

ARA Framework

CONTEXT REPORT FOR DURBAN

Draft Report
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1. Background: – 250 words

The Adaptation Alliance (ARA), a global coalition of over 225 organisations, is working on adaptation action and research from over 60 countries. The ARA focuses on bridging the knowledge-practice divide to enhance progress on adaptation to climate change through a number of impactful initiatives. The SECURE framework is underpinned by a power analysis, which is explored through the lenses of networks, and institutional and cultural norms, shaped by their intersection with biophysical context. The co-creation of new and innovative local adaptation programmes, co-produced by local experts, including the state, research institutions, citizens, the private sector and civil society organisations, who solve problems through the integration of different types of knowledge, is one of the main aims of ARA. The International Institute for Environment and Development (IIED) is coordinating one of these processes, bringing together over 125 organisations from across the world and producing a new approach to tackling climate risks faced by low-income urban communities in the global South. The IIED has created a decision support framework, the SECURE framework, which includes a Gender equality and social inclusion (GESI) component. The ARA SECURE framework emphasises the role of power, and actors and their governance arrangements or networks, in shaping climate outcomes. Co-production interventions therefore focus on behaviour change, brokering agreements, empowerment and system reform; and knowledge, experiential learning and dialogue platforms. This framework will be implemented and reviewed in two informal settlements in Durban, South Africa, using co-production methodologies, through a context specific lens, to enhance and refine the framework, to find appropriate, effective and contextual solutions for urban resilience. Durban has a long history of developing community based climate adaptation programmes that recognise the value of building socio-ecological relationships through joint investment in ecosystem services and poverty alleviation. The city, which has 26%

of its population living in informal settlements, has experienced two significant floods recently (2019 and 2022). This provides the opportunity to learn about climate adaptation and disaster risk reduction, in a context where collaborative innovative programmes, are being developed by the state, research institutions and citizens. The research undertaken for ARA builds on the CLARE INACCT Resilience project (funded by IDRC and FCDO), leveraging recent cases in Durban, South Africa (and to a smaller extent, Beira Mozambique at later stages) to contribute to the evolving body of knowledge informing proactive municipal resilience planning. While building on INACCT Resilience, this project has discrete goals and activities to achieve under the SECURE framing.

2. Domain of action: - 300 words

The Durban team will concentrate on two domains, while recognising that the other domains cut across the processes developed for building climate resilience. The two domains are governance, particularly across formal and informal institutions, hybrid arrangements, knowledge brokering and coalitions/social compacts; and information, communication and awareness, including the community based early flood warning system developed in Durban. The gender and inclusion dimensions of climate change adaptation will be considered within each domain. This focus is based on our existing detailed understanding of the city and the centrality of these domains for understanding and addressing all other cross-cutting issues. We will analyse and reflect on the community of practice that has been established in the Palmiet Catchment Rehabilitation Project, of which the Quarry Road West informal settlement is a part, and we will examine the governance arrangements and networks of Pholani informal settlement which is located North of the city in La Mercy area for comparison. This is also important for co-learning between informal settlement community members who are also co-researchers in this work. Through the application of the SECURE framework and co-productive approach with community members we will describe and map the biophysical and infrastructural environment of each settlement and explain how the biogeography and ecosystem services of each settlement, as well as its built infrastructure, impact on its climate resilience (the one settlement is at risk to landslides while the other is at risk of river and surface level flooding). Together with community members and other stakeholders we will map community assets and services which build climate resilience in both settlements, and understand what risk knowledge, data and information exists in each site and how this is developed, produced and communicated. We will analyse the governance, planning and institutional capacity in each settlement to further develop understanding who gets to know and decide what, and how this knowing is transferred along the information value chain to create impact. These two domains are critical to climate adaptation in the city and the building of

climate resilience, as local communities of practice have shown to be essential to the city and its resilience and sustainability through the major crises the city has faced in the past five years (COVID-19, major social unrest, and two major floods) and this attracts the attention of key stakeholders seeking solutions.

3. Preliminary context analysis

The context analysis provides the background to the case study of Durban, South Africa. It first presents an overview of the city and then outlines the biophysical, institutional, cultural and GESI context. This context analysis builds on previous work (e.g. adding a specific GESI lens and SECURE framing).

3.1 Introduction/Overview

Durban, (eThekweni Municipal Area (EMA)), with its administrative entity eThekweni Municipality, is South Africa's third largest city. It is located in the province of KwaZulu-Natal on the east coast of South Africa. The city has a population of 4.2 million people (see Figure 1).

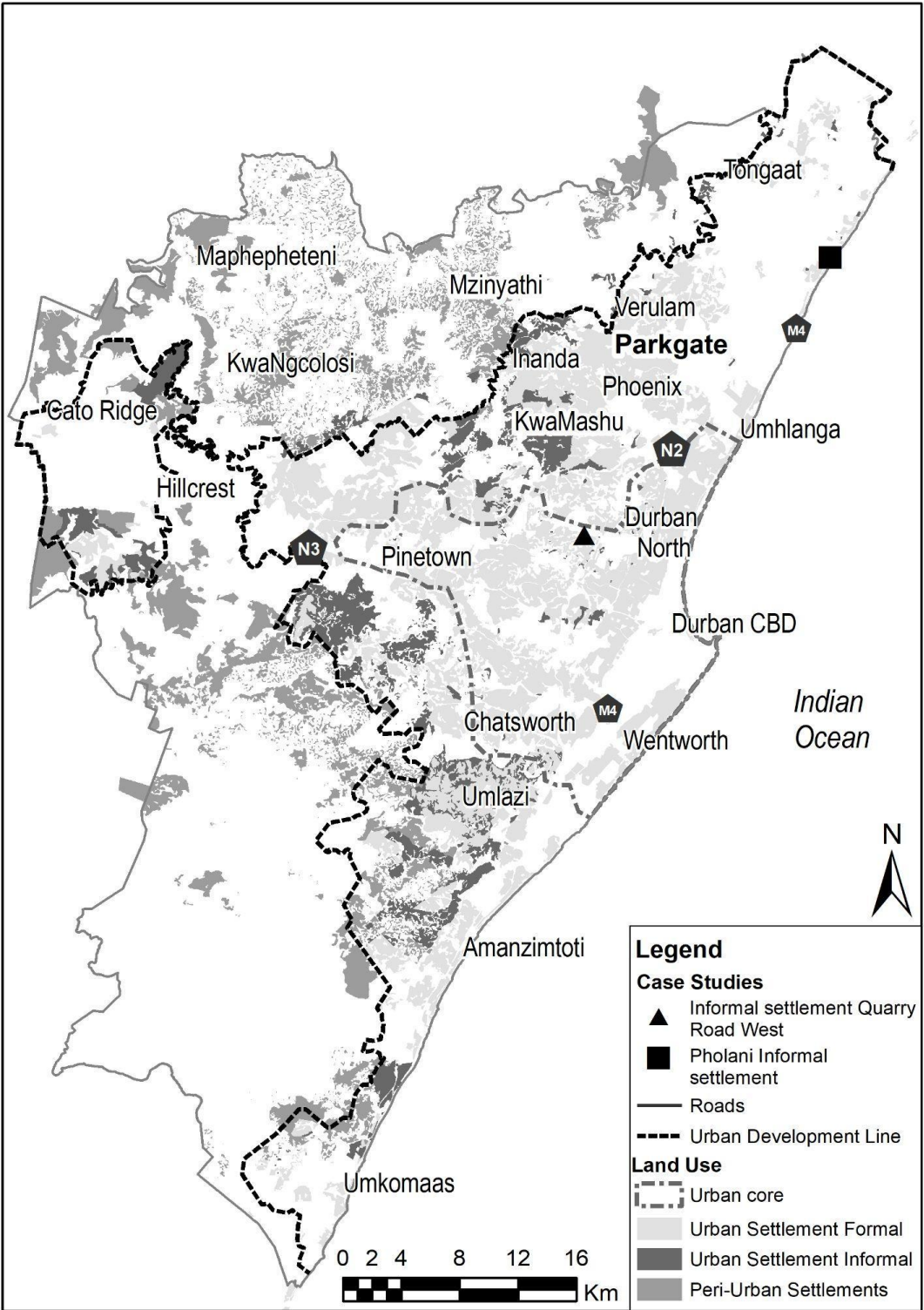


Figure 1 Durban (eThekweni Municipal Area) with two ARA case studies included (Prepared by M. du Sart, Eduaction, 21/04/2024).

The spatial form of Durban reflects its apartheid history, urban entrepreneurial (neo-liberal) growth model, high levels of informality, poverty and inequality, and the presence of an urban edge planning discourse (Sim et al., 2018). This impacts on its governance, which while centralised and undertaken at scale, requires context specific interventions in different spaces and places in the sprawling city. The spatial form is shaped by its land tenure system, with 43% of the land area under the Ingonyama Trust and traditional authorities (21 Traditional Councils); planning concepts of an urban core, a rural periphery and an Urban Development Line (Sim et al., 2018; Sutherland et al., 2014); progressive informal settlement upgrading policy and practice; and neo-liberal urban entrepreneurialism, enacted through state and private sector led, large scale or mega-projects (Hannan and Sutherland, 2018). The reverse model of densification which characterises the municipal landscape, together with business and residential expansion beyond the urban core in municipal and private sector planned development nodes, has led to an inefficient and inequitable urban form. This presents a major challenge to the development of housing and settlements, a viable public transport system and service and infrastructure provision (City Densification Strategy, 2013). This in turn impacts on the city's resilience to climate change.

