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A bottom-up approach to developing a neighbourhood-based resilience measurement framework

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Abstract

Purpose – As disaster resilience activities are increasingly occurring at the neighbourhood level, there is a growing recognition in research and in practice of the contributions that community stakeholders can make in assessing the resilience of their communities. The purpose of this paper is to describe the process in deriving a disaster resilience measurement framework by soliciting the perspectives of stakeholders from urban neighbourhoods in two countries. The authors examined their community values, and their perspectives on both the concept of resilience and the essential elements that they believe would contribute to the resiliency of their neighbourhoods.

Design/methodology/approach – The authors used an appreciative inquiry approach to draw out the perspectives of 58 stakeholders from nine focus groups in five urban neighbourhoods in New Zealand and in the USA.

Findings – Results of this research show common values and recurring perceived characteristics of disaster resilience across the study sites. A neighbourhood-based disaster resilience measurement framework is developed that encompasses individual/psychological, socio-cultural, economic, infrastructural/built, and institutional/governance dimensions of disaster resilience. In the process of developing the framework, the authors identified challenges in engaging certain segments of the population and in accounting for wider structural influences on neighbourhood resilience.

Research limitations/implications – Issues relating to inclusive community engagement and linkages to cross-scalar resilience factors need to be addressed in future studies.

Practical implications – Results of this research provide insights and guidance for policy makers and practitioners when engaging communities in the development of resilience metrics.

Originality/value – This study fills the literature gap in evaluating community values and stakeholders' perspectives on disaster resilience when identifying metrics for resilience interventions in urban neighbourhoods. The proposed measurement framework is derived from cross-cultural and diverse socioeconomic settings.

Keywords Community engagement, Community disaster resilience, Appreciative inquiry, Neighbourhood, Resilience measures

Paper type Research paper

1. Introduction

Building community disaster resilience is integral to disaster risk reduction (DRR) policies and practice (United Nations International Strategy for Disaster Reduction (UNISDR), 2015). Accordingly, there is a pressing need to benchmark existing levels of resilience to aid in the development and evaluation of DRR interventions that meet local needs and enhance communities' abilities to prepare for and respond to natural hazard events (Committee on Increasing National Resilience to Hazards and Disasters and Committee on Science Engineering and Public Policy, 2012). While research into disaster resilience and its measurement continues at a rapid pace, the development of resilience measures that reflect



neighbourhood-level conditions remain scarce (Eisenman *et al.*, 2016). To move towards developing a neighbourhood-based disaster resilience measurement framework that reflects the values and needs of neighbourhood stakeholders, this research study started by conducting focus groups with stakeholders of five different urban neighbourhoods in New Zealand and the USA, investigating what they value in their communities, how they frame disaster resilience, and what they believe to be essential elements that contribute to the resiliency of their communities. This conjoint evaluation approach provides insights into common resilience denominators as well as neighbourhood-specific contextual factors.

2. Measuring disaster resilience

Measuring disaster resilience is fraught with challenges, not least because it is a multi-faceted and multi-scalar concept with wide ranging interpretations and ways of measuring it (Committee on Increasing National Resilience and Disasters and Committee on Science Engineering and Public Policy, 2012; Cutter, 2016; International Federation of Red Cross and Red Crescent Societies, 2016; Ostadtaghizadeh *et al.*, 2015; Sharifi, 2016). Disaster resilience can be conceptualised as community capitals (Ritchie and Gill, 2011), attributes of societal systems such as physical or social units (Renschler *et al.*, 2010), and adaptive capacities (Becker *et al.*, 2015; International Federation of Red Cross and Red Crescent Societies, 2016; Manyena *et al.*, 2011; Sherrieb *et al.*, 2010). These capitals, attributes, and capacities allow a societal system to either bounce back (i.e. return to pre-existing functionality) or bounce forward (i.e. adapt to a different reality) from a disaster (Manyena *et al.*, 2011). This paper frames disaster resilience as the adaptive capacities of a social system to bounce forward from a natural hazard event. That is, disaster resilience refers to individuals' and groups' abilities to learn from, adapt to, and co-exist with natural hazards and their potential consequences (Paton and Johnston, 2017).

Increasingly, policy makers, researchers, and practitioners are advocating for measuring disaster resilience as a means to identify areas for improvement, evaluate resilience strategies, and monitor resilience progress (Committee on Increasing National Resilience, 2012). Recent advances in assessment frameworks and tools to benchmark and track resilience progress include the City Fragility and Resilience Framework (de Boer *et al.*, 2016), the 100 Resilient Cities' City Resilience Index (ARUP and The Rockefeller Foundation, 2014), and the One Billion Coalition for Resilience's indicators (International Federation of Red Cross and Red Crescent Societies, 2015). In the two countries where this study took place, benchmarking community disaster resilience is integral to the National Preparedness Goal and the National Disaster Recovery Framework in the USA (US Department of Homeland Security, 2011a, b) and the National Civil Defence Emergency Management Strategy in New Zealand (Ministry of Civil Defence and Emergency Management, 2012).

