Citizens' Perception of the Resilience of Australian cities

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Abstract

How well does the general public understand the concept of urban resilience? We address this question via an online survey of 500+ citizens living in three large Australian cities (Sydney, Melbourne and Perth). The majority of respondents claim not to know what urban resilience means. Of the remaining respondents, understanding ranges from poor to sophisticated. To circumvent this stated lack of understanding, we cast the concept of urban resilience into a more familiar framework consisting of risk and ability to cope with threats. This allows us to assess perceptions about what may challenge the resilience of Australian cities. Two concerns clearly emerge: i) violence and social unrest and ii) environmental threats. Analysing a number of constructs from the social psychology literature reveals that these two concerns hold different cognitive signatures, whose understanding may facilitate discussion and communication within a public engagement process.

Keywords: Resilience, Urban Resilience, Urban growth, Urban development, Australia, Australian cities

1   Introduction

The use of the concept of 'resilience' in academia has become increasingly common, with a Scopus search showing an ongoing growth within the specialised literature. A key source of the discourse on resilience originated from the field of ecology and was later adopted in other research fields, including the management of complex *socio-ecological systems*. Within the socio-ecological systems literature resilience has been variously been defined as:

- '*The capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the system is capable of self-organization, learning and adaptation*' (Walker, Holling et al. 2004); and
- '*The capacity of a system to absorb disturbance and re-organise so as to retain essentially the same function, structure and feedbacks – to have the same identity*' (O'Connell, Walker et al. 2015);

See also (Olsson, Jerneck et al. 2015) for a longer list of definitions. More broadly in terms of human communities, clearly borrowing on the discourse around complex socio-ecological systems, resilience has been defined:

- '*The ability of human communities to withstand external shocks or perturbations to their infrastructure, such as environmental variability or social, economic or political upheaval, and to recover from such perturbations*' (Adger 2000);

And specifically for cities, resilience has been defined as:

- *'the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience'* (100 Resilient Cities)
- *'Urban resilience refers to the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity'* (Meerow, Newell et al. 2016)

Early notions of urban resilience focused on specific threats such as 'peak oil' or 'climate change' (Newman, Beatley et al. 2009), and continues in more recent publications addressing issues like urban flooding (Lamond and Proverbs 2009), disaster recovery (Vale and Campanella 2005) or extreme weather (Henstra 2012).

While the concept of resilience and the overall framework for its application has been widely debated in the literature, it is important to ask to what extent this has reached the public discourse. In particular, it is important to ask how well the general public understand the concept of urban resilience; whether this lay understanding matters; whether the vision of resilient cities and communities can be achieved without lay understanding; whether institutional, academic, technical and technological forces are sufficient for its success; and whether the concept of resilience itself assume its lay understanding. The Cultural Theory may help us frame these questions (Douglas 1966, Douglas and Wildavsky 1982, Douglas 1985, O'Riordan and Jordan 1999, Kahan, Jenkins-Smith et al. 2011, Price, Walker et al. 2014).

In (Thompson and Beck 2015), the authors discuss a few applications of the Cultural Theory to decision making in the urban environment. In particular, they show how different preferences for ways to manage society, captured under the label Myths of Human Nature, lead to very different perceptions of urban management issues and of available solutions. The Myths of Human Nature describe four broad beliefs about how society functions and should be managed: i) 'hierarchical', focussed on top-down regulations and clear, widely acknowledged power relations, ii) 'individualistic', focussed on individual freedoms leading to spontaneous, self-organising regulations and institutions, iii) 'egalitarian', focussed on bottom-up, local, socially negotiated institutions and iv) 'fatalistic', according to which most attempts at social order are likely to fail. Each of these beliefs underlays a different worldview about society according to which humans are i) flawed, but potentially improvable by social institutions, thereby justifying a hierarchal social organisation, ii) self-serving, ambitious and competitive, endorsing individual freedoms, iii) altruistic, but potentially corruptible by hierarchical and market institutions, supporting egalitarian institutions and vi) unjust and unworthy, leading to fatalistic attitudes (Douglas 1966, Douglas and Wildavsky 1982, Douglas 1985, O'Riordan and Jordan 1999, Kahan, Jenkins-Smith et al. 2011, Price, Walker et al. 2014).

(Thompson 2011, Thompson and Beck 2015) suggest that the discourse about sustainability at large, and urban sustainability in particular, as captured definition '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*' (Bruntland 1987), is not value-free despite being widely accepted and rarely contested. Rather, it conforms to the hierarchal Myth of Nature because it assumes that a unique understanding of sustainability is available, as provided and sanctioned top-down by an international organisation under expert guidance. It is interesting to apply the same reasoning to the discourse about resilience. On the one hand, the concepts of sustainability and resilience are related (O'Connell, Walker et al. 2015) and, as for Bruntland's definition of sustainability, the definitions of resilience listed above hold hierarchical connotations since they are provided and sanctioned top-down by

international organisations, academic institutes and experts. On the other hand, an in depth analysis of the concept of resilience reveals a strong affiliation to the 'egalitarian' Myth of Human Nature. According to the Resilience, Adaptation and Transformation Assessment Framework (RATA) (O'Connell, Walker et al. 2015) pursuing resilience should not necessarily follow universal, top-down, centralised recommendations defined by experts and endorsed by policy making bodies, as the hierarchal Myth of Nature would support. Nor, should it give priority to market forces and individual entrepreneurship, as the individualistic Myth of Nature would support. And obviously it assumes that resilience can be achieved, unlike what a fatalistic Myth of Human Nature may suggest. Rather, it recommends that all steps, from resilience assessment to action, are carried out in a consultative bottom-up fashion, characteristic of the egalitarian Myth of Human Nature by explicitly listing adaptive governance as well as management and multi-stakeholder engagement as two of its four key elements and explicitly recommending to '*examine and develop shared understanding of the system, and vision for the future*' ((O'Connell, Walker et al. 2015) page 4). Emphasis on democracy and community participation within urban approach is also discussed in (Barkham, Brown et al. 2014) and underlays the importance of framing the concept of urban resilience into a particular context by asking a number of core questions (Meerow and Newell 2016):

1. 'Who is the resilience for?' This determines the subjective nature of resilience as being a goal for a particular group. It helps zoom in on who is included and not included in the 'urban system' thereby also forcing to spell out what is meant by '*urban*' (Meerow and Newell 2016);
2. 'What should the system resilient against?' Understanding what type of perturbations that it is important that the urban system is resilient to, and whether the focus is on general (any given stress or threat) or specific resilience (pre-defined stress or threat).
3. 'When is it the resilience for?' Understanding whether the focus is long-term or short-term and whether the focus includes future generations.
4. 'Where is the resilience for?' What are the boundaries of the urban system, and are some areas prioritized over others?
5. 'Why create resilience?' Understanding the goal of building resilience, and the underlying motivations.