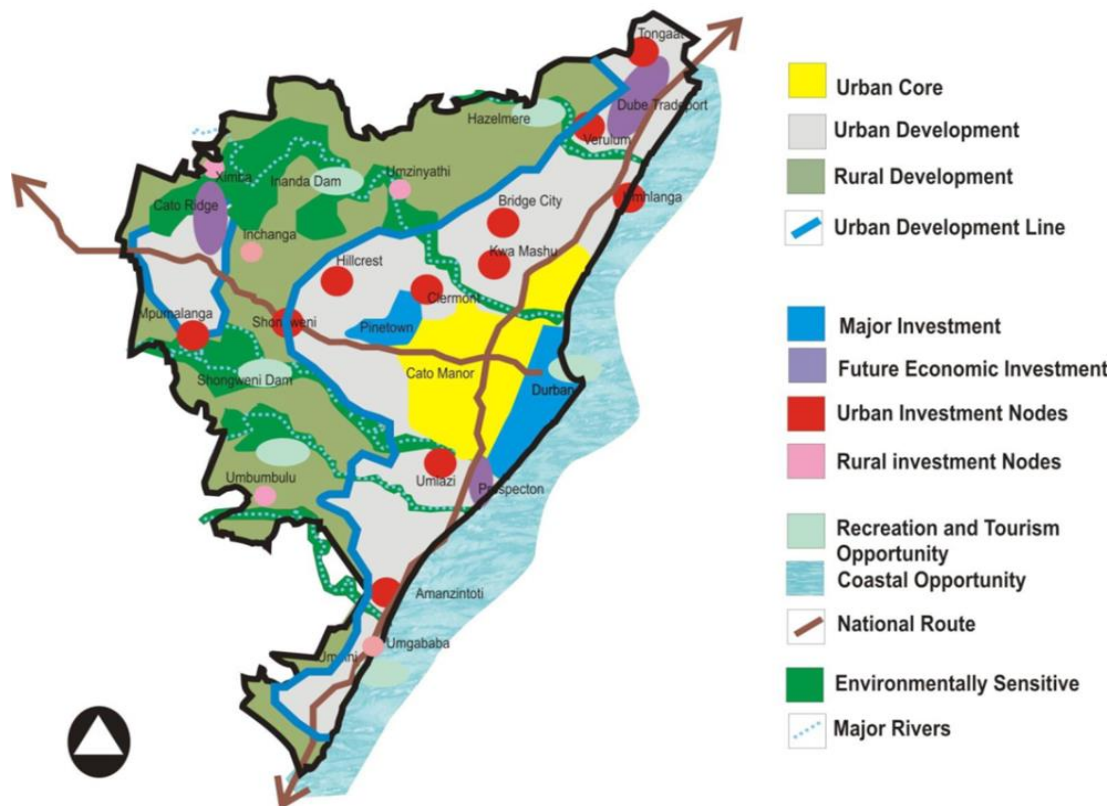


Figure 2 The representative space of Durban, including the Urban Development Line

Durban's legacy of colonialism and apartheid and its post-apartheid development trajectories of rapid urbanisation, low economic growth and incomplete governance (the policy practice gap) and recent disasters, play a significant role in the challenges the city experiences. High levels of poverty and inequality, significant housing and service delivery backlogs, including water, sanitation and waste management, a dual governance system of local government and traditional councils, across 43% of the EMA and significant disruptions over the past five years, including COVID-19, social unrest and floods, place pressure on the state and citizens and impact on well-being and quality of life. These challenges are further exacerbated by global and local drivers of change, including economic crises and climate change.

3.2 Biophysical environment

The implementation of the ARA framework will enable the Durban team to collect data on and analyse the following key biophysical elements that underpin the success of resilience interventions. This will be done at the city scale through the lens of informal settlements and the two case studies selected for the study: Quarry Road West and Pholani informal settlement.

- a) Transformative potential of disasters - Assess how frequent disasters present opportunities for transformative change in resilience planning and implementation.
- b) Built environment- Examine how the built environment both enables and constrains resilience efforts, including issues under consideration.

In order to do so, the context analysis provides background in the biophysical environment in Durban.

Durban has a diverse and abundant natural environment. It is located in a biodiversity hotspot, the Maputaland-Pondoland-Albany Region, with 25% of its species being endemic to this region (eThekweni Municipality 2016/2017). As a result of this high biodiversity, its location in the transitional zone between a warm sub-tropical and cooler temperate climate, and its varied topography, the municipality's unique biogeographical position supports a wide range of aquatic and terrestrial ecosystems with their associated ecosystem services (eThekweni Municipality 2016/2017). Durban has a well-developed open space system to protect its valuable environmental assets, the Durban Metropolitan Open Space System (DMOSS). DMOSS covers 33% of the municipal land area and forms a layer of the municipality's Spatial Development Framework (SDF) (see Figure 3). The restoration and protection of Durban's ecosystem services is integrated into numerous municipal programs, including DMOSS, the city's community ecosystem-based adaptation (CEBA) program, the Transformative Riverine Management Programme, its Climate Strategy, and Resilience Strategy.

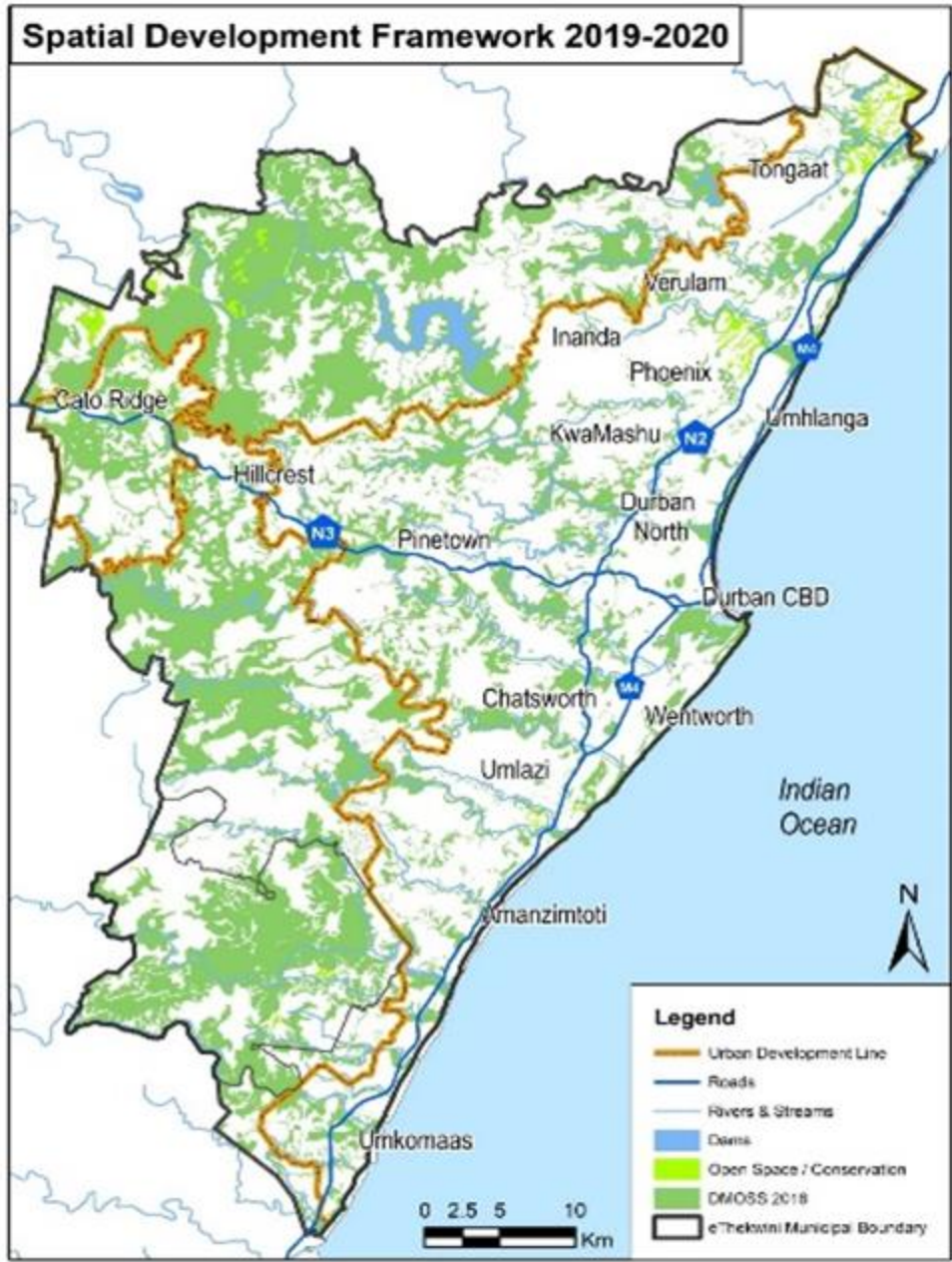


Figure 3 Durban’s environmental spaces (Source: Martel and Sutherland, 2019)

The protection and enhancement of ecosystem services (such as water and soil provision, flood attenuation etc.) are foundational to the resilience and sustainable development of the city and to its adaptation to climate change (Martel and Sutherland, 2022; Roberts et al., 2020; Sutherland et al., 2019; Roberts et al., 2012).

KwaZulu-Natal Province and the city of Durban have a high flood risk, which is likely to intensify with climate change (INR, 2023). According to the INR (2023) eThekweni Municipality is at the forefront of climate action both nationally and internationally with a

large and continually expanding climate change protection programme, as a result of the recognition and understanding of these challenges. The city has a relatively high annual rainfall (550 mm to 1200mm per annum), as a result of its location on the east coast of South Africa. It is significantly impacted by cut-off low pressure systems, which have been responsible for the major floods in the city. These floods have been attributed to climate change, and are likely to increase in the future (Pinto et al., n.d.). Surface water flow and its ability to produce flash floods due to high rainfall, inundation as a result of a rare and prolonged La Nina event (in 2022), a steep topography, poor planning and stormwater management, poor waste management and alien vegetation which impacts on culverts, rapid urbanisation and informal development, exacerbates climate risk in the city.