3. Why assess disaster resilience at the neighbourhood level?

The definition of neighbourhood can be debated without end. This paper adopted Galster's (2001, p. 2112) definition of a neighbourhood as "the bundle of spatially-based attributes associated with clusters of residences, sometimes in conjunction with other land uses". At the neighbourhood scale, neighbourhood characteristics pertaining to demographics, physical features, environmental conditions, politics, social interactions, and sentiments and perspectives can be examined (Galster, 2001). As such, neighbourhoods comprise of diverse communities – groupings of people who share common perspectives or relational ties (MacQueen *et al.*, 2001). As local communities are seen as the frontline in preparing for and dealing with the aftermath of disasters, this diversity creates the need for understanding different perspectives in informing the development of neighbourhood-based resilience measures.

As local units of analysis, neighbourhoods offer unique opportunities for examining interactions between hazards and people's perceptions of and adaptive capacities to those hazards. While neighbourhoods do not have formal governmental authority, they are

“locus par excellence of ‘informal governance’”: people’s ability to maintain social order, arrive at collective decisions, and perform public services when a neighbourhood is temporarily cut off from official public services and authorities (Lelieveldt, 2008, p. 331). Informal governance, through neighbourhood-based organisations and social networks, has demonstrated effectiveness in past disasters (e.g. Hurricane Katrina, Christchurch earthquakes, and Hurricane Sandy) in several ways: promoting collective actions to address both short- and long-term recovery needs (Graham *et al.*, 2016); supporting pre-existing and emergent community leaders who advocate for obtaining resources from decision makers in governments (Paton *et al.*, 2013); cultivating social connections to bolster social support (Chamlee-Wright and Storr, 2010); and fostering a sense of community attachment that facilitates post-disaster return of residents (Chamlee-Wright and Storr, 2009). The lessons learned from these experiences have informed how disaster resilience is measured to date (see Cutter, 2016; Ostadtaghizadeh *et al.*, 2015; Sharifi, 2016).

Although there is a burgeoning of research and development in disaster resilience assessments overall, there is a dearth of research that is geared towards advancing participatory assessments for urban neighbourhoods. The need for comparative analysis by policy makers has contributed to many assessment tools, such as those mentioned in Section 2, to measure resilience quantitatively at the city level or higher, where data are more readily available (Committee on Increasing National Resilience to Hazards and Disasters and Committee on Science Engineering and Public Policy, 2012). Much of the existing participatory neighbourhood assessments have generally been implemented in rural communities, such as the Rural Resilience Index (Cox and Hamlen, 2014; International Federation of Red Cross and Red Crescent Societies, 2016). The application of rural resilience indicators to urban neighbourhoods, however, would be inappropriate due to distinct differences in the underlying drivers of resilience between rural and urban settings (Cutter *et al.*, 2016; International Rescue Committee, 2017).

Another problem is a lack of community input in the development of resilience assessments. While community participation is considered as essential to effective resilience planning (Horney *et al.*, 2016), the incorporation of community input in resilience measuring tools has yet to become a standard practice. Of the 36 selected community disaster resilience assessment tools reviewed by Sharifi (2016), only 36 per cent of them used a participatory approach in their development process, while the rest were formulated through the use of literature and expert opinions. That top-down assessment approach could result in a disconnect from the very diverse values and priorities of people who would be most affected by disasters (Gaillard and Mercer, 2013; International Federation of Red Cross and Red Crescent Societies, 2016; Sharifi, 2016). Bridging this disconnect requires an understanding of what community members value within the context of assessing community disaster resilience (National Academies of Sciences, Engineering, and Medicine, 2017).

This paper addresses these gaps by seeking to develop a neighbourhood-based resilience measurement framework that can be collaboratively implemented among community members, community-based organisations (CBOs), and government agencies in the study sites. It describes the use of a bottom-up approach in deriving key measurement themes through the input from neighbourhood stakeholders during the data collection process and in conducting an inductive analysis of their perspectives.

