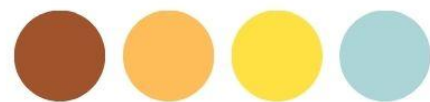




Quarry Road West



INACCT Resilience

*Designing Inclusive African
Coastal City Resilience*

Integrated climate change risk, resilience & disaster response profile – urban informal settlement



1. Settlement dashboard

Field	Information
Settlement name	Quarry Road West
NUSP Category ¹ (Durban)	Category C
Location (city, ward, GPS)	Durban, Ward 34, 29°48'15"S 30°57'58"E
Catchment	Palmiet River Catchment
Year established	1987
Settlement type	Informal
Population estimate	Approximately 4500
Number of sections / zones	4
Number of households	1100
Structure of households	Basic materials (wooden poles, planks, zinc) with some brick houses, 15% double storey dwellings
Layout and density	High density, narrow pathways, road access for 30% of households on the northern and southern side.
Tenure status	Majority of households registered with Human Settlements Unit.
Main livelihoods	Informal and formal due to central location; integration with urban and rural economy.
Key physical features	Located on a flood plain. Low gradient, settlement on banks of the Palmiet river.
Access to services	Communal ablution blocks (poor condition and limited), communal water points (and illegal water connections), free basic water, formal (south of river) and informal (north of river) electrical connections, previous waste management system partially functional, surrounded by roads and freeways, loss of trees (ecological infrastructure),

¹ The National Upgrading Support Programme (NUSP) in South Africa categorises informal settlements into four main types (A, B1, B2, and C) based on their feasibility for in-situ upgrading or the need for relocation.

	no access to communal hall, located within a well-established middle-class neighbourhood, access to Wi-Fi.
Main environmental and climate hazards	Thunderstorms, cut-off low pressure systems with intense, prolonged rain, heat, wind.
Main impacts of environmental and climate hazards	The settlement is located in the flood plain in the lower reaches of the dynamic and fast rising Palmiet River. The settlement experiences flooding from the river, a high-water table (inundation), flooding from roads, and flooding from intense and prolonged rainfall events. Heat is becoming an increasing impact in the dense settlement which has lost many of its trees through fires.
Trend/pattern observed for climate hazards	Increasing frequency and severity of flood events (from rainfall). Increasing number of days experiencing intense heat.
Key vulnerabilities	Precarious and challenging living environment due to socio-economic risk: high levels of poverty and inequality; social challenges within the community including crime, narcotics; trauma and fear related to fires, flooding and crime. Loss of land as a result of flooding leads to densification and a shift from ownership of houses to renting. No insurance, loss and damages require personal reinvestment, which residents limit due to fear of further loss.

	Physical: Dynamic and fast-rising river; flat landscape; lower end of sub-catchment; hole created by 2022 floods. Political: Power alliances require navigation and negotiation. Environmental: Loss of trees and banks, poor waste management, poor sanitation, waste and pollution from upstream.
Key actors involved in the settlement	Area based committee, community-based researchers, municipal departments, universities, aid organisations, neighbours, ward committee, ward councillor, NGOs. High level of capacity within the settlement due to long-term engagement in climate adaptation practices.
Existing adaptation / DRR actions and level of development (e.g. active/ in progress)	Tyres to stabilise banks, carpets to stabilise sediment runoff, platforms for houses at entrances and edges, rehabilitation of hole created by the 2022 floods as a space of healing and hope, water pipes to divert water, tarpaulins over roofs, CBFEWS (including evacuation toolkit, educational posters), small-scale ecological infrastructure and waste management projects. Well-established settlement with strong relationships and social cohesion, good leadership through community-based researchers, who have agency. Strong and long-term relationships with UKZN, and ICLEI Africa. Close proximity to supportive but also sometimes controlling

	neighbours. Support from DMC, NGOs, NPOs and the university post-disaster.
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2. Settlement risk analysis

The settlement risk analysis has not been undertaken for individual households or the four sections, but rather for the settlement as a whole (settlement scale).