Within the Cultural Theory framework, this egalitarian, highly consultative view of resilience assessment and action leads us naturally to ask to what extent the very concept of resilience is understood by the general public. This question is particularly relevant to discussions about the resilience of large metropolitan centres. Projects addressing the resilience of small groups (villages, towns) could conceivably involve a reasonable portion of the overall community. In this setting, the extent to which the concept of resilience is understood could be directly assessed and, should understanding be found to be poor, it could be addressed via dedicated workshops or other fairly direct communication paths. But when the focus of a resilience assessment is a large metropolitan centre, with several million inhabitants, direct consultation is more than problematic, and largely not possible in the same way as for the smaller human settlements. Consultation and engagement is a critical tool in the toolbox for cities, but has to be adapted to the highly complex context with vast numbers of stakeholders. In this setting, consultation is likely to follow a more mainstream political process in which poor understanding of the concept of resilience may be hard to detect, difficult to address or, even worse, easy to exploit.

We believe that the understanding and appreciation of the concept of resilience among the general public should not be taken for granted. On the one hand, as a psychological trait or a personal condition, the term 'resilient' is today of fairly commonly use. On the other hand, several surveys warn us of the poor level of literacy among the general public even in developed countries (see

specifically for Australia). In addition, the concept of resilience as summarised above concerns *systems* and necessarily relies on an understanding of dynamical processes which is known to be poor not only among the general public but also among individuals with high level of education in technical disciplines (Moxnes 1998, Stanovich 1999, Moxnes 2000, Sterman 2008, Cronin, Gonzalez et al. 2009). Finally, cities are mixed natural, technical, economic and social systems, whose implication for resilience are difficult to assess even by experts (Olsson, Jerneck et al. 2015). When resilience is understood under the egalitarian framework recommended in (O'Connell, Walker et al. 2015), it is thus reasonable to ask to what extent the aim of initiatives like 100 Resilient Cities (100 Resilient Cities) is contingent on the general public's very understanding of the concept of resilience.

In this work we explore the understanding and perception of urban resilience via an online survey among inhabitants of three large Australian cities: Sydney, Melbourne and Perth. When asked '*What does urban resilience mean?*' the majority of the respondents claim not to know the answer. More encouraging, a minority of respondents appear to have a reasonably good understanding of resilience. By casting resilience in terms of risk and ability to cope, we are then able to assess *perceptions* of resilience and to identify two classes of perceived risks: the first relates to violence and social instability and the second to environmental threats. Finally, by including a number of psychological constructs from the social cognition literature, we attempt to define the cognitive signature of these perceptions of resilience.

Besides providing an initial map of perceptions of resilience in large Australian cities, our work highlights the need to analyse this issue further. Understanding the concept of resilience involves at least three levels. The first is about an understanding sufficient to make a citizen aware of its significance in urban setting and at the level of social and political discourse. The second, more technical, is about a basic understanding of the dynamics which are at the core of the resilience of a generic, abstract system. The third, by far the most complex, is about the appreciation of these implications at the level of the social dynamics which pertain to the urban setting. Our work addresses only the first level and shows that already at this level the majority of the respondents are aware of *not* understanding the meaning of urban resilience. This points to a direction which needs to be followed both at a research and communication level if the project of urban resilience is to be achieved.

2   Method

 We start by describing the method we used to assess the public understanding of urban resilience. Next, we describe the overall questionnaire we employed, which also includes a number of additional questions and constructs from the social psychology literature. The questionnaire can be found in Appendix A. Finally, we describe how respondents were selected and how the online survey was run.

2.1 Assessment of resilience

We started by asking participants about their attitude to urban growth. Next, we asked if they knew what the concept of urban resilience means. To assess whether respondents differentiate the concepts of resilience and liveability as well as to understand whether liveability is seen as a component of resilience we also asked respondents whether they know what urban liveability means. If they answered they do, then we asked them to provide three keywords or to explain their

understanding in a sentence (Appendix A, Section 1). Next, we proceeded to assess the respondents' perception of resilience to stresses and shocks which can threaten Australian cities (Appendix A, Section 5). A list of threats to large cities was obtained from 100 Resilient Cities network website (http://www.100resilientcities.org/cities#/-_/). In order to keep the length of the survey below the recommended 25-30 minute limit, we grouped these threats into 18 categories (see Table 4; for example, the shocks drought, flooding, or rising sea level were grouping into the Extreme Weather events category).

Questions about resilience to these threats could not be asked explicitly because we did not know in advance whether the concept of resilience was well understood. As a result, we framed the concept of resilience into two components: assessment of risk and assessment of capacity to cope. This framework is in line with the definition of urban resilience as '*the ability of a city to avoid or bounce back from an adverse event - comes from the interplay of vulnerability and adaptive capacity*' in (Barkham, Brown et al. 2014). The authors define vulnerability as '*a city's exposure to shocks in terms of both magnitude and frequency*' (page 3). In particular, perceptions of resilience to different threats were obtained via these steps:

1. Assessment of Risk Intensity. Risk is generally also understood as consisting of two distinct sub-scales: the probability of a stress occurring and the severity of its consequences (Sage and White 1980) and is usually assessed via a two-dimensional matrix of likelihoods and severity of an event. This is in line with the definition of vulnerability in terms of magnitude and frequency of shocks in (Barkham, Brown et al. 2014). It follows that in principle our resilience framework consists of three components: i) probability of occurrence, ii) severity of consequences and iii) ability to cope, and should be assessed via a three-dimensional matrix of likelihoods, severity and coping capacity. This would be cumbersome, and would result in a questionnaire too long to answer. Consequently, we combined the two risk sub-scales (likelihood and severity) into a single Risk Intensity component by asking respondents to assess the risk of a given stress by choosing among four options: 'It won't happen', 'It may happen but would have minor consequences', 'It may happen and would have severe consequences' and 'It is likely to happen and would have severe consequences'. Finally, a numerical score was assigned to these choices ('It won't happen'=1 to 'It is likely to happen and would have severe consequences' = 4).

2. Assessment of Capacity to Cope. For each stress, respondents were asked to answer the question "*do you think your city can cope with this stress*" using a five-point Likert scale ranging from 1 = 'not at all' to 5 = 'certainly'. In order to avoid asking questions which may be perceived as redundant (and potentially annoying), we did not ask this question for threats which were defined as low risk at the previous point. In order to carry out the assessment of resilience at the next point, we assumed that the two Risk Intensity answers 'It won't happen' and 'It may happen but would have minor consequences' would imply the city would 'Certainly' cope with the threat (Capacity to Cope=5).

3. Assessment of Perception of Resilience; this was carried out by first reversing the Risk Intensity score and then adding the Capacity to Cope scores.

4. Finally, to simplify comparison and visualisation in Figure 1 and Table 4, the scores of Perception of Resilience and Risk Intensity were rescaled in the range 1-5.

2.2 The questionnaire

The questionnaire also included questions aimed to explore perceptions and attitudes towards cities, perceptions and understanding of urban resilience, a number of constructs from the social cognition literature and some basic demographics.