4. Methods

4.1 Study sites

The Wellington region of New Zealand and the City and County of San Francisco in the USA were chosen for their similar exposure to and risk of significant seismic hazards (Rhoades *et al.*, 2011; US Geological Survey, 2015). By adopting the spatial boundaries of neighbourhoods used by government planning agencies, five neighbourhoods from these regions were selected. Because past research has shown differential levels of vulnerabilities

and resilience between communities with different socioeconomic status and ethnic make-up (Finch *et al.*, 2010), government data sets were used as a starting point to identify potential neighbourhoods that represent varying degrees of socioeconomic levels and ethnic compositions. Without comparable data sets between these two regions, the authors used different sources of data to narrow the list of potential neighbourhoods: the New Zealand Social Deprivation Index (NZDep) – a composite of socioeconomic variables that measure deprivation of small geographic areas across New Zealand on a continuous score, with a mean of 1,000 index points (Atkinson *et al.*, 2014) – for neighbourhoods in the Wellington region, and census data on household income and racial make-up for neighbourhoods in San Francisco (San Francisco Planning Department, 2012; US Census Bureau, 2014).

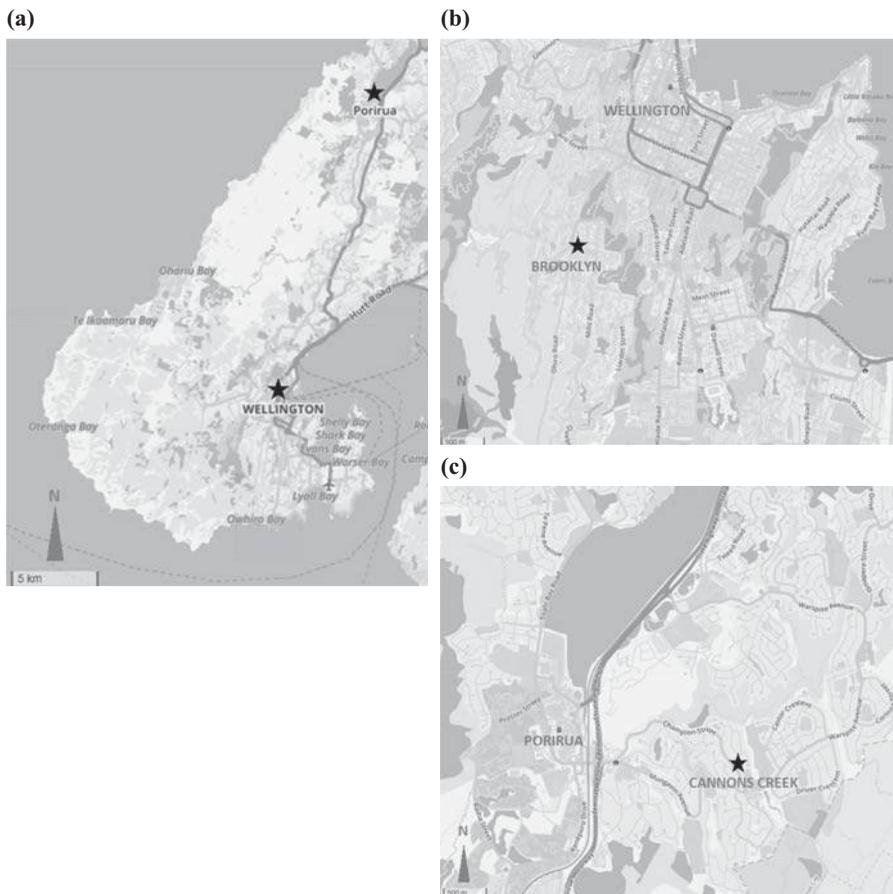
The main author of this study shortlisted the number of neighbourhoods in each region by consulting with local emergency management practitioners. Key neighbourhood stakeholders, or gatekeepers, were involved to assist with determining the suitability of their neighbourhoods as study sites. This consultation process resulted in the selection of two neighbourhoods in the Wellington region and three within San Francisco. In the Wellington region, the two neighbourhoods selected were Brooklyn in Wellington City and Cannons Creek in Porirua City (Figure 1). In San Francisco, the three neighbourhoods were Miraloma Park, Bayview, and Chinatown (Figure 2).

4.1.1 Wellington neighbourhoods. The neighbourhoods of Brooklyn and Cannons Creek represent the extreme ends of social deprivation levels in the Wellington region. Brooklyn's NZDep score is below the region's average, and Cannons Creek (consisting of Cannons Creek North, Cannons Creek East, and Cannons Creek South) has one of the highest scores (Table I). Demographically, Brooklyn has a higher percentage of residents who identify as Pākehā/New Zealand European, while Cannons Creek has a majority of residents who identify themselves as Pasifika (or Pacific Islanders), an ethnic minority. Residents in Brooklyn also have higher median household incomes than their counterparts in Cannons Creek, which has a large population living in social housing.

4.1.2 City and county of San Francisco neighbourhoods. Miraloma Park has one of the highest median household income levels in San Francisco, well above the city's median household income. In contrast, Bayview's and Chinatown's median household income levels are well below the city's median, with both neighbourhoods having a high percentage of low-income residents. Demographically, Miraloma Park's residents are mostly White. Bayview is comprised of mostly ethnic and racial minorities, and has the highest percentage of Black residents than any other neighbourhood in the city. Chinatown consists of mostly ethnic Chinese. A summary of selected demographic characteristics of study sites is listed in Table II.