The benefits of the DMOSS system and ecological infrastructure and the ecosystem services it provides are well documented (Davids et al., 2018). Well managed open spaces provide ecosystem services (including wetlands) which regulate surface water flow, flooding and attenuate water. Well-functioning rivers, whose hydrological, ecological and geomorphological processes are intact and able to respond to change, are critical in a city such as Durban, which has 18 major river systems and 7400 kms of rivers (C40, 2019; Davids et al., 2018). Increased surface water flow is a predicted outcome of climate change in Durban which increases the value of well managed open spaces and the removal of alien vegetation. Alien vegetation tends to have shallow root systems and is easily uprooted during flood events, leading to the blockage of culverts, which has significant impacts as seen in the Durban floods in 2019 and 2022. Evidence from the Sihlanzimvelo programme shows that where rivers had been rehabilitated and stormwater systems were functional, and in the absence of other factors related to the flood event, the impacts of the flooding in 2022 were minor or much less (Leramo Properties, 2022). Further research is required to quantify these benefits during the flood event.

Observational evidence from the Kloof Project, which is a local project in the middle to upper income suburb of Kloof, where a partnership between a civil society organization, businesses and property owners in the area, has led to investment in ecological infrastructure through the greening of all pavements, traffic circles and the railway line with indigenous vegetation, shows the benefits of ecosystem services in corridors at the neighbourhood scale (Beere, 2024). Runoff and stormwater in this area has been reduced as a result of the well vegetated, natural corridors that traverse the area, as well as the improved waste management practices and change in attitudes towards littering that are associated with greening an area.

Kloof project



- Indigenise the landscape
 - Biodiversity and ecosystem services valued
- Maintain quality of the neighbourhood
- Private sector - civil society initiative
- Maintain property values
- Public spaces, attractive and safe pedestrian walkways
- Reduce water use and maintenance
- Reduce surface water flow



Figure 4 The Kloof Project in Durban

3.3 Institutional Dimension

The implementation of the SECURE framework will enable the Durban team to collect data on and analyse the following key institutional elements that inform the success of resilience interventions. This will be done at the city scale through the lens of informal settlements and the two case studies selected for the study: Quarry Road West and Pholani Informal settlement.

- a) Organisational Mapping - Identify key institutions involved in urban governance and resilience planning, including their roles, capacities, and levels of influence.
- b) Capacity and control - Assess the capacity of institutions to address resilience, their influence over resources, and control mechanisms.
- c) Regulations and policy processes- Examine existing regulations and policy frameworks related to resilience and identify gaps or barriers.
- d) Opportunities for change- Identify windows of opportunity within institutional structures for introducing resilience-building measures.

In order to do so, the context analysis provides background on the institutional arrangement that support resilience programmes in the city. The governance and institutional arrangements for resilience and sustainability are outlined below (Sutherland, 2024)¹.

The city has experienced four major and devastating disruptions since 2020 and this has changed its development trajectory and development outcomes in profound ways. Two of these disruptions are major floods, which can be possibly attributed to climate change (e.g. Pinto et al., n.d. State that the floods can be attributed to climate change), or at least used as analogues or proxies for the impacts of climate change on cities and their residents. The policy, strategies, programmes and interventions described above need to be evaluated in light of how they reduced the impact of both the 2019 and 2022 floods, and the impacts of other disasters in Durban (Covid 2020-2022+ and social unrest July 2021).

The city has a long history of building resilience and transformative sustainability through programmes that support the socio-ecological dimensions of development, community ecosystem-based adaptation, water and sanitation innovation and informal settlement upgrading. However, rapid urbanisation, weak governance, poor waste management, alien invasive species and negative environmental behaviour, amongst a citizenry with a high level of environmental consciousness (placing high value on the natural environment), is placing increasing pressure on Durban's ecosystem services. In response, experimental governance; learning by doing; and well-developed collaborative partnerships between the local state, citizens, local community based organisations (including conservancies) and research institutions, which we refer to as urban reform coalitions (Mitlin, 2023; Sutherland et al., 2019; Roberts et al., 2012) help to build the city's resilience. The private sector, at certain times and in some places, engages in these urban reform coalitions (in the interests of capital, corporate social responsibility, and through the collective identities of all actors who reside and work in a neighbourhood). These efforts by multi-actor networks are evident in the progressive approach to sustainability in environmental planning and management, climate protection, catchment management, water and sanitation and human settlements in the city. Within the many urban reform coalitions and governance platforms that have emerged in the city to build sustainability, the coproduction of knowledge and participation of all stakeholders has been the central approach. This has enabled intermediaries or knowledge brokers, to build narratives about the everyday lived worlds of the state and citizens, as they both produce and experience the opportunities and risks in the city.

¹ This section is drawn directly from a report completed by Sutherland (2024) for Centre for Environmental Rights. It will be reduced once we receive a review of the draft.

Durban has a well-established policy discourse, with its associated practices of investing in ecological infrastructure (ecosystem services), in support of built infrastructure, to provide services, improve the functioning of the city, safeguard against risk, improve quality of life and reduce poverty, inequality and vulnerability. Community ecosystem-based adaptation (CEBA), was established as an approach to development and climate change adaptation by Professor Debra Roberts and the Environmental Planning and Climate Protection Department from the early 2000s. This approach was developed to support the city's response to climate change and to create jobs and opportunities through investment in ecosystem services (Roberts et al., 2012; Sutherland and Mazeka, 2019). CEBA draws on the understanding and evidence of the benefits (economic, environmental and social) of Durban's Metropolitan Open Space System (DMOSS). The natural and semi-natural systems of the eThekweni Municipal Area supply ecosystem services worth at least R 4.2 billion per annum with the value of these systems estimated to be between R 48 and R 62 billion (World Bank, 2016). To use built infrastructure to meet all the service needs of the city is currently unaffordable, thus Durban relies on two systems, natural and built, to support the approximately 4.2 million people living in the eThekweni Municipal Area.

Durban is a 'city of rivers'. Rivers have been defined as sustainability pathways in the city (Martel and Sutherland, 2019). Since 2013, investment in ecological infrastructure and the rehabilitation of rivers and catchments, has become a focus of different multi-stakeholder groups across the city, using different models of governance, to address the challenges of pollution, water security risk, health impacts of degraded environments, poor service provision and increased environmental risk and flooding events. Rivers reflect, hold, move and address multiple urban problems and challenges, through their hydrological and ecological processes and their relationships with their catchments (Martel and Sutherland, 2019). These challenges include rapid urbanisation; pollution; poor delivery of infrastructure and services; path dependencies created through hard infrastructure, which use rivers as buffers when engineering systems fail; the growth of informal settlements; sand winning; densification and hardening of catchments; poor storm water management, which is being exacerbated by climate change; and cycles of droughts and floods. If rivers and their catchments are degraded, unhealthy and neglected, the entire system is compromised and the quality of life of urban residents, particularly the poor, declines (Martel and Sutherland, 2019; Anderson et al., 2019; Jewitt et al., 2020; Turpie et al., 2017).

The convergence of water and climate governance in the city (2014), through the leadership of South African National Biodiversity Institute (SANBI) and Neil Macleod, Professor Debra Roberts, Dr Sean O'Donoghue and Geoff Tooley (eThekweni Municipality officials - leading experts in their relevant fields), provided a framework within which both water and climate challenges could be addressed at the catchment

scale (Sutherland and Roberts, 2014). This led to the development of the Umgeni Ecological Infrastructure Partnership (UEIP) and a multitude of locally led catchment rehabilitation projects, which sought to improve environmental governance in the city (Martel and Sutherland 2019. Martel et al., 2022a). Researchers, municipal officials, consultants, civil society organisations and local community groups in the city began to recognize the value of these collective efforts, across different stakeholder groups, to rehabilitate rivers and catchments. The successful municipal-led Sihlanzimvelo programme, the innovative Palmiet Catchment Rehabilitation Project, the Aller River Project, initiated by eThekweni Conservancy's Forum and implemented by Kloof Conservancy, and the Wize Wayz Water Care project, led and funded by the private sector (AECI), provide examples of catchment rehabilitation projects that are focusing on social and environmental transformation, to support built infrastructure, improve water security, reduce risk, improve quality of life in the city and create employment (Martel et al., 2022a). The benefits gained and lessons learnt from these programmes have led to the development of Durban's Transformative Riverine Management Programme (TRMP), launched in 2021. This programme promotes investment in ecological infrastructure, or nature based solutions and is included in Durban's Climate Change Strategy and Action Plan. It aims to protect and enhance ecological infrastructure with its associated ecosystem services, provide sustainable water services, protect the city from flooding and improve quality of life of citizens who live alongside rivers and streams, which form part of Durban's 18 major river systems. The projects within the TRMP have a strong community focus, building state-citizen relationships, establishing partnerships between, and knowledge, capacity and skills of, all stakeholders engaged in catchment rehabilitation, and creating a range of economic opportunities for the urban poor. eThekweni Municipality, through the efforts of the Environmental Planning and Climate Protection Department, Coastal Stormwater and Catchment Management Department have built a business case, policy base and have created institutional buy-in for catchment rehabilitation, with support from the C40 Cities Climate Finance Facility (<https://www.c40knowledgehub.org/>, accessed 27/11/2023). The TRMP business case has shown that for every R1 spent on catchment rehabilitation R1.80 to R3.40 will be obtained in municipal and societal benefits, over 9000 jobs will be created and there will be R12 to R14 billion in societal benefits (C40, 2019).

