing water security.

2.3.2 Dimensions of urban water security

This study defines urban water security as the dynamic capacity of the urban water system (including its social, economic, technological, infrastructural, political, legal, and environmental components) to ensure equitable, secure and reliable access to an adequate, affordable, clean and safe drinking water supply, provide wastewater and sanitation services, protect ecosystems, ensure access to water to sustain livelihoods and socio-economic development, and to adequately respond to water-related climate risks and disasters, in the face of increasing threats.

An urban water system needs to be designed to provide continuous water services without water losses, while also being resilient to climate extremes such as floods and droughts.[233] In this understanding, "dynamic" alludes to the ability of water stakeholders (actors and users) and water infrastructure to proactively adapt to changing climate conditions and water-related disasters, as well as the ability to make decisions in the context of uncertainty.[234] In working towards achieving urban water security,

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230 See the discussion in para 2.3.2.4.

231 Aboelnga *et al* 2019 *Resources* 2; Cosgrove and Loucks 2015 *Water Resources Research* 4834; Bakker and Morinville 2013 *Philosophical Transactions of the Royal Society* 2.

232 Cosgrove and Loucks 2015 *Water Resources Research* 4834; Bakker and Morinville 2013 *Philosophical Transactions of the Royal Society* 2.

233 Aboelnga *Assessment Framework for Urban Water Security* 26.

234 Aboelnga *Assessment Framework for Urban Water Security* 26.

municipalities should consider the social, economic, and environmental conditions present in their local areas, ensure good governance and accountability, implement sound legal arrangements, and collaborate and co-operate with other municipalities, different spheres of government and other sectors, such as the private sector.[235]

This section of this study delineates dimensions of urban water security informed both by the literature on water security, in its generality, and in urban water security more specifically, and the South African urban context. These delineated dimensions are critical for achieving urban water security and include: (a) equitable, secure, and reliable access to an adequate, clean and safe drinking water supply in urban areas, (b) accessible, safe, secure, adequate and equitable sanitation, wastewater, and stormwater services, (c) healthy, functional and sustainable urban aquatic ecosystems, (d) effective water-related climate change adaptation and disaster responses, and e) a reliable and equitable supply of water for sustainable economic and social development. All these dimensions require an enabling water governance and management framework that is integrated, transparent, participatory, and accountable.[236]

2.3.2.1 Equitable, secure, and reliable access to an adequate, clean, and safe drinking water supply in urban areas

South Africa is rapidly urbanising, with over 67.35 per cent of the state's total population living in cities and urban areas in 2020, and with this percentage predicted to rise to more than 71 per cent by 2030.[237] South African cities are already facing a myriad of challenges beyond water availability and quality, with the added pressure of urban poverty and a dire need for local economic development and sustainability. Despite making important strides in improving access to water since 1994, several

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235 Aboelnga *et al* 2019 *Resources* 5-6; Brown, Keath and Wong 2009 *Water Science Technology* 847-855. UN-Water *Water Security and the Global Water Agenda* 26.

236 Due to the prescribed scope and breadth of this thesis, it is not possible to discuss all the dimensions and their elements and sub-elements in detail. For more on water management and governance, see para 2.4 below.

237 O'Neill 2022 https://www.statista.com/statistics/455931/urbanization-in-south-africa/.

informal settlements in South African urban areas are still not adequately serviced, and where water treatment, delivery infrastructure and services are in place they are often deteriorating.[238] At a household and individual level, the inability to maintain adequate access to and an adequate quality of drinking water and sanitation services may be the most salient barrier on the path to sustained urban water security.[239]

The expansion of urban areas both directly and indirectly causes an increase in demand for water services.[240] The first dimension of water security therefore focuses on ensuring equitable, secure, and reliable access to an adequate, clean, and safe drinking water supply in urban areas.[241] This dimension primarily aims to safeguard an adequate and sustainable quantity of water of an acceptable quality, which is physically, legally, and continuously available to meet the water demand of an increasing urban population. The elements under this dimension include water quantity, accessibility, water quality, adequacy and equity, all of which interact with and are affected by one another.[242]

In terms of water quantity, several sub-elements come into play, such as the availability of water resources, the reliability of the water system, consumption, and diversity of new sources.[243] Water availability is affected by various issues including population growth, climate change, pollution, competing water demands, urbanisation, inadequate or failing infrastructures, and various other natural or anthropogenic factors.[244] The challenge to water availability is primarily illustrated through water scarcity, which occurs when demand exceeds supply, at the current price or under current access

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238 Department of Environmental Affairs (DEA) *South Africa's First Annual Climate Change Report* 48; OECD *Water Governance in African Cities* 20, 22.

239 Krueger *et al* 2019 *Global Environmental Change* 66-74; Cosgrove and Loucks 2015 *Water Resources Research* 4829. Sanitation services are discussed separately in para 2.3.2.2.

240 Loucks and Van Beek *Urban Water Systems* 527; Goonetilleke *et al Sustainable Urban Water Environment: Climate, Pollution and Adaptation* 5.

241 See Aboelnga *et al* 2019 *Resources* 5-6; Brown, Keath and Wong 2009 *Water Science Technology* 847-855; UN-Water *Water Security and the Global Water Agenda* 2.

242 Aboelnga *et al* 2019 *Resources* 7.

243 Aboelnga *et al* 2019 *Resources* 6.

244 Douville *et al* "Water Cycle Changes" 1060.

constraints.[245] Many South African cities are currently experiencing, have experienced, or will experience water shortages.[246]

Water scarcity can be in the form of physical or economic scarcity.[247] Physical water scarcity occurs when the demand for water exceeds the amount available, which applies to water needed to fulfil human needs as well as for satisfying ecosystem functions. In this case, physical water scarcity can be ascribed to a lack of rainfall or inequality of geographical water distribution, for example.[248] Economic water scarcity, on the other hand, is represented by poor water infrastructure or poor water management where infrastructure is in place. These are often attributed to a lack of investment or insufficient funds to pay for water.[249] It is arguable that the City of Johannesburg is currently experiencing economic water scarcity even though the major dams supplying the Municipality are full.[250] To increase water availability it is imperative to improve the reliability of the urban water system, to reduce water consumption, to encourage sustainable water use, and to diversify or augment water supply sources.

Ensuring an adequate quantity of water necessitates improving the capacity of municipalities to safeguard a sustainable and integrated water supply from alternative sources.[251] Augmenting the water supply will require introducing measures that enhance water supplies including constructing and maintaining dams and reservoirs (primarily at national level), and introducing alternative water sources such as desalination,

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245 United Nations 2014 https://www.un.org/waterforlifedecade/scarcity.shtml.

246 See para 1.1.

247 UN-Water 2022 https://www.unwater.org/water-facts/water-scarcity.

248 UNESCO *Water Security and the Sustainable Development Goals* 25.

249 International Water Management Institute *Comprehensive Assessment of Water Management in Agriculture* 11; UNESCO *Water Security and the Sustainable Development Goals* 25.

250 Engelbrecht and Monteiro 2021 *South African Journal of Science* 2; Haffajee 2022 https://bit.ly/3CvnRBc; Evans 2022 https://www.dailymaverick.co.za/article/2022-10-12-urgent-steps-need-to-be-taken-if-gauteng-is-to-avoid-running-out-of-water-soon/.

251 Aboelnga *et al* 2019 *Resources* 7; Howard and Bartram *Water, Sanitation and Health Team: Domestic Water Quantity, Service Level and Health* 2.

groundwater, greywater reuse, and stormwater and rainwater harvesting schemes.[252] In this regard, diversifying water sources speaks mainly to ensuring the sustainability of the water supply.

The reliability of the urban water system depends both on ensuring the right quantity of water of the adequate quality and at the required pressure.[253] The water system's reliability is also linked to the abstraction of water, and overall efficiency. For a water system to be considered reliable, water needs to be continuously available with little to no supply interruptions. However, most South African urban water systems do not adhere to the standard of providing a reliable and continuous water supply, with big cities being frequently exposed to issues such as water outages, intermittent water supply, and water pressure reduction.[254]

The unreliability of urban water systems in South Africa has been attributed, *inter alia*, to under-investment and delays in the maintenance and renewal of infrastructure, poor management, limited budgets, poor revenue management by municipalities, the misappropriation of funds, and a lack of capacity or necessary technical skills related to water services operation and maintenance.[255] Challenges such as water interruptions, non-revenue water, and weaknesses in the performance of the water system can be used as indicators of infrastructure reliability.[256] The term "non-revenue water" refers to physical, commercial, and unbilled water losses resulting mainly from infrastructural leakages.[257] South African cities currently experience a staggering 37 per cent in water

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252 Jensen and Wu 2018 *Environmental Science and Policy* 36; Aboelnga *et al* 2019 *Resources* 7; Ndeketeya and Dundu 2022 *Resources, Conservation & Recycling Advance* 1.

253 Aboelnga *et al* 2019 *Resources* 8; Aboelnga *Assessment Framework for Urban Water Security* 28.

254 Loubser, Chimbanga and Jacobs 2021 *Water SA* 2; Bhengu 2020 https://www.news24.com/amp/news24/southafrica/news/rand-water-to-cut-water-pressure-in-three-municipalities-owing-millions-20201109.

255 Du Plessis 2022 https://mg.co.za/news/2022-08-02-basic-water-services-in-south-africa-are-in-decay-after-years-of-progress/.

256 Aboelnga *et al* 2019 *Resources* 8. Also see Steyn *The Realisation of the Constitutional Water Right in South African Cities through Intelligent Water Management Technologies* 130-131.

257 Kingdom, Liemberger and Marin *The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries* 1.

loss from potable water distribution systems.[258] To enhance urban water security, cities can employ innovative technologies to tackle the interconnected challenges of sustainable water service provision, illegal water use, non-revenue water, and insufficient data.[259] However, the literature reviewed suggests that innovation and technology are often overlooked in the pursuit of urban water security. It is crucial for cities to ensure that their water supply systems are functional and resilient as they design, construct, and upgrade them.[260] Addressing water consumption in cities *inter alia* involves improving the capacity of water utilities to supply water to consumers by addressing both demand-side management and the wasteful and excessive consumption of water.[261] It also entails consuming water in the most rational and sustainable way to preserve the water available. Furthermore, implementing measures for water demand management and conservation will also improve water availability, and the system's reliability.

Accessibility relates both to sanitation services and drinking water services.[262] Access has been described as having four elements: spatial, temporal, qualitative, and pecuniary.[263] The spatial element refers to the distance to a point of supply, and the temporal to the intermittency problems of piped water, that is, even where water infrastructure exists, there needs to be proper access.[264] In this context, many cities and other localities in South Africa are currently facing or will in future face intermittent water supply.[265] Furthermore, the (sanitary) quality of water also determines the extent

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258 Bhagwan 2021 *Water Engineering* 11-12.

259 NPC *National Water Security Framework for South Africa (2020)* 20; See Steyn *The Realisation of the Constitutional Water Right in South African Cities through Intelligent Water Management Technologies* 3; Steyn 2022 *SAPL* 1-26.

260 Romero-Lankao and Gnatz 2016 *Current Opinion in Environmental Sustainability* 48.

261 Aboelnga *et al* 2019 *Resources* 8; Aboelnga *Assessment Framework for Urban Water Security* 14. This ties in with the final dimension of urban water security discussed in para 2.3.2.5.

262 Aboelnga *et al* 2019 *Resources* 6.

263 Gawel and Bretschneider 2016 *Journal for European Environmental & Planning Law* 198.

264 Gawel and Bretschneider 2016 *Journal for European Environmental & Planning Law* 198-199.

265 Beard and Mitlin 2021 *World Development* 2-3; Loubser, Chimbanga and Jacobs 2021 *Water SA* 1. "Intermittent water supply" is defined as a management strategy where water supply in a system, or part thereof, is physically shut off to limit the consumption for periods longer than 24 hours.

to which there is access.[266] Lastly, the pecuniary expenses (water prices) determine the potential access of a household.[267] Each of the aforementioned can be assigned to one of the access elements: physical accessibility (spatial), availability (temporal), acceptability (quality), and affordability (pecuniary).[268]

Water quality refers to both drinking water quality and wastewater treatment.[269] Adequacy refers to the actual supply of water being sufficient to meet everybody's needs, in terms of both quality and quantity.[270] Cities must provide drinking water based on minimum service standards such as the amount of water each person requires per day. Equity in the context of water provision means that all people within the jurisdiction of the city should receive a fair supply of the amount of water available, regardless of race, ability, gender, sexuality, age or status, for example.[271] This element can also be effected through the provision of free or low-cost water services to vulnerable populations, as well as ensuring meaningful participation and inclusion of all stakeholders in decision-making processes related to water management.

2.3.2.2 Accessible, safe, secure, adequate and equitable sanitation, wastewater, and stormwater services

The provision of sanitation, wastewater, and stormwater services is seen as a distinct dimension of urban water security even though the provision of drinking water and of sanitation services is often treated as the provision of a single service. While providing sanitation services in the form of facilities such as toilets is important (and will be highlighted later in this thesis), this dimension primarily focuses on the collection and

266 Gawel and Bretschneider 2016 *Journal for European Environmental & Planning Law* 198-199.
267 Gawel and Bretschneider 2016 *Journal for European Environmental & Planning Law* 199.
268 Gawel and Bretschneider 2016 *Journal for European Environmental & Planning Law* 199.
269 Aboelnga *et al* 2019 *Resources* 6.
270 Aboelnga *et al* 2019 *Resources* 8.
271 Aboelnga *et al* 2019 *Resources* 8.

treatment of urban wastewater (sewage) and stormwater to protect human and environmental health and well-being.[272]

Water pollution presents a major threat to water quality, human health, and overall water security.[273] Both point and non-point sources can release pollutants into the environment, and specifically into water resources. Point sources are discrete and well-defined, including pipes or canals that discharge into surface water bodies from municipal, mining, or industrial sources.[274] Non-point sources, on the other hand, cannot be ascribed to a specific source and are typically attributed to land use, climate, and geology.[275] The primary sources of water pollution in urban environments are sewage discharge (wastewater), industrial and agricultural activities, and stormwater and flood water.[276] While water pollution detrimentally affects aquatic ecosystems and is caused by activities in the urban water system, this study discusses it under sanitation, wastewater, and stormwater services, but acknowledges the relation between this dimension and the third dimension.[277]

The state of wastewater management in South Africa is increasingly described as "abysmal", with many reports indicating that municipalities are failing at or incapable of addressing issues of wastewater management.[278] The recently reinstated Blue and Green Drop Certification programmes, which respectively address sewerage and drinking water in municipalities, highlight the alarming state of wastewater treatment

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272 DWS *Green Drop National Report 2022* 3.

273 Bosman, Kidd and Alberts "Water Quality Management" 995; UN-Water *World Water Development Report 2017: Wastewater: The Untapped Resource* 17.

274 Bosman, Kidd and Alberts "Water Quality Management" 997; Brears *Urban Water Security* 17.

275 Bosman, Kidd and Alberts "Water Quality Management" 997.

276 Jiménez "Wastewater Risks in the Urban Water Cycle" 152.

277 The third dimension is discussed in para 2.3.2.3 and pertains to the protection of aquatic ecosystems.

278 Winter and Carden 2022 https://theconversation.com/south-africas-ability-to-manage-wastewater-is-collapsing-whats-at-risk-181608; Kretzmann 2022 https://www.dailymaverick.co.za/article/2022-06-21-a-tsunami-of-human-waste-half-of-sas-sewage-treatment-works-are-failing-says-study/.

and water quality in South Africa.[279] The Green Drop Report, released in March 2022, provides an analysis of the overall performance of wastewater treatment plants and highlights underperformance in several areas related to water treatment in municipalities. However, the Report does not provide any insights into the status of sanitation connected to the wastewater treatment works.[280]

Based on the findings of the Report, of a total of 850 municipal wastewater treatment works, 334 are in a critical risk category, at both the treatment and collection levels.[281] In addition to the general challenges, South Africa's energy crisis also impacts on the ability of municipalities to meet their water service duties, as is evident from the effects of load-shedding on water infrastructure.[282] As a result of the poor management of wastewater treatment works, a lot of the untreated sewage ends up leaking into the environment. The discharge of untreated wastewater and stormwater into rivers, lakes, wetlands, and groundwater poses a danger to these systems as they also support flood control and drought mitigation and pose risks such as water-borne disease outbreaks.[283]

Some of the most significant drivers for the inadequacies in wastewater treatment include that wastewater treatment plants frequently operate above their total capacity, have dysfunctional processes, inadequate infrastructure and unsatisfactory flow monitoring systems. They are generally non-compliant with water legislation, standards and guides.[284] To ensure accountability and efficiency in wastewater and sanitation services, collecting and sharing data, reporting on and monitoring the efficiency of

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279 DWS date unknown http://www.dwa.gov.za/Documents/RSP.aspx. The Blue and Green Drop Programmes are forms of incentive-based regulation established to improve excellence in water quality and wastewater management.

280 Winter and Carden 2022 https://theconversation.com/south-africas-ability-to-manage-wastewater-is-collapsing-whats-at-risk-181608.

281 DWS *Green Drop National Report 2022* 18.

282 Crisp 2022 https://www.engineeringnews.co.za/article/load-shedding-spells-trouble-for-water-supply-2022-07-22/rep_id:4136; Patrick 2022 https://www.news24.com/news24/southafrica/news/load-shedding-likely-to-have-impact-on-water-supply-in-joburg-says-water-utility-20220919; Winter *Power Outages and their Impact on South Africa's Water and Wastewater Sectors* 40-42.

283 UN-Water *World Water Development Report 2017: Wastewater: The Untapped Resource* 40.

284 Van der Merwe-Botha *Water Quality: A Vital Dimension of Water Security* 47-48.

wastewater collection and treatment are imperative. Regular water quality monitoring and water infrastructure assessments are crucial to reducing the risk of the contraction of water-borne diseases, the degradation of ecosystems and major physical water losses. Similarly, data are necessary *inter alia* on the condition of existing wastewater infrastructure and the performance of wastewater treatment.[285]

The provision of sanitation services guarantees all urban residents affordable and physically accessible sanitation, that is safe and secure (in terms of location, privacy, and hygiene), that is reliable and that is socially and culturally acceptable. Like drinking water services, sanitation services also need to be provided equitably, with all people being entitled to access to sanitation services without discrimination. From wastewater collection to its treatment, disposal, and reuse, the associated risks with wastewater should be effectively managed. Wastewater may be collected by the sewage system, flow into a wastewater treatment facility, be kept on the property and treated there, or it may be temporarily stored and then moved to a licensed facility for treatment, depending on the type, quantity, and site conditions.[286]

According to the quantity, quality and site conditions as well as the intended uses of the treated wastewater, various technologies can be used to treat the wastewater after it has been collected. Instead of the mere disposal of treated wastewater into a waterway, coastal or ocean outfall, or land disposal area, treated wastewater can be reintegrated into the environment and reused.[287] This reintegration offers municipalities the opportunity to use water responsibly and to restore it. Treated wastewater may be reused for agricultural irrigation or industrial processes or reintegrated into the environment through restoring the water to aquifers.[288]

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285 UN-Water *World Water Development Report 2017: Wastewater: The Untapped Resource* 45.
286 Jiménez "Wastewater Risks in the Urban Water Cycle" 152.
287 Cisneros "Safe Sanitation in Low Economic Development Areas" 181.
288 Cisneros "Safe Sanitation in Low Economic Development Areas" 188-190.

Municipalities usually have the primary responsibility for urban wastewater.[289] Yet the collaboration of all residents and industries is crucial to avoid water pollution and the dumping of waste – and this requires a combination of water user education, advocacy, incentives, and regulation. According to UN-Water,[290] increasing the political will to tackle pollution at its source and to treating wastewater will protect the environment as well as public health and mitigate the costly impact of pollution while increasing the availability of water resources. It adds that wastewater is an undervalued source of water, energy, nutrients and other recoverable by-products and claims that recycling, reusing and recovering wastewater can alleviate water stress and provide many social, economic and environmental benefits.[291]

In South Africa, stormwater is managed separately from water and sanitation services. Stormwater runoff is produced when the accumulation of rain exceeds the capacity of the city's drainage system.[292] In cases where stormwater flows into sewers that carry both domestic and industrial wastewater, the combined sewer network overflows quicker than expected. As a result, urban sewage systems can be overloaded, resulting in surface water flooding, overflowing urban wastewater treatment plants, and untreated sewage flowing into rivers, lakes, or coastal areas. In addressing stormwater in South African urban areas, consideration should be given to ensuring effective stormwater networks. Cities may need to integrate sustainable urban drainage systems (SUDS) into their planning and development policies.[293] SUDS use natural systems (ecological infrastructure) to support surface water runoff through storage and cleaning before slowly releasing runoff to waterways.[294]

To address the many ills of wastewater, stormwater and sewage management, municipalities can choose to outsource these services, although this is controversial at

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289 See Chapter 4.
290 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.
291 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.
292 Palmer *et al South Africa's Urban Infrastructure Challenge* 26.
293 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 12.
294 Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 12.

times. Meanwhile, maintaining and securing infrastructure for stormwater, sanitation and wastewater services remains one of the most significant interventions.

2.3.2.3 Healthy, functional and sustainable urban aquatic ecosystems

Aquatic ecosystems in South Africa include rivers and streams, estuarine systems, marine systems, wetlands, floodplains, lakes and dams and groundwater systems.[295] Aquatic ecosystems require several components to guarantee their health and capacity to deliver ecological services (their functionality). Depending on the type of ecosystem, these components may include flowing, underground, or surface waters, physical habitats and habitat forms, plants, biota, and biochemical and ecological processes.[296]

Water is acknowledged as one of the most valuable resources for sustaining ecosystems and their services.[297] Notably, Nel *et al*[298] maintain that ecosystem services include provisioning services such as water for domestic and industrial uses, regulating services such as dilution of waste, and cultural services such as aesthetic, recreational, sense of place, and identity associations. These ecosystem services translate into benefits such as reduced water quality treatment costs and improved health, leading to an overall improvement of human well-being.[299]

Healthy, well-functioning ecosystems can also play a significant role in buffering cities, settlements, and infrastructure from climate hazards. At the city level, ecological infrastructure and ecosystem-based approaches can provide alternative means to

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295 Here the terms "water-related ecosystems" and "aquatic ecosystems" are used interchangeably. Aquatic ecosystems are defined as "the abiotic (physical and chemical) and biotic components, habitats and ecological processes contained within rivers and their riparian (bankside) zones, reservoirs, lakes and wetlands and their fringing vegetation." - Wepener, Malherbe and Smit "Water Resources in South Africa" 352. As used above, the term "aquatic ecosystem" refers to the environment (habitat) in which water-dependent species thrive rather than the actual organisms that live there (animals, plants and microbes for example).

296 DEA *South Africa Environment Outlook 2016* 132-133; Wepener, Malherbe and Smit "Water Resources in South Africa" 351-355.

297 UNEP *Water Security and Ecosystem Services: The Critical Connection* 13.

298 Nel *et al* 2017 *Ecosystem Services* 1.

299 Brauman and Daily 2008 *Human Ecology* 1148; Boyd and Banzhaf 2007 *Ecological Economics* 619.

manage water-related risks.[300] Floodplains and wetlands can reduce the impact and occurrence of water-related disasters seeing that they protect cities from floods and droughts by absorbing or storing excess water.[301] The natural environment can also filter or dilute pollutants and improve the quality of water access in cities.[302] Where there is sufficient, good quality freshwater available to support the functioning of ecosystems, the ecosystems will be healthy and capable of providing the water needed for the benefit of both human and natural communities.[303] For instance, improved catchment management, including the clearing away of invasive species, has been identified as one of the most cost-effective ways of increasing water supply in areas such as Cape Town.[304]

Over the years scientists and conservationists have used interchangeable adjectives such as "ecological", "natural", and "green" as means of describing the idea of "naturally functioning ecosystems that deliver valuable services such as freshwater, climate regulation and disaster risk reduction."[305] Urban infrastructure includes green (open spaces such as parks and lawns, as well as mangroves), blue (lakes, rivers, wetlands, aquifers and floodplains), and grey (dams, seawalls, pipes, water treatment plants and embankments) infrastructures. The notion of nature-based solutions provides a more comprehensive inclusive understanding of these forms of infrastructure. These solutions are understood as the actions taken in protecting, sustainably managing and restoring "natural or modified ecosystems that address

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300 AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 12.

301 OECD *Water and Cities: Ensuring Sustainable Futures* 25; AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 12.

302 OECD *Water and Cities: Ensuring Sustainable Futures* 25; AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 12.

303 UN-Water *Water Security and the Global Water Agenda* 17.

304 City of Cape Town *Mayor's Portfolio of Urban Sustainability 2018* 99.

305 Cardosa da Silva and Wheeler 2017 *Perspectives in Ecology and Conservation* 32-35; UNEP *Green Infrastructure Guide for Water Management* 5; South African National Biodiversity Institute (SANBI) *A Framework for Investing in Ecological Infrastructure in South Africa* 3; Brears *Blue and Green Cities: The Role of Blue-Green Infrastructure in Managing Urban Water*.

societal challenges effectively and adaptively" while supporting human well-being and providing biodiversity benefits.[306]

To achieve urban water security there needs to be a balance between the exploitation of water resources and sustaining and protecting urban ecosystem services as "infrastructure" that underpins human well-being and livelihoods (addressing pollution and contamination, the level of water stress, the quality of ambient water, and exploiting green roofs and green areas).[307] Notwithstanding this, cities often fail to connect with the natural processes that occur within them. This dimension requires of municipalities to prioritise the conservation, protection and restoration of biodiversity, including aquatic ecosystems, and mandates that they reduce their environmental impact and to adopt more environmentally friendly consumption and production habits.

Considering the pressure on governments to provide access to water, it often happens that the natural environment is degraded and over-exploited in making water services available to humans.[308] In addition, their infrastructure often obscures the inherent relationships between society and the environment.[309] Hence, the increasing reliance on natural resources and the ecosystem services they provide results in significant stress and pressure on ecosystems, which points to an increasing need for assuring ecological sustainability.[310] Aquatic ecosystems face several threats, including pressures from abstractions and engineered infrastructure, pollution and runoff, urban development, and from alien invasive species. The sub-elements of this dimension include addressing pollution,[311] ensuring good ambient water quality, and strengthening the use of ecological or natural infrastructure.

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306 Cohen-Shacham *et al Nature-based Solutions to Address Global Societal Challenges* 2, 5.
307 Aboelnga *et al* 2019 *Resources* 8.
308 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 14.
309 Ward and Winter 2016 *Water SA* 571.
310 Woodley, Kay and Francis *Ecological Integrity and the Management of Ecosystems* vii; UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 14.
311 This element is addressed in para 2.3.2.2.

Moreover, as Ramirez, Mollinedo and Porras claim,[312] the uncertainty and complexity surrounding water systems, encourage the active involvement of diverse stakeholders in developing adaptive capacity, and better recognising the role that freshwater ecosystem health and sustainability play in fostering such capacity. It suffices to say that water security cannot be guaranteed by nature alone. Instead, both man-made and nature-based solutions are needed.[313] This refers to a need for both built and natural infrastructure for efficient and effective water resources management.[314]

2.3.2.4 Effective water-related climate change risks and disaster responses

It is widely anticipated that urban water security and the water cycle will be profoundly affected by climate change.[315] These impacts are seen in water-related risks, including flood and health risks, droughts and extreme precipitation.[316] These disasters influence urban water supply and sanitation infrastructure, in addition to worsening inequalities and undermining sustainable development.[317]

The two most prominent hydrological (water-related) disasters and climate risks are droughts and floods.[318] Climate change increases the likelihood of disasters and contributes to these through aggravating the circumstances in which they occur. This intrinsically links the actions and interventions that are aimed at mitigating and responding to these risks (disaster risk reduction) with climate change adaptation.[319] City governments must adopt and implement disaster risk reduction (DRR) and management (DRM) measures to adequately address water-related hazards and the impacts of climate change. These measures include lowering peoples' vulnerability to

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312 Ramirez, Mollinedo and Porras "Adaptive Water Governance" 342.
313 Cohen-Shacham *et al Nature-based Solutions to Address Global Societal Challenges* 5.
314 UN-Water *Water Security and the Global Water Agenda* 18.
315 Chapter 4 in Working Group II Contribution to the Sixth Assessment Report of the IPCC: Caretta *et al* "Water" 556. UN-Water *Water Security and the Global Water Agenda* 18.
316 Douville *et al* "Water Cycle Changes" 1106, 1155-1157.
317 UN-Water *Water Security and the Global Water Agenda* 16; UNESCO *Water Development Report* 2019 56.
318 UN-Water 2022 https://www.unwater.org/water-facts/water-and-disasters.
319 Aldunce, Levín and León "Disaster Risk Reduction Informing Climate Change Adaptation" 337.

disasters, increasing their resilience to natural and anthropogenic (man-made) hazards, and promoting both climate change mitigation and adaptation.[320]

Disaster management involves addressing mitigation, preparedness, response, and recovery.[321] This means that cities should firstly aim to reduce or eliminate the likelihood or the impact of a hazard. Additionally, they should assess all possible risks, develop preparedness plans, improve internal capacity, develop awareness among their residents, and implement early-warning systems (EWS).[322] In the context of disaster management, "response" refers to immediate response measures that reduce the impact of a present disaster (such as the emergency provision of water during droughts, for example). In the final instance, recovery measures refer to actions that are aimed at "bouncing back" after a disaster occurrence.

Furthermore, effective and timely EWS, as well as emergency preparedness and neighbourhood response systems are needed to deal with climate-related disasters.[323] An EWS detects and forecasts impending hazardous events and allows warnings to be formulated based on scientific knowledge, monitoring and a consideration of the factors that affect the severity and frequency of disasters.[324] The Council for Scientific and Industrial Research (CSIR) has developed the Green Book, an online climate risk profiling and adaptation tool, that supports municipalities with developing climate-resilient settlements, for example.[325] This internet-based tool provides quantitative scientific evidence that aids in the planning process by presenting factual and numerical evidence regarding the potential effects of urbanisation and climate change on South

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320 Nemakonde and Van Niekerk 2022 *Risks Hazards Crisis Public Policy* 2-4.
321 Traut, Hoeltl and Brandtweiner 2019 *Disaster Management and Human Health Risk* 19.
322 Traut, Hoeltl and Brandtweiner 2019 *Disaster Management and Human Health Risk* 19.
323 Early warning systems (EWS) are described as adaptive measures for climate change, using integrated communication systems (ICTs) to help communities prepare for hazardous climate-related events. – UN 2022 https://www.un.org/en/climatechange/climate-solutions/early-warning-systems.
324 Lumbroso 2018 *International Journal of Disaster Risk Reduction* 530.
325 CSIR 2021 https://www.greenbook.co.za.

African cities and towns.[326] It is notable, that EWS and emergency preparedness response systems are applicable to both droughts and floods.

It is understood that managing flood risks and hazards does not entail eliminating the hazards as these are often unavoidable, but instead refer to the mitigation of flood risk.[327] Hence, responding to water-related disaster events, means looking at the probability and severity of certain events and the damage they will cause. In general, models are used to calculate the impacts of an event, especially in flood mapping.[328] In addition, climate change impacts need to be integrated into climate change models and scenarios, which are used to project the frequency and severity of events in the near and distant future.[329]

Urban droughts can be triggered by several factors such as increased water demand, deforestation, and climate change.[330] Accordingly, drier conditions may increase the ambient health risks and adversely affect agriculture and food security.[331] The country is experiencing more prolonged and intense drought periods than previously, in places such as in Cape Town and Gqeberha.[332] Tarlock[333] stresses that while the law cannot make it rain, it can assist in mitigating the adverse impacts of drought in fundamental ways. For instance, water can be allocated among competing uses to promote the fair, efficient and secure enjoyment of water. Furthermore, the management of drought is a complex issue that requires political-institutional, scientific, regulatory, and technical interventions and collaboration.

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326 CSIR 2021 https://www.greenbook.co.za.

327 Tingsanchali 2012 *Procedia Engineering* 31.

328 UN *Words into Action Guidelines Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation* 42.

329 UN *Words into Action Guidelines Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation* 42.

330 Ray and Shaw "Climate Change: Implication on Urban Drought" 35.

331 Van Niekerk "Disaster Risk Reduction and Climate Change Adaptation and Resilience" 23-10.

332 Sinclair-Smith and Winter "Water Demand Management in Cape Town: Managing Water Security in a Changing Climate" 126. Ellis 2021 https://www.dailymaverick.co.za/article/2021-06-21-water-crisis-nelson-mandela-bay-heads-for-a-dry-july-as-dam-levels-reach-record-lows/.

333 Tarlock "Water Allocation and Management During Drought" 149.

For the most part, it is suggested that adaptation measures be mainstreamed in the broader urban development context, and especially within the urban water security framework.[334] This is because effective adaptation to climate hazards could reduce the impacts of flood, drought, and storm risks.[335] This could include measures to improve the understanding of future risks and their associated impacts.[336] The early identification of potential threats could help improve climate resilience.[337] This may be done by carrying out assessments and implementing adaptation measures designed to minimise climate change impacts.[338] Understanding the various impacts of flash flooding and droughts in South Africa requires considering both physical and societal factors such as governance and budget allocations.[339] The aforementioned can also affect the city's ability to implement effective adaptation measures related to environmental risks.

Cities should enhance the achievement of environmental and climate change resilience and DRM through an improved understanding of the interaction between atmospheric changes, water, land, and people. An approach to disasters is needed that develops measures to help prevent disasters from happening or measures to increase the resilience to disastrous events.[340] This should be based on accurate scientific data, as well as risk-informed planning by mainstreaming risk reduction and resilience building into urban plans, such as flood-risk and drought management plans. For instance, measures that can increase resilience to floods can be implemented by integrating

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334 Aboelnga *et al* 2019 *Resources* 10; UN-Water *Water Security and the Global Water Agenda* 16. Hence, this requires the improvement of existing knowledge of climate impacts and the use of effective technologies and their application and building local capacity for improved preparedness and adaptation. See also Pasquini *et al* 2015 *Climate and Development* 60-70.

335 Piketh *et al* 2014 *Water SA* 750.

336 Pelling and Wisner "Introduction: Urbanization, Human Security and Disaster Risk in Africa" 5.

337 Turnbull, Sterrett and Hilleboe *Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation* 156.

338 Piketh *et al* 2014 *Water SA* 750.

339 Piketh *et al* 2014 *Water SA* 752.

340 UN *Words into Action Guidelines Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation* 35.

SUDS into the design of urban infrastructure to provide spaces safe from flooding.[341] Protecting the institutions, people, environment and infrastructure in cities against water-related climate risks and disasters will require active climate planning which may include drafting resilience strategies, disaster management plans, or climate action plans (encompassing both mitigation and adaptation).[342]

2.3.2.5 Reliable and equitable supply of water for sustainable economic and social development

Water is necessary for health, livelihoods, energy, agriculture, industry and the environment, with economic growth being dependent on a state of water security.[344] The resource limitations in all these sectors require a shift towards increased resource use efficiency, demand management, and more sustainable consumption patterns.[345] In this context, it is imperative to work towards reducing water consumption, reusing and recycling water, and regenerating natural capital by reducing consumptive and non-consumptive uses of water. For these purposes, it is necessary to consider the interactions between water, energy, and food.[346] The WEF nexus is gaining recognition internationally as a crosscutting approach to resource management and sustainable development.[347] The nexus is broadly defined as a method that considers the interaction, synergies and trade-offs between water, energy and food when undertaking the management of these sectors. In the absence of these changes, current

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341 UN *Words into Action Guidelines Implementation Guide for Addressing Water-Related Disasters and Transboundary Cooperation* 35.

342 See Chapter 5 for city-level climate planning in South Africa.

343 Olsson and Head 2015 *Ecology and Society* 1-5.

344 Steyn *et al* "Water Security and South Africa" 22.

345 AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 4.

346 Steyn *et al* "Water Security and South Africa" 25; UN-Water *Water Security and the Global Water Agenda* 14. Here it is also important to consider the mounting literature on the nexus between water, energy and food: Froggatt "The Water–Energy Nexus Meeting Growing Demand in a Resource-Constrained World" 122; Allouche, Middleton and Gyawali *The Water-Food-Energy Nexus: Power, Politics and Justice*; World Economic Forum *Water Security: The Water-Food-Energy-Climate Nexus*.

347 Allouche, Middleton and Gyawali *The Water-Food-Energy Nexus: Power, Politics and Justice* 51.

development trajectories threaten to drive social-ecological systems at all scales towards critical thresholds.[348]

Similarly, water supply assurance represents the role of authorities, such as municipalities, in ensuring water availability to the sectors that need it the most.[349] The agricultural sector is the dominant water user in South Africa, consuming more than 60 per cent of the available water.[350] Urban food production essentially depends on the availability of sufficient land and water resources elsewhere to produce the food.[351] Arguably, if the management of food is efficient, it could offer new opportunities for mutual benefit, including the recycling and reuse of water and the nutrients held in municipal waste products.[352]

Water management challenges in the agricultural sector are two-fold.[353] In the first instance, there is a need to adjust current production methods to deal with both water scarcity and excess water.[354] Furthermore, the other challenge lies in decarbonising the agriculture sector through climate mitigation measures that reduce GHG emissions and improve water availability.[355] UN-Water claims that climate-resilient water resources management provides a powerful mechanism to achieve local, and potentially global, food security, which includes food production, preparation, distribution, consumption and waste.[356] While it is generally thought that the aforementioned falls within the scope of national government competence, the entire food cycle also influences the urban (local) water cycle, which is why the City of Cape Town, during its critical water

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348 AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 4; UN-Water *Water Security and the Global Water Agenda* 114.

349 Funke *et al* "An Analysis of International and South African Discourses and Perspectives on Water Security" 61.

350 DEA South *Africa Environment Outlook 2016* 331.

351 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 6.

352 Cosgrove and Loucks 2015 *Water Resources Research* 4834.

353 UN-Water *World Water Development Report 2020: Water and Climate Change* 4.

354 UN-Water *World Water Development Report 2020: Water and Climate Change* 4.

355 UN-Water *World Water Development Report 2020: Water and Climate Change* 4.

356 UN-Water *Policy Brief: Climate Change and Water* 13.

shortage in 2018, engaged with the agricultural sector to ensure an equitable allocation of water to agriculture and the City's residents, for example.[357]

Scott, Crootof and Kelly-Richards[358] define the urban water-energy nexus as the interlinkages among water, energy and the attendant infrastructure, coupled with the populations that rely on them and the institutions for their governance. They add that when examining urban-rural relationships, it is also important to consider the spatial distribution of the water-energy nexus.[359] Arguing that the proximity of humans to a given water source and sanitation treatment facilities, along with the degree and type of water and sanitation treatment, influences energy use and the associated costs.[360] Furthermore, water and energy interact in a variety of ways.[361] Energy is needed to provide much of the water that is used, and water is needed to provide most of the energy needed and demanded by society.[362] In regards to the first, the impact of load-shedding on water operations in South African cities is emphasised.[363]

Likewise, the energy sector is a significant water user, be it in the extraction of fossil fuels or their processing, water for cooling in power stations, or driving the generators for hydropower.[364] In the water sector, energy use is split into two parts: construction and operation. The energy required for the construction of water infrastructure such as

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357 Warner and Meissner 2021 *International Journal of Disaster Risk Reduction* 3.

358 Scott, Crootof and Kelly-Richards "The Urban Water–Energy Nexus: Building Resilience for Global Change in the "Urban Century""115.

359 Scott, Crootof and Kelly-Richards "The Urban Water–Energy Nexus: Building Resilience for Global Change in the "Urban Century"" 132.

360 Scott, Crootof and Kelly-Richards "The Urban Water–Energy Nexus: Building Resilience for Global Change in the "Urban Century""132.

361 UN-Water *World Water Development Report 2020: Water and Climate Change* 4.

362 Cosgrove and Loucks 2015 *Water Resources Research* 4833.

363 Crisp 2022 https://www.engineeringnews.co.za/article/load-shedding-spells-trouble-for-water-supply-2022-07-22/rep_id:4136; Patrick 2022 https://www.news24.com/news24/southafrica/news/load-shedding-likely-to-have-impact-on-water-supply-in-joburg-says-water-utility-20220919.

364 Froggatt "The Water–Energy Nexus Meeting Growing Demand in a Resource-Constrained World" 117.

dams, piping, and treatment plants is significant.[365] The energy used for various processes, such as pumping water and treating it, is also significant.[366] Froggatt indicates that the overall intensity of the use of energy varies considerably between processes such as pumping and treatment because of differences in the energy requirements of the extraction and treatment stages.[367] Therefore, limitations of either water or energy can constrain future development as well as adversely affect human and environmental health.[368] Improving water supply efficiency for the food and energy sectors is crucial, including measures to reduce non-revenue water such as fixing leaks, metering errors, and addressing water theft.[369] Additionally, municipalities can meter water consumption to manage water demand, implement water-saving technologies, and utilise non-conventional water resources such as treated wastewater for irrigation.

If the challenges associated with food, energy and water are addressed in isolation, there is a risk of increasing food, energy and water insecurity in the country. At the national level the balance can still be maintained, but it is harder to ignore the nexus at the local level.[370] While it may be difficult to assess this dimension at local government level some essential issues for cities to address include water conservation, revenue management, and pricing and budgeting for water supply services, including water loss management. The nature of this dimension connects it with the other four dimensions of urban water security. Hence, this study will review the legal and policy frameworks applicable to this dimension by assessing how they provide for reducing water

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365 Most of the energy use in South Africa comes from coal and non-renewable energy sources which have severely degrading effects on the quality of other natural resources. - DEA *South Africa Environment Outlook 2016* 331. Froggatt "The Water–Energy Nexus Meeting Growing Demand in a Resource-Constrained World" 122.

366 UN-Water *Policy Brief: Climate Change and Water* 13; Froggatt "The Water–Energy Nexus Meeting Growing Demand in a Resource-Constrained World" 122.

367 Froggatt "The Water–Energy Nexus Meeting Growing Demand in a Resource-Constrained World" 122.

368 Cosgrove and Loucks 2015 *Water Resources Research* 4833.

369 UNESCO *Water Security and the Sustainable Development Goals* 54.

370 WWF *The Food Energy Water Nexus* 6, 11.

consumption in key sectors, improving water use efficiency, the reduction of water wastage and loss, and the promotion of integrated and water sensitive approaches.

Table 2-1 below provides a summary of the dimensions of urban water security with their elements and sub-elements as discussed above. The five dimensions are essential for achieving urban water security. Within each dimension are elements that indicate what needs to be achieved under that dimension. Some of the elements could be placed in more than one dimension, indicating the hybrid, integrated and overlapping nature of the dimensions. The sub-elements indicate further, more specific considerations for urban water security necessary to guide action by municipalities.

Table 2-1 Dimensions of urban water security

Dimensions	Elements	Sub-elements
Equitable, secure, and reliable access to an adequate, clean, and safe drinking water supply in urban areas	Water quality	Ensuring drinking water of an adequate quality
	Accessibility	Drinking water services that are physically and economically accessible
		Service sustainability
	Water quantity	Ensuring a reliable supply of water (improving water supply infrastructures)
		Ensure availability of water
		Reducing and encouraging sustainable water consumption
		Diversity of water resources (also relevant for dimension 4)
	Equity	Providing free or low-cost water services to vulnerable populations
Accessible, safe, secure, adequate and equitable sanitation, wastewater, and stormwater services	Stormwater management	Enabling effective stormwater networks
		Promoting the use of SUDS
		Implementing EWS
	Sanitation and wastewater services	Reliability of infrastructure
		Adequate quality (treatment)
		Accessibility of services
		Monitoring and reporting on wastewater systems
Healthy, functional and sustainable urban aquatic ecosystems	Addressing water pollution	

	Improving and protecting ecological, natural, blue or green infrastructure	Restoring and rehabilitating rivers and wetlands
		Encouraging the use and implementation of nature-based solutions
	Ensuring good ambient water quality	Improving groundwater quality and artificially recharging aquifers
		Surface water quality and flows
An effective water-related climate change adaptation and disaster response	Flood risk management	Implementing EWS
		Encourage the use and implementation of nature-based solutions for flood attenuation
	Drought risk management	Augment water supply to ensure long-term sustainability of supply
		Adopting EWS
A reliable and equitable supply of water for sustainable economic and social development	Enhancing productivity and resource efficiency	Reducing water consumption in key sectors (agriculture, energy etc)
		Efficiency of water use
		Balancing competing water uses
		Adequate operation and maintenance of infrastructure
		Effective metering and billing of water users
		Minimising the impact of drought on water resources through water sensitive approaches
		Ensuring the reduction of water wastage and losses

While by no means exhaustive, the dimensions, elements, and sub-elements outlined in Table 2-1 could be used to guide an analytical and focused approach to urban water challenges to ensure urban water security in the long-term. These dimensions are not intended to be considered as a fixed template for urban water security. They should instead be used as a conceptual window enabling an understanding of the multi-dimensional nature of urban water security and urban water challenges. These dimensions further serve as a means of scoping this study in the sense that they are used in subsequent chapters to assess the role of local government in addressing urban water security from the perspective of the international, regional, and national legal and policy frameworks regarding water security.[371]

Based on the above, it is postulated that the demand for water in an urbanised world, as well as human-induced changes to the global water cycle, pose challenges to water management.[372] Undoubtedly the idea of urban water security is multifaceted and integral to urban water management.[373] Additional frameworks and ideas that water security connects with include those of ecological security, integrated urban water management, risk management, resilient and adaptive water management, and water-sensitive cities.[374]

2.4 Governance and management pathways for urban water security

2.4.1 Urban water governance and management

Urban water security requires integrated analysis and planning (considering all aspects and functions of the water system) and coherent law- and policy-making across different relevant governmental institutions and departments.[376] Considering the

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371 See Chapters 3, 4 and 5 of this study.
372 Pereira and Freitas 2017 *Contexto Internacional* 531.
373 Van Ginkel *et al* 2018 *Journal of Water Resources Planning and Management* 3; Aboelnga *et al* 2019 *Resources* 2.
374 Aboelnga *et al* 2019 *Resources* 2; Brown, Keath and Wong 2009 *Water Science Technology* 847-855.
375 Van Beek and Lincklaen *Water Security: Putting the Concept into Practice* 15.
376 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 8.

dimensions of urban water security identified above,[377] urban water governance must ensure that the urban water cycle is managed as an integrated system in which all urban water flows are recognised as a potential resource and where the interconnectedness of water supply, groundwater, stormwater, wastewater, flooding, water quality, wetlands, watercourses, estuaries and coastal waters is recognised.[378]

Water governance is defined as the entirety of the "political, social, economic and administrative systems that are in place to develop and manage" both water resources and water services delivery at different levels of society.[379] Water governance therefore refers to the management of water resources, including water services delivery to diverse populations and industries, in accordance with the laws, institutions, regulations, and policies governing water management.[380] In accord with these definitions, the elements of water governance include: a) the various actors, networks and institutions formally responsible for water (resources) management,[381] b) the mechanisms within which this management must operate,[382] and c) the actual processes that are carried out to manage water resources.[383] These elements will vary depending on a country's political and institutional setup, although in general terms the basic elements are universal.[384] Hence, water security is not just about having a good water system status and about the proper fulfilment of various water system functions - it is

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377 See para 2.3.2.

378 This understanding of urban water governance for water security is derived from a reading of the available literature, including, *inter alia*, Romano and Akhmouch 2019 *Water* 1-9; UN-Habitat *Global Campaign on Urban Governance: Concept Paper* 26-29; OECD *Principles on Water Governance.*

379 UNDP *Water Governance for Poverty Reduction* 17.

380 See Hill *Climate Change and Water Governance* 3; Olsson and Head 2015 *Ecology and Society* 1; Fisher *The Law and Governance of Water Resources* 57; Cosens and Gunderson "Introduction to Practical Panarchy: Linking Law, Resilience and Adaptive Water Governance of Regional Scale Social-Ecological Systems" 9.

381 ICLEI *Understanding the Context – The Role of Local Government in IWRM* 4. Also see Pahl-Wostl 2009 *Global Environmental Change* 356-358.

382 ICLEI *Understanding the Context – The Role of Local Government in IWRM* 5; Pahl-Wostl 2009 *Global Environmental Change* 356-358.

383 ICLEI *Understanding the Context – The Role of Local Government in IWRM* 5; Pahl-Wostl 2009 *Global Environmental Change* 356-358.

384 UNDP *Water Governance for Poverty Reduction* 17; ICLEI *Understanding the Context – The Role of Local Government in IWRM* 4.

also about good (water) governance.[385] Local government, as the level of government most closely associated with local affairs, is in a uniquely influential position in the water governance system.

Good water governance is reliant on well-designed, empowered institutions to adopt and enforce legislative and policy instruments which are conducive to the attainment of predetermined social, economic and environmental goals associated with water security.[386] The following principles are deemed to underlie good urban water governance: sustainability, equity, transparency, accountability, effectiveness, subsidiarity, efficiency, and, civic engagement and participation, integration, and security, with all of these being interdependent and mutually reinforcing.[387] All of these principles underscore the dimensions of urban water security and are necessary in achieving the same. Effective and efficient water governance, therefore, involves drawing on expertise from various government departments from the national to the local levels, various sectors of society, institutions and organisations.

Overall, urban water governance has consequences for, and can be affected by several laws and policies in relevant sectors, such as land-use, spatial planning, transport, energy, solid waste, environment and agriculture, on water resource consumption, quality, and overall security. Urban water governance can be seen as the collective responsibility of various levels of government.[388] As suggested earlier, while central government has a significant role in formulating policies and regulations, local governments have a more active role in managing local water-related activities such as water supply, sanitation, and drainage.[389]

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385 Rogers and Hall *Effective Water Governance* 9.
386 UN-Water *Water Security and the Global Water Agenda* 26.
387 WWP *Water Sector Governance in Africa* 3; Batchelor *Water Governance Literature Assessment* 10; OECD *Principles on Water Governance* 3, 11-12; UN-Habitat *Global Campaign on Urban Governance: Concept Paper* 20-24. Also see the principles elaborated on in the *Rio Declaration on Environment and Development* (1992).
388 Romano and Akhmouch 2019 *Water* 5.
389 Romano and Akhmouch 2019 *Water* 5.

It is notable that management and governance are not synonymous, as management involves operational decisions to achieve specific outcomes, whereas governance refers to the broader processes and institutions through which actors make decisions that affect the environment.[390] To this end, urban water management and governance exist *in tandem*.[391] Water management focuses on the management of water resources and services such as activities related to the use, monitoring and regulation of water supply for example.[392] Water management activities include the collection and storage of water resources, the transport of water to consumers via treatment facilities, the treatment and subsequent release of wastewater and stormwater management.[393] This can be done in various ways including planning, building, and operating water infrastructure,[394] as set out below. Through exercising their governance powers municipalities can also develop legal and policy instruments to address the sustainable management of water in their jurisdictions.[395]

2.4.2 Water management and regulatory approaches for urban water security

Urban water management is a process that involves planning and regulating the use and monitoring of the entire water system. It includes the planning, design, and operation of the infrastructure needed to meet the demands for drinking water and sanitation, the control of infiltration and stormwater runoff, and the maintenance of urban ecosystems.[396] Urban water management needs to be integrated, efficient,

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390 Oakerson "Analyzing the Commons: A Framework" 41–59.

391 Oakerson "Analyzing the Commons: A Framework" 41–59; Armitage, De Loë and Plummer 2012 *Conservation Letters* 245-255.

392 Wolf *Urban Water Security and Water Management* 21.

393 Gluckman *Water Sensitive Urban Design as a Transformative Approach to Urban Water Management in Cape Town: A Case Study of the Proposed River Club Development* 18.

394 Wolf *Urban Water Security and Water Management* 21.

395 Jiménez *et al* 2020 *Water* 2. Pahl-Wostl 2009 *Global Enviromental Change* 355; Oakerson "Analyzing the Commons: A Framework" 41–59; Armitage, De Loë and Plummer 2012 *Conservation Letters* 245-255.

396 Loucks and Van Beek *Urban Water Systems* 527.

equitable, adaptive, co-ordinated and participatory to address the complexity and uncertainty that arises in urban water systems.[397]

Traditional urban water management is deemed to be inadequate to handle water security threats, as evidenced by indicators such as poor sanitation in urban informal settlements, declining water quality in river catchments and aquifers, and widespread biodiversity loss.[398] The dismissal of conventional water management approaches is largely owing to the fact that water supply, sanitation, wastewater treatment, stormwater drainage, flood control and solid waste management are treated as isolated services.[399] Pereira and Freitas[400] profess that command-and-control management has been the dominant approach in water management until recently. They point out that the features of this management approach are centralisation, sectoral institutions, restricted stakeholder participation, and a focus on technical engineering solutions.[401] Furthermore, they indicate that owing to the complexity and unpredictability associated with the Anthropocene, this approach has become obsolete.

The management and use of water in urban areas in developing countries is a complex and dynamic challenge.[402] This is partly owing to the continuous change of socio-economic setting that takes place within a city and the variables and stakeholders that need consideration.[403] Cities in South Africa, for example, all face threats to water security. However, the way these threats are managed will differ because in one instance, water scarcity may be a result of climatic conditions, whilst in another it may be the result of poor infrastructure and management.[404]

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397 Daniell *et al Understanding and Managing Urban Water in Transition* 3.
398 Fell and Carden "A Renewed Technical Agenda for Integrated Urban Water Management" 47.
399 Cosgrove and Loucks 2015 *Water Resources Research* 4834; Pahl-Wostl "Requirements for Adaptive Water Management" 3; Pereira and Freitas 2017 *Contexto Internacional* 530.
400 Pereira and Freitas 2017 *Contexto Internacional* 530.
401 Pereira and Freitas 2017 *Contexto Internacional* 530.
402 Magnusson *Urban Water Security – Local Conditions and Regional Context* 19.
403 Magnusson *Urban Water Security – Local Conditions and Regional Context* 19.
404 See Chapter 5.

Urban water management therefore involves working with the various elements of the urban hydrological cycle to provide water security.[405] This could be achieved through the efficient use of diverse water sources and protecting and restoring the health and integrity of aquatic ecosystems and waterways.[406] Additionally, it involves developing places that collect, recycle, and use water for various purposes, including the use of various water sources and techniques to minimise pollution and protect against flood risk, and the provision of water for productive, sustainable, liveable and resilient communities.[407] The increasing uncertainties and challenges affecting water management have led to a paradigm shift in how water resources are managed.[408] As a result, urban water management has evolved and now needs to integrate the various disciplines involved in the design, planning, engineering, and environmental sciences in the management of water services in urban areas.[409]

Kidd and Ferris[410] suggest that there is a critical relationship between the law and the management of water resources in the context of ensuring sustainability. They assert that two questions arise: how law can contribute to the sustainability of water itself, and how the law's regulation of water can contribute to the sustainability of life - both human life and that of other species in their natural environment.[411] These questions are also relevant in assessing the law's role in promoting urban water security. Kotzé and Kim[412] argue that "law as a social regulatory institution has been complicit in

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405 Government of Western Australia 2017 https://bit.ly/3GyVdBr.

406 Government of Western Australia 2017 https://bit.ly/3GyVdBr.

407 Government of Western Australia 2017 https://bit.ly/3GyVdBr.

408 Coombes and Kuczera "Integrated Urban Water Cycle Management: Moving Towards Systems Understanding" 2-4; Hellström, Jeppsson, and Kärrman 2000 *Environmental Impact Assessment Review* 311-321; Gluckman *Water Sensitive Urban Design as a Transformative Approach to Urban Water Management in Cape Town: A Case Study of the Proposed River Club Development* 18.

409 Water Information Network - South Africa *Water Sensitive Settlements - Securing Water in Urban Spaces* 5.

410 Kidd and Ferris "Introduction: Water and the Law: Towards Sustainability" 2.

411 Kidd and Ferris "Introduction: Water and the Law: Towards Sustainability" 2-3; GWP 2020 https://bit.ly/3glGM9g.

412 Kotzé and Kim 2019 *Earth System Governance* 10; Kotzé 2019 *Sustainability* 5. Also see Dalby "Human Security in the Anthropocene: The Implications of Earth System Analysis"; Bosselmann "Shifting the Legal Paradigm: Earth-Centered Law and Governance" 64-82.

creating the Anthropocene epoch and is unable in its present incarnation to create sustainable solutions to navigate the Anthropocene." In their view, humans need to rethink and reform the law and its role in so-called Earth System Governance (ESG).[413] Hence, the new conditions of the Anthropocene and their impacts on water require new relationships between the environment and society.[414] This also means revisiting how law and governance can contribute to achieving water security.

The World Bank points out that while some cities seem to understand the strategic importance of sound water management, there are still many urban water actors that are unaware of the challenges.[415] The models for urban water management often include limited efforts to achieve sustainability, inadequate coordination with multiple users, lost opportunities to develop local and more economical resources, and disconnection with the water sources.[416] Consequently, many cities tend to underperform in their efforts to increase their water supplies. This is in addition to problems of poor water quality, low service coverage, and deteriorating infrastructure.[417] If water security is to be achieved and sustained, the approaches to water management must reflect the integrated nature of the water cycle by addressing the different users, uses and threats to resources.

There are many approaches to urban water management, and several developing countries are already taking steps to improve the overall management and regulation of their urban water resources, services, and institutions. Accordingly, the GWP considers water security as the overarching goal of water management.[418] The choice of a management approach for water security will depend on the institutional context in the

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413 For a definition of ESG see Biermann *et al Earth System Governance: People, Places and the Planet* 4.

414 Rockström *et al* 2014 *Ecohydrology* 1249-1261; Pereira and Freitas 2017 *Contexto Internacional* 532; Vörösmarty, Pahl-Wostl and Bhaduri *2013 Current Opinion in Environmental Sustainability* 1-4.

415 World Bank *Water Scarce Cities: Thriving in a Finite World* 2.

416 World Bank *Water Scarce Cities: Thriving in a Finite World* 2.

417 World Bank *Water Scarce Cities: Thriving in a Finite World* 2.

418 GWP *Towards Water Security: A Framework for Action*. Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 2.

specific urban area or municipal boundary. Such approaches include integrated water resource management (IWRM), water-sensitive urban design (WSUD), integrated urban water management (IUWM),[419] water conservation and water demand management (WC/WDM) as well as more recent approaches such as resilient water management for cities.[420]

These are different approaches that have been adopted by states or institutions for the optimal planning, development, distribution, and management of water resources within their jurisdictions. The sections below discuss each of these approaches with a view to determining which could be the most suited to guide the optimisation of urban water security in South African cities.

2.4.2.1 Integrated water resource management

IWRM is perhaps one of the earliest and most frequently referenced approaches to water management.[421] According to Muller,[422] IWRM requires the integrated management of all water sources, the collaboration of all water users, managing water quality and quantity jointly, and conducting water planning under the broader framework of national development planning. IWRM therefore seeks to promote more equitable access to water resources and the benefits that are obtained from water to address poverty, to ensure that limited water sources are used efficiently and for the greatest benefit of the greatest number of people and the betterment of the environment, and to achieve the most sustainable utilisation of water possible.[423] IWRM

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419 Steyn *et al* "Water Security and South Africa" 33. Also see Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 12; Wong and Brown 2009 *Water Science Technology* 674.

420 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 162; Honkonen 2017 *PELJ*; Daniell *et al* "Understanding and Managing Urban Water in Transition"; Brown, Keath and Wong 2009 *Water Science Technology*; WRC *Global Series: Water Resilient Cities*.

421 UN 2014 https://www.un.org/waterforlifedecade/iwrm.shtml. IWRM was introduced in 1977 at the Mar del Plata conference. The concept of IWRM was conceptualised by experts from various fields of practice and was built up from the experiences of practitioners.

422 Muller *et al Water Security in South Africa* 17.

423 Batchelor *Water Governance Literature Assessment* 12; ICLEI *Understanding the Context – The Role of Local Government in IWRM* 2.

raises awareness of both international and local water issues, but it is implemented mostly nationally and regionally.

IWRM aims to balance equity, efficiency and sustainability to address water-related developmental issues.[424] The implementation of IWRM requires the establishment of an enabling environment, including suitable legislation, policies and strategies, institutional frameworks and management instruments.[425] It emphasises the concepts of integration, subsidiarity, participation, water management according to hydrological boundaries, and economic, environmental and financial sustainability.[426] It complements what is required for water security in as far as all its principles, particularly the idea of integration, are embedded in the concept of water security.[427] IWRM also aims to balance water supply and demand both through infrastructure development (increasing storage, improving water transfers, and diversifying water sources) and through managing water demand in all the main water use sectors.[428]

With IWRM, the emphasis is on establishing a co-ordinated approach that addresses all aspects of water management, including the development and management of water infrastructure.[429] Development and management decisions need to guide the water sector, emphasising the centrality of the compromise between social equity, ecological integrity and economic growth,[430] whereas other approaches prioritise water protection, which is often associated with an emphasis on minimum (or maximum) thresholds of acceptable levels of risk and a reduction of vulnerability.[431]

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424 ICLEI *Reaping the Benefits – How Local Governments Gain from IWRM* 12.
425 GWP 2017 https://bit.ly/3rYNx3e/.
426 GWP *Integrated Water Resources Management* 22. Lenton and Muller *Integrated Water Resources Management in Practice* 7.
427 Pereira and Freitas 2017 *Contexto Internacional* 530; Van Beek and Lincklaen Arriens *Water Security: Putting the Concept into Practice* 22.
428 Muller *et al Water Security in South Africa* 22-24.
429 GWP 2017 https://bit.ly/3rYNx3e.
430 Bakker and Morinville 2013 *Philosophical Transactions of the Royal Society* 3-4.
431 Bakker and Morinville 2013 *Philosophical Transactions of the Royal Society* 3-4.

Notwithstanding the variety of challenges facing state water resources management, which include fragmented national legal, institutional and administrative frameworks, a lack of financial, human and technical capacity, and poor data availability,[432] the implementation of IWRM or water integrated approaches from the international to the local level produce significant benefits in enhancing water security. City governments can possibly take on a larger role in advancing IWRM towards achieving water security. This can be done through various means such as development planning (through land-use planning for example), and developing and implementing water infrastructure projects.[433] In the context of IWRM, local authorities affect the aquatic ecosystems through their energy supplies, land uses (zoning), point and non-point pollution control, construction practices, solid waste and urban drainage practices, among other areas.[434] Hence, improved coordination and integration of the efforts of all the relevant actors toward commonly accepted goals for their water resources is required.[435]

2.4.2.2 Integrated urban water management

IUWM is an emerging approach to water management that aims to reduce the impact of urban water systems on the natural environment and the communities they serve.[436] The environmental, economic, social, technical and political aspects of water management are all included in IUWM.[437] IUWM is, however, about more than just the urban water cycle and its governance.[438] Water in a city is also linked to a range of other urban management issues,[439] both directly and indirectly, including solid waste management, energy, transport, housing, land-use planning, economic development,

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432 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 13.
433 Butterworth *et al* 2010 *Water Alternatives* 76; ICLEI *Reaping the Benefits – How Local Governments Gain from IWRM* 7.
434 GWP 2017 https://bit.ly/3WRys1y.
435 GWP 2017 https://bit.ly/3WRys1y.
436 Maheepala *Towards the Adoption of Integrated Urban Water Management Approach for Planning* 1.
437 Bahri *Integrated Urban Water Management* 5.
438 WPP *Mainstreaming Water Resources Management in Urban Projects* 4.
439 Jensen and Nair 2019 *Water* 2; De Carvalho *Sustainability Index for Integrated Urban Water Management (IUWM) in Southern African Cities* 2-7.

health, and urban agriculture. Likewise, IUWM has the potential to improve water security and enhance social, ecological and economic sustainability at various scales. It can also help deliver resilient infrastructures that can contribute to environmental quality and resource efficiency.[440]

Successfully implementing IUWM requires the engagement of local communities and collaboration among various stakeholder groups to make multi-point decisions concerning overall water and environmental management.[441] In this vein, IUWM should include assessments to determine the quantity and quality of a water resource, estimate the current and future demands, and anticipate the effects of climate change.[442] This would require involving actors such as municipalities, other levels of government, the private sector and communities at the planning, decision-making, implementation, monitoring and evaluation stages.[443] This approach therefore strongly emphasises local level co-operation and co-ordination in decision-making concerning water issues.

Additionally, IUWM implementation requires consideration of the entire water cycle as a unit, to the extent that the links between water sources, supply, wastewater, and stormwater must be effectively understood and properly translated into action.[444] Lastly, IUWM requires assessing options for water sources that are traditionally less visible or simply less thought of, such as groundwater, rainwater, stormwater, black water (wastewater), and grey water (wastewater such as sink water and dishwasher discharge).[445] This approach also requires maximising the benefits from wastewater, by employing innovative technologies, so that water, energy, biogas, and nutrients can be

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440 Jensen and Nair 2019 *Water* 2; WPP *Mainstreaming Water Resources Management in Urban Projects* 5.

441 Bahri *Integrated Urban Water Management* 5; Jensen and Nair 2019 Water 2; WPP *Mainstreaming Water Resources Management in Urban Projects* 4.

442 Bahri *Integrated Urban Water Management* 6.

443 GWP 2017 https://bit.ly/3tjTrfI.

444 GWP 2017 https://bit.ly/3tjTrfI.

445 Maheepala *Towards the Adoption of Integrated Urban Water Management Approach for Planning* 3; GWP 2017 https://bit.ly/3tjTrfI.

actively reclaimed, which will in turn help fulfil the demand for water in ensuring the sustainable use of water for socio-economic activities.[446] Municipalities need to consider the development and expansion of infrastructure for service provision, monitor and conduct maintenance of existing works, and ensure the optimal use and long-term sustainability of resources. They must further address the need to develop and apply appropriate legislative and institutional frameworks which support the provision of services and the sustainable use of resources.[447]

In implementing IUWM municipalities may have to design adaptive mechanisms to enhance resilience against uncertainty and shifting conditions arising from environmental disasters and climate change.[448] These mechanisms need to provide the required response for the fifth dimension of urban water security in order to be effective.[449] This approach also compels the establishment of urban water partnerships by involving academic institutions, media and advocacy groups as well as industrialists and commercial actors,[450] and implementing low-cost, high-impact solutions that can aid in providing water services in affordable ways, for example.[451] This understanding of the characteristics of IUWM suggests that the approach covers all of the five dimensions of urban water security and presents a strong and viable response to addressing the multiplicity of threats to water security in South African cities.

2.4.2.3 Water conservation and water demand management

Water demand management (WDM) is generally considered part of water conservation (WC),[452] which includes policies, strategies and activities to sustainably manage

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446 GWP 2017 https://bit.ly/3tjTrfI.

447 De Carvalho *Sustainability Index for Integrated Urban Water Management (IUWM) in Southern African Cities* 2-7.

448 GWP 2017 https://bit.ly/3tjTrfI.

449 See para 2.3.2.4.

450 GWP 2017 https://bit.ly/3tjTrfI.

451 GWP 2017 https://bit.ly/3tjTrfI.

452 Daniell *et al Understanding and Managing Urban Water in Transition* 3; WRC *Global Series: Water Resilient Cities* 63-64.

freshwater resources to meet both current as well as future water demand.[453] WDM refers to the strategies implemented by water institutions or consumers to control or alter water demand and usage to enhance economic efficiency, social development and equity, protection of the environment, and the sustainability of water of water services.[454]

WC and WDM differ in many respects, but also overlap.[455] The general aim of WC/WDM is to conserve water by controlling how it is used, influencing how much people want and promoting its efficient use.[456] WC/WDM should thus be considered as part of the planning processes for water resources, water supply and water services. Implementing WC/WDM measures could provide more cost-effective and appropriate solutions to reconcile the gap between growing water demand and existing water resources or infrastructure.[457] These measures are required for all five dimensions of urban water security, as they not only ensure the availability of sufficient drinking water, in general, but also see to it that water is available during drought conditions, and that enough water is available for socio-economic development. These measures can also postpone the need for large new infrastructure such as dams and bulk treatment works.[458] An integrated planning process should be used to decide on the resources, scope and prioritisation of WC/WDM activities.[459]

According to Kidd,[460] many urban centres in South Africa currently pursue WC/WDM, yet the implementation is problematic in smaller towns owing to insufficient information on the current usage and the amount of water they waste. The implementation of

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453 Daniell *et al Understanding and Managing Urban Water in Transition* 3; WRC *Global Series: Water Resilient Cities* 63-64.

454 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa* 97.

455 Daniell *et al Understanding and Managing Urban Water in Transition* 3; WRC *Global Series: Water Resilient Cities* 63-64.

456 WRC *Global Series: Water Resilient Cities 63*-64.

457 WRC *Global Series: Water Resilient Cities* 63-64.

458 Brears 2021 https://www.greengrowthknowledge.org/blog/water-secure-climate-resilient-future-cities.

459 WRC *Global Series: Water Resilient Cities* 63-64.

460 Kidd 2011 *International Journal of Rural Law and Policy* 9.

WC/WDM measures could help manage the increasing water demand and provide a more cost-effective way to conserve water. These measures could also minimise the need for additional capital infrastructure such as dams and bulk treatment works.[461] Municipalities, as water services authorities, can partake in WC/WDM by incorporating measures in their planning processes (such as in the water services development plans) and ensuring that the measures are implemented by water providers.[462]

2.4.2.4 Water sensitive urban design

While WSUD is not formulated as a management approach, for example as water sensitive management, it expresses the goals that urban water management strives to achieve. WSUD has, in part, developed from the concept of water-sensitive cities, which encourages local governments and communities to seek alternative means of sourcing, capturing, storing, treating and using water.[463] The following pillars of practice were identified for water-sensitive cities; cities as catchments, cities that provide ecosystem services, and those that manage their water use more effectively and sensitively.[464] A water-sensitive city is the product of the integration of urban planning, urban management and urban design, which respectively provide for WSUD, sensitive urban water management (SUWM), and water sensitive urban planning (WSUP).[465] WSUD and WSUM are therefore transitional approaches to water-sensitive cities, a term which refers to cities where water is given due prominence in the design, planning and management of urban areas.[466]

WSUD is seen as a multi-disciplined urban water management approach that aims to holistically consider the environmental, social and economic consequences of water

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461 DWAF *National Water Conservation and Water Demand Management Strategy* 14.

462 DWAF *National Water Conservation and Water Demand Management Strategy* 20. See more on this in Chapters 4 and 5 of this study.

463 Wong and Brown 2009 *Water Science and Technology* 673-682.

464 Fourie *et al Guideline on Compiling Water-Sensitive Spatial Plans* 14-15.

465 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa* 19-20.

466 Wong and Brown 2009 *Water Science and Technology* 673-682. Similar terms for WSUD include low-impact development, resilient cities, liveable cities, blue-green cities, sponge cities etc.

management infrastructure.[467] WSUD is an urban planning approach that sees value in a city's stormwater, wastewater and groundwater, which requires integration into the city's water supply, thereby reducing the harm it causes to rivers and other urban water sources.[468] There has been some localised application of WSUD practices in South Africa, such as the Green Point Urban Park in Cape Town and the green roof initiatives adopted by eThekwini and Johannesburg's Eco City initiative.[469] These initiatives can bring about many co-benefits to cities beyond water security, such as lowering temperatures in respect of climate adaptation and mitigation. Furthermore, spatial planning and land use management have been identified as means to integrate land and water planning towards creating water-sensitive settlements.[470] For urban water security, WSUD provides an important link between the spatial planning of the city, services provision, and the human and natural (non-human) components in the city.[471]

This approach proves to be quite beneficial towards addressing urban water security. This is largely because WSUD aims at ensuring that the urban water cycle is managed properly. This management approach thus realises the interlinkages of water sensitivity with various domains such as services provision, the protection of natural resources, public health, the reduction of disaster risk, adaptation to climate change, and urban planning.[472]

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467 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa* ix, 8.

468 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa* ix, 8.

469 Cilliers and Rohr "Integrating WSUD and Mainstream Spatial Planning Approaches: Lessons from South Africa" 358-62.

470 Fisher-Jeffes, Carden and Armitage 2017 *Town and Regional Planning*; Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa: Framework and Guidelines*; Rohr, Cilliers and Fourie 2017 *Town and Regional Planning*.

471 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa* ix; Future Water 2021 http://www.futurewater.uct.ac.za/FW-wsd.

