RESILIENCE ASSESSMENT BENCHMARKING AND IMPACT TOOLKIT (RABIT)

Measuring Resilience in Marginalised Urban Communities: A South African Township Pilot Study

RABIT Working Paper No.1
ISBN: 978-1-905469-92-5

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2021

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Abstract
Marginalised urban communities need to build their resilience to environmental and social shocks and stressors. A first step in this process will be measuring the existing resilience strengths and weaknesses of such communities. Past approaches to this can appear constrained in their understanding of resilience, or may not convert resilience frameworks into quantified measures. This paper reports an initial pilot application of the RABIT (Resilience Benchmarking Assessment and Impact Toolkit) framework, which conceives resilience as nine attributes each with measurable markers. The framework was used to measure resilience of Masiphumelele, a South African township of formal and informal housing regularly disrupted by flood, fire, storms and violence. It found resilience strengths in self-organisation and scale of external connections; but weaknesses in robustness and equality. While the community is relatively good at the coping aspects of resilience such as response and recovery to shocks, it is poor at withstanding shocks and at transforming itself. The pilot drew from only a small evidence base; showed limited consideration of context, agency and power; and did not actualise the framework's potential for identifying community resilience-building priorities. Future use of the framework could therefore seek to expand the size, scope and levels of its application.

Keywords: resilience; urban; marginalised communities; informal settlements; South Africa

A. Introduction

Growth of urbanisation in developing countries has been accompanied by growth in marginalised urban communities: defined here as physical settlements with limited access to the economic and other infrastructure and opportunities of the city (Cahyani & Widaningsih, 2018). While such communities have a flexibility and dynamism that contribute positively to urbanisation, they are also uniquely vulnerable and susceptible to shocks – climatic, physical, economic, social, etc. – often because they are located in high-risk urban areas (Doberstein & Stager, 2012). The postulated solution to this vulnerability is to increase the resilience of such communities. Efforts to improve the resilience of marginalised settlements have often been externally-driven and narrowly-focused: for example, the activities of local government authorities to address individual vulnerabilities such as flood or fire or storm, etc (Satterthwaite, 2011). Alternative approaches see resilience in more holistic and endogenous terms as the systemic ability of a community "to withstand, recover from, adapt to and potentially transform amid short-term shocks and longer-term change" (Heeks & Ospina, 2019:75).

A key challenge for systemic approaches to resilience-building has been conceptualisation and operationalisation: how to frame resilience in a way that moves beyond individual shocks and vulnerabilities but which at the same time allows resilience to be measured in some way; for example, to allow prioritisation of interventions (Woolf et al., 2016). In this paper, our aim is pilot application of one resilience framework – the Resilience Assessment and Benchmarking Impact Toolkit (RABIT) – that offers a holistic but measurable approach. Initial application of the framework in a South African township particularly prone to fire and flood demonstrates its ability to measure community resilience and its potential value for prioritising resilience interventions but also identifies some limitations of its application.

In the next section, we review current knowledge on marginalised communities and resilience in further detail before explaining the RABIT framework. The case study settlement is described alongside our field methodology. Presentation of findings is followed by discussion and conclusions.

B. Resilience of Marginalised Urban Communities

The world has passed the urbanisation 'tipping point' with more than half the global population now living in urban areas; a figure estimated to rise to 70% by 2050 with urban growth fastest in Africa and Asia (UN-Habitat, 2010). This rapid urbanisation has consisted and will consist significantly of marginalised settlements: estimates have put the number of those in developing country cities living in such communities at around 900 million, or some 30% of the total urban population; a figure that may grow by up to 300 million per decade (UN-Habitat, 2016).

A key problem for such settlements is their vulnerability, with vulnerabilities arising from their marginality (a physical marginality arising from being in high-risk locations often rejected for housing by other urban residents due to their precarity but also economic and political marginalisations), their informality (e.g. their limited connection to energy, water, transport, security, health and related infrastructure), and their density of housing (Roy &

AlSayyad, 2004; UN-Habitat, 2015; Patel et al., 2019). These vulnerabilities are often understood in relation to specific physical shocks: natural hazards like floods (De Risi et al., 2013) and landslides (O'Hare & Rivas, 2005) and more directly human-made hazards like fire (Arup, 2018). Some of these short-term shocks – floods, rain-triggered landslides, other storm damage – are being exacerbated by the climate trend of global warming (Baker, 2012). However, these shocks are not the only ones that marginalised settlements face: they may face economic shocks e.g. from wider recession or depression, and varieties of social shocks including waves of crime and violence, or the spread of disease (Marais, 2009; Taleshi, 2009; Sverdlik, 2011).

The broad range of shocks and also the underlying vulnerabilities that may be seen to either cause or at least exacerbate the impact of those shocks have led to a perceived need for a more holistic approach to marginalised settlements. This need has been accelerated by the perceived failure of many externally-driven, technical and shock-specific interventions (Satterthwaite, 2011; Bahadur & Tanner, 2014; Fraser et al., 2017). One widely-used and more-holistic approach draws on the idea of the resilience of communities; seeing communities as systems and seeing resilience as a property of those systems. Literature on resilience and marginalised settlements highlights one or more of four threads of resilience (Torabi et al., 2017). The first is a maintenance of the status quo; withstanding some disturbance such as a short-term shock. The second is a return to a prior state; recovery following the impact of a short-term shock ("bounce back"). The third is some element of systemic change; adapting to longer-term trends ("bounce forward"). One criticism of the application of resilience in relation to marginalised communities is that it is a resilience of stasis; a resilience that sees these communities surviving but never challenging their marginalisation (Béné et al., 2018). Thus, a few sources have begun to add a fourth thread, which is for a resilience of transformation that allows for not just an adaptation of survival but for change that challenges current urban inequalities. From this, one can define resilience as above: the systemic ability of a community "to withstand, recover from, adapt to and potentially transform amid short-term shocks and longer-term change" (Heeks & Ospina, 2019:75).

A first problem is that there has been far too little work to date seeking to understand the resilience of marginalised urban communities:

> "…with few exceptions … the urban resilience literature has chosen to avoid embracing any strong social justice element and to promote (or at least acknowledge) more explicitly the needs and interests of the most marginalized and disenfranchised urban groups." (Béné et al., 2018:129)

What limited work there has been on resilience and the urban periphery has often not defined resilience or used it only as a metaphor or goal (Béné et al., 2018). Where work has sought to apply a systemic understanding of resilience to marginalised settlements (e.g. Seeliger & Turok, 2013; Dobson et al., 2015; Satterthwaite et al., 2020), it has faced two main challenges: conceptualisation and operationalisation (Woolf et al., 2016).

Conceptually, the systemic view of resilience has typically been developed through the identification of various sub-properties – or "attributes" – of resilience (Torabi et al., 2017). For example, Amoako (2018) argues that "self-organisation" and "learning" within informal

urban communities and "scale" of multi-level networks constitute their resilience. Merilainen (2020) states "robustness" and "self-organisation" make up the resilience of low-income urban settlements. Fayazi and Lizarralde (2013) cite "redundancy", "robustness" and "resourcefulness" as the basis for resilience of low-cost housing communities. Desportes et al. (2016) identify "redundancy", "resource diversity" and "flexibility" as the constituents of resilience of informal settlements. Each of the individual conceptualisations of resilience of marginalised urban communities provides a useful insight. However, when viewed in aggregate it can be seen that each individual study is only partial in its coverage of the overall set of resilience attributes that exist. There should therefore be value in integrative resilience frameworks that merge together past conceptualisations into a unified and potentially more comprehensive perspective.