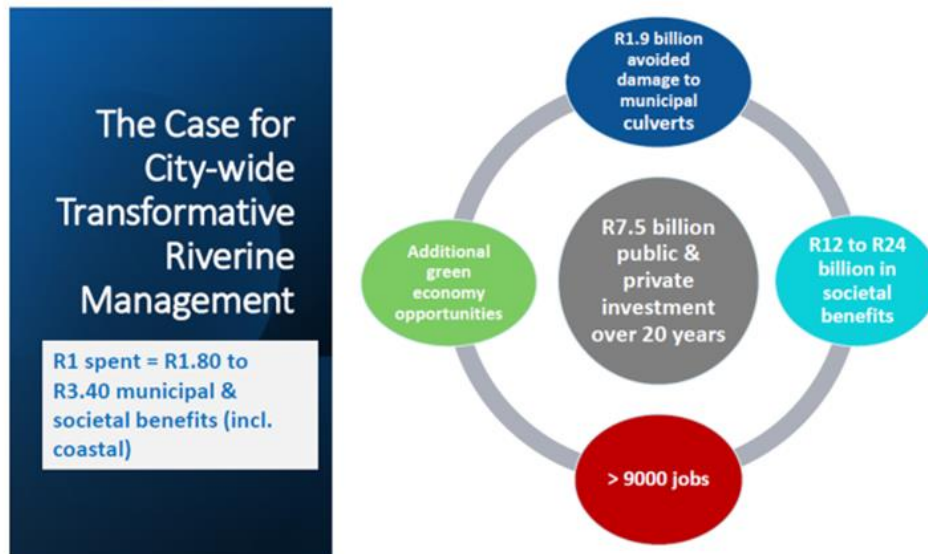


Figure 5 The Business Case for Durban’s Transformative Riverine Management Programme (C40, 2019).

Within catchment rehabilitation programmes, innovative projects which focus on disaster risk reduction through inclusive climate adaptation have emerged. Catchment rehabilitation projects employ local community members as Enviro-Champs to monitor the catchment and to perform functions such as alien clearing, reporting of faulty sewer systems, water pipes and illegal waste sites, and to educate the community about the importance of protecting the environment. This model, which follows the Durban Umgeni Conservation Trust’s (DUCT) approach of using local residents to be the ‘eyes and the ears’ of the catchment and to engage in river rehabilitation work, through a tailored skills development programme, has been successful in KwaZulu-Natal. In the case of the Palmiet Catchment, the Enviro-champs have been instrumental in the functioning of the community based flood early warning system (CBFEWs). The challenge with Enviro-champs programmes is that they are reliant on third stream funding, and hence have a limited time span, which means that trained community members who have been employed as Enviro-Champs, continue to contribute to resilience and sustainability in their settlements, but do not derive any financial benefit from or compensation for this work. The impact of having short term contract work on both the catchment and on the Enviro-Champs, as part of the green economy and

resilience building has been documented by Sutherland and Ngcobese (2022) as part of the Development Bank of South Africa, AFD France and EU Delegation's ecological infrastructure funding project: The Palmiet Catchment Rehabilitation Project (1N-36478).

Another successful local project is a CBFEWS which was established in 2015 in the Palmiet Catchment and which has evolved through social learning, partnerships and socio-technical innovation to a functional early warning system. The CBFEWS includes officials from eThekweni Municipality, researchers from University of KwaZulu-Natal and civil society organisations and community members from both formal and informal settlements within the catchment. It is a locally based, partnership driven early warning system that uses information from the South African Weather Service, the municipal FEWS system and radar, and from real time community data, using Whatsapp groups to communicate flood warnings across the catchment, but most particularly to the highly vulnerable Quarry Road West informal settlement community. The municipality and researchers from UKZN are working on this system, which they have developed collaboratively, to scale it up across the city in the future through the CLARE INACCT research project (Sutherland, 2024). The CBFEWS saved the lives of between 250 and 400 people in the Quarry Road West informal settlement in the Durban floods of 2022.

Durban's Resilience Strategy (eThekweni Municipality, 2017), which was developed by Durban's Core Resilience Team, as a result of Durban being selected as one of the Rockefeller Foundation's 100 Resilient Cities, provides a framework and guidance on building resilience in the city. The Strategy has two main pillars, or resilience building options: collaborative informal settlement action; and integrated and innovative planning at the interface between municipal and traditional governance systems (eThekweni Municipality, 2017). The strategy development process identified six focus areas which were grouped into resilience building themes or issues, which were explored through mutli-stakeholder workshops to identify six levers for change (see Figure 6).

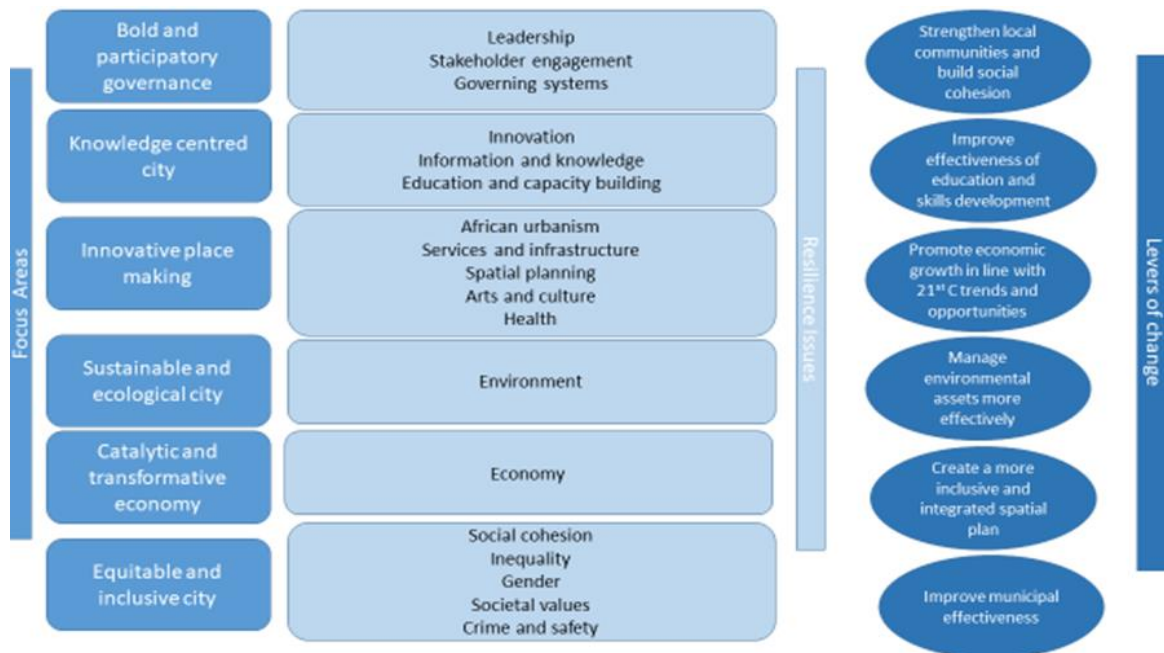


Figure 6 Focus areas, issues and levers for change for Durban’s Resilience Strategy (eThekweni Municipality, 2017)

Engagement Outcome: Six cross-cutting ‘levers of change’ to build resilience in Durban

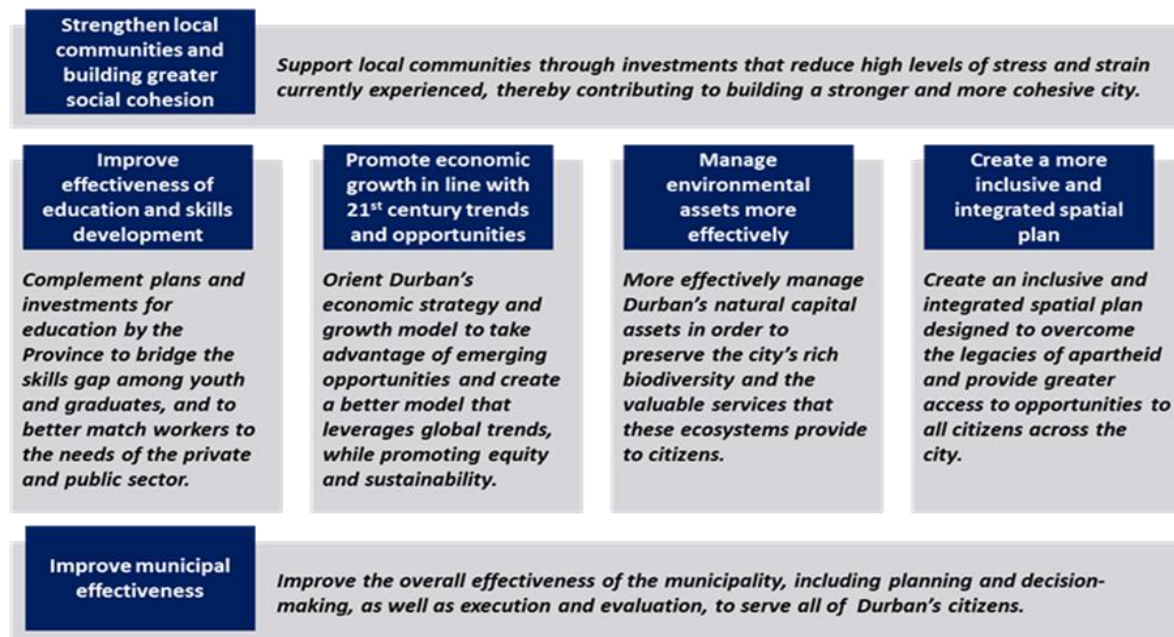


Figure 7 Levers for change for building resilience in Durban (eThekweni Municipality, 2017)

The focus areas, issues and levers for change in Durban’s Resilience Strategy are aligned with the strategies and programmes developed in the city to address poverty and inequality, housing and service provision, to invest in the city’s environmental asset base, to reduce risk and vulnerability and to improve quality of life for all. The focus on informal settlements has been important, as progressive municipal officials, NGOs and NPOs, informal settlement residents and university researchers believe that if resilience can be built in the most vulnerable spaces of the city through improved governance, planning and development using adaptive built and ecological infrastructure and collaborative action, the processes and interventions developed for resilience can be transferred to other spaces in our city.