472 Mishra *et al* 2020 *Conference Series: Earth and Environmental Science* 2.

2.4.2.5 Resilient urban water management

Resilient urban water management is fast gaining traction in scholarship and practice.[473] It refers to the capacity of communities, cities or regions *inter alia* to withstand and adjust to the challenges posed by the increased intensity and frequency of floods and droughts.[474] In considering urban water resilience, it is suggested that various scales in urban water systems be assessed depending on the users (households, communities, and cities), the institutions (service providers and regulators), the technologies and the ecosystems.[475] Johannessen and Wamsler[476] describe three levels of disturbances in the resilience of urban water services:

> i. Socioeconomic disturbance, which is not associated with external hazards but within the urban water service infrastructure and the entities that manage and govern them.
>
> ii. Hazard disturbances, i.e., external hazard, disaster, and crises-related disturbances that are outside the urban water service infrastructure.
>
> iii. Long-term disturbances such as [the effects of] unsustainable resource extraction by the urban water services on the broader social-ecological system and vice versa.

Hence, resilient water management for urban water systems considers both the external threats to the management of water, as well as internal factors (the technical and operational aspects of water management, for example).

South Africa's Long-Term Adaptation Scenarios (LTAS) describe water resilience as being built on integrated planning and based on water management that responds to hydrological variability, including through water planning at national, catchment and system scales.[477] In this context, resilience does not refer to bouncing back to the same (often-poor) state as before.[478] Instead, resilience refers to the ability to shift from the

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473 Harrison *et al Urban Resilience Thinking for Municipalities*.
474 DEA *Long-Term Adaptation Scenarios: Climate Change Implications for the Water Sector* 35.
475 Laitinen 2020 *Water* 4; Johannessen and Wansler 2017 *Ecology and Society* 2; Howe, Vairavamoorthy and Van der Steen *Sustainable Water Management in the City of the Future* 22.
476 Johannessen and Wansler 2017 *Ecology and Society* 3.
477 DEA *LTAS for South Africa: Climate Change Implications for the Water Sector in South Africa* 35.
478 Johannessen and Wamsler 2017 *Ecology and Society* 2.

current position of dysfunctional urban water systems to a position in which there is improved and more equitable access to water, better wastewater treatment, and better water quality.[479] Here it is also important to note that in the context of South Africa the focus of resilience efforts should be on transformation and not purely on adaptation. Hence, instead of focusing on getting people to continuously adapt to precarious living conditions, there should instead be efforts to transform the structural inequities and injustices that are responsible for fueling vulnerabilities in the first place. While this would by no means be an easy feat to perform, it is absolutely required.

Rodina and Harris state that resilience often involves adopting diverse, flexible, adaptive and redundant or supplemental systems.[480] This pertains to both physical infrastructure and governance arrangements, and focusing on restoring and maintaining the aquatic ecosystems.[481] Aside from direct water management, various institutional instruments can also help communities reduce their vulnerability to water-related disasters.[482] This shows that there are many instruments that can enhance resilience, including a choice between hard and soft instruments.[483] Thus, one can achieve resilience against floods by building protective infrastructure or thorough planning which restricts settlements in vulnerable areas.[484]

In addressing the challenges of climate resilience in water management, it has been suggested that resilience should be built into decision-making.[485] A climate-resilient approach to water management aims not only to manage natural resources and protect communities from climate-driven changes but also go beyond "business-as-usual", by

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479 Johannessen and Wamsler 2017 *Ecology and Society* 2.

480 Rodina and Harris 2016 https://theconversation.com/resilience-in-south-africas-urban-water-landscape-60461.

481 Rodina and Harris 2016 https://theconversation.com/resilience-in-south-africas-urban-water-landscape-60461.

482 Sadoff and Muller *Water Management, Water Security and Climate Change Adaptation* 69; GWP 2020 https://bit.ly/3tOCnia. Also see para 2.3.2.4.

483 Sadoff and Muller *Water Management, Water Security and Climate Change Adaptation* 69; GWP 2020 https://bit.ly/3tOCnia.

484 GWP 2020 https://bit.ly/3tOCnia.

485 UN-Water *World Water Development Report 2021: Valuing Water* 131.

including flexible and resilient solutions.[486] This approach would go beyond IWRM and would include the elements of flexibility, redundancy and adaptability.[487] It is worth noting that no single law, policy, action or strategy that a city, state or organisation can implement would prevent a community from experiencing the impacts of climate change-related disasters while protecting the natural water system.[488] Instead, policies need to incorporate an understanding of changing environmental conditions and to maximise the welfare of the people in the communities while ensuring the health of the ecosystems.[489]

Given the significant role of water in social-ecological systems, the multi-dimensional connectivity of environmental, economic and social sustainability challenges and the intertwined nature of human and natural systems,[490] legal systems and policies must promote a sustainable and resilient urban water system to ensure that all dimensions of urban water security are protected.

2.4.2.6 An evaluation of the water management approaches for urban water security

There are differences and similarities in the water management approaches, all of which relate to the five dimensions of urban water security. From the discussion above cities need to consider the benefits and drawbacks of all the approaches to water management to identify and possibly adapt an approach that is most suited for their unique local context.

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486 UN-Water *World Water Development Report 2021: Valuing Water* 131.
487 UN-Water *World Water Development Report 2021: Valuing Water* 131.
488 Brears *Urban Water Security* 2.
489 Brears *Urban Water Security* 2.
490 Biggs *et al What are SES and SES Research?* 4. Social-ecological systems (SES) is an emerging concept for understanding the intertwined nature of human and natural systems in this new, interconnected, and interdependent way.

The idea of "integration" is one of the most common elements in the different management approaches, especially in IUWM and IWRM.[491] Hoekstra, Buurman and Van Ginkel[492] contend that "integrated water" approaches should be considered, in which all water issues are considered comprehensively and in their mutual interdependencies, as well as "water integrated" approaches, in which handling water wisely forms an integral part of urban dynamics and urban design. Urban services (beyond water) management must take account of the socio-economic interdependencies that affect both the effective supply of raw water and the demands placed upon the resource.[493]

If there are to be more sustainable, socially sensitive and economically efficient water management practices, then there needs to be better management of water within the larger interconnected physical and social systems.[494] This management approach intends to strike a balance between present-day needs for water and the preservation of water for future generations.[495] IUWM and IWRM hence provide the necessary frameworks to achieve this vision of integration in water management. Municipalities must therefore be accountable water users, ensuring that water resources are protected through developing laws and policies within the scope of their authority and by implementing local projects that could minimise the negative impacts on water quality and quantity.[496]

WC/WDM may provide tangible benefits such as the minimisation of water losses, water efficiency, water resource protection and the sustainability of the water supply in cities. There is a need for a more guided approach that provides clear direction on what is required and how it will be achieved.[497] Municipalities could implement various demand

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491 See paras 2.4.2.1 and 2.4.2.2 above. Also see Jeleni *et al Integrating Water Resources and Water Services Management Tools* 8-9.

492 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 12.

493 GWP *Urban Water and Sanitation Services: An IWRM Approach* 8.

494 GWP *Urban Water and Sanitation Services: An IWRM Approach* 8; Bahri Integrated Urban Water Management 5.

495 Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 12.

496 ICLEI *Reaping the Benefits – How Local Governments Gain from IWRM* 13.

497 Wegelin and Jacobs 2013 *Water SA* 416.

management tools such as the pricing of water, financial incentives for the installation of water-efficient technologies, and education and awareness programmes to encourage water conservation.[498] Demand management could also be a vital component in optimising the use of resources and reducing GHG emissions. It could help to minimise the amount of water and electricity that are required to maintain a balanced environment.[499] Hence, WC/WDM needs to be integrated in the other management approaches for maximum effectiveness in optimising the attainment of urban water security.

WSUD is perhaps the most pre-emptive water management approach. According to Cilliers and Cilliers,[500] the close relationship between human and natural systems implies that cities and settlements cannot be sustainable or resilient until their dependence on ecosystem services has been recognised. Urban design and planning approaches that are focused on WSUD can help strengthen the integration of water into planning and spatial development processes. This provides numerous benefits for urban water security, including mitigating the adverse effects of water scarcity, improving water quality, and developing social equity, managing and reversing water pollution, developing social equity, and improving climate resilience.[501]

As the vulnerability to climate change impacts increases in cities, efforts to minimise these impacts are increasingly called for. However, even as cities move toward incorporating climate adaptation measures and disaster risk reduction into their plans, implementation is limited.[502] A fundamental shift to urban water resilience is required to ensure an effective response to water-related climate and disaster risks. The benefit in resilient urban water management lies in its emphasis on flexibility, responsiveness and

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498 Brears *Urban Water Security* 115.
499 Brears *Urban Water Security* 115.
500 Cilliers and Cilliers *Planning for Green Infrastructure: Options for South African Cities* 15.
501 Water Information Network - South Africa *Water Sensitive Settlements - Securing Water in Urban Spaces* 6; Cilliers and Rohr "Integrating WSUD and Mainstream Spatial Planning Approaches: Lessons from South Africa" 354.
502 Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 1.

redundancy.[503] A flexible governance system can help manage different water-related risks and water availability. This means learning, reflection and experimentation should be built into the governance and planning processes.[504]

Considering the above, urban water governance and management must be adaptive to achieve urban water security. They further require multi-functional infrastructure and urban design that reinforces water-sensitive planning and should be driven by a desire for inter-generational equity and resilience to climate change. Secondly, local governments would need to be conscious of the limited supply of natural resources, the risk of floods, the need to protect environmental and public health, and the need to secure access to water services.

2.5 Chapter summary

Water security must be placed within the existing paradigm of human security. As is evident from the discussion in the first part of this chapter, water acts as a dominant link across the range of types of securities, including political, health, economic, personal, food, community, and environmental securities.[505] The dimensions of human security enable it to address complex insecurity situations through collaborative, responsive, and sustainable measures that employ a hybrid approach, bringing together various dimensions through a protection and empowerment framework.[506] Assessing the multiple challenges to water security would reduce the risks, threats and vulnerabilities associated with human security and might accordingly contribute to a more secure future for water in cities. [507]

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503 Ramirez, Mollinedo and Porras "Adaptive Water Governance" 348-249; Brears *Urban Water Security* 18.

504 Ramirez, Mollinedo and Porras "Adaptive Water Governance" 348-249; Brears *Urban Water Security* 18.

505 See para 2.2.

506 Tadjbakhsh, Kubo and Konialis "The Concept of Human Security and its Added Value" 12.

507 Adger 2000 *Progress in Human Geography* 348.

As a clear progression from the conceptual foundations for human and water security, the second part of this chapter set out to delineate the dimensions of urban water security in terms of the available scholarly literature on the topic.[508] In light of the definition of urban water security proffered in this study,[509] the dimensions essential to achieving urban water security are: (a) ensuring equitable, secure and reliable access to an adequate, clean and safe drinking water supply, (b) providing accessible, safe, secure, adequate and equitable sanitation, wastewater, and stormwater services, (c) protecting urban aquatic ecosystems, (d) responding to water-related risks and hazards, and e) safeguarding the sustainable supply of water for socio-economic development.[510] It is left to municipalities to manage the urban water cycle as a single system that considers the interconnectedness of the water supply, groundwater, stormwater, wastewater, flooding, water quality and aquatic ecosystems, as well as the potential resource value of all urban water flows.[511]

Following on from the definitions and dimensions of urban water security, the last section of this chapter addressed the role of urban (water) governance and management in addressing water security.[512] Water governance for water security deals with the implementation and enforcement of equitable, efficient and sustainable solutions for problems related to the allocation, provision and coordination of water in urban areas, including notions of demand responsiveness and anticipation, and should be consensus-based, should ensure social inclusiveness, participation and transparency, should be effective and efficient, and should be accountable.[513] A new management paradigm needs to be established to make informed decisions about water that considers the complexity of the issues and their connection with decision-making

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508 Aboelnga *et al* 2019 *Resources* 5-6; Brown, Keath and Wong 2009 *Water Science Technology* 847-855. UN-Water *Water Security and the Global Water Agenda* 26.

509 See para 2.3.1.

510 See para 2.3.2.

511 See inter alia Romano and Akhmouch 2019 *Water* 1-9; UN-Habitat *Global Campaign on Urban Governance: Concept Paper* 26-29; OECD *Principles on Water Governance*.

512 See para 2.4.

513 See para 2.4.2.

around water security.[514] Setting a goal of water security could enable decision-makers to effectively assess and mediate between conflicting demands for water use and minimise the potential adverse impacts of deleterious land and water management practices. Municipalities are important stakeholders in improving the coordination, shaping and implementation of the laws, policies and procedures that are designed to improve the management of water and related resources.

As this chapter has shown, water governance provides the basis for determining and carrying out management actions.[515] The water management approaches assessed here pertain to the different methods and processes that states and institutions have adopted in planning, developing, distributing, and managing water resources in their jurisdictions.[516] This study hence argues that the management of water for achieving water security involves integrating the components of IWRM, WSUD, IUWM and WC/WDM and aiming for achieving urban water resilience. It is therefore suggested that water security requires sustainable, resilient, and integrated water governance that provides for institutional, legal, and regulatory support and capacity for change, adaptive management structures, new forms of relationship, and multi-layered models capable of integrating complex environmental, economic, and social dimensions.

The chapters to follow evaluate the provisions in the international, regional, and national legal frameworks to assess the role of municipalities in addressing water security based on the dimensions identified in this chapter.[517]

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514 Vörösmarty, Pahl-Wostl and Bhaduri 2013 *Current Opinion in Environmental Sustainability* 1-4; Pereira and Freitas 2017 *Contexto Internacional* 530.

515 See para 2.4.1.

516 See para 2.4.2.

517 See Chapters 3, 4 and 5.

3 INTERNATIONAL AND AFRICAN REGIONAL LAW AND POLICY ON URBAN GOVERNANCE AND WATER SECURITY

3.1 Introduction

International and African regional law and regulatory frameworks do not yet have law and policy specifically speaking to water security. However, aspects of the dimensions of water security, as identified and discussed in this study,[518] are spread out across various legal and policy instruments. This chapter starts by assessing the international and African regional framework.[519] The aim is to ascertain which instruments acknowledge and identify actions for addressing water security according to the dimensions identified in Chapter 2. The premise of this chapter is that South African cities could get normative guidance on urban water governance and security from the international and African regional law and policy frameworks.

As stated in Chapter 2,[520] water security is seen to be linked to human rights, as water scarcity may lead to those affected living in deplorable conditions. To violate the human right to water and to access to water resources also constitutes a violation of the right to life and dignity.[521] The extent to which this study relies on international and regional instruments is for the limited purpose of distilling or clarifying the role of sub-national governments in addressing the dimensions of water security.

This chapter acknowledges that the adoption, ratification, and implementation of international and regional instrumentation devolves to national government,[522] and hence the obligations, if any, arising from these instruments would be first and

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518 See para 2.3 for the dimensions.

519 The instruments presented in this chapter are not exhaustive, but they do highlight adequately the pertinence and contemporary importance of cities in achieving water security on a local, regional and global level.

520 See para 2.3.2.1.

521 De Chazournes, Leb and Tignino "Introduction". See General Comment 15 para 1. Qumbu *The Role of Courts in Promoting Water Security in South Africa* 12.

522 Section 231 of the *Constitution*.

foremost the responsibility of national governments.[523] The state of South Africa, constitutes what could be called a semi-federation, with the "state" comprising of national, provincial, and local spheres, which implies that there is a considerable degree of the devolution of power from one sphere to the next. This discussion therefore does not necessarily translate into a benchmark against which to measure South African national and local government laws and policy. Instead, it evaluates the contribution of the international and African law and policy frameworks in defining a role for local government in water security, which may be considered as normative guidance for South African cities.

3.2 International law and policy perspectives on the dimensions of urban water security

3.2.1 Introduction

The international law and policy framework relevant to urban water security comprises a range of instruments from sub-fields such as human rights, urban law, environmental law and water law, as well as development law.[524] In this sense, there is a multitude of legal instruments that are aimed at protecting the environment and managing natural resources internationally and on the African continent. National governments can also formulate their own policies and procedures related to various aspects of the environment, including more specifically water security.

In what follows, attention is paid to international instruments such as treaties, soft-law policies, guidelines, and frameworks which speak to urban water management and

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523 According to sections 39(1) and 233 of the *Constitution*, courts are to consider international human rights instruments when applying the Bill of Rights, as well as to interpret legislation in a manner that is consistent with international law.

524 See Wouters "Water Security: What Role for International Law" 166-181. As transboundary or shared waters are the responsibility of national levels of government this discussion will not cover transnational law or laws relating to shared waters.

security.[525] The idea is to distil from these instruments higher-level perspectives on the dimensions of urban water security to help define the role of sub-national authorities such as municipalities in urban water security.

3.2.2 Overview of international instruments

Lobbying by the international community for the need to consider water as a crucial element of sustainable development is part of the reason for water matters reaching the international law and policy agenda.[526] The advancements in the acknowledgment of water as a crucial policy ideal, and more specifically of a human right to water in international law, can be traced back to several discussions, policy developments, forums and interpretations of existing justifiable human rights.[527]

The *Mar del Plata Action Plan* (1977)[528] acknowledged four decades ago that the accelerated development and orderly administration of water resources is a principal factor in efforts to improve the economic and social conditions of humankind, especially in developing countries. The *Mar del Plata Action Plan* sought to change the international perception of water governance, with many of the Plan's principles still finding application today. In acknowledgment of the scarcity and misuse of fresh water and the risks it poses to sustainability calls were made for the adoption of innovative approaches for the assessment, development and management of freshwater resources through the collaboration and involvement of decision-makers at all levels.[529] Both the *Dublin Statement on Water and Sustainable Development* (1992), and *Agenda 21* were

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525 This chapter also does not delve into the development of the acknowledgment of the human right to water as this has been discussed comprehensively in academic scholarship. For a recent analysis (as until 2020) of these developments, see Steyn *The Realisation of the Constitutional Water Right in South African Cities through Intelligent Water Management Technologies*. Also see Cooper *Covenants, Constitution & Commons: International, Constitutional and Community Responses to Achieve Access to Sufficient Water for Everyone*.

526 UN 2015 https://www.un.org/waterforlifedecade/water_and_sustainable_development.shtml.

527 See Salman and McInerney-Lankford *Human Right to Water: Legal and Policy Dimensions* 5.

528 UN 2020 https://sustainabledevelopment.un.org/topics/waterandsanitation; *Mar del Plata Action Plan* UN Doc E/CONF.70/29 (1977) (*Mar del Plata Action Plan*).

529 *Dublin Statement on Water and Sustainable Development* (1992).

subsequently adopted.[530] *Agenda 21* was one of the first international instruments to have positively engaged cities and towns to stimulate environmental sustainability by encouraging local authorities to develop and implement a *Local Agenda 21* (LA 21).[531] Local authorities are required to fulfil the objectives of *Agenda 21*.[532] It is argued that the provisions throughout *Agenda 21* (where it does not expressly refer to local authorities as with LA 21 for example) are relevant and applicable to local authorities even in the absence of express reference.

Furthermore, the discussions, declarations and resolutions adopted during the World Water Council Fora have largely shaped the development, understanding and implementation of measures concerning water security.[533] The most notable is the *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* (2015), which acknowledges the role of local authorities in addressing water insecurities, extends well beyond merely providing water and sanitation services, or purely serving as an institution of support for national (and provincial) governments.[534]

Other soft-law instruments that speak to the dimensions of urban water security include *Agenda 2030*, the *Sendai Framework*, and the *New Urban Agenda*. All the SDGs in *Agenda 2030* interact with one another and with water security dimensions, but those explicitly relevant are SDG 6 which address clean water and sanitation, SDG 11 which speaks to sustainable cities and communities, SDG 13 on climate action, SDG 14 that addresses life below water, and SDG 15 dealing with land-based ecosystems, all of

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530 UN date unknown https://sustainabledevelopment.un.org/outcomedocuments/agenda21.

531 Chapter 28 of *Agenda 21* titled "Local Authorities' Initiatives in Support of Agenda 21" para 28.2. *Agenda 21 is* the responsibility of governments and requires implementation through national strategies, plans and policies, but remains voluntary and unenforceable. – See Du Plessis *Fulfilment of South Africa's Constitutional Environmental Right in the Local Government Sphere* 79-87. It is notable that prior to *Agenda 21* the *World Commission on Environment and Development (WCED): Our Common Future* UN Doc A/RES/38/161 (1987) (*Brundtland Report*) addressed the urban challenge in its Chapter 9 which spoke to environmental challenges in cities in developing countries and strengthening local authorities to deal with the "urban challenge".

532 *Agenda 21* para 28.3.

533 World Water Council 2021 https://www.worldwatercouncil.org/en/world-event.

534 This is the outcome document of the 7th World Water Forum (2015) accessible at World Water Council 2020 https://bit.ly/3DZO4bR.

which are underscored by SDGs 16 and 17, which respectively address having strong and just institutions and establishing partnerships for achievement of the goals.[535] These SDGs are most likely to be met where local governments have the competence and capacity to fulfil their responsibilities, and where their residents are equipped to make demands for accountability and transparency.[536]

The objectives of the *New Urban Agenda* intricately link to *Agenda 2030*, the *Paris Agreement*, the *Sendai Framework* and other global development agreements and frameworks.[537] In these interlinkages, it is maintained that cities can be regarded as the source of solutions to rather than the cause of the challenges that the world is facing today.[538] The *Convention on Biological Diversity* (1992) (CBD) speaks to the protection of the natural environment, and in particular aquatic ecosystems. The CBD has given explicit recognition to the role of cities and local governments in biodiversity conservation, *inter alia*, through the *Strategic Plan for Biodiversity 2011-2020, and the Aichi Biodiversity Targets*.[539]

The next section provides an analysis of the provisions of specific international law and policy measures that relate to the five dimensions of urban water security.[540] It does so by assessing the provisions concerning the principles and duties placed on sub-national authorities in relation to the dimensions identified in Chapter 2.

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535 McIntyre "International Water Law and SDG 6: Mutually Reinforcing Paradigms" 173.

536 UNESCO *Water Security and the Sustainable Development Goals* 34. The SDGs have been criticised for lacking normative clarity, however, this study does not engage in this discourse. For a comprehensive analysis of the discourse on various SDGs see French and Kotzé *Sustainable Development Goals: Law, Theory and Implementation*, for example.

537 *New Urban Agenda* para 6.

538 *New Urban Agenda* iv.

539 *The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets* adopted by the 10th Conference of the Parties to the CBD Decision X/2 (2010).

540 See para 2.3.2.

3.2.2.1 Ensuring equitable, secure and reliable access to an adequate, clean and safe drinking water supply in urban areas

Access to water is recognised internationally as being imperative to the fulfilment of all human rights. As a result, several international instruments recognise and provide for the fulfilment of access to drinking water,[541] with some instruments specifically recognising a "right" to safe drinking water.[542] International instruments increasingly recognise the fulfilment of criteria such as accessibility, availability, quality, acceptability, and affordability in the frameworks used for monitoring water services at national and global levels.[543]

SDG target 6.1 aims for the universal achievement of equitable access to safe and affordable drinking water by 2030.[544] Achieving this target will require paying increased attention to disadvantaged groups and making efforts to monitor the elimination of inequalities in drinking water services.[545] This target does not provide any specific normative criteria or indicators.[546] However, General Comment 15 provides a good reference point as to what is expected of cities to ensure equitable, secure and reliable access to adequate drinking water services in urban areas.

In this regard states, and arguably municipalities too, need to effectively undertake actions (regulatory and otherwise) to ensure the right to water, as clarified in General Comment 15.[547] The human right to water entitles all people to safe, sufficient, reliable, physically and economically accessible water for personal as well as domestic use.[548] As a starting point, water of an adequate quantity needs to be available for both personal and domestic use. States need to address this goal through providing for availability,

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541 Such as the framing of SDG 6 in *Agenda 2030* for example.
542 UN GA Res 64/292 (2010).
543 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 25.
544 SDG target 6.1.
545 Department of Statistics *SDGs Country Report 2019* 12.
546 Collins "Sustainable Development Goals and Human Rights: Challenges and Opportunities" 69.
547 General Comment 15 para 1.
548 General Comment 15 para 2.

quality and accessibility.[549] In satisfying the availability requirement, the actual supply of water must be sufficient and constant (without undue interruptions) for the personal and domestic uses of everyone.[550] According to the World Health Organisation (WHO), each person requires approximately 50 to 100 litres of water per day to ensure that their basic needs are satisfied.[551] Moving on from sufficient quantity, water needs to be continuously available.[552] Continuous availability essentially refers to the reliability of the water supply,[553] meaning that access to water should be free from interference and not subject to arbitrary disconnections or contamination, and users should be served by an appropriate system of water supply and management. [554]

Furthermore, water supplied must be safe and must not pose a threat to human health or well-being. This means that the water must be free from "micro-organisms, chemical substances and radiological hazards that may threaten human health, and should be of an acceptable colour, odour and taste for personal or domestic use."[555] States are therefore advised to develop national standards that ensure safe drinking water through eliminating or reducing the constituents of water that may be harmful to human health.[556] When it comes to water quality it is advisable that states take a preventive approach to ensure the safety of drinking water.[557] The role of local authorities may be limited to ensuring that they comply with and adhere to the set national standards in this regard. These authorities do have a vital role to play in verifying and auditing the management of the formal drinking-water systems.[558] Safety in relation to water facilities and services also speaks to guaranteeing personal security and water, which

549 General Comment 15 para 12.
550 General Comment 15 para 12(a).
551 UN 2014 https://www.un.org/waterforlifedecade/human_right_to_water.shtml.
552 General Comment 15 para 12(a).
553 See para 2.3.2.1.
554 General Comment 15 para 21.
555 General Comment 15 para 12 (b).
556 WHO *Guidelines for Drinking Water Quality* 2-8.
557 WHO *Guidelines for Drinking Water Quality* 8.
558 WHO *Guidelines for Drinking Water Quality* 11.

means that a person's physical security (in places such as cities) must not be threatened when accessing to water facilities and services.[559]

Accessibility pertains to the extent to which the water facilities and services must be available to all people within the delimited area of the specific governing institution (municipality). There should be no barriers to entry especially concerning physical and economic accessibility, information accessibility, and non-discrimination.[560] To meet the requirement of physical accessibility, all people must be able to access water and the necessary water facilities and services easily and unobtrusively.[561] This necessitates the availability of clean, drinkable water in or near every residence, educational institution, and place of business. According to the WHO, a basic level of services means that the water source must be within 1,000 metres of the household and collection time should not exceed 30 minutes.[562]

Access to drinking water is premised on equitability, which entails that water services should be provided in an affordable manner, and the provision should be non-discriminatory. This essentially refers to the equity dimension inherent to the concept of water security.[563] Regarding economic accessibility, the services and facilities provided should be affordable by all members of society.[564] To improve affordability, General Comment 15 suggests that parties implement policies and programmes like free or low-cost water and income supplements (subsidies), as well as a variety of appropriate low-cost techniques and technologies.[565] Similarly, the UNDP suggests that the cost of water should not exceed 3 per cent of household income.[566] It specifies the normative content of the right to water, stressing that the way in which the right is realised should be

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559 General Comment 15 para 12 (c) (i). Also see the dimensions of human security in para 2.2.2 above.
560 General Comment 15 para 12(c) (i) - (iv).
561 General Comment 15 para 12 (c) (i).
562 WHO *Guidelines for Drinking-Water Quality* 91.
563 See para 2.3.
564 General Comment 15 para 12 (c) (ii).
565 General Comment 15 para 27.
566 UN 2014 https://www.un.org/waterforlifedecade/human_right_to_water.shtml.

sustainable so that both current and future generations can enjoy the realisation thereof.[567]

Legal frameworks must furthermore put in place sufficient procedural safeguards before any disconnections are made. The ability to pursue remedies is essential in cases where users believe their human rights to water or sanitation have been violated.[568] Consumers must be given the opportunity to catch up on payments, if they are unable to do so, they must receive services for free or there must be adequate subsidy mechanisms in place to ensure affordability. In this regard it will be important for municipalities to put into place regulatory or policy mechanisms that ensure affordability. The final factor, information accessibility, involves the right to inquire about, obtain and disseminate information regarding water issues.[569]

Non-discrimination and equality are fundamental principles of human rights and critical components of the right to access to water. In this regard, states need to ensure that the accessibility of drinking water services is not hindered by any factors, especially for disadvantaged or marginalised groups.[570] Based on the international instruments under discussion, states must then ensure physical access to water facilities or services that meet minimum standards for quantity, quality, and reliability, that have enough taps to prevent excessively long wait times, and that are located within a reasonable distance from homes.[571] It also addresses the issue of equity by stressing the significance of ensuring that marginalised farmers have access to sustainable water management systems like rainwater collection and irrigation.[572]

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567 General Comment para 11.
568 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 48.
569 General Comment 15 para 12 (c) (iv).
570 General Comment 15 para 37(e).
571 General Comment 15 para 37 (c)-(d).
572 General Comment 15 para 7.

The legal obligations of state parties are also clearly delineated in General Comment 15.[573] For one, states have a duty to adopt and implement measures towards the full realisation of the right rapidly and effectively.[574] The specific legal obligations imposed under the Comment include obligations to respect, to protect and to fulfil.[575] States have an obligation to ensure that the right to water is not infringed upon in any way, including through the use of arbitrary restrictions or other means. In terms of this obligation, states should refrain *inter alia* from polluting water resources, arbitrarily and illegally disconnecting water and sanitation services, reducing the provision of safe drinking water to slums to meet the demand of wealthier areas, destroying water services and infrastructure as a punitive measure, or depleting water resources relied upon for drinking.[576] It is the responsibility of all spheres of government, including the national government and local government, to implement measures that seek the progressive realisation of the right to water.[577]

The obligation to protect involves the duty of the state to safeguard against threats to the exercise of the right to water from non-state actors, including organisations, businesses, and government agencies.[578] In terms of this obligation, appropriate legal and other measures must be put in place to prevent, for example, third parties from preventing people from having access to sufficient water, or from polluting or inequitably extracting from water resources such as rivers, and other water distribution systems.[579] Additionally, the responsibility also rests on states to ensure that access to water is not disrupted where third parties operate or control water infrastructure in the form of piped water networks or water tanks.[580]

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573 General Comment 15 para 17.
574 General Comment 15 para 18.
575 General Comment 15 para 20.
576 UN *The Right to Water Fact Sheet No 35* 27.
577 UN *Draft Guidelines for The Realization of the Right to Drinking Water Supply and Sanitation* para 2.1.
578 General Comment 15 para 23.
579 General Comment 15 para 23.
580 General Comment 15 para 24.

The obligation to fulfil the right to water entails states taking active steps to ensure that individuals and communities enjoy the right to water.[581] Fulfilling the right to water encompasses the obligations to facilitate, promote and provide.[582] These obligations include *inter alia* actively adopting and implementing measures that educate the public on using water safely and hygienically, on water resource protection and minimising wastewater.[583] When individuals or groups are incapable of realising the right to water themselves and by the means at their disposal, states are obligated to intervene.[584] To meet their obligations states need to adopt measures that will see to the full realisation of the right to water.[585] These measures include acknowledging and transplanting the right in national political and legal systems (preferably through legislation), adopting a national water strategy and plan of action, ensuring the affordability of water, and improving the sustainability and continuous improvement in access to water in both rural areas and informal settlements.[586]

The UN Human Rights Council Resolution 18/1 (UN HRC Res 18/1),[587] claims that governments bear the duty to ensure the full realisation of the entirety of human rights and should put measures in place that use all available resources to progressively realise the right to safe drinking water.[588] Some of the duties placed upon states by the UN HRC Resolution 18/1 include regular monitoring and evaluation of progress towards realising the right to water.[589] Here, it asserts that the full realisation of the right to safe drinking water and sanitation for all can be achieved progressively, by developing comprehensive plans and strategies or the re-examination and revision of existing instruments if they aren't in line with human rights principles and standards.[590] Every

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581 General Comment 15 para 25.
582 General Comment 15 para 25.
583 General Comment 15 para 25.
584 General Comment 15 para 25.
585 General Comment 15 para 26.
586 General Comment 15 para 26.
587 Article 5 of UN HRC Res 18/1.
588 Article 5 of UN HRC Res 18/1.
589 Article 7(a) of UN HRC Res 18/1.
590 Article 7(c) of UN HRC Res 18/1.

single one of these obligations is critical not only to ensuring that the human right to safe and drinking water is fully realised at all levels, but also for assessing the means to ensure overall water security in cities.

Notably, in assessing the role of local authorities in addressing water security, the Resolution calls on states to clearly define their roles in the water and sanitation industries.[591] In this light, it is important that there is sufficient co-ordination between the water-related policies of all spheres of government, and particularly national and local authorities.[592] This is significant for urban water security, as it will determine the full extent of the rights, duties and responsibilities of local governments in addressing the dimensions of water security. Where local authorities have the delegated authority to implement the right to water, the national government retains the responsibility to comply with its international obligations and must ensure that these authorities have the resources and capacity to maintain and provide essential water services and facilities.[593] This requires the oversight and monitoring of the provision of the services by local government, especially where municipalities are struggling to maintain their ability to deliver services in the manner prescribed by law.

Consequently, to ensure the efficient and equitable allocation of water resources, the reconciliation of city development planning with the availability and sustainability of water resources is a necessity.[594] Of equal importance is fulfilling the basic water needs of the urban population, and the implementation of water tariffs. This requires considering the circumstances in each country and reflecting on affordability, availability and the cost of water, especially for productive activities.[595] Notably, when claiming the right to water, questions of quality, quantity, affordability and access to water should be holistically considered.

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591 Article 7(c) of UN HRC Res 18/1.
592 General Comment 15 para 51.
593 General Comment 15 para 51.
594 *Agenda 21* para 18.59(b) (i).
595 *Agenda 21* para 18.59(b) (ii) and (iii).

Building on these provisions, states should create a regulatory environment which obligates water and sanitation providers to respect and protect human rights and refrain from violating these human rights.[596] It is further expressed that to ensure consistency and countrywide compliance with human rights, states should also put in place national minimum standards based on human rights criteria before decentralising water and sanitation services.[597] Considering that the provision of water services is decentralised in South Africa, the aforementioned is highly relevant. Municipalities cannot merely provide water services according to low, ineffective, and sub-par standards. Instead, these must conform to nationally determined and acceptable standards.[598] Hence, while efforts being undertaken so far on water resources development and management should be continued and strengthened, good governance, capacity building and financing are of the utmost importance to succeed in the efforts to address water issues.[599]

3.2.2.2 Provision of equitable, accessible, safe and adequate sanitation, wastewater, and stormwater services

At first glance it may appear that the right to access to sanitation and drinking water services can be considered as a single right, but further analysis shows that the two are distinct but complementary rights.[600] They do, however, have the same normative and legal basis. It is due to their complementarity that states should be cognisant that providing a clean and safe supply of drinking water will not be possible without addressing wastewater treatment and the disposal of sewage.[601] With this in mind, the (human) right to sanitation entitles everyone to sanitation services that provide privacy

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596 Article 7(i) of UN HRC Res 18/1.
597 Article 7(i) of UN HRC Res 18/1.
598 See Chapter 4.
599 *Kyoto Ministerial Declaration* (2003) para 2.
600 Kirschner *The Human Right to Water and Sanitation* 448. UN GA Res 70/169 (2015).
601 Kirschner *The Human Right to Water and Sanitation* 449. General Comment 15 para 29; UN GA Res 70/169 (2015) 3.

and ensure dignity, and that are available, accessible, affordable, hygienic, safe and secure, and socially and culturally acceptable.[602]

SDG target 6.2 aims to ensure that everyone has access to safe and sanitary facilities, with a focus on meeting the needs of women and girls and people in disadvantaged circumstances.[603] In addressing the first indicator under this target, municipalities need to ensure that the provision of sanitation services includes both the instalment of facilities (toilets or pit latrines), as well as the entire life cycle of wastewater and sewage collection and disposal.[604] Those providing sanitation facilities also need to ensure that the needs of everyone are always fulfilled, and where facilities are shared they should not have unreasonable hinderances regarding accessibility.[605] This target also highlights the importance of hygiene and handwashing with soap and water is widely recognised as a priority for reducing disease transmission.[606] In all cases, sanitation facilities must always provide water and soap for handwashing and menstrual hygiene management.[607] Local authorities have the responsibility to ensure that basic infrastructure, monitoring and planning systems are in place to ensure that basic health needs are provided for through safe sanitation.[608] It is equally important that states establish clear responsibilities for the sustainable operation of sanitation services, especially where these services are decentralised.

Where sanitation services are available, states must ensure their accessibility.[609] This entails consideration of the design of facilities, time and distance, as well as physical security. This means that municipalities have to ensure that sanitation facilities are accessible by everyone, having due regard to those facing barriers to access such as

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602 UN-Water 2022 https://www.unwater.org/water-facts/human-rights-water-and-sanitation.
603 SDG target 6.2; Department of Statistics *SDGs Country Report 2019* 12.
604 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 32.
605 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 34.
606 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.
607 SDG indicator 6.2.1b "Proportion of population using safely managed sanitation services."
608 *Agenda 21* para 6.5(a)(i) (emphasis added).
609 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 39.

older persons, children, and those with disabilities.[610] SDG target 11.1 aims to ensure access for all persons to adequate, safe and affordable housing and basic services and to upgrade slums by the year 2030.[611] SDG target 6.2 is further seen to implicitly refer to the right to sanitation, and generally to the rights to health, an adequate standard of living and housing.[612] Based on the definition of what "adequate housing" entails, an argument is made that access to improved sanitation also forms one of the components of adequate housing.[613] In this instance, a household is considered to have access to improved sanitation if an excreta disposal system, through private or public toilets, is available to the members of the household. States need to provide for regulations that outline minimum standards concerning the physical accessibility of sanitation facilities.

Sanitation should further be provided in a manner that ensures both quality and safety.[614] These facilities need to be culturally acceptable, ensuring the safety and privacy of everyone. Additionally, regulations and policy should provide guidance on the regular maintenance and cleaning of the facilities and the emptying of the excreta at the facilities.[615] To this end, states must give due cognisance to the precautionary principle in avoiding or minimising the contamination of water through pollution reduction at source and effluent reuse, recycling and recovery, treatment and environmentally safe disposal.[616] Where pollution cannot be prevented or minimised, states are encouraged to apply the "polluter pays" principle to all kinds of sources, including on-site and off-site sanitation.[617] Based on the foregoing, it is arguable that adequate sanitation is also premised on the right to a safe and healthy environment, which primarily seeks to ensure human health and well-being.

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610 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 39.
611 SDG target 11.1.
612 Article 11(1) of the ICESCR. Scholtz and Barnard "The Environment and the Sustainable Development Goals: 'We Are on a Road to Nowhere'" 233.
613 Article 25 of the *Universal Declaration of Human Rights* (1948).
614 De Albuquerque *Realising the Human Rights to Water and Sanitation: A Handbook* 43.
615 HRC *Report on Sanitation* A/HRC/12/24 para 72.
616 *Agenda 21* para 18.40(b)(iv).
617 *Agenda 21* para 18.40(b)(i).

In the light of SDG target 6.3, states need to improve water quality by reducing pollution, eliminating unauthorised dumping, improving the treatment of wastewater, and substantially increasing the recycling and safe reuse of untreated wastewater.[618] States need to provide measures that address collecting, treating and reusing wastewater from households and industry, reducing diffuse pollution and improving water quality, as these pose major challenges to the water sector.[619] On a national level, achieving SDG target 6.3 demands of states to monitor the compliance of their wastewater systems according to national or local standards.[620] Earlier on, *Agenda 21* provided that states may implement the monitoring and surveillance of water resources and wastes.[621] It is held that states may establish and enforce laws, rules, and policies—such as monitoring, disincentives, pollution fines, and assistance with compliance—to mitigate pollution by both public and private water entities.[622]

Under UN GA Res 70/169, states are encouraged to pursue integrated approaches and to strengthen their water resource management through improving their wastewater treatment and by preventing and reducing surface and groundwater pollution.[623] States are also required to evaluate their existing policies and activities giving careful thought to wastewater management, treatment and reuse, while monitoring resources allocated, financial or otherwise, to ensure access, and to identify the role-players and their capacity in the sector.[624] States need to implement programmes addressing urban storm-water run-off and drainage.[625] They should protect water resources and promote recycling and the reuse of wastewater, and identify and control the sources of industrial pollution.

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618 SDG target 6.3; Department of Statistics *SDGs Country Report 2019* 161.
619 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.
620 SDG target 6.3.1.
621 *Agenda 21* para 18.40(g).
622 UN *Draft Guidelines for The Realization of the Right to Drinking Water Supply and Sanitation* para 7.3.
623 UN GA Res 70/169 (2015) 3. Also see *Agenda 21* para 7.5(d).
624 Article 7(b) of UN HRC Res 18/1.
625 *Agenda 21* para 18.59(ii).

It is recommended that states build and expand sewage treatment facilities and drainage systems, where appropriate, and treat and safely reuse domestic and industrial wastewaters in urban areas. Likewise, states should monitor the extent of the realisation, or the non-realisation, of the right to water,[626] and implement relatively inexpensive targeted water programmes.[627] Lastly, they need to take measures to prevent, treat and control water-borne diseases, in particular ensuring access to adequate sanitation.[628] Furthermore, concerning water and sustainable urban development,[629] states could enhance the water resource protection from depletion, pollution and degradation *inter alia* through the introduction of sanitary waste disposal facilities, the implementation of urban stormwater run-off and drainage programmes, the promotion of the recycling and reuse of waste water and solid wastes, and the control of industrial pollution sources to protect water resources.[630] This, in turn, requires the efficient and equitable allocation of water resources through the reconciliation of city development planning with the availability and sustainability of water resources, and the satisfaction of the basic water needs of the urban population.[631]

3.2.2.3 Protection of urban aquatic ecosystems

To echo an earlier point,[632] healthy, functional, and sustainable ecosystems are fundamentally connected to water security, hence ensuring ecosystem protection and conservation is central to achieving water security.

Agenda 21 explicitly recognises the importance of the protection of water resources, water quality and aquatic ecosystems.[633] It provides that the long-term development of

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626 General Comment 15 para 37 (g).
627 General Comment 15 para 37 (h).
628 General Comment 15 para 37 (i).
629 *Agenda 21* para 18.56-64.
630 *Agenda 21* para 18.59 (a)(i) - (iv).
631 *Agenda 21* para 18.59 (b).
632 See para 2.3.2.3.
633 *Agenda 21* paras 18.35-18.46.

global freshwater requires the holistic management of resources and a recognition of the interconnectedness of the elements related to freshwater and freshwater quality.[634] In this regard, *Agenda 21* encourages countries to ensure that all relevant decisions are preceded by environmental impact assessments (EIAs), and that they consider any ecological consequences that may arise due to developments.[635] States therefore should also apply the "polluter pays" principle, adopt the precautionary approach in water-quality management, and conduct mandatory EIAs of all major water resource development projects potentially impairing water quality and aquatic ecosystems.[636] These provisions are reiterated in the CBD, which necessitates the introduction of measures requiring EIAs of proposed projects that may have a detrimental impact on biological diversity to avoid or minimise any such impacts.[637]

Furthermore, states should promote the participation of all governmental agencies responsible for health and the environment from the earliest stages of planning, during both the implementation and the subsequent monitoring of any socio-economic development scheme and in the formulation and application of relevant legislation and regulations.[638] Consequently, agencies such as municipalities play a prominent role in protecting aquatic systems. This is because they are the sub-national agents that arguably encounter the impacts on ecosystems on a more immediate and intense scale than national or provincial governments.

Agenda 21 suggests that states prepare national plans for the protection and conservation of water resources.[639] Moreover, they are encouraged to provide for the rehabilitation of polluted and degraded water bodies to restore aquatic habitats and ecosystems.[640] Accordingly, to integrate water-quality elements into water resource

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634 *Agenda 21* para 18.35.
635 *Agenda 21* para 7.41 (b).
636 *Agenda 21* paras 18.40 (b)(i)-(v). Also see *Mar del Plata Action Plan* para 34-35.
637 Article 14(1)(a) of the CBD.
638 *Mar del Plata Action Plan* para 36 (k).
639 *Agenda 21* para 18.40(a)(iii).
640 *Agenda 21* paras 18.40 (e)(i).

management, states need to concurrently pursue the objectives of maintaining ecosystem integrity, protecting public health and developing human resources.[641] To further ensure the protection of aquatic environments, it is suggested that states adopt and implement rehabilitation programmes to protect groundwater resources and to provide for the conservation of wetlands.[642]

Adding to the above, states can set targets that establish, according to their capacities and needs, biological, health, physical and chemical quality criteria for all water bodies (surface and groundwater), with a view to the ongoing improvement of water quality.[643] They may also adopt an integrated approach to the environmentally sustainable management of water resources, including the protection of aquatic ecosystems and freshwater living resources.[644] In addition, states should put in place strategies for the environmentally sound management of freshwater and related coastal ecosystems, including the consideration of fisheries, aquaculture, agricultural activities and biodiversity.[645]

As a signatory of and after ratifying the CBD, South Africa must develop national strategies, plans or programmes, or modify existing instruments to ensure that biodiversity conservation and sustainable use of biodiversity are factored into sectoral and cross-sectoral plans, programmes and policies.[646] In addition, the *Strategic Plan for Biodiversity* 2011-2020 and the *Aichi Biodiversity Targets*[647] offer a good policy opportunity for protecting aquatic ecosystems.[648] Based on these frameworks, states are

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641 *Agenda 21* para 18.38 (a)-(c).
642 *Agenda 21* paras 18.40 (e)(i)-(iv).
643 *Agenda 21* para 18.39(f).
644 *Agenda 21* para 18.39(g).
645 *Agenda 21* para 18.39(h).
646 Article 6 (a) and (b) of the CBD.
647 *The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets* adopted by the 10th Conference of the Parties (COP-10) to the CBD Decision X/2 (2010) (hereafter *Strategic Plan for Biodiversity*).
648 A follow up to the *Strategic Plan*, the Post-2020 Global Biodiversity Framework is currently underway and will be introduced at COP-15 in December 2022 - Convention on Biological Diversity 2022 https://www.cbd.int/conferences/post2020.

required to adopt and implement effective, participatory and updated national biodiversity strategies and action plans (NBSAP).[649] Cities and local authorities have an acknowledged role in the services of urban ecosystems, which includes valuing and managing ecosystems as "green" infrastructure that supports cities.[650] To this end, cities are specifically encouraged to value and manage biodiversity and ecosystems as part of their infrastructure and to integrate these into all aspects of local governance. Decision IX/28[651] importantly notes that there are multiple reasons for promoting the engagement of cities and local authorities in the implementation of the CBD. These reasons include the significant role that cities play in designing and implementing land-use and zoning planning tools.[652] Local governments are therefore empowered to develop, enhance and implement local biodiversity strategies and action plans (LBSAPs) in accordance with national guidelines, frameworks and updated NBSAPs.[653]

The objectives under SDG target 6.6 directly aim to contribute to wider improvements in ecosystem health, in both marine (coastal) and terrestrial ecosystems.[654] Based on the targets under SDGs 14 and 15, a connection is drawn between the protection of coastal and terrestrial ecosystems and the conservation, sustainable use and equitable sharing of the benefits arising from natural resources.[655] SDG targets 6.6 and 15.1 include explicit commitments to the protection, restoration, and sustainable use of water-related ecosystems. SDG target 15.9 echoes this call to action, urging states to consider the value of ecosystems and biodiversity in their planning and development

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649 *Strategic Plan for Biodiversity* para 3(a)-(f).

650 *Aichi/Nagoya Declaration* 1.

651 *Promoting engagement of cities and local authorities* adopted by the 9th Conference of the Parties to the CBD Decision IX/28 (2008) (COP-09 Decision IX/28).

652 Preamble of the COP-09 Decision IX/28.

653 *Aichi/Nagoya Declaration* 2; *Plan of Action on Sub-national Governments, Cities and Other Local Authorities for Biodiversity* CBD COP Decision X/22 (2010) (COP-10 Decision X/22) para 3(b).

654 SDG target 6.6 aims to "protect and restore water-related ecosystems", SDG 14 "to conserve and sustainably use the oceans, seas and marine resources for sustainable development", and SDG 15 "to protect, restore and promote sustainable use of terrestrial ecosystems."

655 SDG targets 14.2 "to sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and act for their restoration in order to achieve healthy and productive oceans" and 15.1 "to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services."

processes at all levels.[656] It is to this end that a role for sub-national authorities in the integrated management of (urban) biodiversity and ecosystems can be inferred.[657]

Building on this, *Aichi Biodiversity* Strategic Goal A requires of states to address biodiversity loss by mainstreaming biodiversity across government and society.[658] Target 2 under this goal further urges states to integrate biodiversity values into national and local development strategies and planning processes. Strategic Goal C of the *Aichi Biodiversity Targets* focuses on protecting ecosystems, coastal and marine areas, and biodiversity through the establishment of effective area-based conservation measures and the creation of protected area systems that are ecologically representative and well-connected.[659]

The connection between biodiversity and ecosystem conservation and environmental sustainability is well acknowledged in the *New Urban Agenda*.[660] It further emphasises the importance of planning and managing urban spatial development.[661] The *New Urban Agenda* further outlines commitments to an "ecosystem-based" approach by requiring the integration of appropriate measures into sustainable urban planning and development that take the ecological importance of coastal areas and environmentally sensitive areas into account. Furthermore, it outlines a commitment to foster ecosystem-based solutions to ensure sustainable consumption and production (see also SDG 12) and to ensure that the regenerative capacity of ecosystems is not exceeded.[662]

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656 SDG target 15.9.
657 Du Toit and Cilliers "Urban Ecology" 20-15.
658 *Strategic Plan for Biodiversity* 8.
659 *Strategic Plan for Biodiversity* 9.
660 *New Urban Agenda* para 14 (c).
661 *New Urban Agenda* para 24.
662 *New Urban Agenda* paras 68 and 69.

3.2.2.4 Protection against water-related climate risks

The impacts of climate change on water resources call for more information about and greater understanding of the threats water resources face.[663] This means that states need to understand and quantify the threat of the impact of climate change on freshwater resources, facilitate the implementation of effective national countermeasures as and when the threatening impact is seen as sufficiently confirmed to justify such action, and to study the potential impacts of climate change on areas prone to droughts and floods.[664]

The *Paris Climate Agreement* (2015) explicitly acknowledges the engagement of all levels of government and various actors in addressing climate change.[665] The *Agreement* recognises the importance of ensuring ecosystem integrity, land-based as well as coastal, and the protection of biodiversity.[666] In achieving its mitigation and adaptation objectives, the *Paris Agreement* makes provision for parties to submit nationally determined contributions (NDCs) which are the primary means for governments to communicate their nationally identified priorities and pledges.[667] Article 7 establishes the global goal on adaptation, enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change.[668] Through the establishment of this global goal, the parties likewise recognise that adaptation, specifically, has local and sub-national dimensions that should inform the global climate change response. [669] It is consequently left to national and sub-national governments to update existing NDCs, national adaptation plans, and other national, sub-national, and local climate

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663 *Agenda 21* paras 18.82-18.90.
664 *Agenda 21* para 18.84 (i)-(iii).
665 Preamble of the *Paris Climate Agreement* (2015).
666 Preamble of the *Paris Agreement*.
667 Articles 3 and 4(2) of the *Paris Agreement*. NDCs reflect each Party's capacity and ambitions for climate action, covering mitigation and adaptation governance mechanisms for the implementation of the *Paris Agreement*.
668 Article 7(1) of the *Paris Agreement*.
669 Article 7(2) of the *Paris Agreement*.

strategies to incorporate risk-based approaches to water provision and management practices that align with climate mitigation and adaptation targets.

The *Sendai Framework* recognises the state's role in DRR and emphasises that other stakeholders, including local government and the private sector, have responsibilities in DRR. While the *Sendai Framework* rarely mentions water itself, water-related hazards have a prominent presence, flow through each of the priorities for action, and are central to all seven targets.[670] The *Sendai Framework* acknowledges that a broader, more people-centred preventive approach to disaster risk is a necessity.[671] It adds that practices for disaster risk reduction need to be multi-hazard and multi-sectoral, inclusive and accessible in order to be efficient and effective.[672] Most importantly, it emphasises that disaster risk reduction and management depends on coordination mechanisms within and across sectors and with relevant stakeholders at all levels, and it requires the full engagement of all state institutions of an executive and legislative nature at national and local levels.[673]

The *Sendai Framework* makes a direct connection between climate change, DRR and the need for local action. Considering the provisions in the *Sendai Framework* and SDGs 11 and 13, cities must adopt and implement integrated policies and plans to increase their resilience and adaptive capacity to climate-related hazards and natural disasters.[674] All the targets of SDG 13 on climate action can be linked to the *Sendai Framework*, especially target 13.1, that aims to strengthen adaptive capacity and resilience to disasters. The foregoing links the objectives of SDG 11 with SDGs 6 and 13, while underscoring many other developmental goals.[675] While it does not make any mention

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670 UN-Water *World Water Development Report 2020: Water and Climate Change* 41.
671 *Sendai Framework* para 7.
672 *Sendai Framework* para 7.
673 *Sendai Framework* para 19(e). See Van Rijswick and Tappeiner "Developing an Institutional Framework for Sustainable Regional Water Management in Times of Climate Change" 275.
674 *Sendai Framework* and SDG target 11.b.2 in *Agenda 2030*.
675 Department of Statistics *SDGs Country Report 2019* 186. Also see Gober *Building Resilience for Uncertain Water Futures* 1.

of water, SDG target 13.1 aims to strengthen resilience and the adaptive capacity to climate-related hazards and natural disasters in all countries.[676] The goal thus reinforces the interconnectedness of climate change with water. This further aligns with the *Sendai Framework's* targets relating to the improvement of the disaster resilience of new and existing water infrastructure. Additionally, the *Sendai Framework* recognises that reducing the risk of major disasters caused by floods, storms, heatwaves, droughts and other weather-related disasters is a fundamental aspect of climate change adaptation and sustainable development and is therefore critical to achieving SDG 13.

The targets and indicators of SDG 13 do not merely include mitigation and adaptation interventions but also DRR, impact reduction, early warning, and technology transfer and development action in the context of a policy, strategy, plan or educational awareness.[677] Furthermore, target 13.2 aims to integrate climate change actions into national policies, strategies, and planning (all of which are important in mainstreaming climate change in laws and policies).[678] Adding on, target 13.b seeks to encourage measures for enhancing the capacity for efficient planning and management of climate change. In line with the *Sendai Framework*, target 11.b seeks to dramatically increase the number of cities and human settlements that have integrated policies and plans that target adaptation, DRM, climate resilience and which are comprehensive at all levels.[679] Illustratively, SDG target 11.3 aims at enhancing inclusive and sustainable urbanisation and capacity for integrated, participatory and sustainable human settlement planning and management.[680] The *Sendai Framework* significantly links up with the goals of *Agenda 2030*. In terms of its focus on the mainstreaming of disaster risk assessments into land-use policies, urban planning, land degradation assessments, and informal housing to increase urban resilience, it is apparent that it has a clear connection to SDG 11.

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676 SDG target 13.1.
677 UNESCO *Water Security and the Sustainable Development Goals* 137.
678 SDG targets 13.2 and 13.b.
679 SDG target 11.b.
680 SDG target 11.3.

Concerning the role of stakeholders, the *Sendai Framework* provides that while states have the overall responsibility for reducing disaster risk, it is a shared responsibility between governments and relevant stakeholders.[681] Likewise, it is imperative for national governments to empower local authorities and local communities to reduce disaster risk, including through resources, incentives and the decentralisation of decision-making responsibilities, together with enabling, guiding and coordinating the role of national governments.[682] The mitigation of water-related disasters and addressing climate change as a component of water security relates to target 11.5.[683] This target is directed at addressing disaster-related losses and aims to significantly minimise such losses.[684] Disaster preparedness actions can drastically reduce the damage and loss of life resulting from floods and droughts.[685] This would mean that states need to implement actions in relation to disaster preparedness such as EWS, or disaster risk plans, for example.

Acknowledging that cities are faced with unprecedented threats, the *New Urban Agenda* requires of cities to better prepare for and respond to disasters by drafting DRR and DRM plans. They should also lessen their exposure to risk, strengthen themselves against natural and man-made disasters, and support efforts to mitigate and adapt to climate change.[686] Furthermore, the *New Urban Agenda* is premised on the principle of and commitment to ensuring environmental sustainability by building urban resilience, reducing disaster risks, and mitigating and adapting to climate change.[687] This paragraph links the provisions of the *Paris Agreement* and the *Sendai Framework* with sustainable urban development. The *New Urban Agenda* exhorts states to commit to supporting adaptation planning processes as well as city-level assessments of climate vulnerability and impact, to inform their adaptation plans, policies, programmes, and

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681 *Sendai Framework* para 35.
682 *Sendai Framework* para 19(f).
683 SDG target 11.5.
684 SDG target 11.5.
685 WMO *Dublin Statement and Report of the Conference* 5.
686 *New Urban Agenda* para 13(g).
687 *New Urban Agenda* para 14 (c).

actions that build the resilience of urban inhabitants, including through ecosystem-based adaptation.[688]

The components of disaster risk which include vulnerability, hazard exposure and capacity should underlie all policies and practices for disaster risk management.[689] This knowledge can be leveraged for the purpose of pre-disaster risk assessment, for prevention and mitigation and for the development and implementation of appropriate preparedness and an effective response to disasters.[690] In order to achieve this it is necessary to develop, periodically update and disseminate, as appropriate, location-based disaster risk information, including risk maps, to decision makers, to the general public and to communities at risk of exposure to disaster.[691] What is more is that the process emphasises the need for collaboration among people at the local level through the involvement of community-based organisations (CBOs) and non-governmental organisations (NGOs).[692] In achieving this, it is important to review and promote the coherence and further development of national and local frameworks of laws, regulations and public policies.[693] This would mean defining the roles and responsibilities of stakeholders at all levels, including at local government level.[694] Local strategies and plans for disaster risk reduction need to address the prevention of risk, the reduction of existing risk and strengthening of resilience in response to risk.[695]

Cities will also need to incorporate disaster risk assessments into land-use policy development and implementation, including in urban planning, land degradation assessments, informal and non-permanent housing planning, and the use of guidelines and follow-up tools informed by anticipated demographic and environmental changes.[696]

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688 *New Urban Agenda* para 80.
689 *Sendai Framework* para 23.
690 *Sendai Framework* para 23.
691 *Sendai Framework* para 24 (c).
692 *Sendai Framework* para 24 (o).
693 *Sendai Framework* para 27 (a).
694 *Sendai Framework* para 19(e) and 27(a).
695 *Sendai Framework* para 27 (b).
696 *Sendai Framework* para 30 (f).

Notably, this adds the requirement of promoting the mainstreaming of disaster risk assessment, mapping and management into rural development planning and management. This entails the management *inter alia* of mountains, rivers, coastal flood plain areas, drylands, wetlands and all other areas prone to droughts and flooding, including through the identification of areas that are safe for human settlement, and at the same time preserving ecosystem functions that help to reduce risks.[697]

It is further required of cities to take preventative measures, to incorporate disaster risk reduction into response preparations, and to guarantee adequate resources for effective response and recovery in the event of a disaster.[698] In this regard it is essential to promote the infrastructure resilience and especially at water facilities to ensure that it remains safe, effective and operational during and after disasters.[699] When it comes to disaster risk reduction, it is worth noting that while states have the overall responsibility for reducing disaster risk, it is a shared responsibility between different government agencies and relevant stakeholders.[700]

Notably, the *New Urban Agenda* also covers matters of the resilience of cities to disasters and climate change risks, including floods and droughts.[701] The *New Urban Agenda* aims to integrate disaster risk reduction and climate change adaptation and mitigation considerations and measures into age- and gender-responsive urban and territorial development and planning processes, including the resilience-based and climate effective design of spaces, buildings and construction, services and infrastructure, and nature-based solutions.[702] Herein it commits to developing quality infrastructure and spatial planning, and by mainstreaming holistic and data-informed

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697 *Sendai Framework* para 30 (g).
698 *Sendai Framework* para 32.
699 *Sendai Framework* para 33 (c).
700 *Sendai Framework* para 35.
701 *New Urban Agenda* para 67.
702 *New Urban Agenda* para 77.

disaster risk reduction and management at all levels it commits to reducing vulnerabilities and risk.[703]

To this end, states need to improve the capacity of local authorities to develop and implement disaster risk reduction and response plans, such as risk assessments concerning the location of current and future public facilities, and to formulate adequate contingency and evacuation procedures.[704] Consequently, it commits parties to promoting the sustainable management of natural resources in cities and human settlements in a manner that protects and improves the urban ecosystem and environmental services, reduces GHGs and air pollution and promotes disaster risk reduction and management.[705] For local authorities, DRM should be aided by mechanisms and incentives that ensure compliance with sectoral laws, regulations and policy, such as land-use and urban planning, environmental management, and standards for health and safety.[706] It is therefore necessary to empower local authorities through regulatory and financial means to work and coordinate with civil society, communities and indigenous peoples and migrants in disaster risk management at the local level.[707]

To this end *Agenda 2030*, the *Paris Agreement*, the *New Urban Agenda* and the *Sendai Framework* collectively define a role for municipalities in protecting the urban water system, including the human, social, political, economic, physical, and natural assets, against water-related disasters and climate change. In so doing, these instruments describe a vision for cities to be resilient and sustainable, which includes reduced vulnerability to water insecurities.

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703 *New Urban Agenda* paras 77, 101.
704 *New Urban Agenda* para 101.
705 *New Urban Agenda* para 65.
706 *Sendai Framework* para 27 (d).
707 *Sendai Framework* para 27 (h).

3.2.2.5 Ensure a reliable and equitable supply of water for sustainable economic and social development

Access to safe water has also been acknowledged as a fundamental underlying determinant of many other aspects such as the right to health,[708] the right to adequate housing[709] and the right to food.[710] The *Mar del Plata Action Plan* seemingly acknowledges these linkages and interactions.[711] To this end, countries need to use water effectively, reduce losses, equalise water prices in terms of the purposes for which the water is used over wide areas and reduce water costs.[712] The *Mar del Plata Action Plan* submits that national mechanisms for the management of water resources should apply the best measures to improving the existing systems and the best available techniques for the planning and design of conservation and distribution systems, in the most efficient way.[713] These should also attend to proper maintenance, control at the regional, national and local level, and the operation of delivery systems to increase efficiency.[714] Henceforth, states should consider conservation as an explicit policy, bearing in mind changes in demand, water-use practices, lifestyles and settlement patterns.[715]

Agenda 21 recognises the multiple uses of water in agriculture, water supply and sanitation, industry, urban development, recreation, energy generation, and other activities.[716] The actions which states could implement according to *Agenda 21* include

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708 Article 12(2) of the ICESCR; General Comment 15 para 3; *The Right to The Highest Attainable Standard of Health* General Comment No 14 (2000) paras 11, 12 (a), (b) and (d), 15, 34, 36, 40, 43 and 51. Also see Moyo *Water as a Human Right under International Human Rights Law* 38.

709 Article 11(1) of the ICESCR; Moyo *Water as a Human Right under International Human Rights Law* 39; See also CESCR *General Comment No 7: The Right to Adequate Housing* UN Doc E/1998/22 (1997),

710 Article 11(1) - (2) of the ICESCR; General Comment 15 para 3; General Comment 14 para 8(b); Moyo *Water as a Human Right under International Human Rights Law* 40.

711 Muller 2015 *Water Alternatives* 676.

712 *Mar del Plata Action Plan* para 16 (t).

713 *Mar del Plata Action Plan* para 9.

714 *Mar del Plata Action Plan* para 9.

715 *Mar del Plata Action Plan* para 13 (f).

716 *Agenda 21* para 18.3.

inter alia optimising the allocation of water resources under physical and socio-economic constraints.[717] States might also provide for the implementation of allocation decisions through demand management, pricing mechanisms and regulatory measures, including risk analysis and environmental and social impact assessment, educational programmes, the levying of water tariffs and other economic instruments.[718] Mobilising water resources, developing new and alternative sources of water-supply, wastewater reuse and water recycling and the integration of water (including surface and underground water resources) quantity and quality management could also be implemented.[719] Lastly, states could implement measures promoting water conservation through improved water-use efficiency and wastage minimisation schemes for all users, and through optimising local water resources management.[720]

The role of water as a social, economic and life-sustaining good should be reflected in demand management mechanisms and implemented through water conservation and reuse, resource assessment and financial instruments, as required by *Agenda 21*.[721] The development and strengthening of appropriate capacities is required where water resource management has been decentralised and where it is the responsibility of municipal authorities.[722] National government should therefore establish an enabling environment for municipal authorities that entails the mobilisation of financial and human resources, legislation, standard-setting and other regulatory functions, the monitoring and assessment of the use of water and land resources, and the creation of opportunities for public participation.[723]

General Comment 15 acknowledges the centrality of water in socio-economic activities by highlighting the important link in ensuring access to water for the agriculture sector

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717 *Agenda 21* paras 18.12 (a) and (b).
718 *Agenda 21* paras 18.12 (c)-(h).
719 *Agenda 21* paras 18.12 (i)-(k).
720 *Agenda 21* paras 18.12 (l) and (m).
721 *Agenda 21* para 18.17.
722 *Agenda 21* paras 18.19-18.22 (emphasis added).
723 *Agenda 21* para 18.22.

in realising the right to adequate food.[724] The importance of adopting a national water strategy and plan of action is also noted under this dimension.[725] The required strategies and programmes may include measures that evaluate the effects of actions that may exert influence upon water availability and ecosystems, limit the depletion of water resources, and ensure that proposed developments do not impede access to sufficient water.[726] It may thus be appropriate for states to adopt and implement IWRM programmes and water efficiency plans.[727]

Further programmes could include increased water efficiency at the point of use, decreased water waste during distribution, emergency response planning, and the establishment of competent institutions and appropriate institutional arrangements.[728] Cities can also implement measures that prevent over-consumption and promote water efficiency. These measures can include educating the public, the adoption of conservation technologies as well as restricting water use beyond an acceptable consumption threshold as well as through the imposition of charges.[729] Furthermore, water conservation and reuse could take on an important role with the better management of urban water utilities reducing costly losses for unaccounted water.[730] These plans and programmes need to be adopted and implemented at all levels of government, with national governments having the corresponding duty of ensuring that local government has the necessary capacity to discharge its responsibilities.

Water is essential for meeting many human needs and it is an essential connecting factor for reaching several of the SDGs as already explained. These include achieving food security, providing improved nutrition and promoting sustainable agriculture,

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724 General Comment 15 para 7.
725 General Comment 15 para 37(f).
726 General Comment 15 para 28.
727 UN Draft *Guidelines for The Realization of the Right to Drinking Water Supply and Sanitation* para 4.1.
728 General Comment 15 para 28.
729 UN *Draft Guidelines for The Realization of The Right to Drinking Water Supply and Sanitation* paras 4.1 and 4.2.
730 WMO *Dublin Statement and Report of the Conference* 5.

ensuring access to energy, supporting livelihoods and industry, ensuring sustainable consumption and production patterns, and providing sustainable and healthy environments to live in.[731] The *New Urban Agenda* expresses its support for decentralised decision-making and advocates the coordination of food policies with energy, water, health, transport and waste policies, and the implementation of other policies in urban areas to maximise efficiencies and minimise waste.[732]

SDG target 6.4 boldly aims for states to improve water-use efficiency in all the water-intensive sectors.[733] A further objective is to reduce the number of people affected by water scarcity by ensuring the sustainable extraction and distribution of fresh water. As indicators, water use efficiency and water stress severity are utilised.[734] This target essentially relates to the concern that few countries have the natural and financial resources to continue increasing their water supplies, and instead they have to make better use of the available resources.[735] Hence, combined savings in agriculture, industry and domestic water supplies could significantly defer investment in costly new water-resource development and have an enormous impact on the sustainability of future supplies.[736] Conversely, water scarcity will undoubtedly increase as populations and water demand grows and as the impacts of climate change intensify.[737]

The *New Urban Agenda* adds that it aims to ensure coherence between the goals and measures of sectoral policies. These include rural development, land use, food security and nutrition, the management of natural resources, the provision of public services, water and sanitation, health, the environment, energy, housing, and mobility policies. This coherence should occur at various levels and scales of political administration,

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731 UN-Water *World Water Development Report 2020: Water and Climate Change* 39. These SDGs respectively are SDGs 2, 7, 3, 9, 12 and 1.
732 *New Urban Agenda* para 123.
733 SDG target 6.4; Department of Statistics *SDGs Country Report 2019* 161.
734 Indicators 6.4.1 and 6.4.2.
735 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.
736 WMO *Dublin Statement and Report of the Conference* 5.
737 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 12.

across administrative borders and considering the appropriate functional areas, to strengthen the integration of approaches to urbanisation and to implement integrated urban and territorial planning strategies that factor them in.[738]

3.2.2.6 The governance and management of urban water security dimensions

Urban governance does not feature strongly in the international instruments, apart from the *New Urban Agenda*, as the role of cities must often be read into the instruments. Each of the instruments discussed identifies and describes principles concerning water governance and approaches to water management in some form or other. This section discusses how international law and policy implicitly envision achieving the dimensions of water security as discussed above and will address how this interacts with the expectations placed on cities.[739]

The *Mar del Plata Action Plan* calls for increased focus on integrated water management and planning, and the development of holistic policies, legislation, and administrative guidelines. To this end, the aim is to ensure the appropriate adaptation of resources to human needs, to lessen the likelihood of severe supply shortages, and to protect the environment from harm.[740] Additionally, it recommends that countries should ensure that their national water policies are conceived and carried out within the framework of an interdisciplinary national economic, social and environmental development policy.[741] Regarding institutional arrangements, the *Mar del Plata Action Plan* suggests that the institutional arrangements adopted by each country should ensure that the development and management of water resources take place in the context of national planning, with no mention of local or sub-national planning, and that there is tangible

738 *New Urban Agenda* para 88.
739 See para 2.4.2.
740 *Mar del Plata Action Plan* para 41.
741 *Mar del Plata Action Plan* para 41.

co-ordination among all bodies responsible for the investigation, development and management of water resources.[742]

The *Mar del Plata Action Plan* indicates the lack of coherence and the fragmentation of administrative responsibilities in the field of water management.[743] It points out *inter alia* that provisions which regulate water management are often contained in different laws and regulations, which results in many difficulties in the application and understanding of the provisions.[744] To this end, the Plan recommends that countries prepare a review of existing legislation in order to improve and streamline its scope to cover all aspects pertaining to water resource management, the protection of quality, the prevention of pollution, penalties for undesirable effluent discharge, licensing, abstraction, ownership, and so forth.[745]

An important aspect of water resource management, particularly in addressing water security, is the roles and responsibilities of relevant stakeholders. The *Action Plan* provides that legislation needs to set out the rules of the public ownership of water projects as well as the public's rights, obligations and responsibilities.[746] Additionally, it emphasises the role of public bodies at the proper administrative level in controlling both the quantity and quality of water, and advises states to clearly delineate the administrative procedures required for the co-ordinated, equitable and efficient control and administration of all aspects of water resources.[747]

Nearly all the international instruments identify IWRM or merely "integrated management" as the main water management approach.[748] The most significant provision is in *Agenda 21*, which obliges states to improve IWRM, according to their

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742 *Mar del Plata Action Plan* para 47.
743 *Mar del Plata Action Plan* para 49.
744 *Mar del Plata Action Plan* para 49.
745 *Mar del Plata Action Plan* para 51 (b).
746 *Mar del Plata Action Plan* para 51 (e).
747 *Mar del Plata Action Plan* para 51 (e).
748 *Mar del Plata Action Plan* para 41; *Hague Declaration* para 5; SDG target 6.5.1.

capacity and available resources, through including mechanisms at all levels, including at the lowest appropriate level.[749] This provision finds execution through the delegation of water resources management, in accordance with national legislation. The delegation includes the decentralisation of (water) services to local authorities, private enterprises and communities.[750] States can also ensure the adoption of a city-wide approach to the management of water resources and promote the elaboration of land-use plans that give due consideration to the development of water resources at the national and local level.[751] In addition, *Agenda 21* calls for local capacity-building in the form of developing legislation and policies to promote investment in urban water and waste management.[752] A strong role for local authorities can be achieved through the drafting of LA 21 strategies and the overall improvement of the capacity of local authorities in pursuing IWRM. Notably, to ensure that water policy implementation leads to long-term social and economic benefits, states must also pinpoint, reinforce, or establish as necessary the suitable institutional, legal, and financial mechanisms.[753]

The second principle of the *Dublin Statement* emphasises that water development and management requires as its foundation a participatory approach that involves all users, planners and policymakers at all levels.[754] It adds that decisions require action at the most local level, while also ensuring that all affected parties have a voice in the development and execution of water infrastructure projects.[755] As cities are the hubs of participatory governance and transformation, they will have to deal with a regime of complex regulations, compliance requirements and policies that address water as a right, resource and risk, as is required for urban water security.

