



The Centrality of Power and Networks in Co-producing Urban Resilience:

Piloting Proposed Decision Support Framework with emphasis on Gender,
Equity and Social Inclusion (GESI) in Durban, South Africa

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1. Introduction: Problem statement and intervention rationale

This project aims to show how a co-production intervention, informed by a context analysis as defined in the SECURE framework, which includes an emphasis on power relations, gender and social inclusion, builds knowledge and supports learning and governance processes to produce impact. The co-production of knowledge, as both method and practice, is increasingly being used, within a broader framework of transdisciplinary research, in complex contexts to move systems towards greater resilience and sustainability (Sutherland, 2020). Through applying the SECURE framework this project intervention contributes to building knowledge within bottom up and horizontal networks, integrating knowledge across municipal and research programmes, to build resilience and sustainability in vulnerable communities. This supports learning across vertical networks, thereby informing policy.

An overview of the components of the SECURE framework is provided in Figure 1 and forms the basis on which this report is structured.



Figure 1: An overview of the elements of the SECURE framework, intended to provide a structured way of using a detailed context analysis to inform the design of more impactful interventions.

In the case of Durban, South Africa, the focus of the co-production intervention, which is ongoing, given the applied nature of the research, is on supporting risk reduction and enhancing proactive and inclusive resilience building in informal settlements. This will be achieved through strengthening information and knowledge resources and flows regarding urban climate resilience and community-based flood early warning systems. The intervention is linked to the domain of '**Information, communication and awareness**' as described in the SECURE framework, with the intention of using knowledge to influence governance processes and power



relations. The primary intervention was to facilitate a learning exchange between two informal settlement communities: Quarry Road West (in central Durban within the Palmiet Catchment) and Pholani (La Mercy area on Durban's North Coast). The intervention aimed to be used as a mechanism to:

- Improve community and municipal knowledge on climate impacts and responses (climate adaptation) (*through structured learning exchanges and focus groups involving informal settlement communities, government officials and universities/research institutions*);
- Strengthen community-based research capacity and networks that can advocate for greater support to build climate resilience (*through training and deploying community-based researchers to collect, understand and use data in ways that can leverage change and through learning exchanges between two informal settlement communities*);
- Analyse and shift horizontal power relations within and between communities and other actor groups engaged in urban resilience (state and university) (*through structured engagements involving creative arts methods and conversations that provide opportunities for multiple perspectives to be heard and valued*);
- Analyse and shift vertical power relations between informal settlement communities, local government officials and universities/research institutions (UKZN and ICLEI) (*through focus groups designed to connect knowledge and experiences across informal settlements, government officials and universities/research institutions to strengthen climate resilience action*); and
- Explore how the learnings and knowledge from this process can help inform broader city-wide upscaling of community-based flood early warning systems related to climate change (*through drawing on the context of two informal settlements and sharing this with municipal officials*).

The intervention focused on improving how informal settlement communities are able to use knowledge and strengthened networks, across a governance platform which includes themselves, state officials and university researchers, to prepare for, respond to and recover from climate-related disasters such as floods. The intervention used participatory forms of research and experimental governance to challenge existing power relationships in ways that enhance inclusive climate resilience and climate adaptation. A gender responsive, equitable and social inclusion approach was adopted by integrating specific activities designed to reduce gender and intersectional inequalities in communities. This was done, for example, by focusing on developing the skills of women and vulnerable young men as co-researchers in community surveys, designing focus groups in ways that allow women's voices to be heard, and creating space for female leadership, and leadership by young men, during field visits and in the learning labs. These will be detailed further in the report.

The co-production intervention leveraged windows of opportunity presented by existing collaborative networks and alliances, including key city actors, university researchers, community members, NGOs and engineering and environmental consultants, and the work that is being led by these actors in the informal settlement space in Durban. This work includes the Palmiet Catchment Rehabilitation Project, the Transformative Riverine Management Programme (TRMP), the Clare INACCT Resilience flood preparedness project, Community-Based Forecast Early Warning Systems (CBFEWS) and the Bill and Melinda Gates Foundation's Initiative to Strengthen Disaster Preparedness and Resilience in eThekweni Municipality focussing on Innovative Sanitation Solutions. The horizontal and vertical relations between these actors are



reflected in Figure 2. The role of university researchers as intermediaries or bridges is evident, with the university having stronger influence in quadrants 1, 3 and 4. Quadrant 1 is where the policy and practice of the state is informed by knowledge processes, and where learning is scaled up to inform national and global policy, programmes, practice and knowledge. Quadrant 2 is where the policy and practice of the state is internally negotiated and established. Quadrant 3 reflects the domain of action and engagement on the ground through projects and interventions. Quadrant 4 holds the interaction between the two informal settlement communities, initiated by the university.

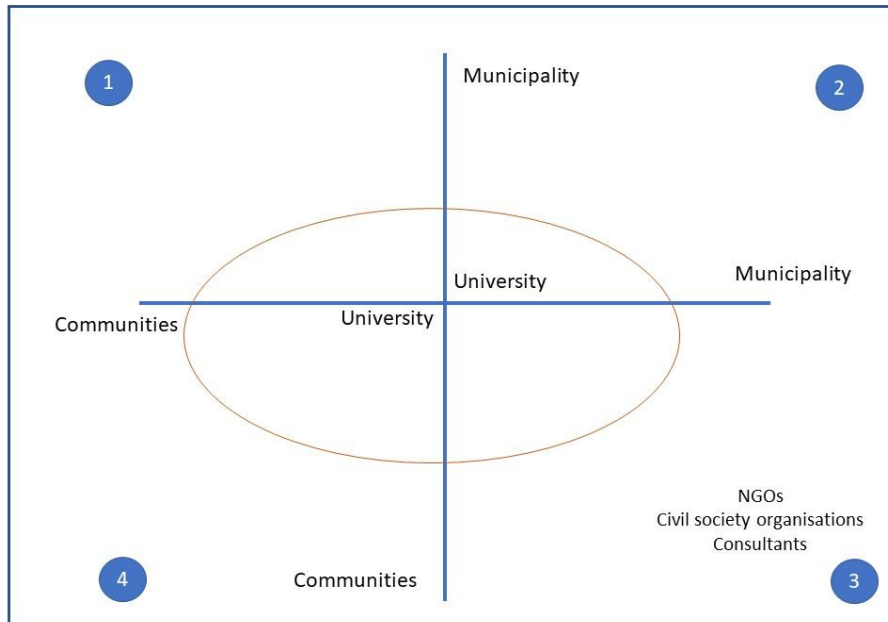


Figure 2: Horizontal and vertical relations between main actors in building urban resilience in Durban.

The intention of the current ARA project was to build from this existing base of experience, collaboration, governance and knowledge to expand and enhance interventions for greater impact through a critical political, gender, equity and inclusion lens. This work is already of significant interest within Durban because of: the growing recognition of the importance of planning for informal settlements within the urban resilience context; existing impactful projects undertaken that have built relationships between city officials, the University of KwaZulu-Natal (UKZN) and the Quarry Road West informal settlement; and the urgent need to strengthen resilience in the most vulnerable communities in a city context that is increasingly subjected to climate-related hazards like floods. In the Durban context, the SECURe framework therefore provides a heuristic to (1) organise existing local experience and knowledge of actors/dynamics in a comprehensive and accessible way and use this to (2) inform the design of further interventions that can expand and enhance the work that is already in place, building on a growing community of practice and increasingly detailed local understanding of the critical barriers and opportunities to resilience building in informal settlements.

Policy is informed through a combination of research, evidence, and input from various stakeholders, including experts, community members, and interest groups. Data and analysis provide a foundation for evidence-based policy-making, helping to identify key issues, potential impacts, and best practices. Once the evidence and input have been gathered, policymakers evaluate options, balancing competing interests, legal frameworks, and long-term goals to



establish a policy that addresses the identified need or challenge, which takes place in Quadrant 2 and 4. The SECURe framework has been used to shape an intervention in Durban, so as to improve and support knowledge flows and learning, and to understand and reconfigure power relations in the city across all quadrants represented in Figure 2.

As indicated, the intervention builds off a significant history of work and relationship-building, without which the intervention would not have been possible. The intervention of scaling up the CBFWS through community engagement was selected, as it had been identified by the actors in the established network as being critical to building resilience to flooding in the city. Since 2016, a CBFWS has been developed and refined in the Palmiet Catchment Rehabilitation Project, with positive outcomes in both localised and major floods and municipal and university actors wished to scale this up across the city. The specific informal community settlement learning exchange, followed by a facilitated engagement with local government officials has taken place within the lifespan of the ARA project (approximately 6 months). However, this is only the beginning of a longer-term process to strengthen cross-community and community-municipality relationships and enhance the Municipality's understanding of what might be needed to upscale initiatives like the CBFWS.

The following sections consolidate the outcomes of a detailed context analysis, and then describe how this analysis was used to inform the key domain, intervention design and implementation. The report concludes by reflecting on the usefulness of the SECURe framework in informing more effective urban climate resilience interventions.

2. Context analysis

The purpose of this section is to map and understand the historical and geographical context of, and the key actors involved in, the proposed intervention and the power relationships and flows of resources, including knowledge, that exist between them. The section also outlines the potential influence of the biophysical context, politics, culture, economy, institutions and gender in facilitating or blocking co-production. These analyses were used to identify collaboration opportunities and provide a rationale for the proposed intervention and its design. This work was completed in practice through our workshops as part of this project and through other research processes in which we are engaged. The project team has drawn on existing experience and related project outputs to consolidate the initial context analysis. Knowledge gaps have been addressed through surveys and focus groups, also building on linked projects. In the case of the latter, opportunities were used to add or refine questions that had specific relevance to the ARA project. Consolidated context insights were then used to inform the priority intervention.

As a cross-cutting approach, the project has further developed the skills of informal settlement community members as co-researchers and implementers of interventions. The importance of this approach will be developed further in the report, but was intended to help address some of the barriers to co-production (e.g. lack of trust in new/external actors) and create an incentive for participation. With regards to the latter, 'data exercises power'. Understanding the data information value chain, including the data collection process, helps communities to strengthen their ability to use such data as a critical resource to leverage change (Sutherland et al., 2019b; Heeks and Shekhar, 2019).



3.2 An overview of actors, power and resource relationships

Politics of all forms (e.g. vertical and horizontal politics, which includes politics between the state and citizens, politics between politicians and municipal officials, party politics, politics within and between communities, politics between the state, citizens and research institutions) strongly influence the way data and knowledge are understood and utilised, alongside other interconnected critical considerations such as gender and other social categorisation of intersectionality. Alongside local scale urban data, an improved understanding of the political economy and political ecology of the city is critical. Together, these shape the inequitable and unjust system of resource access and use and socio-ecological opportunity and failure in the city. By adopting a critical lens that focuses on actors, power and resource relationships, levers for change and intervention points for addressing these inequalities become more apparent.

National, provincial and local government in South Africa have considerable influence in policy and decision making regarding informal settlements. 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. They are also responsible for the provision of services. However, they have limited powers in terms of shifting toward the development of integrated human settlements due to their lack of control over budgets and finance. This is largely determined by national and provincial government for the provision of low cost housing. Institutional complexity presents challenges in terms of allocating responsibility and accountability across the three spheres of government (national, provincial and local government).

As outlined in the actor map below (Figure 3) community members, Area Based Committees and sub-ward committees, actors representing local government (Mayor, Councillors, Ward Development Committee) and local government officials, play a central role in resilience building interventions in informal settlements. Other influential actors include national government, civil society organisations and local networks, NGOs, NPOs 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 in resilience building. International and national funding partners play a central role too, although at a distance, as the local state and universities use this third-stream funding to support innovative governance processes and projects. They can have a direct influence, for example, through the way they frame problems and funding opportunities.



Table 1: A summary of the main actors and their roles, relationships and influence in relation to others.

Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
<p>Informal settlements</p>	<p>Informal settlements are part of the urban fabric, with a quarter of Durban’s population living within them, and with the municipality adopting a progressive approach that recognises that informal settlements are here to stay. They therefore require 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”. Within informal settlements, area based committees and development committees provide leadership at the settlement level, within broader ward committees led by ward councillors.</p>	<p>Local government: Generally, a lack of trust because of inadequate service delivery and limited opportunities to engage. Engagement is mostly through ward councillors. Political alliances shape the relationship between these two groups.</p> <p>Universities: Depends on praxis of universities and researchers, but can play a central role in producing knowledge and building relationships through action based research between actors, particularly in facilitating communities’ access to other actors like local government.</p> <p>NGOs: Similar to the relationship described for universities, but can have their own politics and agendas, which shape outcomes. NGOs focus on practical implementation. They may form part of broader networks of action which connect local communities to broader social movements.</p> <p>Neighbouring communities (formal and informal): Can be contested or supportive, as informal settlements are perceived to be ‘land invasions’ within formal neighbourhoods, which bring challenges related to their socio-economic and urban management conditions, but they also receive support from a moral and social justice perspective.</p>	<ul style="list-style-type: none"> • Strong coordination mechanisms facilitate social mobilisation (often close to elections) including protest action, which can produce some gains/concessions. • Mundane actions of informal settlement residents can re-shape their relationships with the state and with the interventions and planning efforts of the state. • The claims made by informal settlement residents for basic urban rights (e.g. related to service delivery) are undermined by their perceived illegitimacy. • Communities focus on power relations and know how to negotiate and shape power within different alliances. They mobilise and exercise power in different forms in different contexts. • Communities have the ability to leverage power for developmental gains. • In some settlements there is a willingness to ‘sit at the table’ with the municipality and discuss important issues. Communities are therefore increasingly being mobilised under cooperative governance arrangements, often facilitated by university researchers. • Informal settlement residents build relationships with NGOs and NPOs in some instances and their neighbours to demand responses from the state. • Technical knowledge on settlements which can inform planning needs further support as informal settlement residents cannot easily



Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
			negotiate as they lack critical technical knowledge on their settlement.
Academic institutions	<ul style="list-style-type: none"> • Boundary spanning, advocacy, provide funding and platforms for collaboration, communication, profiling and data generation and analysis. • Intermediaries help to build new governance platforms and relationships to adapt to climate change and reduce risk (Sutherland et al, 2019a; Sutherland et al., 2024). • Build the capacities of urban stakeholders and generate bottom-up knowledge to ensure that development decisions are informed by community priorities. • Connect knowledge, expertise and capacities from informal settlements to citywide actors and institutions. 	<p><i>Local government:</i> The relationship varies depending on the initiatives in place to facilitate linkages across the academic and practitioner spaces. This is usually at a departmental level (e.g. the Durban Research Action Partnership between UKZN and the Environmental Planning and Climate Protection Department of eThekweni Municipality)</p> <p><i>Academic institutions:</i> Build relationships across university departments within the academic institution, depending on knowledge required to address challenges (this is supported by the EPIC A programme at the University of KwaZulu-Natal), build relationships with other academic and research institutions both nationally and globally on urban resilience, use academic research institution partnerships to apply for funding and to share knowledge.</p> <p><i>Informal settlements:</i> Builds relationships and partnerships with informal settlement residents across the municipality using co-production methodologies and adopting an action (issues) based approach. Applied research influenced by broader research project proposals which have been influenced and shaped by needs of informal settlement residents.</p> <p><i>NPOs and consultants:</i> Work with NPOs and consultants on applied projects in the city, playing a key role in integrating knowledge for urban resilience.</p> <p><i>Civil society organisations and neighbouring communities:</i> Engage with other actor groups on</p>	<ul style="list-style-type: none"> • Potential to influence in different ways through their positionality which supports the integration of different forms of knowledge and ways of knowing e.g. as an intermediary or knowledge broker. Their access to funding also increases influence. • Hold a position of privilege and power because of university’s status, perceived neutrality, because of playing the role of an intermediary and because of historical advantage, such as the lead researcher being a white woman, which gives them the ability to exercise power and overcome barriers across many of the institutional opportunities and blockages that arise. • Professional position of researchers and their racial identity, gender, age and history, means that community members are more open to taking on new information regarding climate change, than information taken on from their peers. ‘Insiders’ and ‘outsiders’ therefore hold power in different ways. • Academic institutions can be challenged by other community groups, who question their more progressive approach, and who want to hold on to the status quo, while addressing risk and environmental challenges on their terms.



Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
		knowledge co-production through social assessment and innovative governance processes.	
Local Municipality (eThekweni)	<ul style="list-style-type: none"> • Service delivery, resource provision and allocation, coordination of disaster response, communication through FEWS; Drive local policy and development; Closest interface of government with people on the ground. • Different role and politics for municipal officials and politicians. • Role of ward councillors: Can control resources; often a lack of accountability and ineffective communication with informal settlement communities. 	<p><i>Informal settlements:</i> The rights of informal settlements are recognised in the city, underpinned by an informal settlement upgrading policy, particularly relevant to established informal settlements. The municipality has a progressive approach to informal settlements with some officials supporting the upgrading of informal settlements, recognising that they are part of the fabric of the city, while others continue to frame informal settlements as a problem to be eradicated from the city.</p> <p><i>Academic institutions:</i> Durban is unusual in relation to the porous boundaries that exist between municipal departments and the university. This enables experimental governance, the building of partnerships and governance platforms and the sharing of knowledge and capabilities.</p> <p><i>Civil society groups, NPOs:</i> The municipality engages with civil society groups and NPOs through its innovative and inclusive partnerships for sustainability. It usually engages in forums that include the actors that form part of this intervention, with intermediaries playing a critical bridging role and in supporting the building of social cohesion.</p>	<p>Municipality determines policy and decision-making on resource distribution. The Municipality controls the main resources and institutions that shape urban development and action within the domain of action. These include land use planning, development control, environmental management and service delivery. However, budgets and planning for housing are controlled at a national and provincial level.</p> <p>Government red-tape and bureaucracy can be a limiting factor in scaling collaborative interventions and translating ideas into implementation.</p> <p>Municipalities have recognised that while South Africa is a developmental state, with power and resources vested in the state, it cannot address the significant challenges it faces in the city, particularly in the face of climate change, alone. It exercises power but it also recognises, in certain sections of the municipality that it needs to share power and support and capacitate others, when their power and capabilities can have more impact.</p>
NGOs/ CBOs	<ul style="list-style-type: none"> • Supporting advocacy, research and action by coordinated groups. 	<p>In the research contexts, NGOs are typically not as active in comparison to other South African cities such as Cape Town. Other organisations</p>	<p>Power dynamics and influence between NGOs and informal settlement communities in Durban are shaped by the exchange of</p>



Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
	<ul style="list-style-type: none"> • 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 gender empowerment • Promote more collaborative and participatory solutions for improving living conditions in informal settlements. • In some cases, NGOs/CBOs/NPOs are being appointed for government contracts and are becoming more like an extension of the state. • NGOs can serve as intermediaries, bridging the gap between local efforts and governmental aid. 	<p>such as NPOs and consulting firms play an increasingly prominent role in the city. However, in Pholani informal settlement NGOs have been strongly emphasised as key stakeholders providing support in times of crises, particularly ‘Gift of the Givers’ a well-known NGO. Slum Dwellers International also has a presence in some informal settlements, as does Abahlali baseMjondolo. International donors work through NGOs and NPOs on development projects in informal settlements.</p> <p>The relationships between Informal settlement communities and NGOs are generally characterised by collaboration, support, and advocacy. NGOs play a crucial role in addressing the needs of these communities, which often face challenges such as inadequate housing, poor access to basic services, and limited economic opportunities and are predominantly intervention/practical orientated.</p> <p>NGOs typically provide various forms of assistance, including: support for improving housing and infrastructure development; health and social services; advocacy and legal support; economic empowerment: (e.g. through skills training); and community engagement and capacity building. However, in Quarry Road West and Pholani, much of the support has been in the form of post disaster relief efforts such as providing food and supplies in the aftermath.</p>	<p>knowledge and resources. NGOs often hold significant power due to their access to financial resources, expertise, and global networks. They can leverage these assets to influence development projects, policy decisions, and community priorities. However, the power dynamics are not one-sided. Informal settlement communities, while often marginalized, possess local knowledge, cultural understanding, and social networks that are crucial for the success of any intervention. Communities exercise influence by selectively sharing this knowledge or by mobilizing collective action to advocate for their needs and priorities.</p> <p>The exchange of knowledge and resources becomes a key mechanism through which power is negotiated. NGOs provide technical and financial support, while communities contribute their insights and local expertise. The relationship between NGOs and these communities can be cooperative but is often complex. When NGOs recognize and respect the knowledge and agency of the communities, the power dynamic can be more balanced, leading to more sustainable and community-driven outcomes. Conversely, when NGOs impose their agendas without meaningful community involvement, it can lead to tensions, mistrust, and the failure of initiatives.</p> <p>In Durban's informal settlements, the effectiveness of power is influenced by</p>



Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
		<p>The relationship is generally positive, but challenges exist, such as dependency on external aid, potential misalignment of priorities between NGOs and communities, and the complexity of navigating government policies. Nonetheless, NGOs remain significant actors in supporting the resilience and development of informal settlements in Durban, often in immediate post disaster contexts in the form of relief aid.</p> <p>Abahlahli base Mjondolo, which is a nationwide social movement for informal settlements, is an important actor in Durban, where it originated. It is not active in all communities across the city, and it has challenging political relations with what was the ruling party and other political parties. It provides a counter-discourse and it shapes power relations around informality in the city.</p>	<p>historical inequalities, socio-economic conditions, and the broader political environment. Power is constantly shifting, reflecting the evolving relationships between NGOs, the state, and community actors.</p>
<p>Neighbours surrounding/nearby the settlement</p>	<p>In times of crisis such as flooding, surrounding neighbours play a crucial role in supporting informal settlement communities. Their involvement is often informal but highly significant due to the gaps in formal disaster response systems. Neighbours are often the first responders, providing immediate relief in the form of shelter, food, and clothing. The role of neighbours was highlighted as particularly significant in the Pholani informal settlement community.</p>	<p><i>Local government:</i> While local governments may provide official relief, informal settlements are frequently overlooked or underserved. Neighbours in surrounding areas may work with or around government efforts, providing what they can in a more flexible, grassroots manner. However, they often lack the formal recognition or resources to create large-scale impact.</p> <p><i>NGOs/CBOs:</i> In some cases, neighbours work alongside or coordinate with NGOs or CBOs, which may provide supplies, logistics, or expertise.</p>	<p>Resource Sharing: In some cases, neighbours share resources like water and transportation. They may pool together to address immediate needs, including temporary housing or repairing damaged structures. These aspects were strongly emphasised in Pholani, as well as the fact that many community members are employed by these neighbours as domestic workers or provide gardening services.</p> <p>Neighbours and informal settlement community members can also empower one</p>



Actor group	Role in informal settlements	Relationship with other actors	Power dynamics and influence <i>(with a focus on the exchange of knowledge and resources)</i>
		<p><i>Private Sector and Religious Groups:</i> Local businesses or religious institutions sometimes contribute by donating goods or providing services (e.g., temporary shelter or food). Neighbours may direct these donations to those most in need or collaborate to distribute them effectively.</p> <p><i>Communication and Media:</i> Local neighbours may also support in creating awareness and alerting communities about flood warnings. They may serve as a link to media, helping to raise awareness of the crisis and advocate for more formal assistance from both the government and international organisations.</p>	<p>another through collective action. Organising around crisis relief can reinforce solidarity, giving informal communities a louder voice in advocating for long-term infrastructural changes or government attention.</p> <p>There is also a risk of creating dependency when neighbouring communities provide short-term relief. Without systemic change or formal support from authorities, reliance on surrounding neighbours during crises may persist and such communities may continue to be overlooked by government assistance.</p> <p>In some communities neighbourhood security groups play a role in disaster response, but they also come with their own challenges as they securitise responses and can use their efforts to control and dominate responses within communities. They can also be hidden and only appear at times of crisis, often by passing legal and state led policy and practice. This was evident in the social unrest in Durban in 2021.</p>



3.2 Dynamics that impact decision-making, knowledge-sharing and co-production.

This section reflects on the dynamics that shape decision making and knowledge co-production. The analysis shows how relationships are built both horizontally and vertically to move knowledge across different spaces of decision making to effect change. Within each quadrant where engagement and knowledge production are taking place (See Figure 2 and 4) power relations are evident and processes which build collaboration and enable knowledge to be shared and co-produced are supported. In order for urban resilience to be built, knowledge needs to flow across all four quadrants, working across horizontal and vertical relationships. As is evident in Figure 4, transformation takes place when knowledge flows move across vertical scales and within horizontal collaborative partnerships. What is interesting and of importance is that the same set of main actors are present both vertically and horizontally with the additional actors, who may facilitate or broker knowledge exchange and power sharing, being located in the domain of action (quadrant 3), but also appearing in other spaces of engagement.

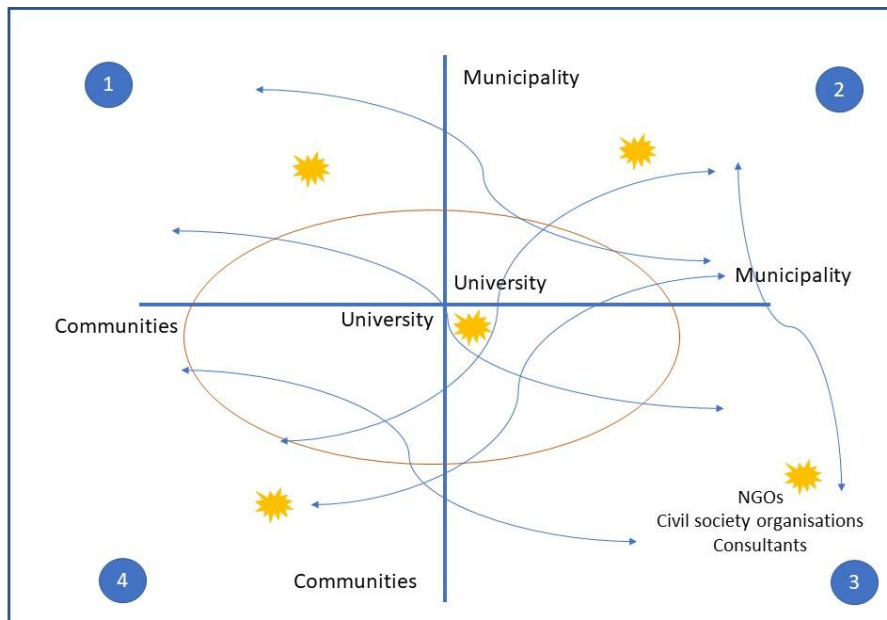


Figure 4: Knowledge flows across both horizontal and vertical spaces

The study has tried to understand and analyse how horizontal relations have been fostered and what barriers and knowledge and power deficits have been addressed. It has explored using arts-based methodologies, how these barriers have been overcome and has examined why these methods have been successful. The building of horizontal relationships in innovative governance partnerships has translated into vertical influence, or the crossing of what usually is a barrier or threshold to local knowledge and experience. This has been possible because of the power sharing and the role of intermediaries in translating knowledge and being opportunistic as a result of the relationships and trust they are able to build and sustain. Positive outcomes in horizontal governance forums also lead to vertical influence. This is evident in Durban where knowledge co-produced on the ground has informed policy and practice (see Sutherland et al., 2024). There has been a level of emergent and sustained self-organisation across the network of



actors, which has led to the building of knowledge over time, which in turn has supported evidence-based policy making. This reflects the process of radical incrementalism, with its ‘little victories in the face of big defeats’, which is supported by scholars working on urban resilience in the African context.

Annexure 2 and Annexure 3 contain the analysis that was undertaken separately to describe the enablers, barriers and incentives to co-production. Table 2 consolidates this analysis to provide an overview of the dynamics that could impact decision-making, knowledge-sharing and co-production. Political relations, gender dynamics, patriarchal norms, culture and beliefs, politics and clientelism play a key role in shaping power relations and networks underpinning urban resilience efforts. These issues have been discussed during workshops with the IIED team, as well as during the recent design workshop from which the team is drawing for baseline understandings. A brief commentary on the inequality, gender and biophysical contexts is included below, before these are consolidated in Table 2, along with other social and cultural norms.

The inequality of climate impacts

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 era 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). Disasters (both acute and chronic) erode individual and household resources, and deny the realisation of human rights, reducing livelihood security and resilience (Culwick, 2019; Fraser et al., 2017; Pharoah, 2016; Williams et al., 2019).

Gender

Gender inequality remains a critical risk driver increasing vulnerability to climate hazards and adverse events in the South African context. The response of those marginalised by unequal gender relations, most notably women and girls, and young men, to extreme weather events and their ability to cope, is largely dependent on the robustness of pre-existing means and capacities and the existence of gender responsive policies and programs needed for resilience. In the aftermath of the 2019 and 2022 floods in Durban, there was evidence of gender-blind hazard responses (such as non-segregated refuge centres and the lack of trauma counselling for men, who had tried to provide support to their families using social norms which defined their masculinity), which exacerbated vulnerability. The floods had a significant impact on access to sexual reproductive health services (Chinyavanhu, 2022). The vulnerability of particular groups within socially constructed gender relations was evident post the floods. This, in combination with other intersectional factors produced risk and vulnerability which re-produced inequality.

Regarding impact on collaboration and information exchange, gender relations can shape access to information and resources and therefore result in the most vulnerable groups having less access to decision-making power. As an example, few women are elected as local councillors to influence decision making. However, gender is not always a barrier, with many women from Quarry Road West informal settlement indicating during project engagements, that gendered norms do not impact on them participating in, and influencing, decision-making. This



may be as a result of the long and well established relationship between the research team and the community in Quarry Road which has opened up the space for participation by a diverse range of actors. Rather, they highlighted issues such as age and availability to participate in engagements as key deciding factors. Gender roles may limit women's participation in public decision-making spaces due to caregiving and other responsibilities. However, in Pholani, gender was recognised as a key influential factor with women highlighting their preference to participate in separate focus groups to men in order for their voices to be adequately heard. Strong women leaders are present in Quarry Road West informal settlement which requires further comparative analysis with Pholani.

In Quarry Road West informal settlement, women have emerged as powerful leaders in addressing climate change, utilising their unique positionality and lived experiences to drive community-centred solutions. Women, often at the intersection of multiple marginalities—such as race, class, and gender—have leveraged their roles as caregivers, organizers, and community advocates to work together and begin to challenge environmental injustices. Despite facing systemic barriers, they have spearheaded initiatives such as flood early warning systems, informal settlement upgrading, improved water and sanitation systems, waste management programs, and disaster preparedness efforts in collaborating with universities and other actors, demonstrating resilience and agency in the face of climate crises. Young men are highly vulnerable in informal settlements, as they are caught up in crises of masculinity, violence and substance abuse as a result of structural and socially constructed norms and responsibilities. They struggle to cope as a result of a lack of support or recognition of how vulnerable they become and how disempowered they feel through their own masculinity and societal expectations of them, in times of crisis (Zwieg, 2022).