The second challenge has been to operationalise resilience frameworks. Systemic, integrated frameworks of resilience of relevance to marginalised settlements have been presented but used for underlying understanding, not as the basis for measurement of resilience (e.g. Seeliger & Turok, 2013; Dobson et al., 2015). As a result, "field agencies and their staff have found it challenging to develop practical operational approaches out of the diversity, complexity and subtlety of resilience thinking" (Woolf et al., 2016:281). There may therefore be value in operationalised resilience frameworks with a demonstrated measurement methodology.

In this paper, we thus sought out an integrative, operationalised resilience framework that could be put into practice in a marginalised urban community. The chosen framework was RABIT: the Resilience Assessment Benchmarking and Impact Toolkit. It is integrative; being based on a review and consolidation of resilience attributes from multiple prior conceptualisations of resilience (Ospina, 2013). The RABIT framework consists of eight resilience attributes. Three are foundational: "integral to the conceptualisation of a resilient system and almost always present within any decomposition of resilience as a system property"; five are enabling: "while not universally discussed, these appeared in multiple sources and were seen to facilitate operation of the foundational attributes" (Heeks & Ospina, 2019:75).

It is also operationalised; having been utilised in a middle-income urban community but not yet in a marginalised settlement (Heeks & Ospina, 2019). The operationalisation derives from the association of each attribute with a set of markers that can be used as measurable indicators. The framework is summarised in Table 1.

Resilience Attribute	Definition	Key Markers/Indicators
FOUNDATIONAL ATTRIBUTES		
Robustness	Ability of the system to maintain its characteristics and performance in the face of contextual shocks and fluctuations.	• Physical preparedness • Institutional capacity • Multi-level governance
Self-Organisation	Ability of the system to independently re-arrange its functions and processes in the face of an external disturbance, without being forced by the influence of other external drivers.	• Collaboration and consensus-building • Social networks • Local leadership and trust
Learning	Capacity of the system to generate feedback with which to gain or create knowledge, and strengthen skills and capacities necessary to experiment and innovate.	• Capacity building • New and traditional knowledge • Reflective thinking
ENABLING ATTRIBUTES		
Redundancy	Extent to which components within a system are substitutable; for example, in the event of disruption or degradation.	• Resource spareness • Functional overlaps and interdependency • Resource substitutability
Rapidity	Speed at which assets can be accessed and mobilised to achieve goals in an efficient manner.	• Rapid resource access • Rapid resource assessment/ coordination • Rapid resource mobilisation
Scale	Breadth of assets and structures a system can access in order to effectively overcome or bounce back from or adapt to the effects of disturbances.	• Multi-level networks • Resource access and (intra-/inter-level) partnerships • Cross-level interactions
Diversity & Flexibility	Ability of the system to undertake different courses of actions with the determinants at its disposal, while enabling them to innovate and utilise the opportunities that may arise from change.	• Different courses of action/emerging opportunities • Adaptable decision-making • Innovation mechanism
Equality	Extent to which the system affords equal access to rights, resources and opportunities to its members.	• Strengthened competencies/gap reduction • Inclusiveness • Openness and accountability

Table 1. The RABIT Resilience Framework

C. Case and Methods

To investigate use of this new resilience framework in a marginalised urban community, we focused on South Africa. It is estimated that roughly 20% of South Africa's population does not live in a formal dwelling; representing some 10 million people at the time of survey in the mid-2010s (SERI, 2018). Of these at least 3 million are estimated to live in informal settlements with the actual number "likely to be significantly higher", and around half that number again live in the backyards of formal housing (SERI, 2018:6). Looking specifically at our focal location of Cape Town, "20.5% of Cape Town's households live in informal dwellings – with 7% in informal backyard structures and 13.5% in informal settlements. We

expect this amount to rise steadily as more and more people move to the city looking for work" (CCT, n.d.). As in other countries, however, urban marginalisation in South Africa is not restricted to informal dwellings (Pieterse, 2019). For example, it is estimated that a further 40% of South Africa's population lives in "townships": "commonly understood to refer to the underdeveloped, usually (but not only) urban, residential areas that during Apartheid were reserved for non-whites" (Pernegger & Godehart, 2007:2). As "underdeveloped" suggests, townships are sites for physical, infrastructural, economic, political and other forms of urban marginalisation (Jensen, 2004; Jürgens et al., 2013).

To reflect the current profile of urban marginalisation in South Africa, we therefore wished to undertake research in a location that was a township and also incorporated informal dwellings including areas of informal settlement. Masiphumelele – a small (c.0.45 km^2) community in the southern part of Cape Town Municipality – met these criteria. It was also selected because of local organisational contacts and because it had recently suffered a number of shocks, including flood, fire and violence.

Masiphumelele originated with a few hundred people in the 1980s who went through cycles of forced removal and return until the area was designated as a township in 1990 (Masicorp, n.d.). It then grew to around 8,000 people by the turn of the century. The formal census recorded roughly 22,000 inhabitants in 2011 of whom roughly three-quarters lived in informal dwellings, though one survey put the population size at almost twice that (Tyler, 2011). More-recent sources quote figures up to 45,000 for the population (Masicorp, 2019). The area has been categorised as follows (see also Figure 1):

> "Masiphumelele is made up of three different housing areas of which, the 'Formal' area makes up the largest portion (approximately 0.37 km^2); the Formal housing area also includes a large group of 'Backyard' residents. The informal 'Wetlands' area in the north and the 'Temporary Relocation Area' (TRA) on the western boundary, make up the rest of the settlement." (Tyler, 2011:20)

Examples of both informal and formal housing in the township are shown in Figures 2 and 3. Following the dissolution of the apartheid government in 1994, three phases of government-funding formal housing development projects (Phases 1-3) have been completed in the community, with work on Phase 4 being conducted in the Western section and due to be completed by 2021.