Hazard	Exposure	Main vulnerabilities	Estimated level of risk (<i>Risk is the product of the hazard, exposure & vulnerability/ capacity</i>)
Floods	High: Much of the settlement is located on a low-lying river floodplain.	Spatial proximity of households built with basic materials on river sand on banks adjacent to the river, which rises and becomes dangerous after 40 mm of rain in the middle catchment. Limited access to stormwater management systems, lack of financial resources, high densities, low levels of defensive infrastructure.	High
Heatwaves	Medium: Increasing heat stress during summer, spring and autumn	Loss of trees, household structures do not reduce heat due to poor ventilation, high density of households, household	Medium

		materials increase heat within structures, limited open spaces.	
Drought	Low: Lack of access to water services if water security in Durban is reduced due to a) droughts or b) water rationing due to a decrease in bulk water as a result of high levels of non-revenue water.	Dependence on municipality for free basic water.	Low
Fire	High: Nature and form of informal settlement and proximity to illegal electricity connections, indoor paraffin and gas stoves, and risk created through substance abuse and violence.	Household materials are highly flammable, high density of settlement, lack of water points to control fires, spatial connection of houses and increasing number of double stories creates neighbourhood risk.	High

3a. Existing capacities and resilience actions

Hazard	Existing capacities / resilience actions	Critical gaps/ needs
Floods	• Tyres to stabilise banks, use carpets to reduce water flow and stabilise sediment runoff, platforms for houses at entrances and edges, water pipes to divert water, tarpaulins over roofs, small-scale ecological infrastructure and waste management projects. • Trenches and pipelines constructed by community to improve drainage. • Community risk mapping, CBFEWS and initial identification of evacuation sites, development of clear response plan, including evacuation routes; communication material/ visual materials to alert broader community to risks and appropriate responses. • Storage of critical documents in safe boxes that can be located and moved quickly. • Well-established settlement with strong relationships and social cohesion, as well as leaders and community-based	Updated community-based risk mapping.

	researchers with agency. Close proximity to some helpful neighbours. • Strong relationships with University of KwaZulu-Natal and municipal officials in climate and environmental departments.	
Heatwaves	• Planting of trees to provide cooling in settlement, double story houses to gain access to air movement through settlement.	Understanding how to reduce heat risk through modifications to household structures, use of materials, location of windows and door, reduction of density of settlement, capacity building on how to deal with health impacts of heat waves.
Wind	• Use of bricks and heavy materials to avoid roofs collapsing or being blown away.	Improvement of structures to reduce impact of wind. Management of trees and cutting of at-risk branches and dead trees.
Drought	• Storage of water in containers within households.	Safety issues related to impact of

		droughts on health and hygiene.
Fire	• Methods to collapse houses quickly in close proximity of burning houses to reduce the spread of fire. • Monitoring and maintenance of illegal electricity connections. • Removal of dead branches of trees. Ability to remove burnt trees after fire is fundamental to future resilience of settlement. • Ability of able-bodied community members to respond quickly and move water through bucket systems to the point of the fire. • Storage of critical documents in safe boxes that can be located and moved quickly.	Improved water hydrant systems that are functional adjacent to and within the settlement. Fire response training. Provision of hose pipes that can connect to fire hydrants to be used by community based first responders.

3b. Additional scientific, technical and local information available for the settlement

- Obscape app, publicly available, which provides community based early warning system advisories, based on forecasting models and real time rainfall, with flood risk threshold identified for the settlement (1.6 m stream level at Birdhurst stream gauge).