First impressions (Section 1 in Appendix A). The purpose of this component of the survey was to gauge the general public's perception of a city, what they understand a city to be and how it functions, and its relation with the environment. We first asked respondents to list five words they freely associate with Australian major cities. Then a set of definitions of the city was presented requesting people to choose the statement which best reflected their opinion. Next, participants were asked to answer whether they consider Australian cities to be part of nature and if wilderness can exist in the city. The section also includes questions related to the spatial boundary and power relations in cities.

Myths of the City (Section 2 in Appendix A). These define three sets of beliefs about urban life and development (Boschetti, Gaffier et al. 2016). The Anti-Urban Myth represents a strongly negative view of urban life, city development and of the impact of cities on the natural environment and social wellbeing. Cities are seen as growing too crowded with unhappy people living in personal alienation among social segregation and inequality. The Cultural City Myth identifies cities with culture and diversity. It represents the belief that what makes cities interesting is culture, ideas, creativity, diversity and architecture. Finally, the Mighty City Myth captures the beliefs that life in a city is better than elsewhere and is likely to improve with urban growth and technological advances.

Myths of the Future (Section 3 in Appendix A). Among the five Myths of the Future identified in (Boschetti, Price et al. 2015), three dimensions were included in the questionnaire: Social crisis, Techno-Optimism, Power and Economic inequality. The Social Crisis myth describes a belief on a future in which social values are likely to decrease. The Techno-Optimism myth illustrates the belief that the quality of life will improve thanks to innovation. Lastly, the Power and Economic Inequality myth describes a future in which imbalance in economic and political power leads to social inequality. These three Myths of the Future were chosen because of their strong statistical significance. The remaining two myths were omitted to keep the overall questionnaire within a 25-30 minute length.

Myths of Nature (Section 4 in Appendix A). As in (Price, Walker et al. 2014), we used the Cultural Environmental Bias measure of environmental worldview to assess the Myths of Nature construct. The rationale for this choice is discussed in (Price, Walker et al. 2014). To keep the questionnaire with the required length, we included only the seven statements which compose the Environment as Ductile scale, which describes the belief that collective action is required to protect the environment.

Social Dominance Orientation (Section 6 in Appendix A). To assess political ideology, we included four items from the Social Dominance theory (Pratto, Stewart et al. 2013). The scale measures the extent to which people endorse social order controlled by a dominating group.

Concern for Future Consequences (CFC) (Section 7 in Appendix A). We used seven statements from the measurement of the construct described in (Strathman, Gleicher et al. 1994). This subscale weights the extent to which people consider distant consequences resulting of their actions or behaviours.

Demographics (Section 8 in Appendix A). The survey also asked questions some standard demographics questions.

2.3 The survey

The survey was conducted in May 2016 with 612 participants from three capital cities in Australia (Sydney, Melbourne and Perth) using an on-line research-only internet panel[1]. The online panel consisted of a group of community members who have explicitly agreed to take part in web-based surveys from time to time. In return they are offered a small non-cash incentive for completing such tasks, such as points towards shopping credits. The gender and age profile of the sample accords with the known population characteristics of Australians. Of the 612 participants, 553 provided reliable answers to all questions and were included in the analysis.

3   Results

3.1 How well is the concept of resilience understood

Table 1 shows the distribution of answers to the question '*what does urban resilience (liveability) mean?*'. The majority of respondents (just over 50%) claim not to know what urban resilience means, around one third claim to have a rough idea and 12% answered the open question describing their understanding of resilience (among these, ~10% provided answers which revealed poor understanding compared to the definitions listed in the Introduction). The picture is slightly more positive for the concept of liveability; around one third of respondents claim not to know what urban liveability means and around half claim to have a rough idea. 17% answered the open question describing their understanding of liveability, around a quarter of whom provided answers which revealed poor understanding of liveability.

Table 1. Answers to the question 'what does urban resilience/liveability mean?'

	'I don't know'	*'I have a rough idea'*	*'To my understanding…'*
What does <u>urban resilience</u> mean?	51%	37%	12%
What does <u>urban liveability</u> mean?	30%	53%	17%

Table 2 shows the most quoted keywords associated to the terms 'urban resilience' and 'urban liveability'. The keywords associated with resilience include the words adapting, survival, change, coping, flexibility and sustainability; they also include a number of verbs (e.g., Adapting, Growing, Surviving, Coping) which suggest that resilience is understood as a process. The keywords associated with liveability include safety, housing, services, jobs, infrastructure, transport, recreation and affordability; they also include mostly nouns (e.g., Ability, Affordability, Cost, Infrastructure,

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[1] The panel used is administered by ORU, an online fieldwork company with QSOAP 'Gold Standard' and the new Global ISO 26362 standard accreditation. The ORU has a database of over 300,000 individuals from across Australia (http://www.theoru.com/).

Transport), suggesting that liveability is understood as a state, more than a process. In addition, a number of keywords appear in both lists, including community, environment/Nature, ability.

Table 2. Twenty most quoted keywords associated to the terms 'urban resilience' and 'urban liveability'. Occurrence represents the percentage of respondents who included the keyword as one of the three available options (thus the sums of occurrence=300%).

	Urban resilience		Urban liveability	
	Word	Occurrence (%)	Word	Occurrence (%)
1	Adapting	21	Living/life	32
2	Growing	19	Ability, to be able	17
3	Surviving	18	Affordability/Cost	17
4	Ability/to be able	13	Infrastructure/Facilities	16
5	Change/changing	12	Transport	13
6	Community	12	Housing	13
7	People/individual	10	Areas, space, place	12
8	Coping	8	Accessibility	12
9	Nature	7	Safety/security	12
10	Living	7	Environment	10
11	Sustainability	7	Quality	10
12	Good	6	Community	10
	Stress, Strength, Recovering, Flexibility, Economy, Capacity, Business, Environment, Progress	>4	Services, Work/jobs, Recreation/ entertainment/fun, People/population, Good	>8

A sample of the definitions of resilience and liveability provided by respondents who chose the *'To my understanding…'* option is provided in Appendix B. This question offered an opportunity to respondents to provide a more nuanced explanation of their understanding of these two terms. Many definitions of resilience focus on the ability/capacity to carry out a task (survive, adapt, grow, respond) if the need arises. It is a *state* (ability), which enables the system to carry out a *process* (adapt/respond). This is broadly in line with the definitions of resilience found in the literature, as listed in the Introduction.

(O'Connell, Walker et al. 2015) highlight the importance of context in any resilience discourse in terms of i) resilience of what, ii) to what and iii) according to whom. Some insights can be obtained by exploring a related question: *who* holds the ability to be resilient? For ten respondents humans do (people, society, communities). For three respondents it is the cities themselves ('cities', 'urban environments', 'systems within cities'); two of these definition use the plural form ('urban environments', 'systems within cities') which may indicate an appreciation of cities as complex systems. Eight responders refer to abilities in a more abstract sense by not specifying who holds it. For what regards the second contextual item (resilience to what) some responders include any possible threats; some mention change itself; others are fairly specific (violence, particularly terrorism, and natural disasters are often mentioned). Of particularly interest is that eight responders mention cities themselves (or urban life) as the threat the system needs to be resilient

to. Only one respondent provided a definition which addresses the third contextual item (resilience according to whom), revealing a concern with power: 'a *concept which can benefit the person who specifies it*'.