4.2 Participant recruitment

To ensure representative perspectives on neighbourhood values and disaster resilience, the authors recruited participants both with and without emergency management experiences, including participation in neighbourhood response trainings and planning meetings, and voluntary or paid experience within the emergency management sector. While participants with emergency management experiences provided insights into existing levels of preparedness and response capacities of their neighbourhoods, the recruitment of participants without such experiences aided in the exploration of contextual influences that affected people's lack of emergency preparedness knowledge. To identify participants, the authors partnered with government agency representatives, CBOs, and community leaders, and posted flyers and social media messages in neighbourhood bulletins. Nine focus groups totalling 58 participants were conducted between March 2016 and October 2016. Participants either lived or worked full-time in a study site and were at least 18 years of age. Table III summarises participants' characteristics and recruitment methods.



Notes: (a) Wellington city and Porirua city, Wellington region; (b) Brooklyn, Wellington city; (c) Cannons Creek, Porirua city

Source: OpenStreetMap contributors (2017)

Resilience
measurement
framework

Figure 1.
Study sites in the
Wellington region:
Brooklyn and
Cannons Creek
(denoted by ★)

4.3 Development of focus group questions

In formulating the focus group questions, the authors adapted questions from two research studies. The first study was a workshop that sought to identify core social resilience characteristics (Table IV) through the perspectives of hazards researchers, emergency management practitioners, and policy makers in the Wellington region (Kwok *et al.*, 2016). In that workshop, social resilience was framed as comprising of four categories of neighbourhood resources and processes (Kwok *et al.*, 2016):

- skills, abilities, and knowledge;
- qualities and amenities;
- values and beliefs; and
- community processes.



Source: OpenStreetMap contributors (2017)

Figure 2.
Study sites in
San Francisco:
Miraloma Park,
Bayview, and
Chinatown
(denoted by ★)

Table I.
Demographics
of Brooklyn,
Cannons Creek, and
Wellington Region

	Pop.	NZDep score	Median HH income (NZD)	Ethnicity (top three)		
Brooklyn	6,504	939	\$102,200	European (78.7%)	Asian (11.3%)	Māori (6.5%)
<i>Cannons Creek</i>						
East	3,594	1,200	\$47,100	Pasifika (65.5%)	European (17.9%)	Māori (17.6%)
South	1,533	1,186	\$47,200	Pasifika (60.3%)	European (23.9%)	Māori (23.9%)
North	3,132	1,238	\$38,900	Pasifika (54.0%)	European (23.7%)	Māori (23.3%)
Wellington Region	471,315	973	\$74,300	European (73.2%)	Māori (12.4%)	Asian (10.0%)

Source: atlas.id (2013)

Table II.
Demographics of
Miraloma Park,
Bayview, Chinatown,
and the City and
County of
San Francisco

	Pop.	% pop below poverty level	Median HH income (USD)	Race and ethnicity (top three)		
Miraloma Park	4,849	6	\$121,151	White (57.6%)	Asian (25.2%)	Latino (9.8%)
Bayview	35,201	23.5	\$49,594	Asian (32.9%)	Black (32.8%)	Latino (21.7%)
Chinatown	9,998	32	\$18,368	Asian (80.9%)	White (12.36%)	Latino (3.7%)
City and County of San Francisco	829,092	13.3	\$78,378	White (41.4%)	Asian (33.3%)	Latino (15.3%)

Sources: San Francisco Planning Department (2012); US Census Bureau (2014)

This study integrated the framing of social resilience with the second study conducted by Freitag *et al.*'s (2014), who used an asset-based appreciative inquiry (AI) approach to elicit people's perspectives on community disaster resilience. AI seeks to explore ideas, values, and perceptions that people have about their environment by focussing on positives rather than on problems (Reed, 2007). Their study first asked research participants to respond to questions such as "What do they like about their community?" and "What makes their community unique?" to help identify local assets that

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Neighbourhood	No. of focus groups	EM experience		Status ^a		Gender		Recruitment method
		With EM training/ planning	Without EM training/ planning	Live	Work	Women	Men	
Brooklyn (NZ)	2	9	6	15	3	6	9	Government agency, flyers, social media, community leaders
Cannons Creek (NZ)	2	1	11	10	7	10	2	CBO representatives, flyers, community leaders
Miraloma Park (USA)	1	8	0	8	1	5	3	Community leaders
Bayview (USA)	3	6	8	12	2	9	5	Government agency, CBOs representatives, flyers, community leaders
Chinatown (USA)	1	4	5	0 ^b	8	5	4	CBO representatives, community leaders
Total	9	28	30			35	23	