- A GIS map of all households in the settlement was produced in 2017 using participatory GIS, which led to an accurate estimation on the number of households in the settlement.
- A series of drone maps that show changes in the settlement since 2018 (available from UKZN).
- A community-based risk map which includes where the 1: 100 flood line was produced for the settlement in 2017 (see Mazeka, B., Sutherland, C., Buthelezi, S. and Khumalo, D. (2019) Community-Based Mapping Methodology for Climate Change Adaptation: A Case Study of Quarry Road West Informal Settlement, Durban, South Africa, in Cobbinah. P.B. and Addaney, M. (eds) *The Geography of Climate Change Adaptation in Urban Africa*, Palgrave MacMillan).
- A Narrative of Home Report, which highlights the importance of place, space, identity and home in the settlement was produced in 2019 (see Sim, V., McCarthy, A., Buthelezi, S., & Khumalo, D. (2018). *Narratives of home and neighbourhood: Possibilities for reimagining urban planning exploring an in-situ upgrade: Quarry Road West informal settlement*. Report produced for Durban University of Technology, NRF Narratives of Home Project, Durban, South Africa).
- A SFINCS model has been developed by eThekweni Municipality for the Palmiet Catchment, which is an important input into the CBFEWS.
- eThekweni Municipality has corporate GIS shapefiles that provide information on local settlements.
- WhatsApp groups facilitate communication of early warnings from the municipality to the community, and local information/observations back into the municipality's technical systems to refine the forecasts (see O'Donoghue, S., Sutherland, C., Tooley, G., Bhengu, S., Martel, P., Mazeka, B., Douwes, J., Leck, H. Strachan, K., and Stow, R. 2025. Early Warning Systems for Disaster Risk Reduction in Informal Settlements: Durban's CBFEWS, INACCT Resilience Project Briefing).
- Stream gauges at Birdhurst and UKZN; rainfall gauge at Pinetown Club Lane and Dunkeld.

4. Governance and community institutions supporting disaster preparedness and response

Institution / group	Role in disaster preparedness & response	Strengths	Challenges / gaps
City Disaster Management Centre	Lead coordination of emergency response, evacuation, and relief operations. Convene Joint Operations Centre for SAWS Level 4 warnings ² .	Strong links to provincial authorities; clear chain of command.	Limited staff; dependent on external resources for large-scale disasters; is not always able to get on-site as quickly as needed in affected areas.
Climate Change Adaptation Branch	Intermediary. Co-produces knowledge with community-based researchers in QRW. Facilitates communication on the CBFWEWS WhatsApp groups between municipal officials and community residents.	Strong leadership in climate adaptation and disaster risk reduction. Develops policy and practice based on scientific and local knowledge in collaboration with multiple actors. Established and leads the PCRP.	Increasing climate risks has made DRR responses, most particularly climate adaptation, and learning more urgent. Climate Change Branch has a critical co-ordinating role to play.

² Level 4 warnings issued by the South African Weather Service (SAWS) indicate a lower likelihood event with significant impacts.

	Supports the Transformative Riverine Management Programme (TRMP) in the Palmiet catchment.		
Coastal Stormwater and Catchment Management	Manages the FEWS, which is integral to the CBFEWS.	Excellent and timely scientific and technical knowledge, which supports the CBFEWS.	Challenges of producing the granular, real-time data (e.g. rain, stream flow and radar) required to scale up the CBFEWS across the city.
University of KwaZulu-Natal	Intermediary. Co-produces research with community-based researchers in QRW and with municipal departments in eThekweni Municipality. Facilitates communication on the CBFEWS WhatsApp groups between municipal officials and community residents.	Strong relationships with residents and municipal officials from various departments, built over many years. Existing trust makes it easier to understand the settlement context and introduce projects/initiatives that could be helpful.	Does not always have full sight of the requirements of the Disaster Management Centre, which is a critical partner for upscaling the CBFEWS. Current support is centred in specific locations – this needs to be broadened, using other local actors.

			Need to sustain commitment to the community, as a result of the urban reform coalition that has been built, which offers significant potential for transformative change, achieved through ongoing research funding (which has to be sustained).
Neighbours	Critical first responders to assist communities during disasters.	Neighbourhood networks, cultural and religious support groups, relationships with community, community surveillance and monitoring.	Co-ordination is sometimes fragmented, but usually aware of community needs.
NGOs - e.g. Gift of the Givers, SA Red Cross	Support emergency response, evacuation, and relief operations.	Links with residents and intermediaries.	Co-ordination is sometimes fragmented. May overlap with or disrupt state responses. Politically may be perceived as being in competition to

			the state, this perception must be avoided, as all actors are required in disasters.
Community-based researchers	Highly capacitated community members who engage in research and implementation of a wide range of resilience and sustainability projects. Enviro-Champs form a subset of this group, they do environmental and social monitoring in the Palmiet Catchment	Embedded researchers and resilience leaders within the community.	Require ongoing funding, need to negotiate conflicts and contestations with other members of the community who may undermine their work.
Civil society organisations	Strong interest in building resilience and sustainability in the Palmiet Catchment, investing time and resources in river and catchment monitoring, and reporting pollution incidences to the municipality.	Local knowledge that supports citizen science through ongoing commitment and hard work across the catchment.	Adopts a particular position on river and catchment rehabilitation and disaster risk reduction, which can be contested by other stakeholders. Challenges municipality to address the cause

			not the symptoms but is struggling to turn this into municipal action and community level improvement.
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5. Community risk narratives: Integration of critical local knowledge