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749 *Agenda 21* para 18.12(o)(a).
750 *Agenda 21* para 18.12(o)(a).
751 *Agenda 21* para 18.59 (c) (i) and (ii).
752 *Agenda 21* para 18.59(e)(i).
753 *Agenda 21* para 18.9 (d).
754 WMO *Dublin Statement and Report of the Conference* 4.
755 WMO *Dublin Statement and Report of the Conference* 4.

Agenda 21 emphasises the importance of comprehensive and integrated water management in addition to the importance of ensuring that sectoral water plans are integrated and aligned with national economic and social policy.[756] However, it also indicates that the lack of co-ordination between different sectoral agencies in charge of developing water resources is proving to be a bigger barrier to implementing integrated water management than was originally thought.[757] The following support actions are necessary to enhance national capacities in addressing the assessment of water resources. These include a review of the legislative and regulatory basis of water resources assessment and the facilitation of close collaboration among water sector agencies - particularly between information producers and users,[758] also the implementation of water management policies based upon realistic appraisals of water resource conditions and trends, and the strengthening of the managerial capabilities of water-user groups, including women, indigenous people, the youth, and local communities.[759]

In the same vein, good water governance is essential to implementing all the targets under SDG 6.[760] More recent reference to IWRM is in SDG target 6.5. In regard to 6.5.1, the aim is to implement IWRM at all levels and to monitor the level of IWRM implementation according to the components of the enabling environment, institutions and participation, management instruments, and financing.[761] Notwithstanding the variety of challenges facing water resources management, which include fragmented national legal, institutional and administrative frameworks, a lack of financial, human and technical capacity, and poor data availability,[762] the implementation of IWRM or

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756 *Agenda 21* para 18.6.
757 *Agenda 21* para 18.6.
758 *Agenda 21* paras 18.23-18.34.
759 *Agenda 21* paras 18.23-18.34.
760 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 13.
761 SDG target 6.5.1; also see UN-Water 2022 https://www.unwater.org/our-work/integrated-monitoring-initiative-sdg-6/indicator-651-degree-integrated-water-resources.
762 UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 13.

water integrated approaches from the international to the local level brings with it significant benefits that enhance water security.[763]

The *Marseille Declaration* acknowledges that cities generate opportunities in terms of improved public health, job creation and the more efficient use of resources.[764] It acknowledges, however, that they also pose major challenges for water and sanitation, due to the increasing demand for water and the related increase in the production of wastewater, storm water and water pollutants, particularly for groundwater, exacerbated by the adverse impacts of climate change.[765] In this regard the *Declaration* intends to promote solutions including improved urban infrastructure and spatial planning processes at the appropriate level and integrated policies among different authorities and between cities and their rural surroundings.[766] It further stresses that local and regional authorities are at the front line of such integrated policies.[767] The *Declaration* importantly provides that good water governance requires multi-stakeholder platforms and legal and institutional frameworks enabling the participation of all, including indigenous peoples, marginalised and other vulnerable groups. It also promotes gender equality, democracy and integrity.[768]

Interestingly, the *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions*[769] recognises the role that local and regional authorities play in ensuring water security in a context where urbanisation is accelerating.[770] It claims further that where local authorities are ordinarily in charge of providing water and sanitation services for their populations, they are also responsible for a much broader spectrum of water-related tasks, including local economic development, the provision of energy, ensuring

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763 See para 2.4.2.1.
764 *Marseille Ministerial Declaration* para 21.
765 *Marseille Ministerial Declaration* para 21.
766 *Marseille Ministerial Declaration* para 21.
767 *Marseille Ministerial Declaration* para 21.
768 *Marseille Ministerial Declaration* para 23.
769 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* (2015) accessible at World Water Council 2020 https://bit.ly/3DZO4bR.
770 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 1.

adequate access to food, poverty reduction, environmental management, resilience to climate change and disasters, and addressing public health issues.[771] This confirms the global acknowledgement of the role local governments can play in promoting sustainable practices in water management, and in specifically addressing the dimensions of water security.

Under the *Daegu-Gyeongbuk Action Framework*, it is essential for local governments to apply the principles of good governance, in particular the principles of equity, transparency and accountability, including the enforcement of existing water laws.[772] Consequently, they must connect water management more closely with urban planning, design and development as well as other relevant urban management sectors.[773] The foregoing ties in well with the water management approaches of WSUD and IUWM.[774] Municipalities must then also optimise integrated and circular approaches, in particular by ensuring water of different quality fit for different purposes and promoting the reuse of treated wastewater.[775] According to the *Daegu-Gyeongbuk Action Framework* municipalities can use the tariff system to regulate water demand and encourage water conservation while ensuring the affordability of water and sanitation services for all.[776] Cities are also considering nature-based approaches such as enhancing ecosystems services and green infrastructure solutions for more sustainable water management, and specifically for stormwater management.[777]

Another commitment under the *Daegu-Gyeongbuk Action Framework* is to manage water at the local and regional levels by including the appropriate consideration of the water needs of the water users and multiple uses in the wider catchment.[778] Lastly,

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771 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 1.
772 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 2.
773 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 2.
774 See para 2.4.2.
775 *Daegu-Gyongbuk Water Action for Sustainable Cities and Regions* 2.
776 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 3
777 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 3.
778 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 3

national governments must commit themselves to creating widespread public awareness about the value of water and the need to treat it as a precious and limited resource.[779] In order to ensure progress in implementation and to achieve these commitments they must develop and provide enabling policy frameworks for local and regional authorities to create conducive conditions for them to engage effectively in the required actions at local and regional level.[780]

In acknowledgment of the important role that local authorities play in addressing water challenges, this document emphasises that for local authorities to deliver their share of responsibilities in the most efficient and effective manner it is important for national government to apply the principle of subsidiarity.[781] This refers to decentralising the relevant mandates and means to the lowest governance level most appropriate to achieve tangible progress towards nationally and globally agreed water-related goals.[782]

The *9th World Water Forum Framework for Action* aims to implement IWRM at all levels,[783] as well as the principles of good water governance, including participatory decision-making,[784] and to foster a water-sensitive approach through legislation and regulation.[785] Additionally it aims to develop accountable, effective, and transparent institutions across all spheres of government, to promote integrity,[786] and to increase water efficiency and sustainable management through science, technology, innovation and education.[787] Likewise, SDG target 6.b notes the importance of local communities to participate in improving water and sanitation management.[788] These targets collectively

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779 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 3.
780 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 2.
781 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 4.
782 *Daegu-Gyeongbuk Water Action for Sustainable Cities and Regions* 4; Du Plessis 2015 *CILSA* 281-316.
783 *9th World Water Forum Framework for Action* para 3A.
784 *9th World Water Forum Framework for Action* para 4B.
785 *9th World Water Forum Framework for Action* para 4C.
786 *9th World Water Forum Framework for Action* para 4D.
787 *9th World Water Forum Framework for Action* para 4E.
788 SDG target 6.b; UN-Water *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation* 14.

affirm that effective and sustainable water management depends on the participation of a range of stakeholders, including local authorities. According to UN-Water linking the implementation of global agendas from the national to the local level is possible through the co-ordinated response to climate commitments.[789] These targets collectively affirm that effective and sustainable water management depends on the participation of all the water stakeholders, including local authorities.

The *New Urban Agenda* contributes to the implementation and localisation of *Agenda 2030*, specifically SDG 11, on "making cities and human settlements inclusive, safe, resilient and sustainable," in an integrated manner.[790] This can be done for example by strengthening urban governance with sound institutions and mechanisms that empower and include urban stakeholders, by establishing appropriate checks and balances, by providing predictability and coherence in urban development plans to enable social inclusion, sustained, inclusive and sustainable economic growth, and environmental protection.[791] The most significant aspiration of the *New Urban Agenda* is that it anchors its implementation on inclusive, implementable and participatory urban policies,[792] and aims to build the urban governance structure *inter alia* by strengthening the capacity of subnational and local governments to implement effective local and metropolitan multilevel governance.[793] These strengthening measures may include promoting adequate investments in protective, accessible and sustainable infrastructure and service provision systems for water, sanitation and hygiene, sewage, solid waste management, urban drainage, the reduction of air pollution, and stormwater management.[794]

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789 UN-Water *World Water Development Report 2020: Water and Climate Change* 41.
790 *New Urban Agenda* para 9; UN-Habitat *SDG 11 Monitoring Framework: A Guide to Assist National and Local Governments to Monitor and Report on SDG Goal 11 Indicators* 50.
791 *New Urban Agenda* para 15(ii).
792 *New Urban Agenda* para 86.
793 *New Urban Agend*a para 90.
794 *New Urban Agenda* para 119

Importantly, the *New Urban Agenda* commits to improve water conservation and sustainable use by restoring water supplies in metropolitan, sub-urban, and rural areas, as well as to involve relevant stakeholders and civil society in these long-term planning processes and spatial development practices.[795] These processes and practices should incorporate integrated water resources planning and management.[796]

The next section focuses on the African regional position concerning urban water governance and security. More specifically, those instruments are explored that help define the role of sub-national authorities such as municipalities in urban water security.

3.3 African regional water law and policy perspectives on the role of cities in water security

3.3.1 Introduction

Water security presents a rather precarious problem for the African continent. Studies predict that rapid urbanisation on the African continent will result in new water management challenges for cities.[797] Similarly, most of Africa suffers from economic water insecurity including inadequate water infrastructure.[798] So too are the lack of institutional capacity and the inadequacy of water governance compromising the continent's ability to attain the needed quantities and quality of water for its social, economic and environmental purposes.[799] Hence, most evaluations of the African water sector point to the need to adopt a holistic approach to urban improvement, including informal settlements, which are seen as integral to the city.[800]

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795 *New Urban Agenda* para 72.
796 *New Urban Agenda* para 73.
797 WPP *The Future of Water in African Cities: Why Wastewater?* 2.
798 WPP *The Future of Water in African Cities: Why Wastewater?* 2.
799 African Development Bank Group (ADBG) *Water Sector Activities and Initiatives Report for 2019* i.
800 ADBG *Water Supply & Sanitation in Africa: Findings, Lessons and Good Practices to Improve Delivery* 8.

Water security is central to each dimension of sustainable development (social, economic, and environmental) in Africa and to improve the quality of life.[801] However, laws and policies specifically addressing water security remain largely absent, due partly to a lack of financial, institutional, and human resources.[802] Nonetheless, the aim of this section is to discuss African regional law and policy perspectives on the dimensions of water in defining the role of cities in water security and water governance.

3.3.2 Overview of African regional instruments

Regional responses to water (security) include the adoption of limited instruments, either expressly devoted to water or reading into instruments devoted to related issues. In the first instance, this discussion provides an analysis of human rights instruments namely the *African Charter on Human and Peoples' Rights* (1982),[803] the *Principles and Guidelines on the Implementation of Economic, Social and Cultural Rights in the African Charter on Human and Peoples' Rights* (2011) (hereafter *Nairobi Guidelines*),[804] Secondly, it refers to instruments speaking to development such as *Agenda 2063: The Future We Want* (2015) and its *First Ten-Year Implementation Plan for 2014-2023*.

Furthermore, this chapter evaluates specific sectoral instruments including the *Abuja Declaration on Water: A Key to Sustainable Development in Africa* (2002), *Africa Water Vision for 2025: Equitable and Sustainable Use of Water for Socioeconomic Development* (2009)[805] and the *Guidelines on the Right to Water in Africa* (2019).[806] This study also discusses the *African Convention on the Conservation of Nature and Natural Resources* (2003) (hereafter the *African Convention*), the *Green Recovery Action Plan*

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801 ADBG *Water Sector Activities and Initiatives Report for 2019* 2.

802 ADBG *Water Sector Activities and Initiatives Report for 2019* 2.

803 *African Charter on Human and Peoples' Rights* (1982) (hereafter *Banjul Charter*).

804 *Principles and Guidelines on the Implementation of Economic, Social and Cultural Rights in the African Charter on Human and Peoples' Rights* (2011) (hereafter *Nairobi Guidelines*).

805 *Africa Water Vision for 2025: Equitable and Sustainable Use of Water for Socioeconomic Development* (2009) (hereafter *Africa Water Vision*).

806 *Guidelines on the Right to Water in Africa* (2019) adopted during the 26th Extra-Ordinary Session of AMCOW held from 16 to 30 July 2019, in Banjul, The Gambia.

2021-2027 (2021)[807] and the *African Climate Change and Resilient Development Strategy and Action Plan 2022–2032* (2022)(hereafter *African Climate Change Strategy*).[808] The *Green Recovery Action Plan* intends to concurrently address a COVID-19 recovery and climate change by focusing on the priority areas of climate finance, renewable energy, energy efficiency and national just transition programmes, nature-based solutions and focus on biodiversity, resilient agriculture, and green and resilient cities.[809]

Notably, the *Africa Water Vision* calls for the strengthening of water governance, improving wise-water decisions, fulfilling urgent water needs, and strengthening the financial basis to achieve the desired water future.[810] According to the *Africa Water Vision* fundamental changes in legal frameworks, policies and strategies, as well as in institutional arrangements and management practices, are required at the national level.[811] In particular it notes that management at the lowest appropriate level is necessitated. Based on *Agenda 2063*, the continent aspires to be prosperous, with the means and resources to drive its own development with sustainable and long-term stewardship of its resources.[812] *Agenda 2063* specifically aims for cities with modernised infrastructure, and where people have access to affordable and decent housing together with all the necessities of life such as energy, water and sanitation.[813] It looks towards achieving a situation where Africa's environment and ecosystems are valued and protected, with climate-resilient economies and communities.[814]

According to the *Agenda 2063 First Implementation Plan*, the key stakeholders in implementing the plan include national and sub-national governments, a point which is

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807 *Green Recovery Action Plan 2021-2027* (2021) (hereafter *Green Recovery Action Plan*).
808 *African Climate Change and Resilient Development Strategy and Action Plan* (2022–2032) (2022) (hereafter *African Climate Change Strategy*).
809 *Green Recovery Action Plan* 3-4.
810 *Africa Water Vision* 2.
811 *Africa Water Vision* 2.
812 *Agenda 2063* para 10.
813 *Agenda 2063* para 10.
814 *Agenda 2063* para 10.

important when considering the Implementation of plans and responses to address water security.[815] The *Agenda 2063 First Implementation Plan*[816] addresses modern liveable habitats and basic quality services under goal 1. However, the priority areas of biodiversity conservation and sustainable natural resource management, water security, and climate resilience and natural disaster preparedness and prevention are addressed under the environmental cluster of goal 7.[817]

Of specific significance to this study is the *African Charter on the Values and Principles of Decentralisation, Local Governance and Local Development* (2014) (*Decentralisation Charter*) which provides guidance to all member states on the decentralisation of powers and functions from the national sphere to other spheres of government.[818] The *Decentralisation Charter* responds to challenges linked to centralised governance in Africa, such as poor service delivery, and unaccountable and unresponsive governance. Also relevant to this discussion is the *Decentralisation Charter's* provision that states which are party to regional, continental, and global treaties and policy instruments should support local governments and ensure that they comply with such instruments and treaties.[819] It is important to keep this in mind as this section unpacks the provisions of regional law and policy. In the case of South Africa, the country debatably has a more developed legal framework for decentralisation than that provided by the Charter.[820]

This section also considers some of the commitments made to fast-track the achievement of the water and sanitation objectives through AMCOW,[821] such as the *Tunis Ministerial Declaration on Accelerating Water Security for Africa's Socio-Economic*

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815 *Agenda 2063 First Implementation Plan* 13.
816 *Agenda 2063 First Implementation Plan* 50.
817 *Agenda 2063 First Implementation Plan* 41.
818 Article 4(a) of the *African Charter on the Values and Principles of Decentralisation, Local Governance and Local Development* (*Decentralisation Charter*).
819 Article 9(2) of the *Decentralisation Charter*.
820 See the discussion in Chapter 4 which unpacks the authority and functions of municipalities.
821 AMCOW 2016 https://bit.ly/3N9BFoD.

Development (hereafter the *Tunis Declaration*) (2008),[822] the *Sharm El-Sheikh Commitments on Water and Sanitation* (2008),[823] the *eThekwini Declaration and AfricaSan Action Plan* (2008), and the *Dakar Declaration* (2014). Already in 2008, the *Tunis Declaration* recommended that states develop national plans and strategies for achieving water security, as well as to systematically increase funding for water and sanitation projects at the local level.[824] These instruments collectively confirm the commitment of African states to the provision of water supply and sanitation services. Likewise, these instruments seek to facilitate the building of water security capacity to ensure sustainable livelihoods and to build adaptive capacity and resilience to climate change impacts.[825]

The section which follows provides an analysis of the provisions of African regional law and policy on the dimensions of urban water security with a view to establish how they outline a role for local government in addressing water security.

3.3.2.1 Ensuring equitable, secure and reliable access to an adequate, clean and safe drinking water supply in urban areas

Despite its being the continent's most prominent human rights instrument, the *Banjul Charter* does not expressly acknowledge a right to access to water. It does, however, address a wide scope of economic, social and cultural rights. As is the case with many of the international instruments discussed above, it is also argued that the right to water is implicit in other rights such as the right to life, the right to property, the right

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822 *Tunis Ministerial Declaration on Accelerating Water Security for Africa's Socio-Economic Development* (2008) (hereafter *Tunis Declaration*) adopted at the First African Water Week on March 26-28, 2008, in Tunisia.

823 *Sharm El-Sheikh Commitments for Accelerating the Achievement of Water and Sanitation Goals in Africa* adopted at the 11th Ordinary Session in Sharm El-Sheikh, Arab Republic of Egypt, from 30 June to 1 July 2008 (hereafter the *Sharm El-Sheikh Commitments*).

824 *Tunis Declaration* para 7(a)-(b).

825 *Africa Water Vision* 17.

to work, the right to health, the right to development, and the right to education.[826] Given this lack of explicit acknowledgement, the *Nairobi Guidelines* set out to affirm that the right to water is implied in various provisions of the *Banjul Charter* and provides normative content to the right similar to General Comment 15.[827] Building on the *Nairobi Guidelines*, the *Guidelines on the Right to Water* provide the principles and guidelines on the right to water to assist states in the implementation of their obligations. The right to water is further underscored by the elements of availability, adequacy, physical and economic accessibility, acceptability and equity.[828]

In Africa, the human right to water is framed as the right of every individual to sufficient, safe, acceptable, physically accessible, and reasonably priced water for both personal as well as domestic use.[829] Thus, the right to water imposes "minimum core obligations" on states.[830] Firstly, states need to provide the minimum required amount of water that is safe and sufficient for both personal and domestic use.[831] The *Nairobi Guidelines* maintain that sufficient water refers to an adequate, regular and continuous water supply.[832] While referencing the WHO standard supply of sufficient water,[833] the *Guidelines on the Right to Water* recommend that states adjust the quantity of water based on a consideration of "special needs" related to age, gender, health and climate conditions.[834]

Physical access to sufficient, safe, and regularly available water is another responsibility placed on states. These facilities or services must be located within a reasonable distance of the user's home, school, place of employment, or healthcare facility, and

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826 These refer, respectively, to articles 4, 14, 15, 16 and 17 of the *Banjul Charter*. This includes the right to housing (read into articles 14, 16 and 18(1)) and the right to food (read into articles 4, 16 and 22).
827 *Nairobi Guidelines* paras 3(a)-(d)
828 *Nairobi Guidelines* para 17.
829 *Nairobi Guidelines* para 88; *Guidelines on the Right to Water* para 12.1.
830 *Nairobi Guidelines* para 17.
831 *Nairobi Guidelines* para 92(a); *Guidelines on the Right to Water* para 13.2.
832 *Nairobi Guidelines* para 89; *Guidelines on the Right to Water* para 13.4.
833 See para 3.2.2.1. *Guidelines on the Right to Water* para 12.2.
834 *Guidelines on the Right to Water* para 13.3.

must have enough water outlets to prevent excessive waiting times.[835] The determining factors for "safe" water that does not contain any hazardous substances, including micro-organisms, chemical substances and radiological hazards, or that could be harmful to human health, and which has an acceptable colour, odour and taste.[836]

Concerning equitable access, the *Guidelines on the Right to Water* goes further by requiring that states provide water to indigenous and marginalised communities before serving more well-off communities.[837] With reference to the affordability and disconnection of water and sanitation services, the *Nairobi Guidelines* in essence state that disconnections should not be arbitrary and are therefore subject to the principle of reasonability and on a fair assessment of the circumstances of the individual.[838] The *Nairobi Guidelines* also reaffirm that the right to water is based on protecting vulnerable groups, promoting and ensuring equality, and abiding by the principle of non-discrimination.[839] Thus, the *Banjul Charter* prohibits any discrimination against individuals on any of the prohibited grounds, in their access to or enjoyment of economic, social and cultural rights, including the right to water. To this end, the *Guidelines on the Right to Water* expressly outlines provisions applicable to vulnerable and marginalised groups, and groups with special water needs.[840]

States have the primary duties to respect, protect and fulfil human rights, including the right to water.[841] Moreover, states should refrain from using access to water as a political tool.[842] As political agents at the local level, local governments should ensure that politics does not interfere with the provision of water services. However, this might be easier said than done. The fulfilment of this right should also be done through

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835 *Nairobi Guidelines*. para 92 (a) – (c).
836 *Nairobi Guidelines* para 90.
837 *Guidelines on the Right to Water* para 13.2.
838 *Nairobi Guidelines* para 92(k).
839 *Nairobi Guidelines* para 92(p)-(v). Article 2 of the *Banjul Charter*.
840 *Guidelines on the Right to Water* paras 17-27.
841 *Nairobi Guidelines* paras 4-12; *Guidelines on the Right to Water* paras 3.1-3.3.
842 *Nairobi Guidelines* para 92(c); *Guidelines on the Right to Water* para 1.4.

progressive realisation for all individuals. Additionally, while prioritising the realisation of the rights for the poorest and most vulnerable in society, states must ensure the satisfaction of the minimum required levels.[843]

To realise the right to water, states need to adopt national strategies or action plans.[844] The strategies and plans of action entail implementing strategies and programmes that are comprehensive and integrated to ensure that there is sufficient and safe water for present and future generations.[845] The means through which states can respond, is through ensuring the sustainable use of water by adopting comprehensive and integrated strategies and programmes.[846] Similarly, the *Guidelines on the Right to Water* also require the development of a comprehensive state-integrated strategy to address all water-related rights, which are by nature interconnected and interdependent.[847] States can implement specific measures to prevent unsustainable water resource extraction, damming, and diversion, and to ensure that proposed new developments do not impede access to sufficient water. They may also establish emergency response mechanisms and competent institutions to implement these strategies and plans.[848]

According to the Nairobi Guidelines, "state parties" include all levels of government (national, regional, and local) and all three branches of government (executive, legislative, and judicial).[849] The *Nairobi Guidelines* prominently indicate the essential role of local authorities by stating that all levels of government, including local authorities, have a primary responsibility in ensuring the realisation of everyone's right to water.[850] These local authorities must manage their water resources in a participatory,

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843 *Nairobi Guidelines* paras 13-15; *Guidelines on the Right to Water* para 3.3.
844 *Nairobi Guidelines* para 92(d).
845 *Nairobi Guidelines* para 92(g).
846 *Nairobi Guidelines* para 92(g).
847 *Guidelines on the Right to Water* 4.
848 *Nairobi Guidelines* paras 92(g) (1) - (8).
849 *Nairobi Guidelines* paras 1(f).
850 *Guidelines on the Right to Water* para 8.5; Also see *Nairobi Guidelines* para 92 (i).

transparent, sustainable, equitable, effective and accountable manner.[851] This ties in with the principles of good water governance required by all water stakeholders.

Consequently, states are responsible for regulating and monitoring private water and sanitation providers. The aim is to ensure that the right to access to water and sanitation is not infringed upon.[852] The state has a responsibility to protect its citizens from threats to their economic, social, and cultural rights, including the right to water, and these provisions are essential to carrying out that responsibility.[853] Where the delivery of water services is outsourced to private services providers, it is necessary to prevent them from violating the right to access to water. In particular, the *Guidelines* emphasise that all levels of government, including local authorities, have a primary responsibility in ensuring the realisation of the right to water of all and managing water resources in a participatory, transparent, sustainable, equitable, effective, and accountable manner.[854]

In addition to ensuring that water and sanitation services are managed at the state level, states should take measures to ensure that everyone has access to these basics in adequate quantities, of sufficient quality and continuity, and at a price that is fair and equitable.[855] In this regard, states are tasked with encouraging proactive citizen involvement in the definition of water and sanitation policies at the local level in a democratic and inclusive manner, as well as seeking and facilitating the participation of communities in the design, strategy, and implementation of projects for water resource management.[856] To ensure the above, states must increase funding for local water and sanitation infrastructure to meet the needs of the poor and those without access to

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851 *Guidelines on the Right to Water* para 8.5; Also see *Nairobi Guidelines* para 92(i).
852 *Nairobi Guidelines* para 92(j).
853 *Nairobi Guidelines* para 7.
854 *Guidelines on the Right to Water in Africa* para 8.5.
855 *Guidelines on the Right to Water* para 8.6. This is reinforced by the *Resolution on a Human Rights-Based Approach to Natural Resources Governance* ACHPR/Res.224 and *Nairobi Guidelines* para 92(i).
856 *Guidelines on the Right to Water* para 8.5; *Nairobi Guidelines* para 92(i).

water and sanitation.[857] They should also assist in building up the capacity of local governments to provide more reliable water and sanitation services.

There is a variety of strategies that find application in addressing the realisation of all water-related rights.[858] These include reducing the impacts of climate change on the right to water, eliminating over-exploitation, monitoring water reserves in accordance with international human rights standards, ensuring that development projects do not interfere with access to adequate water, and developing rain harvesting and irrigation technology.[859] In the light of the foregoing, states can implement their obligations by adopting participatory, transparent and non-discriminatory legislative, policy, administrative, judicial, financial and other measures, with clear responsibilities and adequate resources for implementing policy. They also need to establish monitoring agencies, and clear objectives, targets, timeframes, indicators and benchmarks.[860] Accordingly, institutions and local governments must have the power to discharge their responsibilities and must be adequately resourced in order to be able to do so. They must also respect the need to maintain a gender balance in all facets of their organisation.[861] They will need to adopt an integrated water strategy that links water with sanitation, health, education, a satisfactory environment and other crosscutting rights.[862]

The *Abuja Declaration* claims that a growing number of African countries have put in place arrangements for the management of water resources at all levels.[863] Ensuring the delivery of water and sanitation services will require strengthening their institutional arrangements and embarking on water sector reforms, where applicable.[864] The *Agenda*

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857 *Nairobi Guidelines* para 92(i).
858 *Guidelines on the Right to Water* para 28.1.
859 *Guidelines on the Right to Water* para 28.2 (i) – (x).
860 *Guidelines on the Right to Water* para 34.1.
861 *Guidelines on the Right to Water* para 34.1.
862 *Guidelines on the Right to Water* para.
863 *Abuja Declaration* para 6(b).
864 *Abuja Declaration* para 6(b).

2063 First Implementation Plan[865] addresses the priority area of modern liveable habitats and basic quality services under goal 1. Several national targets are outlined under this goal, including specific targets for access to drinking water and increasing access to quality basic services. Some of the strategies identified in addressing the targets include developing and implementing policies for improved urban and territorial planning, land tenure, land use and management systems.[866]

3.3.2.2 Provision of equitable, accessible, safe and adequate sanitation, wastewater, and stormwater services

The *eThekwini Declaration and AfricaSan Action Plan* (2008)[867] places firm resolutions for sanitation and hygiene at the top of the African development agenda. Under the *eThekwini Declaration*, African states commit to establishing a co-ordinating body with its main responsibility being sanitation and hygiene, with the participation of all stakeholders, including those in finance, health, water, education and local government.[868] The *AfricaSan Action Plan* outlines the importance of district and municipal implementation plans that are in line with national policy and strategy in the provision of sanitation.[869]

Following on this, the *Sharm El-Sheikh Commitments* express the urgent need to develop the continent's water and sanitation infrastructure and institutions to provide services of sufficient and sustainable quantity and quality.[870] The *Sharm El-Sheikh Commitments* call on states to commit to creating conducive environments to enhance the effective engagement of local authorities and the private sector, and to ensure the equitable and sustainable use and promote the integrated management and

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865 *Agenda 2063 First Implementation Plan* 50.
866 *Agenda 2063 First Implementation Plan* 51.
867 *eThekwini Declaration and AfricaSan Action Plan* (2008).
868 *eThekwini Declaration* para 5.
869 Priority area 7 in the *AfricaSan Action Plan* 7.
870 *Preamble of the Sharm El-Sheikh Commitments*.

development of national and shared water resources in Africa.[871] In order to implement these measures that state parties commit themselves to developing local financial instruments and markets for investment in the water and sanitation sectors.[872] The *Sharm El-Sheikh Commitments* add that it is necessary to build institutional and human resources capacity at all levels, including on the decentralised local government level for programme implementation, enhancing information and knowledge management as well as strengthening monitoring and evaluation.[873]

According to the *Nairobi Guidelines*, everyone has the right to have access to adequate and safe sanitation that is favourable to the protection of public health and the environment.[874] In this regard the *Nairobi Guidelines* go further than international instruments by defining sanitation as comprising of at least a clean toilet or latrine, together with the collection, disposal and treatment of human excreta, wastewater, solid waste and stormwater removal. Hygiene education is a further requirement.[875]

The *Dakar Declaration* emphasises the role of water security and sanitation for sustainable economic growth and social progress in the continent.[876] The *Dakar Declaration* (2014) importantly acknowledges that urban growth on the African continent is the highest in the world and that urban water security is at risk owing to the increasing pressure on water resources, there being poor or no wastewater management, and exposure to extreme events.[877] Likewise, parties commit themselves to foregrounding water security and sanitation for growth in Africa.[878] The *Dakar Declaration* further calls for Africa's infrastructure deficit to be addressed, especially the prioritisation of the implementation of water projects, in order to unlock the productive

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871 *Sharm El-Sheikh Commitments on Water and Sanitation* paras (e) and (f).
872 *Sharm El-Sheikh Commitments on Water and Sanitation* para (j).
873 *Sharm El-Sheikh Commitments on Water and Sanitation* para (g).
874 *Nairobi Guidelines* para 91.
875 *Nairobi Guidelines* para 91.
876 *Dakar Declaration* para 11(g).
877 *Dakar Declaration* para 7.
878 *Dakar Declaration* para 11(a).

sectors of national economies and advance the sustainable use of water resources to support agriculture, food security and growth.[879]

Furthermore, the *N'gor Declaration on Sanitation and Hygiene* (2015)[880] was adopted owing to the recognition of the critical state of sanitation in Africa.[881] The *N'gor Declaration* affirms the human right to safe drinking water and sanitation for all and welcomes the aspiration of SDG target 6.2.[882] In this light, states commit to implementing national and local strategies which strongly focus on equity and sustainability.[883] The *N'gor Declaration on Sanitation and Hygiene* requires strong leadership and coordination at all levels to build and sustain governance for sanitation and hygiene across sectors, particularly water, health, nutrition, education, gender and the environment.[884] Additional commitments include ensuring inclusive, safely managed sanitation services and functional hand-washing facilities, and progressively eliminating untreated waste.[885] In line with these commitments, the *N'gor Declaration* calls on the strengthening of local capacity to deliver appropriate services in line with demand, and the development of innovative locally appropriate solutions.[886] There is therefore an express acknowledgement of the important role that local government plays in ensuring sanitation services.

3.3.2.3 Protection of urban aquatic ecosystems

The *Banjul Charter* provides for the right to an environment that is favourable to everyone's development.[887] The substantive duties associated with this right include promoting conservation, preventing environmental degradation and pollution, ensuring

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879 *Dakar Declaration* para 11(b).
880 *N'gor Declaration on Sanitation and Hygiene* (2015) adopted at the 4th AfricaSan Conference by the African Ministers responsible for sanitation and hygiene on 27 May 2015 in Dakar, Senegal.
881 Preamble of the *N'gor Declaration on Sanitation and Hygiene* (2015).
882 Preamble of the *N'gor Declaration on Sanitation and Hygiene*; also see para 3.2.2.2.
883 *N'gor Declaration on Sanitation and Hygiene* para 1.
884 *N'gor Declaration on Sanitation and Hygiene* para 4.
885 *N'gor Declaration on Sanitation and Hygiene* paras 6 and 7.
886 *N'gor Declaration on Sanitation and Hygiene* 2.
887 Article 24 of the *Banjul Charter*.

environmental protection, mitigating detrimental impacts, ensuring ecologically sustainable use, and discouraging private actors from violating the right.[888] While no mention is made of the role of local government in addressing environmental protection in the *Banjul Charter*, the *African Convention* details a role for local authorities in the integration of environmental conservation with socio-economic development.[889] The *African Convention* aims to improve environmental protection, to ensure the conservation and sustainable use of natural resources,[890] and to harmonise and co-ordinate policies with a view to achieving ecologically sound, economically viable, and socially acceptable development policies and programmes.[891]

The *African Convention* obliges states to take measures that will avoid land degradation, as well as to develop long-term strategies to conserve and sustainably manage land resources, such as soil, vegetation, and related water processes.[892] It is arguable that these hydrological processes include aquatic ecosystems. In this regard parties are required to establish land-use plans based on scientific investigations as well as local knowledge and experience and in particular, classification and land-use capability in the implementation of this right.[893] Land-use management and planning are important planning instruments for local governments. With this in mind, it is argued that these long-term strategies and land-use plans are best applicable at local government level.

Due regard must be paid to the integrated management of water resources, a point reiterated in many of the international and regional instruments considered. A duty also rests on states to ensure that national development plans and programmes are designed towards the realisation of a healthy environment that is conducive to the right

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888 Boyd 2011 *The Environmental Rights Revolution* 24; Soyapi *The Role of the Judiciary in Advancing the Right to a Healthy Environment* 47.
889 Article 14 of the *African Convention*.
890 Article 5 of the *African Convention*.
891 Article 2(1) – (3) of the *African Convention*.
892 Article 6 of the *African Convention*.
893 Article 6(3) (a) of the *African Convention*.

to health; for example, in matters relating to water resources management and sanitation.[894] This includes strategies that reduce the depletion of water resources, prevent and control water pollution, and assess the impacts of development on ecosystems.[895] Notably, states may establish competent institutions and appropriate institutional arrangements to carry out the strategies and programmes, which may arguably include local government.

The *African Convention* requires of states to establish, maintain and extend conservation areas, as appropriate.[896] In addition, these tasks are preferably to be performed within the states' framework of environmental and natural resources policies, legislation and programmes, also the assessment of the potential impacts and the necessity of establishing additional conservation areas and wherever possible designate such areas, in order to ensure the long term conservation of biological diversity.[897] States may thus conserve those ecosystems which are most representative of and peculiar to areas under their jurisdiction, and subsequently promote the establishment by local communities of areas managed by them primarily for the conservation and sustainable use of natural resources.[898]

An important instrument in achieving the foregoing is states controlling activities outside conservation areas which are detrimental to the achievement of the purpose for which the conservation areas were created, and establishing for that purpose buffer zones around their borders.[899] The construction of such buffer zones is an oft-used instrument in local government, especially in conserving and protecting areas of special significance.[900] Hence, it is argued that the conservation of ecosystems in the

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894 *Nairobi Guidelines* para 92(g).
895 Article 7(2)(e) of the *African Convention*.
896 Article 12(1) of the *African Convention*.
897 Article 12(1) of the *African Convention*.
898 Article 12(1) (a) and (3) of the *African Convention*.
899 Article 12(4) of the *African Convention*.
900 See Chapter 4.

jurisdiction of local authorities is in principle well-placed as a responsibility of local government.

It is the responsibility of each state to ensure that national and local development strategies incorporate conservation and management of natural resources.[901] The former is an important task local government can take on in addressing aquatic ecosystem protection in their local planning tools. They must also ensure that ecological, economic, cultural, and social factors are fully considered in the formulation of all development plans.[902] The duty also rests on states to take all necessary measures to ensure that development activities and projects are based on sound environmental policies and do not have adverse effects on natural resources and the environment in general, to the maximum extent possible.[903] Equally, they need to ensure that policies, plans, programmes, strategies, projects and activities likely to affect natural resources, ecosystems and the environment in general are the subject of adequate impact assessment at the earliest possible stage and that regular environmental monitoring and audits are conducted.[904]

It is discernible that many environmental obligations can be fulfilled through EIAs, including through subsequent environmental monitoring and auditing.[905] It is also up to states to monitor the condition of their natural resources as well as the impact of development activities and projects upon such resources.[906] Additionally, the *African Climate Change Strategy* contains measures for protecting land-based ecosystems, including the integration of biodiversity conservation and sustainable management in climate change actions.[907] In building low-emission, resilient urban areas, the *African*

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901 Article 14(1)(a) of the *African Convention*.
902 Article 14(1) (b) of the *African Convention*.
903 Article 14(2) (a) of the *African Convention*.
904 Article 14(2) (b) of the *African Convention*.
905 IUCN *An Introduction to the African Convention on the Conservation of Nature and Natural Resources* 8.
906 Article 14(2) (c) of the *African Convention*.
907 *African Climate Change Strategy* 42-43.

Climate Change Strategy identifies four intervention areas including promoting resilient, nature-based solutions and urban green infrastructure. To this end it is recommended that local authorities identify and promote opportunities to incorporate ecosystem-based and hybridised blue-green-grey infrastructure to regulate water flow, treat wastewater, and reduce wastewater runoff.[908] It is recommended in accordance with several international instruments that cities implement and enforce robust EIAs and strategic environmental impact assessments prior to expanding urban centres.

The *Africa Water Vision* imagines a continent where water for sustaining ecosystems and biodiversity is adequate in quantity and quality.[909] It delineates the milestones and targets that could function as intermediate goals to be reached at different levels (local, national, sub-regional and regional) at specified times in progressing towards the goals.[910] The *Africa Water Vision* further specifies that a comprehensive reform of the development of national policies will be required to improve the governance of water resources.[911] It also emphasises the importance of decentralisation and bottom-up institutional arrangements in the development and management of water resources.[912]

The *Guidelines on a Right to Water* declare that states should protect and maintain the quality of water resources, including reservoirs, springs and rivers.[913] In this view, sustainability is seen as going beyond the functionality of services and is intrinsically linked to the principle of the equitable use of water resources.[914] States need to ensure, in this instance, that there are response mechanisms for emergency situations and must establish competent institutions and appropriate institutional arrangements for

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908 *African Climate Change Strategy* 50.
909 *Africa Water Vision* 17.
910 *Africa Water Vision* 19.
911 *Africa Water Vision* 20.
912 *Africa Water Vision* 23.
913 *Guidelines on the Right to Water* para 16.3.
914 *Guidelines on the Right to Water* para 28.1.

implementing the strategies and programmes. They should also prohibit and repress water pollution and the contamination of watersheds and water-related ecosystems.[915]

Notably, the *Decentralisation Charter* calls forcefully for the inclusion of local government in the adequate protection and sustainable use of natural resources at the local level.[916] In this context the *Green Recovery Action Plan* exhorts states to address biodiversity and nature-based solutions by focussing on sustainable land management, forestry and the oceans.[917] In particular, states should support the development and application of tools to better integrate nature and natural capital including biodiversity in national, sectoral and urban recovery and development strategies and plans.[918] This would require coordination at all levels of government as well as cross-sectoral integration. Importantly, interventions of this kind require the exercise of political, and the acknowledgement of the contribution of local authorities to the protection of urban biodiversity protection and to implementing nature-based solutions to the risks posed by climate change.

The *African Climate Change Strategy* seeks to ensure the protection of coastal ecosystems by promoting climate-resilient coastal development and supporting sectoral and integrative interventions.[919] The *Strategy* reiterates the importance of strengthening grey and green adaptation, integrating climate risk in coastal development planning and strengthening disaster risk reduction and preparedness plans and strategies.[920] Most significant for local governments is the *Strategy's* suggestion that climate considerations be integrated in marine spatial planning, coastal zone management and other planning frameworks.[921]

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915 *Guidelines on the Right to Water* para 28.2 (i) – (x).
916 Article 4(a) of the *Decentralisation Charter*.
917 *Green Recovery Action Plan* 3.
918 *Green Recovery Action Plan* 18.
919 *African Climate Change Strategy* 55.
920 *African Climate Change Strategy* 56.
921 *African Climate Change Strategy* 56.

3.3.2.4 Protection against water-related climate risks

Agenda 2063 sees African states acting with a sense of urgency on climate change.[922] Achieving this vision will require developing and implementing a cross-sectoral framework to mitigate and adapt to the effects of climate change - one that covers all levels of governance.[923] On account of this, the *Africa Regional Strategy for Disaster Risk Reduction* (2004) and the *Programme of Action for the Implementation of the Sendai Framework on Disaster Risk Reduction in Africa* (2017)[924] together provide a regional response to preventing new and reducing existing disaster risk.

The *Africa Regional Strategy for Disaster Risk Reduction* concedes that the improved governance of disaster risk reduction depends on the participation of a wide range of actors.[925] Consequently, it is suggested that national governments should increase their political commitment to disaster risk reduction. This would require creating a culture of disaster risk reduction at all levels and empowering those at risk to achieve protection against disaster impacts.[926] In part, the former can be achieved through strengthening lobbying and advocacy for political commitment, responsibility and accountability, improving institutional frameworks for disaster risk reduction, increasing (financial) resource allocation for disaster risk reduction, and strengthening capacities.[927] Strengthening the governance of disaster risk reduction institutions would require aligning laws and policy, and enhancing decentralised disaster risk reduction interventions.[928] In particular, both national and local levels of government need to ensure that they integrate disaster risk reduction in their development strategies and

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922 *Agenda 2063* 16.
923 *Agenda 2063 First Implementation Plan* 61.
924 *AU Programme of Action for the Implementation of the Sendai Framework on Disaster Risk Reduction 2015-2030 in Africa* (hereafter the *Programme of Action*).
925 *Africa Regional Strategy for Disaster Risk Reduction* (2004) 7.
926 *Africa Regional Strategy for Disaster Risk Reduction* 9.
927 *Africa Regional Strategy for Disaster Risk Reduction* 10.
928 *Africa Regional Strategy for Disaster Risk Reduction* 12-13.

prepare and disseminate guidelines for integrating disaster risk reduction in development planning and activities.[929]

As stated above,[930] reducing hazards and climate risks requires the identification and assessment of the risks, and knowledge and understanding of risks, hazards and vulnerabilities is a necessity. Accordingly, the *Africa Regional Strategy for Disaster Risk Reduction* clarifies that the interventions needed to improve the identification and assessment of disaster risks involve improving the quality of the information and data on disaster risks, the identification, assessment and monitoring of hazards, vulnerabilities and capacities, and strengthening early warning systems, institutions, capacity and the resource base.[931]

In line with the provisions of the *Sendai Framework*,[932] the *Programme of Action* effectively aims to prevent new and reduce existing disaster risks by encouraging stakeholders such as local authorities to accelerate the development and implementation of inclusive, holistic and cross-sectoral strategies, programmes and plans of action.[933] In the same breath, links are established with *Agenda 2063*, the SDGs, the *New Urban Agenda*, the *Addis Ababa Action Agenda*, and the *Paris Agreement*.[934] The role of national government is primarily to establish an enabling environment including setting up legislation, policies, strategies, institutions, finance and other instruments to direct, guide and coordinate disaster risk management at all levels of government.[935] Moreover, local authorities must provide for risk analysis and vulnerability assessments, including providing for the integration of disaster risk reduction with climate change adaptation and sustainable development frameworks.[936] In addition, the development and dissemination of disaster risk awareness materials

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929 *Africa Regional Strategy for Disaster Risk Reduction* 13-14.
930 See para 2.3.2.4.
931 *Africa Regional Strategy for Disaster Risk Reduction* 10.
932 See para 3.2.2.4.
933 *Programme of Action* 6-7.
934 *Programme of Action* 7.
935 *Programme of Action* 12.
936 *Programme of Action* 13.

including risk mapping in communities is crucial at local government level.[937] In this light, local authorities are to ensure the integration of climate change, disaster risk reduction and sustainable development strategies, policies, programmes and plans of action to ensure that development and land-use planning are inclusive, resilient, sustainable and informed.

The *Green Recovery Action Plan* acknowledges the importance of green and resilient African cities by exhorting states to act on flooding and water resources with the additional aim of enhancing information, communication and technology.[938] The green and resilient cities intervention is premised on the need to develop sustainable urban planning on the African continent and aligns with the aims of the *Sendai Framework*.[939] In particular, the *Green Recovery Action Plan* emphasises the need for understanding, committing to and factoring long-term climate and disaster-resilient investments into urban planning and implementation processes.[940] This again reiterates the importance of alignment and coordination between national and local governments and sectors such as urban planning, environmental management and service provision. Specific interventions under the *Green Recovery Action Plan* include proactive planning and disaster risk management and reduction. These interventions require sustained investment in early warning, response and preparedness, mainstreaming disaster risk reduction in development processes, and supporting the adoption and implementation of climate-resilient infrastructure.[941]

Most significant for this dimension is the recently adopted *African Climate Change Strategy*,[942] which seeks to ensure that institutions, strategies and decisions for climate risk management and climate resilient development are integrated and implemented as a central aspect of achieving sustainable development. The *African Climate Change*

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937 *Programme of Action* 19.
938 *Green Recovery Action Plan* 21.
939 *Green Recovery Action Plan* 21.
940 *Green Recovery Action Plan* 22.
941 *Green Recovery Action Plan* 21-23.
942 *African Climate Change Strategy* 1.

Strategy advocates an enhanced climate policy, inclusive, multi-scalar governance, and institutional coordination.[943] The intervention areas of relevance identified consist of drafting, reviewing and developing climate change policies and implementation plans at local level.[944] Suggested actions in achieving this intervention require mainstream climate change considerations and policy actions across sectoral policies, and utilising open and transparent engagement with stakeholders.[945]

Additional actions involve strengthening co-ordination and collaboration between sectors and spheres of government, as well as communication with citizens and stakeholders.[946] The *African Climate Change Strategy* also notes the importance of data and knowledge sharing and collection by requiring that states establish systems for the monitoring and reporting of policy implementation, as well as open data and information sharing platforms to foster accountability and transparency.[947] The *African Climate Change Strategy* requires that climate-resilient development objectives and targets are mainstreamed across all areas of governance and into all local development and sector plans.[948]

The *African Climate Change Strategy* acknowledges the important contribution of ecosystem-based adaptation and nature-based solutions such as wetland restoration and the revegetation of riverine areas to prevent flooding or to absorb floodwaters.[949] This legal instrument affirms the important land-use function of sub-national actors by suggesting the adoption of an integrated landscape approach as a basic framework to balance competing demands, manage multiple land uses and understand connections in a specific area.[950] It is further suggested that cities adopt an integrated landscape approach as a basic framework to balance competing demands, manage multiple land

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943 *African Climate Change Strategy* 29.
944 *African Climate Change Strategy* 29.
945 *African Climate Change Strategy* 30.
946 *African Climate Change Strategy* 30.
947 *African Climate Change Strategy* 30.
948 *African Climate Change Strategy* 31.
949 *African Climate Change Strategy* 25-26. Also see paras 2.3.2.3 and 2.3.2.4.
950 *African Climate Change Strategy* 50.

uses, and understand connections in a specific area.[951] In addition, it requires the prioritisation of risk reduction and the building of the adaptive capacity of residents living in informal settlements *inter alia* by advocating the upgrading of informal settlements and slum areas in cities to build urban climate resilience.[952] The former action may be especially beneficial in the context of settlements that are located in flood-risk areas, and where the infrastructure does not exist for those communities to be resilient to climate risks and hazards.

The *African Climate Change Strategy* decisively indicates that resilient systems require a cross-sectoral understanding of vulnerabilities, and coordination for effective implementation of responses.[953] The *Strategy* declares that local governments can be key agents to unlock domestic resources in the implementation of adaptation action, provided they are sufficiently resourced, and their participation and agency are supported.[954] An important role of national government in supporting and overseeing local government is thus espoused. Most pertinently, the *Strategy* suggests that local plans and policies be aligned with NDCs and National Adaption Plans (NAPs) to ensure that climate finance flows to a local level and national targets and actions are achieved.[955] Discernibly, the *Strategy* posits an opportunity for local government to develop climate-relevant local laws to facilitate and enable effective policy implementation.[956]

3.3.2.5 Ensure a reliable and equitable supply of water for sustainable economic and social development

Socio-economic development and the alleviation of poverty in Africa depend to a very large extent on the sustainable management and utilisation of natural resources, and

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951 *African Climate Change Strategy* 50.
952 *African Climate Change Strategy* 51.
953 *African Climate Change Strategy* 52.
954 *African Climate Change Strategy* 60.
955 *African Climate Change Strategy* 61.
956 *African Climate Change Strategy* 77.

the most critical natural resource must arguably be water, closely followed by land.[957] The *Banjul Charter* prominently asserts that it is vital to pay particular attention to the right to development and that civil and political rights cannot be removed from social, economic and cultural rights.[958] On the matter of integrating environmental conservation and socio-economic development, the *African Convention* states that parties should incorporate environmental protection and sustainable development by making natural resource preservation and management central to their respective national and local development strategies.[959] Accordingly, as *Agenda 2063* asserts, all levels of government need to be developmental, democratic and accountable.[960] Being endowed with a developmental mandate, local government takes on a significant role in the aforementioned. Hence, in the drafting of development plans, full consideration is to be given to ecological as well as to economic, cultural, and social factors to promote sustainable development as it pertains to water resources.[961]

The *Nairobi Guidelines*[962] reiterate that the right to water is implicit in the protection of other rights. Among these are the rights to life, dignity, food, healthcare, economic, social, and cultural development, and a healthy environment.[963] The *Africa Water Vision* clarifies that water should always be treated as an economic good, especially in its competing uses for development.[964] The importance in recognising the economic value of water should be reflected in the pricing of water and sanitation services and in the formulation of policies on water allocation for sustaining life and the environment.[965] Again, meeting urgent water needs necessitates expanding the safe water and sanitation services to meet basic human needs, ensuring an adequate supply of water

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957 Roux, Mackay and Hill *Consolidation and Transfer of Knowledge and Experience Gained in The Development and Implementation of Water and Related Policy in South Africa* 1.
958 Preamble of the *Banjul Charter*.
959 Article 14(1) (a) of the *African Convention*.
960 *Agenda 2063* para 30.
961 Article 14(1) (b) of the *African Convention*.
962 *Nairobi Guidelines* para 87.
963 *Nairobi Guidelines* para 87.
964 *Africa Water Vision* 7.
965 *Africa Water Vision* 7.

for sustainable food security and ensuring that water for the environment is adequate in quantity and quality.[966] Additionally, it involves ensuring an adequate supply of water for urban, agricultural, energy, and hydropower production, industry and tourism, and the development of transportation.[967] The *Africa Water Vision* aims specifically for sufficient water for food and energy security, and recognises that ensuring food and energy security calls for a range of actions involving socio-economic development policies.[968]

In a similar vein, *Agenda 2063* foresees an Africa in which water resources are used and managed fairly and sustainably for the benefit of socioeconomic development, regional co-operation, and the natural environment.[969] The *Agenda 2063 First Implementation Plan*[970] similarly identifies the establishment of water tariff system that addresses cross-subsidisation and the needs of the poor as an important strategy in achieving quality basic services. The *Implementation Plan* focusses the need for increased investment on urban settlements; for instance, to promote housing, to replace informal settlements, and to address the inadequacy of water systems.[971]

The *Dar es Salaam Roadmap for Achieving the N'gor Commitments on Water Security and Sanitation in Africa* (2016)[972] focuses on decentralised service delivery, the efficient management of resources to ensure water, energy and food security, and equity and social inclusion.[973] The *African Climate Change Strategy* importantly acknowledges the role of water as a key driver for development, productivity and sustainable economic growth.[974] It specifically aims to guarantee IWRM and holds that states must ensure that hydropower infrastructure is planned in coordination with other sectors that

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966 *Africa Water Vision* 19.
967 *Africa Water Vision* 19.
968 *Africa Water Vision* 15.
969 *Agenda 2063* para 18.
970 *Agenda 2063 First Implementation Plan* 51.
971 *Agenda 2063 First Implementation Plan* 105.
972 *The Dar es Salaam Roadmap for Achieving the Ngor Commitments on Water Security and Sanitation in Africa* (2016).
973 *Dar es Salaam Roadmap* para I (a)-(f).
974 *African Climate Change Strategy* 23.

compete for the same water resources.[975] It is also suggested that states integrate water resource use efficiency in the design of infrastructure and the they build circular economies for waste.[976] Correspondingly, it pronounces that it is necessary to improve the coordination between multiple sectors and in particular between water-energy-food, as well as the environment and land.[977] In this regard it is recommended that states address the barriers to coordinated planning and management in their governance and institutional frameworks.

3.3.2.6 The governance and management of urban water security dimensions

One can discern from the above that there is a clear focus on the sustainability of water resources. The instruments considered demonstrate the commitment of African states to providing water and sanitation services, generating sustainable livelihoods, and adapting to climate change. In addition to its specific benefits in the water sector, water is also important for poverty alleviation, socio-economic growth, regional collaboration and environment sustainability.

The *Africa Water Vision* establishes a framework for achieving its vision by strengthening the management of water resources, enhancing water knowledge, addressing urgent water needs, and bolstering the fiscal base for the continent's desired water future.[978] It therefore proposes a new way of thinking about water management and argues that to bring about the future it envisions, reforms to national-level policies, strategies, legal frameworks, institutions, and management practices are required.[979] The *African Water Vision* notably necessitates the adoption of participatory approaches and management at the lowest appropriate level.[980]

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975 *African Climate Change Strategy* 45.
976 *African Climate Change Strategy* 51.
977 *African Climate Change Strategy* 54.
978 *Africa Water Vision* 2.
979 *Africa Water Vision* 2.
980 *Africa Water Vision* 2.

Strengthening the governance of water resources would require adopting and implementing IWRM principles and policies, and developing and implementing institutional reform and capacity-building at local, national and trans-boundary water-basin levels.[981] It also requires promoting transparency and participation and most importantly, mainstreaming management at the lowest appropriate level and creating institutional arrangements for full stakeholder participation.[982] The *African Water Vision* reiterates many of the principles provided in the international instruments including IWRM, decentralisation or subsidiarity, building capacity, and participation. These principles are well interrelated with improving water-wise decision-making, which entails building institutional, technological, and human capacity for effective water management.[983]

Aspiration three of *Agenda 2063* envisages a continent with a universal culture of good governance, democratic values, gender equality, respect for human rights, justice and the rule of law.[984] *Agenda 2063* specifically emphasises establishing capable institutions at all levels and putting transformative leadership in place.[985] In addition, it aspires for a continent where the institutions are at the service of its people.[986] In this vision, citizens will actively participate in their own social, economic and political development, and competent, professional, rules- and merit-based public institutions will serve the continent and deliver effective and efficient services.[987] This means that institutions at all levels of government will be developmental, democratic, and accountable.[988] The priority areas for these goals respectively comprise of democracy and good governance,

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981 *Africa Water Vision* 17-18.
982 *Africa Water Vision* 18.
983 *Africa Water Vision* 18.
984 *Agenda 2063* para 27.
985 *Agenda 2063* para 28.
986 *Agenda 2063* para 30.
987 *Agenda 2063* para 30.
988 *Agenda 2063* para 30.

human rights, justice and the rule of law, institutions and leadership, and participatory development and local governance.[989]

To achieve these aspirations *Agenda 2063 First Implementation Plan* highlights a need for states to reform their water resources institutions.[990] This involves addressing the human and systems capacity for the collection, analysis and use of water data to enable effective and integrated management of water in water basins, including management at the lowest appropriate level.[991] Furthermore, the *Plan* focusses on participatory development and local governance. Under this priority area, the strengthening of the administrative, fiscal and institutional capacities of municipalities is an important strategy.[992]

Agenda 2063 requires an enabling policy, legal and regulatory environment, which entails not only developing policies and putting in place the requisite legislation and regulation, but also the capacity to enforce them.[993] Undoubtedly, this requires holistic capacity development encompassing human resources and institutions, and an enabling legal and policy environment in which individuals and institutions may interact in a productive manner.[994] None of these components of capacitation could function well in isolation, and weaknesses in any one of these areas could have a cumulative effect on the others.[995] It is important that states build institutional and human resources capacity at all levels for all actors in the water and sanitation sector.[996] As the level closest to the citizens, local governments are in principle in a much better position than central

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989 *Agenda 2063 First Implementation Plan* 20.
990 *Agenda 2063 First Implementation Plan* 60.
991 *Agenda 2063 First Implementation Plan* 60.
992 *Agenda 2063 First Implementation Plan* 70.
993 *Agenda 2063 First Implementation Plan* 105.
994 *Agenda 2063 First Implementation Plan* 105.
995 *Agenda 2063 First Implementation Plan* 105.
996 *Tunis Declaration* para 8(i).

government to deal with matters that require local knowledge and regulation on the basis of local needs and priorities.[997]

While they strive for improved governance, African countries are expected to put in place legal and policy measures to ensure the full decentralisation and rationalisation of their fiscal and administrative functions and to build the associated capacities for municipalities and local government bodies.[998] The *Dar es Salaam Roadmap* aligns itself with globally accepted principles, legal frameworks and trends in best practice in transboundary water management, as well as approaches to assuring water, food and energy security.[999] The *Dar es Salaam Roadmap* challenges states to make progress on water security and sanitation in line with *Agenda 2030* by improving their efficiency, transparency and accountability, and by addressing inequalities and a lack of integrity in the institutions in the water sector.[1000] To improve the quality of the governance of water affairs, states will need to increase the transparency, accountability and integrity in their institutions and to allocate the necessary finances to match the central role of water.[1001] They can achieve this by ensuring that there is a participatory environment for civil society and citizens in policy formulation, sector planning and monitoring.[1002] They could also take account of the complementarity of existing and proposed initiatives and institutions to avoid redundancy and overlap.[1003]

The Nairobi Guidelines define states' obligations by stating that they will respect, protect, and fulfil human rights in all aspects pertaining to economic development, natural resources, management and governance, as well as international co-operation and investment agreements.[1004] Following on this, states are required to ensure in law

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997 *Role of Local Government in The Promotion and Protection of Human Rights – Final Report of the Human Rights Council Advisory Committee* (2015) A/HRC/30/49.
998 *Agenda 2063 First Implementation Plan* 69.
999 *Dar es Salaam Roadmap* para I (j).
1000 Preamble of the *Dar es Salaam Roadmap* and para II (a)-(c) and III (a)-(d).
1001 *Dar es Salaam Roadmap* para II.
1002 *Dar es Salaam Roadmap* para II (a).
1003 *Dar es Salaam Roadmap* para II (c).
1004 *Guidelines on the Right to Water* para 1.2.

and practice that the universally recognised principles of participation, non-discrimination, access to information, sustainability and accountability are respected, protected, promoted and fulfilled in the planning, decision-making, implementation, and monitoring processes in the water sector, as they are integral to the realisation of the right to water.[1005] This requires states to put in place measures toward more democratic and inclusive local water resource management and water, sanitation, and hygiene policy and planning at all levels of society.[1006]

3.4 Concluding remarks

This chapter aimed to explore the nexus between urban governance and water security from an international and African regional law and policy perspective, with a view to determining the role of sub-national authorities such as municipalities. What can be concluded from the above discussion is that the international and regional frameworks are extraordinarily complex and often unclear as to what exactly is required of stakeholders in the water sector, especially regarding water security.

This chapter was therefore divided into two parts, with both assessing the role of municipalities in addressing the dimensions of urban water security according to the international and African regional legal frameworks respectively. Concerning the first dimension of urban water security, this chapter has demonstrated that a human right to water is necessary to ensure equitable, secure and reliable access to an adequate, clean and safe drinking water supply in urban areas.[1007] In view of this acknowledgment, the right to water has been clarified as the right of all natural persons to access to a sufficient, affordable supply of water of an adequate quality.[1008] States have a constant and continuing duty to respect, protect and fulfil, as expeditiously and effectively as

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[1005] *Guidelines on the Right to Water* para 7.2.
[1006] *Guidelines on the Right to Water* para 8.1
[1007] See paras 3.2.2.1 and 3.3.2.1.
[1008] See para 3.2.2.1.

possible, the right to water.[1009] It is argued that although drinking and domestic water provision is primarily outlined as a national government responsibility, there is a collective responsibility in the decision-making process for the use of water.[1010] The decentralised role of water services delivery is acknowledged in both international and regional instruments.

The role of municipalities in providing equitable, accessible, safe and adequate sanitation, wastewater, and stormwater services as per the second dimension of urban water security, according to international and regional law and policy, is scoped out in a similar manner as dimension one.[1011] This dimension is underscored by the right to sanitation, which has until recently primarily been seen as a right attached to the fulfilment of other socio-economic rights. This right requires of states at all levels to work towards fulfilling the elements of availability, quality, acceptability, accessibility, affordability, and equity. Both the first and second dimensions require the drafting, adoption and implementation of development laws, plans, or strategies. In the water sector, these should include specific provisions that direct the achievement of the rights to water and sanitation, including specific standards of service provision, as well as provisions pertaining to the sustainability of future supply under conditions of uncertainty.

Protection of urban aquatic ecosystems as the third dimension of urban water security suggests that while this dimension is premised upon the right to a satisfactory environment, the responsibilities mostly befall national governments.[1012] However, the instruments have defined a role for local authorities in mainstreaming biodiversity and ecosystem conservation through urban planning. This requires drafting strategies or plans such as LBSAPs, for example. The primary measures identified to conserve natural resources is the integration of biodiversity and land management and land-use

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[1009] General Comment 15 para 18.
[1010] *Mar del Plata Action Plan* para 8(h).
[1011] See paras 3.2.2.2 and 3.3.2.2.
[1012] See paras 3.2.2.3 and 3.3.2.3.

planning.[1013] In addition, the importance of thorough environmental assessments for all major infrastructure and urban development projects is stressed throughout the instruments.

Concerning the fourth dimension of urban water security,[1014] the prevention of new and emerging disaster risks and the reduction of existing disaster risks such as floods, droughts and storms are frequently underscored.[1015] In this regard there is an important role for all levels of government in increasing preparedness for response and recovery as a mechanism for integrating more holistic, adaptive, and co-operative approaches that strengthen resilience. In particular, the role of local governments extends from compiling and disseminating disaster risk and vulnerability assessments, integrating climate change considerations in biodiversity, development, water, and land-use planning, to drafting cross-sectoral climate laws, plans or strategies that are inclusive, resilient and disaster-risk informed.

It is discernible that specific measures to address the final dimension of urban water security are not clearly pronounced.[1016] However, it is increasingly recognised that integrated water management is at the heart of this dimension. The instruments also strongly suggest addressing the inadequacy of water systems by working towards making water-wise decisions, which entails building institutional, technological, and human capacity for effective water management.[1017]

It is apparent that the instruments discussed in the chapter refer to and describe the actions needed to address the dimensions and elements of water security. It is therefore left to states to translate these objectives, actions and activities into their national laws and policies, and to fit these international and regional goals into the contexts and frameworks of the respective countries. The international human rights

[1013] See paras 3.2.2.3 and 3.3.2.3.
[1014] See para 3.2.2.4 and 3.3.2.4.
[1015] See para 3.3.2.1.
[1016] See paras 3.2.2.5 and 3.3.2.5.
[1017] *Africa Water Vision* 18.

framework can serve as a basis for developing national policy and domestic law but needs to be supported by capable and accountable institutions to ensure inclusive and impartial policy implementation. These provide a foundation upon which to build partnerships with water-using sectors whose policies and strategies are governed by many factors outside the water sector.[1018]

The following chapter investigates the law and governance of water security in South Africa, specifically. This analysis offers insight into the provisions in South African law and governance and how they address the interface between water security and urban governance.

[1018] AMCOW *Water Security and Climate Resilient Development: Strategic Framework* 4.

4 SOUTH AFRICAN LAW AND POLICY ON THE NEXUS BETWEEN URBAN GOVERNANCE AND WATER SECURITY

4.1 Introduction

As stated before, South Africa faces increasing demands to meet the water needs of a rapidly growing and urbanising population.[1019] In the view of Muller *et al*,[1020] South Africa's challenges in the water sector are going to result in water not being available at the right time nor in the right place to meet the country's developmental demands and international obligations, whilst simultaneously maintaining ecological sustainability.[1021] In addition, the water resources of the country are profoundly affected by industries like mining, energy, and agriculture. Despite this, climate change is leading to a warmer and drier future for the country, with longer and more extreme droughts and more intense floods predicted.[1022] Climate change is not only exacerbating existing vulnerabilities and insecurities, but it is also influencing the ability of people to adapt appropriately to its impacts, including those affecting water.[1023]

Many of the international and regional norms and standards to which many countries have agreed to abide[1024] have already been incorporated into national water law and policies, as will be shown in the discussion in this chapter. The aim of the chapter is to investigate South African law and policy on water security to assist in defining the role of municipalities in addressing the dimensions of water security. The legal and policy framework referred to encompasses the constitutional, environmental, climate change and water law and policy. The study acknowledges that a thorough discussion of case law may be desired and add value to the practical and legal relevance of the role carved

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1019 NPC *Draft National Water Security Framework* (2019) 6.
1020 Muller *et al Water Security in South Africa* 12.
1021 NPC *National Development Plan 2030: Vision for 2030* 37.
1022 NPC *Draft National Water Security Framework* (2019) 6.
1023 UNEP *Climate Change and Human Rights* 1. Satterthwaite *et al* "Adapting to Climate Change in Urban Areas" 15.
1024 See paras 3.2 and 3.3.

out for local government in addressing water security. However, reference to cases is limited to the extent that they give effect to the aim of this chapter which is to dissect what role is set out for local government in addressing the dimensions of urban water security.

In the case of water security, the national legal and policy framework expressly provides for societal needs and expectations and the tools to achieve them. The framework includes the duties, rights and responsibilities for water use, development, management, control, and conservation. These legislative powers and responsibilities have a direct impact on people's water security, health, and well-being.

The overarching legal framework addressing water (security) includes, first, legislation, namely the NWA and *Water Services Act*, and second, policy such as the NWRS,[1025] the NWSMP[1026] and the NWSF. The NWSF indicates that the country is water insecure due to an acknowledged backlog in water infrastructure, insufficient maintenance and investment, inequities in access to water, and deteriorating water quality, as well as climate change.[1027] It goes further in stating that notwithstanding South Africa's successes and world-renowned water policy and legislation, transformation and implementation have remained a serious challenge.[1028] The NWSF recommends, amongst other things, creating an enabling environment by ensuring proper water governance from institutional arrangements through to clear roles and responsibilities with identifiable accountability and authority in all spheres, including the local sphere.[1029]

1025 S 5 of the NWA makes provision for the development of a *National Water Resources Strategy* (NWRS) which was established in the GN 65 in GG 27199 of 28 January 2005. At the time of the conclusion of this study the NWRS was under review and open for public comment. The Draft *National Water Resources Strategy Edition Three* (NWRS-3) was gazetted in GN 2327 in GG 47133 of 29 July 2022.

1026 DWS *National Water and Sanitation Master Plan* Volumes 1-3 available at South African Government 2020 https://www.gov.za/documents/national-water-and-sanitation-master-plan-28-nov-2019-0000.

1027 NPC *National Water Security Framework for South Africa* x.

1028 NPC *National Water Security Framework for South Africa* x.

1029 NPC *National Water Security Framework for South Africa* 90.

The legal and policy framework under discussion which addresses climate change includes the *National Climate Change Response Policy* (2011) (NCCRP)[1030] and the NCCAS.[1031] The *Climate Change Bill* (B9-2022),[1032] although not yet enacted, will be discussed to determine what will be expected of municipalities once the *Climate Change Bill* becomes law.

In addition to the *Constitution*, the shape, form, duties, and functions of municipal governance are expressed, amongst other matters, in the *White Paper on Local Government* (1998), the *Municipal Structures Act*, the *Municipal Systems Act* and the MFMA. This chapter also discusses the provisions of the *Spatial Planning and Land-use Management Act* 16 of 2013 (SPLUMA) in its applicability and relevance to "municipal planning". As stated previously,[1033] water governance comprises the policies, strategies and plans, legal and regulatory frameworks, the institutions, decision-making and monitoring processes, and planning relating to water. The chapter reviews law from sources of legislation, judicial precedent (case law), and academic literature. The purpose of these sources is to contribute to the understanding of the role of municipalities in addressing water security in South African cities.[1034]

4.2 Brief overview of the institutional framework

To understand the present urban water crisis, it is helpful to first understand the institutional framework underpinning water security and management in South Africa. The administration of the laws and policy under discussion is scattered across the national, provincial, and local spheres of government. The overall institutional structure for water security includes all spheres of government, national, provincial and local, as

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1030 *National Climate Change Response Policy* (2011) (NCCRP) in GN 757 in GG 34695 of 19 October 2011.
1031 *National Climate Change Adaptation Strategy for South Africa* (2019) (NCCAS).
1032 GN 1026 in GG 45299 of 11 October 2021 (*Climate Change Bill*).
1033 See para 2.4.
1034 Also see para 1.9 on the research methodology.

co-operative governance is recognised as a vital component of water management.[1035] These institutions are important because they are responsible for law and policymaking, as well as the implementation of these laws and policy. This structure also includes various other public and private actors who have roles to play in water security issues. The discussion on the institutional frameworks for addressing water security is limited to identifying the institutions responsible for addressing aspects of the dimensions of water security.

4.2.1 Institutional framework for environmental matters in general

In South Africa the institutional, policy and legal framework for the management and protection of the natural environment is complex and has resulted in the fragmentation of responsibility in government, both horizontally and vertically.[1036] Consequently, different roles and responsibilities for law and policy-making, implementation, operational management, information, monitoring, regulation and financing are allocated across a broad range of stakeholders.[1037] This reflects the fragmentation and complexity of water law, policy and management, in terms of both structural fragmentation between the various spheres of government as well as the various line functionaries in each sphere.[1038]

The Department of Forestry, Fisheries and the Environment (DFFE) is the lead agent for the environment at national level.[1039] The DFFE has a mandate to give effect to the right of South Africans to an environment that is not harmful to their health or well-being, and to have the environment protected for the benefit of present and future generations.[1040] The DFFE is also the central law and policy-formulating and coordinating

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1035 S 41 of the *Constitution*; Preamble of the *Water Services Act*.
1036 DEA *South Africa Environment Outlook 2016* 55. Also see Kotzé *A Legal Framework for Integrated Environmental Governance in South Africa and the North West Province* and Kotzé 2006 *PELJ* 75-118 for a comprehensive discussion on fragmentation of the South African environmental law regime.
1037 OECD *Water Governance in Cape Town* 38.
1038 Kotzé 2006 *PELJ* 77; DEA *South Africa Environment Outlook 2016* 55.
1039 DFFE 2021 https://www.environment.gov.za/services/government_spheres.
1040 DFFE 2021 https://www.environment.gov.za/services/government_spheres.

body for protecting, conserving and improving the environment. The Department seeks to facilitate co-operative environmental governance across all spheres of government and to provide geographically referenced environmental information for decision-making.[1041] This part of the DFFE's work includes promoting the incorporation of environmental objectives into strategic planning instruments in the national, provincial and local government spheres.[1042] The work of the DFFE in the context of water security is mainly to regulate activities that may affect water resources. This can be done through the implementation of suitable environmental management tools that see to the integrated environmental management of relevant activities – tools such as environmental authorisations.[1043]

The Department is also supported by the following statutory bodies: the South African Weather Service (SAWS), the South African National Biodiversity Institute (SANBI) and the South African National Parks (SANParks).[1044] Each province has its own provincial department focusing on environmental issues.[1045] These departments are responsible for evaluating EIAs and issuing authorisations, for example. Additionally, both national and provincial governments have a corresponding obligation to support, promote and regulate the exercise of authority of local government through legislative or other measures.[1046] This monitoring and supporting function is important in ensuring that

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1041 DFFE 2021 https://www.environment.gov.za/services/government_spheres. Also see ss 23, 23A and 24L of the NEMA, which deal respectively with integrated environmental management, mainstreaming environmental management and the alignment of environmental authorisations.