Can we say anything about perception of the relation between resilience and growth? While one respondent mentions growth as a threat to be resilient to, a few mention growth either as indicator or aim of resilience. Growth is also the second most frequent keyword in Table 2. On the other hand, Table 3 shows the results to the question 'Which of the following best describes your attitude to urban growth?' (Appendix A, Section 5). A large majority of respondents claim to either accept or tolerate growth, with a small minority approving it. Among these, responders tolerating growth are older than responders accepting growth (p<0.05), while we did not find any significant difference in terms of gender and education level. As a result, it is hard to draw firm conclusions about perceptions of the relation between resilience and growth. One likely explanation is that people may use the word growth to mean many different types of growth (Cork, Grigg et al. 2015). This is a topic which deserves further empirical investigation.

Table 3. Responses to the question 'Which of the following best describes your attitude to urban growth?'

	%
I reject it	4
I tolerate it	28
I accept it	44
I approve of it	14
I embrace it	4
NA	5

Overall the respondents provided more definitions of the concept of liveability than resilience, suggesting that liveability is probably the better understood term, as shown in Table 1. Liveability is defined as "*the degree to which a place supports quality of life, health and well-being*" (Major Cities Unit 2012, Lowe, Whitzman et al. 2015). Most pertinent to this study is the difference between understanding of resilience and liveability. Liveability seems to be psychologically 'closer' to everyday life: it is more local in space (often it refers to specific suburbs and local environment, rather than to the overall city) and time (it mostly deals with the present, rather than the future). Three components are often included : i) access to facilities (jobs, health, food, water, transport, culture, ii) affordability and iii) safety, the most often mentioned concern. It also includes more mundane aspects like making life easier, reducing efforts in the daily life and shopping. It is possible that the term liveability captures what resilience is supposed to protect or, in other words, that what defines liveability includes the answer to the 'to what' resilience question. This is a topic which may deserve further research.

It is interesting to consider these results with the capability approach for urban life as proposed in (Blečić, Cecchini et al. 2013). In line with Maslow's hierarchy of needs (Maslow 1943), (Blečić, Cecchini et al. 2013) define two types of capabilities which are essential to individual wellbeing specifically in relation to urban living. The Goal-Capabilities (Autonomy, Self-Esteem, Responsabilities) are abstract and define broad existential aspirations without necessarily defining a precise course of action. The Base-capabilities (Health, Home, Environment, Work and Education, Play, and Participation) can guide action and provide the avenues to fulfil the Goal-Capabilities. Of the six Base-capabilities, Participation is the only one not mentioned in our results. We tentatively

interpret this as suggesting that the concept of liveability is interpreted as pertaining to the individual more than to the community, which in turns may be a cultural bias due to our responders representing a western, wealthy, developed nation. Given that participation is an essential element of the resilience framework recommended in (O'Connell, Walker et al. 2015), this is a topic which deserves further analysis. It would also be of interest to understand to what extent resilience is understood as a Goal-Capability (an aspiration per se) or as a Base-capability (a mean to an end) and whether this affects its perception.

3.2 Perception of Resilience of three large Australia cities

Figure 1 shows the spider plot of the mean Perception of Resilience scores (large values map to higher resilience) for 18 urban threats, averaged over all respondents (thick red line) and over respondents from Perth, Sydney and Melbourne (dashed blue, green and grey line, respectively). There are only minor differences between the three cities, with Sydney and Melbourne showing particularly similar scores. Compared to the scores of the overall population, respondents from Perth perceive their city to be more resilient to 'Overpopulation' and 'Refugees' and to be less resilient to 'Resources scarcity', while respondents from Sydney perceive their city to be more resilient to 'High unemployment' and less resilient to 'Social inequity' and 'Disease outbreak'.

Figure 1. Spider plot of the Resilience for 18 urban threats, averaged over all respondents. The red thick line refers to the full set of respondents. Numerical values of means are given in Table 4. Dashed blue, green and grey lines, refer to respondents from Perth, Sydney and Melbourne, respectively.

Numerical values of means over all respondents for the Risk Intensity, Capacity to Cope and Perception of Resilience are shown in Table 4, where the threats are sorted according to increasing Perception of Resilience. Table 4 shows that High unemployment and Overpopulation are perceived to be the threats to which Australian cities may be least resilient to, followed by climate change, ageing infrastructure, terrorism/war and resource scarcity and depletion of natural resources. As a comparison, it is interesting to highlight the main threats to the resilience of Sydney and Melbourne according to the 100 Resilient Cities project (100 Resilient Cities , 100 Resilient Cities). For both Sydney and Melbourne these include aging infrastructure, heat wave, lack of affordable housing, rapid growth, rising sea level and coastal erosion, social inequity, terrorism and wildfires, with the additional threats of coastal flooding, declining or aging population, disease outbreak, drought, economic shifts, rainfall flooding for Melbourne and infrastructure failure and overtaxed/under developed/unreliable transportation system for Sydney. The general overlap between the threats listed in Table 4 and the ones provided by the 100 Resilient Cities project is a natural consequence of the fact that the 100 Resilient Cities project's list of threats was used to select the items in our questionnaire, as explained in Section 2.1. The most striking difference between our results and the assessment provided by the 100 Resilient Cities project for Melbourne and Sydney is given by High unemployment, which is at the top of the list in our results and does not appear in the 100 Resilient Cities' assessments. It can also be noticed that economic shifts, social inequity and declining or ageing population are fairly low in the rank in our results while they are listed as relevant in the 100 Resilient Cities' assessments.

Table 4. Numerical values of means for the Risk Intensity, Capacity to Cope and Perceptions of Resilience scales.

	Risk intensity	Capacity to Cope	Perception of Resilience
High unemployment	3.54	2.82	3.02
Overpopulation	3.56	2.82	3.03
Climate change	3.5	2.86	3.12
Ageing infrastructure	3.49	2.94	3.14
Terrorism, war	3.32	2.79	3.18
Resource scarcity and depletion of natural resources	3.35	2.81	3.19
Extreme weather events	3.45	3.08	3.22
Economic shifts	3.39	3.02	3.22
Violence (riot, crime)	3.38	2.98	3.24
Social inequity	3.35	2.94	3.27
Declining or ageing population	3.41	3.11	3.28
Refugees	3.24	2.75	3.35
Internet collapsing, cyber-crime	3.19	2.9	3.35
Infrastructure failure	3.17	2.93	3.41
Biodiversity crisis	3.05	2.95	3.52
Technological disasters	3.07	3.1	3.53
Disease outbreak	3	2.96	3.54
Civil unrest	2.9	2.96	3.62