Community risk narratives highlighted the foundational principle that resilience and sustainability initiatives require sustained commitment and collaboration amongst all relevant stakeholders. Partnerships which facilitate co-produced knowledge for resilience solutions improve their ability to be tailored to, as well as embedded within, unique contexts. In Quarry Road West, examples of co-produced knowledge include:

- **Thresholds (in flooding context):** The Quarry Road West informal settlement residents, working with researchers and city officials, understand critical ‘threshold points’ at which specific impacts start to be experienced. For example, when the water level at the upstream Birdhurst stream gauge is over 1.6m, the river downstream at Quarry Road West breaks and scours its banks, and floods the settlement, undermining homes and other structures.
- **Time lags between stream gauge readings and downstream impacts:** For example, observations over time have shown that there is an estimated 40-minute lag time between the stream gauge readings at Birdhurst upstream of Quarry Road West and when these levels reach the settlement.

6. Additional thematic detail

6.1 Service access & infrastructure

Service	Access Level	Condition	Notes
Water	Limited formal access - communal taps.	Fair	Most residents use communal taps, however these are limited for the large number of residents in the settlement. Some residents have connected piped water to their households. EPIC A project fixed main tap point to support the community and the state due to lack of timeous response by eThekweni Water and Sanitation Unit (small pockets of third stream funding can create small but impactful responses).
Sanitation	Limited: 3 sets of CABS, only one is functional.	Poor	Sanitation interventions are urgently needed.
Electricity	Medium	Fair	Illegal and legal connections
Waste management	Low	Poor	Skips provided in one section of the settlement. Excellent proof of concept project that was managed by PPT and which ran for

			18 months, significantly improving the waste management of the settlement, which now is no longer running due to lack of continued funding. Litterboom in partnership with UKZN is working in the settlement. The CLARE-funded INACCT project is supporting the rehabilitation of the hole created by 2022 floods, which includes a waste intervention project.
Roads & access	Good	Good except where hole is, high level of risk for children going to school.	EPIC A, SHEFS-SA and CLARE INACCT cross funding the rehabilitation of the hole through engagement with the municipality and through investment in ecological infrastructure. The roads department has stabilised the hole and eThekweni Water and Sanitation Unit is fixing the sanitation leak, which has been there since the floods in 2022. Community members have kept the hole clear of waste and alien vegetation. Trees have

			been planted in the settlement.
Drainage / stormwater	Poor	Fair	Locally designed and managed storm water systems which reflect high levels of adaptation.

6.2 Key Livelihoods & Economy

Source of livelihood	Livelihood located in or outside the community	Impacts during a flood event
Informal sector activities	Within and outside the community.	Severely disrupted but very quickly re-established. Forms part of the support for the provision of food for example post a flood.
Piecemeal work	Some within the community and surrounding area e.g. short-term work from neighbouring community and government projects.	Some disruptions; residents are not able to work post a flood as they need to allocate all their time and labour to dealing with the water damage in the settlement and in their households, and in restoring order.
Formal work	Outside the settlement.	Community members are engaged in a wide range of formal employment activities, average daily wage for low level work is R150 per day, transport costs usually low due to proximity to major centres, require more detailed research on formal and informal work. Some formal work is short term contracts such as Enviro-Champs.

Trading	Between the settlement and rural areas of origin.	Extensive trading between informal settlement and rural areas of origin with a focus on food and goods such as clothing and cultural artefacts.
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7. Disaster response

7.1 Early warning systems

A CBFEWS was established in 2015 and involves a number of actors, including officials from eThekweni Municipality, researchers from the University of KwaZulu-Natal (UKZN), civil society and non-governmental organisations and residents from both formal and informal settlements within the catchment. The system relies on scientific and technical information (e.g. from the South African Weather Service, the municipal Forecast Early Warning System and radar) and real-time community data, to communicate more accurate flood warnings and updates via WhatsApp groups to those in the catchment, particularly the most vulnerable.