The iQhaza Lethu Informal settlement Upgrading Partnership, which resulted in the country’s first municipal level informal settlement upgrading policy in South Africa, and the Engineering Field Testing Platform which is a transdisciplinary research platform based at the WASH R&D Centre, University of KwaZulu-Natal, to test innovative non-sewered sanitation in Durban (Bill and Melinda Gates Foundation’s Reinvent the Toilet Programme) as part of the diversification of the city’s sanitation services (Odili and Sutherland, 2021) also contribute to resilience building efforts in the city. The latter now focuses more directly on developing and testing resilient sanitation systems that are off grid, and which can form part of disaster risk reduction in the city.

Durban’s Climate Change Strategy (2015, updated in 2022) guides the municipality in its cross-sectoral efforts to address climate change. The strategy recognizes that high level interventions are needed for implementation at the sectoral level to be effective. Four themes with 14 elements have been identified (see Figure 8).



Figure 8 Themes and elements of Durban’s Climate Change Strategy

Durban's Climate Action Plan, which was adopted by Council in 2019, comprises of 33 actions and 149 sub-actions which are aligned with the themes in Durban's Climate Change Strategy. The actions provide the approach for Durban to build climate resilience and obtain carbon neutrality by 2050. The city's strategy and action plan support its efforts in meeting the Paris Agreement targets and guide the urgent need for local action and response by the city to climate change. According to eThekweni Municipality "these ambitious goals cannot be accomplished alone and has called on the support from national and provincial government, the private sector, civil society and the City's citizens to enable it to meet the ambition set out in the plan. The City plans to broadly share its story of developing the CAP, through the compiled Learning Journey: Durban Climate Action Plan"

(www.durban.gov.za/storage/Documents/ClimateAdaptationBranchProjects/DurbanClimateActionPlan.pdf, accessed 20/12/2023).

3.3.1 Institutional arrangements for informal settlements in South Africa and Durban

There is a diverse group of actors that influence decision making in informal settlements in South Africa and Durban (see Table 1). Beyond community members themselves, Area Based Committees and sub-ward committees, actors representing sub-national governments (Mayor, Councillors, Ward Development Committee), politicians and local government officials play a key role. Other influential actors include national government, civil society organisations and local networks, NGOs and bridging actors such as research institutions. These bridging actors play a role as intermediaries between local communities and city authorities on diverse issues, to increase awareness on the challenges and opportunities faced. There are several actors that are less centrally involved such as international partners and organisations but they can also have a direct influence through funding opportunities. Diverse and interconnected roles are performed across different levels by a range of actors working to address urban development challenges in informal settlements.

Both national and local governments have considerable influence in policy and decision making regarding informal settlements, yet power is unevenly distributed. Under South Africa's Local Government: Municipal Systems Act 32 of 2000, local governments have direct responsibility in carrying out strategic local land use planning and development control. However, they have limited powers, particularly budgeting which is largely determined by national and provincial government for housing. Institutional complexity presents challenges in terms of allocating different levels of responsibility and accountability. Stakeholder mapping and network analysis represented in Table 1 will be further developed throughout the project based on engagements with community members in selected informal settlements sites and other stakeholders.

Table 1: Roles and functions of actors shaping in informal settlements

Actors	Roles and Functions - overview indicative examples
National Government	<ul style="list-style-type: none"> · Develop policies relevant to urban development, such as the National Housing Policy and Strategy for South Africa · Environmental protection and resource management · Land allocation through zoning and distribution · Planning matters · Disaster risk management coordination
<p>Sub-National Government:</p> <p>Local government - eThekweni municipal council, mayor, executive or mayoral committee, councillors, ward development committee, traditional authorities, local committees for disaster management</p>	<ul style="list-style-type: none"> · Provide resources · Facilitate services · Drive local policy and development <p>Closest interface of government with people on the ground</p> <p>Mandated to develop and implement the IDP and Spatial Development Framework</p> <p>Mandated to provide services</p> <p>Disaster Risk Management</p> <p>Environmental Planning and Climate Protection</p>
Academia and Research Institutions	<ul style="list-style-type: none"> · Build the capacities of urban stakeholders and generate bottom-up knowledge to ensure that development decisions are informed and shaped by community priorities · Connect knowledge, expertise and capacities from informal settlements to citywide actors and institutions

<p>NGOs</p>	<ul style="list-style-type: none"> · Supporting advocacy, research and action by coordinated groups. · Provide funding and capacity to community-based organisations and civil society networks, and bridge the gap between government and informal settlements. · Promote improved governance and women’s empowerment · Promote more collaborative and participatory solutions for improving living conditions in informal settlements.
<p>Communities and CSOs, and Local Community Network, Community Disaster Management Committees</p>	<ul style="list-style-type: none"> · Community organisation and capacity building · Knowledge exchange · Partnership with local NGOs and international NGOs and research institutions · Local advocacy · Data generation, profiling and enumeration
<p>Community leaders, religious and traditional structures: traditional leaders, chairperson, community leaders CBOs Youth groups Women’s groups Savings group</p>	<ul style="list-style-type: none"> · Organise committees and lead decision-making · Responsible for the regulation of customary laws in their community.
<p>Private Sector and Consultants Including consortia of foreign companies funded by international partners</p>	<ul style="list-style-type: none"> · Research, advisory services, support for interventions and services · (re)building urban structures · supporting development of municipality policies
<p>International/development partners</p>	<ul style="list-style-type: none"> · Provide third stream funding which ensures innovation (re)building urban structures

	<ul style="list-style-type: none"> . supporting development of municipality policies . enhancing early warning systems
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Despite governance challenges, as already noted, there is an increasingly well-networked collection of urban communities of practices in the EMA supporting improved living conditions in informal settlements. These ‘community of practices’ comprise community members, researchers, civil society, NGOs and local government champions. Such alliances are increasingly emerging across diverse African contexts such as in Freetown, Sierra Leone and Nairobi, Kenya (e.g. see Macarthy et al., 2022) and more needs to be known about their role in and potential for supporting locally informed urban resilience, underpinned by growing recognition and empowerment of informal settlement communities, new insights for planning for informality and so forth.

Although more exposed and sensitive to climate hazards, informal settlement residents and communities are resilient and adaptive, developing innovative and hybrid approaches in partnership and networks with other actors to plan for and respond to flooding, fires and other disasters. Informal settlements are highly complex places of intersectional vulnerabilities and inequalities, but which also offer opportunities for innovation, experimentation and transformation (Sutherland, 2020; Williams et al., 2019; Fraser et al., 2017). Guided by the SECURe framework, this research challenges preconceived notions of informality and informal settlements and their complex roles in shaping and supporting urban resilience through a particular gendered and equality lens with the aim of supporting equitable, resilient, and sustainable pathways for urban development. Sutherland (2020); Williams et al., (2019) and RADAR (2018) argue that partnerships, collaboration and the co-production of knowledge and response between the state and citizens for climate adaptation can improve municipal service delivery and strengthen state-citizens relations and local adaptive responses to recurrent climate risks. The role of intermediaries, such as universities, NPOs and NGOs, is essential too, in building new governance platforms and relationships to adapt to climate change and reduce risk (Sutherland et al., 2019).

Informal settlements are intricately linked to the functioning and fabric constituting the wider city and thus require significantly more attention in resilience building efforts. As captured in Durban’s Resilience Strategy (2017): informal settlements “reveal in their most intense form, the multiple socio-ecological and political relations and risks that constitute the city, providing a highly relevant and important space within which to understand, enhance and build resilience” and “If resilience can be enhanced in

informal settlements in the city with their multiple connections to other parts of the city, then it can be built in other areas facing resilience challenges”.

3.4 Cultural Analysis

The implementation of the SECURe framework will enable the Durban team to collect data on and analyse the following key cultural elements that inform the success of resilience interventions. This will be done at the city scale through the lens of informal settlements and the two case studies selected for the study: Quarry Road West informal settlement and Pholani.

- a) Intersectional Identities - Analyse how gender, ethnicity, and other factors intersect to shape vulnerabilities and resilience strategies.
- b) Norms and social practices- Understand formal and informal norms influencing resilience behaviours and adaptation strategies.

South Africa has a heterogeneous and culturally rich population with 11 official languages with a broad mix of ethnicities and religions, with the predominant religion being Christianity (79.8%), mostly Protestantism. Histories of segregation (racial and spatial) notably under colonialism and apartheid shape the EMA's urban condition and its intersectional identities. eThekweni's population has been growing steadily over the past decade, driven by a combination of natural increase and in-migration from rural areas and neighbouring countries. The greatest population concentrations are in the central and north planning regions (IDP, 2015). The city's demographics are characterized by a youthful population. It is estimated that approximately 8 802 households are headed by children and young people between the ages of 15 and 19, and 42.14% of households are headed by women (COGTA, 2019).

The city is diverse in terms of its cultural norms and ways of life, as it is home to 73.8% black Africans, 16.7% Indians/Asians (the largest Indian diaspora outside India), 6.7% whites, and 2.5% coloureds and it reflects the intersection of modernity and tradition in its ways of life and identities, given the wide range of settlement types (26% informal settlements, 43% under traditional authority, mostly in peri-urban areas) and identities within them that make up the EMA. In traditional authority areas, customary tenure and the custodial rights of traditional leaders are recognised through joint administration between the metro authorities and the traditional authorities (COGTA, 2019; Sim et al., 2018).