Biophysical context

The following aspects of the biophysical context are important to consider when planning the co-production interventions:

- *Common disaster events provide an opportunity for mobilisation:* 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, particularly through cut-off low systems, and are likely to increase in the future (Pinto et al., 2022). 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. Frequent flooding affects multiple communities and requires local government responses. This presents an opportunity for mobilisation,



coordination and co-production. Climate stresses and extremes have shaped institutional arrangements and interventions, including planning and co-production of services to better cope and adapt to a changing environment.

- *Common biophysical context issues could facilitate collaboration across vulnerable communities:* For example, soft soils, steep slopes and/or proximity to rivers, provide a starting point for sharing and collaboration across vulnerable communities affected by similar issues. Pholani is located on a steep slope with unconsolidated soils, while Quarry Road is located on a flood plain comprised of unconsolidated river sand, particularly on its northern side. Despite these differences, both settlements are highly vulnerable to flooding with considerable scope for co-learning on resilience strategies.
- *An ecosystem services approach to adaptation can reduce risk and enhance resilience:* 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., 2019a; Roberts et al, 2012). 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). 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 (TRMP), its Climate Strategy, and Resilience Strategy. In particular, the TRMP and CEBA provide critical windows of opportunity to leverage the impact of the project co-production intervention.



Table 2: A summary of the factors that impact the nature and effectiveness of co-production interventions. The table has been split into two consecutive parts – the first captures informal settlement-related information, and the second contains information related to the other key actor groups.

Actor group	Influence of social/cultural norms (on co-production)	Influence of biophysical environment (on co-production)	Incentives for collaboration	Barriers	Enablers
Informal settlements	<p><i>Historical marginalisation of certain groups</i> has created ongoing mistrust and antagonism.</p> <p><i>Gender inequality:</i> Young men are often overlooked in disaster preparedness and response (leads to social challenges); Gender inequality remains a critical risk driver increasing women’s vulnerability to climate hazards and adverse events. In some cases, women participate less in public decision-making spaces (e.g. because of caregiving responsibilities or patriarchal dynamics) and this can affect their access to information and resources, but this is not always the case; Gender-blind hazard responses exacerbate risk and vulnerability; Gender violence is usually exacerbated in the aftermath of disasters. These factors create complex dynamics in communities, which can affect if/how co-production happens. Gender wage gaps, employment segregation, and traditional gender roles limit women’s economic opportunities and resources to adapt to climate events. Unequal gender relations result in marginalized groups having less access to resources such as land, financial credit, and technology, which are crucial for building climate resilience.</p> <p><i>Gender roles</i> can limit opportunities to participate.</p> <p><i>Leadership roles:</i> Some communities have strong leaders who influence the participation of communities but who can also be gate-keepers. In some communities, more nuanced tensions need to be understood (e.g. between young and older people, related to influence and job opportunities)</p> <p><i>Cultural practices and indigenous knowledge systems:</i> Shared cultural and religious beliefs shape understanding and response to climate change, e.g. The river snake (Inkanyamba) which can cause intense storms, amongst other powers, and beating of drums and pots to chase away the rain could influence receptiveness/ participation and trust in more ‘scientific’ knowledge.</p>	<p><i>Vulnerability of informal settlements:</i> e.g. proximity to rivers, steep slopes etc</p> <p><i>Common biophysical context issues could facilitate collaboration:</i> e.g. loose soils in two informal settlements provides a common point for interaction.</p> <p><i>Loss of natural environment:</i> Recognition that the loss of nature makes the impacts of climate change worse – nature ‘fights back’.</p>	<p>Improved access to networks (and possibly resources); Improved access to information and knowledge that could enhance resilience e.g. to floods; Opportunity for hope, empowerment, knowledge sharing and ‘having a voice’.</p>	<p>Lack of trust in eThekweni Municipality; Unequal access to information (e.g. on disasters); Perceptions that NGOs and universities can be ‘extractive’ in the way they partner; Raised expectations (from any of the above actors) can exacerbate tensions if there is inadequate delivery on these; Tensions between actor groups within established forums which undermines</p>	<p>Existing governance platforms in some communities, related to projects (e.g. Palmiet River Catchment Project); Existing intermediaries in some communities, which has helped build trust.</p>



Actor group	Influence of social/cultural norms (on co-production)	Influence of biophysical environment (on co-production)	Incentives for collaboration	Barriers	Enablers
	<p>Indigenous and local knowledge systems, are therefore critical in developing meaningful climate resilient solutions.</p> <p><i>Valuing environmental awareness:</i> Sutherland and Odili (2024) comment on high levels of environmental awareness in most communities, which could increase their interest in participating in related projects/processes.</p> <p><i>Party politics:</i> Strong alliances have an impact on communication and willingness to work together. This can mean certain projects/ interventions are not accepted (depends on which party is supporting the initiative). For communities, party politics can distract from the achievement of developmental goals. It also affects who gets hired for work.</p>			collaborative work.	

Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
Academic institutions	<p>Framing of problems and approach to solutions has been co-produced but this is not always the case with all relationships with academic partners. Strong gender balance in academic team has supported gender integration and gender equity, power and privilege needs to be acknowledged in how it shapes the outcomes of the partnership between universities and communities.</p>	<p>Biophysical context has shaped academic response due to adoption of a transdisciplinary and interdisciplinary research approach adopted in recognition of the complex biophysical environment and the need to address such an approach in order to support resilience building. Strong recognition that both built and ecological infrastructure is critical to</p>	<p>Support for transdisciplinary research, integration of different forms of knowledge which leads to more sustainable outcomes, production of civic science and co-production of knowledge for dissemination, along with practical interventions.</p>	<p>Academics document knowledge but do not in all cases recognise community ownership of knowledge – this requires trust relationships to be built over time and these are not present in many informal settlement communities. Research can be extractive. Commitment to longer term research processes is critical to impact and justice. Time, as academic institutions are busy environments and consultants or NPOs are time bound in terms of resources,</p>	<p>Potential role to play as intermediaries who can use academic positionality and in some cases privilege, which needs to be used in wise and respectful ways, to broker relationships between other actors. There is a growing interest (and funding support) for research focused on building climate resilience in vulnerable communities and this presents opportunities for collaboration.</p>



Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
		support development and urban climate resilience.		and yet these processes require time and ongoing to commitment to going back, sharing and listening.	
Local Municipality	Negative perceptions of informality, but also proactive approaches included in the city's 'Resilience Strategy', iQhaza Lethu programme and plans for incremental upgrading of informal settlements; frustrations of some officials required to support the delivery of interim services to informal settlements in areas that are subject to hazards, where infrastructure will be lost.	<i>'Common' disaster events:</i> Frequent flooding affects multiple communities and requires local government responses. This presents an opportunity for mobilisation, coordination and co-production. <i>Local ecosystem services approach to climate adaptation:</i> The city has a strong focus on ecosystem-based adaptation as a lever for intervention. There is existing work and governance platforms that can support this.	Improve resilience in vulnerable communities which are usually hardest hit; Saving lives; The rights of informal settlements are recognised in the city and therefore mechanisms need to be found to support this; Protect infrastructure e.g. roads and bridges if resilience can be enhanced.	Policy and legislative requirements that do not always 'match' the informal context (limits on innovation); Red tape and bureaucracy limit scaling; Conflicting priorities, ineffective communication, lack of trust; Ward councillors can also play facilitation or blocking role in terms of access, communication etc; Ineffective communication with informal settlements; Institutional resistance to change	Existing platforms that can help facilitate connections and collaborations with informal settlements and tertiary institutions (e.g. D'RAP, TRMP). Similar projects and platforms have increased sensitivity towards informal settlements. Policies/ strategies e.g. Resilience Strategy, upgrading plans; Progressive state officials engage in actor and partner networks providing technical support; Municipality has a set of principles for all riverine interventions to ensure gender and inclusion-centred design; Willingness of some officials to collaborate, even if resources are not available.
NGOs/ CBOs	Division of labour and unequal access to resources can influence how gender roles determine who participates in NGO-led resilience initiatives, as women might have less time	<i>Institutional Capacity:</i> The capacity of local governments and other institutions to manage the biophysical environment also affects how NGOs	Material and non-material benefits and support for ongoing work and influence.	Lack of trust and unmet expectations; Duplication of efforts; Lack of detailed understanding of community dynamics, localised politics and power relations;	Critical role in supporting multiple needs in communities; Potential role as intermediaries between diverse actors; Potential for driving actual change on the ground and



Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
	<p>or be less prioritized in public decision-making processes.</p> <p>Participation and Voice: Cultural norms can affect who speaks and who is heard in community meetings or NGO forums. In patriarchal societies, women's voices might be marginalized, affecting the inclusivity and effectiveness of resilience strategies.</p> <p>Trust and Legitimacy: The success of NGO initiatives often depends on their perceived legitimacy within the community. Cultural norms can influence whether an NGO is seen as a legitimate partner. For instance, NGOs that do not respect local customs or that challenge traditional gender roles might face resistance.</p>	<p>can collaborate on interventions.</p> <p><i>Local NGOs can support mobilisation of funds and additional support</i> for existing initiatives such as local ecosystem services approaches to climate adaptation and existing governance platforms.</p> <p><i>Local environmental regulations and land use policies</i> can influence what types of interventions are feasible or permitted. NGOs need to work within these frameworks to ensure compliance and sustainability.</p>		<p>Inappropriate communication channels.</p>	<p>attracting much needed funding;</p> <p>Community members have detailed traditional knowledge about how to live in and adapt to their environment. Critical to incorporate this knowledge in co-production processes to ensure that interventions are culturally appropriate and effective.</p>
<p>Community members</p>	<p><i>Gender inequality and embedded gender roles:</i> Often implicit/ unspoken conflicts, power struggles and unequal impacts.</p> <p><i>Cultural norms and dynamics:</i> Dynamics and</p>	<p>Geographic and topographic features: Quarry Road is located in a flood plain and Pholani is on a steep slope. This increases vulnerability to flooding, which can</p>	<p><i>Access to Resources and Services:</i> Collaboration with diverse state and non-state actors can improve access to essential resources and services, including</p>	<p><i>Mistrust and Power Imbalances:</i> Communities may not trust external actors, especially if there is a history of broken promises or perceived exploitation. Power imbalances between communities and</p>	<p>Immediate and long-term material and non-material incentives (e.g. monetary benefits, knowledge exchange, education).</p>



Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
	<p>tensions can exist between young and old and those perceived as rural and urban, and national and foreigner, as community member or ‘para’¹.</p> <p><i>Self-enrichment vs communal benefits:</i> Different perspectives on this can create tensions.</p>	<p>undermine infrastructure projects and require tailored interventions like flood defences or improved drainage systems and also creates difficulties in access.</p>	<p>healthcare, education, housing, and infrastructure and can improve living conditions</p> <p><i>Economic Opportunities:</i> Collaboration with actors like the municipality, national government through public works programmes, NGOs and private companies can bring economic opportunities through job creation, skills training, and support for local businesses, helping residents to improve their livelihoods.</p> <p><i>Advocacy and Representation:</i> Working with external stakeholders can amplify the voices of informal settlement communities and shift dominant discourses, helping them to advocate for their rights and needs in broader public and policy discussions.</p>	<p>larger organizations can lead to feelings of marginalisation or a lack of true influence in decision-making processes.</p> <p><i>Misalignment of Goals:</i> The priorities of external stakeholders may not always align with the community’s needs or desires. For example, another actor might prioritize environmental sustainability, while the community is more focused on immediate economic survival.</p> <p><i>Cultural and Communication Gaps:</i> Differences in language, cultural norms, and communication styles can create misunderstandings or hinder effective collaboration. External actors may not fully understand the social dynamics or unique challenges faced by the community.</p> <p><i>Bureaucratic and Legal Challenges:</i> Engaging with government or formal institutions often involves navigating complex and slow bureaucratic processes and legislative barriers to innovation</p>	<p>Local Knowledge and Practices: Residents often have deep knowledge of their environment, which can be invaluable in designing effective interventions. Co-production processes should leverage this knowledge to develop context-specific solutions.</p> <p>Mutual trust, shared objectives, and a commitment to respecting and empowering the community.</p>

¹ A local term with negative connotations, used to describe foreign nationals.



Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
			<p><i>Capacity Building:</i> Collaborations often involve training and capacity-building initiatives, empowering community members with the skills and knowledge to manage projects, engage in decision-making, and sustain improvements independently.</p>	<p>or localised, context specific solutions thereby leading to frustrations.</p>	
<p>Neighbouring communities</p>	<p>Networks based on place, family, ethnicity, or religion can be powerful enablers of mutual aid.</p>	<p>Flooding in informal settlements could also affect surrounding areas by worsening drainage systems, clogging water channels, or creating further infrastructural damage. Helping informal settlements mitigate these impacts could prevent long-term damage to their own properties.</p>	<p>Neighbouring residents may feel a moral duty to help those in need, especially if they have personal connections or shared histories with the people in informal settlements. This sense of solidarity can strengthen community bonds across different locations. When community members provide services such as cleaning and gardening through employment there is a level of reciprocity and returning support. Helping maintain the stability of</p>	<p>Limited resources and capacity in comparison to formal institutions such as local government. Neighbours may face their own resource and infrastructure challenges.</p> <p>In the absence of sufficient formal or informal organisations to coordinate relief efforts and provide an organised framework to assist, there may be difficulties in providing structured, effective support.</p>	<p><i>Communities with strong social connections</i> and existing relationships across settlement lines are more likely to help each other during crises. Networks based on place, family, ethnicity, or religion can be powerful enablers of mutual aid.</p> <p><i>Religious or Cultural Groups:</i> Churches, mosques, or other cultural organisations can facilitate coordinated support efforts. These groups often have existing structures that support pooling of resources and mobilising support during emergencies. Where local businesses, governmental entities, and civic</p>



Actor group	Influence of gender and social/cultural norms on co-production	Influence of biophysical environment on co-production	Incentives for collaboration	Barriers	Enablers
			informal settlements can protect these economic ties.		<p>organizations collaborate, they can amplify efforts to support informal settlement residents, providing resources that might otherwise be inaccessible.</p> <p><i>Social Media Platforms:</i> Online platforms can help raise awareness and crowdsource support from neighbouring communities.</p>

Table 2 has provided a summary of the actors in local and municipal networks that respond to flooding. we may choose to classify neighbourhood support as a special type of place based civil society organisation (Figure 5). Social media which supports WhatsApp based neighbourhood watches plays a critical role in supporting this action and engagement and further reflection on this is required. What is noticeable is that the private sector is not included in this network, which has been an ongoing challenge in governance for risk in the city. It is evident that the private sector engages at a distance, by providing aid and support during times of crisis, by providing funding in certain instances for research programmes, and by being present through the action of individuals who act through neighbourhood networks to effect change. Further research on the role of the private actor is therefore also required.