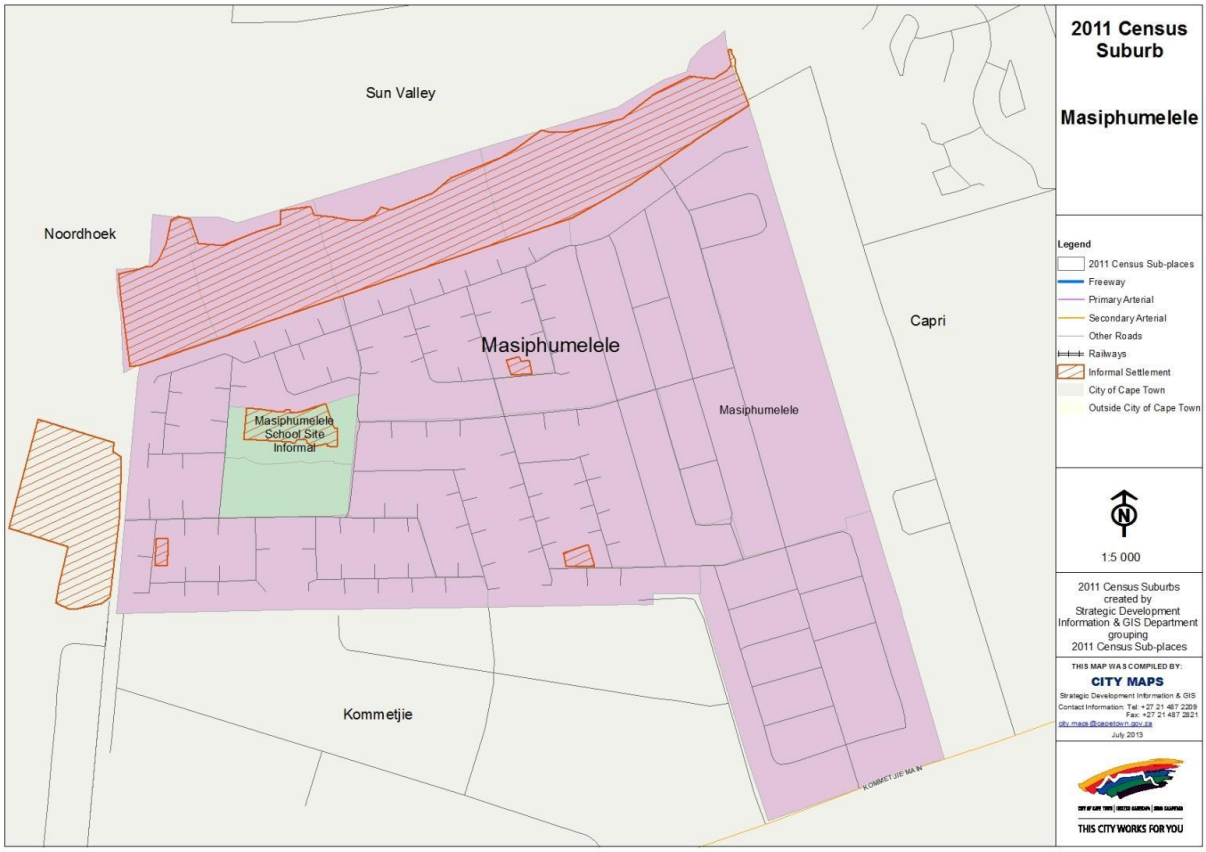

Figure 1. Census Map of Masiphumelele (CCT 2013)

Figure 2. Masiphumelele Informal Settlement (Cape Argus 2017)

Figure 3. Masiphumelele Formal Housing (Römmelmann 2018)

Boundary restrictions to the South, East and West of Masiphumelele have meant the only expansion can occur northwards, into the Wetlands area, exposing residents to high risk of flooding. The settlement was twice hit by floods during 2019 and flooding has been a regular feature in previous years (e.g. Ntongana, 2016; Feni, 2018; Luckhoff, 2019; Zama, 2019); see also Figure 4. Housing density and use of domestic fuel (particularly paraffin) for heating and cooking has also made settlements like Masiphumelele vulnerable to fire hazards (Harte et al., 2009). Fire has been a recurrent problem, with three major conflagrations occurring in Masiphumelele during the period Jul 2019 to Jan 2020 that killed four people and destroyed hundreds of homes (Fisher, 2019; Gontsana, 2019, Seleka, 2020). Masiphumelele also needs to build resilience against other stressors including violent protests and crime (Bothma, 2015; Freedom House, 2017). It therefore has a fairly typical marginalised urban community profile in terms of shocks and stressors.

Figure 4. Informal Dwellings and Refuse/Sewage Deposits in Drainage Channels in Wetlands Area (flood-water level denoted by resident) (Author Haley)

Methods

Pilot application of the RABIT framework involved a two-stage approach. In the first stage, qualitative data were collected in July 2019 via five semi-structured interviews with stakeholders that worked in Masiphumelele community organisations, in order to establish the researcher's familiarity with the community. Findings from this helped understand some of the key shocks and stressors affecting the community, as well as key community institutions. These helped guide the development of both content and process for the second stage.

The second stage consisted of a four-section questionnaire, applied as a structured interview (see Appendix 1). The first section presented open-ended questions that established local context – positive aspects and perceived strengths of the community, perceptions regarding challenges facing the community, and moments of crisis or times of emergency that had been encountered. The second section presented open-ended questions that established the interviewees' perceptions of the role of climate change in the community and the local response, given concerns that climate change may be a significant exacerbator of stressors and shocks in marginalised urban communities (Béné et al., 2018).

The third section presented questions drawn from the three foundational and five enabling resilience attributes of the RABIT framework presented above. Questions were designed in relation to the markers for each attribute as laid out in Table 1 but with some expansion and local customisation based on the findings of the first-stage interviews. Examples leaned

towards specific expression of shocks such as flood and fire, since it was found that interviewees responded more readily when they could link to concrete issues that had impacted the community. Interviewees were asked to rank the community's perceived strength as it applied to each marker statement using a 3-point Likert scale (strong, average, weak) and to elaborate upon their responses where appropriate. The final section of the interview consisted of further open-ended questions about impact of and preparedness for weather events such as storms and flooding. It was only applied when the interviewee had available time.

In all, ten interviews were conducted for this pilot application, during August-September 2019 using a convenience sampling approach. All were residents of Masiphumelele and sourced through contact with two local non-profit organisations: IkamvaYouth and The Township Sisters. Interviews were conducted at the Masiphumelele Public Library, recorded, and then transcribed. Respondents were compensated for their time with an airtime voucher after interview completion. Data analysis consisted of basic numerical manipulation of the quantitative data; and coding of the qualitative data against the resilience attributes and against key community themes.

Details of the second-stage interviewees are presented in Table 2. Though too small to be statistically representative, the sample's profile was a reasonable reflection of the community in terms of gender, age and nationality but an under-representation of those living in informal residences, and of those who are unemployed. All interviewees were black African, which was the profile of 91% of Masiphumelele residents in the most-recent census (CCT, 2013).

Code	Gender	Age	Nationality	Residence	Employment Status
SM19	Male	19	South African	Formal	Employed
SF21	Female	21	South African	Formal	Employed
SF27	Female	27	South African	Formal	Employed
SF34	Female	34	South African	Informal	Unemployed
SM35	Male	35	South African	Informal	Employed
ZM35	Male	35	Zimbabwean	Informal	Employed
ZM36	Male	36	Zimbabwean	Informal	Employed
SF42	Female	42	South African	Formal	Employed
SM44	Male	44	South African	Formal	Employed
SF57	Female	57	South African	Formal	Employed

Table 2. Demographics of Interviewees

D. Findings

A key question asked about urban resilience is "resilience to what?" (Sharifi, 2019). Our initial assumption, given presence of the wetlands in Masiphumelele, was that flooding would be the main shock. In practice, it was concern about resilience to fire that was discussed by far the most: three times more than all other issues combined, with everyone having direct experience (for three respondents) or via friends:

> "For me, fire is the most scary – it is the most common and most scary. … I have two people that I have worked with (one work, one in the church) – their houses burned down. And after a year later, that thing still haunts them. It was a day like this, we were at the training centre, and this girl screams "FIRE FIRE FIRE" out of the blue. And then she collapsed and was rushed to the hospital. And there was no fire. So that's psychological damage – it goes that far. Twice her house burned down; the first time was built by Habitat for Humanity. After the first house was burned down, she took years to rebuild the house and the same thing happened again. It took a strain on her." (SM44)

Floods had only been directly experienced by two respondents; as with fire, this may reflect the bias of the sample towards formal-dwelling residents. Even though the impact of flooding is not uniform throughout Masiphumelele, every respondent demonstrated an awareness of the health and safety hazards for those who were subject to floods. Four discussed storm damage to roofing, and two discussed drought – something which hit Cape Town during the early part of 2019. Then there were more social shocks and stressors with five mentioning crime or violence as issues within the community.

To understand more about the resilience of the community to these disruptions, the survey responses were converted into scores by awarding two points for a response of 'strong', one point for a response of 'average', and no points for a response of 'weak' against each of the attribute markers that formed part of the questionnaire. The individual interviewee score for each marker was then averaged across all ten interviewees. In turn, an attribute score was derived from averaging the average scores for each of that attribute's markers. The results are shown in Table 3. We chose to highlight those markers scoring 0.4 or below (particularly weak), and those markers scoring 1.4 and above (particularly strong): five in each of those two categories. An overall visualisation of attribute scores is shown in Figure 5, marking those below 0.7 as red and those above 1.0 as green. We acknowledge that the small sample size means results should only be seen as indicative, and as a demonstration of a quantification process that would need to be replicated on a larger scale for more robust results.