Understandings and responses to climate variability and change are shaped by a number of interlinked biophysical, social, political, economic and locational factors. A recent study undertaken by the WASH R&D Centre, UKZN has shown the high level of

environmental awareness and valuing of the environment in the city (Sutherland and Odili, 2024). Social processes and cultural beliefs and interests are central considerations. Individuals and communities conceptualise and respond to environmental phenomena through diverse cultural frames of reference which are closely interlinked with livelihoods and traditions. Despite recent increasing attention to the role of culture in mediating understandings and responses to climate change the evidence base remains limited and there are gaps in understandings of the role of culture and belief systems in shaping perceptions and responses to climate impacts, and why this matters for resilience building initiatives.

For example, in the Durban context research has shown that there are widespread beliefs about the 'nkanyamba' (snake like supernatural being) having a considerable impact on flooding events, as well as a strong influence of beliefs in divine powers, regardless of religious affiliation, in shaping perceptions and responses to climate change, which shapes people's understandings and responses to flooding events, (e.g.Oelofse et al, 2002; Leck, 2018). The nkanyamba is a creature of storm and wind and the term refers not only to a climatic phenomenon (usually a tornado) but 'embodies the tornado spirit itself'. According to limited documentary sources, the nkanyamba is aquatic, living in deep water and is able to fly through the air, often in search of its mate, which may live in a deep pool or dam, or to relocate when it has babies (Wood, 2000,.Oelofse et al, 2002; Leck, 2018). Integrating different knowledge and cultural systems is thus critical to ensure the development and implementation of meaningful and locally appropriate climate resilient solutions that are sensitive and relevant to the local context and requires further consideration.

3.5 Network analysis

The implementation of the SECURE framework will enable the Durban team to collect data on and analyse the networks that inform the success of resilience interventions. This will be done at the city scale through the lens of informal settlements and the two case studies selected for the study: Quarry Road West informal settlement and Pholani.

- a) Resource exchange and Influence - Map networks of stakeholders involved in resilience planning, identifying patterns of resource exchange and influence.
- b) Conflict and alignments- Identify potential conflicts of interest among stakeholders and opportunities for alignment towards resilience goals.

As outlined in further detail in Section 3.3, the city has a range of policy, planning instruments and innovative programmes to create a more sustainable and resilient city. These include its progressive climate adaptation work, focused on community ecosystem based adaptation and transformative riverine management; its Climate

Change Strategy; and its Resilience Strategy. A messy and complex network of state and non-state actors underpin the implementation or lack thereof of these resilience initiatives.

The Local Government: Municipal Systems Act 32 of 2000, provides a framework and regulates the process of assigning powers and functions to local government (eThekweni Municipality), including developing and adopting systems and procedures to risk reduction and strengthening resilience. However, weak government capacities, and conventional forms of governance continue to fail, thereby undermining urban resilience. Nevertheless, actors which include the state, civic society, academia, citizens, do not remain passive, but are exploring alternative forms of governance that shape and reshape relations. This includes the nurturing of new urban governance arrangements, re-imagined state-citizen partnerships, by multi actors tailored for local solutions, suitable for context (Mitlin, 2023; Sutherland et al, forthcoming; Sutherland, 2019; Sutherland 2016). Actors recognize the benefits of establishing partnerships and networks of common interest by coming together to work and find solutions towards common objectives. Actors use participatory methods for discussion and negotiation; co-production processes for inclusion, learning, and experimentation, within formal and informal framings (Mitlin, 2023; Tarrow, 2005). The role of bridges or intermediaries have proved critical to transformative responses in the case of Durban.

This context analysis provides insights on the emergence of partnership-based networks of actors (state-citizen-civil society) in Durban, working within and between formal and informal processes in hybrid configurations, to shape and reshape governance for building resilient futures. These governance platforms contribute towards the inclusion of marginalised groups to participate in urban reform, subsequently advancing efforts towards sustainable development. To make this point, this context analysis will reflect on the case of Quarry Road informal settlement, where a number of diverse state and non-state actors are participating in a multi-stakeholder governance platform, instrumental in the design and implementation of projects that contribute towards urban resilience in the city. This will be compared to Pholani informal settlement which has its own localised networks to deal with flooding and climate resilience, but which are not connected into municipal governance systems in the city.

Governance is critical to disaster risk reduction as it determines which institutions (formal and informal) and actors have the power, legitimacy and resources to exercise agency, and ultimately shape the outcomes of climate adaptation. The inclusion of both state and non-state actors, who through the process of governing, steer disaster risk reduction practices, drawing on the norms and principles, legislation, policy and established and innovative practices within society, is essential in developing equitable

climate adaptation responses and disaster risk reduction strategies (Daly et al., 2017; Prakash et al., 2019). Governance of environmental risk in the global south is shifting from a top-down state centred approach that has been reactive and focused on disaster risk management, with limited involvement of citizens, to an approach which is more participatory, inclusive and proactive (Sutherland, 2020). This approach, which is transformative and participatory, draws on the knowledge and skills of multiple actors, including affected communities and academia, and focuses on risk reduction and equitable climate adaptation (Sutherland, 2020). Disaster risk reduction now focuses on structural relations and vulnerability using a political economy and political ecology lens, to understand the spatiality, social, economic, environmental and governance factors shaping the outcomes of a risk event (Sutherland, 2020; Culwick, 2019; Ziervogel et al., 2017; Pharoah, 2016).

Recent research being undertaken by the University of KwaZulu-Natal on Disaster Risk Reduction in the face of floods, in partnership with the planning unit of the Provincial Department of Co-operative Governance and Traditional Affairs, has revealed the complexity of, need for integration and the participatory governance processes required to influence policy and planning at both the provincial and local level.

Philanthropic organisations and global research institutions play a major role in shaping resilience programmes in the city, producing their own governmentalities which shape the outcomes of these programmes. Third stream funding plays a major role in shaping the climate adaptation and resilience agenda as this is where shadow networks develop, allowing the state to undertake creative and innovative work (Leck and Roberts, 2015).

In Durban, co-production is central to the city's Transformative Riverine Management Programme, its climate adaptation strategy (Durban Climate Change Strategy), its engineering field testing platform and its informal settlement upgrading programme, with UKZN playing a leading role in supporting these urban reform coalitions, through its intermediary role of bringing different knowledge producers together in innovative governance platforms. This strong co-production ethic has generated a proposal that addresses needs and aspirations of communities rather than external perceptions thereof.

South Africa will hold national elections on 29 May 2024 and the outcome of these will have a significant impact on the country's development over the next five years, particularly relating to governance and the role of politics in creating the possibility of a failed state. While posing potential risks, the political transition and opportunity for change is significant; this research has the potential to have increasing impact across

scales during this period of change and open up opportunities to influence the way in which current networks and power relations are articulated in the city.

Examples of where networks are active in supporting resilience are presented in the section on institutional dimensions with additional cases presented here. The CBFEWS which has been established through the Palmiet Catchment Rehabilitation Project (PCRP), and includes municipal officials, civil society organisations, community members and research institutions, has had significant benefits for the residents of the highly vulnerable Quarry Road West informal settlement. The flood early warning system, which triggered warnings in 10 April, 2022, the day before the floods, and which sent update warnings and information throughout the day and night of 11 April, 2022, and which was able to identify safe spaces for residents to move to when the settlement was devastated by the floods at 21h00 on 11 April, 2022, saved the lives of between 250 and 400 people. This project has reinforced the understanding that communities are always the first responders in disaster and hence empowerment at the local scale is essential. The CBFEWS continues to operate, with the intention of scaling it up across the city, where possible.

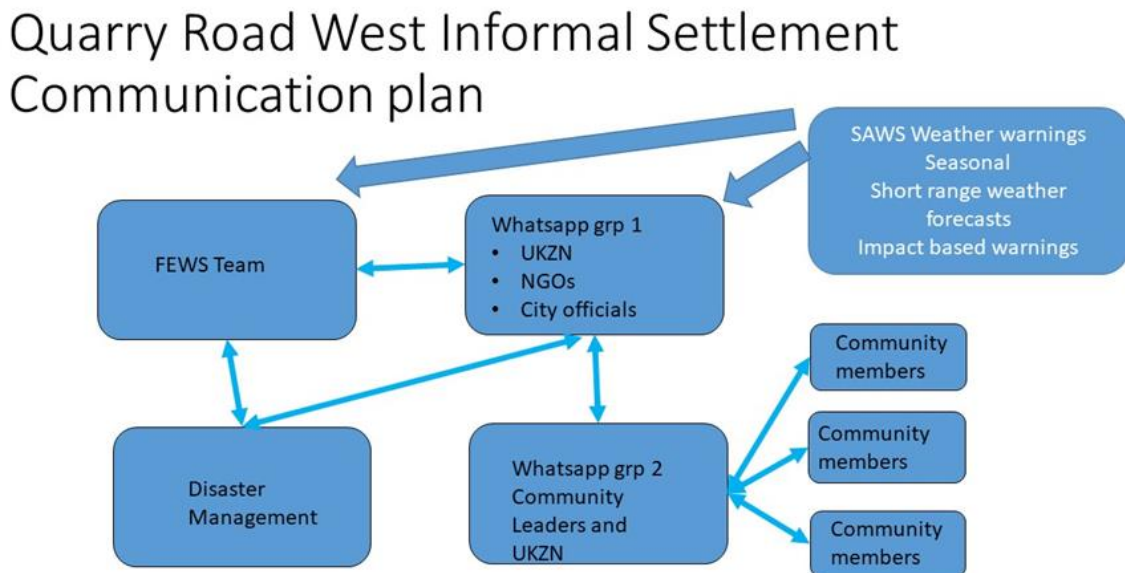


Figure 9 Communication Plan for CBFEWS in the Palmiet Catchment

The iQhaza Lethu Informal Settlement Upgrading Partnership, which built capacity and leadership within Project Preparation Trust and the Human Settlement Unit and the

Engineering Field Testing Platform at the WASH R&D Centre, UKZN, were approached by the Bill and Melinda Gates Foundation and the Water Research Commission who wanted to fund a project on flood resilient innovative sanitation systems. The upgrading partnership and the engineering field testing platform have joined forces (2022 – 2025) to implement three innovative, circular economy, back-end non-sewered sanitation systems to develop flood responsive sanitation systems for the city, which can be replicated elsewhere. The capacity built in the city around informal settlement upgrading and innovative sanitation systems has provided a platform for the development of inclusive flood resilient non-sewered sanitation systems in the city.