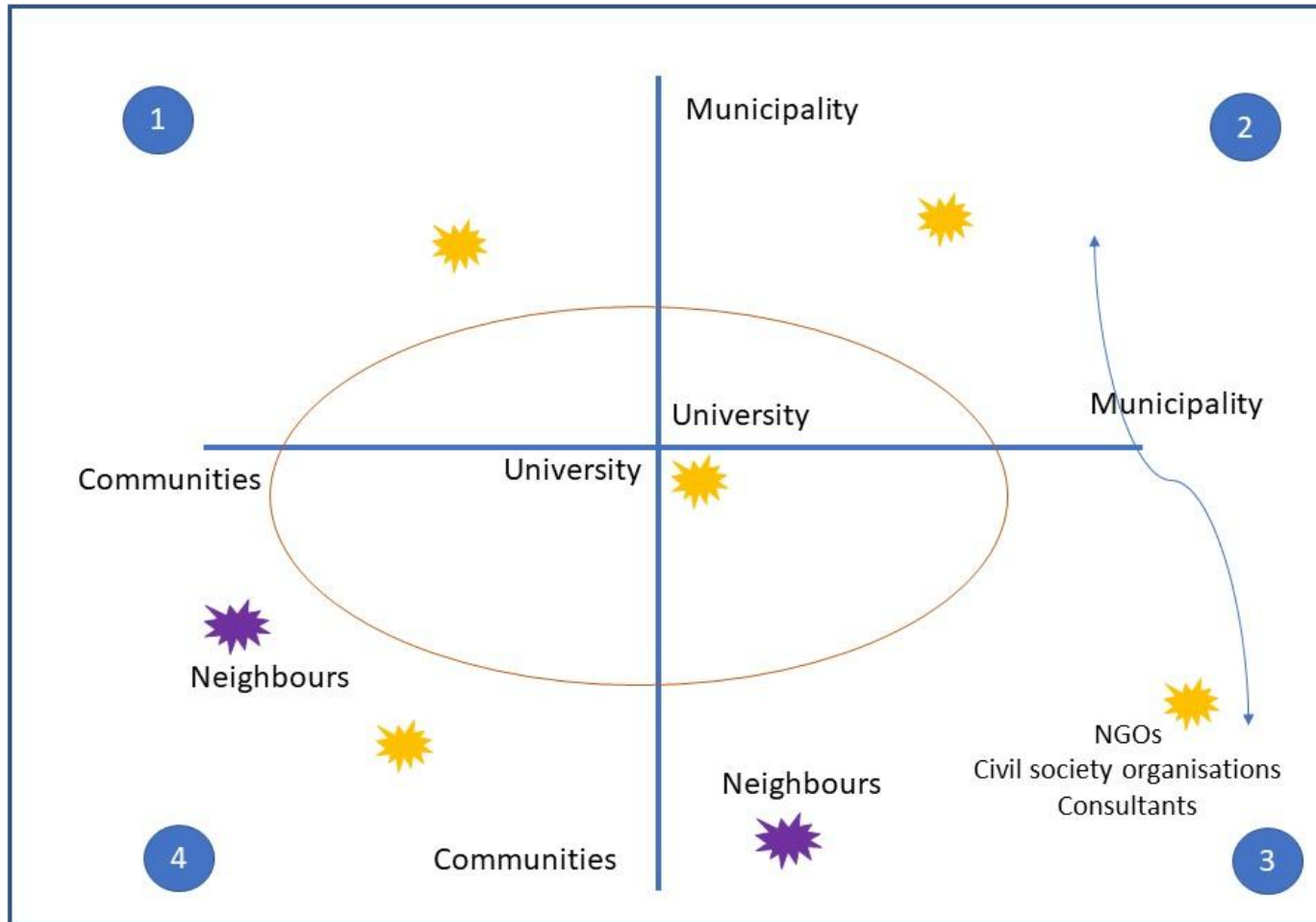


Figure 5: Neighbourhood support as a form of place based civil society organisation



3.4 Collaborative networks of actors to address ‘weak connections’ and build on strategic partnership opportunities

Table 1 and Table 2 provided the basis from which to identify critical ‘weak connections’ that the intervention should aim to address. Important weak connections that are highlighted in the tables include:

- *Weak connections between informal settlements:* Informal settlements often operate in isolation from each other, particularly between locations separated by long distances across the city. Connecting such communities could facilitate information exchange and strengthen self-organisation.
- *Weak connections between informal settlements and local government:* In most informal settlement communities, there are limited opportunities for communities to engage directly with municipal officials in a collaborative way. The connection is often through the ward councillor who has to address the needs of communities across the ward and who does not always communicate community challenges adequately. This results in communities’ needs not being communicated to officials in local government and creates politically charged tensions as community members often explain that this happens for ‘political reasons’. Creating platforms and mechanisms for improved communication and accountability between communities and local government could help.
- *Weak connections in relation to access to different forms of climate change knowledge and data:* Although informal settlement communities have their own detailed knowledge and practices that have been developed to respond to issues like floods, there are opportunities to strengthen their access to climate change information and related data that could better inform how they respond to these challenges.

Additional details on weak connections and barriers to collaboration can be found in Annexure 2 and Annexure 3.

However, there are also opportunities to build on strategic partnerships. As indicated in the introduction to this report, there is potential to leverage existing networks and relationships to begin to address power imbalances and foster co-production of interventions that can build climate resilience in vulnerable communities. As examples:

- *Strategic partnership between informal settlements, UKZN and eThekweni Municipality:* The Palmiet Catchment Rehabilitation Project has, over ten of years, established stronger relationships between the Quarry Road West informal settlement community, the University of KwaZulu-Natal and eThekweni Municipality. This has provided the basis for the development of the CBFWS which has the potential to be applied in context-relevant ways in additional settlements. It is important to note the role of UKZN as a critical intermediary through research but also in its role of spanning the theory/practice divide and the specific intention of the university’s current projects to influence and shape policy.
- *Strategic entry points for co-production through existing projects:* Water, Sanitation and Hygiene (WASH) projects between UKZN and informal settlements such as Quarry Road West and Pholani provide possible entry points for collaboration, as do initiatives like the



TRMP which is currently being led by a collaboration of actors, including eThekweni Municipality.

- *Strategic relationships between some informal settlements and their neighbours:* The strong relationships between some informal settlements (e.g. Pholani) and their neighbours also provides an opportunity to strengthen information flows and disaster responses.

The above-mentioned weak connections and strategic relationships were considered when designing the intervention.



4. Description of the intervention

This section provides a high-level description of the intervention and its purpose. Additional information on the detailed design considerations are outlined in Section 5.

Intervention: Informal settlement learning exchange on climate resilience and community-based forecast early warning systems

Focus of the intervention: **Two informal settlement communities** (Quarry Road West informal settlement and Pholani informal settlement), **eThekweni Municipality officials** and **university/research institutions** involved in climate resilience, disaster management and early warning systems.

The purpose of the intervention is to:

- Facilitate **knowledge building and empowerment** on climate change hazards, impacts and responses (*through structured learning exchanges and focus groups involving informal settlement communities, government officials and universities/research institutions*)
- Build **community-based research capacity** to strengthen community-level understanding and use of data (*through training and deploying community-based researchers to collect, understand and use data in ways that can leverage change*);
- Support self-organising of community networks (*through connecting informal settlement communities and facilitating learning that can build capacity and inspire action*)
- Facilitate more **participatory forms of governance** (within communities, between communities and with municipal officials) that can challenge and shift existing horizontal and vertical power relationships (*through inclusive focus groups designed to connect knowledge and experiences across informal settlements, government officials and universities/research institutions to strengthen climate resilience action*)
- Generate community-based information and learnings to **inform the upscaling of community-based flood early warning systems** (*through drawing on the context of two informal settlements and sharing this with municipal officials*)

The intended impact of the intervention:

- Informal settlement communities are better **equipped to respond to climate change** hazards and are **connected to municipal processes** in ways that facilitate improved **flow of information** and resources ahead of, during and after hazard events.
- Municipal officials are more sensitive to the challenges faced by informal settlement communities and have **improved insight** into the context of different informal settlements and what this might mean for **improved disaster management and early warning systems** at larger scales.

The intervention was undertaken through the lens of the Community-Based Flood Early Warning System (CBFEWS) drawing on the municipal Forecast Early Warning System. This work has been underway for some time and has already built a community of practice across informal settlement communities, municipal officials and the University of KwaZulu-Natal that needs to be scaled up, improved and developed further. A short overview of the CBFEWS is included below for context.



Box 1: Overview of Community-Based Flood Early Warning System (CBFEWS)



The CBFEWS involves the integration of scientific information related to hydrological modelling with community knowledge of the area to more accurately predict when flood evacuation is needed and then communicate this effectively across the CBFEWS platform to vulnerable communities. An important lesson learned to date in the Quarry Road West informal settlement (where this approach has been piloted) are that partnerships are critical in developing the governance platforms that allow engagement and trust-building across actors.

There are a number of ways in which the proposed intervention (with its focus on flows of knowledge resources) could redress unequal power relationships. This includes through:

- **Supporting the development of self-organising networks across informal settlements:** Facilitating relationship building and engagements between community members from Pholani and Quarry Road West informal settlement communities can facilitate knowledge sharing and strengthen advocacy positions and influence on decision making. Self-organisation of the two communities could also leverage additional municipal ‘attention’ and help strengthen the network of communities to pressure ward councillors and municipal officials to act in ways that strengthen climate resilience in vulnerable communities. In South Africa, as guided by the Municipal Structures Act 32 of 2000, community members engage with the municipality through Councillors. Each ward has an elected councillor and a representative councillor who are meant to engage with communities and act as the channel through which their concerns are moved to the municipality: both to political and bureaucratic spaces within the municipality. This process does not work as intended as Councillors are too busy to reach all their constituents and they offer meet with communities, most often during protests when issues have reached a crisis point, they placate them with promises, they may engage municipal officials to address the issues, but they seldom follow up. Developing alternative governance platforms is important as this means that communities can access municipal officials, who do the technical work of the state and the interventions, directly. Power relations shift in this case, as Councillors do not hold all the power as to whether community needs are addressed. This was evident in the response of Pholani residents being the same room as municipal officials during the learning lab, and meeting them and seeing them as 'real people' they could engage with, and has been evident in Quarry Road West informal settlement over the past ten years, where the community has built a relationships with certain sectors of the state.
- **Promoting participatory and inclusive governance and decision-making** by facilitating platforms for engagement between community members and city officials. The focus is also on leveraging the role of intermediaries in this space. The Palmiet Catchment Rehabilitation Project already offers an opportunity to redress power asymmetries by mediating between different actors involved in the governance of the



catchment. Such platforms also provide important opportunities for co-learning between informal settlement community members and between citizens and the state.

- **Building climate resilience through knowledge development:** Sharing knowledge increases the ability of communities to respond better to future events. It also builds capacity to engage with data and climate outputs from systems such as the CBFEWS and builds hope that there are actions that can be taken to reduce risk and enhance resilience. Improving communities' understanding of climate change and their ability to speak confidently to these issues, can also help strengthen linkages with intermediary/bridging organisations, other informal settlements and local government actors, in ways that could shift power dynamics and increase the voice of informal settlements.
- **Capacity building and training:** Co-developing skills of informal settlement communities as co-researchers and implementers helps support community engagement in planning and evaluating urban resilience building initiatives. Being able to generate data and communicate this clearly is an important skill when engaging with actors such as local government. The focus in this project has been to develop these co-researcher skills in a group of women, thus also addressing gender power dynamics within communities.
- **Influencing policy:** Working to upscale the CBFEWS to a second informal settlement has the potential to generate important learnings around (a) how one 'enters' a new space and what relationships need to be in place to do this, (b) what community dynamics need to be considered during planning and implementation, (c) how mechanisms like the CBFEWS translate into new spaces and (d) whether upscaling of such systems, in some form, is possible across a broader range of contexts.

The intervention leveraged windows of opportunity presented by existing collaborative networks and alliances of key city actors, such as between UKZN, local informal settlement communities, civil society organisations and eThekweni Municipality to promote inclusive and transformative urban resilience. The work draws strongly from the existing Palmiet Catchment Rehabilitation Project, of which the Quarry Road West informal settlement is a part. Work is also underway in Pholani informal settlement which is located North of the city in the La Mercy area, for comparison.

As noted, the intervention focused on the domain of '**Information, communication and awareness**' as described in the SECURE framework, with the intention of using knowledge to influence governance and power. This domain was prioritised based on the team's existing detailed understanding of the city and the centrality of this domain for understanding and addressing many other cross-cutting issues. The co-production modalities for this intervention include: producing knowledge and evidence; establishing dialogue and collaboration platforms; and experiential learning and pilot testing.

In terms of the orientation of the intervention in relation to the SECURE framework, the co-production intervention sought to:

- Influence behavioural change (*through sharing experiences on flood actions that have worked in other settlements*)



- Broker agreements (e.g. between informal settlements on how they will sustain communication and support; between eThekweni Municipality and informal settlements on engagement and opportunities to upscale the CBFEWS)
- Facilitate empowerment (through access to knowledge and new networks across informal settlement communities and municipal officials)

The intention is that such interventions could be a catalyst for longer-term system reform and shifts in access to and control of data, information and other resources.

We are also planning to draw on the success of this intervention to engage in a second intervention which involves planning for and beginning to rehabilitate the major ‘holes’ and eroded land in both settlements as a result of the 2022 floods. We would like to invest in ecological infrastructure solutions which can support the resilience of both settlements and which can bring hope and healing. This work will be linked to the EPIC A network, which is a partnership between the city and the municipality, and which is supporting the greening of informal settlements to slow down water flow and reduce heat extremes. The lessons learnt from the CBFEWs intervention will be used to inform the next process of engagement between Quarry Road West informal settlement and Pholani.

5. Design and implementation of the intervention

This section first describes the context of the two informal settlements that are the focus of the intervention. These different contexts are useful in consolidating important characteristics and dynamics that need to be considered when designing the intervention, to ensure involvement and inclusivity. The section then describes specific activities undertaken as part of the intervention, their purpose and intended impact.

5.1 Comparing the Quarry Road West and Pholani informal settlements

Given that Pholani informal settlement is less well known than Quarry Road West and has been comparatively considerably under researched, it is important to understand elements of context that could influence how the intervention is designed. This is important since informal settlements are not all the same, and therefore nuances will influence how interventions unfold. Data gathering for the Pholani informal settlement was undertaken through focus groups linked to the learning exchanges, and through project specific information collected as part of surveys conducted for related WASH focused projects implemented by UKZN. Table 3 compares some contextual aspects of the two settlements.

Table 3: A comparative summary of Quarry Road West and Pholani informal settlements. This information is based on a limited number of focus groups and surveys, and will be developed further over time and through ongoing engagement with both communities

Aspect of context	Quarry Road West informal settlement	Pholani informal settlement
<i>Governance platforms to facilitate engagement with other actors</i>	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	Has its own localised networks to deal with flooding and climate resilience, but these are not connected into municipal governance systems in the city.