1042 DFFE 2021 https://www.environment.gov.za/services/government_spheres.

1043 S 23 of the NEMA.

1044 DFFE 2021 https://www.environment.gov.za/services/statutory_bodies. DEA *South Africa Environment Outlook 2016* 55.

1045 See Schedule 4A of the *Constitution,* which lists the "environment" and "nature conservation" as concurrent functions of national and provincial government. The provincial departments relevant to the cities under discussion in this study include the Western Cape Department of Environmental Affairs and Development Planning, the KwaZulu Natal Department of Economic Development, Tourism and Environmental Affairs, and the Gauteng Department of Agriculture and Rural Development.

1046 Ss 155 (6)(a)-(b) and (7) of the *Constitution*. Also see section 139 of the *Constitution,* which empowers a provincial executive to intervene where a municipality fails to fulfil an executive obligation in terms of legislation.

municipalities have the necessary capacity, support and resources to carry out their mandates as per the constitutional and legislative frameworks.

4.2.2 Institutional framework for water management and governance

The DWS is responsible for water sector policy, support and regulation.[1047] The DWS regulates the use of water resources as well as the framework for water services provision, and functions as a water resource developer, and a water services provider supplying bulk water to individual irrigators and water for domestic purposes.[1048] The NWA designates the Minister of Water and Sanitation as the public trustee of water resources on behalf of national government.[1049] The Minister is responsible for promoting environmental values and ensuring that water is distributed fairly and used for the common good.[1050] In general, the Minister can delegate any ministerial powers and duties to departmental officials, water management institutions, water boards and advisory committees. The DWS also has provincial offices – but all decision-making in relation to the allocation of water happens on a national level if there are no catchment management agencies (CMAs) or water use associations (WUAs) in place. The laws and policies developed and implemented by the DWS serve to inform urban water management laws, policy, plans and strategies and are reviewed below to evaluate the role of local government in addressing water security.[1051]

The institutional structure for water management is delineated in both the NWA and *Water Services Act*. The NWA identifies the water management institutions as comprising CMAs and WUAs. At a regional or catchment level where local community

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1047 SA Gov 2021 https://www.gov.za/about-sa/water-affairs.
1048 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 216.
1049 S 3(1) of the NWA. Also see more on public trusteeship under para 4.3.4 below.
1050 S 3(2) of the NWA.
1051 See para 4.3 below.

involvement is most expected,[1052] CMAs undertake water resource management and planning within a designated water management area.[1053] CMAs are legal entities which perform public functions and powers, but do not form part of any sphere of government.[1054] Currently, only two of nine gazetted CMAs in South Africa are operational, the Inkomati-Usuthu CMA in Mpumalanga and the Breede-Gouritz CMA in the Western Cape.[1055] Where CMAs are not established, the Minister of DWS has all the powers and duties of a CMA in that area. CMAs are responsible *inter alia* for managing regional water infrastructure and supporting local government in the delivery of water services.[1056] The licensing and monitoring of water uses, collecting water use charges, monitoring the quality of the water resources and overseeing land-use activities that affect water management are among the responsibilities of CMAs.[1057] A WUA is a co-operative body of water users who wish to undertake water-related activities for their common interest. These users co-operate in undertaking water-related activities at the local level.[1058]

The Trans-Caledon Tunnel Authority (TCTA),[1059] an agency of the DWS, is a water sector institution specifically charged with financing and implementing bulk raw water infrastructure projects and implementing international agreements.[1060] In this regard, the DWS aims to establish a National Water Resource Infrastructure Agency (NWRIA), which will encompass the national water resources assets as well as the staff of the

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1052 S 1(1)(iii) of the NWA defines catchment in relation to a watercourse or watercourses or part of a watercourse as the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse through surface flow to a common point or common points.

1053 CMAs are regulated by sections 77-80 of the NWA.

1054 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 622-623.

1055 *National Water Resources Strategy* (2019) 59.

1056 *National Water Resources Strategy* (2019) 59.

1057 Department of Water Affairs and Forestry (DWAF) *Strategic Framework for Water Services* 8.

1058 Ss 91-98 of the NWA address water user associations.

1059 Trans-Caledon Tunnel Authority (TCTA) 2020 https://www.tcta.co.za/about-us.

1060 See Chapter 10 of NWA.

TCTA, the Water Trading Entities (WTE) and the Infrastructure Branch of the DWS.[1061] The NWRIA will be responsible for developing and operating South Africa's major national dams and water transfer schemes, with domestic water supply remaining the responsibility of water service providers.

There is a range of other actors and role players that are not directly involved in managing water resources or providing water services, but which play a role in either protecting water resources, providing services other than water services, promoting certain objectives or gathering information.[1062] These actors include the Department of Mineral Resources and Energy (DMRE),[1063] the Department of Agriculture, Land Reform and Rural Development (DALRRD),[1064] National Treasury,[1065] the Department of Health[1066] and the provincial departments established to execute functions related to the mandates of these national departments.[1067] Other actors include non-governmental and community-based entities including organisations such as environmental groups, civil groups and labour unions, who play central roles in ensuring that government structures function well and take responsible decisions on matters affecting the environment or community-based approaches for water services.[1068] Beck, Rodina and Harris[1069] state that NGOs and stakeholders can be separated into two notable groups; those that focus on service delivery, and those involved in holding the state accountable and deepening democracy.

1061 SA Gov 2022 https://www.gov.za/speeches/dws-consultations-establishment-infrastructure-agency-set-motion-3-mar-2022-0000.

1062 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 228.

1063 DMRE 2021 http://www.energy.gov.za/files/au_frame.html.

1064 The Department of Agriculture, Land Reform and Rural Development (DALRRD) has responsibility for agriculture, food safety, food security, land reform, topographic mapping, cadastral survey, the Deeds Offices, and spatial planning. DALRRD 2020 https://www.dalrrd.gov.za/About-Us/Structure-and-Functions.

1065 Department: National Treasury 2022 http://www.treasury.gov.za/.

1066 Department of Health 2020 http://www.health.gov.za/aboutus/.

1067 DEA *South Africa Environment Outlook 2016* 47.

1068 DEA *South Africa Environment Outlook 2016* 47. These can include water services committees, see Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 230, 736-741.

1069 Beck, Rodina and Harris *Institutional and Policy Mapping of the Water Sector in South Africa* 6-7.

Under the *Water Services Act*, water services institutions include water boards, water service authorities (WSAs), water service providers (WSPs) and a water services committee, all of which play key roles in water services provision.[1070] While water boards are seen as organs of state, they do not belong to any sphere of government.[1071] They operate bulk water infrastructure such as dams and in some instances wastewater treatment plants, and sell water from reservoirs to municipalities or industries.[1072] The water boards of relevance in this study include Rand Water in Gauteng[1073] and Umgeni Water in KwaZulu Natal,[1074] which are also the two largest water boards in the country.

The *Water Services Act* designates metropolitan municipalities, selected district municipalities and authorised local municipalities as WSAs. They are responsible for ensuring the provision of water services for domestic and industrial purposes in their area of jurisdiction.[1075] Flowing from their constitutional duties, a municipality as defined by the *Water Services Act* is obliged to progressively ensure efficient, affordable, economical and sustainable access to water supply and sanitation services.[1076] The responsibilities of WSAs include the following: the realisation of the right to access to basic water services, preparing water services development plans (WSDPs), the appointment of WSPs, the regulation of water service provision and WSPs, drafting by-laws, and the provision of information.[1077] A WSA's ability to carry out its duties is contingent on a variety of factors such as the availability of resources, the necessity of the equitable allocation of resources, the requirement to regulate access to water

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1070 S 1(xxiii) of the *Water Services Act.*

1071 Water boards are established through Chapter 6 of the *Water Services Act*. Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 227.

1072 Approval has been obtained to consolidate water boards into regional water utilities to manage regional water resources and regional bulk water and wastewater infrastructure.

1073 Rand Water 2020 https://www.randwater.co.za/AboutUs/Pages/CoreBussiness.aspx.

1074 Umngeni Water 2020 https://www.umgeni.co.za/.

1075 S 1(xx) of the *Water Services Act* defines a WSA as any municipality, including a district or rural council, responsible for ensuring access to water services.

1076 S 11(1) of the *Water Services Act*.

1077 Ss 11(1), 12(1), 19(1) and 21(1) of the *Water Services Act*.

services on an equitable basis, and the obligation to conserve resources.[1078] A municipality may therefore choose to either perform the functions of water provision (as a WSP) itself or it may contract any legal entity (CBO, NGO, organ of state, private company, municipal entity or another municipality) to provide water services on its behalf.[1079] The most common outcome is that the municipality remains its own WSP. A municipality may employ external service delivery mechanisms. As a WSP, a municipality must provide water services in an efficient and effective manner and ensure consumer satisfaction.

Municipalities are the WSAs by operation of law and are responsible for setting tariffs, enforcing relevant legislation, and monitoring service provision. As a WSA a municipality is responsible for providing services and must investigate how services will be provided.[1080] A WSP's primary responsibility is to deliver water services in accordance with the *Water Services Act*, by-laws and other regulations of the WSA, as well as the terms of any contractual conditions established by the WSA.[1081] The *Water Services Act* stipulates that in order to legally operate in the area where the service is to be provided a WSP must first receive authorisation from a WSA.[1082] Only one entity in a designated area will be awarded the authority to provide water services (the WSA), whereas the WSA can appoint more than one service provider in the area to assist with the function (such as a WSP).[1083] In this regard, a municipality, in its role as a WSA, may for example appoint a water board to provide water services as well as a separate provider to deal with wastewater management.

Consequently, it is the responsibility of the WSA to monitor the performance of WSPs and to ensure compliance with contractual agreements and promulgated norms and

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1078 Malzbender *et al Review of Regulatory Aspects of the Water Services Sector* 56.
1079 S 19(1)(a)-(b)(i) and (ii) of the *Water Services Act*; Swart and Adams "Water Services Provision and the Protection of Water Resources" 466.
1080 S 78 of the *Municipal Systems Act*.
1081 S 1(xxiii) of the *Water Services Act*.
1082 S 22(1) of the *Water Services Act*.
1083 Swart and Adams "Water Services Provision and the Protection of Water Resources" 466.

standards. WSPs are the organisations that undertake the operational function for providing water and/or sanitation services. Within this framework the WSA is essentially the regulator of the service and is responsible for ensuring that services are provided effectively, efficiently, sustainably, and affordably.[1084] A WSP could be a local services provider who provides services to or on behalf of only one WSA, or a regional services provider who operates regional infrastructure crossing WSA boundaries and providing water services to or on behalf of more than one WSA.

Furthermore, a water services intermediary is any party or organisation who is obligated to provide water services in terms of a contract where the obligation to provide water services is incidental to the main object of the contract.[1085] If the main purpose of the contract is to provide water services the party is classified as a WSP,[1086] not an intermediary. For instance, farmers that are responsible for providing housing and related services to their employees living on the premises are considered intermediaries when they are contractually obliged to provide basic water services to their employees.[1087] This is also the case where mining companies provide water to their employees living in mining hostels and houses.

The role of civil society is recognised in the *Strategic Framework for Water Services*, which emphasises that civil society should be engaged in policy development, research and advocacy, and in assisting with the planning, implementation and management of programmes and projects at community level.[1088] The *Framework* adds that civil society organisations should be engaged to create a link between government and local communities and to engage capacitated CBOs to manage water services projects at the

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1084 Swart and Adams "Water Services Provision and the Protection of Water Resources" 466.
1085 S 1(xxii) of the *Water Services Act*.
1086 A water services intermediary is excluded from the definition of a WSP under section 1(xxiii) of the *Water Services Act*.
1087 Toxopeus 2018 https://www.politicsweb.co.za/opinion/the-institutional-structure-for-delivering-water-s.
1088 DWAF *Strategic Framework for Water Services* 24.

local level, where appropriate.[1089] This engagement needs to extend beyond mere participation and should entail meaningful engagement to ensure that the rights and concerns of civil society are actively and clearly reflected in the decision-making processes around water management.

Toxopeus[1090] affirms that managing water (services) is a complex process that involves different institutions working together in a coordinated way. Consequently, if one institution is not functioning optimally this adversely affects the chain of service delivery, affecting constitutional rights in the process.[1091] It is therefore apparent that the interplay between government structures, civil society, the private sector, science and legislative processes must help give effect to the achievement of water security in cities.[1092]

4.2.3 Institutional framework for local governance

The Department of Co-operative Governance and Traditional Affairs (COGTA) is a national department with its mandate derived primarily from Chapters 3 and 7 of the *Constitution*.[1093] Among its many responsibilities COGTA has the function of developing national laws and policy applicable to provincial and local government and has oversight of the implementation of several acts, including the *Municipal Systems Act* and the MFMA.[1094] COGTA also ensures that all municipalities perform their basic responsibilities and functions consistently, including supporting the delivery of municipal services to the right quality and standard, promoting good governance, transparency, and

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1089 DWAF *Strategic Framework for Water Services* 24.

1090 Toxopeus 2018 https://www.politicsweb.co.za/opinion/the-institutional-structure-for-delivering-water-s.

1091 Toxopeus 2018 https://www.politicsweb.co.za/opinion/the-institutional-structure-for-delivering-water-s.

1092 DEA *South Africa Environment Outlook 2016* 47.

1093 Chapter 3 covers co-operative government and Chapter 7 of the *Constitution* focuses on local government. Additional chapters relevant to COGTA's mandate are Chapter 6 on Provinces and Chapter 12 on Traditional Leaders.

1094 COGTA 2020 https://www.cogta.gov.za/index.php/about-cooperative-governance-traditional-affairs/.

accountability, and ensuring sound fiscal management and accounting.[1095] In addition, the provincial departments responsible for local government affairs also play a vital role in ensuring municipalities fulfil their constitutional and legal obligations by strengthening their capacity to manage their own affairs, to exercise their powers and to perform their functions, as well as intervening where the preceding cannot be done.[1096]

The South African Local Government Association (SALGA) is an autonomous association with a clear strategic role in representing the interests of local government in the entire system of government, and on the other hand in assisting its members to meet their developmental obligations.[1097] As a full government partner SALGA is responsible for providing common policy positions on a wide range of issues, representing local government interests, actively participating in intergovernmental relations and addressing the unique problems that affect local governments.[1098] SALGA advocates for municipalities nationally with offices in each of the nine provinces.

The South African legal framework expressly confers a right to municipalities to govern the affairs of their communities,[1099] to exercise both legislative and executive authority without improper interference,[1100] and to exercise all functions and powers conferred on or assigned to them.[1101] Additionally, they have the right to do anything reasonably necessary for or incidental to the effective performance of their functions and the exercise of their powers.[1102] In executing their functions, municipalities must further

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[1095] COGTA 2020 https://www.cogta.gov.za/index.php/about-cooperative-governance-traditional-affairs/.

[1096] The departments applicable to the cities assessed in this study include the Western Cape Department of Local Government, KwaZulu-Natal Department of Cooperative Governance and Traditional Affairs, and the Gauteng Department of Co-operative Governance and Traditional Affairs. These departments must adhere to the provisions of sections 139, 154 and 155 of the *Constitution*.

[1097] SALGA 2021 http://www.salga.org.za/About%20Us%20W.html.

[1098] SALGA 2021 http://www.salga.org.za/About%20Us%20W.html.

[1099] S 151(3) of the *Constitution*; s 4(1)(a) of the *Municipal Systems Act*.

[1100] S 151(4) of the *Constitution*; s 4(1)(b) of the *Municipal Systems Act*.

[1101] S 156(1) of the *Constitution*; s 8(1) of the *Municipal Systems Act*.

[1102] S 156(5) of the *Constitution* and s 8(2) of the *Municipal Systems Act*.

strive to ensure that municipal services are provided to the local community in a financially and environmentally sustainable manner.[1103]

The *White Paper on Local Government* reinforces the idea that local government has the responsibility to promote a safe and healthy environment and that services must be delivered in a sustainable way, which includes ensuring ecological sustainability.[1104] The *White Paper* sets out provisions to achieve environmental sustainability by requiring municipalities to include environmental issues in their planning policies, development frameworks, long-term strategic action plans, IDPs and decisions.[1105] Municipalities also need to promote a safe and healthy environment[1106] and to give effect to this duty by passing by-laws and taking decisions in relation thereto.[1107] This function of municipalities is put into effect by means of: (a) legislative measures (such as by-laws); and (b) measures adopted by the municipal executive (e.g. local policies, local-level strategic guidelines, and conservation plans), among others.[1108] Municipalities also have the power to make and enforce by-laws pertaining to issues within their purview, which have been delegated to them, or which are otherwise related to or ancillary to the performance of their duties.[1109] Many sectoral and framework laws require the drafting of by-laws by municipalities that will address specific sectoral issues.

Considering the role of local government in serving its community, acting as a custodian of natural resources, and building vibrant local economies in the context of their legislated powers and responsibilities,[1110] the law and governance instruments with potential for addressing urban water security are discussed in the sections which follow.

1103 See ss 152 and 153(a) of the *Constitution*; s 4(2)(d) of the *Municipal Systems Act*. Furthermore, s 1 of the *Municipal Systems Act* defines "environmentally sustainable" in relation to the provision of a municipal service.

1104 Gen Not 423 in GG 18739 of 13 March 1998.

1105 Gen Not 423 in GG 18739 of 13 March 1998.

1106 S 4(2)(i) of the *Municipal Systems Act*.

1107 S 11(3)(l) and (m) of the *Municipal Systems Act*.

1108 Nel, Du Plessis and Retief "Key Elements for Municipal Action" 2-7.

1109 Ss 151(3), 156(1)(b), 156 (2) and 156(4) of the *Constitution*; Freedman 2014 *PELJ* 578; s 4(1)(a) of the *Municipal Systems Act*. Steytler and De Visser *Local Government Law of South Africa* 5-44.

1110 Nel, Du Plessis and Retief "Key Elements for Municipal Action" 2-3.

The institutional framework applicable to environmental matters, water and local government is rooted in the post-apartheid objective of developmental local government, which is rooted in a system of co-operative government. Departing from an understanding of the institutional framework, the section which follows investigates the legal framework applicable to the dimensions of urban water security.

4.3 The law and policy framework applicable to the dimensions of urban water security

This section evaluates the law and policy framework applicable to the dimensions of urban water security. This analysis is required to determine how national law and policy pertaining to water security establish responsibilities for and confer the authority to promote water security to municipalities in their delineated areas of jurisdiction. Concerning the delineated dimensions of water security,[1111] it is discernible that water security intersects with several functions of local government. Understanding the role of local government requires a review not only of water law but also of laws dealing with the environment, local government, spatial planning and land-use management, and DRM.

4.3.1 Brief overview of the instruments available to address urban water security

This section of the study departs from the perspective that municipalities have legally defined functions and competence to create various instruments that give legal effect to the dimensions of urban water security. In this light, this section provides an analysis of the law, policy and governance instruments available to address urban water security.

At the helm of the instruments municipalities are legally empowered to develop is the integrated development plan (IDP), which serves as the primary strategic planning

[1111] See para 2.3.

instrument for the municipality and is used to guide and inform all planning, development, and decisions related to planning, management, and development.[1112]

All IDPs, regardless of the municipality they pertain to, should contain legally prescribed elements, and becomes binding on the municipality once adopted and implemented.[1113] Service Delivery and Budget Implementation Plans (SDBIPs) play a significant role in implementing the IDP.[1114] The SDBIP is the management, monitoring, and implementation tool necessary for implementing the municipality's delivery of municipal services and the annual budget, the SDBIP must detail quarterly service delivery targets and performance indicators.[1115] The development of the service targets and performance indicators implies that the budget of a municipality must be aligned to the IDP objectives and key performance indicators and targets.[1116]

Municipalities are further obliged to draft and adopt spatial development frameworks (SDFs) and integrate them into their IDPs.[1117] The SDF is one of the key strategic planning instruments that is used to make decisions on land use rights.[1118] Since an SDF has a longer lifespan than an IDP, the SDF provides the spatial context for the IDP over the longer term. The key distinction is that IDPs deal with the full scope of municipal management, including budgeting and institutional resourcing, while SDFs narrow in on spatial issues and spatially targeted budgeting. Municipalities must also develop a land-use scheme (LUS) that implements the municipal SDF and fosters economic growth,

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[1112] S 35(1)(a) of the *Municipal Systems Act*; Van der Berg *Municipal Planning Law and Policy for Sustainable Cities in South Africa* 158; Fuo *Local Government's Role in The Pursuit of Transformative Constitutional Mandate* 339. The adoption, process, minimum content, and broad purpose of the IDP is prescribed in ss 25, 26-34 of the M*unicipal Systems Act*.

[1113] S 26 of the *Municipal Systems Act*.

[1114] The SDBIP is the management and implementation tool that establishes yearly data like quarterly service delivery and monthly budget targets and that connects every service delivery output to the municipal budget. The SDBIP details the capital and operating budget for the municipality to implement its strategy over the course of the fiscal year, making the IDP a reality.

[1115] S 53(1)(c)(ii) of the *Local Government: Municipal Finance Management Act* 56 of 2003 (MFMA).

[1116] Khumalo *A Review of the Alignment Between the Integrated Development Plan and the Performance Management System of the Capricorn District Municipality* 29.

[1117] S 26(e) of the *Systems Act* and sections 20(1) and (2) of the SPLUMA. Also see Van Wyk *Planning Law* 230.

[1118] S 21 of SPLUMA provides an outline of what a municipal SDF should contain.

social inclusion, and efficient land development with minimal impact on public health, the environment, and natural resources (including water resources).[1119] The LUS must include zoning regulations, a zoning map, and a register of all amendments to the LUS, all of which govern how land in each zone can be used and developed.[1120] Through zonings, municipalities can establish frameworks, schemes or plans which outline the different uses allocated to specific areas.[1121] Through this, municipalities can define how property in specific geographic zones can be used. Similarly, zonings can be used to ensure cities protect their natural ecosystems and water sources by restricting development near these areas.[1122] The LUS must strive to balance the interests of the public and the various land uses within the jurisdiction of the city government. It should manage the various conflicts and uncertainties that arise from the different land uses and develop strategies to control these negative externalities.[1123]

As highlighted above, some laws require that municipalities generate specific environmental sector management plans as supplementary parts of their IDPs.[1124] While these plans are additions to their IDPs, their mandates are vested in specific sectoral legislation.[1125] These plans include, amongst others, a WSDP,[1126] an IWMP,[1127] natural resource plans,[1128] a CCRIP,[1129] and a disaster management plan. As per the *Constitution*, everyone has the right to access to a basic water supply and sanitation. As

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1119 S 25 of SPLUMA.
1120 S 24(2) of SPLUMA.
1121 Van Wyk *Planning Law* 231.
1122 S 24(2)(a)-(c) of SPLUMA; Rohr *Evidence Based Water Sensitive Planning: Securing Water Sustainability Through Innovative Spatial Planning Tools* 108-109.
1123 Fourie *et al Guideline on Compiling Water-Sensitive Spatial Plans* 31.
1124 Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-61.
1125 Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-61.
1126 S 12 of the *Water Services Act*.
1127 S 11(6) of NEMWA.
1128 Such as the biodiversity management plan as per section 43 of NEMBA, an invasive species monitoring, control and eradication plan (s 76(2)(b) of NEMBA), and a municipal coastal management programme and estuarine management plan as per s 34(2) of NEMICMA. Also see Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-64 – 3-67 for a more comprehensive outline of the plans required by law.
1129 Clause 15 (3) (b) of the *Climate Change Bill*.

WSAs, municipalities must compile WSDPs[1130] and by-laws to give effect to their mandate to provide water services.[1131] They are similarly also responsible for monitoring the provision of services and the performance of WSPs and water services intermediaries in their areas of jurisdiction through the enactment of by-laws and the regulation of contracts.[1132] The WSDP should form part of the process of developing a municipality's IDP and must include an implementation structure for five years. The WSDP should integrate technical, social, institutional, financial, and environmental planning. The WSDP captures all the responsibilities and tasks required in water service delivery. This may arguably ensure that the planning and provision of water services are addressed in an integrated way that acknowledges the linkages to other services and infrastructure programmes in a municipality.[1133]

SPLUMA also places a duty on the state to protect and promote the environmental right[1134] set out by the *Constitution*, as well as the "right to access to sufficient water" and must take reasonable legislative and other measures to ensure these rights.[1135] In the context of SPLUMA this means that the land-use planning systems and other spatial planning or management decisions must take into consideration the environment and the effects that the proposed development might have on the environment.[1136] Municipalities are obligated to detail how their SDF is consistent with the planning of neighbouring areas to prevent competing initiatives and land uses from being implemented on different sides of administrative boundaries.[1137]

SPLUMA also emphasises the need for sustainable development and the sustainable use of natural resources in such a manner as to have the minimum impact on the

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1130 Ss 3(3) and 12(1) of the *Water Services Act*.
1131 S 21(1) of the *Water Services Act*.
1132 S 27 of the *Water Services Act*. NWRS 68.
1133 Swart and Adams "Water Services Provision and the Protection of Water Resources" 466.
1134 S 24 of the *Constitution*.
1135 Preamble of SPLUMA.
1136 Preamble of SPLUMA.
1137 S 26(d) of the *Municipal Systems Act*.

environment or its resources.[1138] It also specifically states that municipal planning tribunals must ensure compliance with environmental legislation, which indicates that EIAs must be undertaken for all relevant developments in the municipalities, and the possible impact on the environment must be considered in the decision-making process.[1139] Furthermore, conservation purposes are listed as possible purposes for land use, meaning that municipalities can get a LUS for the purposes of protecting against change a piece of land or natural resources or certain characteristics thereof.[1140]

One of the most critical factors that cities should consider is the development of corridors and economic nodes.[1141] These areas can lead to the establishment of either new residential or new commercial districts. Water-sensitive planning also involves identifying green and blue corridors that will manage the use of water.[1142] The SDF can also estimate the amount of water that will be needed in the future by establishing service levels for future communities that are both sustainable and water-efficient, and by determining different approaches to meeting the needs of these communities.[1143] In this vein, the city can incorporate specific water quality and quantity targets for specific spatial areas relating to WC/WDM.[1144] Likewise, the SDF should also identify areas of high land use with a water quantity impact to be prioritised for WC/WDM strategies.[1145]

1138 S 25(1)(d) of SPLUMA.

1139 S 42(2) of SPLUMA.

1140 Schedule 2 of SPLUMA; also see s 1 of SPLUMA, which states that "'conservation purposes" means purposes normally or otherwise reasonably associated with the use of land for the preservation or protection of the natural or built environment, including the preservation or protection of the physical, ecological, cultural or historical characteristics of land against undesirable change or human activity."

1141 Rohr and Fourie 2014 *Transactions on Ecology and The Environment* 289.

1142 Blue-green corridors are those that are designed to retain rainwater from small to frequent rainfall events. They can be managed using rainwater harvesting and green roofs. - Rohr and Fourie 2014 *Transactions on Ecology and The Environment* 289.

1143 S21(1)(e)-(h) of SPLUMA; Rohr *Evidence Based Water Sensitive Planning: Securing Water Sustainability Through Innovative Spatial Planning Tools* 103.

1144 See the discussion in para 2.4.2.3 of this study on WC/WDM as a water management approach.

1145 Rohr *Evidence Based Water Sensitive Planning: Securing Water Sustainability Through Innovative Spatial Planning Tools* 104.

By-laws, being directly and immediately enforceable by the municipality, offer the highest level of safety as command and control instruments.[1146] It is to a large extent by means of enforceable environmental by-laws –to control wastewater discharge, water supply, municipal planning and building regulations, amongst other things – that municipalities regulate their local communities and their industrial and other activities as well as other organs of state in their demarcated areas of jurisdiction.[1147] These by-laws may also be preceded or informed by municipal policies, strategies, plans or programmes on the specific issues they seek to address.[1148] Furthermore, municipalities can also develop by-laws to enforce any of their main planning instruments or other sectoral instruments. To manage coastal access and coastal management programmes a municipality may draft by-laws to provide for the implementation, administration, and enforcement of the coastal management programme.[1149]

4.3.2 Ensuring equitable, secure and reliable access to an adequate, clean and safe drinking water supply in urban areas

Municipalities are constitutionally and legally obliged to provide water services in the form of potable water and sanitation.[1150] According to the *Constitution* everyone has the right to have access to sufficient water,[1151] which must be achieved through progressive realisation and within the available resources of the state, and specifically by local government.[1152] Moreover, as with all rights in the Bill of Rights, the right to access to water must be respected, protected, promoted and fulfilled.[1153] This places certain obligations on local government, including not to interfere with any existing right to

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1146 Nel, Du Plessis and Du Plessis "Instrumentation for Local Environmental Governance" 120-121.
1147 Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-34.
1148 S 11(3)(a) and (j) of the *Systems Act*. A municipality may monitor the impact and effectiveness of any of its services, policies, programmes, and plans. Nel, Du Plessis and Du Plessis "Instrumentation for Local Environmental Governance" 121.
1149 Ss 50 and 20(2) of NEMICMA.
1150 See Schedule 4B of the *Constitution*.
1151 S 27(1)(b) of the *Constitution*.
1152 S 27(2) of the *Constitution*.
1153 In terms of section 7(2) of the *Constitution*. Section 8(2) places similar obligations on individuals and the private sector.

access to water, such as by arbitrarily disconnecting water services.[1154] Additionally, municipalities should prevent violations of the right to access to sufficient water by third parties.[1155] Most importantly, local governments should implement the necessary legal, administrative, financial, judicial, and other measures to ensure the right is fully realised. In addition, the state's responsibility to promote the rights in the Bill of Rights includes the promotion of educational and informational programmes to increase public awareness and understanding of the right of access to sufficient water[1156]

Concerning the normative content of the right to access to adequate water in South Africa,[1157] it is held that the formulation of the right requires definitions of "access" and "sufficiency".[1158] The right is thus understood to be an access right and not an all-encompassing right to water.[1159] This means that the right guarantees at least access by all persons to a long-term sustainable provision of a level of water supply, and a basic minimum supply of potable water located closely to all households.[1160] A basic water supply is defined by the *Water Services Act* as "the prescribed minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households to support life and personal hygiene."[1161]

The *Water Services Act*, read with its Regulations,[1162] provides clear guidelines as to the minimum standard of what is meant by a basic water supply.[1163] In South Africa, a minimum of 25 litres per person per day, or six kilolitres per household per month, is

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1154 Kok and Langford "The Right to Water" 202.
1155 Kok and Langford "The Right to Water" 204.
1156 Kok and Langford "The Right to Water" 204.
1157 See paras 3.2.2.1 and 3.3.2.1 for an analysis of the normative content of the right based on international and regional law.
1158 Cooper "The South African Constitution - Standards of Environmental Protection" 291.
1159 Du Plessis 2010 *RECIEL* 317; Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 145.
1160 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 146.
1161 S 1 of the *Water Services Act*.
1162 *Regulations Relating to Compulsory National Standards and Measures to Conserve Water* GN R509 in GG 22355 of 8 June 2001 (hereafter *Water Regulations*).
1163 S 3 of the *Water Regulations*.

considered to be sufficient, whereas the WHO standard is at a minimum of 50 litres.[1164] The water supply must have a minimum flow rate of at least ten litres per minute and be located within 200 metres of a residence, with an efficiency such that no consumer is without a supply for more than seven full days per year.[1165] In addition, basic service water quality should meet or exceed prevailing guidelines for chemical and microbial contaminants that can have a negative impact on human health. Satisfying all the foregoing basic water supply requirements is the obligation of municipalities.

Municipalities further need to safeguard the reliability of water supply by ensuring that water is continuously available, with supply interruptions of limited duration. To this end, basic water supply services must be efficient enough to ensure that no consumer is without water for more than seven full days per year.[1166] Where interruptions to water supply occur, whether climatic or non-climatic, municipalities must take steps to ensure that consumers have access to alternative water services.[1167] Therefore, in the case of droughts or increased water demand, for example, the duty exists on municipalities, whether they have chosen to outsource or not, to ensure alternative access to water services.

The right to access to water is considered to refer to both *physical* access to water as a basic need and *economic* access to the resource.[1168] Thompson claims that the state's duties differ according to the economic resource available to the different sectors of the population.[1169] In this case the state should direct attention to those without the means of accessing water, considering that those with sufficient economic means already have

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1164 S 3(b) of the *Water Regulations*. See para 3.3.3.1.
1165 S 3(b)(ii)-(iii) of the *Water Regulations*.
1166 S 3(b)(iii) of the *Water Regulations*. Also see *Mazibuko v City of Johannesburg* 2010 3 BCLR 239 (CC) (hereafter the *Mazibuko* case) para 16.
1167 S 4 of the *Water Regulations*.
1168 Wepener, Malherbe and Smit "Water Resources in South Africa" 378.
1169 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 147.

the ability to pay WSPs for water services.[1170] This therefore extends to the equitable access required under this dimension of water security. NEMA requires that the physical, psychological, developmental, cultural and social interests of humans be served equitably.[1171] The NEMA principles affirm the themes of transformation, and the importance of equity.[1172] In this regard, it is understood that while municipalities are not obligated to provide water for free, they are obligated to create mechanisms that enable people to have sufficient access to water.[1173] Municipalities are still obligated to provide a plan of action that demonstrates that full realisation of the right will be achieved in a timely manner, even if resource constraints limit their ability to fulfil their obligations.

Contrarily, the NWRS asserts that it is an important requirement to promote social equity that retail tariffs are pro-poor and that the very poorest are able to access a basic water service for free.[1174] To enable provision to vulnerable groups and persons, the *National Framework for Municipal Indigent Policies* (2006) and *The Free Basic Water Implementation Strategy* (2007) make provision for subsidising the ongoing operating and maintenance costs of a basic water supply service and commit government to making adequate funds available to make this possible.[1175] The current model of targeting indigent households in South Africa places the onus on households

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1170 Thompson *Water Law: A Practical Approach to Resource Management and the Provision of Services* 147.

1171 S 2(2) of NEMA; Couzens and Dent 2006 *PER* 17.

1172 The Preamble of NEMA provides that the state must ensure the realisation of social, economic and environmental rights to meet the basic needs of previously disadvantaged communities. Section 2(4)(d) of NEMA requires equitable access to environmental resources, benefits and services to meet everyone's basic needs.

1173 Kok and Langford "The Right to Water" 198.

1174 NWRS 87.

1175 Department: Provincial and Local Government *National Framework for Municipal Indigent Policies* and the DWAF *Free Basic Water Implementation Strategy* (2007).

to prove that they are indigent.[1176] To access free basic water and free basic sanitation one has to be listed on the indigent register.[1177]

Municipal service delivery should be based on accessibility, simplicity, affordability, quality, accountability, integration, sustainability, value for money, the promotion of competitiveness and the promotion of the new constitutional values.[1178] According to the *Strategic Framework for Water Services*, water and sanitation services should be provided equitably, ensuring that adequate services are provided fairly to all people.[1179] Secondly, they must be provided affordably, requiring that no one is excluded from access to basic services owing to cost. These services should also be provided effectively, efficiently, sustainably (services must be financially, environmentally, institutionally, and socially sustainable), and gender sensitively.[1180] Likewise, as WSAs municipalities have the responsibility to provide access to efficient, affordable, economical and sustainable water services to all the consumers or potential consumers in their areas of jurisdiction.[1181]

Local governments are instructed to ensure sustainable service delivery, meaning the delivery of services in such a manner that the consumer can afford them, and the supplier can provide them within its own means and on a continuous basis. Soyapi[1182] pronounces that sustainability is a core principle which informs the use and protection of water, and ultimately water security.[1183] Hence it is argued that in accordance with this sustainability principle, service provision is an ongoing process that depends on the

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1176 South African Human Rights Commission *7th Report on Economic and Social Rights* 42.

1177 S 97(1)(c) of the *Municipal Systems Act* obliges a municipality "to adopt, maintain and implement a credit control and debt collection policy, which must make provision for indigent debtors that is consistent with its rates and tariff policies and any national policy on indigents."

1178 *White Paper on Local Government* 149-151.

1179 DWAF *Strategic Framework for Water Services* 5. S 73(2)(a) of the *Municipal Systems Act*.

1180 DWAF *Strategic Framework for Water Services* 5. S 73(2)(a)-(d) of the *Municipal Systems Act*.

1181 S 11(1) of the *Water Services Act*.

1182 Soyapi 2017 *PELJ* 4.

1183 Millennium Ecosystem Assessment (MEA) *Ecosystems and Human Well-being: Synthesis* 1.

existence of municipal institutions that are effectively managed both financially and administratively.

Following on their duty to protect the right to access to water,[1184] municipalities must develop legislation and policies which ensure the fulfilment of this right in addition to ensuring that the right is protected from any third-party violation. To this end they must develop and adopt WSDPs and water by-laws.[1185] Based on the prescribed contents, the WSDP must contain biophysical and socio-economic analyses, an assessment of the levels of service, a future growth scenario as depicted in the SDF, a forecast of spatial growth as per the SDF, industrial land use information, water allocation plans, consideration of the cost of water, and an infrastructure asset management plan.[1186] The levels of services, for example, need to be clearly defined in the WSDP. This would entail addressing the basic level of domestic water supply,[1187] interim water supply solutions, and the longer-term domestic water supply vision.[1188] The water resource profile has to do with the quality and quantity of water available to the municipality, including both surface and groundwater. Municipalities specifically need to provide a comprehensive overview of all water and sanitation services that are in place as well as any plans to improve the delivery of such services. To address the service-level profile, the municipality should assess the quality and level of service reaching the people in the municipality, including the management of all wastewaters, and the service and management of waste removal, including the removal of dry waste from industry.[1189]

Seeing that water services provision is a constitutionally mandated local government function, municipalities need to assess their capacity to provide basic municipal

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1184 As per ss 7(2) and 27(1)(b) of the *Constitution*.
1185 Briefly see the discussion under para 4.2.2 above.
1186 S 13(a)-(j) of the *Water Services Act*.
1187 See the *Water Services Act* and the *Strategic Framework for Water Services* which define a "basic (or RDP) household water supply as either 25 litres per person per day, or 6,000 litres per household per month."
1188 National standards are prescribed under s 9(1) of the *Water Services Act*.
1189 Swart and Adams "Water Services Provision and The Protection of Water Resources" 14-31.

services, which includes water and sanitation. Hence, they are obliged to draw up a financial plan to form part of their IDPs.[1190] When a municipality does not provide basic services, at the insistence of the residents a court can order a municipality to improve its financial plan or reduce its services in a certain area and improve them in another. A court can also order a municipality to prioritise the delivery of specific basic services, such as water services, over the delivery of others.[1191] To ensure that there is an equitable and fair prioritisation of the delivery of services, the WSDP process that involves the socio-economic and biophysical analyses of the municipality needs to be sufficiently detailed.

Concerning the passing of by-laws, WSAs must develop, adopt and implement by-laws which contain conditions for the provision of water services.[1192] These by-laws must make provision for the standard of services, the technical conditions of supply, the installation alteration, operation, protection and inspection of water services works and consumer installations, tariffs. They should also provide for the collection of charges, conditions under which services may be discontinued or limited, the prevention of illegal connections to water services works, and the illegal or wasteful use of water.[1193]

In addition to ensuring that municipal services are provided to the local community in a way that is both financially and environmentally sustainable,[1194] municipalities must consult the local community about the technicalities of the municipal services they provide directly or indirectly, as well as the options available for service delivery.[1195] They must also provide residents with complete and accurate details regarding the quality and quantity of municipal services to which they are entitled.[1196] Ultimately national and provincial government's support will be required to ensure equitable,

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1190 Swart and Adams "Water Services Provision and The Protection of Water Resources" 14-25.
1191 Swart and Adams "Water Services Provision and The Protection of Water Resources" 14-25.
1192 S 21(1) of the *Water Services Act*.
1193 S 21(1)(a) and (b) of the *Water Services Act*.
1194 S 4(2)(d) of the *Municipal Systems Act*. S 1 of the Act defines environmentally sustainable.
1195 S 4(2)(f) of the *Municipal Systems Act*.
1196 S 6(2)(e) of the *Municipal Systems Act*.

secure and reliable access to an adequate, clean and safe drinking water supply in urban areas. In the instance where a municipality fails to provide water services or where these services are inadequate, provincial government may be compelled to intervene or take over the function concerned.[1197] Most importantly, a legal obligation rests on both national and provincial government to ensure that municipalities have the capacity to manage their own affairs and are able to exercise their powers and perform the above functions effectively.[1198]

4.3.3 Provision of equitable, accessible, safe and adequate sanitation and wastewater services

Access to sanitation and wastewater services falls broadly under the same legal framework as the right to access to water discussed above, and most of the discussion refers.[1199] In particular, municipalities also have the constitutional and legal obligation of ensuring access to adequate sanitation and wastewater services.[1200] The right to access to basic sanitation, however, is also premised on the need to secure an environment not harmful to human health or well-being.[1201] The duty to deliver continuous, sustainable, and improving sanitation services is also inextricably linked to an adequate standard of living as well as the rights to equality, privacy and dignity.[1202]

All municipalities have a constitutional responsibility to provide services to local communities sustainably.[1203] More specifically, municipalities have a duty to ensure the progressive realisation of efficient, affordable and sustainable access to basic sanitation

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1197 S 139 of the *Constitution* read with ss 119 and 120 of the *Municipal Systems Act*. The *Municipal Systems Act* provides for intervention under the executive authority of municipalities as discussed in Chapter 3, while intervention in terms of the *Water Services Act* is set out in s 63.

1198 S 154 of the *Constitution*.

1199 S 3(1) of the *Water Services Act* provides for a "right to access to a basic water supply and basic sanitation."

1200 Schedule 4B of the *Constitution*.

1201 S 2(a) of the *Water Services Act*; section 24 of the *Constitution*.

1202 *National Sanitation Policy* (2016) 2; Feris "Environmental Rights Protected in the Constitution" 6-17.

1203 S 152(1)(b) of the *Constitution*.

and wastewater services.[1204] The *Water Services Act* defines both what constitutes basic sanitation and sanitation services.[1205] The term "basic sanitation" refers to the bare minimum of services required to ensure the safe, sanitary, and adequate removal and treatment of human waste, household wastewater, and sewage from any type of dwelling, whether formal or informal.[1206] On the other hand, sanitation services refer to the collection, removal, disposal and purification of human excreta, domestic wastewater and effluent that result from the use of water for commercial purposes.[1207] In view of this, municipalities are responsible for the entire lifecycle or value chain of sanitation and wastewater management for both domestic and industrial (commercial) purposes. Municipalities need to ensure that sanitation facilities at a minimum must be reliable, safe, private and ventilated, keep odours to a minimum, are simple to clean, reduce the risk of the spread of sanitation-related diseases, and enable the environmentally responsible treatment and/or removal of human waste and wastewater.[1208]

The *National Sanitation Policy* (2016) expands slightly on these definitions and notably emphasises the importance of appropriate health and hygiene awareness and behaviour, and the communication and local monitoring of good sanitation, hygiene and related practices.[1209] Considering the above, WSAs must prepare sanitation plans as part of their WSDPs that are aligned to national sanitation planning.[1210] In the same vein, sanitation plans, whether included in or separate from WSDPs, must consider and be integrated into spatial and land-use plans [1211]

[1204] S 11(1) of the *Water Services Act*.
[1205] S 1(ii) and (xvi) of the *Water Services Act*.
[1206] S 1(ii) of the *Water Services Act.*
[1207] S 1(xvi) of the *Water Services Act*.
[1208] S 2(a)-(b) of the *Water Regulations*.
[1209] *National Sanitation Policy* (2016) 7-8.
[1210] *National Sanitation Policy* (2016) 13, 23.
[1211] *National Sanitation Policy* (2016) 14.

Concerning the use and disposal of effluent, the *Water Regulations* require that municipalities (in their capacity as water service institutions) must ensure the safety of effluent before approving its use.[1212] Additionally, any tap or point of access to effluent or non-potable water must bear a permanent notice indicating that the water is not potable.[1213] Importantly, any discharge to a water resource must meet NWA standards,[1214] and WSAs are required to accept industrial effluent or other substances into a sewerage system only in a quantity and quality that the treatment plants can purify or treat.[1215] The preceding is important when considering that many municipal wastewater treatment works currently do not have the capacity to treat received wastewater, as is evident from the current state of untreated sewage in South African cities. In this context, municipalities should approach sanitation and wastewater management with due consideration of the preventative and polluter pays principles, as well as the precautionary (risk-averse and cautious) approach.[1216] Consequently, it is preferable for a municipality to prevent environmental damage than to try to mitigate and remedy it later. Moreover, the municipality should ensure that polluters are held accountable for their pollution and pay the costs associated with preventing, minimising, and rehabilitating pollution. Similarly, this obligation must be internalised when the municipality is the polluter, as the municipality must adopt a risk-averse and cautious approach to its own activities, particularly when the full extent of the harm or degradation is unknown.[1217]

Notably, municipalities must ensure that sanitation services are designed, planned, and implemented to reduce the environmental impacts of unmanaged grey water, human waste, and wastewater disposal.[1218] They also need to ensure that sanitation services are adequate and reduce their impact on and consumption of water resources. In this

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[1212] S 8(1) of the *Water Regulations*.
[1213] S 8(2) of the *Water Regulations*.
[1214] S 26(1)(h)-(j) of the NWA.
[1215] S 9 of the *Water Regulations*.
[1216] S 2(4)(a)(vii), (viii) and 2(4)(p) of NEMA.
[1217] Knox-Mosdell and Kotzé "The Regulation and Mitigation of Environmental Pollution" 7-25 – 7-27.
[1218] *National Sanitation Policy* (2016) 23.

regard, the goal of WSAs should be to implement systems that use as little water as possible.[1219] In addition, the choice of sanitation technology or construction method should reflect on the types of settlements, be appropriate and affordable, and consider the local availability of materials and skills.[1220] Most importantly, there need to be clear roles and responsibilities for payments for operations and maintenance,[1221] to which end WSAs must have billing systems in place to raise sufficient revenue for sanitation services.

In general, effluent discharges from municipal wastewater treatment facilities and the disposal of waste on land are both subjected to a water use authorisation.[1222] In this instance it is the responsibility of the municipality to ensure that all listed water uses are authorised by the DWS or the respective CMA before the municipality commences with such a use or activity.[1223] With this in mind, municipalities may arguably also draft and adopt by-laws for pollution regulation and mitigation. The by-laws may be aimed at mitigating any adverse impacts due to sewage, wastewater and stormwater disposal and setting any standards for conducting activities and development in the municipality's jurisdiction.[1224] Additionally, a district and metropolitan municipality may make and administer by-laws relating to "municipal health" generally, which includes aspects relating to water quality monitoring, waste management and environmental pollution control.[1225] These by-laws can address the monitoring of water quality and safety for domestic and recreational purposes, including the water quality of natural sources and sewage treatment plants.

1219 *National Sanitation Policy* (2016) 23.
1220 *National Sanitation Policy* (2016) 23.
1221 *National Sanitation Policy* (2016) 23.
1222 S 21 of the NWA; Swart and Adams "Water Services Provision and The Protection of Water Resources" 14-12.
1223 S 21 of the NWA; Swart and Adams "Water Services Provision and The Protection of Water Resources" 14-12.
1224 S 46(2) of NEMA; Knox-Mosdell and Kotzé "The Regulation and Mitigation of Environmental Pollution" 7-23.
1225 S 32 of the *National Health Act*, read with s 84(1)(i) of the *Municipal Structures Act*.

To address increased waste recovery, prevent pollution and ecological degradation, municipalities must draft a municipal integrated waste management plan (IWMP) as per the provisions of NEMWA.[1226] The IWMP is important because the placement of human activities, and particularly landfills, can have serious effects on water quality both groundwater and surface water. The IWMP also serves as a component of the IDP to ensure that waste management services are streamlined with other services such as water and sanitation.[1227] Amongst other matters, the IWMP must include an assessment of the quantity and type of waste, a plan to separate recyclable and non-recyclable material at the point of source, a waste minimisation and pollution prevention plan, as well as details of the potential environmental impact of the waste, the targets for the recovery of waste (minimisation, re-use, recycling), and programmes and targets to minimise the consumption of natural resources.[1228]

There are also national data on wastewater treatment plants and sewage treatment standards. Municipalities must report to the DWS on the quality of the effluent they discharge into rivers and, in coastal towns, sometimes directly into the ocean monthly. This can be seen on the integrated regulatory information system (IRIS) dashboard. Municipal wastewater treatment works are certified "green drop" if they meet certain requirements under the Green Drop incentive-based programme, which measures wastewater treatment works against national standards, as required by SDG target 6.3.1. It must be strongly noted that municipalities need not provide wastewater and sanitations themselves, especially where their capacity to do so is lacking. They have the legal option of contracting WSPs (outside of themselves), water boards or other third parties to assist them in carrying out these obligations.

[1226] S 4(a) of NEMWA.
[1227] S 11(4)(a)(ii) of NEMWA.
[1228] S 12(1) of NEMWA.

4.3.4 Protection of urban aquatic ecosystems

The protection of the natural environment finds expression under the scope of section 24 of the *Constitution*.[1229] It's important to note that people not only have the right to water, but also the right to water that is not harmful to their health and well-being, and the right to have that water resource safeguarded.[1230] To this end, the environment must be protected through the prevention of pollution and ecological degradation, as well as the overall promotion of the conservation of the environment.[1231] While the environment falls under concurrent national and provincial competence,[1232] there have been sufficient arguments in both scholarship and case law that local government has an important role to play in protecting and conserving the natural environment.[1233] Adding to this, sectoral laws and policy also provide a clear mandate for local governments in protecting the environment at large, and aquatic ecosystems more specifically.

Notably, there rests a constitutional and legal obligation on local government to ensure the right to a clean and healthy environment.[1234] More than that, municipalities have a responsibility to preserve natural resources for the sake of future generations as well as the present.[1235] They also share the duty of promoting ecologically sustainable

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1229 See the definition of "environment" under s 1(ix) of NEMA; Kotzé and Bates 2012 *Water Law Review* 238.

1230 Kotzé and Bates 2012 *Water Law Review* 238.

1231 S 24(b) of the *Constitution*; This environmental right is arguably anthropocentric in nature – see Kotzé 2014 *The Anthropocene Review* 253; Boyd *The Environmental Rights Revolution: A Global Study of Constitutions, Human Rights, and the Environment* 14; Morrow "Of Human Responsibility: Considering the Human/Environment Relationship and Ecosystems in the Anthropocene" 275.

1232 Schedule 4A of the *Constitution*.

1233 In the case of *Le Sueur v eThekwini Municipality* 2013 ZAKZPHC 6 para 24 (hereafter *Le Sueur* case), the High Court held that there is an obligation on municipalities together with other organs of state to contribute to the progressive realisation of the fundamental rights contained in (section 24 of) the *Constitution*, and that this was clearly a mandate from the national legislature regarding environmental matters. Also see Freedman 2014 *PELJ* 586; Humby 2014 *PELJ* 1661; Du Plessis *Fulfilment of South Africa's Constitutional Environmental Right in the Local Government Sphere*.

1234 In terms of s 152 (1)(b) and (d) of the *Constitution* and as stipulated in ss 4(2)(d) and 4(2)(i), 73(1) and (2) of the *Municipal Systems Act*.

1235 S 24(b) read with s 7(2) of the *Constitution*.

development and the responsible use of natural resources, as well as preventing pollution and ecological degradation.[1236] Evidently, local governments have responsibilities concerning the protection and conservation of the environment, ecosystems and the ecosystem services that they provide and the realisation of the rights in sections 24 and 27 as set out in the *Constitution*.[1237]

The NWA defines the "ecological reserve," which consists of the water quantity and quality necessary to preserve aquatic ecosystems and ensure the resource's sustainable development and use from an ecological point of view.[1238] Claiming that the reserve's vision for intra- and intergenerational equity inextricably links essential human needs to the ecological source that fulfils those needs, Takacs[1239] argues that it is the public trustee's responsibility to protect this precious ecosystem that sustains life.[1240] Furthermore, provisions in NEMA, NEMPAA, NEMBA and NEMICMA identify the "state" as the trustee of the environment, which must be "held in public trust for the people".[1241] While each of these statutes designate a specific Minister in the national government as the public trustee of the public trust resource in question, it is notable that as custodians of the natural environment, municipalities (as components of the state) have an obligation to provide protection to the environment and the ecosystems and water resources therein.[1242]

1236 S 24(b)(i), (ii) and (iii) of NEMA.

1237 S 4(2)(i) of the *Municipal Systems Act*.

1238 S 1(xviii) defines "reserve" as meaning "the quantity and quality of water required - (a) to satisfy basic human needs by securing a basic water supply, ... and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource." Also see ss 2(a), 2(b), 2(d), 2(f), 2(g), and 2(h), S 5(3), S 6(1)(a) and (h), as well as Chapter 3 of the NWA.

1239 Takacs 2016 *Berkeley Journal of International Law* 72.

1240 See Viljoen *The Public Trust Doctrine in South African Water Law*; Van der Schyff and Viljoen 2008 *The Journal for Transdisciplinary Research in Southern Africa*; Van der Schyff 2010 *PELJ* on the public trust and water.

1241 S 2(4)(o) of NEMA and ss 3 of the NEMPAA, NEMBA and NEMICMA.

1242 Freedman "Conservation, Sustainable Use of Natural Resources and The Notion of Public Trusteeship" 8-17; Nel, Du Plessis and Du Plessis "Key Elements for Municipal Action" 2-45.

Furthermore, NEMA specifically refers to the need to manage activities that may impact on stressed, sensitive and vulnerable ecosystems.[1243] The sustainable development principle provides for the consideration of all relevant factors that could potentially be harmful to or impact on the environment, especially in relation to ecosystems and the loss of biodiversity.[1244] These principles must be adhered to or considered in any action of an organ of state, including local government, that might adversely affect the environment.[1245] In fulfilling these principles municipalities must manage development and perform their municipal planning functions in a manner that is not detrimental to environmental health and human well-being. NEMA prescribes that municipalities should create an environmental management framework (EMF) to identify and map out areas that are particularly ecologically or geographically sensitive, as well as those where particular land uses are most compatible with, or in conflict with, environmental opportunities and constraints.[1246]

Consequently, NEMBA sets out its aim of the protection, management and conservation of the ecosystems that warrant protection,[1247] including South African biodiversity and the components[1248] thereof.[1249] NEMBA provides for the integrated planning and

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[1243] S 2(4)(r) of NEMA; water resources can be seen as stressed, sensitive and vulnerable ecosystems – see Sabater *et al Effects of Human-Driven Water Stress on River Ecosystems: A Meta-Analysis* 1; Cosgrove and Loucks 2015 *Water Resource Research* 4823-4825. The management and planning procedures mentioned here include such planning and management procedures as are provided for in SPLUMA and are directly relevant to cities, as municipal planning is a competence of local government in line with schedule 4B of the *Constitution*.

[1244] S 2(4)(a) of NEMA, which provides for factors such as the "avoidance, minimization and remediation of the disturbance of the ecosystems and loss of biodiversity, pollution and degradation of the environment, waste, negative impacts on the environment and people's environmental rights, and that the development, use and exploitation of non-renewable resources and the ecosystems of which they are a part do not exceed their capacity or integrity."; also see s 2(3) of NEMA which provides for sustainability by stating that "development must be socially, economically, and environmentally sustainable."

[1245] S 2(1) of NEMA.

[1246] S 24(3) of NEMA.

[1247] These ecosystems that warrant national protection can include water resources or water ecosystems and ecosystems in cities– see Momanyi "Re-thinking Estuarine Ecosystem Governance in the WIO Region" 254; also see the long title of NEMBA.

[1248] S 1 of NEMBA.

[1249] Preamble and s 2(a)(i) of NEMBA.

monitoring of the status of the country's biodiversity[1250] using the *National Biodiversity Framework* (NBF), which is informed by the *National Biodiversity Assessment* (NBA) and *National Biodiversity Strategy and Action Plan* (NBSAP).[1251] Both the NBSAP and the NBF recognise a role for local government in managing biodiversity.[1252] As required in terms of the NEMBA, norms and standards for the Biodiversity Management Plan (BMP)[1253] have been published as Biodiversity Management Plans for Ecosystems (BMPE),[1254] through which the Minister can enter into Biodiversity Management Agreements.[1255] These in turn could form part of bioregional plans, IDPs, and SDFs.[1256] In addition, the Minister may publish a list of ecosystems that are threatened, affording them added protection.[1257] Once listed such areas gain additional protection through EIA processes and through inclusion into municipal IDPs and SDFs.[1258]

The bioregional plan is a spatial planning tool that aims to provide a map of a city's biodiversity priorities, as well as to inform land-use planning and environmental assessment processes and sectors that have policies that affect biodiversity.[1259] The bioregional plan can be used to inform land-use planning and environmental authorisation decisions for a wide range of sectors. The bioregional plan must include a

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1250 S 37(a) and (b) of NEMBA.

1251 See *National Biodiversity Framework* (2008) in GN 813 GG 32474 03 August 2009 (NBF). The purpose of the framework is to co-ordinate and align the efforts of the organisations involved in the conservation of biodiversity in South Africa. Also see DEA *National Biodiversity Strategy and Action Plan 2015-2025* 19 (NBSAP).

1252 NBSAP 7; NBF 22-23.

1253 S 43 of NEMBA.

1254 *Norms and Standards for Biodiversity Management Plans for Ecosystems* (BMPE) - GN 83 GG 37302 of 07 February 2014. The BMPE has been published and is legally binding.

1255 S 44 of NEMBA. These agreements can be linked to the management of protected areas or stewardship programmes in terms of NEMPAA.

1256 S 40 of NEMBA; the Minister may determine geographic regions and publish a plan for the management of biodiversity. See the discussion on these instruments in para 5.3 of this study.

1257 S 52(1) of NEMBA.

1258 S 53(2) of NEMBA; s 24 of NEMA. Furthermore, s 54 of NEMBA requires listed ecosystems to be included in environmental plans in terms of Chapter 3 of NEMA and IDPs in terms of the *Municipal Systems Act*.

1259 Item 2.1 in GN 291 in GG 32006 of 16 March 2009; section 41(a)-(c)(i)-(iv) of NEMBA.

map of biodiversity priority areas known as Critical Biodiversity Areas (CBAs)[1260] and Ecological Support Areas (ESAs)[1261] accompanied by contextual information, land- and resource-use guidelines and supporting GIS data. In this way the plan aims to maintain and retain representative examples of ecosystems, including aquatic systems, as well as important ecological processes, services and infrastructure. The CBAs and ESAs have been incorporated in the listing notices published under NEMA, which trigger the need to secure an environmental authorisation prior to commencing with certain activities undertaken in these areas.[1262] In this light, decision-makers must consider ecosystems such as coastal shores, wetlands, estuaries, and similar systems.[1263]

A municipality with a desire to contribute to biodiversity management may also submit a draft biodiversity management plan to the Minister for any ecosystem listed in terms of NEMBA, or not listed, but that warrants special conservation attention.[1264] Using these tools, local government has jurisdiction over significant natural resources to integrate and align biodiversity considerations into local-level planning.[1265] These legal instruments regulate different aspects pertaining to biodiversity principles and objectives, biodiversity planning, biodiversity management, threatened and protected species, alien invasive species and protected areas. These instruments could specifically assist in the protection of urban aquatic systems such as rivers, wetlands and estuaries.

[1260] CBAs refers to an area that must be maintained in a good ecological condition (natural or near-natural state) to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types as well as for species and ecological processes that depend on natural or near-natural habitat, that have not already been met in the protected area network. One of five broad categories on a CBA map and a subset of biodiversity priority areas. - Chapter 6 Item 2.3 in GN 291 in GG 32006 of 16 March 2009.

[1261] Ecological Support Areas (ESA) are understood to mean areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or is unnecessary to meet them in natural or near-natural areas. – Chapter 6 Item 2.3.2 in GN 291 in GG 32006 of 16 March 2009.

[1262] S 24 of NEMA read with the EIA Regulations in GN R982 and GN R985 in GG 38282 of 04 December 2014, as amended.

[1263] Item 2.3 in GN 291 in GG 32006 of 16 March 2009.

[1264] S 43(1) of NEMBA.

[1265] Paterson "Biodiversity" 19-33.

It is discernible that as in the international and regional frameworks, a role for local government is provided particularly in prescribing, adopting and implementing spatial planning frameworks and land-use management systems, regulating land use change and development applications, and managing municipal land. Notably, the NWSF recognises the important link between water and spatial planning.[1266] To ensure water security, local governments must incorporate strategic water source areas and other critical water infrastructure and ecological infrastructure into their SDFs with accompanying policy direction on land use.[1267]

Through their discretionary powers in terms of zoning in the LUS, municipalities may designate certain urban areas as public open spaces.[1268] The LUS can also promote and protect various natural resources and areas within its territory. This can enable the efficient use of land and minimise the impact on the environment and public health. The LUS has legal enforceability and can be used to prohibit development or to require certain conditions to be met before development starts.[1269] This instrument gives effect to the idea of water-sensitive planning, for example.[1270] In this context the municipality can address water efficiency, restrict development in areas likely to be subjected to flooding, or provide for the protection of natural aquatic systems in its regulations.[1271] The LUS must also include policies that promote the retention of open spaces and develop public spaces for the use of the general population.[1272] In this context the municipality can implement measures to protect freshwater priority areas through proclaiming a buffer zone, designing large open spaces for increased connectivity, and

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1266 NPC *National Water Security Framework for South Africa (2020)* 112.
1267 NPC *National Water Security Framework for South Africa (2020)* 112.
1268 *Integrated Urban Development Framework* (2016) (IUDF) 55-56; NSSD 32.
1269 S 26(1)(a) of SPLUMA states that "an approved land-use scheme has the force of law, and all landowners and users of land, including a municipality, a state-owned enterprise, and organs of state within the municipal boundary, are bound by the provision of such land-use scheme."
1270 S 24(2) of SPLUMA.
1271 Fourie *et al Guideline on Compiling Water-Sensitive Spatial Plans* 31. Also see para 2.4.2.4 on WSUD.
1272 *Sea Front for All v MEC Environmental and Development Planning Western Cape* 2011 3 SA 55 (WCC) paras 42-43.

developing blue-green corridors with a functional and aesthetic role - or for the improvement of water quality, for example.[1273]

An "overlay zone" can also be established to protect certain water bodies such as streams and lakes, even as the communities they serve get more developed. It can also improve the quality of the water supply by setting stricter standards for the development of such areas.[1274] A municipality's LUS can be as stringent or as lax as necessary, depending on its ability to implement the scheme. Use and development of land applications, as well as the current utilisation of buildings and land, are all examples. SPLUMA allows local governments to enact by-laws to implement their own LUS in line with the decision-making criteria of national and provincial.[1275] Municipalities may also petition a court for an order prohibiting the use of land in violation of its LUS.[1276]

NEMICMA establishes norms, standards and policies to promote the conservation and protection of coastal environments and their natural attributes, and speaks to the determination of the coastal zone.[1277] It also provides for the management of estuaries, requiring the Minister of Water and Sanitation to publish an estuarine management protocol.[1278] It equally prescribes requirements for national, provincial and municipal coastal management programmes, which should be aligned with environmental

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1273 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa: Framework and Guidelines* 14.

1274 Rohr and Fourie 2014 *Transactions on Ecology and The Environment* 291.

1275 S 32 of SPLUMA.

1276 S 32(2) of SPLUMA; Van Wyk *Planning Law* 511.

1277 Long title of NEMICMA; also see s 2(c) of NEMICMA. This Act is relevant for the protection of the environment and ecosystem services in coastal cities (such as Cape Town and Durban). The coastal zone is well defined into several areas. The coastal protection zone encompasses an area of up to 1 km from the high-water zone in those areas zoned agriculture, undetermined or unzoned, and any coastal wetland, lake or lagoon.

1278 Ss 33 and 34 of NEMICMA.

management plans, IDPs and SDFs, NBF and the national estuarine management protocol.[1279]

It seems, therefore, that local government legislation acknowledges the need to promote sustainability in the execution of municipal functions especially as far as they relate to water security and the protection of ecosystem services.

4.3.5 Protection against water-related climate risks

Disaster management is considered a national and provincial government concurrent function. However, as Du Plessis contends,[1280] DRR forms a crucial part of the total package of the functions of local government, considering that the functions of building regulations, municipal planning, water, and sanitation services are closely aligned to disaster risk reduction and climate change. The role of local government in climate change adaptation and disaster risk reduction is set out in the NCCRP, NCCAS, the *Climate Change Bill* and the *Disaster Management Act* respectively.

Adaptation is recognised as a shared responsibility among all three spheres of government and calls for cross-sectoral action and inter-departmental co-ordination.[1281] Therefore, considering that the impacts of climate change are both global and local, climate change is as much a sub-national issue as a national one.[1282] Likewise, strategic planning is a crucial instrument for local government to help mitigate and adapt to climate change and to become involved with climate governance efforts. The principal local planning mechanism that a municipality will use in this respect is the IDP, together with different land-use planning instruments.[1283]

1279 See ss 42-49 of NEMICMA.
1280 Du Plessis "Local Government and the Pursuit of Urban Sustainability in South Africa" 275.
1281 NCCRP 14; Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 96.
1282 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 96.
1283 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 96.

The NCCRP[1284] advocates a cross-sectoral approach to water planning, so as to include climate change considerations, and emphasises a need to provide legal regulatory and financial resources and capacity to address climate change in the water sector.[1285] The NCCRP recognises the importance of local governments in fostering climate resilience through activities such as planning human settlements and urban development, providing municipal infrastructure and services, managing water and energy demand, and responding to disasters at the local level.[1286] The relevant elements of the NCCRP for the water sector include integrating climate change considerations in the short-, medium- and long-term water planning processes across relevant sectors such as agriculture, industry, economic development, health, science and technology.[1287]

The NCCRP mandates that coastal communities prepare for the effects of climate change by protecting and restoring natural systems that serve as important coastal defences, funding ongoing research to ascertain the effects of climate change on coastal livelihoods and determining appropriate responses. The following sub-sections outline specific duties pertaining to municipalities in ensuring an effective response to water-related climate and disaster risks.

The NCCAS and the *Climate Change Bill* (once enacted) will act as a common reference point for climate change efforts in South Africa and provide a platform upon which national climate change objectives for the country can be articulated to provide overarching guidance to all sectors of the economy.[1288] Notably the NCCAS is premised on many guiding principles foregrounding people and their needs, serving their physical, psychological, developmental, cultural and social interests equitably, and

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1284 The NCCRP recommends factoring in climate change into plans for key adaptation-related sectors like water, health, human settlements, agriculture and commercial forestry, biodiversity and ecosystems, and DRR and DRM.
1285 NCCRP 16-17; Rumble "Water Resources Management and Climate Change" 9-1.
1286 NCCRP 16-17.
1287 NCCRP 16-17.
1288 NCCAS 6.

supporting and promoting equity in South Africa.[1289] Furthermore, the NCCAS builds upon the extensive international law and policy framework including the SDGs, the *Sendai Framework*, and the *Paris Agreement*.[1290] It distinctly notes that many actions required for climate change responses fall within the responsibility of local government.[1291] These include the provision of basic services such as water, electricity, waste removal, and sanitation and sewage infrastructure maintenance, road management, disaster risk management, and the provision of safe and healthy human settlements.[1292] The NCCAS requires of each municipality to participate in drafting updated climate change strategies that include adaptation responses and drafting associated implementation plans to guide climate response in the respective municipality.[1293]

Together with the NCCAS, the *Climate Change Bill* calls for the development of adaptation policies, plans and strategies by local government.[1294] The *Climate Change Bill* acknowledges that climate change responses raise unique challenges to effective governance because the impacts transcend and challenge traditionally sectoral governance approaches.[1295] The Bill states that this challenge requires nationally driven, coordinated, and co-operative legal and administrative responses that acknowledge the centrality of the provincial and municipal spheres in achieving its objectives.[1296] This Bill is therefore explicit in its acknowledgment of the role played by all spheres of government, especially the local sphere.[1297]

1289 NCCAS 6.
1290 NCCAS 11-12.
1291 NCCAS 24.
1292 NCCAS 24.
1293 NCCAS 41.
1294 NCCAS 14.
1295 Preamble of the *Climate Change Bill*.
1296 Preamble of the *Climate Change Bill*.
1297 Clause 2(a) of the *Climate Change Bill*.

According to the *Climate Change Bill,* municipalities are to undertake a climate change needs and response assessment for the municipality[1298] and to develop and implement a climate change response implementation plan (CCRIP) informed by such an assessment.[1299] Consequently, municipalities need to develop a vulnerability and resilience methodology framework that integrates biophysical and socio-economic aspects of vulnerability and resilience.[1300] The *Climate Change Bill* arguably identifies climate change as a developmental issue, rather than a purely environmental issue, by instructing municipalities to assess the extent to which climate change affects their constitutionally mandated functions and to formulate steps to address these effects in the performance of their functions.[1301]

With due regard to the developmental and environmental functions of local government,[1302] it is discernible that climate change needs to be mainstreamed across the various functions of local government. The climate change needs and responses assessment must identify climate change response considerations and options and assess the municipality's nature and characteristics, as well as its specific climate change needs and risks.[1303] In addition, it should identify and map risks, vulnerabilities, areas, ecosystems, and communities that will emerge or are vulnerable to climate change in the municipality's operational area.[1304] The assessment must also be based on the best available science and data, and must identify measures and mechanisms for managing and implementing responses to climate change.[1305]

1298 Clause 15(1)(a) of the *Climate Change Bill*.
1299 Clause 15(1)(d) of the *Climate Change Bill*.
1300 NCCAS 38-39. Here it is up to national government to develop a National Climate Risk and Vulnerability Assessment Framework (NCRVAF), which would guide local assessments. This would involve municipalities using the NCRVAF as guidance when undertaking initial assessments and developing response plans. Municipalities would also be expected to use the NCRVAF as guidance when reviewing and revising existing assessments and response plans.
1301 Clause 15(1)(b) of the *Climate Change Bill*.
1302 See section 152 of the *Constitution*.
1303 Clause 15(2)(a)-(b) of the *Climate Change Bill*.
1304 Clause 15(2)(c) of the *Climate Change Bill*.
1305 Clause 15(2)(d)–(e) of the *Climate Change Bill*.

Furthermore, the CCRIP must be integrated into and inform municipal planning processes and instruments.[1306] In this light, climate change adaptation and mitigation will in future (pending the promulgation of the Bill) become crucial components of municipal planning and related activities.[1307] Likewise, the NCCAS requires the integration of climate change adaptation into municipal development planning documents, budget documents and by-laws.[1308] This will involve each municipality ensuring that climate change policies, projects and programmes are reflected in municipal strategic development planning and budget documents, including IDPs, SDFs and SDBIPs. While the CCRIP is not yet a statutory requirement, some city governments in South Africa have taken the initiative, at the behest of international city networks, to draft their own climate action plans which lay out their strategies, including specific measures, to reduce GHG emissions, adapt to the impacts of climate change, and detail the cities' governance structure, powers, and capacity.[1309]

District municipal plans can be utilised to assist local municipalities.[1310] These strategies and associated implementation plans must be reviewed and updated every five years. Additionally, each municipality must establish a Municipal Committee on Climate Change that will be responsible for co-ordinating the climate change response actions in the municipality. Taylor[1311] argues that local government performance management systems (PMS) can also incorporate climate adaptation targets, indicators, and objectives.[1312] To that end, the PMS for a municipality may include adaptation-related targets and indicators if they are included in the IDP.[1313] Making a direct link between the goal of

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1306 Clause 15(1)(d) of the *Climate Change Bill*.
1307 Clause 15(1) (d) of the *Climate Change Bill*.
1308 NCCAS 42.
1309 C40 Cities Climate Leadership Group 2022 https://www.c40.org/what-we-do/raising-climate-ambition/1-5c-climate-action-plans/. See a discussion of these in Chapter 5.
1310 NCCAS 41.
1311 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 101.
1312 The performance management system refers to the setting of IDP performance objectives and targets and measuring performance against objectives and targets through monitoring and evaluation processes.
1313 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 101.

reducing the risks and impacts of climate change and the delivery of essential public service functions like water services can increase political and administrative support for adaptation efforts, which can lead to greater cross-departmental implementation.[1314]

On the disaster management front,[1315] local governments are urged to incorporate climate change into their DRM plans and are urged to develop and improve EWS for extreme weather and climatic events.[1316] As per the discussion above, it is apparent that DRM and DRR should form a critical component of climate change responsiveness and of addressing risks to water security in the form of water-related disasters.[1317] The *Disaster Management Act* provides that these authorities are responsible for conducting risk assessments, identifying communities and ecosystems that are exposed or vulnerable to physical and human-induced threats (such as climate change and water insecurity), and preparing disaster risk management plans.[1318]

Municipalities must establish statutory and physical structures that ensure that DRR is coordinated and implemented by government entities, NGOs and the private sector.[1319] These structures include a municipal DRM plan as an integral part of the IDP,[1320] a municipal DRM framework,[1321] a municipal DRM centre,[1322] a municipal DRM advisory forum, and a municipal inter-departmental DRM committee.[1323] must evaluate the possible disasters and their potential impacts in the municipal area, as well as specifics about communities that are vulnerable to those disasters, considering their level of

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1314 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 101.