Attributes & Markers	**Score**
Robustness	**0.62**
Community preparedness to respond to disasters or climatic events/emergencies	0.6
Availability of physical infrastructure/physical measures that have been adopted in the community to prevent damage in case of climatic emergencies	0.3
Contact and coordination between members of the community and institutions that operate in this area (e.g. committees, local authorities)	1.2
Preparedness of the community's infrastructure/ housing to the impact of climatic emergencies or events	0.8
Availability of laws or policies that help to reduce the risk of the community to climatic events	0.2

Attributes & Markers	Score
Self-Organisation	**1.13**
Capacity of the community members to organise among themselves, in case of crisis or problems	1.6
Degree of trust among members of the community	0.5
Social networks or networks of collaboration operating in the community	1.5
Membership of local groups or associations	0.9
Learning	**0.85**
Ability of the community to learn from past experiences, for example in the case of natural disasters like fire or climatic events like flooding and water shortages	0.7
Knowledge sharing among members of the community	1.0
Access to training/awareness-raising activities about climate change	0.6
Use/acknowledgement of traditional knowledge/ indigenous adaptation practices	1.1
Redundancy	**0.90**
Ability of community members to diversify their income sources (e.g. selling different products, finding alternative employment)	1.1
Availability of several institutions/organisations that work on the same issues (for example, multiple cooperatives or NGOs working on climate change issues, women's empowerment, upskilling, etc.)	0.7
Ability to access support from family, friends and neighbours in times of emergency	1.5
Custom of saving money that can be used in the case of disasters or emergencies	0.3
Rapidity	**0.97**
Capacity of the community to respond and act rapidly in case of emergency or climatic events	1.2
Ability of community members to access resources swiftly, for example, immediate support from friends/institutions/insurance, in case of need	0.8
Local availability of early warning systems (e.g. government weather notifications, SMS alerts, WhatsApp groups within the community)	0.9
Scale	**1.23**
Contact among members of the community and institutions/ organisations that are not based in this area (e.g. that operate at the regional or national level)	1.4
Capacity of the community to receive support from institutions or groups that are not part of the community, in situations of emergency or crisis	1.4
Examples of associations or collaborative work between the community, the private sector, NGOs and/or local/national authorities	0.9
Diversity and Flexibility	**0.74**
Ability of the community to adapt well to change (e.g. to changes in the economic, political or environmental situation)	0.6
Ability of community members to identify options to do things differently from the past (e.g. in cases of emergencies, look for different options/ solutions)	0.7

Attributes & Markers	**Score**
Access of community members to different sources of information	1.5
Ability of the community to implement innovative practices	0.3
Ability of the community to see change as an opportunity, rather than as a threat	0.6
Equality	**0.67**
Ability of community groups/associations to take decisions that affect the community in a participative manner	0.9
Existence of gaps between different community groups, for example between seniors and youth, or among people with higher and lower income	0.3
Extent to which needs and opinions of all community members (including seniors, youth, women-headed households, disabled, etc) are being heard and considered (for example as part of community projects/ initiatives, local organisations)	0.8

Table 3. Strength/Weakness of Resilience Attributes and Markers

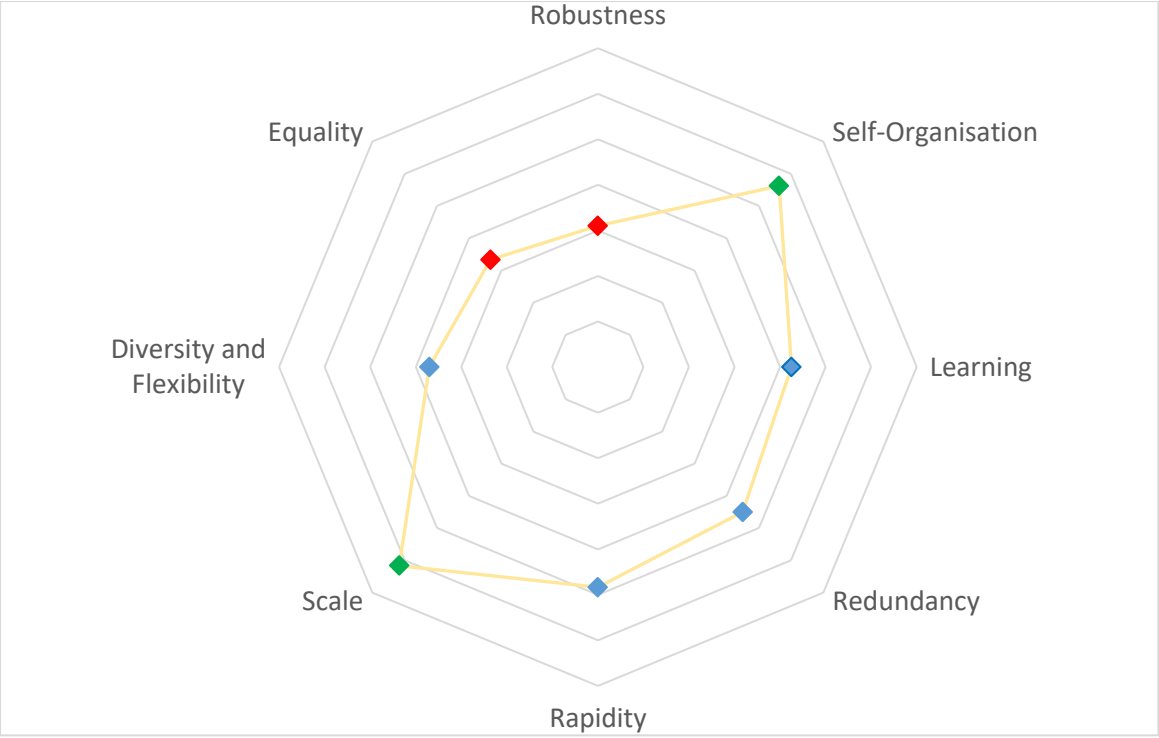

Figure 5. Visualisation of Community Resilience Attribute Scores

There are some individual marker outliers within otherwise average attributes. There are high scores for access to additional support from family, friends, etc., and for access to different sources of information. There are low scores for saving for disasters, and for ability of the community to implement innovative practices. These two were exemplified in the problems of trying to introduce a fairly obvious financial innovation – home insurance – which respondents identified as being undermined by lack of financial literacy, lack of trust, and the immediate needs of the present taking precedence over those of potential futures.

Our focus for more detailed discussion, however, will be the attribute outliers: those pairs scoring highest and lowest which could be taken to represent relative resilience strengths and weaknesses within the community.

Community Resilience Relative Strengths

As indicated in the analysed data above, interviewees rated self-organisation and scale as the two strongest resilience attributes of Masiphumelele, with marker scores as shown in Figure 6.