Aspect of context	Quarry Road West informal settlement	Pholani informal settlement
	building resilient futures. These governance platforms contribute towards the inclusion of marginalised groups to participate in urban reform.	There is considerable mistrust of government and other actors linked to marginalisation. Strong governance relationships with surrounding neighbourhood
<i>Influence</i>	May have more influence on local government because of governance platforms, voice given to communities through 'flagship' projects and engagements with eThekweni Municipality	Possibly has less influence than Quarry Road West. However, this influence will increase as a result of a sanitation project that has been recently initiated in this area.
<i>Access to the community</i>	Access to the community is easier because of the projects that have been initiated, and the strong intermediary role that is played by the university. Existing projects have helped develop relationships and a level of trust, as well as a better understanding of processes to follow in the community (e.g. relating to access)	Fewer initiatives in this settlement means it is not as well understood. Initial engagements suggested there might be strong 'gate-keepers'. Trust relationship has not yet been developed.
<i>Gender and other dynamics</i>	Women play a strong role in community leadership and are free to voice their opinions and contribute their ideas.	More binary gender relationships: Women expressed appreciation of being in a focus group without men so that their voices were not overpowered. Tension between older and younger people in communities. There is a perception amongst the older members that the youth are ignoring beliefs and cultural knowledge which is exacerbating the impacts of climate change.
<i>Cultural norms</i>	Inkanyamba is seen as having influence on the river, floods and their impact.	Banging drums is used as a way to chase away the bad weather and floods
<i>Involvement of other actors</i>	NPOs – Project Preparation Trust is active in Quarry Road West. UKZN is involved in the Palmiet Catchment Rehabilitation Project, as well as Palmiet River Valley Conservancy and the municipality.	It is not clear who the main actors are in Pholani and their influence. The Pholani community expressed a desire to work with trusted partners like the university.
<i>Biophysical context</i>	Located within the floodplain of the Palmiet River. Floodplain soils are relatively unstable. Land is flatter than in Pholani.	Located on steep slopes and prone to landslides. Many inhabitants have experienced secondary displacement after moving to Pholani to escape more flood-prone areas. Strong winds can also be a challenge in Pholani.
<i>Climate resilience practices</i>	Use of sandbags to stabilise land. Multiple localised climate adaptation strategies that have been documented as part of the Palmiet Catchment Rehabilitation Project.	Use carpets on their roofs to stop water from coming inside. Carpets are also used outside to slow down the flow of water and reduce soil erosion.



Aspect of context	Quarry Road West informal settlement	Pholani informal settlement
<i>Flow of information</i>	Community-Based Flood Early Warning System exists to warn the community about imminent flooding (WhatsApp group). Given that cell phone (mobile) signal is not available in all parts of the informal settlement, the initial warning messages are then passed on via loudspeakers or other messaging.	Disaster information might be accessed via TV, radio or phones (for those who have smartphones), but for most this is too late. WhatsApp groups can help, but signal can be an issue in this settlement.

This comparison across the two informal settlements was used to inform aspects of intervention design to ensure that new relationships could be developed in a constructive and inclusive manner.

5.2 Key considerations when designing the intervention

The comparative analysis across the two communities (Table 3) has implications for how the communities were approached to participate in the intervention (this is more relevant in the case of Pholani) and for how the intervention was designed to achieve the project objectives and facilitate inclusion and participation. The following considerations are important and have been incorporated into the methodological approach for the intervention:

The objectives of the intervention

Given that Pholani has significantly less interaction with eThekweni Municipality than Quarry Road West, the intervention aimed to *strengthen platforms for engagement with municipal officials*.

Accessing and engaging the community in ways that build trust

There is a high level of frustration in both communities around the absence of any meaningful change in the lives of informal settlement communities. There is also frustration with the extractive nature of research. It has been critical to consider which leaders to approach for access to the community and whether there are existing leverage points (e.g. UKZN WASH projects in Quarry Road West and Pholani) that could facilitate this more easily. Importantly, work needs to be done slowly to build trust in a meaningful way.

The approach of building ‘co-researchers’ within communities could also help ensure that communities gain something practical from the research (e.g. skills, knowledge) and that the data generated becomes a leverage point for future engagements with actors like the Municipality, NGOs and others. The ability to generate and access this data could also serve as an incentive for collaboration/ co-production.

Ensuring inclusivity

There are strong leaders and existing power and political dynamics in both communities. For example, in Pholani, there is an under-representation of women in decision-making and the



youth seem to be marginalised. Creative approaches and tools to facilitate more inclusive participation in learning exchanges and focus group discussions (e.g. using affinity groupings according to gender and/or settlement) were therefore deployed. Gender and intersectionality dynamics were strongly considered when facilitating discussions so that insights from both men and women could be gathered.

Entry points for collaboration

There are some shared cultural beliefs across the two communities (see Table 3 for examples) that could provide a starting point from which to build relationships. Given the importance of such beliefs, there was a need to recognise and integrate cultural practices and knowledge into the engagement to build a sense of unity across the settlements.

5.3 Details of the intervention

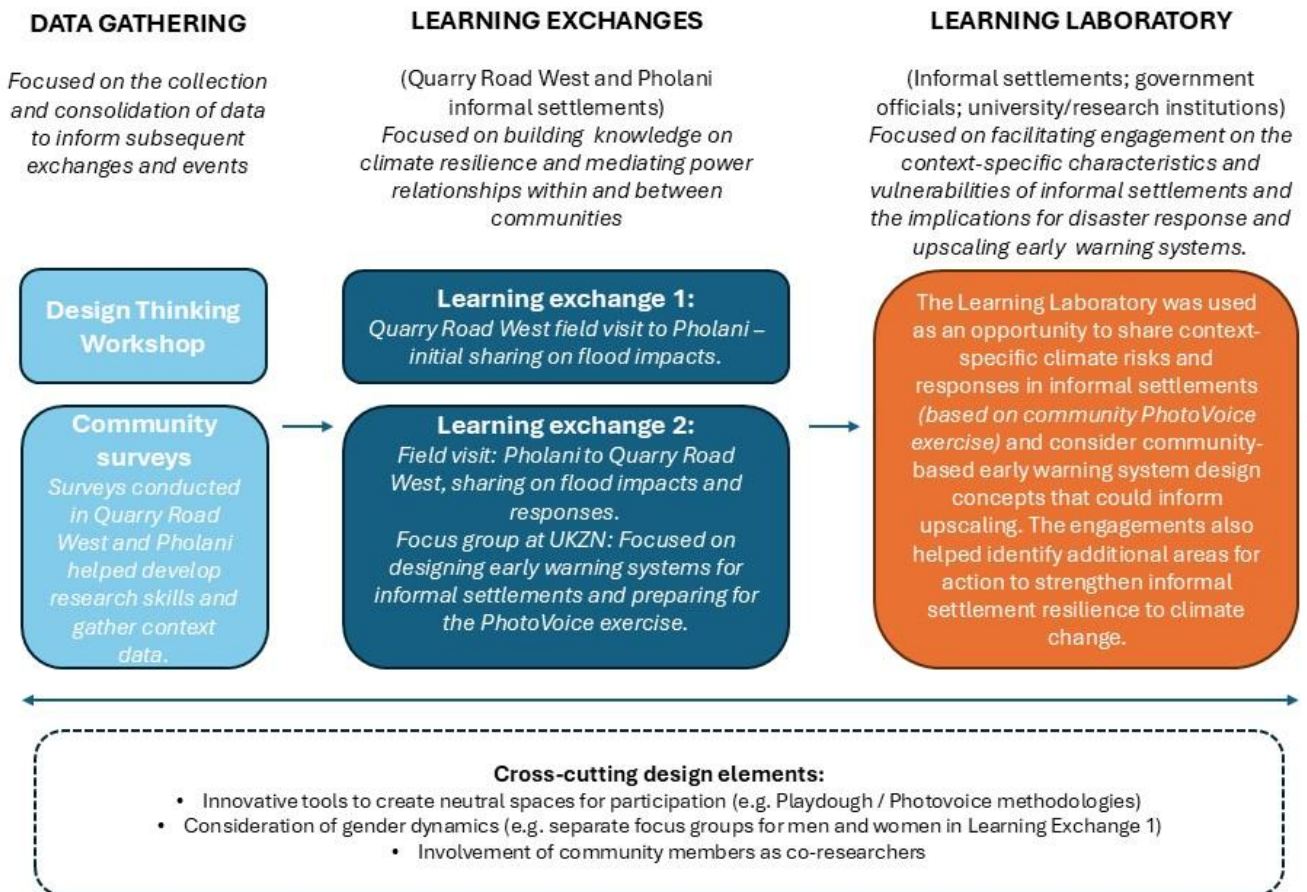


Figure 6 provides an overview of the activities undertaken for the intervention which included field visits to Pholani and Quarry Road West informal settlements (Figure 7). Further detail on each activity is then provided in Table 4.



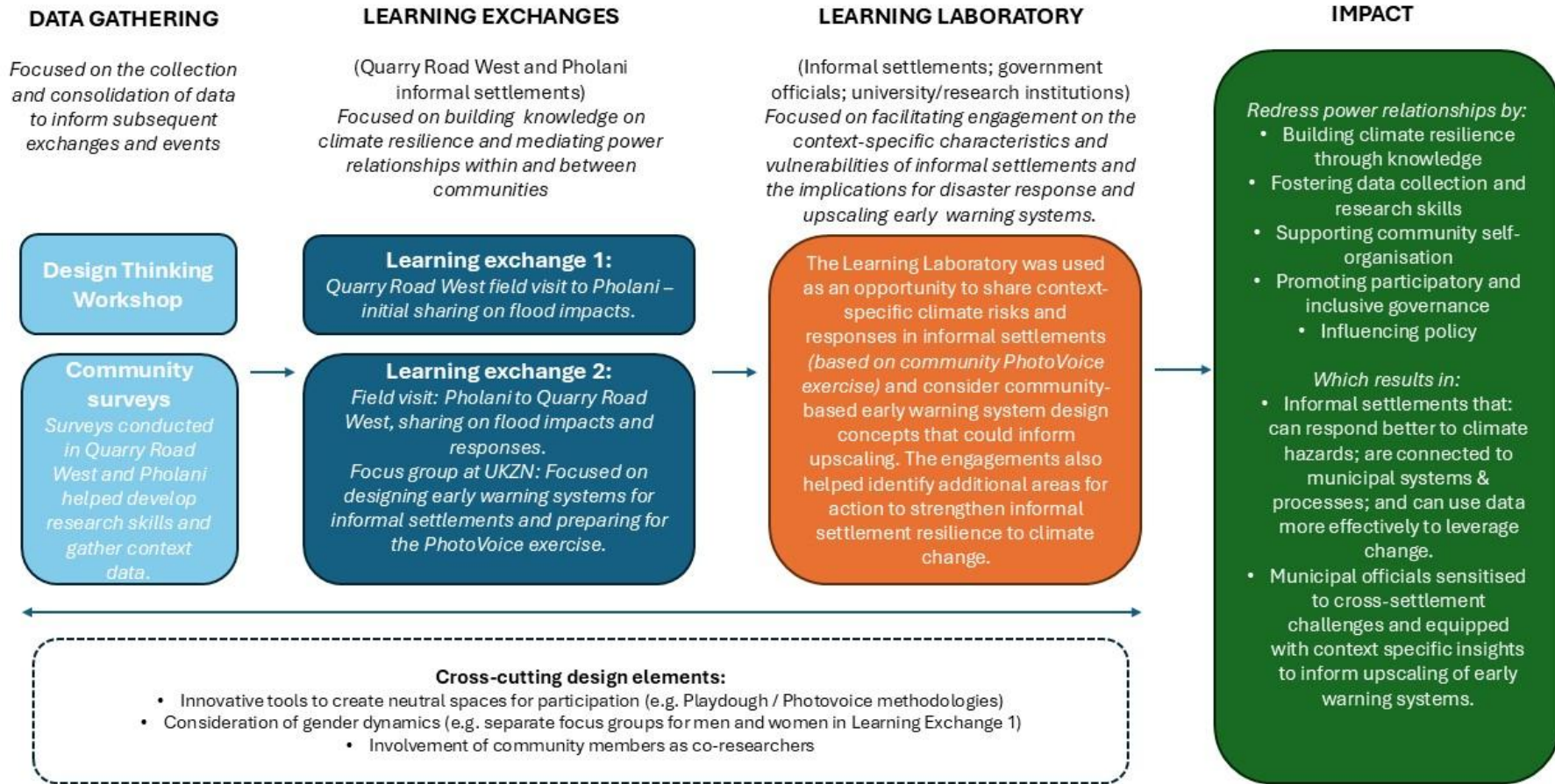


Figure 6: An overview of the activities undertaken as part of the intervention, the way in which these contribute towards the intended impact, and the cross-cutting design elements that were used to facilitate more neutral collaborative spaces.



Figure 7: Quarry Road West community members explain to Pholani informal settlement representatives how their community was impacted by the 2022 floods in Durban, the responses that they implemented and the actors that were key to the response. Community member Nonho upfront is showing the group that her home used to be where the hole is in the image, but it was washed away in the 2022 floods.



Table 4: A detailed description of the activities undertaken, their purpose and expected impact.

Activity	Purpose and approach	Description	Actors involved	Intended impact
<p>Community surveys</p>	<p>To develop the skills of informal settlement community members as co-researchers and gather context information on the two informal settlements - Quarry Road West and Pholani.</p>	<p>Five women and one young man from Quarry Road West received training on how to conduct a community survey. They conducted surveys in Pholani (previous similar surveys had already been undertaken in Quarry Road West and we have drawn baseline understandings from these). The longer term intention is for this training to be replicated for Pholani community members. The surveys addressed a range of questions, focused on understanding: the communities' relationship with eThekweni Municipality and other stakeholders; community governance structures and who is represented in these; their knowledge of climate change, its impacts and community responses. Three of these co-researchers also were part of community interviews as part of the Design Workshop, that also generated important insights for the current project.</p>	<p>UKZN lead researchers; Community co-researchers; informal settlement community members from Quarry Road West and Pholani settlements.</p>	<p>To elevate the role and voice of people, including women, in informal settlements by developing their skills as co-researchers and providing them with platforms to share their own experiences and insights on issues faced by informal settlements. This was intended to address the barrier relating to unequal access to information and serve as an enabler of informal settlements' ability to use data to advocate for change.</p> <p>The surveys themselves were designed to gather important context information on community power and relational dynamics across actor groups, and how climate change is experienced in each of the informal settlements. This has been integrated into this report and used to inform the intervention design.</p>
<p>Learning exchange 1: Focus Group</p>	<p>To broker an initial conversation between Quarry Road West and Pholani in relation to flood issues. In response to community gender dynamics identified, focus groups were run separately for women and men.</p>	<p>Initial introductions and engagement with community leaders in Quarry Road and Pholani for obtaining access to communities and willingness to collaborate. Engaging these powerful 'gate keepers' is a critical first step prior to any engagement or intervention. Quarry Road West community members were transported to Pholani to see and hear the challenges faced by the community</p>	<p>Quarry Road West and Pholani community leaders and residents UKZN ICLEI</p>	<p>To begin the process of building trust between the two informal settlement communities and with the intermediaries (UKZN and ICLEI).</p> <p>An important mechanism was to use the power of intermediaries to bridge between informal settlement communities.</p>