Notes: ^aSome participants live and work full-time in the neighbourhood and are listed in both columns; ^ba participant in the Chinatown focus group is a non-resident client of a community-based organisation

Table III.
Participants' background, gender, and recruitment methods

Cognitive dimension of social resilience (attitudes, values, and beliefs of individuals about themselves and their environment)	Structural dimension of social resilience (discrete features and characteristics of a social entity such as people and communities)
Adaptability – ability to embrace change	Access to economic resources
Collective efficacy	Community (and individual) preparedness
Community inclusiveness	Democratic and collaborative decision-making and problem-solving policies and processes
Connectedness between networks	Disaster management planning
Leadership	Diversity of skills and training
Sense of community and attachment	Knowledge of community assets and beliefs
Shared community beliefs and values	Knowledge of risks and hazard consequences
Social support	Robust community spaces and amenities
Trust	Social networks

Table IV.
Core attributes of social resilience of communities from the perspectives of researchers, policy makers, and practitioners

Source: Kwok *et al.* (2016)

promote individual and community well-being (Freitag *et al.*, 2014, p. 325). This was followed by a discussion about the resources required for community preparedness, response, and recovery (Freitag *et al.*, 2014).

By integrating the questions and approaches used in these two earlier studies, this study sought to identify common and contextual disaster resilience themes by asking participants the following questions: How would you describe your neighbourhood? What are your favourite things or places in the neighbourhood? When you hear the phrase “community disaster resilience”, what do you think of? What does your neighbourhood need (e.g. skills, abilities, knowledge, resources, values and beliefs, and community processes) in order to anticipate, cope with, and overcome the challenges and changes from a disaster, such as an earthquake?

Using the qualitative data analysis principles set out by Braun and Clarke (2006), responses to these questions were audio-taped, transcribed, coded, and analysed by their themes.

5. Results

5.1 *What do neighbourhood stakeholders consider as important in their communities?*

Participants' responses suggest that their community values are rooted in the identities and socio-cultural norms of their neighbourhoods.

5.1.1 Neighbourhood identities. Many factors influenced how participants framed the identities of their neighbourhoods, but a dominant contributor to the formation of neighbourhood identities is a neighbourhood's history. Participants with long residential tenure were able to provide a degree of historical continuity by recounting the changes (e.g. demographic changes) that had occurred in their neighbourhoods. Although they attributed much of the neighbourhood changes to external influences, the legacy of historical identities of these neighbourhoods continues to the present day.

While participants took pride in their neighbourhoods' positive identities, they actively rebuked (or reframed) those with negative connotations. For example, in Cannons Creek and Bayview, which were beset by high rates of crime in the past, participants felt that the lingering reputation of their neighbourhoods as high-crime, dysfunctional places masked the existing community strengths (e.g. strong social bonds between residents) that contribute to their neighbourhoods' disaster resilience.

Neighbourhood identities are also reflected in existing neighbourhood amenities and features, which participants from all focus groups pointed to as a source of community pride. Local parks, retail shops, food establishments, recreational facilities, neighbourhood-wide events, and schools provide opportunities for everyday interactions and cultivate a sense of shared experiences among residents. For instance, participants recounted their neighbourhood coming together in advocating for the development of certain amenities (e.g. community gardens) or exclusion of unwanted ones (e.g. liquor stores). These collective actions have served to solidify a sense of community and community attachment, which are the factors that contribute to neighbourhood resilience (Chamlee-Wright and Storr, 2009)

5.1.2 Socio-cultural norms of neighbourhoods. Participants voiced the importance of "knowing your neighbours" as essential to maintaining a sense of community and disaster resiliency. Regardless of a neighbourhood's socioeconomic level, participants' responses demonstrate that each neighbourhood examined has a high degree of social connectedness. That connectedness is reinforced by different social and cultural infrastructures in each neighbourhood: churches in Cannons Creek; cultural networks and CBOs in Bayview; the residents' association in Miraloma Park; CBOs and cultural homogeneity in Chinatown; and community-based groups and schools in Brooklyn.

Yet, focus group discussions highlighted the fragility of these social norms, which can be enhanced or depleted by neighbourhood changes over time. Bayview (San Francisco) provides the starkest example. Participants discussed at length their feelings on the loss of community among African-Americans residents and other low-income community members because many have relocated elsewhere due to the rising cost of living and encroaching gentrification. Although many felt that the neighbourhood is still close-knit, the rapid changes in neighbourhood demographics are eroding place-based social bonds and social support that had been built over decades.

5.2 *How is "community disaster resilience" defined by neighbourhood stakeholders?*

The phrase community disaster resilience elicited a wide range of responses among participants. The aggregated responses were coded and categorised based on the following resilience aspects: scales of resilience, resilience of whom, resilience to what, and resilience outcomes (Table V).