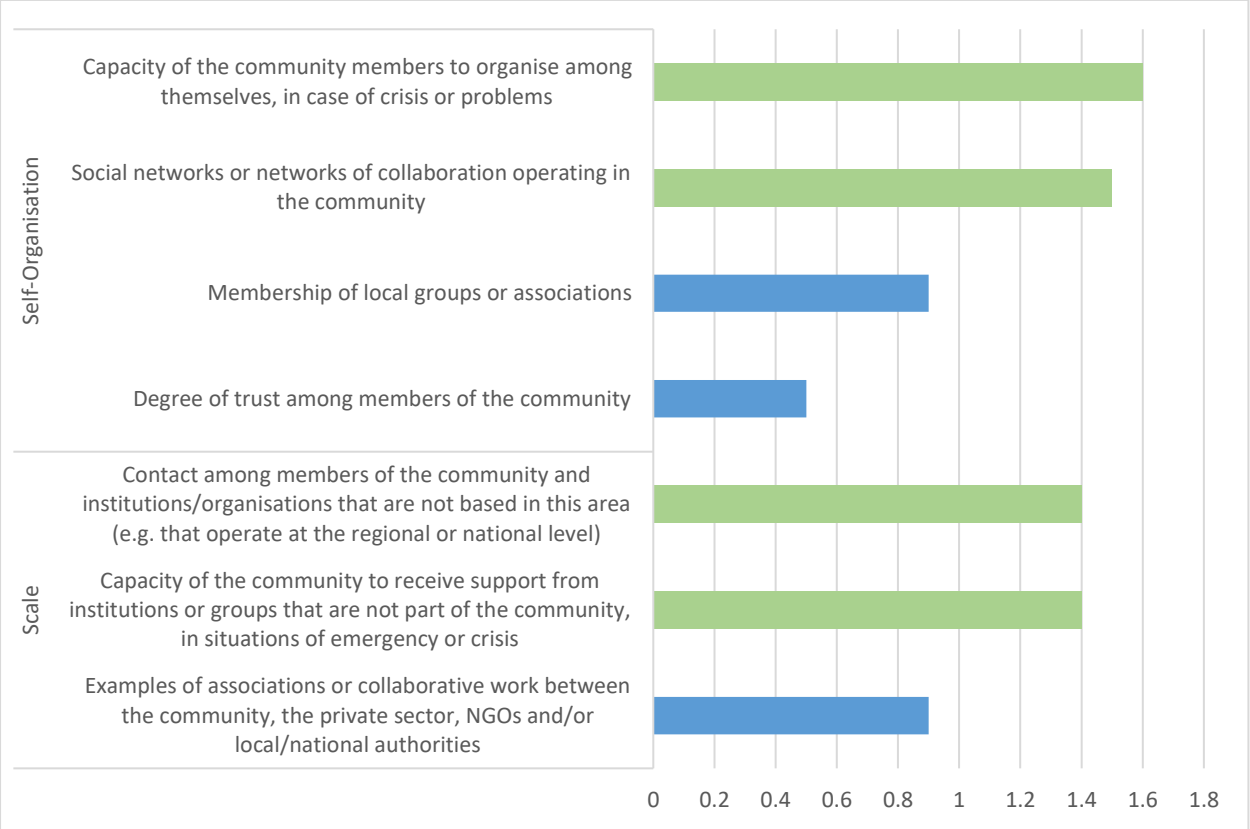

Figure 6. Markers of Relatively-Strong Resilience Attributes

Interviewees were readily able to evidence the ability of community members to organise among themselves in times of crisis or emergency. One resident described the community's organisational capacity as spontaneous, stating:

> "Masi is a strong community. It is very spontaneous, you can't know how the community will respond until you see it. …it's very interesting because people just step in to help. They know where to go. Like in the other instance of where there was the fire (in July) – people were asked to go to the community hall, but they said no, we're not going there, we're going to the Methodist church because it's closer to where we are. We want to be able to move from here to receive the building material. When I say it is spontaneous, the response to these things does not mean the structures will do their things. We will come together as a community to find a solution. We will find people already (and support them in our own way)." (SM44)

Another resident highlighted community cohesion during the response cycle to emergency, stating, "when there is an emergency, people coordinate, they work together. All the time when there's problem or emergency, I always see people working together, fighting for the problem together" (ZM35). One resident summarised community members' willingness to assist simply, stating "people mobilise and support each other" (SM19).

There were strengths seen in relation to the degree of collaboration and role of social networks. A number of endogenous support systems have been developed within the community to support residents, including a local committee system that is called upon to support aid distribution following disasters. One resident described the formation of committees as a vital part of recovery efforts:

> "[*These committees*] are formed based on the section that you're staying in. The East section has their own committee of people that are staying there, they overlook and deal with the issues that occur in that area. If people are having issues, the committee will sit down and try to resolve the problem. So those people that do that are taking over when there is a fire. The committee is what will come and distribute food and drink to the people. Then they can sort it by themselves." (SF27)

Stokvels, a savings or investment society to which members regularly contribute an agreed amount and from which they receive a lump sum payment on a rotating basis, were discussed as another internal means of collaboration and networking, as well as the Masiphumelele Development Forum that seeks to convene local interests and present concerns to external stakeholders as a united front. A female resident involved in the coordination of programming for the Development Forum and the Desmond Tutu HIV Foundation highlighted the regular occurrence of programming to ensure community awareness of existing projects, "as organisations that are working here, we have the NGO forum meetings, quarterly, and all other organisations that are here in the community will come together to see how everyone is doing." (SF27). In addition, WhatsApp and Facebook groups involving other community members were utilised by all respondents.

Alongside these resilience strengths – features of self-organisation that can be and are being used in the face of external shocks and other stressors – there were some potential challenges for this attribute. The degree of trust among community members was rated relatively low: half of interviewees rated it as average; half rated it as weak. While characteristic of marginalised urban communities (Preisendorfer et al., 2014; Kyed, 2019) this may create problems in mobilising wider community self-organisation. Self-organisation can also have an ugly side. Two interviewees mentioned the convening of extra-judicial "kangaroo courts" within the community, seen as examples of strong community collaboration:

> "At one point, we used to do what we would call a kangaroo court. People in the community, if they find someone who is stealing from someone, they burn him to death…we as the community, we deal with the issue, without taking it to the law enforcement. They are too slow." (ZM36)

In relation to scale, there was a sense of good connections with external organisations and institutions, particularly in the surrounding vicinity of Masiphumelele; and that these connections were of value in bringing resources into the community in the event of an

emergency. Examples of such nearby connections to external support systems included three NGOs operating in Southern Cape Town: Masicorp, Valley Development Projects and Community Cohesion, which have enabled access to wider resources including money, materials and capabilities (e.g. for education, training, counselling, etc.). One resident described external support as a vital resource in the fire response cycle:

> "People from outside the community, a lot of the people that stay in Fish Hoek and Kommetjie [*affluent suburbs in the immediate area*], as well as churches and other organisations, come in with food parcels, clothing, necessities when there are disasters." (SM44)

Another resident described the services provided from the surrounding community, stating "when there is a fire, many people come with their clothes. They come with their tea and support." (SF34). Impactful responses from nearby businesses were also mentioned though the rating for the final scale marker – expanding coverage beyond respondents' own suggestions to cover not just NGOs and businesses but also local and national authorities – was only 0.9. One interpretation is that NGOs and to some extent businesses are seen as positive channels for wider resource access but government less so.

Community Resilience Relative Weaknesses

At the other end of the spectrum, interviewees rated robustness and equality as the two weakest resilience attributes of Masiphumelele, with marker scores as shown in Figure 7.