The ranking of concerns and Perception of Resilience in Table 4 can be a useful starting point for discussions in a public engagement forum. This discussion could be made simpler and more effective if clear relations between these concerns was found to exist and to be of intuitive appeal and easily interpretable. To explore this we subjected the Perceptions of Resilience scores for the 18 threats to exploratory factor analyses (maximum likelihood extraction with oblimin rotation). The analysis suggested a two factor structure and the threats with strong loading on only one factor were assigned to either of the factors[2]. This analysis shows that 50.3% of the common variance in the data can be explained by two factors (respectively 42.2% and 8.1%), each representing four threats, as shown in Table 5. The first factor includes violence (riot, crime), refugees, terrorism & war and civil unrest and clearly captures safety concerns related to various perceived drivers of violence. The second factor includes climate change, extreme weather events, resource scarcity and biodiversity crisis and clearly captures concerns about environmental threats playing out at broader scales than the Australian cities under analysis. These two factors are correlated, with the correlation being positive, strong (0.45) and statistically significant (p-value<0.001). This means that respondents concerned about violence and also likely to be concerned about environmental threats. A confirmatory factor analysis was then conducted and the hypothesised model of two factor solution provided good measures of fit (CFI=0.98; TLI= 0.97; RMSEA=0.051, CI=[0.032;0.069]). A table with the loadings for all 18 threats is include in Appendix

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[2] Threats were assigned to a specific factor if three different criteria were satisfied: i) the threat's loading into a factor is >0.5, ii) the ratio between the loading to this factor and the loading to the second factor is >3 and iii) the threat's communality is >0.3.

Table 5. Loading coefficients of the two factor solution underlying the Perception of Resilience for three large Australian cities. Four threats load on each factor, respectively.

	Resilience to Violence	Resilience to Environmental Threats
Violence (riot, crime)	**0.78**	0.02
Refugees	**0.67**	0.02
Terrorism, war	**0.67**	-0.07
Civil unrest	**0.62**	0.08
Climate change	-0.10	**0.86**
Extreme weather events	0.09	**0.67**
Resource scarcity and depletion of natural resources	0.10	**0.64**
Biodiversity crisis	0.13	**0.58**

3.3 Perception of Resilience factors: Cognitive signature

Table 6 shows the correlations between these two Perception of Resilience factors and the cognitive constructs described in Section 2.2. Both Perception of Resilience factors share a negative correlation with the 'Social Crisis' Myth of the Future, which describes a belief on a future characterised by lower social values (Boschetti, Price et al. 2015). In the case of the Resilience to Violence factor, this correlation is unsurprisingly strong, given that violence and social unrest are likely results of social stress. In the case of the Resilience to Environmental Threats factor, the negative correlation may reflect the beliefs that environmental decline is ultimately linked to a decline in social values, as captured by the 'egalitarian' Myth of Nature (O'Riordan and Jordan 1999, Price, Walker et al. 2014, Thompson and Beck 2015). This interpretation is supported by the observation that both factors negatively correlate with the 'Power and Economic Inequality' Myth of the Future (which describes a future in which imbalance in economic and political power leads to social inequality) and by the negative correlation with the 'Anti-Urban Myth' of the City, which see cities as a locus and source of social and environmental decline. No correlation is found with the 'Techno-Optimism' Myth of the Future which describes a belief in a future which will be improved by technological innovation (Boschetti, Price et al. 2015), suggesting the technology is not perceived as relevant to urban resilience. Not surprisingly, the Resilience to Environmental Threats factor has a negative correlation with the 'Environment as Ductile' construct, endorsing the view that Nature is not infinitely resilient, but rather can sustain only limited pressure before collapse. Also not surprisingly, both factors show a positive correlation with Attitude to Urban Growth, highlighting that perceptions of resilience are related to acceptance of growth. The Resilience to Environmental Threats factor shows a positive correlation with the Social Dominance Orientation (SDO), which shows that perception of (low) Resilience to Environmental Threats is associated with endorsing a more egalitarian order, possibly seen as an avenue to address environmental threats. Both Perception of Resilience factors are positively correlated to Mighty City Myth, which captures the positive side of urban life (Boschetti, Gaffier et al. 2016) (the more cities are perceived as resilient the more positive urban life is seen and viceversa), while only the Resilience to Environmental Threats factor shows a negative correlation with the Cultural City Myth, which endorses a view of cities as locus of culture, diversity and beauty.

We summarise this analysis by highlighting both the similarities and the differences in the cognitive signatures of the two Perception of Resilience factors. For what concerns the similarities, a citizen who believes that the city where (s)he lives has low resilience to either violence or environmental threats is likely to be concerned about worsening social values, equity and environmental conditions, to be more sensitive to the perils than the benefits of urban life and as a result to have a negative view of urban growth. For what concerns the differences, Resilience to Environmental Threats factor shows a more nuanced signature by including an egalitarian attitude to governance, concern for future consequences of current actions, and positive attitude towards the cultural aspects and diverse richness of urban life, which are in line with a left-wing liberal political orientation.

Table 6. Correlations between the Perception of Resilience factors identified in Table 5 and a number of cognitive constructs. Values in bold are statistically significant at the following levels * p<.05, ** p<.01, ***p< .001.

	Resilience to Violence	Resilience to Environmental Threats
Social Crisis	**-0.49***	**-0.25***
Power-Eco Inequality	**-0.25***	**-0.37***
Techno-Optimism	0.05	0.01
Environment as Ductile	**-0.13**	**-0.45***
Attitude to Urban Growth	**0.12**	**0.14**
Social Dominance Orientation	-0.03	**0.32***
Concern for Future Consequences	-0.05	**-0.22***
Anti-Urban Myth	**-0.29***	**-0.23***
Cultural City Myth	-0.02	**-0.14***
Mighty City Myth	**0.16***	**0.19***

Finally, Table 7 shows the correlation between the Perception of Resilience factors and basic demographics data. A number of correlations are statistically significant: female respondents seem to be more concerned than males about both types of Resilience threats while respondents with lower level of attained education as well as older respondents seem to be more concerned about Resilience to Violence. These results are broadly in line with the social psychology literature (Bord and O'Connor 1997, Davis and Dossetor 2010).

Table 7. Correlations between the Perception of Resilience factors and basic demographic data. Values in bold are statistically significant at the following levels * p<.05, ** p<.01, ***p< .001.

	Resilience to Violence	Resilience to Environmental Threats
Age	**-0.12**	-0.05
Gender	**0.10***	**0.12**
Education	**0.18***	0.05

4   Discussion

In this section we reflect on a number of results arising from this work. Some threats which both the media and the political discourse consider to be highly significant for Australian cities and for large

cities in developed countries in general are not among the top concerns for our respondents. In Section 3.2, we have compared our results to published resilience assessments for Sydney and Melbourne. For an international comparison, (FactCoExist 2016) list the top ten resilience concerns according to mayors of large US cities. Public safety and environment risk rank high and so they do in our analysis, as we discussed above. On the other hand, Economic Development and Budgets are the first and third concerns, respectively, according to US city mayors, while in our results economic concerns are expressed indirectly in the form of high unemployment and aging infrastructure. Assuming our results are representative of the overall Australian population (as they should, given how the respondents have been selected), this partial misalignment between media and political discourse at national and international level on the one hand and our respondents on the other may be factual or may be due to an unclear delineation of the urban vs national scope of these concerns, which naturally overlap. For example, the possibility that economic threats may be perceived by the general public as having a scope broader, or more abstract, than actual cities is something which may require further study.