Activity	Purpose and approach	Description	Actors involved	Intended impact
<p>Learning exchange 2: Field visit</p>	<p>To share knowledge on climate change impacts and responses in two settlement contexts, specifically in relation to floods.</p>	<p>Pholani community members were transported to Quarry Road West for a visual tour of the flood impacts experienced, and initiatives (like waste management and forecast early warning systems) that have been put in place to reduce impacts and loss of life.</p> <p>Specific conversations were focused on: flood damage and community stories; fire responses; potential interventions to address flood damage (e.g. hole in the ground); waste recycling initiatives; and sanitation approaches.</p>	<p>Quarry Road West and Pholani community leaders and residents UKZN ICLEI</p>	<p>To build practical knowledge on flood impacts and responses.</p> <p>Connection of the two informal settlement communities and continued development of the relationship between them, with the potential for this to facilitate improved self-organisation of networks within and between these communities over the longer term.</p> <p>Connecting two informal settlement communities strengthens their ability to leverage a more 'collective' power/ influence when engaging with other actors (e.g. municipal officials), thus addressing the barrier of 'informal settlement invisibility' in the eyes of some government officials.</p>
<p>Learning Exchange 2: Focus group</p>	<p>To better understand how different informal settlements experience flood events, how they currently respond, and what ideas they have on how an early warning system could work in different contexts.</p> <p>Interactive Approach: Use of playdough methodology helps to put all community members on an 'equal footing' so that embedded community power dynamics</p>	<p>Focus group was convened at UKZN's School of Built Environment and Development Studies. Introductory questions probed around main climate hazards experienced, how communities are currently warned about such events and if/how a CBFEWS approach might work in Pholani (Figure 8).</p> <p>The 'playdough exercise' asked participants to use their playdough and materials to design a story on how an early warning system might work in Durban in the context of settlements close to rivers and on steep slopes. They were also asked</p>	<p>Quarry Road West and Pholani community leaders and residents UKZN ICLEI</p>	<p>Addressing power dynamics within communities to ensure participation: Convening at UKZN allowed engagement between informal settlements in a neutral space and an opportunity to hear different perspectives from within communities. The use of the playdough creative approach also assisted with this.</p> <p>Empowering communities to build and share ideas on climate change responses and, in so doing, generate data that can feed into municipal processes related to early warning systems.</p>



Activity	Purpose and approach	Description	Actors involved	Intended impact
	<p>and do not overshadow the process. Also builds knowledge and skills as co-researchers.</p> <p>Mixed groups were convened across communities and gender.</p>	<p>to reflect on the actors that would need to be involved and the possible barriers to implementation. The outputs from this exercise are shown in Figure 9.</p> <p>The PhotoVoice activity was also introduced. Further elaboration on the playdough and PhotoVoice creative arts methodologies is included in Box 2.</p>		
<p>Learning Laboratory</p>	<p>Brokering a conversation platform between informal settlement communities and local government officials to engage on building climate resilience.</p> <p>Enhancing an understanding of scaling opportunities – The current CBFWS operates in Quarry Road West and needs to be upscaled.</p> <p>Interactive Approach: Photovoice approach helps build the capacity of informal settlement communities as co-researchers.</p>	<p>The Learning Laboratory involved sharing a gallery of photos depicting how rains and floods affect communities, what actions they take to reduce these impacts and who has helped them (internal or external to their community) to cope with flood events. Community members acted as co-researchers in this work and shared their stories directly with the local and provincial government officials present (Figure 10). In addition to sensitising officials to the different contexts in which floods are experienced, the information generated through the playdough and photovoice exercises could help inform further thinking about how to upscale early warning systems. This has already been communicated by government officials in attendance within and across their departments.</p>	<p>Quarry Road West and Pholani community leaders and residents UKZN ICLEI eThekweni Municipality officials (Climate Change Department, Coastal Stormwater and Catchment Management, Biodiversity Management/TRMP) Co-operative Governance and Traditional Affairs (CoGTA) (provincial government), NGO representative</p>	<p>Shifting vertical power relations by bringing diverse stakeholders together. Connecting communities with government officials and other key stakeholders helps to establish relationships and trust building for addressing unequal power relations. This helps address the barriers related to lack of trust between informal settlements, the Municipality and other actors, and poor communication with informal settlement residents.</p> <p>Insights across two communities in different contexts can assist with designing and upscaling early warning systems to other settlements, with potential impacts in reducing vulnerability to climate change across additional informal settlements.</p>



Figure 8: Community members share their experiences of floods whilst designing flood early warning systems.



Figure 9: The early warning systems designed using playdough by four mixed groups of Quarry Road West and Pholani community members.

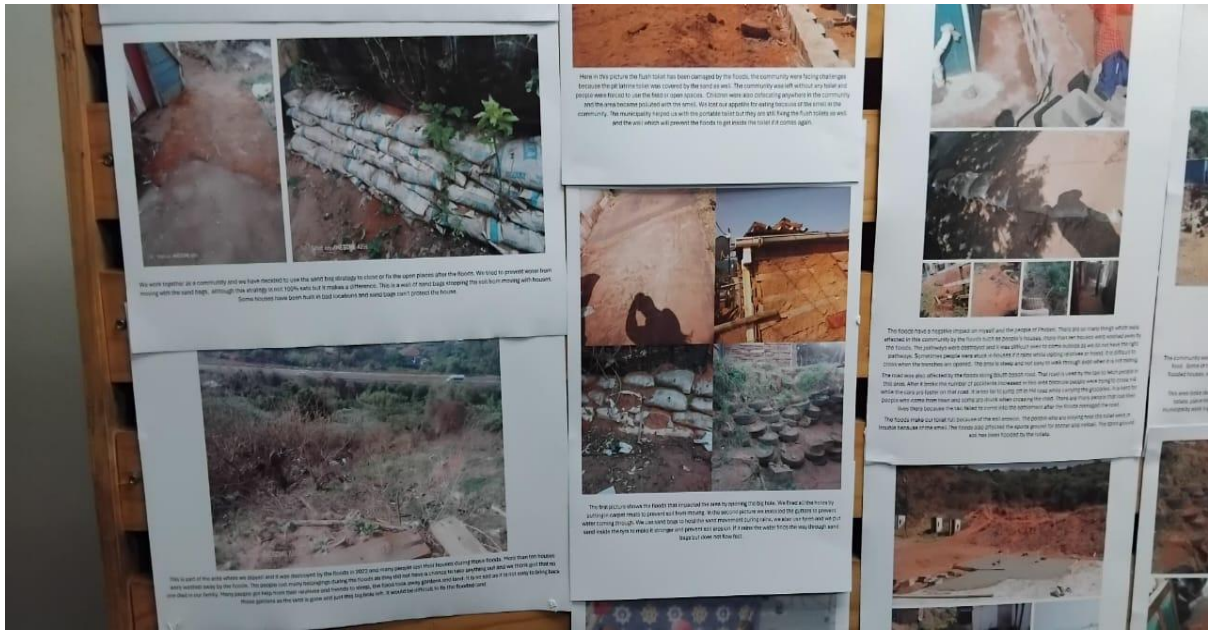


Figure 10: The PhotoVoice exhibition at the Learning Lab



BOX 2: Reflection on arts-based methods for redressing symbolic orders

Arts-based methods such as photovoice and play dough modelling can create opportunities to challenge symbolic orders that marginalise certain groups by providing an alternative, creative and interactive non-verbal form of expression. Key aspects are indicated below:

Embodied, Sensory Expression:

- Play dough modelling is a hands-on, tactile experience that allows individuals to express ideas, emotions, and identities through material moulding. By creating physical objects, participants engage with their own embodied knowledge, often revealing experiences, emotions and viewpoints that are difficult to verbalise.
- Marginalised actors may face barriers in articulating their experiences using dominant language forms, which are often shaped by hegemonic cultural norms. Artistic methods offer a space to express what language cannot fully capture, allowing for a more direct and personal engagement with issues of identity and power dynamics.
- In cases where people have experienced trauma, or are from different linguistic or cultural backgrounds, for example, the symbolic order upheld by dominant languages and modes of expression may exclude certain experiences or voices. Artistic methods help to overcome these limitations by offering an alternative and interactive medium for representation and expression.

Disrupting Dominant Discourses:

Narrative methods can be constraining because they often rely on structures that reflect dominant cultural ideologies and can thus be limiting to those marginalised by gender and intersectional factors such as race and socio-economic status.

Symbolic orders can lead to marginalisation of certain groups by prioritising or privileging certain knowledge forms. For example, patriarchal, or colonial symbolic orders may favour textual or linguistic knowledge over other forms. Play dough modelling and photovoice allows individuals to produce and embody counter-symbols that might be overlooked within these dominant frameworks. The act of creating shapes and forms with play dough and images from photography can subvert dominant cultural narratives. This can support communication of alternative realities, challenging norms about what is considered 'valid' knowledge or representation.

Inclusive, Non-Hierarchical Spaces for Dialogue:

Marginalised groups may feel excluded by formal or academic narrative processes and play dough modelling and photovoice opens up space for inclusive engagement and expression, on individuals' own terms. Arts-based methods such as play dough and photovoice are accessible to a broad range of participants, across all ages as they are not limited to specific languages or terminologies, making it an equitable medium for dialogue and expression, thereby fostering more inclusive participation.



Engaging the Imagination and the Subconscious:

The imaginative processes that underpin playdough modelling and photovoice can lead to the creation of new symbols or forms of meaning; through shaping and reshaping materialities, participants symbolically control narratives, identities and other factors. Improvisation and experimentation through these processes are critical components.

Collective and Relational Co-Creation:

Play dough modelling is often done in group settings and photovoice used as the basis for group engagements, fostering a collaborative environment where participants engage in shared meaning-making and reflection on experiences. This collective focus and output can symbolise the reconfiguration of social bonds and the construction of new social relations that challenge power relations underpinning hierarchical structures that often sustain marginalisation and inequality. This can help to build community and trust among participants.

Sources: Bentz, 2020; Bradshaw, 2018; Gabrys and Yusoff, 2012; Kasumovic, 2023; Liguori et al, 2021; Parsons & Pratt, 2024

Despite their considerable potential for impact, arts-based approaches are not yet strongly integrated in transdisciplinary climate research, with more traditional ‘scientific’ approaches dominating (Kasumovic, 2023; Liguori et al, 2021). One key limitation is that they are often viewed as not being ‘serious’ or ‘legitimate’ forms of research and data collection. However, as this project has demonstrated they have considerable scope for being taken seriously, and can lead to highly impactful insights. For example, community members commented during the final learning lab about how they were initially sceptical of the arts-based approaches but through engaging with them they realised their seriousness and their outputs made them ‘validated’ as co researchers and representing their communities. Increased arts, science and community collaborations that include such creative approaches can support continued legitimisation of such activities, so that the inclusion of artistic approaches within climate research and the benefits thereof become clearer and mainstreamed and knowledge hierarchies (lay knowledge vs. scientific knowledge) can be addressed (Kasumovic, 2023; Liguori et al, 2021). Adopting collaborative and innovative methodological approaches through combining traditional methodologies (e.g. focus groups and surveys) with creative arts-based methods helps to uncover multiple layers of meaning and understanding. For example, the photovoice exercise revealed strong ties between Pholani residents and their Indian neighbours and NGOs during times of crisis, which was not as strongly apparent during focus group and other interactions.



6. Assessing the initial impact of the intervention

The intervention was selected and designed to build more resilient informal settlement communities through knowledge exchange, brokering participatory governance opportunities and generating data that could inform the upscaling of a community based flood early warning system beyond just the Quarry Road West community.

In terms of assessing the initial outcomes of the intervention, a number of intermediate measures can be used. These include: tracking participation, monitoring the level of engagement in activities/ learning exchange, particularly in terms of women and other minority groups; and demonstrating linkages and inclusive relations developed between informal settlement community members for supporting co-learning on forecast early warning systems (e.g. interactions between communities initiated, contact details exchanged etc).

It is important to emphasize that, within the short time-frame of the current ARA project, it is not possible to make definitive statements about impacts on power relations and resource flows. Such impacts would need to be monitored over longer time horizons. For the purposes of this project, initial observations are made as the basis from which further work could be developed. Beyond the period of the current project, it would be important to consider additional metrics that can assess progress in relation to: building climate resilience in informal settlements; strengthening networks; facilitating sustained and equitable engagement within and between communities; and sustaining platforms for engagement with municipal officials.

Table 5 summarises the initial observations from the project activities.



Table 5: Initial impact observations from the activities undertaken during the ARA project

Activity	Intended impact	Initial observations
<p>Design Thinking Workshop</p>	<p>Prior to the below activities, the project team participated in an intensive Design Thinking course which involved city officials, community members from Quarry Road West informal settlement, university researchers and NGO stakeholders. This engagement focused on developing innovative, solutions orientated approaches to further developing CBFEWS and Durban’s Transformative Riverine Management Programme, both directly relevant to this project.</p>	<p><i>Power relations:</i> The workshop provided an opportunity for diverse stakeholders to engage in robust discussions and identify key priority areas for further intervention and upscaling of the initiatives. These initial connections could pave the way for ongoing engagement and the ability to articulate shared positions on some experiences and was a very unusual opportunity for community members to engage with city officials and other stakeholders to engage in depth and inclusive discussions for five full days. The workshop also made use of interactive methodologies such as lego modelling that helped to set the basis and receptiveness for further innovative project methodologies used.</p> <p><i>Gender:</i> the workshop was equally attended by men and women and created the space for women’s perspectives to be heard openly and strongly.</p> <p><i>Resource flows:</i> This exchange helped develop participants knowledge of climate change and its impacts from both indigenous and ‘scientific’ perspectives. This was a critical opportunity for reflexive learning and exchange of ideas.</p>



Activity	Intended impact	Initial observations
<p>Community surveys</p>	<p>To elevate the role and voice of marginalised groups including women in informal settlements by developing their skills as co-researchers. The surveys were also intended to generate additional context information (particularly for Pholani settlement) to help inform the intervention design.</p>	<p><i>Power relations:</i> The development of female and male co-researchers has likely elevated their voices, and the voices of others, particularly women in the focus groups, thus shifting power relations between and within communities to be more inclusive and less patriarchal and hierarchical. The surveys themselves generated important insights on the gender dynamics within Pholani informal settlement, so that this could be accommodated within the design of subsequent field visits and focus groups.</p> <p><i>Gender</i> The growing confidence of the co-researchers from Quarry Road West has been evident in their ability to lead and guide discussions during field trips. The participation of women and vulnerable young men in the subsequent focus group discussions has also been high - it is not clear whether the development of the co-researchers has played a role in this.</p> <p><i>Resource flows</i> The development of co-researcher skills in a group that is usually the <i>subject</i> of research helps equip these community members with new knowledge and positions them more strongly to engage with actors like eThekweni Municipality, UKZN and others.</p>
<p>Learning exchange 1</p>	<p>To begin building connections and relationships across Quarry Road West and Pholani informal settlements</p>	<p><i>Power relations:</i> The exchange provided an opportunity for the two communities to engage in robust discussions and identify areas of commonality in terms of service delivery, climate change and other issues. These initial connections could pave the way for ongoing engagement and the ability to articulate shared positions on some experiences.</p> <p><i>Gender:</i> Separate focus groups were convened for men and women, and women commented that they were relieved to be able to contribute more freely than would have been possible in a mixed group. The focus group design therefore created space for women’s perspectives to be heard more strongly.</p> <p><i>Resource flows:</i> Pholani participants commented that this exchange helped grow their knowledge of climate change and its impacts. They saw this as a critical part of strengthening their community’s ability to respond to hazard events.</p>
<p>Learning exchange 2: Field visit</p>	<p>To build practical knowledge on flood impacts and responses and continue strengthening the relationship between the two communities, as the basis for self-organisation of networks</p>	<p><i>Power relations:</i> The second exchange of the two communities appeared to further strengthen these connections, which could help sustain this new network. As indicated previously, these initial connections could pave the way for ongoing engagement and the ability to articulate shared positions on some experiences, particularly with those who currently hold much of the power (e.g. ward councillors, local government officials). For example, there was a shared sense that party politics was a major threat to service delivery and the implementation of early warning systems.</p>