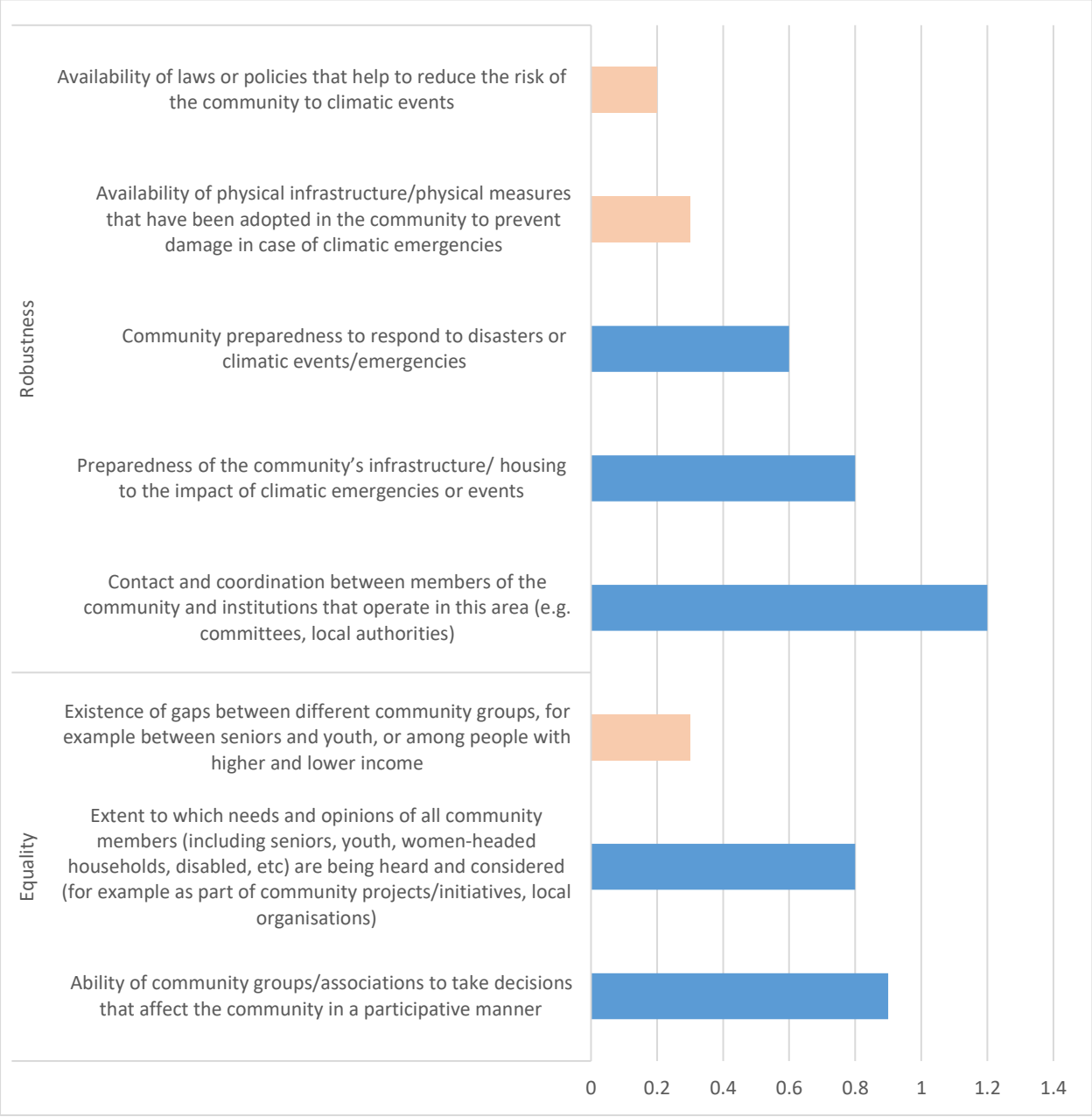

Figure 7. Markers of Relatively-Weak Resilience Attributes

The robustness of the community – its ability to maintain functionality in the face of shocks and stressors – was seen as lacking in at least some regards. Echoing the concern about government noted above, the lowest-ranked of all 31 markers was that relating to laws or policies to reduce the risk of the community to climate events – eight of the ten interviewees rated this as weak. They expressed general cynicism about the impact of such higher-level legislation; particularly its implementation: "So okay, how has the stuff like

rules and regulations that were brought, does it affect, has it brought change? I would say it's weak" (SM19); "They are weak, or no one is following them. They might exist but no one is following them" (SF42).

As shown in these quotes, a particular issue was the implementation of any laws or policies. An example is the dumping and storage of items within storm-water systems which has been a partial cause of flooding within the township (Chambers, 2019). Although illegal and known about, it has not been rectified and similarly with other activities that can cause problems within the community: "even if they (*law officers*) expose someone who is openly doing wrong, the people responsible for fixing it are not competent" (ZM36). Drainage ditches and canals have been built by the City of Cape Town and Western Cape governments to try to reduce vulnerability of the Wetlands area. But lack of maintenance and clearance means they make an ineffective contribution to resilience: Figure 4 gave some sense of that.

Very much linked to this, the availability of physical infrastructure or measures to prevent damage in case of climate emergency represented the second-lowest robustness marker. The failure of the storm-water systems was noted above, and there were even greater concerns about the lack of proactive measures taken to reduce fire risk. One resident addressed the occurrence of fire as a direct result of failure to learn from previous incidents:

> "if you live in a community, and that thing [*fire*] happens year after year, why can't you prevent that from happening? We should ask what is causing this, let's try to do something so we don't have this issue. But it keeps happening." (ZM36).

The density of housing was also seen as a problem:

> "The community is vulnerable in the sense that, I think the space is not conducive to host so many people. There are space limitations which, that density of the population, is making things difficult to respond in a manner which is effective. Because it leads to limited access, you can't get where you need to be." (SM44).

This, for example, was consistently reported as a problem in enabling an effective response from the fire services. Even when they did arrive (the nearest fire station was 6km away in Fish Hoek), there was no fire hydrant infrastructure and no way for fire trucks to drive into the informal settlements areas of Masiphumelele:

> "At one point, I spoke to one of the firemen. He said that, in some instances, they have to let a few houses burn because there's no way for them to physically get the truck in (to the wetlands). It's too dangerous for them to force their way in, sometimes they have to let a few houses burn to get in. It's not that they want to, it's the situation that requires them to do so." (SF21)

The "go-to" solution from the Fire and Rescue Service to the dangers of fire in informal settlements has been that applied to make formal dwellings more robust against the dangers of fire: smoke detectors. But these are of little use in the presence of the main source of fire in informal settlements – open flames (Arup, 2018). The soot from such flames continuously triggers smoke detectors and so householders simply disconnect them. What would be required is heat detectors. The other solution that authorities have proposed, underway at the time of writing, is to build a fire station in Masiphumelele. Not only have residents been concerned that the building is taking place on land that had been earmarked for formal housing, but they also point out that this solution will make no

difference to the key problem of fighting fires in the informal settlement: housing density (Kotze, 2017; Ndongeni, 2019).

From an external perspective, the solution might seem simple: build formal housing and prioritise relocation of residents living in Masiphumelele's informal settlement areas. As multiple respondents indicated, this is precisely what the City of Cape Town's Human Settlements Directorate has done within each of the phases of new house-building. But a combination of economic marginalisation, high unemployment levels and a spirit of entrepreneurship – what interviewees referred to as "the hustle" – have led those rehoused to remain in the informal settlement and use their formal residence as a source of rental income. Adding in the population growth pressures, this also leads to the construction of informal dwellings in the backyards of formal housing (examples are visible in Figure 3). Thus contextual pressures have undermined well-intended external interventions that could have strengthened physical robustness.