In this type of analysis, what is missing from the results may be as relevant as the results themselves. Three items stand out. First, when asked about urban resilience, our respondents seem to be indifferent to technological innovation, which is seen neither as a solution nor a threat. Technology is not among the most frequent keywords associated with either resilience or liveability, it ranks third from the bottom in terms of perception of threat and does not show any correlation with the Perception of Resilience factors. This is somehow at odds with current media emphasis on Smart Cities, the potential disruptions Artificial Intelligence may cause on both job security and society at large and the impact driverless cars may have on urban and national transport.

Second, the word 'future' is mentioned only twice in all definitions of resilience and keywords associated with it. As discussed in (Olsson, Jerneck et al. 2015), the concept of resilience includes both stability and change. (O'Connell, Walker et al. 2015) highlight the close relation between resilience, transformation and adaptation. At its core, a resilience assessment involves choosing which among the functions important to us now, we want to maintain into the future (O'Connell, Walker et al. 2015). In other words, by definition, the concept of resilience keeps an eye on the future while holding one foot in the present. The reason why the word future occurs so rarely in our responses and what role the future plays in perceptions of resilience is another direction of research worth pursuing for at least two reasons. First, the analysis in Section 3.3 shows the Perception of Resilience factors share some relation with two of the Myths of the Future identified in (Boschetti, Price et al. 2015). Second, previous research shows that attitudes towards the future are very malleable (Boschetti, Walker et al. 2016) and that it is difficult to ensure consistency between current choices and future consequences (Richert, Boschetti et al. 2016). Taken together, this literature suggests that the three contextual questions associated with resilience assessment (resilience of what, to what and according to whom) (O'Connell, Walker et al. 2015) could be extended with a fourth question: 'until when'.

Third among the missing topics are institutions and governance, which are considered an essential component of resilience in the literature (Walker, Barrett et al. 2009). The only term related to these concepts is community, which is often mentioned a keyword but only once in the definition of resilience. There could be a number of reasons for this. In (Boschetti, Gaffier et al. 2016) we show that when asked 'Who makes things happen in major Australian cities?' respondents perceive city councils, state governments and big businesses as the top players. It is possible that institutions pertaining to cities are considered distributed among too many scales (several councils at the local scale and national and international players at broader scales) to be considered relevant. However, it

should also be noticed that institutions are rarely mentioned in the commonly accepted definitions of resilience (among the definition listed in the Introduction, institutions are mentioned only once as actors which need to be resilient, rather than as contributors or threats to resilience) and rarely as issues relevant to urban life and development (Boschetti, Gaffier et al. 2016).

The discourse about environmental management and environmental and social sustainability is often cast within the STEEP (Society, Technology, Environment, Economy and Politics) framework (Hunt, Lombardi et al. 2012). It is interesting to notice that in our results pertaining to urban resilience two of these five items are basically missing (Technology and Politics) and one receives only indirect attention (Economy). This is particularly significant given that cities are widely recognised to be engines of economic development and technological and cultural (and thus political) innovation (Bettencourt, Lobo et al. 2007). In alignment with a parallel study (Boschetti, Gaffier et al. 2016), these observations suggest that the ways in which issues relevant to the development, sustainably and resilience of large cities are conceptualised may differ from how the same issues are conceptualised at the global and national scale. Similarly, the conceptualisation of sustainability and resilience in the environmental and urban arena may also differ. This indicates that care should be used in porting to urban analysis results from cognitive psychology, political discourse and narrative analysis which were developed in relation to environmental and national issues. In turn, this points to a direction of research which is likely to inform how to best engage the public in the urban resilience discourse.

Naturally, these directions for further research also highlight the limitations of the questionnaire used in this study. Some of the questions we discussed above could be included in a future version of the questionnaire, depending on the specific scope of the survey and provided this does not result in a questionnaire too long to answer. We believe an even more effective way to improve our questionnaire could involve a discussion of the results of our study within a focus-group setting. This would allow researchers to explore issues related to urban and economic growth, perception of the future and distinction between urban vs national scopes, for example, via open-ended questions leading to team discussions which may bring to the fore issues the researchers may not consider as relevant but may hold the key to an effective communication of resilience issues.

5   Conclusions

The vast majority of the respondents to our survey either claim not to know what urban resilience means or display a poor understanding. Only a minority shows a good understanding of resilience in terms of complex system behaviour. This result suggests that better communication from both academics and institutions is needed if discussions about resilience, sustainability, transformation and adaptation of large cities is to be carried out under the 'urban resilience' label. Nevertheless, our results also show that it is possible to engage the general public in discussions about resilience by casting the concept into the more familiar framework of Risk Intensity and Capacity to Cope. This conclusion is supported by the fact that the relation between the Perceptions of Resilience factors obtained within this framework and a number of cognitive constructs are clear, statistically significant and easily interpretable within the social psychology theory.

Among the 18 threats we enquired about, our respondents identify overpopulation and high unemployment as the ones to which Australian cities are likely to be the least resilient to. When the threats are jointly analysed, two clear groups of concerns arise. The first includes violence (riot,

crime), refugees, terrorism, war and civil unrest. The second includes climate change, extreme weather events, resource scarcity and depletion of natural resources and biodiversity crisis.

The Perceptions of Resilience approach does not overcome the need to address our respondents' self-claimed lack of understanding of the concept of urban resilience. On the contrary, our analysis suggests a number of issues which need specific communication effort and others which would benefit from further research. These include, among others, why technology and institutions are almost completely missing from our respondents' description of resilience; the scarce emphasis placed on the economy; the relation between urban, national and global scales in resilience assessments; the role of attitudes towards the future in the understanding of resilience and the role played by growth in terms of threat, aspiration or indicator of resilience.

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7 Appendix A – the questionnaire

7.1 First impressions

What are the first five words that come to mind when you think about major Australian cities?

1.	2.	3.	4.	5.

Which of the following statements best reflects your opinion about what defines major Australian cities?

[__] An urban location exceeding a certain population size
[__] An urban location exceeding a certain physical size
[__] An urban location that is important economically or culturally
[__] An urban location that is a collection of smaller suburbs and towns
[__] An urban location with its own government and administration
[__] An urban location with its own unique type of inhabitants
[__] Other (please specify) _____

Do you consider major Australian cities to be a part of nature? Please use the scale below.

1 = Cities are completely separate from nature	**2.**	**3** = Cities are sometimes be part of nature	**4.**	**5** = Cities are always part of nature

Can the wilderness exist in major Australian cities? Please use the scale below.

1 = Wilderness cannot exist in cities	**2.**	**3** = Wilderness can sometimes exist in cities	**4.**	**5** = Wilderness always exist in cities

Where would you place the spatial boundary of the city?

1. Between the inner city and the suburbs [__]
2. Between the suburbs and the larger metropolitan area [__]
3. Beyond the urban region [__]
4. Other *(please specify)* _____

Who makes things happen in major Australian cities? Please use the scale below.