These examples, while not comprehensive, provide evidence of the disaster preparedness of the city and its commitment to building resilience in a way which is relevant to its context and its challenges. The Durban floods of 2022 were devastating floods, as will be described in the next section, and hence these mitigation and adaptation measures could not possibly address the impacts of 359 mm of rain, falling on a saturated city in 24 hours (Schulze, 2022). However, at the local and city scale, the benefits of the city's (state, citizens and the private sectors) efforts to date, whether in investing in ecological infrastructure, building social cohesion and partnerships and addressing informal settlement upgrading and service provision challenges show the city's commitment to disaster risk reduction. Waste management is a major problem in the city, with solid waste impacting significantly on the functioning of stormwater management systems (which is one of the main aims of the Sihlanzimvelo programme), however local waste management projects, litter booms and research undertaken by Green Corridors, in partnership with the University of KwaZulu-Natal and ETH Switzerland, as well as well implemented PEP projects (through Project Preparation Trust) are having an impact in this space.

3.6 Gender, inclusion and intersectionality

The impact of climate variability and change is not even nor equal, with intersectional factors including race, gender, class (poverty and inequality), geographical context and location, and political agency, determining the outcomes of a disaster. In the post colonial, post-apartheid eras of South Africa, a lack of significant social and economic transformation for the poorest of the poor has created spaces of extreme marginalisation, poverty and inequality (Leibrandt, et al., 2009). Informal settlements experience significant impacts from natural hazards, worsened by climate change and their exposure, context, vulnerability, and social and political marginalisation in disaster risk management policy and practice. Unanticipated climate change hazards undermine the hard earned development gains of South Africa in the post-colonial, post apartheid era, particularly in spaces of poverty, inequality and marginalisation. Disasters (both

acute and chronic) erode individual and household resources, and denies the realisation of human rights, reducing livelihood security and resilience (Culwick, 2019; Fraser et al., 2017; Pharoah, 2016; Williams et al., 2019). This further increases the vulnerability of both human and environmental systems as the relationship between society and the environment is locked into a dialectically negative set of relations (Sutherland et al., 2020). Reactive resilience measures in response to such disasters also divert resources from other city services (sanitation, healthcare, education) for immediate recovery, which has ripple effects for continuing consistent and reliable service delivery and development.

Gender inequality remains a critical risk driver increasing women's vulnerability to climate hazards and adverse events. Women's responses to extreme weather events and their ability to cope, is largely dependent on the robustness of pre-existing means and capacities informed by gender responsive policies and programs needed for resilience. Women in South Africa have an approximately 1-in-5 chance of experiencing gender violence in their lifetime (WEF, 2022).

Following floods and landslides in April 2019, a case study was conducted in eThekweni of the factors that shaped the vulnerability and adaptation experiences of black African women in informal settlements. That research demonstrated that various forms of discrimination and access (on the basis of gender, race, poverty) intersect to shape and compound vulnerability and resilience to climate hazards. Notably, the research included how gender blind hazard responses (such as non-segregated refuge centres) exposed women and girls to violence and assault, but also highlighted how women's internalised (or imposed) responsibility for their family's welfare prompted proactive adaptive strategies. The study also highlighted opportunities for translating women's experiential knowledge to future flood management interventions (Udo and Naidu, 2022).

During the latest floods, damaged, disrupted and overburdened health infrastructure limited women's ability to access sexual reproductive health services such as HIV/STI testing/screening, family planning, and pre- and antenatal services, as well as facilities and treatment following GBV (Chinyavanhu, 2022). Furthermore, to cope with the impacts of these floods on disrupting livelihoods, and the loss of housing and resources, the risk of harmful coping strategies for women and girls including sex work, and early or forced marriage (ukuthwala) was expected to increase (ibid). Damage to schools and community displacement are also expected to worsen trends of lost learning and school drop-outs, already heightened as a result of the recent COVID-19 pandemic (Chinyavanhu, 2022).

Through applying a strong GESI lens, the research focuses on avoiding discourses of victimisation and portraying women as inherently vulnerable. In the research context, young men have been identified as an increasingly vulnerable group, particularly in eThekweni. UKZN's experience working in these contexts has identified young men as being particularly vulnerable and unsupported after hazard events, partially due to being overlooked as a target demographic in response planning and provisioning, leaving them highly exposed to manipulation and exploitation by drug dealers, gangs and other criminal elements. After past hazard events, UKZN observed many young men developing substance abuse and dependency issues and engaging with criminality, contributing to safety and security concerns for themselves and their broader communities. This is an important additional research consideration.

Addressing gaps in knowledge:

This research contributes to gaps in knowledge identified by Sutherland (2020); Williams et al., (2019), Fraser et al., (2019) and Ziervogel et al., (2018) on the governance arrangements, actors and socio-technical-ecological interventions required to adapt to and reduce the impact of climate change in informal settlement settings which are complex, dynamic, and highly unequal, but which also offer opportunities for innovation, experimentation and transformation (Sutherland, 2020; Williams et al., 2019; Fraser et al., 2017). Van Niekerk (2015) argues that many African countries are leaders in community based disaster risk reduction and climate adaptation at the local scale due to the presence of strong and committed civil society actors and the inclusion of ecosystem based adaptation approaches in their response strategies (Martel et al, 2022; Roberts et al., 2012). However, using transdisciplinary research methods, we need to learn better, collectively, about how to integrate technical and scientific responses to climate change with community based adaptations and practices on the ground, through an intersectionality lens.

This research will also build upon a wide range of research that has been conducted in Durban. The 2021 analyses by Membele, Naidu, and Mutanga, "Integrating Indigenous Knowledge and Geographical Information System in mapping flood vulnerability in informal settlements in a South African context: a critical review" emphasised how the use of indigenous/local knowledge and geographical information systems in mapping flood vulnerability was highly fragmented, and that this produced shortfalls in understanding where floods could cause disaster. Despite institutional provisions (in national policy and regulation) for including indigenous knowledge in resilience planning, Membele, Naidu and Mutanga (2022) describe how utilisation of this knowledge and the inputs of communities is still low, and often nonexistent in urban areas. In contrast, Mazeka et al., (2019), "Community-based mapping methodology for climate change adaptation: A case study of Quarry Road West informal settlement,

Durban, South Africa”, in their research on community based risk mapping and knowledge production in the same settlement, have shown how the co-production of knowledge has supported the building of resilience to climate change and has highlighted the methodologies that can be used in supporting community based climate adaptation and risk reduction. Sutherland (2020) and Williams et al. (2018; 2019) have examined the approaches and governance platforms required to improve climate responsiveness in informal settlements and this research, will be used as a point of departure to develop further knowledge and interventions, while integrating with the policy developed and lessons learned in the iQhaza Lethu incremental upgrading of informal settlements partnership programme, which was implemented in Durban between 2016 and 2020, as well the innovation in water and sanitation provision that is being implemented by eThekweni Municipality and the WASH R&D Centre at UKZN (Sindall et al., 2021). It will also be aligned with Durban’s Climate Change Strategy and Resilient Cities Strategy (eThekweni Municipality, 2017), both of which have a focus on informal settlements.

Udo and Naidu (2022), Sutherland (2020) and Williams et al., (2018; 2019) emphasise how varying dimensions of vulnerability (i.e. where communities are situated, and social, racial and economic identities) should be taken into consideration when developing and implementing municipal planning. In order to shift paradigms from a focus on sector and infrastructural development and fortification, towards thematic (resilience) and population-oriented planning, a deeper understanding is required of the intersectional vulnerability of communities and how cities are best placed to respond to that sensitivity. This will ensure planning addresses both the vulnerability of the built environment (physical vulnerability) as well as social aspects.

REFERENCES

Dupont, V., Jordhus-Lier, D., Sutherland, C., Braathen, E. (2016) *The Politics of Slums in the Global South. Urban informality in Brazil, India, South Africa and Peru*, Routledge, London.

Hannan, S. and Sutherland, C. (2015) Mega-projects and sustainability in Durban, South Africa: Convergent or divergent agendas? -*Habitat International*, 45, 205-212.

Hordijk, C., Miranda, L., Sutherland, C. and Scott, D. (2015) Participatory Instruments and Practices in Urban Governance, In Gupta, J., Pfeffer, K., Verrest, H. and Ros-Tonen, M (eds) *Geographies of urban governance, Advanced theories, methods and practices*, Springer International, London.

Leck, H. (2017) The role of culture in climate adaptation: 'the nkanyamba caused that storm', *Third World Thematics: A TWQ Journal*, 2:2-3, 296-315, DOI: 10.1080/23802014.2017.1408424

Leck, H., Sutherland, C., Scott, D. and Oelofse, G. (2011) Social and Cultural Barriers to Climate Change Adaptation Implementation in SADC, in *Barriers to Climate Change Adaptation Implementation in SADC*, Institute for Global Dialogue, Johannesburg.

Martel, P. and Sutherland, C. (2019) in Cobbinah, P.B. and Addaney, M. (eds) *Governing River Rehabilitation for Climate Adaptation and Water Security in Durban, South Africa, The Geography of Climate Change Adaptation in Urban Africa*, Palgrave MacMillan.

Martel, P., Sutherland, C., Hannan, S., and Magwaza, F. (2022) River Rehabilitation Projects, and their associated ecological infrastructure, as a spatial expression of a more resilient and sustainable Durban, in Cobbinah, P. and Addaney, M. (eds) *Sustainable Urban Futures in Africa*, Routledge.