Activity	Intended impact	Initial observations
	and greater ability to leverage voice and power on critical issues.	<p><i>Gender:</i> Leadership of the Quarry Road West inputs at the field trip was shared across genders. Most of the contributions to the subsequent discussions whilst still in the settlement were, however, from men. This dynamic shifted again when the focus groups reconvened at the university.</p> <p><i>Resource flows:</i> As indicated previously, improved knowledge on climate change helps equip communities to respond more effectively.</p>
<p>Learning Exchange 2: Focus group</p>	<p>Addressing power dynamics within communities to ensure participation and generating new ideas on context-relevant early warning systems</p>	<p><i>Power relations:</i> The use of the playdough method helped ensure that all community members participated equally, regardless of whether they were community leaders or not, thus neutralising intra-community vertical power dynamics. Groups were mixed across the two informal settlements, thus also helping to strengthen connections across the communities. Discussions were dynamic and spirited, possibly an early indication of the relationships forming across these two communities (Figure 11).</p> <p><i>Gender:</i> The use of the playdough methodology also made it easier for men and women to participate equally. Group feedback after the playdough activity was shared by men and women across the groups.</p> <p><i>Resource flows:</i> New knowledge was generated through the exercise and was shared with local government officials at the Learning Lab event, thus potentially strengthening the contribution of community-based insights into local government planning around how to expand early warning systems. Interesting insights that were generated around future early warning systems, included:</p> <ul style="list-style-type: none"> ● Simple visual/ colour-coded messages (e.g. traffic light colours) provide an easy way of communicating messages. ● The inconsistency of cellphone (mobile) signal and data in communities can limit cellphone-based communication. ● WhatsApp communication therefore needs to be supplemented with whistles, loudspeakers etc ● Education on climate change and its impacts is important in helping communities to interpret messages (e.g. early warnings) that are shared with them. ● Early warnings need to be delivered by trusted community members, so that they are taken seriously.
<p>Learning Laboratory</p>	<p>Addressing vertical power relations and bringing diverse stakeholders together.</p> <p>Using community insights to improve understanding of how early warning systems might be upscaled.</p>	<p><i>Power relations:</i> Power relations were addressed in the learning lab as community members found themselves in the same room as municipal officials, provincial government officials (COGTA) and university researchers, sitting at round tables, where each actor group could present their views on CBFWS and other climate change responses. The format of the learning lab enabled each actor group to speak about their positionality and their views on and role in adapting to climate change. In their introductions, participants also expressed their excitement at seeing their experiences (through the PhotoVoice exercise) validated by those present in the Learning Lab. This directly addresses the challenge of informal settlements mostly being ‘invisible’ to decision-makers.</p> <p><i>Gender:</i> The use of PhotoVoice as a means of sharing experiences and practical responses to climate change, provided a neutral way for all to participate and have their voices heard.</p>



Activity	Intended impact	Initial observations
		<p><i>Resources flows:</i> The flow of knowledge was two-directional during the Learning Lab: Informal settlement residents were grateful to be exposed to new information on climate change and the Municipality’s work and expressed a desire for more opportunities to engage and learn; Government officials expressed the value of engaging with informal settlements to be able to ‘groundtruth’ their desktop work and understand the challenges to which municipal planning needs to respond. Officials also validated the approaches adopted by informal settlements to reduce flood risk. Specifically, the use of carpets to slow water down and reduce soil erosion was seen by one of the Municipality’s engineers to be an excellent alternative to other approaches. This dual knowledge flow was powerful in laying the foundations for stronger and more equitable relationships between key actors.</p>



Figure 11: Community members engage in discussion on their options for early warning systems in two contexts

7. Concluding reflections

This project has provided an important opportunity to reflect critically on how an analysis of power relations, gender, equity and social inclusion can be used to inform more thoughtful and impactful co-production interventions that build knowledge, strengthen networks and shift horizontal and vertical power relationships towards more inclusive and equitable climate resilience outcomes. It has also provided an opportunity to test alternative engagement approaches such as the use of affinity groupings and arts-based methodologies, that create space for multiple forms of knowledge to be heard and validated in ways that would otherwise not be possible. In doing this, it has allowed Durban's existing work in informal settlements to expand into new spaces, opening up possibilities for the creation of self-organising networks, new governance platforms and practical interventions to enhance the resilience of informal settlements to climate change.

The project also lays important foundations for critical empirical and conceptual contributions to understanding how the processes of transcending and jumping across scales occurs, particularly through horizontal networking, highlighting the significance of self-organisation in underpinning this. Emergent self-organisation refers to the ability of systems or communities, such as informal settlements, to spontaneously develop order and adapt to changing conditions in the absence of centralised control (Boonstra & Boelens, 2011; Eizenberg, 2019). When emerging through horizontal relations rather than through hierarchical structures, this critical capacity is particularly significant in the context of informal settlements as it reflects locally driven collaboration, innovation, and adaptability. In such contexts, where resources, infrastructure, and formal governance are often limited, horizontal relations and networks



enable communities to share resources, knowledge, and strategies for resilience building and development. This can facilitate collective problem solving and actions, encouraging localised (rather than top down) solutions. Furthermore, horizontal ties foster solidarity and collective action as individuals and groups collaborate to improve living conditions and confront pressures such as climate change impacts. Such relations also promote innovation as operating through informal structures allows for flexibility and experimentation.

This reasoning links to the idea of radical incrementalism, which emphasizes gradual, small-scale interventions that are transformative over time (Ernstson et al, 2014). Rather than imposing large-scale, top-down plans and interventions that may negatively disrupt communities, radical incrementalism supports the idea that change should emerge from within communities themselves, respecting their autonomy and knowledge (Ernstson et al, 2014).

Incremental aggregation of horizontal linkages between informal settlements across urban contexts refers to the gradual strengthening of connections, collaboration, and networks among these settlements. These can be based on shared needs, common goals, or collective actions, and in this case, relating to building climate resilience. Translating these horizontal linkages into vertical influence entails shifting local, community-level collaboration into influence across scales that reach vertical levels of decision-making (e.g. municipal, regional, national governments, NGOs).

The action and activities of the main actors and those that support them, which is both horizontal and vertical, as defined by the analysis undertaken in this research, is presented in Figure 12.

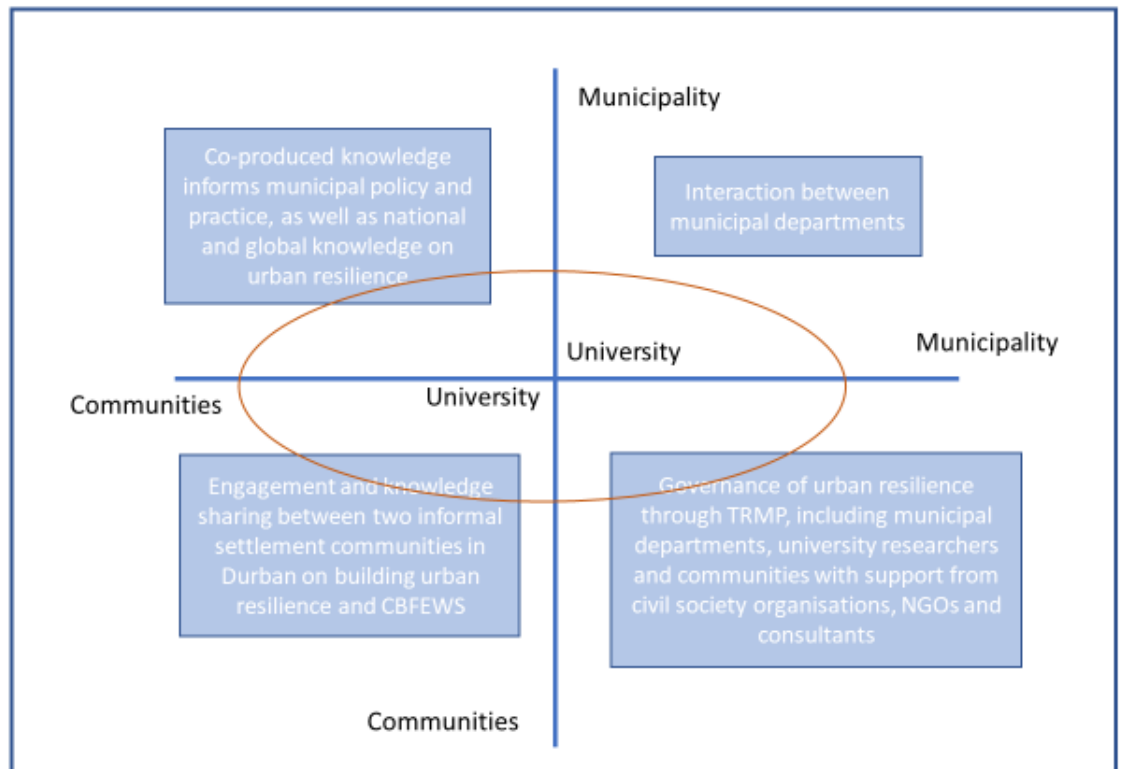




Figure 12: Horizontal and vertical relations and the activities and outcomes of the intervention

For this project, there are several ways in which quantitative incremental aggregation of these horizontal linkages can potentially translate into vertical influence:

- *Collective Representation of Needs*
Through bringing informal settlement communities together to share knowledge, experiences, data, and strategies for addressing common challenges such as building resilience to flooding, there is scope for creating quantitative impact through increasing the number of settlements and their inhabitants involved and the scope of collaboration (e.g. the geographic area they cover) over time. As more settlements join forces, their collective voice becomes stronger with more potential to lobby for policy changes and funding or infrastructure improvements. Increased quantitative representation has the potential to translate to increased bargaining power.
- *Combining Resources and Knowledge*
Through collaborating and combining knowledge, data and other resources, measurable outcomes can start to become visible and monitored such as residents impacted, or improvements in infrastructure (e.g. shared practices of building trenches to slow flood water across the settlements). This stronger base of quantitative data and pooled resources, can create vertical influence through increased legitimacy and data driven advocacy.
- *Creation of Networks and Coalitions*
As more informal settlements connect, there is potential for the formation of coalitions that can represent interests on a larger scale and potential to form relationships with non-governmental organizations, advocacy groups, and government organisations for supporting urban resilience building. The quantitative aggregation of participating settlements and their residents can demonstrate collective power, and open scope for influence across vertical scales. Relatedly, there is considerable potential to build political alliances. Politicians may also be more likely to engage with informal networks due to the large voter base or support base they represent.

However, this project has also demonstrated how these same actions of ‘bringing together’ can directly influence vertical relationships with policy and decision-makers. The Learning Lab, for example, was a powerful demonstration of mutual learning across informal settlements, government officials and universities/research organisations. In this learning space, the expression and validation of the voices of informal settlement residents (through the PhotoVoice exhibition and workshop contributions) not only strengthened informal settlement residents’ perceptions of their own knowledge and its value, but also helped government officials to verify, groundtruth (and sometimes adjust) their own understanding of the climate change challenges faced by informal settlements, the innovation that is already present in responding to these, and the potential to use these insights to upscale relevant work (like the CBFWS) more broadly across Durban’s informal settlements.



These processes do not happen easily but involve the slow and consistent fostering of relationships and networks over time and the careful and respectful entry into new project areas where dynamics are less well understood. The framework that was applied for this project has the potential to help provide some structure to the process of thinking through and designing more inclusive and impactful interventions in the city's most vulnerable places.

8. Reflections on the SECURe framework

The points below capture initial reflections from the team on the SECURe framework and its usefulness in informing more impactful work in the space of urban resilience.

The SECURe framework provides a helpful 'heuristic' device against which to organise knowledge and informed by a strong 'power and politics' lens, but should be used in a flexible way

The framework provides a heuristic that is useful in organising existing local experience and knowledge of actors/dynamics in a comprehensive way, with a critical emphasis on power and politics and informing the design of further interventions, including those that intend to expand and enhance work that is already underway. However, it should be applied in a flexible way that matches the needs of particular project contexts at particular times.

The application of the framework over short timelines relies on significant existing/prior knowledge of the context

For the current project, the team has relied heavily on past (and existing) work in Durban to undertake the context analyses that have been required. This suggests that the effective application of the SECURe framework might *require* an existing and reasonably good level of understanding of the context in which the intervention is being proposed. Alternatively, the timelines for designing and implementing an intervention would need to be significantly longer, to allow for this knowledge to be developed and trust relationships built with partners. Trust is a critical underpinning of co-production and this framework's central focus on power and politics calls for a strong level of trust for stakeholders to share openly on such issues. It is unlikely that communities and project participants would be comfortable sharing sensitive information on gender and power dynamics without such a well-established and pre-existing relationship. Furthermore, to meet expectations in terms of the scope of the project, outputs and interventions, significant leveraging of additional funding has been required to cover staff time and other costs.

The short timeline of the ARA project does not allow impact conclusions to be generated

The impact that is anticipated from the current project, in terms of shifting power relations and flows of resources, is considerably ambitious considering the six-month project timeline. Such shifts can take many years and often occur through consistent and incremental actions to build relationships, foster trust and identify meaningful spaces for intervention. The current project builds off such long-term investments and will, in itself, provide an important starting point for expansion of what has been done before. However, it is only possible in this report to point to 'intended and emerging impacts' and 'initial observations'.

The design of the framework

Some practical considerations in relation to the design of the framework are as follows:



- A caution needs to be raised around the framework's *inherent assumption that 'co-production' is always the appropriate and/or desired approach* to achieve specific objectives. This is not always the case and for some communities, remaining outside of collaborative engagement processes may give them more leverage to achieve certain outcomes in specific situations. The framework should make this assumption more explicit and should create space to reflect on the level of impact achieved through a co-production approach.
- *'Party politics'* should be included as an explicit consideration along with other gender dynamics, social and cultural norms etc. In countries like South Africa, party politics can have a significant impact on the extent to which communities will engage in processes and the level of uptake and support for projects and interventions.
- *Accessibility of the framework*: It is important to consider that many users of the framework will likely be practitioners. Many of the tables that were used for the early context analysis are extremely detailed and conceptually complex, particularly for those not accustomed to adopting more analytical approaches to their work. It might help to simplify some of the tables so that the rationale for the questions being asked is clearer. Alternatively, considering a simpler set of critical guideline questions could help to focus discussions on the most important issues and relationships. Terminology could also be simplified. For example, terms such as 'modalities of co-production' will likely be unfamiliar to those outside of academic environments.
- The *biophysical* component of the context analysis is currently less well developed in comparison to other components. Further thought needs to be given as to how to strengthen these inputs within the framework.