1315 Section 1 of the *Disaster Management Act* defines "disaster" as "a progressive or sudden, widespread or localised, natural or human-caused occurrence."

1316 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 97.

1317 See para 2.3.2.4 of this study.

1318 S 53(1)(a) -(c) of the *Disaster Management Act*.

1319 S 42(1)(a) of the *Disaster Management Act*; Van der Berg, Du Plessis and Murphree "Local Disaster Risk Reduction and Management in South Africa's Response to Climate Change" 12-17; Van Niekerk "Disaster Risk Reduction and Climate Change Resilience and Adaptation" 855–76.

1320 S 53 of the *Disaster Management Act* and section 26(g) of the *Municipal Systems Act*.

1321 S 42 of the *Disaster Management Act*.

1322 S 44(1)(a) of the *Disaster Management Act*.

1323 Du Plessis "Local Government and the Pursuit of Urban Sustainability in South Africa" 275-276; S 42(1)(a) of the *Disaster Management Act*.

socio-economic, physical, environmental and political vulnerability.[1324] Other elements which should be included in the plan are contingency measures and plans for response (emergency preparedness and response), and details on measures to reduce the vulnerability of disaster-prone areas.[1325] This plan, subject to consultation with the local community during its preparation, must be aligned with the SDF of the municipality.

The municipal disaster management framework (MDMF) must ensure an integrated, co-ordinated, and uniform approach to disaster risk reduction in a municipality.[1326] Van Niekerk[1327] claims that while this instrument is highly operational, it provides an ideal opportunity for the incorporation of issues of climate change and adaptation by focusing on disaster risk reduction. Consequently, addressing water-related hazards and climate change necessitates the adoption and implementation of DRR and DRM programmes and policies, the lessening of vulnerability, the strengthening of resilience and the enhancement of responsiveness to both natural and anthropogenic hazards, and the promotion of both the mitigation and adaptation to climate change.[1328]

A municipality should also co-ordinate and manage disasters in terms of existing legislation, contingency plans and by-laws.[1329] These by-laws may be adopted in the event of a declaration of a local state of disaster, such as in a case of severe droughts or flooding. They may thus make provision for extraordinary measures for emergency responses and relief, such as the release of available resources (equipment, vehicles and facilities), the release of personnel of the municipality for rendering emergency

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1324 S 53(2)(b) of the *Disaster Management Act*.
1325 Ss 49(1)(d) and 53(2)(c), (i) and (k) of the *Disaster Management Act*.
1326 S 42(1) of the *Disaster Management Act*.
1327 Van Niekerk "Disaster Risk Reduction and Climate Change Resilience and Adaptation" 871.
1328 S 1 of the *Disaster Management Act* defines disaster management as a "continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at (a) preventing or reducing the risk of disasters; (b) mitigating the severity or consequences of disasters; (c) emergency preparedness; (d) a rapid and effective response to disasters; and (e) post-disaster recovery and rehabilitation." See Chapter 2 of this study.
1329 S 55(2) of the *Disaster Management Act*.

services, the dissemination of the information required for dealing with the disaster, and any other steps that may be necessary to prevent an escalation of the disaster.[1330]

In addition, the disaster management plan must define responsibilities and authorities based on the MDMF. Regarding emergency response in post-disaster recovery and rehabilitation, the municipality's capacity to fulfill its role and responsibilities in terms of its disaster management strategies and contingency strategies and emergency procedures in the event of a disaster, including measures to finance these strategies, must be clearly spelled out[1331] The global COVID-19 pandemic[1332] continues to direct attention to the importance of the provision of safe water, sanitation and hygienic conditions during emergency situations.[1333] As part of the plan, those regions, ecosystems, communities, and households that are susceptible to natural and anthropogenic hazards should be identified and mapped.[1334]

Municipalities must include *inter alia* a thorough and scientific disaster risk assessment which indicates all known and foreseeable hazards, their frequency, their magnitudes linked to seasonality and their possible geographical areas of impact, as well as methods of early warnings.[1335] Municipalities are responsible for determining (as applicable) the hundred-year flood lines within their municipal areas.[1336] Local governments are tasked with enforcing the use of flood zones to lessen the impact of flooding on people and property. Municipalities could use spatial tools to locate and map freshwater ecosystems, river and wetland buffers, and high-risk areas for drought

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1330 S 55(2)– (4) of the *Disaster Management Act*; Van der Berg, Du Plessis and Murphree "Local Disaster Risk Reduction and Management in South Africa's Response to Climate Change" 12-19; Van der Berg *Legal Perspectives on the Function of Public-Private Partnerships in Local Disaster Management in South Africa* 30.

1331 S 53(1)(a)(i)-(vi) of the *Disaster Management Act*.

1332 WHO 2021 https://www.who.int/health-topics/coronavirus#tab=tab_1.

1333 Cooper *Water Security Beyond Covid-19* 2.

1334 S 53(2)(c) of the *Disaster Management Act*.

1335 Van Niekerk "Disaster Risk Reduction and Climate Change Adaptation and Resilience" 23-19.

1336 According to ss 121 and 144 of the NWA flood hazard mapping is only required for high-risk dams or dam categories, as well as new developments on town layout plans where the 100-year flood line must be indicated.

and flooding. The disaster management plan could be a means to reduce the risk of water-related disasters by developing policies that will promote dam safety, flood hazards and droughts, and minimise pollution or the degradation of water resources. The disaster management plan should identify linkages and cross-references to IDP projects aimed at reducing the disaster risk profile of the municipality, and indicators of their success, contingency measures and plans for response (emergency preparedness and response), and contain detail on a supportive information and communication management system for disaster risk reduction.[1337] The plan could therefore facilitate the inclusion of water-related planning and budget allocations in the strategies and plans for water management.

4.3.6 Ensuring a reliable and equitable supply of water for sustainable economic and social development

While access to water for domestic and household purposes is the responsibility of local government,[1338] access to water resources for socio-economic development or productive uses such as irrigation, mining, and industrial processes is the responsibility of the DWS.[1339] South Africa's *National Water and Sanitation Master Plan* (2018) acknowledges that water security presents a profound challenge to South Africa's social well-being and economic growth.[1340] Unlike food and energy security, water security needs to be considered in terms of both absence and presence, having the potential to be a threat and thus uniquely bringing a destructive quality.[1341] As many of the sectors that intersect with water security and that are also water-intensive (energy and food) are placed at the national government level of responsibility, this section primarily looks at promoting the efficient, sustainable and beneficial use of water in the public interest.

1337 S 26(g) of the *Municipal Systems Act* and s 53(2)(a) of the *Disaster Management Act*.
1338 See dimension one in para 4.3.2.
1339 Kidd "Pollution of Water in South Africa by Untreated Sewage: Addressing the Governance Issues" 413.
1340 DWS *National Water and Sanitation Master Plan Volume 1* 1, 19.
1341 Grey and Sadoff 2007 *Water Policy* 545-571.

This makes it necessary to assess the measures which reduce the consumption of water, and which promote efficient water use.[1342]

As stated above,[1343] the *Constitution* guarantees everyone the right to access to sufficient food and water, which require progressive realisation.[1344] The NWRS prioritises local water resource maximisation and the "source to tap and back to source" water conservation principle in order to increase people's availability of clean water for consumption and industrial production. for domestic and productive use.[1345] In South Africa the agricultural sector is the dominant water user, consuming more than 60 per cent of the total water available.[1346] The NWRS points out, however, that the sector supports a significant portion of the South African economy, assures food security for the country and contributes to job creation and employment throughout the food production value chain.[1347] For this reason it is recommended that WC/WDM must become entrenched in the agricultural sector.[1348]

Likewise, the NWRS aims to enhance water use efficiency in the sector through means such as minimising water losses or water wastage, efficient irrigation systems such as drip irrigation, and creating an enabling environment to facilitate technology transfer about water use efficiency and productivity improvement technologies.[1349] It also includes equitable water pricing as a mechanism of financial support to water-based livelihoods and food security.[1350] The NWRS also aims for the development of water

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1342 See para 2.3.2.5.
1343 See para 4.4.1 above.
1344 S 27(1)(b) of the *Constitution*.
1345 NWRS 7.
1346 DEA *South Africa Environment Outlook 2016* 331.
1347 NWRS 55.
1348 NWRS 55.
1349 NWRS 55.
1350 NWRS 89.

management plans (WMPs) to implement WC/WDM in the agricultural sector. The plans include, for example, the WSDP currently developed by municipalities.[1351]

Concerning energy, the NWRS emphasises that the energy sector is water intensive, and this is counterproductive in an already water-stressed country. The NWRS consequently affirms that the water-energy nexus should receive more attention to ensure that policies that transition to a sustainable, low-carbon economy are achieved in South Africa.[1352] The aim is henceforth to ensure that all sectors use water efficiently and effectively and enhance existing WC/WDM programmes across all sectors.[1353] Municipalities can in this regard achieve the goals of sustainable use, demand reduction, efficient and equitable allocation, and reduce consumption through pricing mechanisms and other incentives that promote WC/WDM.

Changing how consumers view and use water, and conservation through education and awareness programmes also presents an opportunity to achieve optimum, long-term, environmentally sustainable social and economic benefits for society.[1354] All sectors should also ensure that they set targets and all water use sectors should develop measures to use water efficiently and report on the implementation of interventions[1355] Equally, authorisation processes should be aligned with WC/WDM priorities and encourage interventions that improve water use efficiency.[1356] The implementation of WC/WDM measures may provide a more cost-effective or suitable solution for reconciling the rising water demand with existing water resources or infrastructure. Where water is used inefficiently, WC/WDM could delay the need for capital infrastructure, such as dams and bulk treatment works, in areas where water is used inefficiently. The allocation of resources, the scope of work, and the prioritisation of activities related to WC/WDM should be determined through an integrated planning

[1351] NWRS 55.
[1352] NWRS 55.
[1353] NWRS 55.
[1354] NWRS 56.
[1355] NWRS 56.
[1356] NWRS 55.

procedure. Municipalities are required to play an important supporting role through their own regulations, incentives and policies.

The NCCRP sets out eight "flagship" adaptation responses, which include the WC/WDM Flagship Programme.[1357] One of the elements of a safely managed water supply is ensuring that the infrastructure of the improved water source is operated and maintained in a manner that ensures that a water supply is available as and when needed, thus offering sustainable services. The *National Strategy for Sustainable Development* (NSSD) defines the objective of moving towards a green economy as a just transition towards a resource-efficient, low-carbon and pro-employment growth path.[1358] The NSSD identifies nine focus areas for targeted intervention; including resource conservation and management, water management, environmental sustainability, clean energy and energy efficiency, agriculture, food production and forestry, and sustainable consumption and production.[1359] The design of urban infrastructure such as water supplies, energy, wastewater treatment, road and stormwater drainage should take into account these targeted intervention areas.

Table 4-1 provides a summary of the role of local government in addressing the dimensions of urban water security based on the discussion in this chapter. The duties of city governments in relation to urban water security are distilled in the following categories: the provision of services, law-making, permitting and licensing, monitoring and enforcement, strategic planning, consultation requirements, and the more general duties as prescribed by the national law and policy framework in this chapter.

Table 4-1: Specific role of local government in relation to the dimensions of water security

[1357] This programme serves as the implementation of the *National Water Conversation and Demand Management Strategy* (2004).
[1358] *National Strategy for Sustainable Development and Action Plan* (2011–2014) (hereafter NSSD).
[1359] NSSD 24.

Function category	**Linking the dimensions of urban water security to specific roles provided in South African law and policy**				**Responsibility at local level**
	Ensuring equitable, secure and reliable access to adequate, clean and safe water services	Protection of urban aquatic ecosystems	Protection against water-related climate risks and disasters	Ensuring the sustainable use of water for socio-economic activities	
Provision of services	• Provide access to efficient, affordable, economical and sustainable water services. • Compliance with national standards and measures to conserve water. • Ensure the provision of effective, efficient and sustainable water services. • Establishment and operation of domestic wastewater and sewage disposal systems.	• Establishment of local protected areas. • Management of other protected areas (as the management authority) and co- management of protected areas • Implementation of biodiversity management plan • Provision of coastal access land and coastal public property • Provision of facilities that promote access to coastal public property. • Activities in coastal waters	• Emergency incident response • Provision of external engineering services • Disaster management through the municipal disaster management centre.	• Management of water services works and purification of wastewater.	• All municipalities (WSAs/ WSPs) • District and metropolitan (unless assigned to local)

Law-making	• Regulate water services provision and water services providers within their area through the enactment of by-laws and the regulation of contracts (WSA) (including standards and tariffs, water services intermediaries, industrial use of water and industrial effluent)	• Adoption of by-laws for local protected areas (including strategic water source areas). • Adoption of by-laws for district and metropolitan municipalities -coastal access land, -estuarine management plans, -coastal management programme, -coastal planning scheme (if part of land use scheme) • Delineation of coastal boundary and coastal management lines. • Adoption of coastal planning scheme.	• Adoption of by-laws for local protected areas	• Promulgate by-laws controlling industrial effluent and control of industrial water pollution. • Adoption of model by-laws for management of environmental impacts.	• All municipalities • Local and metropolitan

Permitting and licensing	• Approval for water services provider. • Approval for use of water from another source.	• Ensuring that land development / land use approval secures public access to coastal public property.	• Approval of land development and land use applications (water-sensitive considerations to be included).	• Approval for industrial use of water. • Approval of land development and land use applications (though a municipal planning tribunal or authorised official). • Decision on land development and land use application appeals (as appeal authority)	• WSA • District and metropolitan (unless assigned to local)
Monitoring and enforcement	• Monitor the provision of services and the performance of WSPs and water services intermediaries (WSA). • Enforcement powers under Water Services Act (failure to perform functions).	• Act as competent authority for control of alien or listed invasive species (if delegated). • Enforcement by environmental management inspectors.			• WSA • Local and metropolitan

Strategic planning	• Adoption of water services development plan (to form part of IDP)	• Alignment of IDP with other plans, policies etc. (biodiversity framework and bioregional plan) • Preparation of invasive species monitoring, control and eradication plan for land under its control, to be included in the IDP. • Preparation of biodiversity management plan (discretionary) and alignment with National Biodiversity Framework. • Preparation of invasive species monitoring, control and eradication plan for protected area. • Adoption of municipal coastal management programme (may form part of IDP and SDF), aligned with national and provincial coastal management programme. • Inclusion of coastal access land in SDF • Adoption of estuarine management plan, which must be included in municipal coastal management programme and/or IDP	• To be included in IDP, preparation of: - SDF - Municipal disaster risk management plan - Development of framework for disaster management - Climate change response implementation plan (to form part of IDP).	- Prepare water services development plans to ensure effective, efficient, affordable, economical and sustainable access which promotes sustainable livelihoods and economic development. - Prepare integrated waste management plan (integrate into IDP).	• WSA • District and metropolitan (unless assigned to local)

Consultation requirements	• Provision of comment regarding catchment management strategy, declaration of controlled activities, establishment, and general conditions of a water board.	• Consultation by municipality with Minister in respect of bioregions. • Consultation by municipality with SANBI in respect of invasive species control and eradication plan and biodiversity management plan. • Consultation by municipality with MEC in respect of coastal management lines. • Notification to Registrar of Deeds of coastal boundary determination. • Public and inter-governmental consultation in respect of coastal management programme and estuarine management plans • Consultation to resolve conflicts in terms of NEMICMA	• Comment on environmental authorisation applications.	• Consultation with municipality by Minister regarding norms and standards for land use Consultation by municipality with Premier in respect of land use scheme • Consultation with organs of state in respect of SPLUMA approval, plans and programmes. • Consultation with local municipality by district municipality in respect of disaster management. • Comment on environmental authorisation applications.	WSA and WSP

General	• Representation on governing board of catchment management agency • Setting of tariffs for water services • Reporting on implementation development plan • Reporting on the implementation of development plan during each financial year	• Reporting on status of listed invasive species. • Establishment of municipal coastal committees (discretionary) • Reporting to MEC relating to implementation of responsibilities for coastal access land • Reporting to Minister in respect of estuarine management plan • Provision of compensation in respect of determination of coastal boundaries		• Taking of reasonable measures to ensure general duty of care. • Application of SPLUMA development principles • Application for exemption from SPLUMA • Decision making in accordance with SDF. • Record-keeping in respect of land development decisions • Reporting by municipal planning tribunal	• WSA • Local and metropolitan

4.4 Water management and governance approaches in South African law

South Africa's approach to water management tends to lean towards WC/WDM and more often, IWRM. Both the NWA and the *Water Services Act* provide the legislative context for water resources management and water services respectively. The policy framework emerging from these two laws addresses three important concepts that have shaped the direction of the water sector, namely IWRM, the principle of equity in access to water, and the promotion of institutional decentralisation.[1360] Based on international best practice, four factors are considered in assessing the degree of IWRM implementation: an enabling environment, institutions and participation, management instruments, and financing.[1361]

Concerning the enabling environment, South Africa has an extensive legal and policy framework addressing the water sector, with extensive policies, laws and plans in place at national level. The NWA embodies and mainstreams IWRM, promoting sustainability and equity, and the protection and conservation of water resources.[1362] The NWRS requires integration and alignment in the planning of water resources, water supplies and regional or bulk infrastructure by water institutions in the supply chain.[1363] It adds that this should be accomplished through IWRM, which promotes the co-ordinated planning, development, and the management of water, land, and related resources to optimise the resulting social and economic benefits in an equitable manner without adversely affecting the viability of ecosystems.[1364] Municipalities also need to adopt integrated approaches to planning and ensuring the provision of municipal services, and to promote the democratic values and principles enshrined in the *Constitution*.[1365]

[1360] Smith *Municipal Compliance with Water Services Policy: A Challenge for Water Security* 5; Savage, Eales and Smith *Securing South Africa's Water Sector Support Growth and Sustainable Development* 5.

[1361] Department of Statistics *Sustainable Development Goals: Country Report 2019* 169.

[1362] See the Preamble of the NWA.

[1363] NWRS 68.

[1364] NWRS 68.

[1365] *White Paper on Local Government* 150-151. Also see s 195 of the *Constitution*.

This chapter argues that a total water cycle approach is more likely to produce long-term resilient solutions to urban water management problems than a focus on ensuring a constant supply of water. To address water constraints and move towards water security in the country, municipalities need to put in place strong water conservation methods and steadfast WDM reduction mechanisms.[1366] Therefore, it is imperative that water service institutions take measures to prevent water loss, such as reducing the frequency and severity of water leaks. WC/WDM programmes should be viewed as the management of water services in addition to the water resources management. Municipalities, as WSAs are required to integrate WC/WDM into their WSDPs and to ensure that WSPs implement the same.[1367] Additionally, the NWSF requires the integrated planning of both water resources and water services provision.[1368]

One of the actions identified in the NWSMP for regulating the water and sanitation sector is to include water use efficiency and conservation targets in the key performance indicators (KPIs) of municipal managers and municipal water supply and sanitation managers, and in municipal implementation plans.[1369] The responsibility for this action is handed over to municipalities and COGTA.[1370] It identifies a role for developing and implementing municipal by-laws to protect water quality, and places this responsibility on the DWS and WSAs.[1371] To this end, the NWSMP states that WC/WDM is an integral part of the broader strategies needed to reconcile available supply with demand for water.[1372] It adds that IWRM and planning ensure that water fit for use is available for urban and rural growth, whilst ensuring that industrial and agricultural requirements at local, regional and national scale are met in an integrated manner.[1373]

1366 DWAF *National Water Conservation and Water Demand Management Strategy* 4.
1367 DWAF *National Water Conservation and Water Demand Management Strategy* 20.
1368 NPC *National Water Security Framework for South Africa* 33.
1369 DWS *National Water and Sanitation Master Plan Volume 1* 27.
1370 DWS *National Water and Sanitation Master Plan Volume 1* 27.
1371 DWS *National Water and Sanitation Master Plan Volume 1* 27.
1372 DWS *National Water and Sanitation Master Plan Volume 2* 10.
1373 DWS *National Water and Sanitation Master Plan Volume 2* 10.

4.5 Chapter summary

The aim of this chapter has been to determine the role of municipalities in water security as far as it concerns the provisions in national law and policy. It is evident that water security interacts with an array of functions and services at local government level. This chapter has shown that a review of water law, as well as laws dealing with environmental management, local government, spatial planning and land-use management, and disaster-risk management, is necessary to understand the potential for municipalities, particularly metropolitan municipalities, to assume water security duties.

The chapter has provided an exposition of the role players in and actors responsible *inter alia* for water services provision, water resource protection, activities affecting water resources, and activities that are affected by water resources.[1374] Furthermore, this chapter has reviewed the extensive South African law and policy framework that may provide the tools and instruments for local governments to begin addressing water security. As a result, the interconnectedness of water security's many components have been brought into sharp focus, with multiple entry points suggested for local governments to take a pre-emptive approach to addressing each. At the same time, it shows how fragmented the laws are that municipalities must adhere to.

The chapter has shown that there is a role for local government in each dimension of urban water security, with some of the duties and responsibilities being better clarified in one or two of the dimensions. The first and second dimensions of water security are straightforward in that local government has a constitutionally and legally defined duty to provide water and sanitation services.[1375] This is rooted in section 27 of the *Constitution,* which guarantees the right to access to water, with the NWA, *Water Services Act*, NWRS, NWSMP and various other policies substantiating the right and the

[1374] See para 4.2.
[1375] See para 4.3.2 and 4.3.3.

role of local government in its fulfilment.[1376] This results in a clear and enforceable legal framework that places a mandate on the state, and specifically on local government, to ensure the realisation of the right.

While the legal duties and responsibilities of local government are expressed clearly concerning both dimensions, the normative content has not been framed in sufficient detail. However, there is an express legal duty on local government to ensure that water services (both the first and the second dimensions)[1377] are provided equitably, affordably, effectively, reliably, gender and culture appropriately, and sustainably. In both dimensions, local government must realise access to water services progressively and subject to the available resources. In giving effect to their water services obligations, municipalities must adopt WSDPs and water services by-laws. In addition, the adoption and implementation of IWMPs for wastewater services is encouraged. The standards to which these instruments must adhere are outlined in legislation. However, it is notable that municipalities should outline the availability of resources (both for drinking and sanitation), equitably allocate the same to all consumers in their jurisdiction, regulate access in an equitable manner, and provide details on the tariff structures.[1378] The water service by-laws should also outline the standards of the services provided, including the technical conditions of supply, quality, quantity, installation, alteration, operation, protection and inspection of water services works.

Concerning the third dimension, the environmental right and a whole suite of environmental laws such as the NEMA, NEMBA, NEMPAA, NEMICMA and their supporting policies such as the NBSAP and the NBF, provide extensive protection to aquatic ecosystems.[1379] The environmental legal framework provides for several conservation planning tools, including LBSAPs, biodiversity management or bioregional plans, EMFs and space management plans. As biodiversity planning can take place on

[1376] See para 4.3.1.
[1377] See para 4.3.2 and 4.3.3.
[1378] See para 4.3.2 on the contents of WSDPs.
[1379] See para 4.3.3.

various levels, NEMBA allows for municipalities to request permission to draft bioregional plans or biodiversity management plans.[1380] Similarly, they can also make optimal use of stormwater and urban waterways for flood control, recharging aquifers and reusing water, basing their decisions on sound ecological principles, and being sensitive to their ecosystems and the array of services they offer. In addition to drafting these conservation plans, local land-use decisions should incorporate considerations of biodiversity. It is imperative that spatial biodiversity priority areas are incorporated into spatial plans and policies that guide development at the provincial and local levels. This includes SDFs, municipal zoning schemes, land-use change permits, and environmental assessments.

Furthermore, regarding protection against water-related climate and disaster risks, it is seen that municipalities increasingly play a vital role in preventing and managing disasters as well as in taking mitigation and adaptation actions in addressing climate change. As a result, cities must account for anticipated climate change risks and impacts when developing disaster management plans, outlining strategies and detailing how they intend to invest in climate change adaptation, including ecosystem and community-based adaptation strategies.[1381] In terms of mitigating disaster risk, spatial planning instruments such as SDFs and LUSs typically ensure that development is situated on land with a low risk of natural disaster.[1382] Several sector plans are available to local governments, including CCRIPs and disaster management or risk management plans, which aim to facilitate an adequate prevention and mitigation, preparedness-, response-, recovery- and rehabilitation- response for water-related disasters.

The fourth dimension emphasises the importance of WC/WDM, and municipalities should, either in their WSDPs or their individual WC/WDM plans, outline measures that address non-revenue water, reduce water consumption and manage overall demand. It

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[1380] Ss 40(2)(b) and 43 of NEMBA.
[1381] See para 4.3.5.
[1382] See para 4.3.5.

is evident that there is a multitude of legal and policy tools and instruments available to local authorities to address the dimensions of water security in their local laws, policies, plans and strategies. Using their wide array of powers and instruments, municipalities can go beyond what is required in law to optimise the attainment of water security.

In the chapter which follows, the role that the law foresees for municipalities will feed into the analysis of the law and the governance instruments of the three municipalities. The analysis concerns selected instruments in the three cities to assess how their laws, policies, plans and strategies respond to the role that was suggested for local government in relation to urban water security.[1383]

[1383] See Chapters 3 and 4.

5 LOCAL LEVEL LAW, POLICY AND PLANNING FOR WATER SECURITY IN THREE SOUTH AFRICAN CITIES

5.1 Introduction

Considering the theoretical underpinnings of urban water security[1384] and the analysis of the expected and potential role of municipalities in international, regional and national legal frameworks in relation to the dimensions of urban water security,[1385] this chapter addresses the question of how the role of cities in addressing water security is currently playing out. The chapter makes use of a desktop case study to evaluate the legally relevant role of municipalities in addressing water security in South Africa. It may at this juncture be noted that local government in South Africa has extensive legislative and executive authority – all of which was acquired after the abolition of apartheid.[1386]

Hence, this chapter aims to critically analyse specific city-level law and governance responses (by-laws, local policies, plans, and strategies) for water security in South Africa.[1387] The discussion looks at the state of play in the City of Cape Town Metropolitan Municipality, eThekwini Metropolitan Municipality and the City of Johannesburg Metropolitan Municipality specifically. Such a determination may add to the understanding of the expectation and vision for cities as agents in addressing the dimensions of urban water security. The analysis in each case starts off with a discussion of the cities' socio-economic and ecological profiles. As explained previously,

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1384 See the discussion in Chapter 2.

1385 See the discussion in Chapters 3 and 4.

1386 S 152(1)(b) of the *Constitution*; the rights in the Bill of Rights when read with ss 7(2) and 8(1) of the *Constitution*; De Visser "Institutional Framework for Developmental Local Government: Making Good on the Promise of Development?" 41. Naudé and Jansen van Rensburg 2007 *Public Administration and Development* 393-412; De Visser 2009 *CJLG* 11-12.

1387 While highly relevant, strategic and informative documents such as water, biodiversity and environmental reports are not included as specific instruments, their content is integrated into the discussion. The discussion focuses on the instruments outlined in this section, as well as additional instruments pertaining to the dimensions and their sub-elements which are relevant for addressing water security.

all these cities face water insecurity, albeit to different degrees. The justification of the choice of cities is provided in Chapter 1.[1388]

Following on the discussion of the cities' contextual backgrounds, the law and governance instruments in each city are discussed with reference to the dimensions underpinning urban water security as identified in Chapter 2 of this study.[1389] This is done with a view to evaluating how the cities respond to their role in urban water security as envisioned in international and national law and policy. The chapter assesses the state of play in the three cities by discussing the cities' instruments according to the delineated dimensions.[1390] To prevent duplication and redundancy in the discussion of the instruments, the first and second dimensions of urban water security are assessed together as far as they concern the cities' duty to provide water services (domestic water as well as sanitation services).

5.2 City of Cape Town

5.2.1 Local water insecurity profile

The City of Cape Town is a metropolitan municipality located in the Western Cape Province of South Africa.[1391] Cape Town is still very much characterised by high levels of socio-economic inequality and spatial fragmentation, both of which have significant impacts on water services delivery, for example.[1392] The spatial and economic inequality in the city can provide the context for assessing and managing the various risks associated with climate change, considering that they may translate into different

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1388 See para 1.9 on the research methodology.

1389 These local instruments were identified based on the national legal framework discussed in Chapter 4 in line with the five dimensions identified in Chapter 2. The chapter discusses both regulatory and policy instruments in so far as they fall within the scope of analysis.

1390 See table 4-1 in Chapter 4.

1391 COGTA *Profile: City of Cape Town Metropolitan* 11.

1392 Taylor *Climate Information for Building Resilient South African Cities* 127.

degrees of vulnerability to climate conditions and extreme weather events.[1393] Additionally, the city environment is continuously affected negatively by urban development and various threats related to urbanisation.[1394]

The factors that are contributing to the city's vulnerability include the increasing number of households and businesses, the rising cost of water supplies and the degradation of the city's water catchments due to the presence of alien plants.[1395] Other factors include the lack of adequate water supplies, extensive water leakages and wastage, the lack of proper infrastructure, and real estate development along the city's coastlines which exposes residents to various risks.[1396] Cape Town's wastewater treatment plants also continue to pump untreated sewage into its rivers and oceans.[1397]

Cape Town is a rapidly growing urban centre with an estimated population of 4.4 million people.[1398] It is held that nearly a third of this population cannot afford to pay for water, making them eligible for a free allocation each month.[1399] The city features numerous rivers and wetlands with a sizeable portion of lowland Cape Town being surrounded by seasonal and perennial wetlands interconnected via the groundwater system.[1400] Cape Town's coastline is about 308 kilometres long and features various coastal landforms. The region is home to over eighty endangered and rare species, which are found in the wide range of diverse marine and coastal ecosystems. The city's coastal zone is also known for its recreational activities and quality of life. It is also one

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1393 Taylor, Cartwright and Sutherland *Institutional Pathways for Local Climate Adaptation* 34; City of Cape Town *State of the Environment Report* 9.

1394 City of Cape Town *State of the Environment Report* 9; OECD *Water Governance in Cape Town* 16.

1395 City of Cape Town *State of the Environment Report* 9, 12.

1396 Taylor, Cartwright and Sutherland *Institutional Pathways for Local Climate Adaptation* 50.

1397 Kretzmann 2019 https://www.groundup.org.za/article/polluted-milnerton-lagoon-particularly-disgusting/; Kretzmann and Joseph 2020 https://www.groundup.org.za/article/green-scorpions-order-city-cape-town-sort-out-pollution-milnerton-lagoon/; Human 2022 https://www.groundup.org.za/article/fish-die-off-in-polluted-milnerton-lagoon/.

1398 Statistics SA 2018 https://www.statssa.gov.za/publications/P0302/P03022018.pdf; Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 2; OECD *Water Governance in Cape Town* 17.

1399 Ziervogel *Unpacking the Cape Town Drought: Lessons Learned* 2-3.

1400 Sinclair-Smith and Winter "Water Demand Management in Cape Town Managing Water Security in A Changing Climate" 100; City of Cape Town *State of the Environment Report* 12.

of the city's greatest ecological assets.[1401] As a coastal city, Cape Town is also vulnerable to various climatic changes. These include rising sea levels and the increasing size of storm surges.

The City of Cape Town is both a WSA and a WSP as stipulated by the *Water Services Act*.[1402] This means that the city has full responsibility for the bulk water functions with no water board involvement. Having been predominantly reliant on dams as a primary source of water, Cape Town experienced its most severe drought on record from 2015 to 2018, as dam levels dropped dangerously low.[1403] The term "day zero" signified the time when the supply of water to certain areas of the city would have to be cut off to ensure that supplies were still available throughout the remainder of the dry season.[1404] Cape Town was able to circumvent a complete water crisis through various measures, such as drastically cutting the city's water consumption, implementing emergency planning and transferring water from the agricultural sector.[1405]

5.2.2 Urban water security in the City of Cape Town

5.2.2.1 Ensuring equitable, secure and reliable access to adequate, clean and safe water services

The state of play concerning the provision of water services is evaluated in the first instance against the duty to draft a WSDP or water services by-law. In the second instance, this section looks at the city's governance and management of stormwater services.

1401 Taylor *Climate Information for Building Resilient South African Cities* 133.

1402 See para 4.2.2 on WSPs and WSAs.

1403 Cape Town obtained over 95% of its water from a system of six rain-fed dams that also supply agriculture and other urban areas. – Ziervogel *Unpacking the Cape Town Drought: Lessons Learned* 3; Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 2.

1404 Rodina 2019 *Wiley Interdisciplinary Reviews* 1."Day Zero would have hit if the total dam level in the supply system reached 13,5% of storage capacity. That would have provided an allocation of 25 litres per capita per day to four million Capetonians for three months before dam levels reached 10%, at which point extraction from dams would have become progressively more challenging."- City of Cape Town *Water Strategy 2020* 98.

1405 Rodina 2019 *Wiley Interdisciplinary Reviews* 1.

5.2.2.1.1 Provision of water services: adopting water services development plans, by-laws and strategies

Cape Town aims for excellence in basic service delivery by exceeding national standards of delivery to all its customers, through harnessing opportunities via innovation and technology, prudently and sustainably investing in infrastructure, diversifying the water resource mix to provide affordable and sustainable services, and expanding digital access as a basic service so that everyone can access the benefits of digital expansion and utilise the opportunities this brings.[1406]

Despite some settlements or dwellings temporarily falling outside the national service standard in Cape Town, most households have an adequate water supply that complies with national norms and service standards, requiring basic water supply facilities within 200 metres.[1407] Cape Town has moved away from its dependence on surface water and is now exploring other non-surface water options. Under its infrastructure investment programme, the IDP plans to strengthen, refurbish and maintain its bulk water supply system.[1408] To fully achieve this aim, the IDP identifies actions which include ensuring adequate human and financial resources, maintenance, and the refurbishment of existing infrastructure,[1409] large bulk infrastructure projects, working with DWS and various other provincial departments to ensure that the water supply system keeps up with growing water demand, and extending the capacity of the water supply system.[1410]

Although the city's water supply augmentation programme is expected to provide additional water, it will take some time for the system to receive its full supply.[1411] The cost of the new water, which includes the treatment of wastewater, ground water, and

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1406 City of Cape Town *Integrated Development Plan 2021-2022* 50-51.
1407 City of Cape Town *Integrated Development Plan* 34, 129.
1408 City of Cape Town *Integrated Development Plan* 85.
1409 This includes upgrades to major pump stations, the repair of concrete structures such as reservoirs and dam intakes, and the verification and replacement of large-diameter meters. City of Cape Town *Integrated Development Plan* 85.
1410 City of Cape Town *Integrated Development Plan* 85.
1411 City of Cape Town *Integrated Development Plan* 119.

desalination will also have a high-cost burden on the users and the city. Improvement of the management techniques related to water supply such as reducing the prevalence of invasive species has been regarded as a cost-effective way of increasing the supply.[1412] Targeted interventions include water demand management actions, entailing pressure management, treated effluent reuse, sewer interventions, and law enforcement for the protection of water and sanitation resources.[1413]

Through its WSDP, Cape Town aspires to become a "water-sensitive city" that provides water services that are "safe, reliable, sustainable, and affordable" to all residents.[1414] The WSDP points out that all formal areas are already adequately provided with water and sanitation services, while services in informal settlement areas are continually being improved.[1415] To achieve its vision, the WSDP acknowledges the role of augmenting, refurbishing, and maintaining the city's bulk water supply system to Cape Town and its surrounding regions.[1416] The WSDP maps out several water resource schemes to augment the capacity of the water supply system. This includes water reclamation, groundwater, seawater desalination, rivers and waterways, and water conservation and demand management strategies.[1417] All these measures aim to ensure a continuous, reliable, adequate and sustainable supply of water of an adequate quality.

Regarding water infrastructure management, the WSDP provides an overview of the sufficiency of the resources and processes in place to effectively operate and maintain the water services.[1418] This means focusing on the maintenance and refurbishment of existing infrastructure, including the upgrading of major pump stations, the repair of concrete structures such as reservoirs and dam intakes, and the verification and

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[1412] City of Cape Town *Integrated Development Plan* 119.
[1413] City of Cape Town *Integrated Development Plan* 122.
[1414] City of Cape Town *Water Services Development Plan 2017-2022* 14.
[1415] City of Cape Town *Integrated Development Plan* 14.
[1416] City of Cape Town *Integrated Development Plan* 50.
[1417] City of Cape Town *Integrated Development Plan* 50-52, 85.
[1418] City of Cape Town *Integrated Development Plan* 185.

replacement of large diameter meters.[1419] Additionally, the city will be conducting an assessment of the funding requirements and options for its capital development and maintenance programmes, and assessing the impact of these funding requirements on the bulk water tariff.[1420] Variable tariffs are used with water restrictions to manage short-term demand during periods of drought. The city reviews and pre-approves tariffs to allow for different levels of water restriction each year.

In addition to its WSDP (required by law),[1421] Cape Town has also adopted a *Water Strategy* (2019)[1422] which underscores the importance of accessibility, reliability and water quality in water and sanitation services provision.[1423] The New Water Programme is notable for the urgency and scale of the challenge, as well as the cost of addressing it.[1424] The Programme was developed following the severe drought that affected Cape Town between 2015 and 2017. Over the next decade, the New Water Programme pledges to implement several interventions, including those aimed at better water management, groundwater abstraction, reuse, and desalination, and an increase in the availability of surface water.[1425]

Cape Town's goal is to have an abundant, reliable water supply, and they plan to do so by increasing their supply through the construction of cost-effective new water capacity, and then gradually increasing that capacity in a way that can withstand and adapt to future changes.[1426] The *Water Strategy* aims to ensure that wastewater reuse is maximised to meet the needs of the future water demand. The ten-year programme includes plans to recharge the Cape Flats aquifer and provide drinking water to a substantial portion of the municipality using treated wastewater.[1427] Currently, some 8

1419 City of Cape Town *Integrated Development Plan* 65.
1420 City of Cape Town *Integrated Development Plan* 83.
1421 See para 4.3.2.
1422 City of Cape Town *Water Strategy* 4.
1423 City of Cape Town *Water Strategy* 15.
1424 City of Cape Town *Water Strategy* 28.
1425 City of Cape Town *Water Strategy* 28.
1426 City of Cape Town *Water Strategy* 25
1427 City of Cape Town *Water Strategy* 28.

per cent of treated wastewater goes for commercial, industrial and landscaping purposes.[1428]

Several low-cost interventions have also been identified, such as controlling and managing invasive alien vegetation, improving the efficiency and effectiveness of the integrated surface water system, and water demand management.[1429] The City is also committed to ensuring that invasive alien vegetation in the catchments of the dams supplying Cape Town is eradicated.[1430] The system yield can be increased with minimal additional cost by implementing this source control measure. The *Water Strategy* also identifies the Municipality's collaboration with other entities to identify and clear the remaining water catchments. It will also develop mechanisms to fund the efforts.[1431]

This means continuous improvement of the quality of the services being provided. Water from springs, groundwater, reclamation, and desalination systems, as well as other safe sources, will be provided to Cape Town in accordance with mandatory national standards.[1432] To this end, Cape Town's *Water Strategy* intends to implement an effective water quality monitoring programme to monitor environmental or raw water from alternative water resources such rivers, dams, beaches, rainwater, wetlands and wastewater.[1433] This commitment also aims to ensure that water is affordable for all consumers, as required by law.

As per the *Water Strategy*, the level and structure of water and sanitation charges will also change over time to better reflect the costs of providing new supplies and improving wastewater treatment.[1434] To offset the rising overhead of operating and maintaining the distribution system, the fixed charges will increase. The long-term tariff

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[1428] City of Cape Town *Water Strategy* 28.
[1429] City of Cape Town *Water Strategy* 32.
[1430] City of Cape Town *Water Strategy* 36.
[1431] City of Cape Town *Water Strategy* 28.
[1432] City of Cape Town *Water Strategy* 69.
[1433] City of Cape Town *Water Strategy* 69. "This will be done in accordance with the requirements of the Blue and Green Drop regulations and risk assessment."
[1434] City of Cape Town *Water Strategy* 39.

will be set at the cost of providing new supplies. The revenues will need to meet the actual costs of these projects and the expenses associated with maintaining infrastructure.[1435] The city's future water tariffs will be lower than those that were imposed during the drought.[1436] The volumetric water tariff will also decrease, as will the cost of desalinated water. The city will continue to provide subsidies to households that cannot afford the cost of water.[1437]

Notably, the WSDP appropriately acknowledges the interaction between natural and grey infrastructure in water management. It holds that natural resources, such as rivers and groundwater sources, and engineered water infrastructure, wastewater, and stormwater services, require planning and management in an integrated and holistic way.[1438] The WSDP states that the aim of this is to improve the quality of the water supply, conserve and rehabilitate the natural environment, improve ecological health and improve the resilience of the water supply.[1439] Concerning the quality of the drinking water, the WSDP claims that the city complies with the national standards, with its water treatment plants being strictly monitored on a continual operational basis.

5.2.2.1.2 Managing and providing stormwater services

Both natural and engineered infrastructure make up Cape Town's stormwater system. This system comprises of streams, wetlands, pipes, surface canals, dams, and pumping stations. As a result, the emphasis is shifting from engineering solutions like piping away stormwater to more sustainable ones like facilitating stormwater absorption in a

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1435 City of Cape Town *Water Strategy* 39.
1436 City of Cape Town *Water Strategy* 39, 61.
1437 City of Cape Town *Water Strategy* 39, 61."In the first instance, this subsidy will come from an appropriate share of the National Government equitable share grant. If this is insufficient, the cost of providing this water will be cross subsidised from the rates account and other water and sanitation users."
1438 City of Cape Town *Integrated Development Plan* 51.
1439 City of Cape Town *Integrated Development Plan* 52.

more natural way.[1440] This approach is captured in the *Catchment, Stormwater and River Management Strategy* (2002). This *Strategy* aims to enhance an integrated and sustainable approach to stormwater and catchment management. Stormwater policies, such as the *Floodplain and River Corridor Management Policy* (2009) and the *Management of Stormwater Impacts Policy* (2009), have been integrated into the SDF and the IDP. This includes the integration of WSUD[1441] and SUDS principles into the process of development applications and approvals, directly influencing planning and design.[1442]

The *Stormwater Management By-law* (2005), while not very detailed, aims to regulate activities that could have a negative effect on the operation and maintenance of the stormwater system.[1443] The by-law speaks to the protection of Cape Town's stormwater system by prohibiting any person from damaging, endangering, destroying or undertaking any action that is likely to damage, endanger or destroy the stormwater system or the operation thereof.[1444] Furthermore, it forbids discharge onto any surface, any substance other than stormwater, where such a substance could find its way into the stormwater system, or is likely to damage the stormwater system or interfere with the operation thereof or contaminate or pollute the water therein.[1445] Neither may such a person drain, abstract or divert any water directly from the stormwater system.[1446]

Notably, the *Stormwater Management By-law* (2005) addresses the potential of flood risk by prescribing that the stormwater system's capacity may not be obstructed or reduced without written consent from the City Council.[1447] The by-law acknowledges the

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[1440] Taylor "Managing Stormwater and Flood Risk in a Changing Climate: Charting Urban Adaptation Pathways in Cape Town" 227.
[1441] See the discussion in para 2.4 on WSUD as a water management approach.
[1442] Taylor "Managing Stormwater and Flood Risk in A Changing Climate: Charting Urban Adaptation Pathways in Cape Town" 228.
[1443] Preamble of the City of Cape Town *Stormwater Management By-law*.
[1444] Section 4(a) of the City of Cape Town *Stormwater Management By-law*.
[1445] Section 4(b) and (c) of the City of Cape Town *Stormwater Management By-law*.
[1446] Section 4(f) of the City of Cape Town *Stormwater Management By-law*.
[1447] Section 5(a) of the City of Cape Town *Stormwater Management By-law*.

importance of EIAs in managing flood risk and emphasises the City Council's authority to impose conditions, such as the establishment of flood lines and the undertaking of impact assessments and environmental impact studies, to comply with environmental legislation such as the NEMA.[1448] In addition, the by-law adheres to the polluter-pays principle with regard to water pollution incidents. It mandates the owner of the property on which the incident took place, or is still in the process of taking place, or the person responsible for the incident, to immediately report the incident and bear the cost of all reasonable steps taken to contain and minimise the effects of the pollution, including the rehabilitation of the environment.[1449] This robust framework underscores the significance of the by-law in protecting the public interest.

The *Floodplain and River Corridor Management Policy* (2009) necessitates the management of well-maintained and sustainable watercourses, and places significant value on balancing flood risk, ecological and socio-economic considerations in developments near watercourses and wetlands.[1450] In order to effectively mitigate the adverse impacts of stormwater runoff from urban areas, the Policy advocates for the integration of WSUD principles into the planning and management of stormwater in Cape Town. Moreover, the Policy recognises the critical role of watercourses and wetlands in the stormwater management system, the biodiversity network, and recreational and economic opportunities. By incorporating these principles into urban planning and stormwater management, the Policy aims to create a more resilient and sustainable city that can withstand the challenges of a changing climate.[1451]

The *Management of Urban Stormwater Impacts Policy* (2009) aims to implement WSUD principles and SUDS into urban planning and stormwater management in Cape Town in

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[1448] S 6(1)(a) -(c) of the City of Cape Town *Stormwater Management By-law*; also see the discussion on the provisions of NEMA in Chapter 4.
[1449] S 7(a) and (b) of the City of Cape Town *Stormwater Management By-law*.
[1450] City of Cape Town *Stormwater Management By-law* 1.
[1451] City of Cape Town *Floodplain and River Corridor Management Policy* 5.

order to lessen the negative effects of stormwater runoff from urban areas.[1452] The Policy's two-pronged objective is to reduce the devastating impact of flooding on local economies and communities, while simultaneously safeguarding people's health, preserving aquatic ecosystems, and maintaining recreational water quality.[1453] The Policy recognises the dual importance of ecological and grey infrastructure, and it is a fundamental tool for promoting the sustainable and effective management of stormwater in Cape Town.[1454] In this regard, it is held that a single measure is not adequate to ensure that water quality treatment is maintained. There needs to be a combination of various measures that are implemented at the source and at the receiving waters, varying from preventative measures and development controls.[1455]

The city's regulations also require that all urban stormwater management systems are designed in a way that will reduce the impacts of their runoff on the receiving waters. This is done using best practice guidelines and standards that are to be established by the Council.[1456] The implementation of WSUD principles will also be incorporated into the planning and design of new development projects. These projects should be designed and constructed in a way that utilises SUDS.[1457] The systems are to be planned and constructed according to the city's guidelines and international best practice.[1458] Secondly, existing developed areas will be retrofitted in accordance with WSUD and SUDs principles. These will be implemented according to the requirements of the city, using appropriate structural (engineered and ecological infrastructure) and non-structural (public awareness, operating and maintenance practices, and education programmes) measures.[1459]

[1452] Preamble of the City of Cape Town *Management of Urban Stormwater Impacts Policy*.
[1453] City of Cape Town *Management of Urban Stormwater Impacts Policy* 5.
[1454] City of Cape Town *Management of Urban Stormwater Impacts Policy* 5. Also see the discussion under para 2.3.2.3 in this study on the distinction between grey and ecological infrastructure.
[1455] City of Cape Town *Management of Urban Stormwater Impacts Policy* 6.
[1456] City of Cape Town *Management of Urban Stormwater Impacts Policy* 8.
[1457] City of Cape Town *Management of Urban Stormwater Impacts Policy* 8.
[1458] City of Cape Town *Management of Urban Stormwater Impacts Policy* 8.
[1459] City of Cape Town *Management of Urban Stormwater Impacts Policy* 8.

The best management practices are also to be adapted to meet the local conditions of the communities where they are located, especially as there is often a shortage of land in informal areas, making treatment at source impractical.[1460] The Policy identifies the importance of promoting urban biodiversity, alignment with other sustainability and WSUD initiatives and introducing incentive schemes to promote and facilitate the adoption of WSUD measures by private developers and individual households, as well as ongoing monitoring of stormwater treatment.[1461]

5.2.2.2 Protection of urban aquatic ecosystems

This dimension is assessed based on the conservation plans and strategies adopted by the city, the mainstreaming of urban aquatic ecosystem protection, and the protection of the coastal environment.

5.2.2.2.1 Adopting conservation plans and strategies

On the biodiversity front the city has developed and adopted a *Local Biodiversity Strategy and Action Plan* (2019) and the *Cape Town Bioregional Plan* (2015), that are used by a variety of sectors whose decisions have an impact on urban biodiversity to inform and direct planning, environmental assessment, and natural resource management.[1462] The *Bioregional Plan* provides for the integrated management of wetlands, rivers and coastal areas. It further aims to ensure the preservation of the city's ecosystems so that they continue to provide residents with high-quality, long-lasting environmental goods and services, including those of recreation, tourism, environmental education, and job creation.[1463]

[1460] City of Cape Town *Management of Urban Stormwater Impacts Policy* 9.
[1461] City of Cape Town *Management of Urban Stormwater Impacts Policy* 10-11.
[1462] City of Cape Town 2022 https://www.capetown.gov.za/Explore%20and%20enjoy/nature-and-outdoors/Be-an-eco-tourist/Our-conservation-strategies-and-plans; City of Cape Town *Bioregional Plan* 2.
[1463] City of Cape Town *Bioregional Plan* 10-11.

The *Bioregional Plan* contains the biodiversity profile for the bioregion, the Biodiversity Network (BioNet) and guidelines pertaining to land-use planning and decision-making. These guidelines aim to serve as a guide for various sectors whose policies and decisions influence biodiversity, including land-use planning, environmental assessments and authorisations, and natural resources management.[1464] The BioNet is a spatial plan that identifies terrestrial and aquatic features that are essential for preserving biodiversity and sustaining ecosystem functioning. These are classified as CBAs and critical ESAs respectively.[1465] The BioNet was integrated into the CTSDF, which was then approved as the statutory spatial component of the IDP.[1466]

To implement the BioNet, the city makes use of the protections under the NEMPAA, and will mainstream the *Bioregional Plan* into planning and development, maintain and review existing partnerships, and increase the quantity of conservation land through internal and external partnerships, stewardship programmes, and land acquisition.[1467] The LBSAP, BioNet and *Bioregional Plan* have integrated climate change considerations and make explicit provision for climate adaptation measures which include ecological processes and services.[1468] Notably, the *Bioregional Plan* acknowledges the importance in the value of healthy ecosystems' delivery of goods and services (e.g. clean water) in ensuring the long-term survival of human, plant and animals species in response to rapid climatic changes.[1469]

The *Bioregional Plan* provides for broad, generic environmental principles and guidelines for land use and decision-making. Concerning protected areas, the Plan specifies that management plans are required and must be implemented, monitored, and reviewed,

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[1464] City of Cape Town *Bioregional Plan* 2, 9, 19-20. The Plan identifies several government departments and agencies whose decisions and actions impact on biodiversity and the natural environment including the DWS, national and provincial environment departments and CMAs, amongst others.
[1465] City of Cape Town *Bioregional Plan* 2; City of Cape Town *MSDF* 62, 197.
[1466] City of Cape Town *Bioregional Plan* 25; City of Cape Town *MSDF* 57.
[1467] City of Cape Town *Local Biodiversity Strategy and Action Plan* 74.
[1468] City of Cape Town *Bioregional Plan* 12, 14 and 27.
[1469] City of Cape Town *Bioregional Plan* 13.

invasive alien species (IAS) control programmes should be prioritised and implemented, and legal boundaries must be surveyed and permanently marked.[1470] Compatible actions comprise conservation, low-impact recreation and ecotourism and environmental education, and development on existing footprints only, or in adjacent degraded areas.[1471] Regarding CBAs,[1472] appropriate formal protected area status should be obtained. Furthermore, the Plan requires interim measures to secure their long-term protection through conservation agreements for example.[1473] Since ESAs are required to maintain large-scale ecosystem processes, climate change mitigation, animal movement corridors and other large-scale ecosystem processes, the *Bioregional Plan* aims to secure appropriate land-use zoning or formal protected area status where possible.[1474]

The Plan also makes provision for biodiversity offsets and holds that where a significant negative impact on biodiversity cannot be minimised or mitigated, desirable developments may be approved based either on an on-site offset (which would include a stewardship agreement and management mechanism for the conservation area set aside) or an off-site offset to conserve biodiversity at an alternative site.[1475]

The LBSAP identifies six strategic objectives necessary for the city to implement the Plan.[1476] The first strategic objective relates to developing and maintaining relevant policies and strategies to ensure alignment with relevant international, national, provincial and City of Cape Town legislation, policies, and strategies.[1477] This requires the ongoing strategic alignment of all branch policies, the IDP, and provincial and national strategy.[1478] To achieve this the city needs to review its existing policies, identify gaps and develop new or update existing laws and policy, and align its by-laws,

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[1470] City of Cape Town *Bioregional Plan* 40.
[1471] City of Cape Town *Bioregional Plan* 48.
[1472] City of Cape Town *Bioregional Plan* 49.
[1473] City of Cape Town *Bioregional Plan* 52.
[1474] City of Cape Town *Bioregional Plan* 54.
[1475] City of Cape Town *Bioregional Plan* 59.
[1476] City of Cape Town *Local Biodiversity Strategy and Action Plan* 40-73.
[1477] City of Cape Town *LBSAP* 41. Also see paras 3.2.2.3, 3.2.3.3 and 4.3.4.
[1478] City of Cape Town *LBSAP* 41.

policies and strategies to those at international, national and provincial levels.[1479] Likewise, the city will need to map ecosystem services and infrastructure for the BioNet (the green infrastructure plan). Several legislative tools for biodiversity protection have been developed and implemented by the city.[1480] In the medium term the city should strive for mainstream its *Bioregional Plan* into decision making by integrating the overlay zone in the zoning scheme as well as developing a by-law and internal rules for the management and protection of protected areas.[1481]

The LBSAP further identifies securing the formal conservation status and managing and maintaining identified and existing wetland priority sites as a second strategic objective.[1482] The outcome for this objective is to ensure adequate protection and management to mitigate further biodiversity loss. Some of the actions to achieve this outcome entail ensuring that biodiversity and infrastructure on the reserves is managed according to best management practices, investigating how the impacts of global environmental change (including climate change) can be incorporated into the management of the protected areas, and implementing management and subsidiary plans for protected areas.[1483]

Strategic objective 4 focuses on significantly reducing the threat posed by invasive species to Cape Town's natural economic and social assets.[1484] The aim of this objective is to reduce the invasive species in Cape Town through the implementation of sustainable programmes.[1485] Firstly, the city aims to collaborate with the DFFE on an ongoing basis to minimise the risk of new invasive species entering the city boundaries, and will identify, monitor and manage invasion pathways to prevent invasive species from being moved to areas within the boundaries of the city where they do not

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[1479] City of Cape Town *LBSAP* 41.
[1480] City of Cape Town *LBSAP* 43.
[1481] City of Cape Town *LBSAP* 43-45.
[1482] City of Cape Town *LBSAP* 47.
[1483] City of Cape Town *LBSAP* 50-51.
[1484] City of Cape Town *LBSAP* 58.
[1485] City of Cape Town *LBSAP* 58.

occur.[1486] Secondly, it purposes to manage, control and monitor the distribution and efficacy of control methods to target invasive species according to management plans.[1487] Notably, the most significant action here is coordinating invasive species control in the city's Strategic Water Source Areas. Another activity focuses on reducing the extent of the prevalence of listed invasive plants on proclaimed protected areas, on biodiversity agreement sites and in aquatic waterways.[1488] The monitoring, eradication and control of invasive species also need to be integrated in the city's IDP. The city will collect, collate and analyse data on invasive species and manage a comprehensive database in compliance with NEMBA.[1489]

To ensure the effective and efficient management of the biodiversity management branch, the LBSAP commits to developing and implementing a monitoring plan. This will entail developing an ecological monitoring plan for biodiversity in the city and ensuring the alignment of the invasive species programme,[1490] developing and implementing appropriate ecological monitoring programmes for protected areas, developing an ecological integrity monitoring programme, and investigating how to monitor the impacts of climate change as well as the biodiversity contribution to climate change resilience.[1491] Ultimately the LBSAP aims for a holistic and multifaceted approach to biodiversity conservation, protection, promotion and use.

The CTSDF maps out its proposed actions for implementing many of the described initiatives through spatial strategies. These actions are linked to policy guidelines and specific measures to be taken by the city.[1492] Some of the specific measures and policy guidelines which relate to water security include supporting the introduction and implementation of by-laws and policies on sustainable resource use, including exploring

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1486 City of Cape Town *LBSAP* 58.
1487 City of Cape Town *LBSAP* 59.
1488 City of Cape Town *LBSAP* 61.
1489 City of Cape Town *LBSAP* 62-63.
1490 City of Cape Town *LBSAP* 69.
1491 City of Cape Town *LBSAP* 70.
1492 City of Cape Town *MSDF* 105.

opportunities to restore and protect the city's aquifers.[1493] This would necessitate incorporating aquifer protection and restoration needs into spatial planning, development, and landscape design strategies and policies.[1494] To increase efforts to enhance and protect biodiversity, the CTSDF aims to utilise the Bioregional Plan as a means of assessing the impact of development on CBAs and to make relevant decisions based on the development guidelines, including the consolidation of existing conservation and protected areas, especially where these provide buffers against climate change.[1495]

Additionally, the CTSDF strives to mitigate the impact of urban development on ecosystems. To that end, it seeks to encourage responsible water consumption and supply, safeguard the health of aquatic ecosystems in the area, and responding to climate change, all of which could have an impact on water scarcity and flood frequency.[1496] Importantly, the CTSDF advises that land-use management decisions should take the following WSUD principles into account: maintaining natural stream and catchment flow, integrating water with the landscape, protecting and restoring water quality, and reducing the demand for water.[1497] In the same vein, development should not unduly compromise the city's freshwater ecosystems, especially those aquifers with the ability to be used as water sources. [1498]

The CTSDF also sets out development directives based on environmental, risk and social factors that are likely to impact on the development potential of sites and that may trigger additional legislative processes such as EIAs, for example.[1499] Developments must show how they avoid risk, conserve assets, align with the city's investment

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[1493] City of Cape Town *MSDF* 122.
[1494] City of Cape Town *MSDF* 122.
[1495] City of Cape Town *MSDF* 123, 127. The CBAs include statutory conservation areas that are formally protected and managed, ecological corridors such as coastal and dune protection zones, major river corridors and water bodies, and other ecological support areas.
[1496] City of Cape Town *MSDF* 128.
[1497] City of Cape Town *MSDF* 128.
[1498] City of Cape Town *MSDF* 128.
[1499] City of Cape Town *MSDF* 56, 59. Also see para 4.3.4.

priorities and contribute to spatial transformation.[1500] In an application for assessment the applicant will demonstrate that it has been cognisant of the relevant environmental management instruments.[1501] The environmental development directives include those pertaining to the coastal edge, protected environmental or marine areas and wetlands. These directives are tied to the city's *Coastal Management Policy* and *Coastal By-law*, *Climate Change Policy*, *Bioregional Plan*, and various other instruments in the city.[1502] These directives support the prevention of urban development on the coastal edge, prevent the weakening or destruction of water sources through the inappropriate location and design of developments, and could result in the rejection of development where protected areas have been properly delineated, for example.[1503]

5.2.2.2.2 Mainstreaming ecosystem protection

As stated earlier, municipalities should mainstream and integrate biodiversity considerations into their policies and strategies. The IDP for Cape Town seeks to manage urban growth and strike a balance between urban development and environmental protection, among other things, through the more efficient use of infrastructure, social facilities, and amenities, and the more sustainable use of natural resources (land and water).[1504] As such, this spatial priority aims to promote actions such as the efficient use of resources such as land, water and biodiversity, including protecting and maintaining existing surface and groundwater resources and maintaining existing and future water supplies.[1505] Further actions include avoiding or managing the negative impacts of development on natural resources, and considering biodiversity and aquatic resources when planning new development.[1506]

1500 City of Cape Town *MSDF* 57.
1501 City of Cape Town *MSDF* 61; s 12(1) of SPLUMA.
1502 City of Cape Town *MSDF* 61.
1503 City of Cape Town *MSDF* 62-63.
1504 City of Cape Town *Integrated Development Plan* 74.
1505 City of Cape Town *Integrated Development Plan* 74.
1506 City of Cape Town *Integrated Development Plan* 74.

The importance of preserving natural assets and ecosystems for climate change adaptation is appropriately recognised in the IDP. In this regard the IDP strives for the protection and conservation of biodiversity and the management of coastal systems, as well as the preservation of green infrastructure.[1507] The climate change programme[1508] is appropriately supported and reinforced by various projects, which include biodiversity, coastal and green infrastructure management, integrated coastal management, invasive species management, waste minimisation and recycling.

The IDP identifies various projects that can be tied in with water security dimensions.[1509] The city's invasive species management project, which is aligned with its LBSAP, aims to implement invasive species management plans.[1510] The green infrastructure programme currently underway also supports the climate change programme, which is based on the identification of ecosystem services provided by natural and green open spaces in the city.[1511] The project focuses on flood attenuation, water purification and filtration, coastal zone protection, and recreational and cultural opportunities.[1512] The programme plans for a policy and by-law review with the intention of embedding green infrastructure principles and approaches transversally in the city.[1513]

The *Cape Town Spatial Development Framework* (CTSDF)[1514] commits to servicing, protecting, enhancing and extending critical natural assets through investing in protecting of these resources.[1515] This entails protecting the resources by proclaiming them under NEMPAA as conservation areas or as CBAs.[1516] The *Municipal Planning By-law* (2015) emphasises the CTSDF as the principal policy tool for evaluating applications

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1507 City of Cape Town *Integrated Development Plan* 104.
1508 Programme 1.4 B in the City of Cape Town *Integrated Development Plan* 102-106.
1509 City of Cape Town *Integrated Development Plan* 106.
1510 City of Cape Town *Integrated Development Plan* 106.
1511 City of Cape Town *Integrated Development Plan* 106.
1512 City of Cape Town *Integrated Development Plan* 106.
1513 City of Cape Town *Integrated Development Plan* 106.
1514 City of Cape Town *Municipal Spatial Development Framework* (hereafter MSDF) 2.
1515 City of Cape Town *MSDF* 52.
1516 City of Cape Town *MSDF* 53.

for new or enhanced land use rights.[1517] The City plans to recharge the Cape Flats aquifer which provides drinking water to a portion of the city. These projects are part of the city's strategy to create a water-sensitive city that will maximise the use of the urban water cycle and protect Cape Town's natural ecosystems.[1518]

This spatial strategy aims to make the most of non-renewable resources such as land, water and biodiversity, and to sustainably manage existing and future water supplies. It encourages the use of these resources to enhance spatial justice and requires the inclusion of biodiversity, aquatic resources and networks considerations when planning new development.[1519] The CTSDF also contains commitments aimed at avoiding or managing negative development impacts on natural resources, considering their finite nature and the costs associated with mitigating or rehabilitating degraded natural areas, and promoting risk-averse and sustainable urban development along the coast.[1520] It also actively pursues national biodiversity targets as defined in the city's *Bioregional Plan*.[1521]

Beyond the development directives the CTSDF also identifies various conceptual designations that are important to directing development in the city.[1522] These include the spatial transformation areas, intensification areas, and additional spatial informants. The spatial transformation areas describe the land-use guidelines for the urban inner core, incremental growth and consolidation areas, and critical natural areas.[1523] In this instance the CTSDF describes the desired land use outcomes, refraining from certain land uses, and in the case of critical natural areas aims to enhance and connect the critical natural assets that support the city and regional environment and ecology.[1524]

[1517] City of Cape Town *MSDF* 172; City of Cape Town *Municipal Planning By-law* (2015) as amended.
[1518] City of Cape Town *Water Strategy* 28.
[1519] City of Cape Town *MSDF* 57.
[1520] City of Cape Town *MSDF* 57.
[1521] City of Cape Town *MSDF* 57.
[1522] City of Cape Town *MSDF* 146.
[1523] City of Cape Town *MSDF* 73-75.
[1524] City of Cape Town *MSDF* 73-75.

The CAP aims to protect both human and ecosystem health.[1525] The first objective is to design and implement a green infrastructure programme that helps mitigate the effects of climate change while also safeguarding biodiversity and improving ecosystem services.[1526] To achieve this the *Climate Change Strategy* and CAP are aligned with the *Bioregional Plan*, BioNet and LBSAP.[1527] Through spatial and policy frameworks, for instance, the green infrastructure programme aims to guide land-use decision making and appropriate urban development. Furthermore, it should be aimed at resolving inequalities by encouraging the development of high-quality, safe green spaces all over the city, as well as fostering a renewed relationship between humans and the natural world and improving the health and well-being of local communities.[1528]

5.2.2.2.3 Protecting the coastal ecosystem

The Cape Town *Coastal By-law* (2020) aligns with the vision of the city's *Integrated Coastal Management Policy* (2014).[1529] In order to manage the many facets of Cape Town's coast in a way that advances the its policy goals, an integrated coastal management framework is currently under development.[1530] Cape Town's integrated coastal management framework primarily comprises of the *Coastal By-law*, coastal overlay zones, coastal operational management protocols, the integrated coastal management programme[1531] and the coastal economic and spatial development plan.[1532]

The city aims to steer future coastal development toward safeguarding existing coastal processes and systems. This will involve the implementation of measures such as the establishment of a Coastal Overlay Zone and the implementation of Estuary Management Plans to provide the necessary framework to safeguard the existing

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1525 City of Cape Town *Climate Change Strategy* 46; City of Cape Town *Climate Change Action Plan* 114.
1526 City of Cape Town *Climate Change Strategy* 46; City of Cape Town *Climate Change Action Plan* 115.
1527 City of Cape Town *Climate Change Action Plan* 115.
1528 City of Cape Town *Climate Change Action Plan* 116.
1529 *Cape Town Coastal By-law* (2020); City of Cape Town *Integrated Coastal Management Policy* (2014).
1530 City of Cape Town *Integrated Coastal Management Policy* 8-9, 14.
1531 This refers to a coastal management programme adopted in terms of s 48 of NEMICMA.
1532 City of Cape Town *Integrated Coastal Management Policy* 15.

coastal systems and areas at risk of development.[1533] In order to keep coastal ecosystems thriving, water quality high, and vulnerable coastlines protected from erosion and storm surges, estuaries serve multiple functions, all of which can be better managed with a well-crafted Estuary Management Plan.[1534] Cape Town will also implement measures to rehabilitate degraded coastal systems such as beaches, estuaries, rocky shores, coastal wetland systems and dune systems.[1535] It will also play an active role in the regulation of activities that have an impact on Cape Town's coastline, such as the proclamation of marine protected areas.[1536] To minimise the impacts of risk associated with sea level rise and storm surge events and promote the long-term sustainability of coastal development in the city, the City of Cape Town will develop and implement a Coastal Protection Zone (CPZ) and identify Coastal Flood Risk Areas (CFRAs).[1537]

Expanding on this, the CTSDF requires that the development of coastal areas be done in a way that does not reduce, harm, or degrade the environment. Similarly, development in high flood risk areas also needs to be avoided and carefully managed.[1538] It should also be conducted in a way that will enhance the character and integrity of the adjacent wetlands and watercourses.[1539] The principles in consideration with this directive are linked to the city's *Integrated Coastal Management Policy* (2014) and its *Floodplain and River Corridor Management Policy* (2009).[1540] The city defines its coastal edge as a delineated area around the coast that restricts urban development,

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1533 City of Cape Town *Integrated Coastal Management Policy* 11-12.
1534 City of Cape Town *Integrated Coastal Management Policy* 11-12.
1535 City of Cape Town *Integrated Coastal Management Policy* 11-12. DEA *Guidelines for the Development and Implementation of Estuarine Management Plans in terms of the National Estuarine Management Protocol*.
1536 City of Cape Town *Integrated Coastal Management Policy* 11-12.
1537 City of Cape Town *Bioregional Plan* 60.
1538 City of Cape Town *MSDF* 65.
1539 City of Cape Town *MSDF* 65.
1540 See City of Cape Town *Integrated Coastal Management Policy* and City of Cape Town 2022 https://resource.capetown.gov.za/documentcentre/Documents/Bylaws%20and%20policies/Floodplain%20and%20River%20Corridor%20Management%20Policy%20-%20approved%20on%2027%20May%202009.pdf.

primarily to protect coastal resources and avoid hazards and financial risks associated with areas at risk of flooding, storm surges, and long-term climate change impacts.[1541]

In terms of risk management and mitigation, the city will adopt a risk-averse and cautious approach in addressing the threats posed by storm surges and coastal erosion.[1542] In this vein it will approve only projects that are designed to safeguard the private property of their occupants from the threat of coastal erosion. It will also require the inclusion of climate change adaptation measures in the approval process.[1543] Likewise, the Policy also requires that the project be managed in a way that will not compound the risk to the city.[1544] The Policy provides a strategic and overarching guideline that defines the rationale for developing coastal regulatory mechanisms in the city. To this end, the By-law contains regulations aiming at ensuring socially and environmentally sound activities along the coast, thereby enhancing, protecting, and optimising social and recreational opportunities.[1545] The By-law expresses the city's duties *inter alia* to ensure the sustainable use and development of the coastal area by aligning municipal planning with the NEMICMA, by promoting the protection of the natural environment of the coastal zone and by providing measures to mitigate and manage the impacts of coastal erosion and storm surge events.[1546]

Neither the Policy nor the By-law addresses desalination in Cape Town. Given that desalination would result in an important alternative water supply which would impact on water security and coastal management, this is a significant oversight by the city. The By-law also does not address the clearing of alien vegetation, the provision of a safety measure intended to reduce the risk of injury to people, the rehabilitation and management of the coastal zone, waste removal and disposal, stormwater

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1541 City of Cape Town *MSDF* 73-75.
1542 City of Cape Town *Integrated Coastal Management Policy* 13.
1543 City of Cape Town *Integrated Coastal Management Policy* 13.
1544 City of Cape Town *Integrated Coastal Management Policy* 13.
1545 City of Cape Town *Integrated Coastal Management Policy* 16.
1546 Sections 2(1) (b), (c) and (f) of the *City of Cape Town Coastal By-law* (2020) (hereafter *Coastal By-law*).

management, and the demarcation and containment of pollution.[1547] The By-law provides an important means of regulation and oversight. Should it have addressed the aforementioned it would have made an important contribution to the alignment between, enforcement of and implementation of the Coastal Management Programme, *Integrated Coastal Management Policy* and the CTSDF in its application to the coastal area.