1 = Not at all	**2.**	**3** = Somewhat	**4.**	**5** = Certainly

1. City councils [__]
2. Federal government [__]
3. State/Territory government [__]
4. Corporations [__]
5. Big business [__]
6. City residents [__]
7. Neighbour communities
8. Rich people [__]
9. No one [__]
10. Other *(please specify)* _____

What does urban resilience mean?

1. I don't know [__]
2. I have a rough idea, it is about *(give three key-words)* [__] [__] [__]
3. To my understanding, I would explain as (*explain in a few words*) _____

What does city liveability mean?

1. I don't know [__]
2. I have a rough idea, it is about *(give three key-words)* [__] [__] [__]
3. To my understanding, I would explain as (*explain in a few words*) _____

7.2 Myths of the Cities

Think about major Australian cities today. Please read each of the statements below and indicate whether you agree or disagree on a scale of one to five.

1 = Strongly disagree	2 = Moderately disagree	3 = Neither agree nor disagree	4 = Moderately agree	5 = Strongly agree

Anti-Urban Myth

1. Because of globalisation, cities have lost their identity and look the same [__]
2. Urban development is not working very well [__]
3. Urban development has resulted in disadvantage and inequality [__]

4. Segregation is a serious problem in cities [__]
5. The population in cities has grown to unsustainable levels [__]
6. Cities are responsible for the depletion of natural resources [__]
7. Although there are many things to do in cities. few of them are affordable [__]
8. Although there are many things to do in cities, people don't have enough time to enjoy them [__]
9. People in cities are more likely to be unhappy and depressed [__]
10. Cities contribute to social alienation [__]

Cultural City Myth

11. As cities grow, citizens are exposed to more ideas and cultures [__]
12. Cities are places of cultural diversity [__]
13. Entertainment and culture make cities more attractive [__]
14. Architecture and heritage buildings are an important component of a city [__]
15. Natural areas in cities make them more attractive places to live [__]

City Living Myth

16. Larger cities are more appealing than small cities and towns [__]
17. The population in cities is healthier and more health-conscious [__]
18. People in cities are more concerned about protecting the environment [__]
19. As cities grow, they become better places to live [__]
20. With better technology we can solve all problems in cities [__]
21. Cities work best when they are high density and built-up [__]

7.3 Myth of the Future

Think about Australia's future… Please read each statement and decide whether you agree or disagree with each statement as follows.

1 = Strongly disagree	**2** = Moderately disagree	**3** = Neither agree nor disagree	**4** = Moderately agree	**5** = Strongly agree

Social crisis:

1. Crime and drug abuse will increase [__]
2. Traditional morals and family values will decline [__]
3. Society will be so involved in the internet and virtual world that it will lose touch with reality [__]
4. Law and order will decline [__]
5. Society will become more ignorant because of changes in technology and education [__]

Techno-Optimism:

1. Genetic technology will create more effective medicine and agriculture [__]
2. Scientific innovations will improve medicine so that it is preventive and personalized [__]
3. The coming decades will see new exciting economic markets emerge [__]
4. There will be new improved ways to produce food and feed the world [__]
5. The internet will make education available for all [__]

Power and Economic inequality:

1. Multi-national corporations will become alarmingly powerful [__]
2. Continued economic growth will result in social inequality [__]
3. Companies and governments will collect public data to control or influence people [__]
4. A poorly regulated financial sector will result in another global economic crisis [__]
5. The difference between the rich and poor will continue to grow [__]

7.4 Myth of Nature – Ductile Environment

Think about Australia's future… Please read each statement and decide whether you agree or disagree with each statement as follows.

1 = Strongly disagree	**2** = Moderately disagree	**3** = Neither agree nor disagree	**4** = Moderately agree	**5** = Strongly agree

1. The natural environment will become unstable if humans exceed the limits identified by experts [__]
2. When pushed beyond the limits identified by experts the natural environment will not recover [__]
3. The natural environment can be managed if there are clear rules about what is allowed [__]
4. If the balance of the natural environment is upset the whole system will collapse [__]
5. Conservation and protection are the most rational strategy for managing the natural environment [__]
6. We all have a moral obligation to protect the environment and consume fewer resources [__]

7.5 Cities resilience

Which of the following best describes your attitude to urban growth?

1. I reject it [__]
2. I tolerate it [__]
3. I accept it [__]
4. I approve of it [__]
5. I embrace it [__]
6. N/A [__]

How intense do you think is the risk for the following stresses and shocks in your city?

1 = It won't happen	**2** = It may happen, but would have minor consequences	**3** = It may happen, and would have severe consequences	**4** = It is likely to happen and would have severe consequences

1. Extreme weather events (drought, heat wave, flooding) [__]
2. Climate change [__]
3. Ageing infrastructure [__]
4. Infrastructure failure (major blackouts) [__]
5. Economic shifts (another financial crisis) [__]
6. Declining or ageing population [__]

7.   High unemployment [__]
8.   Overpopulation [__]
9.   Refugees [__]
10. Social inequity [__]
11. Civil unrest [__]
12. Violence (riot, crime) [__]
13. Terrorism, war [__]
14. Disease outbreak [__]
15. Resource scarcity and depletion of natural resources [__]
16. Biodiversity crisis [__]
17. Technological disasters (industrial explosion, chemical accident) [__]
18. Internet collapsing, cyber-crime [__]

Do you think your city can cope with the following stresses and shocks? Please use the scale below.

1 = Not at all	**2.**	**3** = Somewhat	**4.**	**5** = Certainly

1.   Extreme weather events (drought, heat wave, flooding) [__]
2.   Climate change [__]
3.   Ageing infrastructure [__]
4.   Infrastructure failure (major blackouts) [__]
5.   Economic shifts (another financial crisis) [__]
6.   Declining or ageing population [__]
7.   High unemployment [__]
8.   Overpopulation [__]
9.   Refugees [__]
10. Social inequity [__]
11. Civil unrest [__]
12. Violence (riot, crime) [__]
13. Terrorism, war [__]
14. Disease outbreak [__]
15. Resource scarcity and depletion of natural resources [__]
16. Biodiversity crisis [__]
17. Technological disasters (industrial explosion, chemical accident) [__]
18. Internet collapsing, cyber-crime [__]

7.6 Social dominance orientation

Read each statement and decide whether you agree or disagree with each statement as follows.

1 = Strongly disagree	2 = Moderately disagree	3 = Neither agree nor disagree	4 = Moderately agree	5 = Strongly agree

1. In setting priorities, we must consider all groups [__]
2. Group equality should be our ideal [__]

3. Superior groups should dominate inferior groups [__]
4. We should not push for equality between groups [__]

7.7 Consideration of future consequences scale – CFC Future subscale

Read each statement and decide whether you agree or disagree with each statement as follows.