There were also concerns about the robustness of the community in the face of crime and gang violence; stressors that were seen to be on the rise and were mentioned by a majority of respondents. Slightly offsetting this was a sense that Masiphumelele might be more robust in dealing with this than other townships in the region. A young resident who was raised in the community highlighted the benefits of familiarity from the community's relatively small size:

> "Everybody knows each other, we know everybody from Masi. If you're not from Masi, we'll recognise you immediately. For example, if there were a carjacking and it's said that this was done by someone not from Masi and they describe this person very well, word would go around very quickly and this person would be found, if they are still in Masi. When there are community issues; say there's been a lot of break-ins, the committees are able to broadcast a message and everyone will come together." (SF21)

Equality was the lowest-ranked enabling attribute and second-lowest attribute overall. In particular, seven of the ten respondents identified weakness arising from intra-community divisions. Although the question mentioned age and income divisions, these were not the gaps mainly discussed by interviewees. Instead, four (including the two Zimbabweans) mentioned divisions of ethnicity, particularly between South African nationals and other nationalities:

> "someway, somehow we used to get along. Now there's times where some things go wrong, say there is a Zimbabwean that's involved, then that thing of 'you're not from here' comes out. When there's problems, that creates issues." (SF27)
> "let me put it this way – South Africans, some, not all, have a way of treating non-South Africans differently. I think it's got to do with the fact that they know they're foreigners. They have an upper hand, of constantly running them [*down*]." (SF21)

As the first quote suggests at the start, Masiphumelele has had a reputation for relatively good relations between different nationalities and these may be issues of identity and attitude more than xenophobic actions (Jara & Peberdy, 2010).

Gender inequalities are an issue within the township – mentioned by three of the five women interviewees, though none of the men. There are institutional norms of inequality:

> "We also have an issue with patriarchy – or a system that devalues women. It's a cultural norm, no one expects women to complain, men are supposed to have the higher voice, the higher power. Women are supposed to obey, submit. They are supposed to be very submissive." (SF21)

The ugliest side of this is violence against women, something mentioned by only one interviewee but which is widespread in South Africa's townships (Britton, 2006; Chutel, 2019).

Finally, division between youth and community elders has been an issue within the community (Freedom House, 2017) though it was only highlighted by one of the interviewees: "The relationship between the young and old, the elders, is no longer there. … In terms of youth and elders, there is a gap. And it's costing us." (SM44).

Summary

On the basis of the small pilot evidence base, the findings suggest ways in which this marginalised urban community's resilience may be relatively strong (self-organisation and scale), relatively weak (robustness and equality), and somewhere in-between (learning, redundancy, rapidity, and diversity and flexibility). Findings would need to be more-widely replicated but the profile suggests overall that the community may be relatively well-equipped to mobilise responses to shocks such as flood, fire and even some crimes; but perhaps more limited in its ability to develop robust defences to prevent these shocks happening or to resist their impact.

We could understand the pilot findings in terms of the four components of resilience. Reflected in its three highest-scoring attributes (scale, self-organisation and rapidity), the community appears relatively good at "bounce back": right from its earliest history of eviction and return it has shown its ability to recover from and survive whatever is thrown at it. The community may have some capacity for adaptation: fair overall strength in self-organisation, learning, diversity and flexibility contribute to this. We can see this reflected in its ability to contend over its more-than thirty-year history with very different political regimes, and with very significant population growth.

Even this adaptation, however, has been more "coping with" than true "bouncing forward" and the community appears weaker in the other two aspects of resilience. It does not seem very robust – the weakest of all the attributes – and this shows in the damage done by regular but intermittent shocks like fire and flood. Nor was there evidence of it transforming itself; reflected in low scores for equality and also in markers for innovation and the generation of internal savings. Despite some significant efforts by the state to upgrade housing, there is a danger that Masiphumelele remains what it has always been – poor, marginalised and unequal, with institutionalised inequalities such as those between men and women.

E. Discussion

Care must be taken here because of the pilot nature of this framework application. However, there is potential shown for contributions to our knowledge of resilience and

marginalised urban communities. At a most basic level, this is a small but direct contribution to what has, to date, been a relatively limited body of work. Although that literature occasionally (e.g. Seeliger & Turok, 2013) focuses on the lack of resilience within these communities, the research here is in line with the majority of past work in recognising that marginalised urban communities have resilience strengths as well as weaknesses. The analytical challenges in much past application of resilience were noted above: lack of definition, lack of conceptualisation, or only partial coverage of the elements of resilience (Torabi et al., 2017; Béné et al., 2018).

What the RABIT framework has been shown to provide is a broad and systematic assessment of community resilience; identifying specific but cross-cutting resilience dimensions that are relevant to multiple types of shock and trend. As expected from a systemic model of resilience, it therefore transcends the limitations of approaches that focus just on externally-driven, shock-specific interventions; providing a more holistic and endogenous approach to resilience-building. Indeed, it shows the challenges inherent in such interventions, and offers a means to analyse the risks of planned resilience interventions.

We also noted above the operational challenges in much past application of resilience to marginalised urban communities: either the absence of measurement where integrated conceptualisations of resilience are presented, or a complexity of measuring incommensurable conceptual elements (Woolf et al., 2016). The RABIT pilot shows it can provide a basis for measurement; measuring only one conceptual category: the properties or attributes of communities as systems. No socio-ecological approach to resilience can measure objectively. However, the approach used here is inter-subjective and so it could – if administered to a larger respondent group – provide the basis for benchmarking community resilience. This could then allow for longitudinal tracking of resilience, including tracking changes in resilience in response to interventions, though it would require further research to demonstrate this.

Our pilot sample size was small, so findings about differential perceptions of resilience can only be tentative and at best suggestive at this stage. Nonetheless, individual differences were an emergent finding not reflected in past evaluations of resilience in marginalised urban communities. For example, South African residents mainly expressed concerns regarding safety and security, and population density. By contrast, the foreign nationals expressed concerns regarding the economic environment and youth unemployment. We have already noted differences between men and women; for example, in relation to reporting of gender inequalities. And there were also differences relating to housing. Individuals living in formal dwellings expressed concerns about job security while those in informal housing expressed concerns regarding access to shelter and service delivery. Various dimensions of individual difference – we can likely add employment status and age to nationality, gender and housing – thus appear to colour perceptions of priority shocks and stressors but also to impact perceptions about relative strength and weakness of different resilient attributes and markers. Again, only through further research could these dimensions of difference be properly investigated and validated.

Past work has also highlighted the dangers of a lack of transformation of marginalised urban communities (Turok, 2016; Béné et al., 2018), and pilot application of RABIT has suggested some internal constraints that hamper transformation and which further research could study. These include lack of trust, lack of innovative capacity, intra-community inequalities and divisions, and the focus of both internal structures and external connections on crisis response and survival rather than development.

Finally, we can identify some limitations in the application of the current framework. Wider contexts, such as those of local urban governance and regulation, impact the resilience of marginalised settlements (Tanner et al., 2009; Chitengi, 2018). Yet the focus of fieldwork on only one level and system – the community – meant limited consideration of context, restricted just to perceptions of community members. Evidence-gathering about context, including interviews with higher-level urban stakeholders, was missing, as was formal analysis of resilience of the wider city and its institutions. Somewhat mirroring this, the agency of individual community members is a key to resilience-building (Berkes & Ross, 2012; Friend & Moench, 2013). Yet notions of agency – individuals, their driving forces, the capacities and constraints on their actions – were not particularly well-represented as compared, say, with analysis of institutions within the community. Finally, the distribution and enactment of urban power, both within and external to a community, shapes the resilience of urban communities and can readily hamper anything other than incremental change (Bahadur & Tanner, 2014; Béné et al., 2018). While intra-community power was reflected to some extent in the equality attribute, for example in terms of gender relations, this fell some way short of a full consideration of the role that power plays in the resilience of marginalised communities.