The By-law importantly provides for the protection of the coastal zone through the implementation of a duty of care, which prohibits any person from causing, continuing to cause, or contributing to an adverse effect on the coastal zone.[1548] To this end the By-law prescribes that:

> A person who: causes an adverse effect in the coastal zone; contributes to an adverse effect in the coastal zone; allows an adverse effect to continue in the coastal zone; or owns, controls, or has the right to use land on, or premises in which an activity occurs, that— causes an adverse effect to continue in the coastal zone; contributes to an adverse effect in the coastal zone; or allows an adverse effect to continue in the coastal zone - must take reasonable measures to prevent the adverse effect from occurring, or continuing from recurring, and must remedy the adverse effect.[1549]

The duty of care principle is important in that it will hold any person liable for the activities mentioned in the section, to ensure the sustainable use and development of the coastal area, as well as to promote the protection of the natural environment of the coastal zone. Additionally, the By-law speaks to the protection of the coastal environment by prohibiting any person from undertaking specific actions such as interfering with, impeding, or restricting the natural dynamic coastal process unless written authorisation is granted by the city.[1550]

While the *Coastal By-law* does not deal with waste removal and disposal by the city, it does prohibit people from littering in the coastal zone, disturbing, altering or

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[1547] Sections 3(2) (a)-(k) of the *Coastal By-law*.
[1548] S 5 of the *Coastal By-law*.
[1549] S 5(2)(a)-(d)(i)-(iii) of the *Coastal By-law*.
[1550] S 7(2)(a)-(d) of the *Coastal By-law*.

contaminating a water body, water source or water supply, and draining or redirecting contaminated water from private land into the coastal zone.[1551] Accordingly, the By-law makes it possible for the city to erect signs displaying pictograms that set out activities which are allowed, or are prohibited, at various places within the coastal zone.[1552] The By-law provides strict enforcement mechanisms and defines the offences and penalties should a person be guilty of an offence in terms of the *Coastal By-law*. A person may for example be liable to a fine, and upon conviction to a period of imprisonment not exceeding two years.[1553]

Cape Town's integrated coastal management programme provides a comprehensive approach to managing the various aspects of the coastal environment it has jurisdiction over.[1554] It will also set the standards and operating protocols that will ensure that the various coastal aspects are in line with national legislation.[1555] To address coastal hazards, such as storm surge, coastal erosion and coastal flooding from estuaries, the by-law focuses on developing a coastal overlay zone, managing risk through existing land use management regulatory systems.[1556]

When property or infrastructure is at risk from coastal hazards, the overlay zone will apply additional development regulations. This will allow the municipality to effectively manage the development of areas at risk through strategic land use and building development.[1557] There is also a concern that the municipality may struggle to effectively manage development in these vulnerable areas, especially as pressure mounts to expand the urban edge and revise regulations in favour of property development.[1558] This conflict between the interests of property developers and the

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[1551] S 7(4)(a)-(b)(i)-(iii) of the *Coastal By-law*.
[1552] S 11(2)(a)(i)-(ii) of the *Coastal By-law*.
[1553] S 28(1)-(2) of the *Coastal By-law*.
[1554] City of Cape Town *Integrated Coastal Management Policy* 16.
[1555] City of Cape Town *Integrated Coastal Management Policy* 16.
[1556] City of Cape Town *Integrated Coastal Management Policy* 15.
[1557] City of Cape Town *Integrated Coastal Management Policy* 16.
[1558] Taylor, Cartwright and Sutherland *Institutional Pathways for Local Climate Adaptation* 60-61.

principles of sustainable urban planning is exemplified by the fact that property developers have already submitted applications and City councillors are pushing the City administration to deviate from the agreed principles in the CTSDF.[1559] As such, the implementation of the overlay zone raises questions about the municipality's ability to balance the interests of property developers with the need to uphold sustainable urban planning principles in areas at risk of coastal hazards.

When it comes to planning and development activities near wetlands and watercourses, the city's regulations require that they be designed in a way that addresses the various environmental and socio-economic factors that affect the area.[1560] When evaluating applications, it is important to consider ecological buffers which provide continuous habitats for various aquatic and terrestrial species. These measures are designed to protect wetlands and watercourses from the effects of development and activity on their adjacent riparian areas.[1561] Aside from reducing the amount of water that ends up in the receiving waters, the use of buffers can also help improve the quality of the streams and other sources of pollution.[1562] The use of wetlands and watercourses can also help stimulate local economies and break down social and political barriers. It is therefore important that the development of adjacent areas is carried out in a way that will benefit the local community and the environment.[1563]

Both the city's CAP and its *Climate Change Strategy* aim to ensure coastal management and resilience. Both coastal communities and ecosystems stand to benefit from the promotion of coastal resilience, Together, these objectives seek to establish efficient co-operative and empowering mechanisms for dealing with difficult problems of coastal management in the face of climate change.[1564] To achieve the first objective, a process must be set in motion to make coastal communities and ecosystems more resilient to

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[1559] Taylor, Cartwright and Sutherland *Institutional Pathways for Local Climate Adaptation* 60-61.
[1560] City of Cape Town *Floodplain and River Corridor Management Policy* 8.
[1561] City of Cape Town *Floodplain and River Corridor Management Policy* 8.
[1562] City of Cape Town *Floodplain and River Corridor Management Policy* 8.
[1563] City of Cape Town *Floodplain and River Corridor Management Policy* 9-10.
[1564] City of Cape Town *Climate Change Strategy* 33; City of Cape Town *Climate Change Action Plan* 47.

the consequences of coastal pressures caused by climate change.[1565] The first step is to conduct an in-depth analysis of the many environmental, social, and economic factors that influence coastal areas and ecosystems to determine the current regulations and what additional measures are needed.[1566] This will also help identify areas where additional regulations are needed.

To effectively address the effects of climate change on Cape Town's coastal environment, the city is also required to develop a coastal and sea-defence decision framework. The framework will also be used to identify and implement various interventions that are designed to improve the coastal environment.[1567] Some of these include the rehabilitation of natural coastal ecosystems and the establishment of vegetated dune systems.[1568] Other interventions include the construction of sea walls and the upgrading of existing infrastructure. Secondly, the first goal requires conducting ongoing legal reviews and conducting transdisciplinary studies related to the effects of climate change on the coastal environment.[1569] Updating the sea-level rise risk assessment is also crucial to ensure that all necessary measures are in place to mitigate future risks. Additionally, fine-scale erosion assessments should be conducted to identify areas that are particularly susceptible to erosion.[1570] Overall, a multi-pronged approach that combines physical interventions with ongoing research and assessments is necessary to effectively address the challenges of climate change on the coastal environment.

The city also conducts regular legal reviews and studies to address the various legal issues related to the ownership and liability of properties in the coastal areas.[1571] These include continuing implementation of its *Coastal Management By-law* (2020) and its

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[1565] City of Cape Town *Climate Change Action Plan* 48.
[1566] City of Cape Town *Climate Change Action Plan* 48.
[1567] City of Cape Town *Climate Change Action Plan* 49.
[1568] City of Cape Town *Climate Change Action Plan* 49.
[1569] City of Cape Town *Climate Change Action Plan* 50.
[1570] City of Cape Town *Climate Change Action Plan* 50.
[1571] City of Cape Town *Climate Change Action Plan* 50.

provisions related to managing the impacts of climate change on coastal management. Secondly, the city regularly reviews national and provincial legislation to ensure that it is in line with the legislation and is adequately prepared to address the various risks associated with climate change.[1572] Cape Town also plans to establish planning regulations that will allow it to manage the effects of climate change on the coastal zone, such as coastal overlay zones.[1573] This strategic framework area and its goals acknowledge the significance of efficient co-operative and empowering mechanisms in the context of climate change for addressing challenges in coastal management.[1574] The goal is to establish effective co-operative mechanisms for addressing the various complex coastal management issues related to climate change.[1575] This will allow the public, businesses, and other government agencies to work together on a regular basis.

5.2.2.3 Protection against water-related climate risks and disasters

The city acknowledges its responsibility of ensuring water security in the face of the challenges of increasing population, unpredictable weather conditions, natural water scarcity and the need to connect more people to water.[1576] To address the effects of droughts, the city implemented various measures such as demand management initiatives, monitoring dam behaviour, and accelerating the implementation of augmentation projects, aquifer recharge projects, and the development of long-term and permanent re-use projects.[1577] Additional measures include managing the city's financial impacts through adjusted tariff structures, coordinating with different spheres of government, and improving citizen and stakeholder involvement in addressing various problems.[1578]

[1572] City of Cape Town *Climate Change Action Plan* 50. Also see the discussion of the *Coastal Management By-law* (2020) in para 5.4.2.6 of this study.
[1573] City of Cape Town *Climate Change Action Plan* 50.
[1574] City of Cape Town *Climate Change Strategy* 32; City of Cape Town *Climate Change Action Plan* 51.
[1575] City of Cape Town *Climate Change Action Plan* 51.
[1576] City of Cape Town *Water Strategy 2019* 3.
[1577] City of Cape Town *Water Outlook Report 2018* 11.
[1578] City of Cape Town *Water Outlook Report 2018* 11.

Cape Town's CAP is streamlined across all its development instruments as envisioned in the international, regional and national frameworks.[1579] Cape Town adopted a *Climate Change Policy* in 2017, which envisions to become a low-carbon, climate-resilient, resource-efficient city with inclusive economic and social development and environmental sustainability..[1580] The review of the Policy culminated in the *Climate Change Strategy* (2021) which should be read in conjunction with the *Climate Change Action Plan* (2021).[1581] The *Climate Change Strategy* provides a broad framework for decision-making regarding climate change. It also has the strategic direction for implementing the various actions and programmes of action.[1582] The *Climate Change Action Plan* provides a framework for the various actions that the municipality will take in response to climate change. These actions are supported by various categorised subsidiary actions and are designed to be carried out in a programmatic manner.[1583]

The Strategy and CAP also identify several cross-cutting work areas and goals which support the implementation of the strategic focus areas.[1584] Cape Town therefore commits firstly to mainstreaming climate change responses into all strategies, policies, processes, and plans integrating a climate change response into the relevant sector plans, assisting the relevant departments in assessing climate risks, and providing support to the relevant departments in considering climate risks.[1585] The city's climate change response strategy and policies are to be integrated into its existing strategies, by-laws, plans and implementation plans when they are reviewed and updated.[1586]

1579 See paras 3.2.3.4, 3.3.2.4, and 4.3.5. City of Cape Town *Integrated Development Plan* 102-103.
1580 City of Cape Town *Climate Change Policy*. Taylor and Davies "An Overview of Climate Change and Urban Development in Cape Town" 56-57.
1581 City of Cape Town *Climate Change Strategy* 5, 47; City of Cape Town *Climate Change Action Plan* 15,22.
1582 City of Cape Town *Climate Change Strategy* 47.
1583 City of Cape Town *Climate Change Strategy* 47.
1584 City of Cape Town *Climate Change Strategy* 41; City of Cape Town *Climate Change Action Plan* 93.
1585 City of Cape Town *Climate Change Action Plan* 93.
1586 City of Cape Town *Climate Change Action Plan* 94.

In adherence to ensuring an evidence base for its climate actions, The city mapped climate hazards, identified vulnerable areas (spatially and across sectors), conducted an economic risk analysis, pinpointed specific risk areas based on the combination of hazards and vulnerability, and compiled a list of suggested adaptation options in order to provide a solid foundation for its climate actions.[1587] The climate risks identified include drought and water shortages, flooding and their effects on people and buildings, coastal erosion and sea level rise and their effects on coastal buildings, and damage from intense storms and high winds.[1588]

The framework for action identified by the *Strategy* and CAP entails an ongoing process of evaluation, assessment and learning.[1589] The actions that the city will take in implementing its vision and goals are related to the areas of governance and regulation. These include adapting institutional arrangements, policies, strategies and by-laws that will enable the mainstreaming of the climate change response.[1590] Additionally, the actions comprise of climate-responsive and transformational planning and the establishment of incentives and financial support for climate-resilient infrastructure development.[1591] Further actions encompass integrated infrastructure development and maintenance, training and skills development, behaviour change and communications, collaboration and partnerships, and research, data and knowledge management.[1592] To ensure the implementation of the city's climate change vision and principles, the Strategy and CAP identify six strategic focus areas and associated goals and actions which focus on climate change adaptation and mitigation.[1593]

Strategic framework area 2 focuses on water security and drought-readiness and aligns with the *Water Strategy* in taking bold action to reduce the risk of drought and water

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[1587] City of Cape Town *Climate Change Strategy* 15; City of Cape Town *Climate Change Action Plan* 16.
[1588] City of Cape Town *Climate Change Action Plan* 18.
[1589] City of Cape Town *Climate Change Strategy* 27; City of Cape Town *Climate Change Action Plan* 30.
[1590] City of Cape Town *Climate Change Strategy* 27; City of Cape Town *Climate Change Action Plan* 30.
[1591] City of Cape Town *Climate Change Strategy* 27; City of Cape Town *Climate Change Action Plan* 30.
[1592] City of Cape Town *Climate Change Strategy* 28; City of Cape Town *Climate Change Action Plan* 30.
[1593] City of Cape Town *Climate Change Strategy* 29; City of Cape Town *Climate Change Action Plan* 29.

scarcity.[1594] The goals under this area are to reduce the demand for water, to protect water resources and ensure sustainability of supply, which entails the continued implementation of the WC/WDM programme.[1595] The WC/WDM actions relate to infrastructure programmes and behavioural interventions, all of which are highlighted in the city's WSDP and *Water Strategy*. In addition, another action entails working on augmenting and increasing water supplies to achieve the long-term sustainability of supply, which is reliant on augmenting projects, monitoring climate change impacts, and developing a bulk water decision support system.[1596]

Despite identifying groundwater as an alternative water supply, the CAP does not specify implementing or developing a monitoring system and publicly accessible database of groundwater abstraction. The last action entails getting rid of alien invasive plants in the city's natural areas and water catchment or aquifer recharge areas.[1597] The CAP stresses the significance of carrying forward with climate change research and good governance measures, such as an assessment of climate change impacts and regular stakeholder engagement, beyond merely repeating the interventions outlined in the *Water Strategy* and WSDP.[1598]

Under strategic framework area 3 the city focuses on water sensitivity, flood readiness and storm management.[1599] To address the challenges associated with this area the city commits to working towards proactively reducing flood risk through the implementation of a water-sensitive city strategy or plan. This goal requires developing and implementing a water-sensitive city strategy or plan that focuses on economic and financial incentives, regulatory mechanisms and direct investment in infrastructure for

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1594 City of Cape Town *Climate Change Strategy* 31; City of Cape Town *Climate Change Action Plan* 39. Also see the discussion in paragraph 5.4.2.4 on the Water Strategy.
1595 City of Cape Town *Climate Change Strategy* 31; City of Cape Town *Climate Change Action Plan* 40.
1596 City of Cape Town *Climate Change Action Plan* 41.
1597 City of Cape Town *Climate Change Strategy* 31; City of Cape Town *Climate Change Action Plan* 39, 42.
1598 City of Cape Town *Climate Change Action Plan* 41.
1599 City of Cape Town *Climate Change Strategy* 32; City of Cape Town *Climate Change Action Plan* 43.

WSUD in Cape Town.[1600] To accomplish this, Cape Town will need to improve its capacity to address flood-risk through enhanced flood risk mapping and the implementation of early-warning systems, as well as take action to reduce flood risk and storm damage through disaster mitigation approaches.[1601] Additional subsidiary actions involve the rehabilitation and restoration of a wetland and the connection of the wetland with the groundwater. It should also involve long-term collaborations and educational opportunities with the local community.[1602]

The CAP also acknowledges the importance of technology by mandating the development of a database of nature-based solutions and best practices for responding to climate change in Cape Town.[1603] The CAP also requires actions to address water pollution,[1604] and acknowledges that the pollution of inland water bodies and coastal waters has a direct impact on the city's resilience in terms of water security.[1605] To address this, the Water Quality Improvement Programme (WQIP) will be put into effect to determine the origins of pollution, create catchment-based pollution abatement plans, establish priority action plans to direct short- and medium-term mitigation, track how well they're working, and evaluate the efficacy of stormwater systems that empty into arid coastal regions.[1606]

The city's climate change responses should also be integrated into the city's strategic infrastructure, budgeting and project management processes, such as SDBIPs and the Medium-Term Expenditure Plans (MTEF).[1607] To achieve this, all capital projects need to be screened and prioritised to ensure that they are aligned with the city's climate change adaptation and mitigation goals. Other measures to ensure the effective

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[1600] City of Cape Town *Climate Change Strategy* 32; City of Cape Town *Climate Change Action Plan* 44.
[1601] City of Cape Town *Climate Change Strategy* 32; City of Cape Town *Climate Change Action Plan* 46.
[1602] City of Cape Town *Climate Change Action* Plan 45.
[1603] City of Cape Town *Climate Change Action Plan* 116.
[1604] City of Cape Town *Climate Change Strategy* 46; City of Cape Town *Climate Change Action Plan* 118.
[1605] City of Cape Town *Climate Change Action Plan* 118.
[1606] City of Cape Town *Climate Change Action Plan* 118.
[1607] City of Cape Town *Climate Change Action Plan* 94. See the discussion in para 4.3.3 on the inclusion of climate change in SDBIPs as per national law and policy.

mainstreaming of climate change response and research outputs include convening and maintaining transversal working groups, conducting and commissioning research on climate change, improving climate change data, modelling, and knowledge management, and continuing to use tools, methodologies, and platforms to enable an innovative climate response.[1608] This will allow it to take effective action and implement the necessary measures based on the best available scientific knowledge.

The *Disaster Risk Management Plan* (2015) speaks to prevention, risk-reduction and preparedness as well as emergency responsiveness.[1609] In line with the requirements under the *Disaster Management Act*, Cape Town has established a Disaster Risk Management Centre that specialises in issues concerning disasters and DRM and which promotes an integrated and co-ordinated approach to the DRM function.[1610] Concerning water and sanitation services, the DRM plan provides that the water sector needs to draft plans and provide for certain considerations in the water strategies and in water management.[1611] These include proactive programmes to support provision of alternative water supplies, the identification and optimisation of essential services that may require restoration in the midst of an emergency or disaster, and the establishment and maintenance of a resources database.[1612]

The *Disaster Risk Management Plan* incorporates river and flash floods, flooding, stormwater overflow, drought risk, climate change and coastal zone protection, and the disruption of essential services and infrastructure, and various other hazards based on a comprehensive disaster risk assessment.[1613] Other risks identified in the DRM plan are a change in aquifer recharge and a change in rainfall patterns.[1614] Some of the issues

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[1608] City of Cape Town *Climate Change Strategy* 42-45; City of Cape Town *Climate Change Action Plan* 95-97.
[1609] City of Cape Town *Disaster Risk Management Plan* 5.
[1610] City of Cape Town *Disaster Risk Management Plan* 11. See s 44 of the *Disaster Management Act* on the duties of the Centre.
[1611] City of Cape Town *Disaster Risk Management Plan* 29.
[1612] City of Cape Town *Disaster Risk Management Plan* 29.
[1613] City of Cape Town *Disaster Risk Management Plan* 41.
[1614] City of Cape Town *Disaster Risk Management Plan* 42.

identified as solidifying DRM in the city include integrating DRM plans and programmes with those in the IDP and establishing effective prevention and risk reduction programmes that are designed to meet the needs of the most vulnerable communities.[1615] It will also establish a culture of scientific analysis and use the latest technology to monitor and manage disaster risk, introduce rapid response measures, and undertake extensive education and awareness programmes.[1616]

In the same vein, the DRM specifies that the city needs to develop and implement integrated city-wide strategies that cover disaster prevention and disaster risk reduction.[1617] These strategies can include policies and legislation, risk reduction studies and projects, economic development programmes, disaster-risk vulnerability assessments, training and community awareness, hazard management, early warning systems, environmental impact assessments, and community education and capacity building.[1618] Cape Town responded to its 2018 drought challenge[1619] by implementing various restrictions and tariff hikes to conserve the scarce resource.[1620] The situation prompted widespread communication for crucial water conservation, impacting on livelihoods and the economy.[1621] Although climate change exacerbated the intense drought conditions, political factors, management and increasing urbanisation and competition for water resources also placed immense stress on the city's already limited resources.[1622] This situation emphasises the importance of understanding the urban water system as an integrated system, with WC/WDM forming a component of the water resources, water supply and water services planning process.

1615 City of Cape Town *Disaster Risk Management Plan* 42.
1616 City of Cape Town *Disaster Risk Management Plan* 42.
1617 City of Cape Town *Disaster Risk Management Plan* 42.
1618 City of Cape Town *Disaster Risk Management Plan* 42.
1619 City of Cape Town *Mayor's Portfolio of Urban Sustainability 2018* 99; Sinclair-Smith and Winter "Water Demand Management in Cape Town: Managing Water Security in a Changing Climate" 126.
1620 Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 2.
1621 Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 2.
1622 Cole *et al* 2021 *International Journal of Disaster Risk Reduction* 2.

5.2.2.4 Ensuring the sustainable use of water for socio-economic activities

For Cape Town, planning in the context of uncertainty is important, especially considering that the two planning factors for the development of new water supply are the future water demand and the availability of water.[1623] The effects of the drought have not been fully explored, and it is uncertain how the situation will change in the near to longer term. Future rainfall is also uncertain due to climate change.[1624] The changes in the behaviour of water users are mainly due to factors such as the price of water and the availability of alternative water sources. Future water availability is also uncertain due to uncertainties caused by climate change.[1625] Despite the uncertainties, it is still important to plan for scenarios that are based on current conditions and not on future restrictions. The city's goal is to provide enough water to meet its future water-wise demand.

The City of Cape Town is the biggest water user in the Western Cape's water supply system and aims to work with other stakeholders to improve integrated planning and resource management.[1626] The city will also build stronger relationships with its relevant stakeholder groups by sharing expertise and information to improve the planning and cost-effective implementation of water projects.[1627] Based on the intensive engagement during the drought, the city will promote and facilitate future engagement through creating an enabling environment for citizens and civil society.[1628] Additionally, the city will be engaging more with businesses, research institutions, non-governmental and neighbourhood organisations, other spheres of government, organised labour, and international bodies.[1629]

[1623] City of Cape Town *Water Strategy* 28.
[1624] City of Cape Town *Water Strategy* 28.
[1625] City of Cape Town *Water Strategy* 28.
[1626] City of Cape Town *Water Strategy* 47.
[1627] City of Cape Town *Water Strategy* 47.
[1628] City of Cape Town *Water Strategy* 64.
[1629] City of Cape Town *Water Strategy* 64.

Cape Town also aims to collaborate with other water users and partners to identify opportunities to improve the social, ecological, and economic benefits of the water resources, and to reduce the risks.[1630] This commitment speaks to various approaches to valuing water for environmental considerations, water-related infrastructure, drinking water, sanitation, and hygiene. It looks at valuation issues in food and agriculture, business, industry and energy.[1631] Some of the options to consider include amending the existing legal agreements to provide users with greater transparency and information that specifies the rights of users in the system.[1632] Professionalising the system's operations and ensuring adequate funding for the continued operation of the system are also included.[1633] Through this commitment the city also plans for professionalising the management of the water supply system's operations.[1634] This will involve improving the monitoring and metering systems and exploring the possibility of improving the governance structures.[1635]

The city will continue to review and enhance its by-laws, regulatory mechanisms, and other incentives to encourage water reuse, groundwater, and wastewater treatment, in addition to using pricing mechanisms to encourage water efficiency.[1636] Incentives will also be evaluated to see if they can be more cost-effective. For instance, the city will approve debt write-offs and treatment linked to responsible payment if they are justified.[1637] The measures are supported by the city's *Water By-law* (2010), the *Water Amendment By-law* (2018) and the *Treated Effluent By-law* (2010) (as amended in

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1630 City of Cape Town *Water Strategy* 43. These partners include urban and agricultural water users and other spheres of government.
1631 City of Cape Town *Water Strategy* 46; UN-Water *World Water Development Report 2021: Valuing Water* 21.
1632 City of Cape Town *Water Strategy* 47.
1633 City of Cape Town *Water Strategy* 47.
1634 City of Cape Town *Water Strategy* 47.
1635 City of Cape Town *Water Strategy* 47.
1636 City of Cape Town *Water Strategy* 21.
1637 City of Cape Town *Water Strategy* 21.

2015).[1638] These by-laws provide tightened water regulations to promote water use efficiency, allow for more effective enforcement, and allow for and regulate the use of alternative water sources.[1639] They specify water efficiency standards, make provision and regulate the use of alternative water sources such as greywater, rainwater, groundwater, surface water and seawater, and have introduced several permanent water saving measures including restrictions on garden watering times and hosepipe use, compulsory water audits for large users, and various other efficiency regulations.[1640]

Additionally, Cape Town aims to implement various financial and economic incentives to encourage the move toward becoming a water-sensitive city.[1641] These include the establishment of various tax and service charges, as well as the changing of the rules of the game using land use permissions, by-laws and building codes, for example.[1642] The city's investments in infrastructure will be geared toward making sure the initiative pays for itself. A comprehensive approach that includes all levels of government and the community is necessary to realise these commitments. This will entail investing in the people, improving the operational efficiency and effectiveness of network management, improving cash collection, and expanding and managing the bulk water and wastewater infrastructure.[1643] The Strategy details the city's capital budget regarding operations and maintenance and provides a clear exposition of the investment plan and required capital expenditure to meet the growing needs.[1644]

1638 City of Cape Town 2022 https://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-water-and-sanitation-services/know-your-water-regulations.

1639 Sinclair-Smith and Winter "Water Demand Management in Cape Town: Managing Water Security in a Changing Climate" 111.

1640 Sinclair-Smith and Winter "Water Demand Management in Cape Town: Managing Water Security in a Changing Climate" 111.

1641 City of Cape Town *Water Strategy* 53.

1642 City of Cape Town *Water Strategy* 53.

1643 City of Cape Town *Water Strategy* 55-57.

1644 City of Cape Town *Water Strategy* 60.

Acknowledging the role of climate change in water resources management, the WSDP aligns its vision with the city's *Climate Change Strategy*.[1645] To ensure an ongoing, slightly restricted supply of water, the city implements water restrictions during droughts.[1646] To this end the WSDP highlights the importance of efficient water use and maximising the use of existing infrastructure as part of the city's *Water Demand Management and Water Conservation Strategy* (2007).[1647] Some of the measures implemented for WC/WDM include the management of pressure, the use of treated effluent, the replacement of water piping, the provision of education awareness campaigns, water restrictions and stepped tariffs, the detection and repair of active leaks, and the replacement of meters and water management devices.[1648]

Notably, in the matter of the impact of urban development on natural resources, the CTSDF requires that urban agricultural operations should comply with the WSDP, which should in future incorporate water supplies for urban agriculture and related activities.[1649] The CTSDF acknowledges the importance of the Philippi Horticultural Area (PHA) in supporting food security in the city.[1650] As an aquifer recharge area, the PHA is valuable from a water resilience perspective.[1651] At present, the CTSDF is the only statutory document that recognises the role of the aquifer in providing reliance in the area. The relevance of this is illustrated in the outcome of the case of *Philippi Horticultural Area Food and Farming Campaign v MEC for Local Government, Western Cape*,[1652] which dealt with a successful challenge to various decisions relating to the proposed development of a portion of the Philippi Horticultural Area.[1653] The matter was

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1645 City of Cape Town *Water Services Development Plan* 17.
1646 City of Cape Town *Integrated Development Plan* 50.
1647 City of Cape Town *Integrated Development Plan* 55, 83; City of Cape Town *Long-Term Water Conservation and Water Demand Management Strategy*.
1648 City of Cape Town *Integrated Development Plan* 55, 86; City of Cape Town *Long-Term Water Conservation and Water Demand Management Strategy* (2007) 84-140.
1649 City of Cape Town *MSDF* 130.
1650 City of Cape Town *MSDF* 72, 130.
1651 City of Cape Town *MSDF* 146.
1652 2020 3 SA 486 (WCC).
1653 City of Cape Town *Water Strategy* 36.

reverted to the decision-making authority for consideration of the impact of climate change and water scarcity on existing rights related to the aquifer.[1654] Consequently, it is the city's responsibility to plan for the use of water and other natural resources, as well as to prevent urban encroachment and the unauthorised use of land in agricultural areas.

5.2.3 Evaluation

Cape Town is one of the few cities in South Africa aiming to actively implement WSUD.[1655] To this end, the city's aim extends beyond just achieving a state of water security, but instead the intention is transform into a "water-sensitive city" that relies on ecologically sound practices such as the efficient use of stormwater and urban waterways for flood control, aquifer recharge, water reuse, and recreational purposes.[1656] To achieve this, Cape Town will have to meet all its service delivery obligations such as water supply, sewerage and drainage management, point and diffuse source pollution management, the conservation and promotion of waterway protection, and finally engage in adaptive, multifunctional infrastructure and urban design that reinforces water-sensitive behaviours.[1657] This will require consideration of drivers such as water supply, access and security, public health protection, flood protection, the protection of social amenities and the environment, the limits of natural resources, inter-generational equity, and resilience to climate change.[1658]

In the context of the prescribed role of local government in water security, Cape Town has adopted and implemented all the instruments legally required and has opted to innovatively use its authority to implement and adopt additional instruments. Indicatively, the city has a comprehensive WSDP that covers all the aspects outlined by

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1654 *Philippi* case para 142.
1655 See para 2.4.
1656 City of Cape Town *Water Strategy* 49.
1657 City of Cape Town *Water Strategy* 50.
1658 City of Cape Town *Water Strategy* 50.

law,[1659] to which end the WSDP indicates that the municipality addresses each one of the elements under the first two dimensions of urban water security. This WSDP provides for progressive improvement of equitable, secure and reliable access to adequate, clean and safe water services. The WSDP is further supplemented by a *Water Strategy* which comprehensively outlines both the status quo of services provision as well as projected and future services provision. The city will also provide opportunities for interaction and continuous learning and promote ways to share knowledge and develop communities of practice.[1660] In terms of implementation, the *Water Strategy* will be reviewed annually in line with the WSDP. Furthermore, the Strategy will be monitored through existing planning instruments.[1661]

Furthermore, Cape Town has an extensive law and governance framework for the protection of urban aquatic ecosystems. In line with the provisions of the CBD, NEMBA, NEMPAA and several other international and national laws and policy,[1662] the city has adopted conservation plans and mainstreamed these into planning and land-use instruments. Cape Town is well acknowledged for its long history of climate change integration into its policies, planning and operations.[1663] The city has taken significant steps to address climate change. It has incorporated climate change considerations into several legal instruments and established dedicated instruments for managing climate change and disaster risks. These instruments are designed to address sector-specific issues that both affect and are affected by climate change.

1659 See para 4.3.2.
1660 City of Cape Town *Water Outlook Report 2018* 65.
1661 City of Cape Town *Water Outlook Report 2018* 66.
1662 See paras 3.2.3.3 and 4.3.4.
1663 Taylor *Climate Information for Building Resilient South African Cities* 12; City of Cape Town *Climate Change Strategy* 5.

5.3 City of eThekwini

5.3.1 Local water insecurity profile

eThekwini, also known as the city of Durban, is one of South Africa's three largest cities and is governed by the eThekwini Metropolitan Municipality.[1664] The municipal area covers approximately 2 555 square kilometres (km^2) and comprises of an estimated population of approximately 4 million people. The eThekwini Water and Sanitation department manages a water network that exceeds 14 500 km and a sewer network that exceeds 8500 km. eThekwini is served by 361 water storage facilities and 33 water pump stations.[1665]

Durban is in the middle of the Maputaland-Pondoland-Albany biodiversity hotspot, which includes both terrestrial and aquatic ecosystems (such as rivers, oceans and estuaries).[1666] Notably, the eThekwini Municipal Area contains:

> … 98 km of coastline, 18 major river catchments and 16 estuaries, 4000 km of river, and nearly 80 000 hectares of land identified as part of the Durban Metropolitan Open Space System (D'MOSS).[1667]

Critical ecosystem services, such as the storing and filtering of water, coastal protection, and the cooling of urban areas, may be compromised due to the projected negative impacts of climate change on the city's ecosystems.[1668] The eThekwini Municipal Area's rivers, which supply 90% of the region's water and serve as a crucial habitat for various flora and fauna, have become significantly polluted due to human activities.[1669] There are also 12 dams on the rivers that provide freshwater for the

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[1664] The boundaries of the City of Durban and the eThekwini Municipal Area are the same, therefore the geographical area is referred to as Durban and the local government is referred to as eThekwini Municipality, both of which terms are often used interchangeably in this study.

[1665] eThekwini Municipality *Integrated Development Plan 2021-2022* 868.

[1666] eThekwini Municipality *Our Biodiverse City* 9.

[1667] eThekwini Municipality *Integrated Development Plan 2019/2020* 91.

[1668] eThekwini Municipality *Durban Climate Change Strategy* 6.

[1669] World Bank *Greening Africa's Cities* 22. Also see CEPF 2022 https://www.cepf.net/our-work/biodiversity-hotspots/maputaland-pondoland-albany

region.[1670] Additionally, the wetlands in eThekwini have significantly deteriorated, resulting in an inability to meet the area's biological and biodiversity requirements. This has resulted in a permanent loss of over 20% of the wetlands, further compounding the ecological disaster in the region.[1671]

The widespread land use conversion and land encroachment in wetlands has resulted in the degradation of the present ecological status of the river systems of Durban. Agriculture and urban development have also affected the water quality of the wetlands.[1672] The lack of reliable data substantiating the use of aquifers points to the fact that the use of groundwater is not well-documented.[1673] Of the 300 estuaries in SA, 76 are in the KwaZulu-Natal Province, which has produced a Coastal Management Programme (2017-2022) to provide policy direction for the management of the coastal zone. It clearly identifies the roles and responsibilities at the national, provincial, and local government levels.

As a coastal city Durban is subject to periodic cyclones, coastal erosion and flooding. Similarly, the environment is constantly under pressure due to the development of commercial and residential areas, the prevalence of invasive alien species, and pollution. Changing rainfall patterns are expected to have a significant impact on the availability of water and agricultural productivity in Durban.[1674] These changes could also affect the efficacy of dams to capture and store sufficient water, which will influence the amount of water available for human consumption and industrial use.[1675] Durban is a coastal city which experiences more rainfall than inland cities. Due to its position on the receiving catchments, eThekwini Municipality experiences problems with flooding

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1670 World Bank *Greening Africa's Cities* 24.
1671 World Bank *Greening Africa's Cities* 24,28.
1672 World Bank *Greening Africa's Cities* 28.
1673 World Bank *Greening Africa's Cities* 31.
1674 eThekwini Municipality *Climatic Future for Durban* viii; Roberts and O'Donoghue 2013 *Environment and Urbanization* 303-304.
1675 eThekwini Municipality *Durban Climate Change Strategy* (2015) 5.

and erosion caused by stormwater that flows down from the higher catchments.[1676] Durban is projected to experience an increase in the frequency and intensity of extreme weather events, including flash floods, droughts, and an increase in the number and severity of coastal storms - which will be exacerbated by sea level rise.[1677]

eThekwini Municipality receives its water supply from the water board, Umgeni Water.[1678] eThekwini has undergone a period of rapid urbanisation that has contributed to the degradation of the city's natural environment. Unplanned, densely populated informal settlements that lack basic water, sewerage, and waste services now cover much of the city's land area.[1679] Furthermore, the increasing number of residential and commercial developments along the periphery of the city's urban boundary has resulted in the encroachment of natural habitats and biodiversity.[1680] Durban still faces significant challenges relating to high levels of inequality, poverty and unemployment, as well as unequal (and in many cases, inadequate) access to housing, water, sanitation, and electricity.

The increasing frequency of storms and the resulting flooding are also expected to have a negative impact on the city's water quality and infrastructure, and are expected to have a deleterious effect on human health.[1681] In April 2022 eThekwini experienced one of its worst instances of flooding and landslides, resulting in harm to infrastructure, agriculture, property and human health and well-being.[1682] In addition, many of the water treatment plants have been damaged, and the outdated sewer systems are causing the overflow of untreated water. The urban poor are likely to be those most at risk. These impacts are likely to be compounded by indirect or non-climate change-

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1676 eThekwini Municipality *Integrated Development Plan* 790.
1677 Roberts and O'Donoghue 2013 *Environment and Urbanization* 303-304.
1678 Umgeni Water is a state-owned entity, is one of Africa's most successful organisations involved in water management and is the largest supplier of bulk potable water in KwaZulu-Natal, South Africa, including supply to the eThekwini Municipality – Umngeni Water 2020 https://www.umgeni.co.za/.
1679 World Bank *Greening Africa's Cities* 28.
1680 World Bank *Greening Africa's Cities* 28.
1681 World Bank *Greening Africa's Cities* 31; eThekwini Municipality *Durban Climate Change Strategy* 5.
1682 Mwai 2022 https://www.bbc.com/news/61107685; Nicolson 2022 https://bit.ly/3KHAUB2.

related risks such as the steep population growth rate.[1683] The most vulnerable communities in Durban are the people living in informal settlements. Often such settlements are in low-lying areas that are susceptible to flooding, or in areas with steep slopes or unstable soils, or in environmentally sensitive areas.

The factors that prevent eThekwini from effectively preparing for and implementing its adaptation plans are mainly related to its short-term goals and development needs, which often override long-term sustainability concerns and adaptability, and the ineffective links between the city government and the community structures.[1684] Other factors such as the lack of understanding of the link between biodiversity and climate change are also hindering the city's efforts to prepare for and adapt to the changing environment.[1685]

5.3.2 Urban water security in the eThekwini Municipality

5.3.2.1 Ensuring equitable, secure and reliable access to adequate, clean and safe water services

5.3.2.1.1 Provision of water services: adopting water services development plans, by-laws and strategies

The eThekwini Municipality *Integrated Development Plan* 2021-2022 (eThekwini IDP)[1686] indicates that the Municipality has made significant progress in addressing service delivery backlogs, with continued allocations of municipal resources to improve on service delivery.[1687] As an additional means of assisting its residents, the Municipality offers rebates on utility bills and subsidises some essential services. These subsidies

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1683 Taylor, Cartwright and Sutherland *Institutional Pathways for Local Climate Adaptation* 67-68.
1684 Roberts and O'Donoghue 2013 *Environment and Urbanization* 304; Roberts "Thinking Globally, Acting Locally: Institutionalizing Climate Change at the Local Government Level in Durban, South Africa" 254.
1685 Roberts and O'Donoghue 2013 *Environment and Urbanization* 304.
1686 eThekwini Municipality *Integrated Development Plan 2021/22*.
1687 eThekwini Municipality *Integrated Development Plan* 155.

contribute significantly to the equity aspect of ensuring affordable access to water services.

The IDP also maps out the interventions related to the challenges facing water services and infrastructure delivery. These challenges include that of non-revenue water through which eThekwini aims to implement a WC/WDM implementation plan. Concerning the adequacy of water resources, eThekwini will implement the security of water supply, and for infrastructure stability a replacement programme and proactive maintenance. Despite various measures to increase water supply, reduce water losses and encourage water conservation, the municipality predicts that the demand for water will exceed the supply within the next ten years, putting a greater strain on water quality and ecosystems.[1688]

The eight plans that make up the municipality's delivery strategy are all interconnected. All of the plans, programs, and projects work together for maximum effect in carrying out their missions and achieving their intended results.[1689] The first plan aims to develop and sustain the municipality's spatial, built, and natural environment, and aims to ensure the city's sustainable, resilient and integrated growth and development.[1690] This objective aligns itself with the national legislation discussed above, wherein municipalities are required to strive to balance social, ecological and economic priorities in their attempt to achieve sustainable development.[1691] The various programmes and initiatives that the city has planned for the next five years include developing a sustainable spatial planning system,[1692] ensuring the sustainability of natural resources, managing the built environment, balancing potential economic generation with the

[1688] eThekwini Municipality *Integrated Development Plan* 183.
[1689] eThekwini Municipality *Integrated Development Plan* 15, 361.
[1690] eThekwini Municipality *Integrated Development Plan* 382.
[1691] eThekwini Municipality *Integrated Development Plan* 352.
[1692] eThekwini Municipality *Integrated Development Plan* 383.

community's social and environmental needs, and implementing a climate response programme.[1693]

The third plan aims to promote access to equitable, adequate, and sustainable levels of household infrastructure and community services in order to create a quality living environment.[1694] These include addressing infrastructure backlogs, and the provision of incremental services to informal settlements, such as stormwater control.[1695] The programme focusing on new integrated housing developments is illustrative of this. The housing programme makes provision for the integrated delivery of associated services such as water, electricity, access by road, stormwater control, and sanitation.[1696] Through its basic incremental services programme, eThekwini provides for the installation and maintenance of communal ablution blocks with access to water supply, and a basic road network and footpaths with associated stormwater controls. Instead of providing preferential service to a small number of settlements, the goal is to deliver as quickly as possible to as many settlements as possible.[1697]

As stated in the IDP, the city plans to implement an Integrated Infrastructure Asset Management Plan that will initially cover the administration of utilities, transportation, recreation, waste, and property.[1698] The Plan will examine the technical life-cycle of an asset to determine when maintenance is required to keep the asset in good working condition before it fails to meet the community's needs and must be replaced. Equally

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1693 eThekwini Municipality *Integrated Development Plan* 15, 383-400 for a comprehensive exposition of the spatial planning and land-use management system for the entire Municipal area comprising of the Long-Term Development Framework, the LUS, Local Area Plans, special projects, the BEPP, Spatial Development Plans, Precinct Plans, and the MSDF and IDP. Section 11 of the eThekwini Municipality *Planning and Land Use Management By-Law* (2016).

1694 eThekwini Municipality *Integrated Development Plan* 502.

1695 eThekwini Municipality *Integrated Development Plan* 502.

1696 eThekwini Municipality *Integrated Development Plan* 503.

1697 eThekwini Municipality *Integrated Development Plan* 503.

1698 eThekwini Municipality *Integrated Development Plan* 510.

important to the city is updating its water, sewage, and stormwater infrastructure, so it has developed a budget to do so.[1699]

The fifth plan concentrates on promoting a socially just environment and aims to contribute to a safe, healthy, and secure environment.[1700] The second strategic focus area of under this plan in the IDP aims to work towards promoting the health of the city's residents.[1701] One of the programmes under this plan entails improving compliance monitoring of environmental programmes in accordance with Environmental Health Norms and Standards.[1702] This includes ongoing self-assessments and audits of waste management, the control of environmental pollution and the monitoring of water quality.

The intention expressed in the sixth plan is to create a vibrant and creative city that will stimulate economic growth, social cohesion, and sustainability.[1703] Notably, ensuring the efficient administration of environmental resources and ecosystem services is a key programme in this plan's overall effort to achieve its objective.[1704] Therefore, the eThekwini Municipality acknowledges that the natural areas within its jurisdiction may provide significant benefits for human well-being in terms of health, social, cultural, and economic requirements through the provision of ecosystem services.[1705] Durban also recognises that functional urban river systems may contribute to reducing the effects of water-borne diseases and improve the health levels of communities that rely on the river for their water supply. Seeing that the city struggles with flooding, wetlands and grasslands can be used to reduce the severity of flooding and improving overall

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1699 eThekwini Municipality *Integrated Development Plan* 510.
1700 eThekwini Municipality *Integrated Development Plan* 540.
1701 eThekwini Municipality *Integrated Development Plan* 547.
1702 eThekwini Municipality *Integrated Development Plan* 548-549.
1703 eThekwini Municipality *Integrated Development Plan* 595.
1704 eThekwini Municipality *Integrated Development Plan* 604.
1705 eThekwini Municipality *Integrated Development Plan* 79, 604.

liveability.[1706] The management and protection of healthy ecosystems also help to deliver on the strategic priorities articulated in the IDP.[1707]

The last two strategies aim to maximise the municipality's financial resources to ensure long-term financial viability and sustainability and to establish a strong, caring, and democratic institution to promote and support a consultative and participatory local government.[1708] To this end the IDP conveys the municipality's goal of ensuring a strong, caring, accountable and democratic institution to promote and support their consultative, ethical, effective, efficient and participatory local governance.[1709] To achieve this end, the IDP identifies co-operative governance, and international and inter-governmental relations as means of ensuring that the municipality's concerns are dealt with in a concerted and co-ordinated manner, and to improve service delivery.[1710]

The Municipality's WSDP includes interventions that ensure a balance between water demands and water sources. Provision is also made to address backlogs concerning access to water and sanitation in the city's informal settlements.[1711] eThekwini has thus developed a single data base of dwellings and, from that, a backlog model for each service provider. Access to potable water for the residents of informal settlements is provided either by means of a water dispenser / standpipe, and / or a communal ablution block.[1712] The WSDP also states that all households must be served by either a water distribution pipe or an ablution block or both within a maximum distance of 200 meters.[1713] It is therefore apparent that the WSDP covers all the elements under the water services dimensions.[1714]

1706 eThekwini Municipality *Integrated Development Plan* 79.
1707 eThekwini Municipality *Integrated Development Plan* 79.
1708 eThekwini Municipality *Integrated Development Plan* 624-686.
1709 eThekwini Municipality *Integrated Development Plan* 624.
1710 eThekwini Municipality *Integrated Development Plan* 626.
1711 eThekwini Municipality *Water Services Development Plan* 77.
1712 eThekwini Municipality *Water Services Development Plan* 79.
1713 eThekwini Municipality *Water Services Development Plan* 79.
1714 Dimensions 1 and 2, see paras 2.3.2.1 and 2.3.2.2.

5.3.2.1.2 Management of stormwater services

The Green Rivers programme aims to improve poor river water quality by coordinating all activities which minimise the number of overflows from the sewage reticulation system to rivers.[1715] As such, the programme encompasses activities which address the infiltration and accumulation of illegal stormwater openings, illegal discharges of toxic pollutants and other factors which have a negative impact on the sewer reticulation system and which may result in an overflow from the sewerage system to a watercourse.[1716] Annual reporting is required, based on the improvement of overall river water quality resulting predominantly from a reduction in pollution by sewage and measured as the percentage of all the river sampling points where the river water is of such poor quality that intervention is required.[1717] Monthly reporting on the status of rivers needs to be more detailed and should assess whether rivers are in an ideal, acceptable, poor or critical state based on the index provided in the WSDP.[1718]

The *Stormwater Management By-law* has been approved by the eThekwini Municipal Council but is currently awaiting publication in the *Provincial Gazette*.[1719] The eThekwini Municipality's *Guidelines and Policy for the Design of Stormwater Drainage and Stormwater Management Systems* (2008) addresses challenges such as inadequate stormwater infrastructure, poor coastal management, and ineffective catchment management.[1720] The design of small-scale stormwater reticulation and collection systems, as well as the attenuation tanks and runoff discharge controls used to manage and control stormwater runoff from sites, must adhere to these guidelines.[1721] The guidelines include sizing and design recommendations for outlet discharge controls or

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1715 eThekwini Municipality *Water Services Development Plan* 51.
1716 eThekwini Municipality *Water Services Development Plan* 51.
1717 eThekwini Municipality *Water Services Development Plan* 51-52.
1718 eThekwini Municipality *Water Services Development Plan* 60-63.
1719 eThekwini Municipality *Integrated Development Plan* 790.
1720 eThekwini Municipality *Guidelines and Policy for the Design of Stormwater Drainage and Stormwater Management Systems* (2008) (hereafter *Stormwater Guidelines*).
1721 eThekwini Municipality *Stormwater Guidelines* 1.

overflows, watercourses, underground pipelines, and small channels.[1722] Accordingly, these must be planned to efficiently collect storm water, regulate it, and transport it to a larger or major drainage system. The *Stormwater Management Policy* provides an outline of the minimum information required in a stormwater management plan.[1723]

5.3.2.2 Protection of urban aquatic ecosystems

5.3.2.2.1 Mainstreaming ecosystem protection

The IDP also expresses the city's aim to develop sustainable programmes and long-term plans that will help mitigate climate change, protect biodiversity, and offset or reduce carbon emissions and other greenhouse gas emissions within the city limits.[1724] In the same vein, eThekwini invests in urban conservation and the management of natural resources through removing alien plant species and public education campaigns.[1725]

The eThekwini IDP acknowledges that the goods and services supplied by its ecosystems are essential to the municipality's growth and development needs and to the overall social and economic well-being of the city.[1726] The IDP indicates that the available data suggests that many of the local level thresholds for the natural ecosystems in Durban have already or soon will be exceeded.[1727] One of the programmes under the first plan aims to ensure the long-term sustainability of the natural resource base, which includes protecting eThekwini's vulnerable and significant

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[1722] eThekwini Municipality *Stormwater Guidelines* 1.
[1723] eThekwini Municipality *Stormwater Guidelines* 9.
[1724] eThekwini Municipality *Integrated Development Plan* 79, 605.
[1725] eThekwini Municipality *Integrated Development Plan* 605-606.
[1726] eThekwini Municipality *Integrated Development Plan* 78.
[1727] eThekwini Municipality *Integrated Development Plan* 77, 88.

terrestrial and aquatic natural environments.[1728] One of the means of achieving this is through the Durban Metropolitan Open Space System (D'MOSS).[1729]

D'MOSS is a controlled development layer and aims to protect both the natural infrastructure and biodiversity assets as well as to achieve optimal ecosystem functionality and biodiversity conservation. eThekwini's biodiversity assets comprise rivers, wetlands, estuaries, grasslands, forests and coastal zone resources.[1730] The D'MOSS has been integrated into all eThekwini planning schemes as a control area or overlay.[1731] Municipalities may use their constitutionally granted planning authority to serve environmental interests, and in particular through conservation planning.[1732]

The eThekwini *Municipal Spatial Development Framework* is aligned with the requirements of the *Systems Act*, SPLUMA and the eThekwini *Municipal Planning and Land Use By-Law* (2016).[1733] The eThekwini Municipality *Planning and Land Use Management By-Law*, 2016 provides for plans to inform the social, economic, environmental and infrastructural development in the municipality.[1734] The By-law provides that the municipality must have an MSDF that must consider all environmental management instruments passed by the appropriate environmental management authority,[1735] and must identify areas not suitable for development or areas where

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1728 eThekwini Municipality *Integrated Development Plan* 418.

1729 eThekwini Municipality 2011 http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Durban_Open_Space/Pages/-What-is-the-Durban-Metropolitan-Open-Space-System.aspx.

1730 eThekwini Municipality *Integrated Development Plan* 418.

1731 eThekwini Municipality 2011 http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Durban_Open_Space/Pages/-What-is-the-Durban-Metropolitan-Open-Space-System.aspx.

1732 *Le Sueur* case paras 39-40.

1733 eThekwini Municipal *Spatial Development Framework 2020-2021* 1; eThekwini Municipality *Integrated Development Plan 2020/21* 387; section 11 of the *eThekwini Municipality Planning and Land Use Management By-law* (2016) (hereafter *Planning By-Law*).

1734 S 2(a) of the eThekwini Municipality *Planning By-Law.*

1735 S 9(m) of the eThekwini Municipality *Planning By-Law*.

impacts must be managed, and provide guidance in terms of decision-making on environmental resource protection.[1736]

In addressing the loss, depletion and degradation of its natural resources, the eThekwini Municipality aims to ensure the effective management of environmental goods and ecosystem services. The municipality's primary tool for informing various responses to the protection and management of the rich, highly threatened and valuable natural resource base is the D'MOSS.[1737] D'MOSS is mapped using an expert-based approach to identify areas for inclusion into the layer. The MSDF states that any proposed development falling within the D'MOSS layer will require an assessment of the potential environmental impact of such development.[1738] Similarly, the MSDF specifies that any development within a D'MOSS controlled area may be prohibited or restricted if prior approval has not yet been obtained. Irrespective of the existing zoning, any development in a sensitive area, such as a coastal corridor or an area adjacent to significant environmental assets, will require careful review to ensure that it does not negatively impact the local ecosystem.

The MSDF highlights the importance of the ecosystem services provided by the D'MOSS and states that for the D'MOSS to continue to deliver these services it needs to be sensitively integrated and effectively managed.[1739] According to the by-law, the municipality's spatial plans must include a strategic assessment of environmental pressures and opportunities in the area, as well as a description of where environmental sensitivities are located.[1740] The by-law goes further in providing that the municipality must have a land-use scheme in line with the MSDF and that land-use and development in the municipal area must make a minimal impact on the environment and natural

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1736 Ss 11(5)(e) and (f) of the eThekwini Municipality *Planning By-Law.*
1737 eThekwini *MSDF* 126.
1738 eThekwini *MSDF* 128.
1739 eThekwini *MSDF* 132.
1740 S 10(j) of the eThekwini Municipality *Planning By-Law*.

resources.[1741] The SDF also outlines the municipality's strategic environmental assessment (SEA) process. Through this the municipality initiated the development of an SEA methodology that incorporates global thinking on the importance of ecosystems for well-being and development and aims to integrate and translate this into the local context.[1742]

The MSDF emphasises that the municipality's natural environments have been severely modified by landscape change, habitat fragmentation, invasive alien species, over exploitation and pollution.[1743] To this end it provides that it is necessary to increase the total area that is protected and managed for conservation to ensure the protection of the biodiversity and associated ecosystem services in the municipal area. Unfortunately, the MSDF also indicates that based on the current ecological condition of Durban's aquatic ecosystems, they are amongst the lowest ranked systems in the country.[1744] The City uses tools like controlled development areas, environmental servitudes, environmental special rating areas, environmental land acquisition, and taking environmental factors into account when preparing the municipal valuation roll to combat threats to the aquatic ecosystems and biodiversity.[1745] The municipality has also taken several steps toward improved natural asset management, including the active reforestation of certain open spaces (buffer zones) and the improved management and restoration of other areas.[1746]

Through land-use planning mechanisms, the formation of public-private partnerships, and biodiversity stewardship, the D'MOSS layer seeks to identify open spaces with high conservation value and associated ESAs in need of protection and management.[1747] The eThekwini City Council has adopted biodiversity stewardship as a strategy for working

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[1741] S 15(1)(d) of the eThekwini Municipality *Planning By-Law*.
[1742] eThekwini *MSDF* 143.
[1743] eThekwini Municipality *MSDF* 132.
[1744] eThekwini Municipality *MSDF* 135.
[1745] eThekwini Municipality *MSDF* 136.
[1746] eThekwini Municipality *MSDF* 136.
[1747] eThekwini Municipality *Integrated Development Plan* 418.

with both private and traditional landowners and administrators to achieve long-term sustainability in their natural resource management.[1748] The IDP also acknowledges the importance of successfully controlling invasive alien species to conserve biodiversity and ensure optimal ecosystem functionality.[1749] Consequently, the municipality's *Invasive Alien Species Framework Strategy and Action Plan* (2014) and the *Invasive Alien Species Management Plan* respectively provide a guideline for achieving alien invasive species control, as well as a concrete plan for how and where this must occur.[1750] The city also has a dedicated restoration ecology branch that oversees managing, rehabilitating, restoring, and engineering different ecosystems like wetlands, grasslands and dunes.[1751]

The city's commitment to protecting and restoring its ecological infrastructure is in response to the threats to biodiversity and the effects of climate change. It also purposes to enhance Durban's resilience to the persistent short-term and disasters to which it is prone.[1752] The city is also committed to protecting and enhancing the health of its natural ecosystems, and recognises the role of ecosystem services and natural capital in facilitating both its adaptation and its mitigation efforts.[1753] This focus area entails identifying and managing public open spaces that can play a strategic role in flood attenuation, storm damage and cooling services, as well as integrating SUDS into the city's planning and development policies.[1754] To this end, the city will ensure that its plans have public green open space allocation to assist with ecosystem services such as flood attenuation and cooling services and will develop master drainage plans for all river catchments within the municipal boundaries.[1755] The city has also partnered with

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[1748] eThekwini Municipality *Integrated Development Plan* 418.
[1749] eThekwini Municipality *Integrated Development Plan* 419.
[1750] eThekwini Municipality *Integrated Development Plan* 419.
[1751] eThekwini Municipality *Integrated Development Plan* 419.
[1752] eThekwini Municipality *Integrated Development Plan* 84, 418.
[1753] eThekwini Municipality *Climate Action Plan* 46, 50.
[1754] eThekwini Municipality *Climate Action Plan* 50.
[1755] eThekwini Municipality *Climate Action Plan* 46.

provincial and national government, Umgeni Water, SANBI and other local municipalities to address the challenges of water security in the uMngeni catchment. [1756]

The DCCS and CAP provide for the establishment of the Transformative River Management Programme (TRMP), which aims to rehabilitate and sustainably manage the 7 400 km of streams and rivers in the city.[1757] The TRMP aims to protect these corridors against the flooding, drought and higher temperatures that can be expected from climate change. The programme requires conducting a baseline assessment and vulnerability analysis of the city's rivers and streams and a cost-benefit analysis of transformative river management options considering climate change and social inclusion.[1758] The CAP also has a specific thematic area aimed at protecting Durban's biodiversity to build climate resilience.[1759] The city aims to respond to the challenges associated with biodiversity protection through utilising spatial planning tools, land acquisition, collaboration, and investment in novel ecosystems. Actions involved in this area include identifying biodiversity priority areas and incorporating these into spatial and strategic planning, which will entail embedding biodiversity considerations, including the D'MOSS layer, into the eThekwini MSDF and other spatial plans, as well as the strategic planning process.[1760]

Secondly, it involves increasing the protection of areas in Durban that have high climate change value through assessing and quantifying the climate change (mitigation and adaptation) value of the D'MOSS layer.[1761] Moreover, the City will acquire additional land parcels with biodiversity and climate change value through stewardship programmes with private landowners and in traditional authority areas.[1762] In addition to

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1756 eThekwini Municipality *Climate Action Plan* 46.
1757 eThekwini Municipality *Durban Climate Change Strategy* 15; eThekwini Municipality *Climate Action Plan* 50. Also see C40 Climate Change Cities Leadership Group *Transformative Riverine Management Projects in Durban*.
1758 eThekwini Municipality *Climate Action Plan* 50.
1759 eThekwini Municipality *Climate Action Plan* 54.
1760 eThekwini Municipality *Climate Action Plan* 56.
1761 eThekwini Municipality *Climate Action Plan* 56.
1762 eThekwini Municipality *Climate Action Plan* 56.

strengthening its institutional capacity the City will also identify and implement additional innovative environmental protection tools and collaborative governance approaches to protect areas of environmental significance, through establishing special rating areas, payment for ecosystem services and conservation banking, for example.[1763]

The CAP aims for an increase in the management effectiveness of biodiversity conservation areas under the management of the eThekwini Municipality.[1764] Achieving this requires the drafting and implementation of effective management plans for all nature reserves and other sites considered important for biodiversity conservation.[1765] However, this also means that the city will have to undertake the necessary enforcement action when notified of illegal activities on sites that have biodiversity and ecosystem service value.[1766] The CAP also briefly mentions that the municipality needs to undertake the effective control of biological invasions by preventing new invasions and managing existing invaded areas.[1767]

The city also intends to address the vulnerability of many of its communities and to enhance their resilience.[1768] Interventions under this thematic area encompass facilitating the transition of all informal settlements and previously disadvantaged communities towards climate resilience.[1769] Some of the specific actions identified here are to relocate high risk informal settlements to suitable alternative available sites or to prioritise these sites for the expansion of the community-based flood early warning system initiative where they have not been relocated.[1770] The CAP also encourages the adoption of resilient building designs and materials that promote heat mitigation and resilience to flooding in informal settlements.[1771] Similarly, this thematic area focuses on

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1763 eThekwini Municipality *Climate Action Plan* 56.
1764 eThekwini Municipality *Climate Action Plan* 56.
1765 eThekwini Municipality *Climate Action Plan* 56.
1766 eThekwini Municipality *Climate Action Plan* 56.
1767 eThekwini Municipality *Climate Action Plan* 56.
1768 eThekwini Municipality *Climate Action Plan* 64.
1769 eThekwini Municipality *Climate Action Plan* 64.
1770 eThekwini Municipality *Climate Action Plan* 64.
1771 eThekwini Municipality *Climate Action Plan* 64.

helping communities to put in place systems to assist in the management of stormwater, and promoting the greening of informal settlements help with cooling and to act as natural flood attenuation solutions.[1772]

To address the climate change vulnerability of the city's townships, the CAP advocates conducting community vulnerability assessments and developing climate resilient townships using mitigation and adaptation solutions such as passive cooling, rainwater harvesting and solar energy, to improve people's livelihoods and well-being.[1773] Finally, the CAP requires of the city to integrate and align disaster management with climate change resilience.[1774] This will entail integrating climate change risks into the city's disaster management plans by requiring climate risks to be accounted for in municipal line departments' disaster management plans to facilitate effective disaster risk assessment, reduction and response.[1775] Likewise, the city will need to implement early warning systems for extreme events, facilitate multi-departmental disaster management forums that prioritise climate change-related risks and extreme events, and develop a contingency plan that responds to more extreme and high impact storms and flooding events.[1776]

The CAP acknowledges that achieving these various interventions and actions will require a lot more than just commitment; it will require partnerships, financing, and the use of various other tools.[1777] The CAP therefore outlines its approach to achieving the city's vision by harnessing private sector collaboration and active citizen participation, accessing international and local funding opportunities, financing climate change action

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[1772] eThekwini Municipality *Climate Action Plan* 43.
[1773] eThekwini Municipality *Climate Action Plan* 64.
[1774] eThekwini Municipality *Climate Action Plan* 64.
[1775] eThekwini Municipality *Climate Action Plan* 65.
[1776] eThekwini Municipality *Climate Action Plan* 65.
[1777] eThekwini Municipality *Climate Action Plan* 74.

through the city's existing budget, and building on and leveraging public-private partnerships to fund projects.[1778]

5.3.2.2.2 Protecting the coastal ecosystem

The WSDP also provides for river and estuarine reserve determinations.[1779] The WSDP notes that while the responsibility to manage these ecological reserves lies with the DWS, due to staffing and funding limitations in the DWS those that have been completed have been managed by the Municipality.[1780] In making these determinations the Municipality also outlines several recommendations concerning the estuaries in the municipal area.[1781]

The CAP outlines measures aimed at protecting the city from sea-level rise and coastal storms.[1782] These include actions that will identify, protect and relocate existing municipal infrastructure currently located in high-risk coastal areas, such as conducting detailed analyses of coastal storm and sea-level rise projections and establish setback lines to identify coastal areas at the greatest risk of coastal storm damage and flooding.[1783] The city intends to develop guidelines for the modification and retrofitting of infrastructure and development in high-risk zones to reduce the chances of its being damaged by coastal storms.[1784] On the topic of transversal management, the city will make information on coastal erosion and the setback lines available to all municipal departments responsible for municipal infrastructure and development, and will educate relevant officials to ensure that no new nonessential infrastructure is located in the designated high-risk zones.[1785] As a final intervention the city will see to the identification of existing infrastructure located in high-risk areas over the long term and

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1778 eThekwini Municipality *Climate Action Plan* 74-78.
1779 eThekwini Municipality *Water Services Development Plan* 74.
1780 eThekwini Municipality *Water Services Development Plan* 74.
1781 eThekwini Municipality *Water Services Development Plan* 76.
1782 eThekwini Municipality *Climate Action Plan* 60.
1783 eThekwini Municipality *Climate Action Plan* 60, 62.
1784 eThekwini Municipality *Climate Action Plan* 62.
1785 eThekwini Municipality *Climate Action Plan* 62.

identify areas to which coastal municipal infrastructure currently located in high-risk coastal areas could be relocated in the long term.[1786]

The *eThekwini Coastal Management By-law* (2019)[1787] provides for measures aimed at managing and protecting the coastal zone and for aligning development in the coastal zone in terms of the provisions of NEMICMA.[1788] The by-law provides for the establishment of the Municipal Coastal Committee,[1789] gives effect to the Municipal Coastal Management Programme, and aims to promote co-operative governance between the municipality and other relevant spheres of government relating to the management of the coastal zone.[1790] The by-law defines the role of the municipality in integrated coastal management as being to accept responsibility for the proper management and control of the coastal zone, and provides for the regulation, conservation and protection of natural resources occurring in the municipality's coastal zone, for both the current and future generations.[1791] To ensure integrated coastal management, the municipality needs to ensure that it adheres to the principle of co-operative governance and aligns its actions with those of other spheres of government and organs of state.[1792]

The by-law also gives effect to the administrative capacity of the municipality to administer, implement and enforce the provisions provided therein, as well as the duties provided in terms of NEMICMA.[1793] The by-law seems to promote an anthropocentric approach to the management and conservation of the City's coastal area by asserting that the municipality must manage the coastal zone in a manner ensuring that the municipality's environmental, economic, and social benefits linked to the coastal zone

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1786 eThekwini Municipality *Climate Action Plan* 62.
1787 eThekwini Municipality *eThekwini Coastal Management By-law*.
1788 Ss 3(b) and (d) of the *eThekwini Coastal Management By-law*.
1789 Ss 8, 9 and 10 of the By-law respectively for the establishment of the Municipal Coastal Committee, as well as its role and powers pertaining to coastal management.
1790 S 3(c) and (e) of the *eThekwini Coastal Management By-law*.
1791 S 6 (b) and (f) of the *eThekwini Coastal Management By-law*.
1792 S 6(c) of the eThekwini *Coastal Management By-law*.
1793 S 7(2) of the *eThekwini Coastal Management By-law*.

are utilised to their full extent.[1794] This approach often does not acknowledge the ecological integrity of the coastal zone, and acknowledges the role of the coast only in so far as it follows a "people-first" perspective.

The Municipal Coastal Programme (MCP) is extensively dealt with under Chapter five of the by-law. The MCP needs to identify and delineate the geographic area of the coastal zone of the municipality, identify active measures aimed at co-ordinating and aligning municipal planning in the coastal zone with the provisions of NEMICMA, and to set out the principles to be applied in municipal planning and development in the coastal zone.[1795] The municipality will also have to prescribe rules and guidelines relating to access to the coastal zone and should align the MCP with the National and Provincial Coastal Management Programmes and the National Estuarine Management Protocol.[1796] The by-law also requires consistency between the municipality's SDF, IDP and LUS (amongst others) and the aforementioned programmes.[1797] Similarly, the municipality may establish and implement a Coastal Planning Scheme, which may form and be enforced as part of any LUS adopted by the municipality.[1798]

The municipality must also take all reasonable measures to promote and ensure the achievement of the provisions in the NEMICMA and the by-law in such a manner as to ensure the preservation of the ecological integrity of the coastal zone, the mitigation of the effects of natural disasters, and the sustainable use of the coastal zone's spatial capacity.[1799] In this regard the municipality may regulate, control or restrict any activity in the coastal zone to prevent amplifying the impact or severity of natural hazards in

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1794 S 7(3) of the *eThekwini Coastal Management By-law*.
1795 S 12(2)(a), (c) and (d) of the *eThekwini Coastal Management By-law*.
1796 Ss 12(2) and 15(1) of the *eThekwini Coastal Management By-law*.
1797 S 16(1)(a) of the *eThekwini Coastal Management By-law*.
1798 S 16(4) and (5) of the *eThekwini Coastal Management By-law*.
1799 S 20(1)(a)-(c) of the *eThekwini Coastal Management By-law*.

the coastal zone. It should also safeguard coastal communities and economies from hazards caused by coastal processes such as rising sea levels.[1800]

The by-law acknowledges the municipality's constitutional duty to promote a safe and healthy environment,[1801] and requires of the municipality to manage and control activities which may have a detrimental effect on the natural environment and natural resources of the coastal zone.[1802] The municipality must give effect to the provisions of the MCP, NEMICMA and any other law which seeks to protect the natural environment and natural resources of the coastal zone, such as NEMBA or NEMA, for example.[1803] The by-law therefore places a duty of care on any person whose activity, conduct or omission may cause, causes or has caused significant pollution of and environmental degradation of the coastal environment.[1804]

In addition to regulating, controlling and restricting activities in the coastal zone, the by-law grants the municipality the power to do the same concerning development in the coastal zone.[1805] This includes the prohibition of any development or use of land in the coastal zone if it is not compliant with the requirements of the MCP, the adoption of a Coastal Planning Scheme to manage development and land use in the coastal zone, and the integration of such a scheme within the municipality's LUS.[1806] Likewise, the municipality is empowered to delineate a coastal management line on any maps that form part of the LUS that are applicable to the subject coastal area, and it may determine and adjust the coastal boundaries of coastal access land.[1807]

1800 S 21(1) and (2)(b)-(c) of the *eThekwini Coastal Management By-law*.
1801 S 152(1)(d) of the *Constitution*.
1802 S 27(1)(a) of the *eThekwini Coastal Management By-law*.
1803 S 27(1)(b) of the *eThekwini Coastal Management By-law*.
1804 S 27(2) of the *eThekwini Coastal Management By-law*.
1805 S 29 of the *eThekwini Coastal Management By-law*.
1806 S 29(1)-(3) of the *eThekwini Coastal Management By-law*.
1807 S30(1)-(2) of the *eThekwini Coastal Management By-law*.

The by-law provides for a strong means of protecting and managing the municipality's coastal zone in line with the requirements of NEMICMA.[1808] It further provides the means of enforcing compliance with the provisions through issuing a compliance notice, describing the offences and penalties in terms of the By-law provisions.[1809]

5.3.2.2.3 Protection against water-related climate risks and disasters

The SDF provides a detailed analysis of the impacts of climate change in Durban according to the best available science, as well as an overview of the city's GHG inventory.[1810] The eThekwini municipality has developed several well-formed strategic responses to climate change, including the *Durban Climate Change Strategy* (2015). While the MSDF has spatially responded to climate change on many different levels, particularly through its densification strategy, it is important that Durban continues to advance the integration between the City's spatial planning and the City's climate response mechanisms.[1811]

The MSDF identifies the municipality's approach to addressing alignment in terms of cross-boundary planning and alignment with neighbouring municipalities and municipal horizontal and vertical alignment (transversal alignment). [1812] The goal of cross-border planning and alignment is to ensure that initiatives and land uses on either side of an administrative border do not conflict with one another, and that there is a shared vision for the development of local infrastructure that allows for optimum utilisation of the area's comparative advantages.[1813] The conservation of biodiversity and the timely implementation of appropriate responses to climate change and disaster management also depend critically on cross-border planning and alignment.

1808 See para 4.3.4.
1809 Ss 31, 33 and 34 of the *eThekwini Coastal Management By-law*.
1810 eThekwini Municipality *MSDF* 143.
1811 eThekwini Municipality *MSDF* 148-149.
1812 eThekwini Municipality *Integrated Development Plan* 50.
1813 eThekwini Municipality *Integrated Development Plan* 50.

Transversal alignment speaks to synthesising and integrating the top-down and bottom-up planning processes between different spheres of government and sectors.[1814] Hence, the SDF aligns with all the national and provincial policies and strategies as well as with municipal sector departments and plans.[1815] Given the importance of eThekwini to the economic growth of the region and the need for coordinated and integrated cross boundary planning, the eThekwini municipality has spearheaded the establishment of three cross-boundary fora through its planning department. The municipality has also engaged other key government departments and parastatals on cross-boundary issues.[1816]

Additionally, the city's approach to climate response planning is integrated into its IDP.[1817] This focus area details the interventions contained in the *Durban Climate Change Strategy* and the *Durban Climate Action Plan* (2019). Some of the interventions include developing and implementing a municipal climate response programme focusing both on climate change adaptation and mitigation. Additionally, the climate change programmes and projects in the themes of the *Strategy* will be embedded in line functions relating to implementation, with progress being tracked using the Municipality's monitoring and evaluation framework. To the extent possible, this will be linked to the city's SDBIP and IDP reporting procedures.[1818]

The eThekwini IDP outlines the city's climate change risks as well as its resilience profile.[1819] The municipality launched the Municipal Climate Protection Programme (MCPP) in 2004 in response to the changes brought about by climate change. This initiative has been designed to enhance the municipality's ability to deal with climate change and focuses primarily on adaptation. The Climate Protection branch carried out

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1814 eThekwini Municipality *Integrated Development Plan* 50.
1815 eThekwini Municipality *Integrated Development Plan* 50-51.
1816 eThekwini Municipality *Integrated Development Plan* 91.
1817 eThekwini Municipality *Integrated Development Plan* 421.
1818 eThekwini Municipality *Integrated Development Plan* 422.
1819 eThekwini Municipality *Integrated Development Plan* 219.

a strategic planning process in 2016.[1820] The branch determined that the two components of the Municipal Scorecard, namely the *Durban Adaptation Charter* (DAC) and the *Durban Climate Change Strategy*, were collectively agreed to be internationally, nationally, and locally mandated, and thus should be pursued as central elements of the department's scorecard commitments.[1821]

The eThekwini IDP specifies the municipality's approach to disaster risk management by mapping out information related to the levels of disaster risks, hazards, vulnerabilities, manageability, and capacities in its area of jurisdiction.[1822] The city's hazard profile specifies that hydro-meteorological hazards (severe storms and flood risks and dam failures) infrastructure and service delivery failures are among the City's prioritised hazards.[1823] Despite its high level of development, eThekwini is still susceptible to the failure of various services. Some of these include the failure of the water supply and sanitation systems, and information technology and communication systems.[1824] Infrastructure and service delivery failure hazards can lead to disasters such as flooding which can damage infrastructure and processes such as water provision and disrupt disaster response and recovery efforts.[1825] Likewise, the IDP includes the draft Disaster Management Sector Plan for the period 2021/2022. [1826]

To address water-related disasters in the city, the eThekwini CAP shows that the municipality has developed a Forecast Early Warning System (FEWS) which models integration software that enables eThekwini to forecast floods to ensure effective and efficient response measures.[1827] The design includes prediction of the weather and floods, and coastal modelling. The system alerts authorities to severe weather and

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[1820] eThekwini Municipality *Integrated Development Plan* 219.
[1821] eThekwini Municipality *Integrated Development Plan* 219.
[1822] eThekwini Municipality *Integrated Development Plan* 211.
[1823] eThekwini Municipality *Integrated Development Plan* 212.
[1824] eThekwini Municipality *Integrated Development Plan* 218.
[1825] eThekwini Municipality *Integrated Development Plan* 218.
[1826] eThekwini Municipality *Integrated Development Plan* 925.
[1827] eThekwini Municipality *Climate Action Plan* 46, 49.

provides temporal and spatial data to assist decision making. The city will also develop an early warning system for stormwater management. Similarly, the city has prepared 1-in-100-year flood lines for the management of floods and flood risks, which have incorporated climate change projections.[1828] All development within the flood lines is prohibited. To this end, the CAP commits the city to continuously implementing and enforcing updated standards and policies that take climate change risks into consideration for the planning and construction of future developments and infrastructure. Despite making provision for EWS, the implementation of these systems leaves much to be desired. It has been argued that the extent of the damage to both humans and the natural environment caused by the recent floods in eThekwini could have been mitigated in part if the early warning systems had been implemented and active.