The diverse views of these participants mirror existing definitional debates on community disaster resilience in the literature. However, it is important to note that the term

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Resilience aspects	Themes
Scales of resilience	Levels – individual, household, community, society Spatial – proximity between neighbourhoods and to hazards Temporal – preparedness, response, recovery
Resilience of whom?	Neighbourhood/community Diverse groups
Resilience to what?	Internal and external stresses – both human-induced and natural hazards
Resilience processes	Adapting (to change); bouncing back; coming together; coping; reframing expectations (e.g. receiving external assistance); striving; surviving; withstanding/resisting adversity
Resilience outcomes	Residents benefitted from changes Maintenance of psychological and physical health and well-being Reduction in everyday vulnerabilities of people (e.g. homelessness) Retention of residents Resumption and sustainability of community functions

Table V.
Focus group participants' definition of "community disaster resilience" (aggregated responses from all focus groups)

resilience was not a universally understood concept. Many participants without emergency management knowledge and from the Chinatown focus group did not understand what "resilience" meant and required further clarification. For participants who did not understand the phrase, the term resilience was replaced with community strengths, a phrase that aligns with this study's framing of the concept (see Section 4.3). While responses to the alternate phrase were found not to be markedly different, the authors recognise participants' responses could have supplanted other perspectives if they had fully understood the term "resilience". To maximise community input in disaster resilience planning, this issue highlights the need for translating "resilience" and its conceptual meanings into appropriate cultural and linguistic contexts of community members (International Federation of Red Cross and Red Crescent Societies, 2016).

5.3 What do neighbourhood stakeholders think their communities need to cope with a natural hazard event?

In identifying characteristics of neighbourhood resilience, and in particular social resilience, this section discusses participants' responses relating to the following areas: skills, abilities, and knowledge; qualities and amenities; values and perceptions; and community processes (see Section 4.3) Although focus group questions were geared towards identifying the characteristics of social resilience, a range of responses necessitates that the identified characteristics be categorised into different resilience domains. These characteristics are coded into five broad areas: individual/psychological, socio-cultural, economic, infrastructural/built, and institutional/governance. By synthesising participants' responses to this question and those relating to Sections 5.1. and 5.2., Table VI lists the resilience characteristics that were identified to be essential to neighbourhood resilience, along with a description, participant's quote, and supporting literature reference(s) for each theme.

The themes in this list serve as a foundation for measuring both tangible and intangible components of disaster resilience at the neighbourhood level. These include people's values and beliefs as well as neighbourhoods' assets and capacities. Many of these themes are similar to those stated by emergency practitioners, policy makers and researchers – individuals who are considered as DRR experts but may not be embedded within the communities they serve (see Table IV). The consistency of responses between DRR experts and focus group participants suggests that neighbourhood stakeholders are not only aware of the resilience assets and gaps in their communities, but they can also provide contextual insights into neighbourhood conditions and processes that could be valuable in DRR planning. Hence, local stakeholders

Category	Theme – neighbourhood resilience	Description	In the words of participants	Reference
Individual/ psychological	Individual responsibility	Personal responsibility for self-protection (e.g. disaster preparedness)	“Make people [...] as robust as possible so they can survive without anybody. Nobody is going to come help you, if you have no food in your house, you gonna go hungry”	Becker <i>et al.</i> (2015)
	Psychological well-being	Pre-existing and post-disaster mental and emotional health of individuals	“Do they have symptoms of traumatic stress? It’s that kind of stuff that’s really complex. And that’s stuff that get missed off, cause it’s not on the surface”	Paton <i>et al.</i> (2013)
	Self-efficacy	An individual’s belief that s/he can do something to control the outcome of a disaster	“If there’s trouble in front of my place, I’d go out and address it. And that makes it safe for the old and the young to come out of their houses and say hello”	Becker <i>et al.</i> (2015)
Socio-cultural	Awareness of hazard risks	Awareness of natural hazards that exist in the neighbourhood	“Definitely flooding. If there’s a storm, it [the creek] will flood – almost every year”	Becker <i>et al.</i> (2015)
	Awareness of vulnerabilities of people and structures	Knowledge of people who might need assistance and of buildings/structures that might be at risk in a disaster	“The biggest community that would be affected [...] by a major earthquake would be the council flats at the bottom of the hill. And there are whole floors of people who don’t speak English”	Becker <i>et al.</i> (2015)
	Collective efficacy	The belief that a community can do something to control the outcome of a disaster	“What you need is a support network, if they are already active. If people are already doing things, then [in] emergencies [it is] much easier to make things happen”	Paton <i>et al.</i> (2013)
	Community participation	People’s participation in community groups and events that enhance their social networks and connections	“Like our NERT program and the Miraloma Park Improvement Club [...] The more people that you have that get active or even knows about things leads to resilience. It’s not something that happens overnight. It’s an ongoing process”	Becker <i>et al.</i> (2015), Sherrieb <i>et al.</i> (2010)
	Cultural values and practices	Cultural values, beliefs, practices of individuals and groups that enhance their resilience	“I think with that extended family and especially amongst the African-American [...] it is a family – it has the same family support [than a nuclear family structure]”	Chamlee-Wright and Storr (2010)
	Education and training	Knowledge needed and how people can gain such knowledge in preparing for and responding to disasters	“They tell you to keep batteries in your house, flashlight, water, you have to keep some canned goods or some type of food [...] And once we have those [preparedness training] sessions and they let us know what we need to do in case of an earthquake, we’d be better prepared”	Paton (2013)
	Information and communication	Availability and accessibility of disaster risk information and the mechanisms that aid in	“So people just need to have the information in whatever capacity, whether it’s through the schools, the	Norris <i>et al.</i> (2008)