F. Conclusions

This pilot research has provided an initial illustration of the way in which the RABIT framework could serve as a diagnostic tool to measure the resilience of marginalised urban communities; not a particularised resilience to specific threats but a more holistic resilience to a broad spectrum of external shocks and internal stressors. This could provide stakeholders with a new understanding of a community's resilience strengths and weaknesses, and could also support more effective resilience-building interventions; not least because such interventions will be better designed when they understand those internal strengths and weaknesses. While shown to help address some conceptual and operational challenges identified in the literature, the framework was also shown to have some limitations at least in its current application; in respect of context, agency and power.

In terms of practical recommendations that derive from the research undertaken here, we have no direct evidence from this pilot study. However, one can readily develop a set of action plans from the RABIT framework. Resilience-building action priorities could address the 'red-flagged' items identified from the survey; for example, seeking ways to strengthen the components of robustness and equality. As in other applications of RABIT (Heeks & Ospina, 2019), visualisations of the findings could be presented to a workshop of key stakeholders. They could directly accept those attributes and/or markers with the lowest scores as the highest priorities for resilience-building interventions. Alternatively, they could use the findings as the basis for a priority-setting discussion. The workshop would

then go on to plan actions – ideally with clear responsibilities, resourcing and timelines – to address each of the prioritised areas for action.

As just noted, application of this framework could also re-orient thinking on external interventions. Of course measures to improve housing or flood-water drainage should continue. But they can be designed in light of the understanding of the community that this resilience analysis provides. This can help understand which interventions are likely to work well and which less well. It can help understand what community resilience strengths can be utilised to support implementation; particularly longer-term maintenance of infrastructure. And it can help understand that, alongside any specific interventions, more generic measures are needed to build up the weakest attributes within the community itself.

We can finally consider directions for future research. What has been shown here is just an initial proof-of-concept; suggesting the viability of using the RABIT framework to evaluate resilience with a marginalised urban community. Next steps could extend the research in three directions. First in terms of size; interviewing a greater number of community residents. This would ensure greater validity of findings through better representation both statistically and, for example, in terms of employment and informal housing with the latter also incorporating better representation of those directly affected by flood and fire. It would allow investigation of the issue noted above of individual differences: not just in perceptions of shocks / stressors but also in assessment of resilience strengths and weaknesses. It might also allow separate assessment of the resilience of informal and formal housing areas of the community, given the greater vulnerability of the former.

Second in terms of scope; expanding beyond this primary-stage process of benchmarking resilience to the further stages of feeding results back to key community stakeholders; prioritising resilience weaknesses and resilience-building actions; and then putting those actions into practice. There could also be more "upstream" involvement of the community. For example, although guided by the first-stage interviews, selection of markers was a relatively top-down process. This might explain the rather unexpected outcome that two of the attributes – redundancy, and diversity and flexibility – contain both high- and low-scoring markers. Future work could consider a more participative approach that involved co-development of the markers with community representatives; potentially addressing the limited consideration of power within the current framework. Such co-development could also include award of differential weights to attributes and/or markers.

Third in terms of level, one can look to expansion in two directions to address some of the limitations identified. What we might call 'macro-level' expansion would look beyond the community at wider systems within the city, province and even nation. Until these can themselves demonstrate resilience, particularly transformative resilience, then Masiphumelele will likely survive its internal stressors and external shocks even when exacerbated by long-term trends but it will remain marginalised:

> "In South Africa, the particular circumstances of the post-apartheid landscape render urban planning frameworks prone to reinforcing the marginalisation of informal stakeholder engagement, ultimately perpetuating a socio-spatial inequality such programs set out to mitigate." (Weiss, 2014:3)

What we might call 'nano-level' expansion would look within the community at the resilience of individuals because it is individuals – their motivations, their agency – that act as a main foundation for resilience-related action or inaction within the community. This would potentially demand some modification of the current attributes in order to make them appropriate for an individual person.

Acknowledgements
This research was made possible by the financial support of the United States Agency for International Development's Global Development Lab.

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Appendix 1: Structured Questionnaire

A. Local context

- What are the positive characteristics/strengths of the community?
- What are the problems faced by the community? And what are the external problems that do not originate in the community, but that affect it?
- In the time that you have lived in/worked with this community, what have been the situations of emergency or risk that you have had to face? For example, moments of crisis or disasters that needed to be overcome?

B. Role of climate change impacts and local response

- In your experience, has there been any incident related to climate change that has affected the community?
- What was the response to those incidents? What did you do, why, and who helped you?
- Are there any measures that have been taken to prevent or mitigate those impacts in the future?

C. Community resilience attributes

How would you rate the following attributes in the community:

Robustness	Weak	Average	Strong
Community preparedness to respond to disasters or climatic events/emergencies			
Availability of physical infrastructure/physical measures that have been adopted in the community to prevent damage in case of climatic emergencies			
Contact and coordination between members of the community and institutions that operate in this area (e.g. committees, local authorities)			
Preparedness of the community's infrastructure/housing to the impact of climatic emergencies or events			
Availability of laws or policies that help to reduce the risk of the community to climatic events			

Self-Organisation	Weak	Average	Strong
Capacity of the community members to organise among themselves, in case of crisis or problems			
Degree of trust among members of the community			
Social networks or networks of collaboration operating in the community			
Membership of local groups or associations			

Learning	Weak	Average	Strong
Ability of the community to learn from past experiences, for example in the case of natural disasters like fire or climatic events like flooding and water shortages			
Knowledge sharing among members of the community			
Access to training/awareness-raising activities about climate change			
Use/acknowledgement of traditional knowledge/ indigenous adaptation practices			

Redundancy	Weak	Average	Strong
Ability of community members to diversify their income sources (e.g. selling different products, finding alternative employment)			
Availability of several institutions/organisations that work on the same issues (for example, multiple cooperatives or NGOs working on climate change issues, women's empowerment, upskilling, etc.)			
Ability to access support from family, friends and neighbours in times of emergency			
Custom of saving money that can be used in the case of disasters or emergencies			

Rapidity	Weak	Average	Strong
Capacity of the community to respond and act rapidly in case of emergency or climatic events			
Ability of community members to access resources swiftly, for example, immediate support from friends/institutions/ insurance, in case of need			
Local availability of early warning systems (e.g. government weather notifications, SMS alerts, WhatsApp groups within the community)			

Scale	Weak	Average	Strong
Contact among members of the community and institutions/organisations that are not based in this area (e.g. that operate at the regional or national level)			
Capacity of the community to receive support from institutions or groups that are not part of the community, in situations of emergency or crisis			
Examples of associations or collaborative work between the community, the private sector, NGOs and/or local/ national authorities			

Diversity and Flexibility	Weak	Average	Strong
Ability of the community to adapt well to change (e.g. to changes in the economic, political or environmental situation)			
Ability of community members to identify options to do things differently from the past (e.g. in cases of emergencies, look for different options/solutions)			
Access of community members to different sources of information			
Ability of the community to implement innovative practices			
Ability of the community to see change as an opportunity, rather than as a threat			

Equality	Weak	Average	Strong
Ability of community groups/associations to take decisions that affect the community in a participative manner			
Existence of gaps between different community groups, for example between seniors and youth, or among people with higher and lower income			
Extent to which needs and opinions of all community members (including seniors, youth, women-headed households, disabled, etc) are being heard and considered (for example as part of community projects/initiatives, local organisations)			

D. Open-ended final questions (only asked when time permitted)

- What do you feel would make the greatest impact in your ability to prepare for upcoming weather events?
- Are there members of your community that are better-equipped than yourself for upcoming weather events? If yes, how and why are they better-equipped?
- Are there members of your community that are less-equipped than yourself for upcoming weather events? If yes, how and why are they less-equipped?
- Do you have anything additional that you would like to share with the research team?