Like the City of Cape Town, Durban is recognised both nationally and internationally for its long record of accomplishment in addressing climate change.[1829] The municipality has developed a *Climate Action Plan* (2019) that builds on the *Durban Climate Change Strategy* (2015) (hereafter DCCS). The DCCS lays out a city-wide approach to adapting to climate change and mitigating Durban's contribution to climate change. Since climate change is expected to affect all sectors of society in Durban, the response outlined in this Strategy represents a Durban-wide response, which seeks to create an enabling environment for partnerships across different sectors and stakeholders.[1830] The DCCS follows a sector-based approach and identifies ten interrelated climate change themes which comprise of "water, sea level rise, biodiversity, food security, health, energy, waste and pollution, transport, economic development, and knowledge generation and understanding."[1831]

[1828] eThekwini Municipality *Climate Action Plan* 46.
[1829] Taylor *Climate Information for Building Resilient South African Cities* 14.
[1830] eThekwini Municipality *Durban Climate Change Strategy* (2015) 11-12.
[1831] eThekwini Municipality *Durban Climate Change Strategy* 12.

Regarding water, the DCCS aims to minimise the impacts of climate change on the secure, clean, and safe supply of water to its residents. To achieve this the municipality will facilitate co-operation among relevant agencies to jointly manage the impacts of climate change on catchments that supply water, will implement the WC/WDM measures to reduce water demand, and will adopt and enforce simple, innovative, adaptive engineering approaches to water treatment that respond to projected changes in water quality as a result of climate change.[1832] Moreover, the DCCS realises the role of nature-based solutions in flood and stormwater protection services, prioritising the needs of vulnerable communities concerning water connections, planning for drought cycles, and incorporating projected climate change impacts into proactive municipal planning. [1833] The DCCS also affirms the importance of taking a risk-averse approach to water quality protection by imposing stringent controls on water-polluting land uses and activities to ensure that the impacts of climate change are not exacerbated.[1834]

The municipality will also adopt and enforce a risk-averse approach for spatial, land-use, and infrastructure planning and development that responds to potentially amplified flooding and stormwater due to climate change.[1835] Correspondingly, the municipality plans to adopt and enforce adaptive engineering approaches that are flexible and can evolve in response to changing threats and levels of flooding, as well as retrofitting and modifying existing infrastructure and public spaces using these approaches to provide protection against future water-related climate impacts.[1836] These approaches relate to what is understood as resilient urban water management.[1837]

Identifying and relocating existing critical infrastructure in areas of high flood risk to areas of lower risk and relocating or upgrading informal and low-income settlements that are vulnerable to flooding are also important interventions in achieving the goal of

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[1832] eThekwini Municipality *Durban Climate Change Strategy* 13-14.
[1833] eThekwini Municipality *Durban Climate Change Strategy* 14.
[1834] eThekwini Municipality *Durban Climate Change Strategy* 14.
[1835] eThekwini Municipality *Durban Climate Change Strategy* 14.
[1836] eThekwini Municipality *Durban Climate Change Strategy* 15.
[1837] See para 2.4.2.5.

limiting amplified flooding and increased levels of stormwater.[1838] This statement is followed by a commitment to monitor the effectiveness of stormwater systems and to upgrade them so that they can respond to variable conditions, and to incorporate the possibility of extreme water-related climate change events into the operational planning of the provision of basic services such as public transport, water, electricity, waste water management and refuse collection in order to prevent the long-term disruption of services and the pollution of water bodies.[1839]

The DCCS aims for the city's protective coastal ecological infrastructure to be maintained, restored, and enhanced to provide a buffer against sea level rise and coastal storms.[1840] Firstly, the municipality will ensure that current and future development complies with the provincial coastal management line and risk zones, and will develop a coastal management policy to manage private and municipal developments located in the coastal zone.[1841] Again, the DCCS provides that the municipality acknowledges and will make use of natural defence systems (nature-based solutions) to provide protection services against sea-level rise, coastal storms and coastal erosion.[1842]

The DCCS recognises that ecosystem functioning and connectivity needs to be enhanced through integrated planning and effective action to reduce the climate change impacts on biodiversity and maximise the delivery of ecosystem services.[1843] In this case, it is necessary to adopt and enforce integrated planning approaches and development controls that protect the integrity and enhance the functionality and resilience of the city's biodiversity and natural capital to withstand climate change impacts.[1844] Notably, the DCCS recognises the important role of planning in protecting

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1838 eThekwini Municipality *Durban Climate Change Strategy* 15.
1839 eThekwini Municipality *Durban Climate Change Strategy* 15.
1840 eThekwini Municipality *Durban Climate Change Strategy* 15-16.
1841 eThekwini Municipality *Durban Climate Change Strategy* 16.
1842 eThekwini Municipality *Durban Climate Change Strategy* 16.
1843 eThekwini Municipality *Durban Climate Change Strategy* 17.
1844 eThekwini Municipality *Durban Climate Change Strategy* 17.

the natural environment by expressing the municipality's commitment to designing and managing the built environment to contribute positively to the supply of ecosystem services, minimise the pollution and degradation of the natural environment, and contribute to biodiversity conservation and the sequestration of carbon dioxide.[1845]

The DCCS expressly calls for the consideration of climate change impacts in the EIA process where it is likely that the development will affect the resilience or adaptive capacity of ecosystems to climate change.[1846] It further describes the role of the municipality in identifying mechanisms for incentivising landowners to protect and manage natural environments on their properties to maximise ecosystem functioning and resilience to withstand climate change impacts.[1847] The municipality will also have to actively manage the spread of alien invasive species in freshwater, marine and terrestrial habitats to protect against the increased spread of these species as a result of climate change.[1848]

Interestingly, the DCCS provides for the prioritisation of restoring, protecting and managing ecosystems that are most vulnerable do the effects of climate change as well as ecosystems that play a role in alleviating the impacts of climate change on vulnerable communities or infrastructure, and that contribute towards mitigating climate change.[1849] Finally, the municipality needs to develop local biodiversity and ecosystem conservation and management plans in a participatory manner with local stakeholders.[1850] The plans should address the optimisation of carbon storage in ecosystems and the protection of scarce or vulnerable habitats, and optimise and sustain the supply of ecosystem services under climate change uncertainties. [1851]

[1845] eThekwini Municipality *Durban Climate Change Strategy* 17.
[1846] eThekwini Municipality *Durban Climate Change Strategy* 17.
[1847] eThekwini Municipality *Durban Climate Change Strategy* 18.
[1848] eThekwini Municipality *Durban Climate Change Strategy* 18.
[1849] eThekwini Municipality *Durban Climate Change Strategy* 18.
[1850] eThekwini Municipality *Durban Climate Change Strategy* 19.
[1851] eThekwini Municipality *Durban Climate Change Strategy* 19.

Given the unpredictability of the effects of climate change and the related disasters, the municipality needs to promote healthy communities and living environments that are prepared for the full range of climate change impacts. [1852] This could entail identifying communities that are vulnerable to high temperatures, floods and other climate-related events and develop and implement appropriate plans to reduce the vulnerability of these communities.[1853] Finally, to better handle emergency and disaster situations related to climate change and health, the municipality must develop community emergency plans in response to possible climate related disasters that include the use of early warning systems with associated public health advice.[1854]

The eThekwini CAP outlines 33 high-level actions and 149 sub-actions that are grouped into nine thematic areas that align with the *Climate Change Strategy*. Most significantly it speaks to providing sustainable water services and protection from flooding,[1855] protecting its biodiversity to build climate resilience,[1856] protecting the city from sea-level rise, and building resilience in the city's vulnerable communities. Water security has a relatively strong focus in the city's CAP, which emphasises the need to increase the city's alternative water supply capacity to meet the demands that may result from the impact of climate change.[1857] The city is taking proactive measures to ensure water security, including incorporating climate change considerations into bulk water purchase agreements to mitigate potential upstream impacts that extend beyond the city's operational boundaries.[1858] This approach presents an opportunity to mitigate the effects of climate change on the city's water resources and to foster a sustainable water supply system for future generations.

[1852] eThekwini Municipality *Durban Climate Change Strategy* 22.
[1853] eThekwini Municipality *Durban Climate Change Strategy* 22.
[1854] eThekwini Municipality *Durban Climate Change Strategy* 22.
[1855] eThekwini Municipality *Climate Action Plan* 45.
[1856] eThekwini Municipality *Climate Action Plan* 54.
[1857] eThekwini Municipality *Climate Action Plan* 46-47.
[1858] eThekwini Municipality *Climate Action Plan* 47.

Additionally, eThekwini has implemented programmes that focus on reduced consumption and demand-side reductions through measures such as introducing more greywater systems, water recycling and capture, improved water-metering, and the reduction of illegal water connections.[1859] In this context the city will implement water reuse and remix (a combination of treated effluent and seawater) programmes at wastewater treatment works, as well as a city-wide rainwater harvesting programme to capture and store rainwater for reuse.[1860] eThekwini will also promulgate a water services by-law to incorporate climate change response measures and review alternative water policies, such as a rainwater harvesting policy, linked to the by-law by 2025.[1861]

The municipality also seeks to reduce water demand to protect the city against drought risks.[1862] The CAP also acknowledges the possible loss of revenue resulting from reduced income from water sales, through the implementation of measures to reduce water demand. Consequently, the municipality will focus on developing a funding model for eThekwini Municipality that takes this into account.[1863] The city will also expand on existing water-saving awareness campaigns to promote behavioural change through the marketing of technologies, communication and education programmes, as well as continuing to implement programmes to reduce non-revenue water losses.[1864]

The city also aims to ensure the installation of urine diversion toilets that act as an interim solution in rural parts of the city where traditional sanitation is too costly to develop, and to facilitate a programme to convert 50% of municipal-owned buildings and all new households to low-flush toilets by 2030.[1865] Additionally, the municipality will work with other metropolitan municipalities in South Africa to implement a water

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1859 eThekwini Municipality *Climate Action Plan* 46.
1860 eThekwini Municipality *Climate Action Plan* 47.
1861 eThekwini Municipality *Climate Action Plan* 47.
1862 eThekwini Municipality *Climate Action Plan* 48.
1863 eThekwini Municipality *Climate Action Plan* 48.
1864 eThekwini Municipality *Climate Action Plan* 48.
1865 eThekwini Municipality *Climate Action Plan* 46, 48.

services auditing programme that addresses water quality and wastewater treatment.[1866] This will function like the national Blue and Green drop reports.[1867] To improve the quality of effluent being discharged into water bodies, the CAP states that the municipality will design new wastewater treatment works and extensions to existing works against stricter standards, to improve the quality of effluent being discharged to the rivers.[1868] The municipality will have to impose stringent controls on water polluting land uses and activities to ensure that the impacts of climate change are not exacerbated.[1869]

The CAP also highlights the city's focus on establishing protection measures, where possible, for existing development and infrastructure at risk of flooding, relocating all new non-essential infrastructure outside high-risk climate change areas, and discouraging further essential development.[1870] These interventions are also reiterated in the DCCS, which further relies on conducting analyses of projections and modelling climate systems to communicate results, which may be beyond the capability of most municipal line departments.[1871] The proposed interventions are not proactive, but rather reactive in nature, it remains to be seen if this will be enough to identify and protect municipal infrastructure located in zones at high risk of flooding. A more comprehensive and science- and fact-based response is urgently required to address the severe impacts of climate change on the city's water system.

The eThekwini *Municipal Disaster Management Plan* (2016) addresses both natural (storms, floods and droughts) and non-natural hazards (the failure of infrastructure services and dam failures).[1872] The Plan confirms the institutional and organisational

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1866 eThekwini Municipality *Climate Action Plan* 48.
1867 See para 2.3.2.3.
1868 eThekwini Municipality *Climate Action Plan* 46.
1869 eThekwini Municipality *Climate Action Plan* 48.
1870 eThekwini Municipality *Climate Action Plan* 49; eThekwini Municipality *Durban Climate Change Strategy* 15-16.
1871 eThekwini Municipality *Climate Action Plan* 49.
1872 eThekwini Municipal *Disaster Management Plan* 7-8.

arrangements for preventing disasters and mitigating the effects of hazards that cannot be prevented. It also lays out the protocols to be followed during normal operations for disaster preparedness and emergency response.[1873] As per the requirements of the *Disaster Management Act*, the city has established the eThekwini Municipal Disaster Management Centre as well as an Advisory Forum to ensure that all aspects of disaster management, namely prevention, mitigation, response and recovery are undertaken.[1874]

The municipality has also developed a Municipal Disaster Management Framework (MDMF) with four key performance areas focusing on integrated institutional capacity for disaster risk management, disaster risk assessment, disaster risk reduction, and response and recovery.[1875] The first key performance area (KPA) focuses on the necessary processes and mechanisms for establishing co-operative arrangements with pertinent agencies in the municipal area, surrounding municipalities, and the Provincial Disaster Management Centre (PDMC).[1876] These include arrangements for the direction, development and adoption of integrated disaster risk management policy, for stakeholder participation and the engagement of technical advice in disaster risk management planning and operations, and for disaster risk management co-operation with other local, regional, national and international agencies.[1877]

The second KPA addresses the requirements for implementing disaster risk assessment and monitoring by all municipal departments, stakeholders and role players. The imperatives under this KPA entail conducting disaster risk assessments to inform disaster risk management and risk reduction policies, planning and programming.[1878] However, there seems to be a lack of urgency in the phrasing, as they are only required to "progressively" integrate these assessments into the IDP and report on them

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1873 eThekwini Municipal *Disaster Management Plan* 9.
1874 See the discussion on the *Disaster Management Act* under para 4.4.5 of this study. eThekwini Municipality *Disaster Management Plan* 9, 11-12.
1875 eThekwini Municipality *Disaster Management Plan* 37.
1876 eThekwini Municipality *Disaster Management Plan* 37.
1877 eThekwini Municipality *Disaster Management Plan* 38-39.
1878 eThekwini Municipality *Disaster Management Plan* 39.

annually to the PDMC and national disaster management centre.[1879] Likewise the municipality is required to generate a municipal indicative disaster risk profile, monitor, update and disseminate disaster risk information, and conduct quality control of these assessments.[1880]

The city importantly delineates KPA 3 that addresses requirements for the alignment of a disaster management framework and planning in all departments of the municipality, as required by law.[1881] This KPA gives attention to the planning for and integration of core risk reduction principles and mitigation into on-going programmes and initiatives.[1882] The KPA's effectiveness is dependent on the rigorous compilation of integrated and relevant disaster risk management plans by all stakeholders. It is imperative to meticulously map and identify priority disaster risks, areas and communities, and initiate high-impact risk reduction initiatives.[1883] Likewise, disaster risk reduction efforts need to be included in strategic integrating structures and processes.[1884]

Considering the city's vulnerability to floods, it is not enough to simply comply with national laws; eThekwini must go above and beyond by incorporating risk avoidance behaviour into SDFs, IDPs, regulations, by-laws, and standards.[1885] The municipality must step up and take responsibility for implementing and monitoring disaster risk reduction programs and initiatives, as it plays a critical role in mitigating the effects of potential disasters.[1886]

1879 eThekwini Municipality *Disaster Management Plan* 40.
1880 eThekwini Municipality *Disaster Management Plan* 40.
1881 See para 4.3.5.
1882 eThekwini Municipality *Disaster Management Plan* 41.
1883 eThekwini Municipality *Disaster Management Plan* 41.
1884 eThekwini Municipality *Disaster Management Plan* 41.
1885 eThekwini Municipality *Disaster Management Plan* 41-42.
1886 eThekwini Municipality *Disaster Management Plan* 42.

The fourth KPA describes the priorities for implementation to ensure effective response, recovery, and rehabilitation planning.[1887] This entails focusing on identifying and implementing effective and appropriate EWS,[1888] and communicating this information to stakeholders to ensure an appropriate response.[1889] Similarly, the municipality will need to create guidelines and mechanisms for assessing, classifying, declaring and reviewing disasters.[1890] These guidelines and mechanisms should provide methods for rapidly classifying disasters and declaring states of disasters, and methods for assessing and costing significant events or disasters.[1891] To ensure a coherent and appropriate response to disasters, the municipality needs to focus on integrating response and recovery efforts, establishing standardised and regulated relief measures, and integrating rehabilitation and reconstruction projects with developmental initiatives.[1892]

To ensure the overall implementation of these KPAs, the *Disaster Management Plan* outlines three enablers that facilitate a consistent approach. All the KPAs rely on these enabling factors, which include information management and communication, education, training, public awareness, research, and disaster risk management funding arrangements.[1893] Some of the imperatives under these enablers entail ensuring that information management and communications systems support the KPAs and imperatives of the MDMF, and developing an integrated information management and communications system for disaster risk management encompassing all service units in the municipality.[1894]

1887 eThekwini Municipality *Disaster Management Plan* 42.
1888 See para 2.3.2.3 on early warning systems.
1889 eThekwini Municipality *Disaster Management Plan* 42.
1890 eThekwini Municipality *Disaster Management Plan* 42.
1891 eThekwini Municipality *Disaster Management Plan* 42.
1892 eThekwini Municipality *Disaster Management Plan* 43.
1893 eThekwini Municipality *Disaster Management Plan* 44-49.
1894 eThekwini Municipality *Disaster Management Plan* 44-45.

5.3.3 Ensuring the sustainable use of water for socio-economic activities

According to the IDP, the city's main objective is to "ensure equitable, environmentally, socially, and financially sustainable water and sanitation services that are of technically excellent quality and are provided in a manner that is consistent with the highest standards of environmental stewardship and social responsibility."[1895] To achieve this goal the water and sanitation department will focus on customer service, reducing costs, achieving operational efficiency, organisational capacity, and achieving financial sustainability. The initiatives identified to address the security of supply comprise drought mitigation measures, optimising and augmenting the current water supply, managing the financial aspects, energy and carbon projects, and education and training measures.[1896]

The WSDP discusses the existing situation concerning non-revenue water in detail.[1897] It distinguishes between real losses and apparent losses and outlines the measures needed to address these losses.[1898] Real losses concern pressure management, speedy and quality repair, active leakage control and pipeline materials management.[1899] Apparent losses are addressed through policy and enforcement, customer meter management, data handling controls and water accounting controls.[1900] Due to the status of non-revenue water in the municipality, the WSDP establishes weekly, monthly and annual monitoring and evaluation of the water infrastructure.[1901]

The WSDP is embedded in the municipality's integrated planning system, which partly comprises of the IDP, SDF, and Local Area Plans.[1902] The WSDP states that WCWDM is a priority activity for eThekwini and states that a wide range of measures to reduce losses

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1895 eThekwini Municipality *Integrated Development Plan* 160.
1896 eThekwini Municipality *Integrated Development Plan* 163.
1897 eThekwini Municipality *Water Services Development Plan* 44-51.
1898 eThekwini Municipality *Water Services Development Plan* 47.
1899 eThekwini Municipality *Water Services Development Plan* 47.
1900 eThekwini Municipality *Water Services Development Plan* 48.
1901 eThekwini Municipality *Water Services Development Plan* 50-51.
1902 eThekwini Municipality *Water Services Development Plan* 60-63.

and improve the efficient use of water has been implemented.[1903] These include engineered interventions such as the construction of dams for immediate and short-term demand.[1904] Additionally, the eThekwini Water and Sanitation Unit also concluded a feasibility study on the reclamation and re-use of treated effluent for potable water use.[1905] This intervention entails the replacement of water released from the upstream impoundments and dams, making more water available for urban water supply from these dams. This approach will typically involve the replacement of releases made to meet the ecological reserve flow requirements[1906] as well as reclamation and recycling to upstream impoundments, making this water available for indirect water use, and also the reclamation and direct re-use to supplement the water supply to areas subject to growing urban, commercial, and industrial needs.[1907] These interventions are particularly relevant as they are also identified as alternative supplies to industry – therefore assisting with ensuring water for socio-economic livelihoods and productivity.

5.3.4 Evaluation

While the eThekwini Municipality can in general be said to have adopted and implemented all the prescribed measures and responses to address challenges to urban water security in its area of jurisdiction, a study of the available instruments suggests otherwise.

In relation to the first two dimensions, the eThekwini Municipality legal framework generally encompasses the elements necessary for the fulfilment of its water services provision mandate. The WSDP and IDP are well integrated, as was shown in the above discussion. However, beyond providing and allocating sanitation facilities, the instruments do not cover the city's approach to addressing wastewater and sewage in the detail required for ensuring urban water security. The WSDP therefore misses an

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1903 eThekwini Municipality *Water Services Development Plan* 69.
1904 eThekwini Municipality *Water Services Development Plan* 69.
1905 eThekwini Municipality *Water Services Development Plan* 70.
1906 eThekwini Municipality *Water Services Development Plan* 70.
1907 eThekwini Municipality *Water Services Development Plan* 70.

opportunity to integrate the city's water services (drinking water, wastewater) and resource protection.

Pertaining to the protection of urban aquatic ecosystems, eThekwini has wide-ranging provisions across all its instruments which point to the mainstreaming of biodiversity into its development and planning processes. This is laudable, especially with the acknowledgement of the city's approach concerning ecosystem-based adaptation and its integration of biodiversity planning with spatial planning as is evidenced by the D'MOSS. The foregoing represents the City's required interventions for developing and implementing a sustainable and integrated spatial planning system. However, it can be argued that these approaches and interventions would benefit from the adoption of biodiversity focused strategies and plans such as a bioregional plan, a biodiversity management plan or LBSAP. These instruments may arguably provide a more coherent approach toward conserving the city's aquatic ecosystems.

Furthermore, just as is the case with Cape Town, eThekwini has an extensive climate change and disaster management response programme. While the interventions outlined in the CAP are significantly more detailed, the DRMP is not as extensive. The city also misses an opportunity to streamline and integrate its DRM efforts with its climate change response. It may be noted that disaster management is more technical in its response, with climate change interventions being noticeably more aspirational. Hence, the integration of DRM and CCA may prove to be beneficial in ensuring an adequate response to water-related climate risks and disasters.

In the final instance, eThekwini acknowledges the importance of including all water users in the water value chain and acknowledges the values of water extending beyond human consumption. To this end the city has several responses outlined to address non-revenue water, which would assist in managing the water available for all water uses. In addition, the city could do more in regard to including WC/WDM measures that would address consumption and demand in all sectors.

5.4 City of Johannesburg

5.4.1 Local water insecurity profile

The City of Johannesburg Metropolitan Municipality is situated in South Africa's economic hub in the Gauteng Province.[1908] With a population of approximately 6 million people,[1909] Johannesburg supplies water to domestic, commercial, and industrial customers.

Johannesburg includes scattered regions of residential, township, industrial and office developments, with a sizeable proportion of the city's residents living in informal settlements. As the number of households increase, extra strain is put on the existing infrastructure.[1910] The city's total infrastructure backlog stands at R170 billion composed of collapsing bridges, city pavements that are in a poor condition, potholes, burst water pipes and ailing substations. Johannesburg is also notorious for its constant interruptions of water supply.[1911] Johannesburg struggles with high levels of poverty and inequality, high levels of migration, social exclusion, and substandard levels of human development. These issues are further exacerbated by unequal development, long and costly commutes, inadequate basic services and policies not focused on ensuring and maintaining sustainable growth.[1912]

Johannesburg is one of the few major cities not located on a water source, and receives its water from the Vaal Dam, approximately 100km away. Hence water scarcity and the increasing cost of water present significant challenges. The bulk of the water supply is pumped from the Lesotho Highlands through a system of interconnected water sources, pumps, valves, pump stations, purification plants, pipelines of various diameters and

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1908 Mokwena *Municipal Responses to Climate Change in South Africa* 24.
1909 Macrotrends 2022 http://www.macrotrends.net/cities/22486/johannesburg/population.
1910 City of Johannesburg *Integrated Development Plan 2019/20* 8.
1911 Mafata 2021 https://www.news24.com/news24/southafrica/news/joburg-can-no-longer-rely-on-its-water-supply-20210910.
1912 City of Johannesburg *Integrated Development Plan* 18.

reservoirs.[1913] Rand Water supplies bulk water to Johannesburg Water, a municipal entity, which then manages the sale of water to consumers and wastewater collection and treatment.[1914] Johannesburg Water is responsible for the distribution of potable water, sewage and wastewater management, and maintaining and expanding the city's water infrastructure.[1915] With issues such as ageing infrastructure, backlog challenges with regard to water and sewer pipe replacements, and considerable water debts, the city faces exceptionally complex interactions within and between human and water systems. The surface water is currently stressed and threatened by pollution and the destruction of river catchments. Additionally, the city experiences high non-revenue water and further water losses due to its aging infrastructure. Droughts and other climatic variations in the region are projected to increase in frequency in future decades.

Johannesburg contains the largest man-made forest in the world, with an estimated 10 million trees in the city. The key natural landscape features of Johannesburg include rivers, wetlands, protected areas, parks and recreational areas, ridges, forest, grassland, and bushland. However, the increase in paved and impermeable surfaces that is in direct relation to the increased residential, commercial, and industrial development in the city has led to increased frequencies of greater volumes of runoff surface waters into the watercourses throughout Johannesburg.[1916] This has led to stream bed modifications, riverbank erosion and degradation, and riparian vegetation destruction.

1913 Water Wheel *Johannesburg – City on A Watershed* 19.

1914 Rand Water provides bulk potable water to more than 11 million people in Gauteng, parts of Mpumalanga, the Free State and North West – an area that stretches over 18 000 km^2. Rand Water draws water from its catchments and purifies it for human consumption. The water is then supplied / sold to Municipalities, mines and industries. The municipalities, e.g., Johannesburg Water, in turn supply the water, at a cost, to the consumers or individual households. – Rand Water 2020 https://www.randwater.co.za/AboutUs/Pages/CoreBussiness.aspx.

1915 City of Johannesburg *Johannesburg Water Business Plan 2019/20* 11.

1916 City of Johannesburg *LBSAP* 57.

5.4.2 Instruments in the City of Johannesburg

5.4.2.1 Ensuring equitable, secure and reliable access to adequate, clean and safe water services

The Johannesburg Water entity is responsible for drafting five-year water services plans as agreed between the city and the entity. However, Johannesburg Water has not adopted any plans as it relies mainly on its long-term infrastructure plan. For the purposes of this section, the study looks at the Business Plan of Johannesburg Water as it outlines many of the components required in WSDPs.

5.4.2.1.1 Provision of water services: adopting water services development plans, by-laws and strategies

Acknowledging that not all have equitable access to water services, the IDP identifies the upgrading of informal settlements as an aim. This involves expanding free rudimentary service delivery in informal settlements by rolling out basic water, electricity and sanitation services.[1917] This would entail the provision of basic services and access to communal standpipes and sanitation in the form of Ventilated Improved Pits (VIPs), waterborne toilets and ablution blocks, as well as improving the existing infrastructure through upgrading, maintenance and renewal/replacement projects.[1918] The water and sanitation programme aims to provide an improved quality of access to drinkable water and adequate sanitation, and targets the repair and maintenance of the water infrastructure.

The city commits to improving the reliability of its water services by concluding water supply interruptions within 12 hours, clearing sewer blockages within 24 hours of notification, and enhancing service delivery by having metered connections read on a

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[1917] City of Johannesburg *Integrated Development Plan* 66.
[1918] City of Johannesburg *Integrated Development Plan* 66.

monthly basis.[1919] The upgrading of basic water services to informal settlements will be effected and dispersed informal households will continue to receive nominal water services through water tankers as aspects of the attempt to effectively ensure redress and expand access to reliable quality bulk services to the unserved communities in the city.[1920] There will also be an attempt to reduce resource consumption, which addresses energy and water demand by way of demand side management, and to provide for alternative sources of water and water conservation.[1921] Additionally, the city aims to minimise environmental pollution by addressing water resources and integrated waste management. This will be done through rehabilitating water courses, improving the health of river courses and groundwater, and reducing the generation of waste.[1922]

In its Business Plan 2019/20 the city's WSP, Johannesburg Water, identifies six goals necessary for achieving the city's outcomes and priorities.[1923] The first strategic goal focuses primarily on rolling out infrastructure and the upgrading and renewal of networks, the expansion of wastewater treatment works and storage capacity, and water demand management initiatives.[1924] The Plan sets out the city's critical assets that require replacement or renewal as well as the required funds to renew or replace the water network infrastructure.[1925] The outcomes of the water networks infrastructure renewal/replacement would be to reduce bursts, improve response times and the water supply, and renew or replace the wastewater infrastructure to reduce sewer blockages, improved response time and reduce sewer spills at wastewater treatment works and improve effluent/sludge quality.[1926]

1919 City of Johannesburg *Integrated Development Plan* 72.
1920 City of Johannesburg *Integrated Development Plan* 72.
1921 City of Johannesburg *Integrated Development Plan* 75.
1922 City of Johannesburg *Integrated Development Plan* 75.
1923 Johannesburg *Water Business Plan 2019/20* 9. The Business Plan is a strategy document that sets out how the relevant department in the city as well as Johannesburg Water will achieve service delivery objectives.
1924 Johannesburg *Water Business Plan* 20.
1925 Johannesburg *Water Business Plan* 20.
1926 Johannesburg *Water Business Plan* 20.

The second goal focuses on delivering good quality water and sanitation services that are accessible, reliable and efficient, in an environmentally responsible and sustainable way.[1927] The priority areas under this goal include upgrading informal settlements and addressing service backlogs in general.[1928] The Plan also highlights the city's *Drought Response Plan,* which is currently under development, which will deal with implementation plans for a possible drought situation in future, and which will investigate the use of alternative resources like effluent and ground water abstraction.[1929] The problem here, however, is that mines in the area have exposed most of the underground water to acid mine drainage, so groundwater may not present a viable option for the city.[1930]

The third strategic goal aims to improve customer and stakeholder satisfaction. The purpose of this goal is to enhance internal and external communication, influence behavioural change towards water conservation and the proper use of water and sewer infrastructure, which would lead to improved customer satisfaction.[1931] This goal aims to create a culture of enhanced service delivery, create a city that responds to the needs of citizens, customers, stakeholders and businesses, and preserves the natural resources for future generations.[1932]

The fourth goal purports to enhance sound financial management, sustainability and clean governance. Initiatives identified under this goal aim to enhance revenue by identifying missing customers, ensuring that all customers are billed at the correct tariff and that all customers are billed monthly for the services rendered.[1933] Furthermore, it includes investigating unbilled and unmetered consumption as a measure of curbing commercial losses and enhancing revenue, and implementing prepayment technology

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1927 Johannesburg *Water Business Plan* 37.
1928 Johannesburg *Water Business Plan* 37.
1929 Johannesburg *Water Business Plan* 39.
1930 See Naicker, Cukrowska and McCarthy 2003 *Environmental Pollution* 29-40.
1931 Johannesburg *Water Business Plan* 40.
1932 Johannesburg *Water Business Plan* 40.
1933 Johannesburg *Water Business Plan* 42.

and systems that support revenue enhancement.[1934] The use of technology for effective and efficient operations is the fifth goal. In this regard the entity encourages innovation and efficiency to optimise service delivery.[1935] Some of the key objectives are to drive urban water resilience and sustainability and improve water demand management through technology while protecting water resources and reducing non-revenue water.[1936] Chapter 5 of the Plan maps out the SDGs which are applicable to the business of Johannesburg Water.[1937] It references SDG 5 on gender equality, SDG 6 on clean water and sanitation, SDG 8 on decent work and economic growth, SDG 9 on industry, innovation and infrastructure, SDG 11 on sustainable cities and communities, SDG 12 on responsible consumption and production, and SDG 13 on climate change action.[1938]

The city also has a *Draft Water Service By-law* (2018), which aims to address city-specific sanitation issues while adhering to national regulations.[1939] The purpose of the by-law will be to develop, maintain, and monitor adequate water and sanitation systems. The draft by-law covers the connection of water supply, standards of measurements, installation work and protection of the water supply system, water distribution and testing, as well as WC/WDM and several other relevant concerns for water and sanitation.[1940] The draft by-law takes a more integrated approach to water management and includes provisions on sanitation services, industrial effluent, and (importantly) drainage installation.

5.4.2.1.2 Management of stormwater services

The city commits to providing a baseline for determining the types of additional treatment facilities that may be required for wastewater recycling. In so doing the city

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1934 Johannesburg *Water Business Plan* 42, 45.
1935 Johannesburg *Water Business Plan* 48.
1936 Johannesburg *Water Business Plan* 50.
1937 Johannesburg *Water Business Plan* 59.
1938 Johannesburg *Water Business Plan* 59. Also see the discussion in para 3.2.3
1939 City of Johannesburg *Draft Water Service By-law*.
1940 Chapters 4, 5, 6, 7, 9 and 10 of the *Draft Water Service By-law* respectively.

will develop clear and practical guidelines to define its water treatment requirements and quality standards for reuse, implement a rainwater harvesting guideline, and assess water supply quantities and demand fluctuations to determine storage and treatment capacity requirements.[1941] The city also aims to develop and deploy a small-scale water treatment and purification system and a water use strategy that identifies additional interventions.[1942] To address the city's vulnerabilities concerning stormwater, it will investigate the potential for stormwater harvesting and initiate a pilot project for decentralised water use including water recycling and stormwater harvesting.[1943]

The City of Johannesburg *Stormwater Management By-law* (2010) aims to manage, control, and regulate the quantity, quality, flow and velocity of stormwater runoff from any property in the municipal area.[1944] The aim is therefore to address the erosion and degradation of watercourses, sedimentation in ponds and watercourses, the degradation of water quality, and excess stormwater runoff onto a public road, which may pose a danger to life or property or both.[1945]

The by-law is binding on developers who propose to undertake or who have undertaken any work contemplated in the by-law, contractors or agents appointed to carry out such work, and any owner of a property that has been developed.[1946] Chapter 2 lists the site development permits that need to be obtained in terms of the by-law.[1947] A permit is required for any of the following site development activities:

> (a) Any site development activity in respect of a major development;
>
> (b) any site development activity that will require connection to the Council's stormwater drainage system;
>
> (c) any grading activity that will result in the movement of 100m^3 or more of earth;

1941 City of Johannesburg *Climate Action Plan* 95.
1942 City of Johannesburg *Climate Action Plan* 96.
1943 City of Johannesburg *Climate Action Plan* 96.
1944 S 2 of the *Stormwater Management By-law*.
1945 S 2(a)-(d) of the *Stormwater Management By-law*.
1946 S 4 (1)-(3) of the *Stormwater Management By-law*.
1947 S 5 of the *Stormwater Management By-law*.

(d) any grading activity that will result in a temporary or permanent slope with a steepness exceeding 3 m horizontal to 1 m vertical and with a total slope height, measured vertically from bottom to top of the slope, exceeding 1,5 m;

(e) any grading activity that will include the construction of an embankment or berm which will result in the impoundment of water to a depth exceeding 450 mm or with a maximum volume exceeding 50 m^3 of water;

(f) any grading activity that will result in the diversion of any existing stormwater drainage feature from its natural point of entry to or exit from a development site;

(g) any clearing or grading on a slope steeper than 3 m horizontal to 1 m vertical; and

(h) any clearing within a floodplain.[1948]

The rest of the sections deal with the exceptions to the above permit requirements, the specifics concerning applications for permits, the expiry of permits, and the procedure concerning any permit modifications.[1949] It is further expected of developers to prepare a stormwater drainage plan.[1950] The stormwater drainage plan must cover the collection, transportation, treatment and discharge of stormwater from the development site.[1951] This plan must contain an analysis of the impact of stormwater quantity and must contain features to mitigate such impacts.[1952] The impacts which must be evaluated and mitigated include flooding, infiltration to groundwater or any area of land with the ability to contribute to or recharge ground water, the deterioration of stormwater quality, and any spill or discharge of a pollutant into stormwater.[1953]

The role of wetlands in stormwater management is also covered in the by-law.[1954] The quantity and velocity of any stormwater discharge directly or indirectly into a wetland must be controlled and treated to the extent that such a discharge attains a quality in

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[1948] S 5 of the *Stormwater Management By-law*.
[1949] Ss 6, 7, 8 and 15 of the *Stormwater Management By-law*.
[1950] S 11(1) of the *Stormwater Management By-law*.
[1951] S 11(2) of the *Stormwater Management By-law*.
[1952] S 11(3)(a) of the *Stormwater Management By-law*.
[1953] S 11(b) of the *Stormwater Management By-law*.
[1954] S 44 of the *Stormwater Management By-law*.

compliance with the requirements of the NWA and the NEMA.[1955] Concerning the management of stormwater in a catchment area, the by-law provides that the Agency should develop requirements for a catchment area for the control at source of stormwater, stormwater treatment and erosion control at any water course, and requirements relating to any wetland or other water quality-sensitive area.[1956]

The by-law deals with the operation and management of stormwater drainage facilities under Chapter 6.[1957] The provisions require of property owners to undertake the continual effective operation, maintenance and repair of stormwater drainage facilities or measures in accordance with the provisions of the by-law.[1958] The by-law also delineates several duties for the entity responsible for stormwater management. These duties include maintaining new stormwater facilities, maintaining existing stormwater drainage facilities, inspections of privately maintained stormwater facilities, and the adoption of an inspection schedule for the purpose of ensuring the regular and effective inspection of stormwater facilities.[1959] These provisions essentially see the role of the municipality either as the provider of these services or facilitating the supervision and monitoring of contracted entities in carrying out these duties.

Chapter 8 of the by-law addresses stormwater pollution and prohibits the discharge of any substance other than unpolluted stormwater runoff and other unpolluted natural surface water runoff into a stormwater system, any connection to the stormwater system which could result in the discharge to it of any pollutant, or a connection from the interior of any building or structure.[1960] It also requires the operation and maintenance of pollution control devices to ensure that the performance thereof meets appropriate standards.[1961] These provisions are significant as they tie into the city's role

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1955 S 44(1) of the *Stormwater Management By-law*.
1956 S 46 of the *Stormwater Management By-law*.
1957 Ss 49–52 of the *Stormwater Management By-law*.
1958 S 48(1) of the *Stormwater Management By-law*.
1959 Ss 47–52 of the *Stormwater Management By-law*.
1960 S 54 (1)(a)-(c) of the *Stormwater Management By-law*.
1961 S 55 of the *Stormwater Management By-law*.

in ensuring an environment not harmful to health or well-being, although not explicitly stated.

The city's *Stormwater Management Manual* (2017) speaks to the protection and enhancement of water quality, and the protection of ecological resources and open space networks.[1962] It also provides for catchment master planning and catchment recovery.[1963] The Manual further addresses flood and hazard risk and focuses on flood management and adaptation to climate and weather change, and aims to address densification and brownfields development, informal settlements and informal densification. [1964]

5.4.2.2 Protection of urban aquatic ecosystems

The IDP further recognises the importance of conserving natural resources. This can be achieved firstly through protecting the natural environment, which entails the conservation of biodiversity and the management of open spaces, more specifically acquiring, protecting, rehabilitating, and maintaining functional ecosystems, and making equitable provision of open spaces.[1965] The city is managing its rivers through the rehabilitation of the water courses in each of the identified water management units in the two catchments.[1966] The city endeavours to continuously establish new protected areas on its CBAs and to conduct feasibility studies for this purpose. These interventions allow for the protection of threatened species and ecosystems together with the related goods and service.[1967] The IDP states that Open Space Planning aims to improve the protection and management of the whole landscape and to secure critical natural processes underpinning development, including important habitats and ecological

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[1962] City of Johannesburg *Stormwater Management Manual* 4.
[1963] City of Johannesburg *Stormwater Management Manual* 7-8.
[1964] City of Johannesburg *Stormwater Management Manual* 9-11.
[1965] City of Johannesburg *Integrated Development Plan* 75.
[1966] City of Johannesburg *Integrated Development Plan* 76.
[1967] City of Johannesburg *Integrated Development Plan* 76.

linkages, to protect water catchments and to harness the benefits of green infrastructure, both natural and engineered.[1968]

5.4.2.2.1 Adopting conservation plans and strategies

The City of Johannesburg *Local Biodiversity Strategy and Action Plan* (2015) sets out a framework and a plan of action for the conservation and sustainable use of biological diversity and the equitable sharing of the benefits derived from this use.[1969] The LBSAP indicates that Johannesburg suffers a high degree of negative ecological impacts and environmental pressures through its ever-increasing population density.[1970] The LBSAP further details that conservation buffer zone allocation should be taken into consideration during the planning phases of developments and recommends that these areas should not only remain undeveloped but should remain unimpacted by development activities.[1971]

The LBSAP also refers to the *Catchment Policy,* which aims to meet the city's obligations regarding the protection and management of its water catchments by using an integrated approach in line with the legislative requirements and best management practices and in the interests of environmental and economic sustainability and the amenity and safety of all the city's residents.[1972] To this end, no development may take place within the riparian area and 30 metre buffer zone of any riparian area or wetland or within the 100 year flood line without the approval of the City of Johannesburg Environmental Management Department on behalf of the City of Johannesburg.[1973] The difficulty here is balancing urban development with the provision and restoration of aquatic ecosystem services and adopting an integrated approach to catchment

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1968 City of Johannesburg *Integrated Development Plan* 76.
1969 City of Johannesburg *Local Biodiversity Strategy and Action Plan* (2015) (LBSAP) 1.
1970 City of Johannesburg *LBSAP* 5.
1971 City of Johannesburg *LBSAP* 8.
1972 City of Johannesburg *LBSAP* 10.
1973 City of Johannesburg *LBSAP* 10.

management. Likewise, it is important to understand the intersection of stormwater, land use and aquatic health considerations in a catchment context.

The LBSAP also provides an overview of the Johannesburg Metropolitan Open Space System (JMOSS), a tool which addresses the management of the city's natural open space resources, and which aims to conserve and protect biodiversity during development planning.[1974] The JMOSS Management Strategy identifies the specific and general actions and responsibilities required for determining the status and importance of primary open space, specific management guidelines pertaining to sensitive environmental features such as ridges, guidelines for the general management of open space including actions for the control of alien and invasive species, access control and the disposal of waste, mechanisms to control development and land use in and around primary open space, and mechanisms to control the sustainable use of natural resources in primary open spaces.[1975]

The LBSAP further provides details of the various action plans required to meet the vision and strategic objectives of the city, comprising of seven sections addressing different suites of problems.[1976] The first includes an assessment of the broader strategic issues of the urban ecological framework that essentially sets the scene for biodiversity protection and integration.[1977] The urban ecological network requires of the City to define the conservation objectives, describe the likely urban development scenarios, conduct a strategic environmental assessment of the impacts of each scenario on the objectives, and to classify and spatially locate the various elements that comprise an ecologically network.[1978]

1974 City of Johannesburg *LBSAP* 11.
1975 City of Johannesburg *LBSAP* 11. There is also the provincial *Gauteng Ridges Policy*, but this does not cover aquatic ecosystems.
1976 City of Johannesburg *LBSAP* 23.
1977 City of Johannesburg *LBSAP* 24.
1978 City of Johannesburg *LBSAP* 24.

Crosscutting actions that will contribute to achieving this include integrated decision-making and planning that mainstreams biodiversity conservation, clear conservation objectives aimed at improving the sustainability of the urban environment, as well as defining strategic environmental assessment that compares the conservation objectives with development scenarios.[1979] Ultimately the aim is to indicate how and where development will have the greatest impact on the identified conservation objectives and consequently also where amendment of the various planning frameworks will be required.[1980]

The second section deals with issues of governance and institutional arrangements that would enable the implementation of the biodiversity strategy and action plans.[1981] The LBSAP identifies adaptive management as the general approach to inform the governance of biodiversity in the city.[1982] This approach emphasises monitoring the effectiveness of the actions and encourages learning and novelty, thus increasing resilience in the city's governance systems.[1983] The underlying principles for governance in this area are participation, a defined and transparent governance structure, and accountability.[1984] Participation ensures that consultation forms part of the governance process, in order to build trust and understanding, and to facilitate the identification of impending problems or innovative solutions.[1985] Each functional entity in the city must be able to define its role with respect to biodiversity mainstreaming, its monitoring and improvement process, as well as its relationships with other entities, whether these are on the same institutional level or not.[1986] Lastly, the authorities must be held

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1979 City of Johannesburg *LBSAP* 25.
1980 City of Johannesburg *LBSAP* 27.
1981 City of Johannesburg *LBSAP* 23.
1982 City of Johannesburg *LBSAP* 34.
1983 City of Johannesburg *LBSAP* 34.
1984 City of Johannesburg *LBSAP* 34.
1985 City of Johannesburg *LBSAP* 34.
1986 City of Johannesburg *LBSAP* 34.

accountable for their decisions and actions, and in particular with regard to the equitable inclusion of the concerns of minority groups and the risks they face.[1987]

It is also apparent that biodiversity management is highly dependent on the possession of quality spatial and ecological information. Hence, the City of Johannesburg needs to centralise, standardise and improve the quality of its environmental management information base in order to be able to inform all stakeholders fully and improve their access to relevant biodiversity information.[1988] This would require developing an environmental information management system, sourcing up-to-date information on biodiversity from various stakeholders, identifying information gaps and devising strategies to address such gaps, uploading relevant information, and developing strategies for the ongoing improvement of information gathering.[1989]

The LBSAP also acknowledges the need to undertake strategic environmental spatial planning, deeming it necessary to identify priority areas where strategic assessments and frameworks are required, as a complementary process to the formulation of an overall ecological management framework.[1990] Other actions relevant to this plan include integrating biodiversity considerations into the planning and budgeting processes of the city, aligning land-use planning with ecological principles for open space planning, and developing a monitoring and evaluation programme for biodiversity management.[1991]

The third action area relates to environmental education and awareness to raise the profile and understanding on the benefits of urban biodiversity in the city.[1992] The fourth addresses the various biodiversity features of special concern in the city, comprising of watercourses, wetlands and ecosystems.[1993] Actions identified in this section relate to

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1987 City of Johannesburg *LBSAP* 34.
1988 City of Johannesburg *LBSAP* 35.
1989 City of Johannesburg *LBSAP* 35.
1990 City of Johannesburg *LBSAP* 36.
1991 City of Johannesburg *LBSAP* 38, 39, 42.
1992 City of Johannesburg *LBSAP* 43.
1993 City of Johannesburg *LBSAP* 43.

raising awareness regarding wetland values, protection, rehabilitation, policies and regulations, and encourage involvement by individuals, groups, corporations and industries in all aspects of wetland protection and rehabilitation.[1994] Furthermore, the city will develop an accessible, computerised database for wetlands through the JMOSS and use this information to produce a readable report for the public, outlining wetland targets and trends.[1995]

The LBSAP acknowledges the importance of not allowing any development in wetlands and the enforcement of wetland buffers through biodiversity management in the city.[1996] Additionally, implementing environment friendly stormwater management policies that reduce the impact on aquatic ecosystems also forms an important component in preserving the City's biodiversity features.[1997] Consequently, the City of Johannesburg has placed management strategies such as the *Catchment Management Plan* and *Stormwater By-laws* into practice to potentially curb the effects of poor historical stormwater management.[1998]

The City of Johannesburg thus seeks to reduce the safety hazard of flash flooding, to enhance the overall ecological integrity of surface water, to rehabilitate riparian zones, and to allow for flood attenuation and the filtration of surface water runoff.[1999] In terms of this Plan the rehabilitation and conservation of wetlands can primarily be achieved through upgrading infrastructure, detailed rehabilitation plans for priority areas, and engineering designs that consider the socio-economic impacts of rehabilitation efforts that may result in alterations to the current hydrological regime.[2000] The LBSAP outlines further activities such as an integrated catchment approach to water resource management, aligning departmental structures to ensure integrated decision-making,

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1994 City of Johannesburg *LBSAP* 53.
1995 City of Johannesburg *LBSAP* 54.
1996 City of Johannesburg *LBSAP* 56.
1997 City of Johannesburg *LBSAP* 57.
1998 City of Johannesburg *LBSAP* 57.
1999 City of Johannesburg *LBSAP* 58.
2000 City of Johannesburg *LBSAP* 59-60.

enforcing and maintaining rules and regulations for floodplains, riparian buffers and the protection of wetlands, enforcing development guidelines and environmental requirements for land development, and enforcing the polluter-pays principle relating to the pollution of water courses.[2001]

The LBSAP also outlines plans to address the social open space system in Johannesburg and the biodiversity contribution that this can make.[2002] Significant actions include stronger enforcement and monitoring of development activities, limiting the use of natural resources and water in public spaces, and systematically replacing water-intensive invasive plants with indigenous plants and trees.[2003] However, the difficulty here is that there may be unintended consequences to removing invasive plants to unlock water in that the invasive tress may have been planted to provide drainage for mines. If these trees are removed, the city may be faced with wetlands and streams it did not know about.[2004] Much of the impact could be minimised through careful planning and the avoidance of sensitive areas, by enforcing the regulations and by-laws for the management of invasive plant species within the appropriate policy and legislative frameworks, and by implementing incentives and disincentives to encourage compliance.[2005]

There are several plans, programmes, and laws applicable to addressing the action plans. These include the SDF, IDP and JMOSS. The LBSAP acknowledges that threatened ecosystems, ecological corridors and other spatial biodiversity features should be considered in a meaningful way in the planning categories and land management guidelines as set out in SDFs.[2006] The LBSAP also contains detailed recommendations for a monitoring and evaluating framework in the implementation of

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2001 City of Johannesburg *LBSAP* 61.
2002 City of Johannesburg *LBSAP* 80.
2003 City of Johannesburg *LBSAP* 82-85.
2004 See Hirsch 2019 https://theconversation.com/south-africa-needs-a-fresh-approach-to-managing-invasive-trees-like-eucalyptus-126777.
2005 City of Johannesburg *LBSAP* 91-93.
2006 City of Johannesburg *LBSAP* 35.

the Plan. These recommendations include reviewing the LBSAP every five years, detailing clear responsibilities and time frames for the implementation of the action plans, mainstreaming the action plans into the City's business plans, performance management systems and budget allocations, and developing acceptable indicators to monitor progress.[2007]

5.4.2.2.2 Mainstreaming ecosystem protection

The protection of the natural environment and the promotion of sustainable environmental practices are also emphasised throughout the city's IDP.[2008] In this regard the IDP emphasises the importance of the natural environment for the health and wellness of current and future generations.[2009] As emphasised in international, regional and national laws,[2010] links between land use and the natural environment are also established in the city's IDP. To this end it seeks to address increasing pressure on the natural environment and green infrastructure, urban sprawl and fragmentation, inefficient residential densities and land use diversity.[2011] The city's *Environmental Sustainability Strategy* (2019) emphasises the municipality's need to preserve its natural resources.[2012] The IDP thus highlights the importance of being cognisant of the impact of urban life on the environment.[2013] The programmes identified under this outcome include biodiversity conservation, open space planning, water resource management, waste management, water demand management and climate change management.[2014]

The SDF identifies several goals under the guise of themes such as inclusivity, connectivity, and resilience.[2015] Through its resilience theme the SDF portrays the

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2007 City of Johannesburg *LBSAP* 109.
2008 City of Johannesburg *Integrated Development Plan* 68.
2009 City of Johannesburg *Integrated Development Plan* 69.
2010 See paras 3.2.2.3, 3.3.2.3 and 4.3.4.
2011 City of Johannesburg *Integrated Development Plan* 55, 65.
2012 City of Johannesburg *Integrated Development Plan* 70.
2013 City of Johannesburg *Integrated Development Plan* 71.
2014 City of Johannesburg *Integrated Development Plan* 71.
2015 City of Johannesburg *Spatial Development Framework* 71.

municipal vision for protecting the natural environment as a protection buffer, protecting valuable green infrastructure and areas of high agricultural potential, promoting sustainable energy use, reinforcing the urban development boundary, and protecting biodiversity resources.[2016] Strategies under this theme include ensuring environmentally sensitive and open areas, providing for green open spaces, implementing the metropolitan open space system, and providing innovation, development and the application of new technologies and solutions in the effort to curb, halt, reverse and adapt to global climate change.[2017] In the case of climate change, anticipating climate change and integrating climate change mitigation and adaptation into the SDF and urban planning practices of Johannesburg will help the city to plan for resilience.[2018] The SDF will further integrate the link between urbanisation patterns, energy intensity and carbon emission levels.

Key spatial interventions and priorities in this regard include protecting and enhancing biodiversity resources by using them as structuring elements for urbanisation and ecosystem services (including stormwater, natural purification system, and public open space), considering the JMOSS as an integrated social open space layer, restricting any development in the ecological footprint and disaster- and hazard-prone areas, planning natural buffer zones in the ecological footprint and disaster-prone areas, and protecting them from flooding and/or exposure to mining waste.[2019] The spatial framework envisions Johannesburg as a hierarchy of dense mixed-use transformation areas, corridors and nodes, that integrate the natural ecological system as a structuring layer, and that are connected by an efficient public transit system.[2020]

[2016] City of Johannesburg *Spatial Development Framework* 80.
[2017] City of Johannesburg *Spatial Development Framework* 81.
[2018] City of Johannesburg *Spatial Development Framework* 82.
[2019] City of Johannesburg *Spatial Development Framework* 91.
[2020] City of Johannesburg *Spatial Development Framework* 86.

The City of Johannesburg SDF provides for an integrated natural structure as a provider of ecosystem services under its spatial framework.[2021] This includes the mapping of the city's CBAs.[2022] The development strategy outlined in the SDF emphasises the importance of applying development controls and supporting mechanisms in critical biodiversity areas to protect and enhance these valuable city assets.[2023] To this end Johannesburg must plan natural areas such as wetlands and swamps as protected natural buffers, serving as the natural urban development boundary, and must protect them from flooding and climate change-related damage.[2024] It is also clear that all development proposals and applications must demonstrate the integration of the natural environment into the development and deal with the impact of the development on the city's natural resources.[2025] In this instance, relevant instruments under consideration include the application of EIAs to land-use management and other applications, using the *Catchment Management Policy* (2008), wetland audits, JMOSS, permitting and licensing requirements for water, air and waste, which should inform all development proposals.[2026] The SDF also emphasises the city's approach to financing various services, including the green infrastructure necessary to the management of stormwater and flooding.[2027]

5.4.2.3 Protection against water-related climate risks and disasters

The city's IDP focuses on creating caring and safe communities, which *inter alia* addresses by-law enforcement and disaster risk mitigation and reduction.[2028] The SDF details the climate change risks and opportunities as well as the municipality's approach to climate change adaptation.[2029] In this light the SDF aims to build resilience in

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2021 City of Johannesburg *Spatial Development Framework* 88.
2022 City of Johannesburg *Spatial Development Framework* 88.
2023 City of Johannesburg *Spatial Development Framework* 89.
2024 City of Johannesburg *Spatial Development Framework* 90.
2025 City of Johannesburg *Spatial Development Framework* 91.
2026 City of Johannesburg *Spatial Development Framework* 91.
2027 City of Johannesburg *Spatial Development Framework* 91.
2028 City of Johannesburg *Integrated Development Plan* 78.
2029 City of Johannesburg *Spatial Development Framework* 33-34.

communities, promote a compact carbon-efficient urban form, and preserve the natural environment that provides irreplaceable ecosystem services for the city.[2030]

The City of Johannesburg is focused on risk reduction strategies to reduce the impact of disasters and to protect communities and the infrastructure.[2031] Thus, the city indicates the alignment of its *Disaster Management Plan* with the *Sendai Framework* and the IDP.[2032] The IDP emphasises the importance of adequate knowledge of disaster risk, strengthening governance to manage disaster risk, investing in DRR for resilience, and enhancing disaster preparedness to effectively respond to disasters and rebuilding more effectively after disasters.[2033] Specific activities included under this outcome include developing integrated disaster risk mitigation plans in geographically specific high-risk areas. The city has several instruments speaking directly to climate change, such as the *Energy and Climate Change Strategy and Action Plan*, the *Climate Change Adaptation Plan* (2009), the *Climate Change Strategic Framework* (2015) and the *Climate Action Plan* (2021).

Together with various cross-cutting sectoral goals, water security is expressly addressed in the city's *Climate Change Adaptation Plan* (2009).[2034] The IDP indicates that the supporting strategies for this outcome include the *Climate Change Strategic Framework* (CCSF) and the *Environmental Sustainability Strategy*. The CCSF aims to make climate change action an integral part of the organisation, bringing in place the core supporting mechanisms for climate change action and where necessary empowering the city to realise its increased ambitions with regard to responding to climate change.[2035] The CCSF hence provides the City of Johannesburg with additional structures and guidelines that will enable it to further strengthen its contribution to the global fight

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2030 City of Johannesburg *Spatial Development Framework* 35.
2031 City of Johannesburg *Integrated Development Plan* 80.
2032 City of Johannesburg *Integrated Development Plan* 80.
2033 City of Johannesburg *Integrated Development Plan* 81.
2034 City of Johannesburg *Climate Change Adaptation Plan* 79.
2035 City of Johannesburg *Integrated Development Plan* 70.

against climate change by mainstreaming and institutionalising climate change throughout the organisation.[2036]

The city's Risk Assessment Framework involves the identification and prioritisation of risk.[2037] The risks identified include an increased demand for water, the risk of urban flood, disruption to water security and the degradation of ecosystems.[2038] Thereafter, the Plan assesses the risks to determine their relative priority with respect to the potential negative consequences for the City of Johannesburg and its residents.[2039] The Plan emphasises the city's various strategies that address existing flooding and stormwater issues including the *Catchment Management Plan*, the *Integrated Stormwater Management Plan* and the *Stormwater By-law.*[2040] These instruments provide a positive step towards "climate-proofing" the City of Johannesburg stormwater system, particularly with its emphasis on the retention and attenuation of stormwater at source and its express mention of the importance of SUDS in reducing the potential of flooding in new and existing developments.[2041]

The Plan indicates that threats to water security, whether from demand or supply issues internal to the City of Johannesburg or because of threats to external supply, can be dealt with only through a combination of both supply and demand initiatives.[2042] Other initiatives include aiming to plan and regulate the security of supply to the city's industry, agriculture and residential consumers, and implementing a demand-side management strategy for implementation during shortages, including conservation, education and tariff structures.[2043] Capital expenditure projects for the City of

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2036 City of Johannesburg *Integrated Development Plan* 70.
2037 City of Johannesburg *Climate Change Adaptation Plan* 40.
2038 City of Johannesburg *Climate Change Adaptation Plan* 42-50.
2039 City of Johannesburg *Climate Change Adaptation Plan* 53.
2040 City of Johannesburg *Climate Change Adaptation Plan* 62.
2041 City of Johannesburg *Climate Change Adaptation Plan* 62, 79.
2042 City of Johannesburg *Climate Change Adaptation Plan* 67.
2043 City of Johannesburg *Climate Change Adaptation Plan* 67-68.

Johannesburg , including those related to stormwater and sanitation, are prioritised according to a graphical information system (GIS)-based tool known as CIMS.[2044]

The *Climate Change Strategic Framework* (2015) (CCSF) focuses on organisational aspects and considerations rather than on climate change content and sets out a roadmap gearing the City of Johannesburg for increased climate change action in partnership with business and society, to realise the city's ambitious climate change goals.[2045] The CCSF addresses the organisation of climate change action in the city and improving the effectiveness of the delivery of existing strategies and plans through the improvement of the supporting processes and systems.[2046] As such, the *Framework* provides a platform and structured approach to developing and implementing specific strategies and action plans for mitigation and adaptation.[2047]

Specific climate adaptation activities outlined in the Framework include integrating climate change adaptation into the city's strategic planning mechanisms, including a review of the management and organisational structures for implementing climate change adaptation (and mitigation) projects, developing alternative financing options to fund adaptation activities, developing a Climate Change Information Management System to support relevant decision making in the city, and improving stakeholder engagement.[2048]

The CCSF states that roles and responsibilities should be assigned on a departmental level and at a central level to optimise the structure driving climate change action.[2049] The CCSF states that assigned leadership on climate change action per sector would facilitate the required institutionalisation by advancing responsibilities for defining sector-based climate change adaptation and mitigation targets, planning and

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2044 City of Johannesburg *Climate Change Adaptation Plan* 53.
2045 City of Johannesburg *Climate Change Strategic Framework* 6.
2046 City of Johannesburg *Climate Change Strategic Framework* 6.
2047 City of Johannesburg *Climate Change Strategic Framework* 14.
2048 City of Johannesburg *Climate Change Strategic Framework* 35.
2049 City of Johannesburg *Climate Change Strategic Framework* 43.

implementing climate change actions in the specific sector, monitoring and reporting on the impact of climate change, engaging with citizens and the business on a sectoral basis, and championing sector-specific climate change action and awareness raising.[2050]

The city's *Climate Action Plan* (2021) builds on previous participatory processes as well as the *Adaptation Plan*.[2051] The institutional structure for implementing the city's CAP is described as firstly comprising of the Directorate of Air Quality and Climate Change within the Environment and Infrastructure Services Department, which is responsible for coordinating and advancing the city's climate change agenda.[2052] This unit deals with climate change baselines and forecasts, cross-sectoral engagement, strategic planning, monitoring and reporting, climate change communications and events, climate change financing, and diplomacy.[2053] The city has also established a Climate Action Forum that aims to facilitate cross-sectoral engagement in support of climate change mainstreaming in the city administration.[2054] The CAP also institutionalises a steering committee to provide strategic guidance related to the authorisation, resourcing and delivery of climate action in the city and to make recommendations to the city's most senior administrative committee.[2055] Several cross-sectoral technical working groups also exist that aim to enhance collaboration between different departments and municipal entities on specific issues or projects relevant to their respective functions.[2056]

In line with the requirement of informing climate plans and strategies with scientific evidence,[2057] Johannesburg's CAP is informed by sound baseline data. The CAP process enhances the city's evidence base, utilising the latest data and information combined with flexible tools and robust methods and models.[2058] The city's GHG emissions

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2050 City of Johannesburg *Climate Change Strategic Framework* 65.
2051 City of Johannesburg *Climate Action Plan*.
2052 City of Johannesburg *Climate Action Plan* 27.
2053 City of Johannesburg *Climate Action Plan* 27.
2054 City of Johannesburg *Climate Action Plan* 27.
2055 City of Johannesburg *Climate Action Plan* 27.
2056 City of Johannesburg *Climate Action Plan* 27.
2057 See paras 2.3.2.4, 3.2.2.4, 3.3.2.4 and 4.3.5.
2058 City of Johannesburg *Climate Action Plan* 32.

inventory and emissions profile, climate change projections, the Climate Change Risk and Vulnerability Assessment, and the Green Book produced by the CSIR[2059] provide the evidence base that informs the CAP.[2060] The *Adaptation Plan* identifies the city's risk and vulnerabilities through the scientific modelling of future climatic conditions and includes an assessment of existing trends in temperature and precipitation in the City of Johannesburg region.[2061] A key issue is that much of the city's climate change-related vulnerability stems from the fact that several systems considered most likely to be impacted upon by climate change are already severely stressed under existing climatic conditions due to poor urban environmental management or a lack of appropriate development controls.[2062]

The CAP identifies and prioritises key actions necessary for enhancing the city's climate resilience and to understand and address its climate risks and vulnerabilities.[2063] Future climate risks and changes that will impact on the city include changes in rainfall variability and intensity, which may significantly contribute to the risk of drought, flood and water insecurity.[2064] To this end the CAP lists the specific areas vulnerable to drought, flooding and heatwaves in the City of Johannesburg.[2065] The CAP hence presents the City of Johannesburg's targets and actions related to two main overarching goals, to achieve net-zero emissions and to create a climate-resilient city by 2050.[2066]

Improved water supply and wastewater treatment are identified as climate mitigation targets which aim for the reduction of water losses and to improve energy efficiency and sustainability in the water and wastewater systems, including water treatment, conveyance and supply, and wastewater treatment and disposal.[2067] The city recognises

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2059 CSIR 2021 https://www.greenbook.co.za.
2060 City of Johannesburg *Climate Action Plan* 32.
2061 City of Johannesburg *Climate Change Adaptation Plan* 5.
2062 City of Johannesburg *Climate Change Adaptation Plan* 5.
2063 City of Johannesburg *Climate Action Plan* 42.
2064 City of Johannesburg *Climate Action Plan* 46.
2065 City of Johannesburg *Climate Action Plan* 47.
2066 City of Johannesburg *Climate Action Plan* 54.
2067 City of Johannesburg *Climate Action Plan* 54, 84.

that even though water supply and wastewater treatment systems generate only a small share of the city's emissions, they still offer substantial opportunities for mitigation.[2068] Consequently, the CAP aims to implement measures to reduce the GHG emissions resulting from the treatment of wastewater whilst improving service delivery to and affordability for a growing number of consumers.[2069] Correspondingly, the city has already implemented several infrastructure upgrade initiatives to reduce water losses.[2070] The city aims to improve the efficiency of water conveyance by installing more efficient pumps to reduce energy use, improve service delivery and reduce charges for consumers.[2071]

The CAP describes a climate-resilient city as being able to manage disaster risk and mitigate the negative impacts of climate change on the City's population and economy.[2072] Johannesburg's climate-resilient targets focus on enhancing water security, creating resilient human settlements, implementing flood and drought management strategies, developing resilient infrastructure, and enhancing the health and well-being of communities.[2073] Water security aims to achieve greater access to a reliable water supply and to sanitation services, as well as to have water supplied from alternative sources, and to reduce water demand and water losses.[2074]

As in the case of Cape Town,[2075] the CAP also directs the city's attention to integrating the urban water cycle into urban design principles, to minimising environmental degradation and improving aesthetic and recreational appeal by using methodologies such as runoff management in open spaces and improvements to the drainage of surface water.[2076] This action speaks directly to achieving WSUD, comprising of sub-

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2068 City of Johannesburg *Climate Action Plan* 84.
2069 City of Johannesburg *Climate Action Plan* 86.
2070 City of Johannesburg *Climate Action Plan* 84.
2071 City of Johannesburg *Climate Action Plan* 87.
2072 City of Johannesburg *Climate Action Plan* 88.
2073 City of Johannesburg *Climate Action Plan* 55.
2074 City of Johannesburg *Climate Action Plan* 90.
2075 See para 5.4.2.8 above.
2076 City of Johannesburg *Climate Action Plan* 96.

actions such as developing guidelines for SUDS, implementing the benefits of ecological infrastructure, implementing SUDS to drain surface water in a more sustainable manner than conventional techniques and managing multifunctional open spaces that can be used for runoff management at strategic points, as well as mandating the use of cool, permeable paving to reduce the urban heat island effect and reduce flood risk.[2077]

Further actions under the water security theme include a water pollution monitoring and management programme which aims to minimise the pollution of water resources through more stringent water quality monitoring and the enforcement of standards as well as through the restriction of polluting behaviour.[2078] It is therefore necessary to monitor and enforce standards limiting the pollution of water sources by industries, mines and construction sites, to monitor water pollution in rivers and other water sources, and to implement measures aimed at restoring rivers.[2079]

The City of Johannesburg is also required to prepare regular reports containing assessments of the health of rivers, and to promote environmental health for the city's catchment areas.[2080] The City will also aim to reduce water pollution by encouraging the responsible use of fertilisers, and to reduce the risk of urban non-point source pollution by expanding access to sanitation and improving the management of wastewater treatment works.[2081] Other related actions include minimising acid mine drainage through industrial water assessment and mitigation programmes, improving the management of solid waste to reduce the risk of pollution to urban water sources, supporting the development of a Water Quality Management Plan for the Vaal Dam and Vaal River, and implementing catchment management practices to reduce the water-quality risks to urban dams and attenuation ponds.[2082]

2077 City of Johannesburg *Climate Action Plan* 97.
2078 City of Johannesburg *Climate Action Plan* 98.
2079 City of Johannesburg *Climate Action Plan* 98.
2080 City of Johannesburg *Climate Action Plan* 98.
2081 City of Johannesburg *Climate Action Plan* 98.
2082 City of Johannesburg *Climate Action Plan* 98.

The theme of resilient human settlement aims to promote climate-sensitive urban planning and management to safeguard communities.[2083] In terms of the principles enunciated here the city aims to provide access to safe, resilient, and affordable basic services and to improve the provision of access to safe and sustainable open spaces.[2084] The objective is primarily to achieve climate-sensitive urban planning and management, thus limiting the encroachment of urban sprawl on natural areas that provide protection from extreme events (nature-based solutions). The sustainable livelihoods programme under this theme aims *inter alia* to identify climate-related and non-climate-related shocks, vulnerabilities and critical trends in hazards facing vulnerable communities, and to identify infrastructure that should be prioritised for protection from climate change to preserve livelihoods and public investment.[2085]

This theme also speaks directly to spatial planning and the sustainable land efficient use that purports to mitigate the negative impacts of climate change through restrictions on development and land use, creating buffers, developing a spatial risk assessment for key infrastructure, and designing and planning settlements with their natural corridors in mind.[2086] These actions speak to the intersections between climate adaptation, disaster risk reduction and water security.[2087]

The third theme, flood and drought management, focuses on actions to minimise and manage the risk of climate impacts.[2088] The actions aim to ensure that flood management is mainstreamed and improved across all sectors to minimise the social, economic and environmental impacts of flooding.[2089] This includes implementing fully functional early warning systems for floods, droughts and storms, and ensuring that the

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2083 City of Johannesburg *Climate Action Plan* 100.
2084 City of Johannesburg *Climate Action Plan* 100.
2085 City of Johannesburg *Climate Action Plan* 102.
2086 City of Johannesburg *Climate Action Plan* 105.
2087 City of Johannesburg *Climate Action Plan* 105.
2088 City of Johannesburg *Climate Action Plan* 106.
2089 City of Johannesburg *Climate Action Plan* 106.

response plans for floods and droughts are updated.[2090] The flood response and improved resilience programme aims to protect communities and infrastructure from the impacts of flooding by reducing risk and recovery time and costs through measures including integrated planning, the enforcement of land-use and development restrictions, and infrastructure development.[2091] Specific interventions identified in the CAP include integrating climate change into the City's *Stormwater Master Plan*, conducting flood risk assessments to facilitate flood risk reduction and awareness-raising in high risk communities, mapping the 100-, 50- and 20-year flood lines for rivers and streams within the urban edge, and reviewing these maps every five years.[2092]

The city should also visibly demarcate flood lines to prevent development in zones with a high flood risk and to allow for better management, should enforce strict land-use and development restrictions to prevent development in at-risk areas and in areas within the 100-year flood lines, should identify new or planned facilities above the 100-year flood line, and should introduce disaster management measures.[2093] To ensure the inclusion of the community, the municipality should also develop a flood-risk education and awareness programme for high-risk communities.[2094] Furthermore, it is necessary for the city to identify and protect critical disaster response infrastructure including ICTs, health facilities, electrical infrastructure, social facilities, fire stations and escape routes, as well as to increase the capacity of the Johannesburg's infrastructure for stormwater drainage and flood control, and to develop a detailed Master Drainage Plan for all river catchments.[2095]

The drought response and improved resilience programme aims to protect residents, land and infrastructure from droughts by reducing the risk and the cost of recovery

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2090 City of Johannesburg *Climate Action Plan* 106.
2091 City of Johannesburg *Climate Action Plan* 108.
2092 City of Johannesburg *Climate Action Plan* 108.
2093 City of Johannesburg *Climate Action Plan* 108.
2094 City of Johannesburg *Climate Action Plan* 108.
2095 City of Johannesburg *Climate Action Plan* 108.

through measures including the review and enforcement of land use and development restrictions and the identification of critical interventions.[2096] These actions focus specifically on DRR and DRM through formalising institutional roles and partnerships for drought mitigation, developing an early warning system for droughts, reviewing current restrictions on water use and demand, developing an updated drought response plan, and identifying critical interventions to be implemented during a drought to minimise its social and economic impacts.[2097] All of these interventions address the intersections between WSUD, implementing SUDS, climate change adaptation and DRM.