Table VI.
Disaster resilience themes for measuring resilience of urban neighbourhoods

(continued)

Category	Theme – neighbourhood resilience	Description	In the words of participants	Reference
	Learning from past hazard events (locally or elsewhere)	the dissemination of such information Past experiences – both disasters and other adverse events	kapi-mana [newspaper]. But it needs to be on a regular basis” “There’s a lot of lessons were learned from that [flooding] event, cause a lot of people were affected by it”	Becker <i>et al.</i> (2015)
	Place attachment	The degree of people’s emotional investment in their neighbourhood that increases their motivation to protect that investment	“I think also homeowners are, they don’t all, they’re more likely to have children. Renters do as well. I think [...] when people got children they become a lot more cemented because they are using the facilities”	Becker <i>et al.</i> (2015), Norris <i>et al.</i> (2008)
	Diversity of skills	People in the neighbourhood with the necessary skillsets to meet the diverse demands arising from a disaster	“You might have a register: Who could fix houses, people who have access to plumbing, plumbers and engineers. But then, social workers, or someone who could go walk some old lady’s dog or volunteer networks”	Paton <i>et al.</i> (2013)
	Social networks	Social connections between individuals and groups	“I think we could get to know our neighbours better and also the people who don’t live in our community, so opportunities to get to know the people [...] in different contexts as an opportunity to build that resilience”	Aldrich (2012)
	Social responsibility	Responsibility to assist others in or outside of the neighbourhood, including social support	“Resilience is based on community and neighbours knowing one another other, learning how to take care of one another”	Paton <i>et al.</i> (2013)
	Stability of population	Length of residence in the neighbourhood	“There are many people who’ve been here for many, many years [...] till now, there’s been a pretty low turnover. People have roots going back”	Sherrieb <i>et al.</i> (2010)
	Understanding potential hazard impacts and consequences	Ability to anticipate potential disaster impacts on people and the neighbourhood	“It could be ten days, two weeks, till there’s actually some reliable supply other than fresh water coming in”	Becker <i>et al.</i> (2015)
Economic	Economic resilience of individuals and communities	Financial health of individuals, households, and the neighbourhood	“I think poverty comes in as well. A lot people, they are scrapping by as it is, they don’t have the money to have food stored up, and generators. There’s where the resources are lower than wealthier neighbourhoods”	Sherrieb <i>et al.</i> (2010)
Infrastructural/ built	Neighbourhood space and amenities	Places and services that support individual, household, and community functions	“I would want to be at the pub when the earthquake occurs because we’ve developed quite a community there”	Chamlee-Wright and Storr (2009)
	Structural integrity of buildings and infrastructure (e.g. roads) and lifelines	The ability of buildings, infrastructure and lifelines to survive disaster impacts and maintain their functions	“Those basic things like being able to flick on electricity, and the tap to get water, and to flush the toilet, or to drive down the road to pick up a cell phone or whatever or communicate with somebody”	Cutter <i>et al.</i> (2014)

(continued)

Table VI.

Category	Theme – neighbourhood resilience	Description	In the words of participants	Reference
Institutional/ governance	Civic infrastructure	Networks of CBOs and agencies	“You need those [social services] organisations and those who people can recognize”	Graham <i>et al.</i> (2016)
	Experiences and effectiveness in collective action	Past experiences and effectiveness in people coming together to solve community problems	“We’ve had a few protests then. When that happened, as a community, we all stepped up and we all marched together, and we are all like one group”	Graham <i>et al.</i> (2016)
	Unifying leadership	Leaders or organisations who represent the interests of the neighbourhood	“I think it’s really important is that in order for a neighbourhood to have a voice and be heard by either an elected official [...] we need to have some sort of a group that speaks for more than just one person”	Paton <i>et al.</i> (2013)
	Inclusiveness	Inclusion of diverse stakeholders and views in community planning process	“We are the last ones to know of or be in on anything in any information. It’s hard to get information [...] we are the last ones to know”	Paton <i>et al.</i> (2013)
	Community planning	The presence of disaster plans within the neighbourhood	“There are temporary plans for individuals who don’t have housing or who are unable to go back to their apartments. There’ll be shelter locations available and there’s going to be account for having more people we can put here temporarily”	Becker <i>et al.</i> (2015)

Table VI.

and practitioners should adopt tools such as the urban context analysis (International Rescue Committee, 2017) to help generate contextual information that aid in the collaborative process of assessing resilience and designing neighbourhood-specific interventions.