The CBFEWS uses rainfall gauges in the upper catchment to forecast flood risk for informal settlements in the lower catchment. Understanding time lags between stream gauge readings and downstream impacts, as well as co-developed critical 'threshold points' enable time-sensitive responses to minimise the impact of flooding. When flood risk is detected, this is communicated in an accessible and actionable format to informal settlement residents.

There are two WhatsApp groups: One between researchers and municipal officials who help interpret and translate the warning information into something relevant to the Quarry Road West community, who are represented on the second WhatsApp group. A newly developed flood response toolkit includes additional methods for communicating flood risk, including the use of loudhailers and whistles, as well as a colour coded flag system, which indicate various flood risk levels. This is supported by work done by Obscape who modelled correlations between rain gauge and stream gauge data, developing a simpler and more cost effective way of forecasting flood events. The Obscape app provides excellent early flood warning advisories for the Palmiet Catchment.

Alert Type	Responsible agency	Communication channels	Target audience
Advisory	CBFEWS	WhatsApp groups	Community members in Quarry Road West informal settlement
Warning	SAWS	Radio, city-wide SMS, social media	Public
Warning	eThekweni Municipality	Radio, city-wide SMS, social media	Public
Evacuation order	<i>Municipality's Emergency Response Team</i> Under extreme risk of floods, the CBFEWS, once SAWS has issued a warning	Radio, city-wide SMS, social media WhatsApp groups	Public Community members in Quarry Road West informal settlement

7.2 Preparedness measures in place

Activity	Summary Description	Lead community group
First responders	Some residents monitor river levels. Others have basic emergency kit items to use during a disaster event to communicate with the broader community, and support basic response measures (e.g. staying away from the rising river; evacuating etc).	Local resident group
Disaster Management Centre	Protocol in place to help by providing tents, sourcing alternate shelters,	

	recording those requiring assistance, including the provision of materials. Supports post disaster co-ordination in terms of external assistance and other aspects. Operates during and for two weeks post disaster and then disaster response and re-settlement then becomes the responsibility of the Human Settlements Unit.	
SALGA	Protocols in place to provide social assistance, (e.g. support for replacing IDs). Also supports municipalities to conduct damage and loss assessments and integrate findings into municipal recovery plans and IDPs.	
Social Development Department	Assistance with clinic cards and lost documentation for social grants, IDs etc	
Gift of the Givers, Red Cross	Protocols in place to provide food parcels, blankets.	
University researchers	Experience in DRR built up through long-term engagement with community members strengthens the ability to respond to needs as they emerge in relation to the context and nature of the disaster, by playing a facilitating and co-ordinating role. Ongoing development and documentation of knowledge for improved DRR.	

7.3 Critical access & transport routes

Route name	Status in flood / hazard	Alternate route	Notes
M19 Freeway	Flood water flows from the M19 freeway into the settlement, freeway experiences high water flows but does not flood.	Not currently required.	M19 offramp can flood and also is a place where community members evacuate to.
Quarry Road West	Flooding in sections of the road, severely damaged in 2022 flood.	No alternate route.	Impact of 2022 floods on this road has led to safety and mobility issues from the settlement to the road with many pedestrians now walking in the lane of the road
Mountbatten Drive	Limited flooding to date, used as an access and evacuation road.		

7.4 Vulnerable groups

Households located immediately adjacent to the Palmiet River, impacted by collapse of banks, households adjacent to freeway and Quarry Road West Road where stormwater flows off roads, all households due to inundation and poor stormwater management. Households that are home to those who engage in narcotics and alcohol abuse as they are not able to respond quickly. Households with children and the elderly.