The CAP commits the city to safeguarding hard infrastructure as well as ecological infrastructure.[2098] The CAP aims to minimise the exposure of key infrastructure (such as roads, stormwater drains, public facilities and the energy grid) to climate-related hazards by ensuring appropriate development and asset management planning, performing infrastructure retrofits, updating inspection procedures and increasing maintenance.[2099] Additionally, the city needs to conserve and protect the infrastructure that provides ecological support, recreation and stormwater management by developing and implementing training and education programmes, planting trees and resilient plant species, investing in the conservation of natural habitats, rehabilitating urban wetlands and expanding green public spaces.[2100] The city therefore recognises the importance of transitioning to a water-sensitive city and incorporating WSUD into all aspects of urban planning.[2101]

The city aspires to creating healthy communities and provides for actions to protect its residents and businesses from climate change-induced hazards such as floods, droughts, and storms by establishing EWS that can effectively and quickly distribute

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[2096] City of Johannesburg *Climate Action Plan* 109.
[2097] City of Johannesburg *Climate Action Plan* 109.
[2098] City of Johannesburg *Climate Action Plan* 110.
[2099] City of Johannesburg *Climate Action Plan* 112.
[2100] City of Johannesburg *Climate Action Plan* 112.
[2101] City of Johannesburg *Climate Action Plan* 110.

reliable, useful information to all residents.[2102] This would require developing a drought-response protocol to enhance preparedness, including provisions for drought monitoring early warnings, drought severity assessments, mitigation interventions (including restrictions on water use) and recovery interventions.[2103] The city also aims to develop a drought early warning system, and will design and implement an early warning system and response protocol for floods.[2104] It is apparent from these provisions, as said earlier,[2105] that an effective and timely EWS, emergency preparedness and neighbourhood response systems are needed to deal with climate-related disasters.

Chapter 5 of the CAP addresses the implementation of the CAP and includes a high-level cost-benefit analysis of the proposed actions, financing options (internal and external),[2106] interactions between different actors and activities, and the monitoring, evaluation and reporting framework to be used.[2107] In regard to monitoring, evaluation, reporting and the revision of the CAP, the city will identify quarterly targets and KPIs, ensure that CAP targets and KPIs are reflected in the business plans of departments and entities and on staff scorecards, and regularly monitor and report at least annually on the progress of implementation.[2108] A city-wide cross-sectoral approach will be required to facilitate engagement with residents, the private sector, and other key stakeholders (academia, NGOs etc.) both to raise awareness of climate change and to mobilise support for mainstreaming climate change and implementing CAP.[2109]

The purpose of the City of Johannesburg *Disaster Management Plan* (2012) is to document the organisational and institutional arrangements for disaster management

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2102 City of Johannesburg *Climate Action Plan* 114, 121.
2103 City of Johannesburg *Climate Action Plan* 121.
2104 City of Johannesburg *Climate Action Plan* 121.
2105 See para 2.3.2.4
2106 Annexure 1 provides an overview of possible funding mechanisms for the CAP comprising of international multilateral finance mechanisms as well as domestic finance mechanisms. - City of Johannesburg *Climate Action Plan* 168.
2107 City of Johannesburg *Climate Action Plan* 126.
2108 City of Johannesburg *Climate Action Plan* 130.
2109 City of Johannesburg *Climate Action Plan* 142.

planning, which includes the assignment of primary and secondary responsibilities for priority disasters that pose threats to the City.[2110] It establishes the operational procedures for disaster reduction planning as well as the emergency procedures to be implemented in the event of a disaster occurring or threatening to occur in the City.[2111] The *Disaster Management Plan* aligns with the NDMF and addresses disaster management through four KPAs: integrated institutional capacity for the management of the risk of disaster, the assessment of the risk of disaster risk, the reduction of the risk of disaster, and response and recovery.[2112] The Plan requires that the city's Developmental Planning Department consult the Disaster Management Centre (DMC) before any development is approved. This will ensure that all necessary risk reduction measures are incorporated in the city's long-term planning.[2113] The City of Johannesburg's by-laws are also an integral part of DRM and are significant in the mitigation and alleviation of disaster risk. Hence, the DMC will monitor and educate communities on the existing by-laws and engage stakeholders in enforcement and compliance.[2114]

The Plan describes the city's risk profile, including a risk map illustrating flood hotspots and high-risk informal settlements.[2115] The city's current disaster risk profile is based on an initial high-level risk identification process conducted by the DMC and its regional offices.[2116] The prevalent disaster hazards in the Plan include floods, poor drainage systems, and urban degradation.[2117] The Plan provides an overview of the municipality's roles and responsibilities during a disaster.[2118] The key responsibilities of the City of Johannesburg DRR teams include *inter alia* establishing and maintaining adequate

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[2110] City of Johannesburg *Disaster Management Plan* 3.
[2111] City of Johannesburg *Disaster Management Plan* 3.
[2112] City of Johannesburg *Disaster Management Plan* 3.
[2113] City of Johannesburg *Disaster Management Plan* 6.
[2114] City of Johannesburg *Disaster Management Plan* 6-7.
[2115] City of Johannesburg *Disaster Management Plan* 10-15.
[2116] City of Johannesburg *Disaster Management Plan* 10.
[2117] City of Johannesburg *Disaster Management Plan* 11.
[2118] City of Johannesburg *Disaster Management Plan* 23-27.

institutional capacity to enable the implementation of the requirements of the Act, which will promote an integrated and coordinated approach to DRM.[2119] The DRR teams should also facilitate the development, implementation and maintenance of disaster management plans, programmes and practices for the reduction of the risk of strategic disaster, which will ensure that individuals, households, communities, infrastructure and the environment within the boundaries of the City are resilient to disasters.[2120] Additionally, they must develop, implement and maintain dynamic mechanisms for monitoring, evaluating and continuously improving disaster risk management practice, projects and programmes, and ensure the development and maintenance of a current and relevant disaster risk profile.[2121]

In addition, the DMC will compile and maintain a Disaster Management Plan, and the City of Johannesburg Municipal Disaster Management Advisory Forum (DMAF) will be responsible for approving the plan, as well as the incorporation of the relevant risk-specific and departmental disaster management plans.[2122] As part of risk-reduction and preparedness the DMAF must ensure that regular disaster risk assessments are undertaken in the city, it must assess the capacity of the city to implement emergency or disaster response actions, and it must oversee the formulation of plans and projects to reduce disaster risk, including integration with the initiatives in the City of Johannesburg IDP.[2123] During major emergency or disaster response and relief phases, the DMAF must evaluate the impact of any disaster that has occurred in the city and investigate additional consequences and disaster risk in the emergency zones. Additionally, it should evaluate all response actions taken by departments contributing to the implementation of this plan and provide advice and recommendations on the response actions, including the mitigation of additional disaster risk, as required.[2124] The

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[2119] City of Johannesburg *Disaster Management Plan* 23.
[2120] City of Johannesburg *Disaster Management Plan* 23.
[2121] City of Johannesburg *Disaster Management Plan* 24.
[2122] City of Johannesburg *Disaster Management Plan* 28.
[2123] City of Johannesburg *Disaster Management Plan* 28.
[2124] City of Johannesburg *Disaster Management Plan* 29.

DMAF's role during the recovery and rehabilitation phase is to facilitate a speedy return to normalcy for affected communities and to offer guidance for the elimination or reduction of disaster risks in the future.[2125]

In addition, the city has established two specific risk sub-forums. The Flood Mitigation Forum consists of all role players involved in dealing with disasters, and the Climate Change Forum consists of stakeholders engaged in the research into climate change and the development of adaptation strategies, such as academics and environmental departments at national, provincial and local levels.[2126]

5.4.2.4 Ensuring the sustainable use of water for socio-economic activities

Johannesburg Water established a pipe replacement programme that is designed to ensure the continued reduction of the loss of non-revenue water, pipe bursts and sewer blockages throughout the City of Johannesburg, and to sustain a good level of service to City of Johannesburg customers.[2127] Johannesburg Water is also rolling out network upgrades and storage infrastructure aimed at increasing the city's storage capacity.[2128] Furthermore, the WC/WDM initiatives involve the repair and service of bulk water management meters, active leak detection and night flow analysis, pressure management, pipe replacement, and the application of a stepped tariff.[2129] Further interventions which also aim at reducing the loss of non-revenue water include ensuring that all customers are metered, ensuring that customers are aware of the need to conserve water, retrofitting leaking plumbing fittings at schools, and mounting education campaigns to educate citizens on the management of water demand.[2130]

2125 City of Johannesburg *Disaster Management Plan* 29.
2126 City of Johannesburg *Disaster Management Plan* 30.
2127 Johannesburg *Water Business Plan* 20.
2128 Johannesburg *Water Business Plan* 28.
2129 Johannesburg *Water Business Plan* 31-32.
2130 Johannesburg *Water Business Plan* 33.

Climate adaptation action areas for water security in the CAP but relevant for this dimension include providing for water demand, water supply, water innovation and water quality.[2131] To achieve water conservation and manage demand the city will minimise water losses, ensure equitable access and improve the efficiency of the use of water by implementing education and awareness-raising campaigns, improving demand management structures, investing in infrastructure, and amending regulations.[2132] The many subsidiary actions proposed include implementing education and awareness-raising campaign to encourage water saving, implementing a Water Conservation and Demand Management Strategy, introducing efficiency-inducing pricing structures, and implementing demand management solutions (metering, step tariffs, restrictions, incentives and technology).[2133] Additionally, the subsidiary actions include repairing and upgrading existing water infrastructure (pipe replacement, pressure management, bulk meter repairs), promoting water-conserving technologies and practices for urban agriculture, revising water level regulation licences to encourage a reduction in the demand for water, clearing invasive vegetation from infested catchments, reviewing existing wastewater treatment works and evaluating the potential for the direct and indirect re-use of water for drinking.[2134]

Moreover, the CAP aims to scale up the city's water supply by establishing water recycling schemes and achieving this through undertaking integrated development planning to determine how water recycling will fit into short- and long-term water use and supply.[2135] To achieve this, the city aims to identify potential alternative water sources, to mainstream the use of the identified alternative water sources into an Integrated Water Management Plan and the city's SDF, as well as to review and update the municipal guidelines for the recycling of water, the use of greywater and the

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[2131] City of Johannesburg *Climate Action Plan* 92.
[2132] City of Johannesburg *Climate Action Plan* 94.
[2133] City of Johannesburg *Climate Action Plan* 94.
[2134] City of Johannesburg *Climate Action Plan* 94.
[2135] City of Johannesburg *Climate Action Plan* 95.

harvesting of stormwater.[2136] The proposals are aspects of the implementation of the integrated planning underscored by several of the instruments discussed above.[2137]

5.4.3 Evaluation

Unlike the other cities, the City of Johannesburg does not have a WSDP, but does have a *Draft Water Service By-law* which covers most of the elements necessary for addressing the first and second dimensions of urban water security. Furthermore, the city is aware of its infrastructural inadequacies and makes provision for these through various projects of its WSP, including the augmentation of water supply and the renewal of aging infrastructure.

However, the city's water woes cannot be addressed through water sector interventions. Instead, the city will have to coordinate its policies with waste management, land-use, energy, housing and agriculture. The city faces significant problems with stormwater but its instruments speaking to these are largely outdated. The city's stormwater by-law is clear in its pronouncement of the duties that rest upon the entity responsible for stormwater, but there is a need for the city to integrate its water by-laws. In the absence of a WSDP, even though its entity, Johannesburg Water, has its own internal plans, the city also needs enforceable mechanisms and tools that will be conducive to the effective provision of a water service.

Concerning the protection of urban aquatic ecosystems, the city has both adopted instruments to give effect to the protection of its biodiversity and mainstreamed the protection of biodiversity into its planning instruments as well as into other sectoral instruments such as its CAP. In addition, using its land-use and spatial planning function, Johannesburg, like Durban, has delineated its own open space areas. It is apparent from the discussion that Johannesburg is serious about the protection of its biodiversity and urban ecosystems. It can be said that the city largely adheres to the

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[2136] City of Johannesburg *Climate Action Plan* 96.
[2137] See specifically para 3.2.2.6 and 3.3.2.6.

vision that is set out in the international regional and national instruments concerning the management of biodiversity.

The City's climate response is also extensive and aligned with the planning processes and instruments. The *Climate Adaptation Plan*, the *Climate Change Strategic Framework* and the *Disaster Management Plan* collectively aim at reducing the impact of disasters and protecting communities and infrastructure. These instruments are further aligned with various sectoral instruments. In addition, they acknowledge and encourage the implementation of multi-hazard EWS and basing its emergency responses on disaster risk information and assessments.

Similarly, the IDP outlines the proposed interventions to improve access to water services in the city through undertaking integrated planning, exploring the possibilities of alternative water sources, assessing water sources for recycling and investing in smart infrastructure. To this end, Johannesburg also aims to put into place effective demand-side management processes and sustainable water-catchment management practices, as well as investments in alternative supplies to increase the levels of net water savings. In line with this it will adopt water demand management practices to minimise water losses, ensure equitable access and improve the efficiency of water use by implementing education and awareness-raising campaigns, improving demand management structures, investing in infrastructure, and amending regulations. These interventions are relevant for the final dimension of urban water security as well.

5.5 Highlights of the state of play on urban water security in Cape Town, Durban and Johannesburg

Several themes emerge from the evaluation of the three cities relating to the institutional, political, environmental, and social factors that shape water security at city-government level in South Africa. These cities have diverse but strong economies, all three have high urbanisation rates matched by high levels of poverty and inequality and varying degrees of water insecurity. However, it is observable in the foregoing

discussion that the three selected municipalities are contributing significantly to addressing the various dimensions of urban water security, with law and policy being important components of these contributions.

5.5.1 Provision of water services

All three cities are sprawling in configuration, with deep social and spatial divides established through apartheid planning. All three experience varying degrees of informal settlements which are largely lacking access to water services of an adequate quality and quantity. While the cities make provision for addressing the backlog in their IDPs, WSDP and other instruments, they do not sufficiently propose realistic measures to address the growing inequality with regard to the urban poor. Equity is an important consideration in achieving water security,[2138] hence ensuring that everyone is considered in decision-making processes and that no one is left behind is imperative.

Judging from the instruments under discussion, it appears that all three cities address the subsidiary elements under the first dimension of urban water security; ensuring equitable, secure, and reliable access to an adequate, clean, and safe drinking water supply in urban areas.[2139] The subsidiary elements pertain to water quality, accessibility, water quantity, equity and adequacy. The most important instrument available to these cities in addressing this dimension is the WSDP, and while Cape Town has a relatively extensive WSDP adhering to legislative requirements, and even going beyond them,[2140] the WSDP sourced through the eThekwini Municipality's website is largely outdated, with the latest available one being from 2012.[2141] This is apparent in the technical manner that this instrument deals with access to water, with equity and sustainability considerations being largely absent from the provisions. The business plan of

[2138] See para 2.3.2.1.
[2139] See para 2.3.
[2140] See para 5.4.2.3.
[2141] See para 5.5.2.3.

Johannesburg Water is a lot more comprehensive and deals decisively with all the dimensions of urban water security.

The planning process should also consider the several factors that affect and are affected by water to achieve sustainability in water management. Water should also be considered as an integral part of the overall urban water cycle. To this end several factors such as stormwater drainage, WSUD, water efficiency, the protection of water resources, reuse and recycling should also be considered as part of the planning process to ensure that the cities' water resources are protected. As such, planning instruments such as IDPs, SDFs, LUSs and the cities' relevant by-laws should embody the aforementioned. The incorporation of these issues can be seen across the three cities' instruments.

Through many of their instruments the cities identify the exploration of complementary resources such as desalination, groundwater, and treated effluent, amongst others. Aside from investing in human and financial resources, the three municipalities have made significant efforts to address the social, political, and financial challenges in their water-related instruments. Their collective efforts have helped raise awareness about various water issues and the need for drastic action to address them.

In all three cities, stormwater is dealt with separately from other sources of water, including wastewater. This is contradictory to the aims which WSUD and IUWM seek to achieve. Considering that stormwater management is ordinarily a function performed by the roads and infrastructure sector of a municipality it is often not dealt with in the WSDP, as is the case with the municipalities in question.[2142] Cape Town reinforces this general support of water-sensitivity principles – included in the IDP and SDF – by developing policy that addresses the transition to a WSC directly. Its *Stormwater Impacts Policy* was developed to minimise the negative effects of stormwater runoff in

[2142] Cilliers and Rohr "Integrating WSUD and Mainstream Spatial Planning Approaches: Lessons from South Africa" 356.

the city by introducing WSUD principles into urban planning and stormwater management. The policy introduces best practice criteria for achieving sustainable urban drainage objectives in various development scenarios and requires that all stormwater management systems need to be planned and designed in accordance with these criteria.[2143]

Contrarily, despite having significant struggles with managing stormwater, eThekwini Municipality does not yet have specific dedicated policies or strategies addressing stormwater management in sufficient detail. Instead, eThekwini Municipality's *Guidelines and Policy for the Design of Stormwater Drainage and Stormwater Management Systems* (2008) is rather technical in nature and only implicitly speaks of natural infrastructure that could possibly contribute towards sustainable urban drainage. The City of Johannesburg *Stormwater Management By-law* (2010), while addressing stormwater in sufficient detail, mostly describes the impacts of stormwater and the maintenance and operation of infrastructure, and not necessarily the potential of soft (ecological) infrastructure as a means of stormwater management.

5.5.2 Protection of urban aquatic ecosystems

While it is apparent that all three cities have instruments dealing with the protection of natural resources, it is arguable that their intention is not necessarily to serve the purpose of water security. The focus seems instead to be on biodiversity conservation.

Only two cities have drafted biodiversity plans in the form of LBSAPs in line with the provisions of the CBD and national conservation laws and policy. The City of Cape Town recognises that as the city expands, approaches must be sought and promoted that allow green infrastructure options. These methods are designed to improve a city's liveability and resilience in the face of climate change and its future effects on human

[2143] See the discussion in para 5.4.2.7 above.

settlement.[2144] Cape Town has expressly committed itself to ensuring that its actions and decisions retain, restore, and where possible expand and optimise ecosystem functioning and ecological infrastructure and that such work is integrated with the city's development needs as a means of adapting to the impacts of climate change and sequestering carbon.

It is apparent from the discussion on eThekwini, that when making decisions, operating, and planning the contribution (and associated value) of ecological infrastructure and ecosystem goods and services should protected, and, where possible, proactively restored. The eThekwini IDP with its sector plans serves as an example of how a municipality can execute its powers and use its planning tools to manage and protect ecosystems and to further incidental objectives such as water security. As is apparent from its IDP, the municipality recognises the natural environment and especially ecosystems and water resources in terms of its planning mandate.

From the outset, eThekwini Municipality recognises that ecosystems, including ecological infrastructure such as dams, rivers, and wetlands (water resources), are worthy and deserving of protection and conservation. The municipality goes further in providing concrete plans, goals, outcomes and programmes to enable this protection and conservation. Despite the importance of acknowledging natural thresholds, there is still a lack of awareness about them when it comes to planning and approval processes in the municipality. An urgent need to improve the understanding of these natural thresholds is also needed to guide the planning and approval processes.[2145] The city could then use this data in its planning and permitting procedures. The role of ecological systems in enhancing the resilience of the built and natural environment is also discussed comprehensively in both the IDP and SDF of the city.[2146] While the instruments refer to biodiversity plans and invasive species frameworks these are not

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[2144] City of Cape Town *Climate Change Action Plan* 116.
[2145] eThekwini Municipality *Integrated Development Plan* 88.
[2146] eThekwini Municipality *Integrated Development Plan* 88.

available on the city's website, thus making it difficult to assess whether the contents speak to this dimension.

In all three cities the existing SDFs also highlight several challenges related to aquatic systems and conservation areas. The SDFs reference the bioregional plans or biodiversity plans in several sections throughout the instruments. They refer to the land-use guidelines as assigned to CBAs and ESAs. This includes maps representing all protected areas found in the cities. The SDFs also recommend that the further loss of natural habitat should be avoided in these areas, and in some cases that degraded or disturbed CBAs and ESAs be prioritised for rehabilitation through programmes such as working for water and working for wetlands.

All three cities have apparently adopted and implemented LBSAPs, but while eThekwini references the same in several documents such as its CAP, the instrument is not available on the city's website. Cape Town and Johannesburg have comprehensive LBSAPs which address *inter alia* issues of the protection of biodiversity, the preservation of ecosystems, and the control of stormwater and floods, as well as prescribing approaches to development which may be categorised as being water sensitive.[2147] However, with the current state of biodiversity and ecosystem degradation there is little evidence of actual implementation of the provisions, The City of Johannesburg's LBSAP is replete with references to the international and national position in law and contains a framework for monitoring and evaluation.

Furthermore, the management of the coastal environment is complex due to the several factors that affect it, such as human activities and other factors.[2148] This has led to the recognition of the need for a comprehensive approach to coastal management. The City of Cape Town seems to acknowledge that integrated coastal management forms a critical component of such a comprehensive approach. As such, the City's *Integrated*

[2147] See the discussions in para 5.4.2.5 and 5.6.2.4 above.

[2148] Chippendale, Sowman and Colenbrander "The Sea Change of Coastal Risk Management in the City of Cape Town: Towards A New Paradigm of Collaborative Governance" 178.

Coastal Management Policy embeds principles reflected in NEMICMA, namely that decisions relating to the coast will be facilitated by broad-based stakeholder engagement and public consultation, that decisions will be made in the interests of the greater good (they will be equitable and just), and that accountability will be established.[2149] Similarly, eThekwini's *Coastal Management By-law* addresses the municipality's mandate and role in integrated coastal management and simultaneously acknowledges the inter-generational and intra-generational equity component in such management.[2150] The City of Johannesburg is an inland city and this discussion therefore bears no relevance to the city.

5.5.3 Ensuring an adequate response to water-related climate risks and disasters

All three cities have stand-alone climate change plans and/or strategies that build on various risk and vulnerability assessments reflecting inputs from sectors such as disaster management, health, water and sanitation, urban planning, roads, and stormwater. For example, the Climate Response Strategy[2151] and the Climate Action Plans[2152] demonstrate climate-specific analyses and approaches that provide a framework to guide municipal health and water departments in their thinking on climate change and to motivate action across the municipality.

It is apparent from the discussion on the CAPs of eThekwini, Cape Town and Johannesburg that climate change is certainly not just an environmental issue. It intersects with several other sectors across the social, political, technical and economic dimensions. The CAPs not only outline the goals, targets, outcomes and actions necessary for climate adaptation, mitigation and resilience, but also identify the leading and supporting authorities as well as the partners necessary for each of these. Furthermore, while disaster risk management is central to achieving climate resilience,

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[2149] Chippendale, Sowman and Colenbrander "The Sea Change of Coastal Risk Management in the City of Cape Town: Towards A New Paradigm of Collaborative Governance" 183.
[2150] See the discussion in para 5.5.2.2 above.
[2151] See the discussion in para 5.4.2.6 above.
[2152] See para 5.5.2.4 above.

it has been slow to link risk reduction related to extreme events to the impacts of climate change. This is highlighted through the provisions in eThekwini and Cape Town's Disaster Management Plans. The risks and hazards predominately associated within the climate change-water security-disaster risk management nexus include mostly droughts, stormwater, coastal and flooding risks.

All three cities have shown leadership in integrating climate change into their municipal planning processes. The way forward is to ensure that these climate change strategies are mainstreamed throughout the municipal strategic planning environment and to ensure that the plans are adhered to.

5.5.4 Water for development

The fourth dimension of urban water security relates to establishing better awareness of the interconnectedness of land, water, and environmental resources and the effect of human interference on future water supply. In this context the majority of the cities' instruments addressed this to a limited extent. Specific provision for water for socio-economic development was not made, however.

It is clear from the preceding discussion that the three selected metropolitan municipalities are playing a significant role in setting and influencing the direction of the overall national policy agenda on water security. Even more encouraging is the leading effort that has been made by Cape Town to initiate and draft a comprehensive water strategy. Arguably, it can be said that all the instruments and initiatives show a genuine commitment to prioritising water management in the context of South Africa's socio-economic development and climate change conditions.

One of the key approaches to water security that sets the City of Cape Town apart from eThekwini and Johannesburg is the city's increasing focus on water-sensitivity.[2153] The city aims to address all aspects of the urban water cycle holistically, including water

[2153] See para 5.4.2.4.

supply, sewage, and stormwater management, as well as aquatic water systems or related environmental resources. The practice of resilience-thinking aims to enhance the capabilities of systems to perform in a constantly changing and unpredictable environment. It involves developing strategies and procedures that can help the municipality to adapt to unforeseen changes and improve its performance. The City of Cape Town consistently refers to and has mainstreamed a resilience approach throughout most of its instruments.[2154] The City employs a strong perspective on WSUD, and water-sensitive development can be seen throughout its policies and strategies. This is imperative for water security.

All three cities emphasise the importance of transversal work and collaboration in many of the issues that affect them, including climate change, water and biodiversity. These collaborations will be important in moving towards urban water security in these cities. In the context of collaboration, they way to optimally integrate water security would seem to be to focus on the community's needs and develop realistic goals and targets to ensure that the projects are carried out in alignment with the existing water, environmental and local government laws.[2155]

5.6 Chapter summary

This chapter has examined the existing city-level water security law and governance instruments in the City of Cape Town, eThekwini, and the City of Johannesburg. The aim of the analysis was to assess how these municipalities have given meaning to their legally defined roles in addressing water security, as outlined in Chapters 3 and 4.

It is evident from the discussion that even though various similarities in the quest for urban water security might be identified, water security is addressed differently in each city (context-based planning). These diverse approaches to the application of the

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[2154] City of Cape Town *Climate Change Action Plan* 124: "Resilience and sustainability are included as integral to the guiding principles informing the City of Cape Town's overall masterplan, the IDP, which also includes a climate change programme and related projects."

[2155] Nel, Du Plessis and Du Plessis "Instruments for Local Environmental Governance" 3-25.

dimensions of urban water security in city-level law and governance ensure that the distinctive socio-economic and environmental issues of these contexts are accounted for. The three cases of Cape Town, Durban and Johannesburg are illustrations of how cities can innovatively address water security concerns based on their legislatively defined powers and authorities and based on their duty to act on issues relevant to exercising their constitutionally awarded powers and responsibilities. The preceding discussion suggests that the three major metropolitan municipalities, also South Africa's three biggest cities, are playing a significant role in setting and influencing the direction of both local and national law and the policy agenda on water security.

While this discussion has not attempted to assess the implementation of the by-laws municipal policies, plans or strategies discussed, it is important to note that a better focus on the implementation of existing plans such as the IDP, the SDF and various other cross-cutting instruments is necessary if water security is to be achieved. If the object is to optimise city-government's ability to address water security, there should not be too many projects or actions cutting across the various municipal plans. Instead, cities should identify priority projects and actions and align these with their budgets, and then concentrate on implementing them.

The analysis of the instruments has shown that the cities are considering green infrastructure options equally or comparatively equal to engineered infrastructure. The extent to which municipalities can implement these modes of infrastructure depends not only on their financial resources but also on their technical capabilities in relation to traditional engineering matters, such as the construction of stormwater and sewer systems. Similarly, the instruments in all three case studies speak to the need to adapt infrastructure and buildings to respond to changes in climate, as well as the need to put in place measures to reduce the GHG emissions associated with the use of the infrastructure. The aforementioned is important when considering not only that water security is affected by climate change, but also that climate change will have a significant impact on the infrastructure necessary for ensuring water security.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Background

South Africa's cities currently face severe and interlinked water security challenges, which is evident through the challenges of an intermittent water supply, severe floods, poor environmental water quality, unplanned settlements, which are further intensified by climate change.[2156] In addition to these challenges, South Africa's water governance structure is fragmented across several axes, horizontally across water and environmental sub-sectors, vertically between spheres of government, and spatially between administrative jurisdictions.[2157] This has resulted in governance approaches that are inherently sectoral and siloed within the confines of local government. Similarly, in the absence of a mechanism for institutional coordination, uncontrolled development has undermined the delivery of basic services that support liveability and growth. If water security is to be achieved and sustained, approaches to water management must reflect the integrated nature of the water cycle by addressing different users, uses, threats and threatened resources.[2158]

Furthermore, achieving water security is not a once and for all time matter, particularly not in the face of climate change, urbanisation and the wide scope of governance challenges. It will require a systematic effort to sustain it and managing climate change impacts amongst all the other drivers that are putting pressure on water resources. Water security calls for technical, legal, and institutional innovations that can drive opportunities to improve service delivery as well as to protect the urban system against any threats. This is only possible through the development of effective city-level law and governance responses that are co-ordinated, integrated and collaborative.

[2156] See Chapter 2.
[2157] See para 4.2.
[2158] See para 2.3.

6.2 Context and focus of study

This study sought to answer the research question of how city-level law and governance responses in South Africa address water security, and how these responses can be optimised.

The study follows on several previous studies that focused on urban water security.[2159] The main focus of these water security-related studies is the concept of scarcity or abundance of water and the factors that will affect the supply of water in the future.[2160] To achieve and sustain water security, the approaches to water management must reflect the connectedness of the urban water system by considering the different users and uses of water, as well as the threats to and from water.[2161] Canvassed against this background, this study investigated urban water security from a law and policy perspective, with a specific focus on South African cities.

Chapter 2 provided a literature review of the concept of water security, and more specifically defined urban water security and delineated the dimensions of urban water security. In bridging the gap between the theoretical understanding of urban water security and the management of water, the chapter provided a discussion on the management approaches for water security. Chapter 3 introduced the concept of urban water security from an international and African regional law and policy perspective. This chapter made use of the delineated dimensions of urban water security to help define the role of sub-national authorities such as municipalities in urban water security.[2162] Chapter 4 provided an extensive analysis of South African law and policy which address and give effect to the dimensions of (urban) water security. Chapter 5 considered the laws and policies of three South African cities and assessed how they

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[2159] Some of these studies include: Aboelnga *et al* 2019 *Resources;* Allan, Kenway and Head 2018 *Urban Water Journal* 899-910; Brears *Urban Water Security*; Hoekstra, Buurman and Van Ginkel 2018 *Environmental Research Letters* 1-14. Also see para 2.3.

[2160] See paras 2.1 and 2.3.

[2161] See more specifically para 2.4.2.

[2162] See paras 3.2 and 3.3.

have addressed water security in their by-laws, policies, and planning instruments with a view to determining whether the measures used in these municipalities address threats to water security measured against the dimensions identified in Chapter 2. The study is based on the idea that the current laws and governance practices at the city level in South Africa are not adequate to address water security issues. However, the study suggests that there is potential to improve these practices by adopting and implementing integrated and coordinated policy and regulatory measures.

6.3 Main findings

The exploration of the question how city-level law and governance responses currently address water security, and how these responses can be optimised, yielded the following results:

6.3.1 The concept of urban water security and its dimensions is currently still vague

This thesis has shown that there are many debates and various understandings of water security and its specific dimensions.[2163] However, these often focus on the national level and not enough on a systemic macro-level such as at city level. While the concept has its roots in the general concept of water security, primary notions such as human and environmental security have contributed to current understandings and framings of urban water security.[2164] One could question whether the term here is set too broadly and therefore difficult to appropriately define, delineate or measure. This would constrain the proper use of the concept to an all-embracing term which is not measurable and, in general, its use within broader contexts such as for city-level governance—where it does not have specific key dimensions—and might lack normative value.[2165] Furthermore, the South African understanding of water security is largely rooted in the internationally defined theories of water security which primarily refer to

[2163] Para 2.3.1.
[2164] See paras 2.2 and 2.3 of this study.
[2165] The discussion in paras 2.2.2 and 2.3.1 highlights some of the critique against security concepts.

either an abundance or scarcity of water. Water security is also mostly understood as referring to water services accessibility and water resources protection, which ignores the many challenges and lived realities concerning water in South Africa.

Premised on the discussion in Chapter 4, it is discernible that urban water security in South Africa does not have explicit roots in the law and policy framework.[2166] Instead, the national law and policy are relatively vague regarding reference to water security, save for the NWSF. The NWSF acknowledges that water security encompasses the entirety of the water sector, and extends the term to cover the development, operation and maintenance of water and sanitation infrastructure, as well as enabling elements such as water research, monitoring, information, communication, and stakeholder empowerment.[2167] This study has attempted to define urban water security considering the varied challenges in South Africa. In so doing, the definition developed in this study is more comprehensive and cognisant of local circumstances. Urban water security for purpose of this study is defined as: the dynamic capacity of the urban water system (including its social, economic, technological, infrastructural, political, legal, and environmental components) to ensure equitable, secure, and reliable access to an adequate, affordable, clean, and safe drinking water supply, provide wastewater and sanitation services, protect ecosystems, ensure access to water to sustain livelihoods and socio-economic development, and protect against water-borne pollution and water-related climate risks and disasters, in the face of increasing threats.[2168]

As established in Chapter 2, the dimensions that are critical for achieving urban water security include: (a) equitable, secure, and reliable access to an adequate, clean, and safe drinking water supply, (b) accessible, safe, secure, adequate, and equitable sanitation, wastewater, and stormwater services, (c) healthy, functional and sustainable urban aquatic ecosystems, (d) effective water-related climate risks and disaster

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2166 Chapter 4 of this study.
2167 Para 4.3.1.
2168 Para 2.3.1.

responses, and e) a reliable and equitable supply of water for sustainable economic and social development. As this study has established, all these dimensions require an enabling water governance and management framework that is integrated, transparent, participatory and accountable.[2169] As well as through the collaboration and co-operation in and between countries and across various levels of government and various sectors within countries.[2170]

From the discussion, it is determined that water security is not solely dependent on water availability and resource protection, but also involves the protection, development, and management of water resources, as well as administration and distribution of water services and water infrastructure. While these are separate activities, they are all interrelated and important for ensuring water security.

6.3.2 Innovative water management approaches will increasingly play a role in how water security is achieved in urban areas

There are clear indicators in the literature discussed that water governance is essential to achieving water security, and that it requires well-designed and empowered institutions with supporting legislative and policy instruments.[2171] Water governance entails a wide range of organisations (institutions), contexts, actors, and mechanisms for formulating and implementing laws and policy, all of which directly affects water security. Addressing the confluence of water challenges will therefore require a strong governance response.

The principle or concept of "integration" features in all the management approaches discussed in para 2.4.[2172] The primary aim of integration in urban water management is to do away with silo-based approaches to water management. By acknowledging the environmental, economic, social, technical and political factors inherent in water

[2169] Para 2.3.1.
[2170] See paras 2.3.1, 2.3.2 and 2.4.
[2171] See paras 2.4.1 and 2.4.2.
[2172] See para 2.4.

management, this study affirms that achieving urban water security requires combining different water management approaches. It is therefore suggested that water security requires sustainable, resilient, and integrated water governance that provides for institutional, legal, and regulatory support and capacity for change, adaptive management structures, new forms of relationships, and multi-layered models capable of integrating complex environmental, economic, and social dimensions.

Implementing IWRM, which is a holistic approach to managing water resources at the basin level, can help optimise water allocation and use, taking into account social, economic, and environmental factors.[2173] This can ensure that water resources are managed in a coordinated and sustainable manner, reducing the risk of water scarcity and improving water security in cities. IUWM also takes a more comprehensive approach by integrating various aspects of water management, including water supply, wastewater treatment, stormwater management, and water reuse, into a single system.[2174] By adopting IUWM, South African cities can better manage their water resources, optimise water use, and reduce water waste and pollution.[2175] WC/WDM is an important aspect of sustainable water management and overall water security as it involves implementing measures to reduce water consumption and improve water use efficiency.[2176] This can include measures such as water metering, water pricing mechanisms, public awareness campaigns, and water-saving technologies. By implementing WC/WDM strategies, South African cities can effectively manage their water demand, reduce stress on water resources, and ensure more sustainable water use practices.

WSUD, on the other hand, focuses on integrating water management into urban planning and design to mimic natural water cycles and reduce the impact of

[2173] See para 2.4.2.1.
[2174] See para 2.4.2.2.
[2175] See para 2.4.2.2.
[2176] See para 2.4.2.3.

urbanisation on water resources.[2177] WSUD techniques, such as rainwater harvesting, stormwater management, and green infrastructure, can help cities capture and store rainwater, reduce runoff, and recharge groundwater, thereby replenishing local water resources and reducing the demand for potable water. WSUD can also enhance urban resilience to climate change by reducing the vulnerability of cities to flooding and improving water quality through natural filtration processes.[2178]

Hence, adopting and implementing IWRM, WSUD, IUWM, WC/WDM, and resilient water management approaches in South African cities can provide opportunities to address the threats to water security and ensure sustainable water management practices in the face of climate change, population growth, and urbanisation. These approaches can help protect water resources, optimise water use, and enhance resilience in urban water systems, leading to more sustainable and resilient cities in South Africa.

6.3.3 International and African regional law and policy provide guiding principles and direction but do not (yet) clearly define the role of city-governments in water security

International and African regional law and policy instruments are ambiguous on the role of sub-national authorities such as municipalities in addressing urban water security.[2179] While it has been found that many of the instruments discussed do not make explicit reference to water security, many contain provisions related to the respective dimensions.[2180] The study revealed that the international and African regional law and policy instruments, some of which are binding while others are not, primarily serve as a guide as to what is expected of local government in relation to the specific dimensions.

It is primarily through soft-law instruments such as *Agenda 2030*, the NUA and the *Sendai Framework* that a role for cities to address the dimensions of urban water

[2177] See para 2.4.2.4.
[2178] See para 2.4.2.4
[2179] Chapter 3 of this study.
[2180] See paras 3.2 and 3.3.

security is carved out.[2181] While these instruments provide insight into what obligations states ought to fulfil in addressing global priorities, they are not enforceable. Still, these instruments are increasingly being regarded as "compelling law" and have been integrated into national legal frameworks, as is the case with the SDGs for example.[2182] International and regional law and policy dictate that the local authorities have a role in addressing the dimensions of water security which entails the following. Local authorities have a collective responsibility to ensure equitable, secure and reliable access to an adequate, clean and safe water services.[2183] To this end, these instruments confirm that local authorities have a continuous duty to respect, protect and fulfil, as expeditiously and effectively as possible, the full realisation of the right to water and sanitation.

Concerning the third dimension, most of the instruments suggest that local authorities have a role in mainstreaming biodiversity and ecosystem conservation into urban planning.[2184] In particular, they identify a role for local authorities in drafting strategies or plans such as LBSAPs and the integration of biodiversity, land management and land-use planning.[2185] Tellingly, the law and policy framework on the fourth dimension signals a role for local authorities in compiling and disseminating disaster risk and vulnerability assessments, incorporating climate change considerations into biodiversity, development, water, and land-use planning, and developing cross-sectoral climate laws, plans, or strategies that are inclusive, resilient, and disaster-risk informed.[2186] As per the last dimension, the instruments are not particularly clear on a role for local government specifically, but do in part acknowledge a role for local authorities towards becoming

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2181 See para 3.2.2.
2182 See para 3.2.2.
2183 See paras 3.2.2.1, 3.2.2.2 3.3.2.1 and 3.3.2.2
2184 See paras 3.2.2.3 and 3.3.2.3.
2185 See paras 3.2.3.3 and 3.3.2.3.
2186 See paras 3.2.3.3 and 3.3.2.3.

more water wise, and to implement measures that address water demand, conservation and efficiency.[2187]

6.3.4 Findings pertaining to the dimensions of urban water security in the South African context

Through the perspective of national law and policy, as well as the municipal case studies,[2188] the findings on the role of local government in addressing water security in South Africa are discussed according to the five dimensions of urban water security identified in Chapter 2.[2189]

6.3.4.1 Cities need adequate law (s) and governance instruments to ensure access to water services

Concerning the first dimension, the human right to access to sufficient water has a long and progressive international and regional developmental history.[2190] This study confirms that the right of access to water entitles all individuals to safe, sufficient, acceptable, as well as economically and physically accessible water for personal and domestic use. This means that states, and sub-national authorities, need to ensure "universal" access based on the minimum standards of water required for personal and domestic uses. This also holds true for South Africa. Notably, when asserting the right of access to water, questions of accessibility, affordability, quality and quantity water should be considered holistically.

From the assessment of the first and second dimensions of water security, it is apparent that an extensive legal framework exists that gives effect to equitable, secure and reliable access to adequate, clean and safe water services in urban areas. This is rooted in section 27 of the *Constitution* which guarantees the right to access to water,

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2187 See paras 3.2.2.5 and 3.3.2.5.
2188 Chapters 4 and 5.
2189 Chapter 3 of this study.
2190 Para 3.2.2.1.

together with the NWA, *Water Services Act*, NWRS, NWSMP and various other policies substantiating the right.[2191] These instruments place a mandate on the state, and specifically on local government as a water services authority, to ensure the realisation of the right. Notably, this study confirms that local government has the core duty of providing access to sustainable and affordable water, sanitation and wastewater services.[2192] Municipalities need to ensure that these services are provided in a financially and environmentally sustainable manner and should consult with their residents about the level, quality, range and impact of the services provided directly or indirectly by the municipality, and the available options for service delivery.[2193]

An important instrument in giving effect to this dimension is the municipality's WSDP and relevant water service by-laws, which should acknowledge the linkages to other services and infrastructure programmes in the municipality.[2194] The WSDP captures all the responsibilities and tasks required for water service delivery, and must describe the water sources to be used, as well as the quantity of water to be extracted from and discharged into each source, in accordance with the prescribed contents.[2195] To this end, the WSDP should expressly point out new and alternative sources of water supply, wastewater reuse and water recycling and the integration of water (including surface and groundwater resources). Furthermore, cities need to predict the future water demand in their jurisdictions in the WSDP, which will ensure that water accessibility is not hindered by growing demands.

In terms of addressing the first dimension, all three cities have made significant strides towards ensuring and improving equitable, secure, and reliable access to adequate and safe water and sanitation services.[2196] Specific instruments that have aided in addressing this dimension are the IDPs and WSDPs and in the case of Cape Town, the *Water*

2191 See Chapters 3, 4 and 5.
2192 Para 4.3.2.
2193 Section 4(2)(f) of the *Municipal Systems Act*.
2194 See para 4.3.2.
2195 See para 4.3.2.
2196 See paras 5.3, 5.4 and 5.5.

Strategy.[2197] Cape Town's WSDP acknowledges threats to future water supply in the City and emphasises the importance to Cape Town and its surrounding regions of augmenting, refurbishing and maintaining the city's bulk water supply system.[2198] The WSDP maps several water resources schemes to augment the capacity of the water supply system. These include water reclamation, groundwater, desalination, rivers and waterways, and WC/WDM strategies.[2199]

eThekwini Municipality's WSDP describes the City's focus on delivering quality and affordable services according to customer-centred, financial, process-related, and organisational capacity perspectives.[2200] To this end Cape Town aims to improve *inter alia* the process of water services delivery through effective performance, removing constraints, improving efficiency, and adequate infrastructure to support current and future demand for water and sanitation services.[2201] The WSDP also highlights the short- to long-term projects and interventions envisaged to balance water requirements with water resources in conjunction with its water board and DWS, at both the national and the provincial levels.

Noting that infrastructural deficiency is one of the city's key threats to water security, Johannesburg's WSDP primarily addresses infrastructure upgrading and maintenance, and upgrading informal settlements to address water services backlogs. The WSDP aims to reduce, in general, infrastructural inadequacies such as burst pipes, sewer blockages and spills, contamination in wastewater systems, and further aims to improve the City's response time in addressing incidents that occur regarding infrastructure.[2202] The study has noted that the lack of basic services in informal settlements can hamper the establishment of water security. As such, there is a need for the active integration of urban informal settlements into the rest of the city.

2197 See paras 5.2.2, 5.3.2 and 5.4.2.
2198 City of Cape Town *Integrated Development Plan* 50.
2199 See para 5.3.
2200 See para 5.4.
2201 See para 5.4.
2202 See para 5.5.

6.3.4.2 Urban aquatic ecosystems can best be protected by adopting local biodiversity plans, mainstreaming biodiversity considerations and aligning these with spatial planning instruments

Chapter 2 shows that addressing urban water security requires striking a balance between the use of water resources on the one hand and the maintenance and protection of urban ecosystems on the other.[2203] These issues are of equal consideration in ensuring both societal and ecological well-being and resilience. From the discussion of the national legal framework, it is discernible that municipalities have a role to play in the protection of aquatic urban ecosystems.[2204] NEMA, NEMBA, NEMPAA and other national plans and policies mandate the preparation and implementation of several planning instruments to protect and conserve the environmental resources, including open space management plans, biodiversity plans and bioregional plans.[2205] Effective measures to protect and restore aquatic habitats are typically included in conservation plans. These measures often involve promoting sustainable land use practices, managing invasive species, and reducing pollution. To achieve the best results, it is crucial to integrate these plans into spatial planning instruments such as SDFs and LUS. These instruments allow for geographical and spatial mapping of vulnerable or stressed ecosystems in addition to protecting these ecosystems from harmful activities through the implementation of zoning schemes.

The analysis of city-level law and governance instruments in Chapter 5 has shown that the cities are already considering green infrastructure options as often or almost as often as they are considering more traditional forms of engineering.[2206] The extent to which municipalities can implement these infrastructure types depends not only on their financial resources but also on their technical capabilities in relation to traditional engineering matters such as stormwater and sewer system construction. As with built

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[2203] See para 2.3.2.2
[2204] See para 4.3.4.
[2205] See para 4.3.4.
[2206] See paras 5.2.2.2, 5.3.2.2 and 5.4.2.2.

infrastructure, ecological infrastructure requires active management and maintenance, and in some cases rehabilitation or restoration.[2207]

Responses that the cities have implemented to ensure the protection of aquatic ecosystems include clearing alien vegetation, rehabilitating existing ecosystems such as rivers, wetlands, and estuaries within the cities' limits, zoning conservation areas and implementing buffers.[2208] The benefits of urban aquatic ecosystems are acknowledged throughout the cities' biodiversity plans and climate action plans, with acknowledgment specifically of benefits for the other dimensions of water security such as for pollution mitigation and decreased flooding and stormwater runoff.[2209]

Cape Town has both a LBSAP and *Bioregional Plan*, providing for integrated management of wetlands, rivers and coastal areas, developing and implementing appropriate ecological monitoring programmes for protected areas, developing an ecological integrity monitoring programme, and investigating how to monitor climate change impacts as well as the contribution of biodiversity to climate resilience.[2210] eThekwini does not yet have a dedicated policy or plan relating to biodiversity planning and protection. The Municipality does, however, propose to ensure the long-term sustainability of its natural resource base including protecting important aquatic natural environments within the eThekwini Municipal Area through the D'MOSS.[2211] This controlled development layer for the protection of Durban's biodiversity assets and core ecological infrastructure, is given effect to in the IDP, SDF and *Municipal Planning By-law* of the Municipality.[2212]

The Johannesburg LBSAP describes the City's *Catchment Policy* which aims to meet the City's obligations to the protection and management of its water catchments by using

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2207 Para 2.3.2.2.
2208 See paras 5.3, 5.4 and 5.5.
2209 See paras 5.3, 5.4 and 5.5.
2210 City of Cape Town *LBSAP* 70.
2211 eThekwini Municipality 2011 https://bit.ly/3Vn8Fgt.
2212 See para 5.4.

an integrated approach in line with legislative requirements and best management practices and in the interests of environmental and economic sustainability and the amenity and safety of all the City's residents.[2213] The LBSAP further states that conservation buffer zone allocation should be taken into consideration during the planning phases of developments and these areas should not only remain undeveloped, but should remain unimpacted by development activities.[2214]

6.3.4.3 Responses to water-related climate risks and disasters are addressed disjointedly through mainly climate adaptation or disaster management

The study has shown that while regional law and policy support decentralised disaster risk reduction and climate change actions, actual devolution of authority to lower administrative levels has often been limited.[2215] Where such provisions do exist, it is vital for all levels of government and stakeholder groups to take ownership of climate strategies, policies, programmes and plans. Firstly, local authorities are required to develop, review and update climate change actions.[2216] They should also undertake city-level assessments of climate vulnerability and impacts, to inform their adaptation plans, policies and strategies and to build the resilience of their inhabitants.[2217]

Some of the specific responses identified for cities include mainstreaming climate change considerations into local development and sector plans, promoting nature-based solutions and urban green infrastructure, increasing the uptake of climate information services, implementing strategies for reducing and adapting to the consequences of climate change across all economic sectors, prioritising risk reduction and building the adaptive capacity of residents living in informal or peri-urban settlements.[2218]

[2213] City of Johannesburg *LBSAP* 10.
[2214] City of Johannesburg *LBSAP* 8.
[2215] Para 3.3.2.3.
[2216] Para 3.3.2.3.
[2217] *New Urban Agenda* para 80.
[2218] Para 3.3.2.3. *African Climate Change Strategy* 50-56.

It would be helpful to plan for drought by investing in technology to improve on water use sufficiency as well as being prepared to adapt to drought.[2219] Drought management requires the expertise and skills of local governments together with other stakeholders to implement innovative solutions. Besides monitoring and (alternative) resource management, drought management may also include responses such as demand management and early warning systems. Municipalities are encouraged to either develop drought management plans or to provide measures dealing with drought management in both their climate action plans and their disaster management plans.

The evaluation in Chapter 5 shows that the three cities use a combination of instruments to address water-related disasters and climate change, through disaster management plans as well as climate action plans.[2220] While these cities still have some way to go in terms of harmonising and mainstreaming climate change adaptation and disaster risk reduction into their laws and policy, many guidelines exist in their available instruments which aim to assist in enhancing adaptive capacity, resilience and transformation. The instruments in all three cases speak to the need to adapt infrastructure and buildings to respond to changes in climate, as well as the need to put in place measures to reduce the GHG emissions associated with the use of the infrastructure. The foregoing is important when considering that water security is affected by climate change, but also that climate change will have a significant impact on the infrastructure necessary for ensuring water security.

[2219] Tarlock "Water Allocation and Management During Drought" 149.
[2220] See paras 5.2.2.3, 5.3.2.3 and 5.4.2.3.

6.3.4.4 The role of local government in ensuring access to water for socio-economic development, livelihoods and productivity requires further clarification

Concerning the fourth dimension, the role of water as a social, economic, and life-sustaining good, the study found that water is acknowledged to be a critical enabler for productivity and sustainable economic growth.[2221]

The study has established that the role of municipalities in ensuring a reliable and equitable supply of water for sustainable economic and social development is significantly less clear in relation to the other dimensions. While the legal framework acknowledges the interdependencies between water and various sectors such as land, health, energy, food and the environment, precise duties and responsibilities remain unclear and ambiguous.[2222] Priority interventions and responses for this dimension need to acknowledge the interdependencies between water and other sectors. Additionally, the assessment found that cities must co-ordinate and align their waste, energy, water, environmental, and food policies, as well as the implementation of other policies in metropolitan areas to maximise efficiency and reduce water loss and waste.[2223] It has been established that when addressing this dimension, states need to change water users' behaviour, and encourage WC/WDM.

This study has established that the final dimension speaks to finding a balance between competing water uses, effective metering and billing of water users, minimising the impact of cities on water resources through applying a water-sensitive approach, and reducing water wastage and losses, as well as promoting energy-efficient water use.[2224] As the final dimension primarily deals with the socio-economic aspects of urban water security, municipalities need to set conditions *inter alia* for the determination of a structure of tariffs, conditions for payment, procedures for limiting or discontinuing

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[2221] See paras 3.2.2.4, 3.3.2.4 and 4.3.6.
[2222] See para 4.3.5.
[2223] Para 3.2.2.4; *New Urban Agenda* para 123.
[2224] See para 2.3.2.4.

water services, and measures to promote water conservation and demand.[2225] Taking this into account, the design of urban infrastructure such as water services, energy, wastewater treatment, road and stormwater drainage should be primarily focused on maximising efficiency, balancing water resource use and distribution, and reducing losses.[2226]

Municipalities can achieve maximum, long-term, ecologically sustainable social and economic advantages by modifying consumer behaviour towards water treatment and conservation through education and awareness programmes. It is important to make sure that all sectors that utilise water contribute to water-efficient measures and report on the progress of any interventions they may have put into place. Equally important is making sure that the approval processes are conducive to initiatives that increase water use efficiency and are in line with WC/WDM priorities.[2227]

Pertaining to the final dimension of urban water security, some the cities' instruments addressed the interdependent relationship between water, energy, food, health, land and various other sectors, to some extent. Specific provision for water for socio-economic development was not made, however. All three cities have made provision for addressing the subsidiary elements of this dimension such as addressing water efficiency, energy-efficient water provision, measures for addressing non-revenue water and WC/WDM in their IDPs and have similar crosscutting provisions in instruments such as the WSDPs and Climate Action Plans.[2228] Durban, for example, aims *inter alia* to achieve financial sustainability in its service delivery through levying sustainable tariffs and controlling costs. Similarly, Johannesburg Water has rolled out network upgrades and storage infrastructure aimed at increasing the city's storage capacity, as well as the repair and service of bulk water management meters, active leak detection and night

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2225 Section 4 of the *Water Services Act*.
2226 See para 4.3.5.
2227 NWRS 55.
2228 See paras 5.2.3, 5.3.3 and 5.4.3.

flow analysis, pressure management, pipe replacement, and the application of stepped tariffs for water users.[2229]

In the discussion in Chapter 5, it is evident that, even though various similarities in the quest for urban water security can be identified, water security is approached differently in each city.[2230] To avoid generalisations as to the role of municipalities in addressing water security based on the case study discussion, the study sought to draw context-specific conclusions that could be replicated under similar conditions or in similar contexts.[2231] It is evident that while the three selected cities are providing actions and measures to deal with water insecurity across the five dimensions, urban water security is not yet a familiar concept in the cities, as reflected in the lack of acknowledgement thereto in their instruments.[2232] Hence, it can be deduced that the concept of urban water security has not been fully explored by the cities, at least not in a coherent and coordinated manner. A significant amount of work still needs to be done for these three cities to be transformed into water-secure cities.

6.4 Recommendations

In view of the main findings outlined above, this study makes the following recommendations:

6.4.1 National government should adapt national water policy to guide the actions, duties and responsibilities of local government in addressing water security

Currently the NWSF aims to guide all water-related policies across the governance system in terms of short-, intermediate and long-term planning and support and provide cross-sectoral water security through full engagement of stakeholders at all

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2229 City of Johannesburg *Johannesburg Water Business Plan* 2019/20 31-32.
2230 See para 5.5.
2231 See paras 5.2.1, 5.3.1 and 5.4.1.
2232 Paras 5.2, 5.3 and 5.4.

levels.[2233] This study recommends that national government specifically review and revise the NWSF to define a clearer role for local government in addressing the dimensions of urban water security.

Considering the interconnectedness of water supply, groundwater, stormwater, wastewater, rivers, wetlands, watercourses, estuaries, and coastal waters (where applicable),[2234] the successful implementation of urban water security measures requires an integrated approach. Hence, water security requires coordinating actors within the framework of overarching water-related standards and targets — supported by legislation and associated regulations as well as monitoring and enforcement powers — which may be best designed and set by national government rather than local. To this end, the NWSF needs to clearly delineate the institutions necessary in addressing water security, from national to local, and both private and public. Additionally, it is proposed that national government promote the goal of water security through mainstreaming the dimensions of water security, together with outlining specific duties and actions in relation to each in one co-ordinated framework.

The NWSF should guide the activities, responsibilities, and obligations of municipalities, water providers, government agencies, the private sector, households, and communities. In the first instance, it should provide a clear definition of (urban) water security considering the local context. Furthermore, responses for guiding cities towards water security should include setting specific water quality and quantity targets to be regulated through municipal by-laws, and guidelines for tariff structures to implement WC/WDM strategies. The NWSF must require that municipalities have strict WC/WDM strategies and policies in place, measures to address non-revenue water and include future planning for increased water demand through identifying specific alternative water sources based on their local context. The NWSF should provide directives for ecologically sensitive land-use planning and management which will contribute to

[2233] See para 4.3.
[2234] See para 2.3.

ensuring the health of aquatic ecosystems and provide additional benefits such as flood and stormwater mitigation. It is essential that the *Framework* define the role of local government regarding planning and preparedness, policy and strategies, post-disaster management, response and recovery measures, coordination, capacity building, finance, regulations, and monitoring, in so far it relates to water security.

The *Framework* should include a clear exposition on the following role and duties for local government:

(a) Adopting WSDPs and corresponding by-laws that give effect to all uses and users of water within the municipal boundary,

(b) Implementing local biodiversity plans and strategies for the protection of urban aquatic ecosystems and the role of municipal planning instruments in addressing their protection, and

(c) Implementing coherent and integrated local climate change and disaster management plans for addressing droughts and floods.

In revising the NWSF, national government should integrate, align and ensure cross-sector coherence of laws and policies in partnership with municipalities. This will ensure a bottom-up alignment of the laws and policy applicable to municipalities in addressing water security.

6.4.2 Every municipality should embed and integrate the urban water security dimensions in its spatial planning instruments

It is further proposed that spatial planning and water should recognise the geographic limit to water availability and encourage the determination of an ecological reserve.[2235] Likewise, spatial planning should incorporate environmental protection and follow a

[2235] See para 4.2.

water-sensitive approach.[2236] In the light of this established link between water and spatial planning, to optimise their responses towards urban water security cities are advised to adopt or participate in developing strategic plans, introducing land-use management measures that strive to reduce the vulnerability of their communities (green corridors and buffer zones), and ensuring that water-related infrastructure is resilient and can maintain essential services.[2237] Several considerations such as stormwater drainage, WSUD, water efficiency, protection of water resources, reuse and recycling should also be considered as part of the planning process to optimise the role of municipalities in addressing water security.

In view of the first dimension of urban water security, implementation of this recommendation can assist in ensuring that the accessibility of water services effectively address the imbalances in equitable distribution in the informal settlements in cities. Cities should also prioritise responses that help restore and rehabilitate urban ecosystems and contribute to climate mitigation, adaptation, and disaster risk reduction efforts. Municipalities are also encouraged to implement climate-resilient land-use policies, which would help to reduce disaster risk by entrenching standards for building resilience in law and prohibiting or restricting new development using overlay zones and base zoning. Through making use of spatial planning instruments, cities can regulate building heights and set requirements for flood-proofing and other measures in flood-prone areas, for example.

Bearing the above in mind, planning instruments such as IDPs, SDFs, LUSs, metropolitan open space systems (MOSS), as well as bioregional and conservation plans, and planning by-laws have been identified as being the key instruments to achieve water security.[2238] Municipalities could also develop incentives, such as subsidies

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[2236] See para 2.4.2.
[2237] See paras 2.3.2.2, 3.2.2.2, and 4.3.2.
[2238] See Chapter 4.

or reductions in rates and taxes, for other stakeholders to comply with urban water security objectives.[2239]

6.4.3 Municipalities should adopt local biodiversity plans and mainstream biodiversity considerations into planning processes and instruments

This study has shown that all three cities are prone to experiencing environmental, social, and economic threats due to uncontrolled urban development and poor land-use planning.[2240] It has also been established that some responses to these threats could be through spatial planning.[2241] The South African legal framework acknowledges that water resource management is inseparable from spatial and land-use management. Protecting fragile ecosystems and their associated ecosystem services requires careful planning and management of land use at the municipal level. Municipalities can use zoning tools, such as the SDF and LUS, to safeguard ecosystem services and water supply catchment areas by preventing potentially polluting land uses in those areas. Likewise, they can use these tools to prohibit development close to urban aquatic ecosystems such as rivers, wetlands and estuaries.[2242]

In this instance, the municipality can implement measures to protect freshwater priority areas through a buffer zone, designing large open spaces for increased connectivity, and developing blue-green corridors with a functional and aesthetic role, or for improvement of water quality, for example.[2243] Municipalities can use these measures to draw attention to ecological hotspots and to identify areas where different types of land use are most or least compatible with the natural environment. Included in the municipal SDF, the LUS, and any corresponding planning by-laws should be a list of

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2239 See para 5.1.
2240 See para 2.3.2.2 and Chapter 5.
2241 See para 2.3.2.2.
2242 Sections 24(2)(a) -(c) of SPLUMA; *Rohr Evidence Based Water Sensitive Planning: Securing Water Sustainability Through Innovative Spatial Planning Tools* 108-109.
2243 Armitage *et al Water Sensitive Urban Design (WSUD) for South Africa: Framework and Guidelines* 14.

priority areas for management, conservation and restoration of ecosystems, as well as areas where more detailed planning and assessment is required.[2244] It will be necessary for cities to use both built and natural infrastructure to respond to prevalent threats such as water pollution and contamination, water stress, droughts, floods, and ecosystem degradation.[2245]

Coastal municipalities need to protect and rehabilitate natural systems that serve as important coastal defences, fund ongoing research into the effects of climate change on coastal livelihoods, and incorporate climate information into municipal coastal management plans.[2246] Coastal municipalities should also establish municipal coastal management programmes, which should be aligned with environmental management plans, IDPs and SDFs, the NBF and the national estuarine management protocol.[2247] Using these instruments, local government has jurisdiction over significant natural resources to integrate and align biodiversity considerations into local-level planning.[2248] These instruments will be most beneficial in ensuring the protection of urban aquatic ecosystems.

6.4.4 Cities should adopt integrated climate change and disaster risk management plans and strategies

As per the discussion above it is apparent that disaster risk-reduction and management should form a critical component of climate change responsiveness and in addressing risks to water security in the form of water-related disasters.[2249] In line with the *Sendai Framework*, *Agenda 2030*, and the *New Urban Agenda*, disaster risk reduction strategies and policies should mainstream and integrate DRR within and across all

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2244 Para 4.3.3.
2245 Para 2.3.2.2.
2246 Para 4.3.4; NCCRP 16-17.
2247 See sections 42-49 of NEMICMA.
2248 Paterson "Biodiversity" 19-33.
2249 See para 2.3.2.3 of this study.

sectors, across different timescales and with targets, and indicators.[2250] A "whole-of-society" approach is required to prevent the emergence of new risks, reduce existing risk, and enhance resilience to residual risk.

In South Africa all three spheres of government have important roles to play in climate responses as well as DRM,[2251] which requires both sectoral interventions and cross-sector and cross-departmental coordination.[2252] The only way to ensure water-related disaster risk management and reduction is to encourage all sectors to account for water risks in their laws, policies and plans. In the future, municipalities are to undertake a climate change needs and response assessment[2253] and to develop and implement a climate change response implementation plan informed by such an assessment.[2254] Furthermore, the municipal climate change response implementation plan, must be integrated and must inform municipal development planning processes and instruments.

To address water-related disasters such as droughts and floods, this study recommends that cities integrate disaster risk reduction and climate change adaptation considerations and measures, with each other, and into urban and spatial development and planning processes, including the law and governance frameworks for services and infrastructure, and the environment.[2255] Municipalities should develop and improve early warning systems for extreme weather and climatic events and monitor climate change and disaster risk-related early warning indicators at the local level as part of climate change and disaster risk and response preparedness, even though disaster risk management is primarily a national-level function.[2256] Hence, municipalities must establish statutory and physical structures that ensure that disaster risk reduction is

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2250 See para 3.2.2.4.
2251 See para 4.3.5.
2252 NCCRP 14; Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 96.
2253 Para 4.3.4; Section 9(1) (a) of the *Climate Change Bill*.
2254 Para 4.3.4; Section 9(1) (b) of the *Climate Change Bill*.
2255 *New Urban Agenda* para 101.
2256 Para 4.3.4.

coordinated and implemented.[2257] They will need to develop, adopt, and implement a municipal disaster risk management plan as an integrated part of the IDP and a municipal disaster risk management framework. As prescribed by law, municipalities need to establish a municipal disaster risk management centre, a municipal disaster risk management advisory forum, and a municipal interdepartmental disaster risk management committee.[2258] These institutions are important in ensuring a coherent and adequate response to water-related disasters at municipal level.

Based on their legally defined duties to participate in drafting updated climate change strategies that include adaptation responses and drafting associated implementation plans to guide climate response in the respective municipality,[2259] municipalities are further directed to factor climate change into disaster risk management plans.[2260] In addition, municipalities are responsible for integrating their disaster risk management plan into the IDP. The plan must "anticipate the types of disasters that are most likely to occur in the municipal area and their potential effects," in while also providing data about communities at risk, considering their socio-economic, physical, environmental, and political vulnerability. Further components that should be included in the plan include contingency measures and response plans (emergency preparedness and response), as well as specifics regarding actions to lessen the vulnerability of disaster-prone areas. This plan, subject to collaboration with the local community during its development, must be consistent with the municipality's SDF.

To this end, strategic planning is also a vital tool for local government to assist in, mitigate and adapt to climate change and engage in climate governance initiatives. The IDP, together with spatial planning tools, will be the municipality's primary local planning mechanism in this regard. Likewise, the NCCAS requires the integration of

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2257 Du Plessis "Local Government and the Pursuit of Urban Sustainability in South Africa" 275-276; Van Niekerk "Disaster Risk Reduction and Climate Change Resilience and Adaptation" 855–76.

2258 Du Plessis "Local Government and the Pursuit of Urban Sustainability in South Africa" 275-276; Section 42(1)(a) of the *Disaster Management Act*.

2259 NCCAS 41.

2260 Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 97.

climate change adaptation into municipal development planning documents, budget documents, and by-laws.[2261] This will involve each municipality ensuring that climate change projects and programmes are reflected in municipal strategic development planning and budget documents, including IDPs, SDFs, and SDBIPs.

The management of water risks necessitates that every municipality must develop and implement hazard-specific early warning systems and assess the efficacy of their systems in terms of response time, forecast accuracy, and dissemination efficiency. To better understand local risks and solutions, cities must integrate local data, knowledge, and community participation by combining spatial information focusing on physical infrastructure and risks to assets with socio-economic information to pinpoint the most vulnerable areas and communities. Responses include developing municipal early warning systems that address vulnerability in stormwater, wastewater, and water resources infrastructure. Furthermore, all municipalities are directed to factor climate change into DRM plans, and *vice versa*.[2262] For coastal cities, municipalities should also integrate climate risk in coastal development planning. Similarly, they will need to strengthen disaster risk reduction and preparedness plans and strategies by incorporating climate concerns in marine spatial planning, integrated coastal zone management and other planning frameworks.

6.4.5 Municipalities to reform relevant water by-laws and municipal policies

Municipalities regulate their local communities, industrial and other activities, and other organs of state within their delineated areas of jurisdiction largely by means of enforceable environmental by-laws such as those controlling wastewater discharge, water supply, municipal health, public nuisances, and pollution.

It is necessary to ensure adequate bulk water and wastewater treatment and distribution capacities at the local government level, with national and provincial

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[2261] NCCAS 42.
[2262] Taylor *Urban Climate Adaptation as a Process of Organisational Decision Making* 97.

government oversight. However, simply managing and maintaining wastewater treatment plants and associated sewage systems is insufficient.[2263] This entails the following: (a) the pricing of water based on the cost of providing additional supply, while maintaining the commitment to provide a basic amount of water free of charge to those who cannot afford it; (b) revising by-laws and planning requirements, and using other incentives to support water efficiency and the treatment and reuse of water; (c) substantially improving quality service and customer engagement; and (d) managing the water network effectively to reduce losses and non-revenue water.[2264] It is further up to cities to integrate water resource use efficiency in the design of infrastructure as well as building a circular economy for waste.[2265]

This study therefore recommends that municipalities develop, adopt, and implement by-laws and local policies that address wastewater, sanitation and stormwater services. The relevant aspects these by-laws must address include standards concerning the operation and protection of water services works and consumer installations, tariffs, collection of charges, circumstances under which services may be discontinued or limited, prevention of unlawful connections to water services works and the unlawful or wasteful use of water.[2266] These by-laws can be linked with the water services by-laws that are already required by law. In particular, the drafting, adoption and implementation of these by-laws can facilitate the establishment of guidelines and protocols governing the construction, operation, and maintenance of wastewater and sanitation systems in each municipality, ultimately promoting their safety, efficacy, and sustainability.

To optimise the role of municipalities in ensuring a reliable and equitable supply of water for sustainable economic and social development, these by-laws and local policies must address efficiency of water use, promote wastewater recycling and reuse, and

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2263 See paras 2.3.2.2 and 4.3.3.
2264 Para 3.3.2.4.
2265 *African Climate Change Strategy* 87.
2266 Section 21(1)(a) and (b) of the *Water Services Act*.

incorporate water-wise water management practices for urban drainage and wastewater treatment systems. These by-laws should typically set out the minimum criteria for wastewater treatment works based on national standards and guidelines. Furthermore, these by-laws should address water wastage and water losses by specifically addressing measures to deal with non-revenue water. Consequently, states need to invest in innovation to produce water-efficient and climate-sensitive technologies, and practices to deal with cost-effective wastewater treatment.[2267] It is most important to improve coordination between multiple sectors, particularly water-energy-food, but also environment and land, and to promote tools and decision-making approaches that incorporate multi-sector objectives and performance indicators.[2268] To attain and maintain urban water security, water management approaches must consider a variety of users, uses, risks, and threatened resources to reflect the integrated character of the water system.

6.5 Areas for future research

In line with the stated objectives and identified limitations,[2269] there is a need for more research on many fronts, as was made apparent throughout the course of this study. Matters for further research are outlined below. Further research on these issues could help us gain a better grasp of the roles and responsibilities of local government in South Africa in terms of urban water security.

(d) The dimensions, elements and sub-elements of urban water security identified in this study could be further developed and refined to provide indicators for cities against which they could assess and evaluate their own local governance instruments.

[2267] Para 3.3.2.4; *African Climate Change Strategy* 88.
[2268] *African Climate Change Strategy* 89.
[2269] See paras 1.6 and 1.8 respectively.

(e) Further research is needed on the legally relevant dynamics of the nexus between urban planning, water resources management, governance, and finance for urban water security.

(f) Water management is important in achieving water security; however, this study could not assess the technical and operational aspects concerning the management of urban water. This remains a topic for future studies.

(g) The critical role of investment, funding, water infrastructure development, and, where applicable, technologies in promoting water security in South African cities requires further investigation.

(h) The role of development and building controls (and permitting requirements) in aiding municipalities to address water security is emphasised in this study. Municipalities can also adopt and develop regulations requiring water-efficiency in building regulations, for example. These regulations could pertain to ensuring that only water-efficient devices such as low-flow taps, low-flow showerheads, low-flow toilets or dual flush toilets are installed in new buildings, for example. Further research can be undertaken to assess the contribution of building regulations to water security.

(i) The impact of COVID-19 on South Africa's water infrastructure (impact of shut-downs, emergency operation and management strategies) should be assessed considering future predictions of global and regional disease outbreak. The extent to which similar disease outbreaks can influence water security also remains open for future studies.

(j) The role of public-private partnerships, or other collaborative forms of governance, towards enhancing the achievement of water security in local government requires unpacking.

(k) While this discussion has not attempted to evaluate the implementation of municipal by-laws, policies, plans or strategies, it is important to note that a greater emphasis on the implementation of existing plans such as the IDP, SDF, and various other cross-cutting instruments is required to expedite the implementation of identified actions and achieve water security. The implementation of existing city-level laws, plans, policies, and strategies on water security as well as the level of compliance with national legislation may have to be critically assessed.

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