While the themes in Table VI are based on the findings of focus groups from the study sites, the authors caution readers in applying these resilience measurement themes to other communities. Rather, this paper emphasises the need for a bottom-up approach to developing a disaster resilience measurement framework that reflects place-specific values and perspectives. Additionally, this research process highlights several challenges and considerations for neighbourhood stakeholders and government agencies seeking to collaboratively develop neighbourhood-based disaster resilience assessment tools.

6. Challenges and considerations

6.1 Community engagement issues

While community engagement has been advocated in community-based DRR planning (Horney *et al.*, 2016; Pfefferbaum *et al.*, 2015), this and other studies (e.g. Vallance, 2014) point to a disconnect between the rhetoric of community engagement and challenges in engaging representative segments of a neighbourhood in the field. For example, a significant shortcoming in this study was the lack of involvement from several key stakeholder groups, especially the business community, non-English speakers, and certain ethnic minority groups. Although resilience themes in this qualitative study reached saturation (Fusch and Ness, 2015), factors such as timing, language accessibility, location, salience of the research topic, and relevance of focus groups could have created unintentional barriers for participation.

Due to time and financial resource constraints experienced by practitioners and community-based agencies, achieving full community engagement may not be possible. Thus, the goal of community engagement may not have to include everyone, but rather to identify and work with the more vulnerable and disempowered groups in developing strategies for community development, mentoring, and advocacy as part of the capacity-building and DRR planning process. This is especially important as vulnerable populations are often the least able to participate in local planning (Horney *et al.*, 2016). Community engagement strategies also need to reduce other engagement barriers such as those relating to terminologies and languages, gender, income, disabilities, and stakeholders' cultural beliefs and values (International Federation, 2014). Although Table VI describes resilience measurement themes that are shared across the study sites, the perspectives stemming from stakeholders from other diverse backgrounds and experiences could help refine these themes for each neighbourhood.

6.2 *Scaling issues*

Another challenge in formulating neighbourhood-based measurements is that neighbourhoods do not exist in a vacuum. As resilience is conceptualised as existing across different societal domains and spatial scales, a systems approach to assessing resilience that take into account linkages of resilient capacities, disaster risks, and societal vulnerabilities becomes necessary (Cavallo and Ireland, 2014). A drawback in developing neighbourhood-level measures is the inherent challenge of accounting for external influences that, on most occasions, are dictated by city- or regional-level policies enacted at levels beyond the purview of neighbourhood governance.

Therefore, neighbourhood-based measures need to reflect conditions and processes that are amenable to change through community development, engagement, and empowerment programmes. Especially when many of these neighbourhood-based programmes are carried out for a short period of time, it is essential to assess neighbourhood conditions and determine realistic performance expectations and metrics. For instance, resilience measures that are focused on social capital need to decipher which aspects of the concept are amendable to change by neighbourhood-based interventions. Furthermore, neighbourhood-based assessments need to consider for potential cascading effects that are beyond the control of neighbourhoods (e.g. influx of displaced residents from neighbouring communities and relocation of employment opportunities). Thus, the authors advocate for having a multi-scalar assessment that links the effects of resilience policies and interventions at multiple societal levels while incorporating the values and needs of neighbourhood stakeholders.

In summary, this study addressed how neighbourhood stakeholders conceptualise social resilience of disasters. Their community values point to the importance of neighbourhood identities, amenities, and socio-cultural norms in contributing to community disaster resilience. Their perspectives also reveal their understanding of the individual/psychological, socio-cultural, economic, infrastructural/built, and infrastructural/governance dimensions of resilience. Rather than applying the identified resilience themes to other localities (as they might not be applicable), this study highlights the importance of using bottom-up methods, such as those described in this paper, as imperative to the identification of resilience measures that reflect local values and priorities. While recognising challenges such as engaging the whole-of-community and accounting for structural influences that are external to neighbourhood governance, the authors believe that this study's approach could help advance the call for sharing DRR responsibilities between governments and communities by cultivating the "commitment, goodwill, knowledge, experience, and resources" between them (UNISDR, 2015, p. 23).

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