7.5 Post-event recovery priority tasks

a. Immediate to short term tasks:

Task	Lead actor	Timeframe
Document loss and damages	Disaster Management Centre. Community leadership and community-based researchers.	Immediately
Restore water supply	eThekweni Water and Sanitation Unit.	2 days
Restore sanitation services	eThekweni Water and Sanitation Unit.	2 days
Ensure that electrical connections are safe	Municipal Electricity Department. Those who maintain illegal electricity connections.	2 days
Secure safe shelter, ideally with separate areas for men and women	Disaster Management Centre for the first 10 days.	Within first 24 hours
Provision of blankets and food parcels	Disaster Management Unit, Gift of the Givers, Red Cross, neighbours.	Within first 24 hours
Provide replacement documentation and provide social grant support	Social Development Department and SALGA.	2 days
Provide building materials for rebuilding of houses	Human Settlements Unit.	2 weeks
Rebuild homes	Community members.	From one day onwards
Psychological counselling	Ma'at Institute University of KwaZulu-Natal.	Within first week
Further improvement of CBFWS through	CBFEWS team (municipal officials, researchers, community members).	2 days

documentation of performance in the flood		
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b. Medium to longer term tasks:

Task	Lead actor	Timeframe
Replace and fix broken infrastructure	Relevant municipal departments.	> 3 months
Rehabilitate catchment and restore ecosystem services	TRMP in municipality.	> 3 months
Move community members out of temporary accommodation and relocate them to appropriate housing	Relevant municipal departments.	1 month
Psychological counselling	Ma'at Institute University of KwaZulu-Natal.	Six month interval re-visit settlement
Further improvement of CBFEWS	CBFEWS team (municipal officials, researchers, community members).	Ongoing

7.6 Key contacts

Role / function	Contact name	Contact number	Notes

8. Post-event review & lessons learned

This review and lessons learned should ideally capture lessons learned across stakeholder groups, including the Municipality, community residents/volunteers and others involved in the settlement during disaster events.

Date of event	Hazard	Key successes	Challenges faced	Actions to improve

9. Informing future interventions: Priority actions and research areas

Priority area	Specific action / research area	Lead actor	Potential partner/s	Time line	Status
Flood risk mapping	Lack of high-resolution flood hazard maps for informal	Local government (relevant department)	Local university GIS department. Community		In progress

	settlement zones.		members. Meteorological agency.		
Flood risk management	Revegetation of riverbanks.	Community Enviro-Champs.	Local NGO and university.	By Dec 2026	Nearing completion
Infrastructure resilience	Repair damaged road infrastructure.	City's Engineering Unit Roads Department.	University researchers and community members.	By September 2025	Completed
Infrastructure resilience	Repair damaged stormwater infrastructure and investment in ecosystem services.	Coastal Stormwater and Catchment Management.	University researchers and community members including Enviro-Champs.	Ongoing	Ongoing
Infrastructure resilience	Repair damaged CABS and sanitation services.	eThekwini Water and Sanitation Unit.			Not completed
Volunteer kits	First aid kits and food kits needed by community volunteers.	Local NGO/ Aid organisation University researchers.	Municipality's Disaster Management Centre, university researchers (SHEFS-SA).	By Dec 2025	Emergency food parcel protocol completed

10. Additional information

Recommendations for integrating and actioning risk profile insights

The climate risk profiles are designed to be updated to ensure relevance, accuracy, and uptake by local stakeholders. Part of ensuring the continued use and maximum impact of this profile is exploring recommendations for embedding it within the appropriate municipal workflows as well as encouraging engagement and inputs from relevant stakeholders that have not yet been consulted. Recommendations suggested to date include:

- Aligning post-event priority recovery tasks [see section 7.5] with eThekweni municipality's Disaster Management Centre's (DMC) institutional framework. For example, establishing how it relates to the Level 2 Disaster Management Risk and Response Management Plan, as well as how it will be implemented by the Centre when undertaking activities such as upscaling the CBFEWS to additional sites in Durban.
- Developing and maintaining a database of role players for flood resilience in Quarry Road West, including their responsibilities and contact details. This will ensure that this profile can be used effectively during a storm event.
- Working with DMC to develop a set list of characteristics for Section 6. Additional thematic detail, to minimise subjective interpretations and ensure consistency across profiles.
- Utilising corporate GIS for improved spatial data insights.

11. Updates to the risk and resilience profile:

This profile was last updated by:

_____ (Name) _____ (Date) _____

(Signed)

_____ (Name) _____ (Date) _____

(Signed)

_____ (Name) _____ (Date) _____

(Signed)

_____ (Name) _____ (Date) _____

(Signed)