Martel, P., Sutherland, C. and Hannan, S. (2022) Governing river rehabilitation projects for transformative capacity development, *Water Policy*, 24 (5): 778–796.

Mazeka, B., Sutherland, C., Buthelezi, S. and Khumalo, D. (2019) Community-Based Mapping Methodology for Climate Change Adaptation: A Case Study of Quarry Road West Informal Settlement, Durban, South Africa, in Cobbinah, P.B. and Addaney, M. (eds) *The Geography of Climate Change Adaptation in Urban Africa*, Palgrave MacMillan.

Oelofse, C. (2002) "Dimensions of Urban Environmental Risk." In *Urban Vulnerability: Perspectives from Southern Africa*, Cape Town, edited by C. Nomdo and E. Coetzee, 28–52. Cape Town: Peri Peri Publications.

Roberts, D., Douwes, J., Sutherland, C. and Sim, V. (2020) Durban's 100 Resilient Cities journey: governing resilience from within, *Environment and Urbanisation*, 32(2), p 547-568.

Scott, D., Sutherland, C., Sim, V. and Robbins, G. (2015) Pro-growth challenges to sustainability in South Africa, in Hansen, A. and Wethal, U. (eds) *Emerging Economies and Challenges to Sustainability. Theories, strategies, local realities*. Routledge, London.

Sim, V., Sutherland, C., Buthelezi, S., and Khumalo, D. (2018) Possibilities for a hybrid approach to planning and governance at the interface of the administrative and traditional authority systems in Durban, *Urban Forum*, 29(4), 351-368.

Sim, V., Sutherland, C., and Scott, D. (2016) Pushing the boundaries - Urban Edge challenges in eThekweni Municipality, *South African Geographical Journal*, 98(1), 37-60.

Sutherland, C. (2020) Involving people in informal settlements in NHG based on South African experience, in *Oxford Research Encyclopedia of Natural Hazard Science*, Oxford University Press, Oxford.

Sutherland, C. and Mazeka, B. (2019) Ecosystem services in South Africa. In Knight, J. and Rogerson, C. (eds) *The Geography of South Africa, World Regional Geography Book Series*, Nature New York: Springer.

Sutherland, C., Hordijk, M., and Scott, D., (2016). Emerging practices of community adaptation within innovative water and climate change policies in Durban, South Africa, In Roy, M., Cawood, S., Hordijk, M., and Hulme, D., (eds.), *Urban Poverty and climate change. Life in the slums of Asia, Africa and Latin America*, Routledge, Oxon.

Sutherland, C., Roberts, D., and Douwes, J. (2019) Constructing resilience at three different scales: The 100 Resilient Cities programme, Durban's Resilience Journey and everyday resilience in the Palmiet Rehabilitation, *Human Geography*, 12(1), p 33-49.

Sutherland, C., Scott, D., Brooks, S. and Guy, H. (2011) Lay knowledge of Risk: Exploring the 'Riskscapes' of South Durban Communities, published proceedings of 'Risk and Africa – Conceptualised risk in the context of contemporary Africa International Symposium' 27-29 November, 2008, Bayreuth, Germany.

Sutherland, C., Scott, D., Nel, E., and Nel., A. (2018) Conceptualising 'the urban' through the lens of Durban, South Africa, *Urban Forum*, 29(4), 333-350.

Sutherland, C., Sim, V., and Scott, D. (2015) Contested discourses of a mixed-use megaproject: Cornubia, Durban, *Habitat International*, 45, 185-195.

Sutherland, C., Sim, V., Buthelezi, S., and Khumalo, D. (2016) Social constructions of environmental services in a rapidly densifying peri-urban area under dual governance in Durban, South Africa, *African Biodiversity and Conservation*, 46(2), 1-12.

Taylor, A., Cartwright, A., and Sutherland, C. (2014) *Institutional pathways for local climate adaptation: A comparison of three South African municipalities*, Focales, AFD, France.

Vogel, C., Scott, D., Culwick, C., and Sutherland, C. (2016) Environmental problem solving in South Africa: Harnessing creative imaginaries to address 'wicked' challenges and opportunities, *South African Geographical Journal*, 98(3), 515-530.

Williams, D., Manéz Costa, M., Sutherland, C., Cilliers, L. and Scheffran, J. (2019) Vulnerability of informal settlements in the context of rapid urbanization and climate change, *Environment and Urbanisation*, 31(1), 157-176.

Williams, D.S. Máñez Costa, M., Celliers, L. and Sutherland, C. (2018) Informal Settlements and Flooding: Identifying Strengths and Weaknesses in Local Governance for Water Management, *Water*, 10, 871.

Wood, F. "The Snake in the Sky: Tornadoes in Clay and Local Narrative in the Hogsback-Alice Area." *Critical Arts* 14 (2000): 79–95.

Appendix A

Explaining the dual governance system in Durban

The dual governance system characterising eThekweni, which is largely unique compared to other South African metros presents a number of complex governance challenges, particularly regarding land and urban management, service provision and the municipality's financial sustainability.

The constitutionally mandated authority of traditional governance systems has created both overlaps and disjuncture in the SA governance system, particularly at the local level (Goldman and Reynolds, 2008). The institution of traditional leadership is governed by national and provincial legislation, and functions alongside the democratic political system. Section 81 of the Municipal Structures Act makes provisions for traditional leaders to participate in formal proceedings of municipal councils. Furthermore, the White Paper on Traditional Leadership and Governance entrenches the key institutional role of traditional councils, in the fight against poverty and the promotion of good governance (DPLG, 2003). However, the roles and responsibilities between local government and traditional authorities remain ambiguous, thus leading to power disputes, tense relations and other complications. This dual system is typical of African contexts where customary land tenure regimes operate in parallel to democratic local government (Durban Resilience Strategy, 2017).

A largely rural service level is provided in these areas in terms of the Municipality's differentiated services model which is relatively uncontested by traditional leadership (Sutherland, et al, 2014' 100RC). However, tensions have emerged between traditional and municipal governance regarding customary land tenure practices (traditional land allocation and leases) where development is misaligned with municipal spatial plans and does not follow conventional land use planning control.

Traditional councils allocate land to individuals for residential and subsistence purposes through customary law, resulting in a customary land right although the state retains ownership (ITB, 2014). Traditional land allocations on IT land have risen significantly in recent years largely as a result reverse migration of lower and middle income households, leaving townships and central urban areas for IT land due to multiple perceived benefits such as gaining legal access to land for a minimal cost compared with the private property market (Sutherland et al, 2016). Households occupying IT land are also not required to pay municipal rates, have access to free basic services from the Municipality and are not required to comply with the time consuming and costly building

plan submission process. While these benefits and opportunities can support household resilience occupying land in IT areas also presents considerable risks such as lack of land use plans and building approvals, inadequate storm water management, occupation of marginal land, and growing inequality and class differentiation in some IT areas (Sutherland et al, 2016; Durban Resilience Strategy, 2017).

The rapid growth in these areas has created considerable servicing and other challenges in these areas which poses threats to the long term resilience of communities in these areas and the city more widely (100RC). A particularly notable issue that a significant proportion of around 50% of IT land of high biodiversity value and plays a vital role in providing environmental services to the entire city area. Traditional authorities have significant power over key natural and human resources as well as the direction of local development paths and livelihood opportunities (Beall, 2005). Therefore, it is essential for tensions between traditional and local governance authorities to be addressed and for traditional leaders to be meaningfully involved in shaping mitigation and adaptation agendas. As demand for land in these areas intensifies IT leaders are increasingly allocating marginal and environmentally sensitive land (e.g. floodplains, wetlands, steep slopes and the coastal zone) which increased risk from flooding and other events, particularly in the context of climate change (100 RC).

National planning legislation requires municipalities to prepare 'wall to wall' land use schemes by 2020 to support improved land use management in IT locations. Yet weak cooperative governance due to lack of trust, meaningful engagement and understanding between the Municipality and traditional leadership has resulted in delays to achieving this in the eThekweni context. Traditional leaders are concerned about upholding their customary powers under the scheme as well as the introduction of municipal rates payment requirements. The Municipality has legal entitlement to introduce rates on IT land for service provision and other investments in these areas. However, this is complicated by limited cadastral information, street addresses and information on land rights beneficiaries, and lack of clarity and agreement on fair property valuation in these areas. Innovative governance approaches are required to shift from the binary between traditional and city leadership to support the integration of governance across the municipal and traditional systems, that respects and incorporates indigenous knowledge and local context (Sim and Sutherland, 2017). Durban's Resilience Strategy (2017) outlines that ineffective integrated governance is the predominant underlying cause for resilience challenges and risks in IT areas in Durban. This also applies to informal settlement contexts.

It is estimated that the official housing backlog of informal settlements in Durban is 238 000 households, equating to just over 800 000, or one quarter of the city's population, live in informal settlements (eThekweni Municipality, 2017, Durban Resilience Strategy, 2017). There are over 587 informal settlements dispersed across the city, many located on peripheral steep land or flood plains, placing them at higher risk of erosion and flooding. Addressing the housing backlog is a major challenge, particularly given the lack of well located, serviced land areas with good access to public transport, as well as social and economic opportunities. In recognition that informal settlements are critical to providing housing to the urban poor and the extreme housing backlogs Durban has adopted a progressive and innovative approach to informal settlements; accepting them as part of the city's form, which has also shaped provincial and national government responses to informality and upgrading. In partnership with organisations (e.g. Project Preparation Trust, Shack/Slum Dwellers International) eThekweni has undertaken different levels of in situ informal settlement upgrading. For example, Municipality's Human Settlements Unit, with the support of Engineering Services has implemented the Incremental Services Programme, which provides community ablution blocks and electricity to informal settlements not targeted for relocation in the short term. However, many critical challenges remain.

[1] The Ingonyama is the King of the Zulu Nation