The application of the framework

A number of factors should be considered in relation to how the framework is applied:

- The framework describes a process of analysis that is somewhat linear in nature, with little flexibility at present to adapt and shift, particularly in light of emerging findings through community engagements for example. In reality, it is likely to be a far more *complex and iterative process*, undertaken over longer periods of time.
- The *extent of 'co-production'* under the current framework is unclear. Much of the analysis was framed by the SECURE framework and initially strongly desktop based so was not co-produced with those who would be involved in the intervention/s. In addition, domains of action were identified early, to inform more focused application of the framework. There are important advantages to doing this, but this is not a 'strictly' co-production approach.
- There is a *tension between power and co-production*. The framework is inherently trying to redress power asymmetries as part of achieving more impactful objectives. However, those same power dynamics will often undermine the ability to co-produce the design of an intervention. Such tensions need to be carefully considered.
- An important consideration is *'Who uses the framework?'* As alluded to earlier, it is unlikely that policy-makers and practitioners will adopt the detailed and strongly conceptual/academic approach required by the very detailed multiple steps under the framework, underpinned by complex terminology that may not be familiar to practitioners



and community members involved in the co-production process. This re-emphasises the need to see how to simplify terminology and questions.

- In many contexts, particularly in complex informal settlements there is a significant amount of *contextual information that is unspoken and may never be fully understood*. A caution is that an upfront application of the framework in a new context would only *begin* the process of understanding the complex dynamics. It is critical to see this as an iterative process as one engages and learns more, to then inform future practices. Therefore, this requires that those who are designing co-production interventions, acknowledge that there are still significant gaps in their understanding, and build in opportunities to reflect on, and adapt to, emerging observations.

9. References

Bentz, J. Learning about climate change in, with and through art. *Climatic Change* 162, 1595–1612 (2020). <https://doi.org/10.1007/s10584-020-02804-4>

Boonstra, B. and Boelens, L., 2011. Self-organization in urban development: towards a new perspective on spatial planning. *Urban Research & Practice*, 4(2), pp.99-122.

Bradshaw, M. (2018). Natural Connections: Forest Schools, Art Education, and Playful Practices. *Art Education*, 71(4), 30–35. <https://doi.org/10.1080/00043125.2018.1465315>

Chinyavanhu, T., 2022. “OPINION | Thandile Chinyavanhu: KZN floods - Climate change IS a gender issue”. *News24*. 11 May 2022. URL: <https://www.news24.com/news24/opinions/columnists/guestcolumn/opinion-thandile-chinyavanhu-climate-change-is-a-gender-issue-20220511> [Accessed: 22 September 2022]

Culwick, C. (2019). Disasters and Disaster Risk Management in South Africa. In: Knight, J., Rogerson, C. (eds) *The Geography of South Africa*. World Regional Geography Book Series. Springer, Cham. https://doi.org/10.1007/978-3-319-94974-1_32

Eizenberg, E. (2019). Patterns of self-organization in the context of urban planning: Reconsidering venues of participation. *Planning Theory*, 18(1), 40-57. <https://doi.org/10.1177/1473095218764225>

Ernstson, H., Lawhon, M., & Duminy, J. (2014). Conceptual Vectors of African Urbanism: ‘Engaged Theory-Making’ and ‘Platforms of Engagement.’ *Regional Studies*, 48(9), 1563–1577. <https://doi.org/10.1080/00343404.2014.892573>.

EThekweni Municipality (2017) Durban’s Resilience Strategy.

Fraser, A. Leck, H. Parnell, S., Pelling, M., Brown, D. and Lwasa. S. (2017) Meeting the challenge of risk-sensitive and resilient urban development in sub-Saharan Africa: Directions for future research and practice, *International Journal of Disaster Risk Reduction* 26, p 106–109.



Gabrys, J and Yusoff, K. 2012. Arts, Sciences and Climate Change: Practices and Politics at the Threshold, *Science as Culture* 21, no. 1, 7.

Heeks, R. and Shekhar, S. (2019). Datafication, development and marginalised urban communities: An applied data justice framework. *Information, Communication and Society*, 22(7), 992-1011.

INR. (2023). “Integrating knowledge systems in flood-risk modelling for sustainable solid waste management and flood resilience in urban informal settlements in South Africa”, Situational Analysis Report, DEFRA-JNCC ENVIRONMENTAL POLLUTION PROGRAMME PROJECT SA 2.1, <https://inr.org.za/wp-content/uploads/2024/03/JNCC-FLOOD-RESILIENCE-AND-WASTE-MANAGEMENT-PROJECT-SITUATIONAL-ANALYSIS-REPORT.pdf>

Kasumovic, M.2023. Picturing Climate: Steps Towards embedding artistic practice into climate change research. *Teaching Beyond the Curriculum – Focus on Pedagogy 2023*.

Leibbrandt, M., I. Woolard, A. Finn. J. Argent (2009), “Trends in South African income distribution and poverty since the fall of Apartheid”. OECD Social, Employment and Migration Working Papers No. 101, January.

Liguori, A., McEwen, L., Blake, J., & Wilson, M. 2021. Towards ‘creative participatory science’: exploring future scenarios through specialist drought science and community storytelling. *Frontiers in Environmental Science*, 8, 589856.

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.

Parsons, M., & Pratt, S. 2024. *Art-based Climate Resilience Toolkit*.

Pharoah, R. (2016) *Strengthening urban resilience in African cities: Understanding and addressing urban risk*, ActionAid.

Pinto, I., Zachariah, M., Wolski, P., Landman, S., Phakula, V., Maluleke, W., Bopape, M.-J., Engelbrecht, C., Jack, C., McClure, A., Bonnet, R., Vautard, R., Philip, S., Kew, S., Heinrich, D., Vahlberg, M., Singh, R., Arrighi, J., Thalheimer, L., van Aalst, M., Li, S., Sun, J., Vecchi, G., Yang, W., Tradowsky, J., Otto, F.E.L. & Dipura, R. (2022). Climate change exacerbated rainfall causing devastating flooding in Eastern South Africa. *World Weather Attribution*. Accessed at: <https://www.worldweatherattribution.org/climate-change-exacerbated-rainfall-causing-devastating-flooding-in-eastern-south-africa/>

Roberts, D., Boon, R., Diederichs, N., Douwes, E., Govender, N., McInnes, A., ... Spires, M., 2012. Exploring ecosystem-based adaptation in Durban, South Africa: “learning-by-doing” at the local government coal face. *Environment and Urbanisation*, 24(1), pp. 167–195.

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.



Sutherland, C., Nel, E., Nel, A. and Hill, T. (2024) Countering urban binaries within a third space: Durban, South Africa’s experience as a counter-city, *Cities*, 152, 105165.

Sutherland, C. and Odili (2024) Durban residents’ perceptions of wastewater reuse, report prepared for Swedish Research Council.

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., Roberts, D., and Douwes, J. (2019a) 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., Mazeka, B., Buthelezi, S., Khumalo, D., Martel, P. (2019b) Making informal settlements ‘visible’ through datafication: A case study of Quarry Road West informal settlement, Durban, South Africa, Development Informatics Working Paper Series, Paper No. 83, Centre for Development Informatics, Global Development Institute, University of Manchester, UK.

Williams, D., Manez 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.

10. Annexures

Annexure 1:

Annexure 1: Mapping actors and lines of influence and exchange

Actors	Roles and functions	Connections to, and implications for, the domain
National Government and Provincial 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 	Relevant legislation outlines the need for community-based (or other) early warning systems. Such policies are an enabler to expand the CBFWS and to motivate for more support from sub-national government in such expansion to other communities.



Actors	Roles and functions	Connections to, and implications for, the domain
<p>Sub-National Government:</p> <p>Local government - eThekweni municipal council, mayor, executive or mayoral committee, ward 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 Mandated to develop and implement the IDP and Spatial Development Framework Mandated to provide services Disaster Risk Management Environmental Planning and Climate Protection</p>	<p>The service delivery mandate of local government is a potential enabler for the rehabilitation of the damaged area in the informal settlement (if the plans align with planning requirements and if resources are available) but could also be a barrier, if what the community is planning does not align.</p>
<p>Academia and Research Institutions</p>	<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 <p>Connect knowledge, expertise and capacities from informal settlements to citywide actors and institutions</p>	<p>Connect knowledge and expertise and act as an intermediary for facilitating mediation across the communities and between communities and external actors.</p>
<p>NGOs</p> <ul style="list-style-type: none"> · 	<p>Supporting advocacy, research and action by coordinated groups.</p> <ul style="list-style-type: none"> · 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>Addressed in column 2 and also acts as an intermediary for facilitating mediation across the communities and between communities and external actors. This can help to strengthen communications linked to early warning systems and leveraging resources to enhance community assets (in this case rehabilitating a damaged section of the informal settlement).</p>
<p>Informal Settlement 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 	<p>Potential to support knowledge exchange and networks across informal settlement communities as part of learning exchanges aimed at upscaling the CBFWS approach. Exact role (including possible data</p>



Actors	Roles and functions	Connections to, and implications for, the domain
	<ul style="list-style-type: none"> · Data generation, profiling and enumeration 	contributions to inform the domains of action) still needs to be determined through field work.
Community leaders, religious and traditional structures: traditional leaders, chairperson, community leaders CBOs Youth groups Women's groups Savings group	Organise committees and lead decision-making <ul style="list-style-type: none"> · Responsible for the regulation of customary laws in their community. 	Diverse groups that each have considerable impact on domains. These need to be further unpacked through analysis of empirical data.
Private Sector and Consultants Including consortia of foreign companies funded by international partners	Research, advisory services, support for interventions and services <ul style="list-style-type: none"> · (re)building urban structures · supporting development of municipality policies 	Potential enabler for the rehabilitation of the damaged area in the informal settlement and CBFWEWS through providing advisory services, sharing resources and knowledge (as part of Corporate Social Investment), and supporting governance as a 'neutral' intermediary. Direct implications for community assets through potential funding element.
International/ development partners and philanthropic institutions	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 	Direct implications for community assets and supporting effective governance through potential funding element.

An additional actor, not described in the above table is the Ratepayer Associations:

- Due to cultural/religious beliefs, members of communities surrounding the Quarry Road informal settlement (often belonging to RatePayers Associations) assume humanitarian roles during times of emergency – providing resources and help to “save lives”.
 - However, this supportive role to informal dwellers does not translate into supporting socio-economic development efforts that can stabilise the presence of informal dwellers, or give legitimacy to their claims over the land or service provision. Religious and community leaders can help to play a bridging role to support more long term development goals, with the potential of emancipation and redressing power asymmetries.
- They have an ability to offer a “security muscle” which translates into an influence over informal settlement influence.
- They own land, in some occasions some of which was originally occupied by informal dwellers, although this occupation tends to have been extended beyond the limits of their tenure today.



- Land tenure sometimes translates into rents being paid by informal dwellers.
- Ratepayers draw on ‘cheap labour’ from informal dwellers – which besides being a form of economic exploitation and socio-economic vulnerability, also is a form of income for informal dwellers. These are all key elements shaping power relations and influence over decision making that require further exploration.
- Paying taxes seems to grant ratepayers association leverage over government officials, sometimes demonstrated through their ability to block government projects.



Annexure 2:

Annexure 2: Weak connections and blockages to collaboration

Actor groups where weak connections exclude vulnerable groups	Blockages	Strong influence capacity of other actors that further weakens this link	Potential interventions and the impact of strengthened connections
Informal settlements - Ratepayers Association	<p>Informal status prevents informal settlers joining. Existing interests (land ownership etc) Ethnic barriers to unity</p> <p>Block some kinds of interventions in informal settlements/secured governance, yet support fire/humanitarian response (e.g., to protect their interests [own the land], security and control in their neighbourhood, kindness/religious beliefs, labour dependence)</p> <p>Own form of informal governance; but also affect formal spaces e.g., through their representative ward councillors, via community mobilisation, ability to pay rates.</p>	<p>Bring them on board to ensure that they support (not block) efforts to develop the informal settlement.</p> <p>E.g., Strengthen narrative of informal settlements as pillars of the community through labour relations (and shift away from conflictual/exploitative relations).</p> <p>Leverage religious leaders to move ratepayers associations from the humanitarian to the development space; Religion as a device to transcend potential conflicts.</p>	<p>Create platforms and mechanisms for improved communication and accountability between rate payers associations and informal settlement communities</p> <p>Having ratepayers associations more supportive of informal settlements might help ensure the sustainability of co-produced asset rehabilitation interventions in the community. . Strengthened relationships could also facilitate information exchange and additional networks of support when the CBFWEWS flags imminent flooding.</p>
Ward councillors - local communities - local government	Councillors control over resources, lack of accountability, ineffective communication , community needs not communicated to local gov , corruption		<p>Create platforms and mechanisms for improved communication and accountability between ward councillors, ward committees and communities and local government.</p> <p>A strengthened connection with ward councillor might facilitate better access to disaster resources when these are needed.</p>



Actor groups where weak connections exclude vulnerable groups	Blockages	Strong influence capacity of other actors that further weakens this link	Potential interventions and the impact of strengthened connections
Communities and funding bodies/funders	Access, awareness, regulatory barriers etc	Government bodies often have direct access to and prioritise links with funders	Bridge builders/intermediaries support links with funders



Annexure 3:

Annexure 3: Analysing drivers and blockers to collaboration and exchange

Implications over influence capacity and exchange of resources and knowledge?					
Link between pair of actors/Institutions (name both)	Access and control over resources and Institutions	Incentives	Blockers (regulation, culture, vision, framing,	Enablers (Vision, framing, regulation, culture, etc)	Potential Interventions
Municipality - informal settlement communities - NGOs - intermediaries	Municipality controls the main resources and institutions that shape urban development and action within the domain of action.	Resilience Building across the catchment - to floods Saving lives	Regulation, conflicting priorities, ineffective communication, lack of trust	eThekweni municipality has developed a set of principles for all riverine interventions to ensure gender- and inclusion sensitive design. The principles contributed to the cooperative businesses approach aiming to provide economic opportunities to vulnerable communities living along the rivers. DRAP and other well established governance platforms that can build on Willingness to collaborate	CBFEWS is emerging from the platform - joint interest
The bridge		Collectively shape interventions in the Palmiet River Catchment	Perceived as State extension (?) in some instances	Shared desire to benefit interventions in the catchment, at least on paper. Does this apply to both proposed interventions in question?	
Ward Councillors - Informal settlement group			Political association	Political association	



Weather services - CBFWS (Quarry Road)			Regulation that shapes the issue of CB-warnings.		
Ratepayers associations - Informal net (Islam/Hindu from India)	Land owners - rental from informal dweller Government programmes - for service provision Security muscle - they can control crime - This gives them influence over the community Local resources - to support security Other times external/NGO/research	Life concern is bringing them onboard Neighbourhood role: protection of their land Culture/Religion - value of saviours/saving life/Humanitarian	Ethnicity - Dominant with respect to other groups	They operate as informal government Space proximity (Domestic) Labour / cheap labour - Rental over the land	Sometimes they respond to fire - emergency response
Rate Association - Government	Associated to the opposition party - extension of political groups Not necessarily visible all the time	Political incentive Social mobilisation		Sometimes political representation Paying taxes - Incentive for influence	
Informal Settlement Groups - Neighbouring community	self-mobilising capacity - close the neighbourhood if decided				
Religious leaders - Ratepayer				Transcending conflict lines	



Informal Settlement - Age groups					
Different political groups					
Formality and informality shape other					
Quarry Road - Palmiet River Catchment					
Pholani - Quarry Road					
Informal settlements - municipality					
Academic informal settlements			Academic/researchers interested to document/cover, disregarding/not fully recognising community ownership. In Quarry Road there are longstanding trust-building relations; might not translate to a new context.		
Informal settlement groups - WhatsApp group	WhatsApp group - women's leaders			White power-deployed to influence the State	