1 = Strongly disagree	**2** = Moderately disagree	**3** = Neither agree nor disagree	**4** = Moderately agree	**5** = Strongly agree

1. I consider how things might be in the future, and try to influence those things with my day to day behaviour [__]
2. Often I engage in a particular behaviour in order to achieve outcomes that may not result for many years [__]
3. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes [__]
4. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years [__]
5. I think it is more important to perform a behaviour with important distant consequences than a behaviour with less important immediate consequences [__]
6. When I make a decision, I think about how it might affect me in the future [__]
7. My behaviour is generally influenced by future consequences [__]

7.8 Demographics

What is your year of birth? [__]

What is your gender? [__]

What is the highest level of education you have achieved?

Primary School [__]   High school / Tertiary school [__]   Trade / TAFE qualification [__]
Undergraduate degree [__]   Postgraduate qualification [__]

8   Appendix B – Definitions of resilience and liveability

Resilience. Sample of definitions of resilience provided to responders who chose *'To my understanding…'* option to the resilience question in Appendix A Section 9. Five responders wrote "*capacity of individuals, communities, institutions, businesses and systems within a city to survive*", which is likely to be cut and pasted from http://www.100resilientcities.org/resilience the first hit on a Google search for urban resilience in Australia at the time of the survey.

- *Ability to withstand change with little detriment to the inhabitants*
- *Able to accommodate growth with capacity to expand provide essential services at large*
- *Being able to live in a crowded and somewhat selfish environment*
- *Capacity of community to adapt to city*
- *it is the ability to support the people who live there and infrastructure*

- *It means that an urban society can bounce back from negative effects. these negative effects may be the aftermath effects of the destruction of the twin towers in new york u.s.a. it also can mean the aftermath effects of natural disasters around the world or the fairly recent disastrous effects of the worldwide financial crisis. It can also refer to the bounce back after other terrorist attacks or the killing of innocent people around the world - such as wars. mass shootings of people.*
- *How to deal with urban population*
- *Humans adapting and surviving through anything*
- *The ability for our urban environments to change and adapt to new ideas and social change*
- *the ability for people to adapt to living in the city*
- *the ability of society to continue growing and adapting*
- *The ability to adapt to changed circumstances.*
- *The ability to survive major disruptions such as an earthquake or a Muslim terrorist attack.*
- *The ability to withstand change. Develop and transform.*
- *The capability to prepare for, respond to and recover from significant multi-hazard threats such as natural disasters and such with minimum damage to public safety and health. The economy. and security of a given urban area*
- *The capacity to respond in healthy ways to diversity, adverse incidents and other challenges*
- *To understand & grow with future change*
- *Urban resilience is when the people that live in the urban they can do and are strong to uphold culture*
- *Systems within a city to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience.*
- *Referring to the ability of people who live in cities as well as the cities themselves to survive and adapt to changing conditions and to grow in a positive way. Also refers to the ability of cities and people to overcome problems both manmade and natural - this would require forward planning in coping with foreseeable problems*
- *It over comes the teething problems and keeps growing*
- *As someone who can adapt to city lifestyle, but does not allow it to consume them.*
- *A concept which can benefit the person who specifies it.*
- *Not becoming depressed by living in population dense conditions*
- *Abstaining from, or being a part of the culture of the living area of a community.*

Liveability. Sample of definitions of liveability provided to responders who chose *'To my understanding…'* option to the resilience question in ..

- *Access to things that make life better such as schools, medical facilities, shopping, sport and recreation, employment opportunities.*
- *The ability to live cleanly and have access to services that I require.*
- *Access to amenities and resources, inclusionary practices that make an area desirable and safe to live in. A stable economic infrastructure. A visually aesthetic and functional space.*
- *A measure of the quality of life available to residents in the urban areas of the city.*
- *Place where people can live safely*
- *The ability to exist safely in an area without fear of untoward happenings*
- *Surviving the perils of mass isolation*
- *Being affordable and not having to go outside the community*
- *The essential services are reliable, water, power, transport, being safe, having green space, hospitals, education facilities, health services, sporting facilities, cultural facilities clean air*

- *The human space available in our urban environments. Space to live.*
- *Basic access to health and shelter in an urban setting*
- *Culture, resources, quality, innovation*
- *How well the urban environment compliments modern living.*
- *Being able to survive urban conditions to an old age.*
- *The degree to which people can live safely within an area (suburb/shire etc.) whilst having access to schools, health care services, recreational facilities/parklands, public transport*
- *Affordable, safe and exciting place to live*
- *The ability to live with adequate food, water, housing, employment and recreation/the arts.*
- *good place to live*
- *The community being able live sustainably*
- *Private space, not overcrowded and retail and shopping available and public transport*
- *to be able to successfully live a life in an urban society - such as being able to afford suitable housing & food, clean safe drinking water and other affordable good quality living requirements like clothing, footwear, medical personnel requirements - such as suitably qualified & experienced doctors, dentists, eye wear, haircutters, etc. and reliable safe public transport systems, reliable safe airports and to ensure that any illegal immigrants are sent back to where they came from.*
- *Quality of life - ease of cultural access and transport.*
- *Being an affordable place to live. A place full of opportunities, growth and prospects. Where everything is within arm's reach.*
- *Judged by a scale that takes into account how people who live in a city feel about their environment and stress or joy coming from it*
- *Affordable area with good amenities and some nature*
- *The function of the urban area to provide its inhabitants with a place of shelter, employment, recreation, transport and caring services.*
- *ensuring there is sufficient amenities and transportation to accommodate residents*
- *The ability to monetarily afford living in a city, affording and accessing activities and infrastructure.*
- *The area is good to live in and have good housing facilities*
- *Living in harmony with environment*
- *Excellent infrastructure and supported by hubs of schools, shops, community spaces, green spaces and transport.*
- *Natural and friendly environment*
- *How enjoyable, accessible and safe it is to be in an urban area.*
- *The quality of lifestyle available in a certain area/suburb including but not limited to the area, surroundings, markets and shops etc.*
- *all aspects of living considered, including economy, society stability, safety, culture*
- *Being able to live within your means in whatever area you are. Being a part of it totally*
- *It is very close to central but enough far away from there*
- *The layout, sense of community and integration of nature into well planned spaces.*
- *Power, transport, work, pleasure facilities*
- *The ability to reach all needed facilities, support, recreation, etc. without significant effort or travel.*

9   Appendix D – Factor analysis of Perception of Resilience

Table 8. Loading coefficients for all 18 threats on the two factor solution underlying the Perception of Resilience for three large Australian cities.

	Resilience to Violence	Resilience to Environmental Threats
Refugees	0.73	-0.14
Terrorism, war	0.72	-0.07
Violence (riot, crime)	0.71	-0.02
Civil unrest	0.71	-0.02
Infrastructure failure	0.52	0.19
Disease outbreak	0.52	0.20
Internet collapsing, cyber-crime	0.50	0.21
Economic shifts	0.48	0.26
Technological disasters	0.48	0.26
Overpopulation	0.38	0.27
High unemployment	0.37	0.36
Ageing infrastructure	0.33	0.36
Declining or ageing population	0.17	0.43
Social inequity	0.29	0.47
Biodiversity crisis	0.14	0.60
Extreme weather events	0.07	0.63
Resource scarcity and depletion of natural resources	0.10	0.64
Climate change	-0.15	0.81