Literature review on city resilience peer review framework

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1. Introduction

Disasters, and their impacts, have been seen to have increasingly destructive consequences on the societies they affect. In 2016 alone, a number of devastating earthquakes were reported in Japan, Ecuador, Tanzania, Italy and New Zealand, while severe flooding was recorded across the US, Europe and Asia, and abnormal weather events reached a record high in the US. The resultant effects of global adverse events have resulted in approximately 11,000 people losing their lives or going missing (Swiss Re, 2017). In addition, economic losses have substantially risen from USD 94 billion in 2015, to USD175 billion in 2016; the highest they have been since 2012 (Swiss Re, 2017).

These figures demonstrate the magnitude of disaster effects and provide critical insights into disaster trends. Whilst reduction in disaster mortality has been observed in the last decade, many countries are still unable to reduce the risk of hazards faster than their hazard-exposed populations increase (UNISDR, 2015). In addition, global loss trends indicate that the rapid growth of economic assets in hazard-prone regions is increasing disaster risk (UNISDR, 2015).

These issues are particularly salient in urban environments which now house the majority of the world's growing population (Meerow et al., 2016). Cities in both developing and developed nations face increased risks. Whilst developing nations have seen large influxes in forms of informal urbanisation, where urban planning and land use remain unregulated (Meerow et al., 2016), developed nations face emerging and evolving threats related to climate change and population expansion (Gilissen et al., 2016). Research indicates that around 54.5 per cent of the world's population were living in urban settlements in 2016; a figure which is expected to increase to 60 per cent by 2030, with one in every three people living in cities with at least half a million inhabitants (United Nations, 2016).

As a result of the growing risks facing urban settlements, increasing attention has been paid to notions of urban and city resilience. As a result the United Nations Office for Disaster Risk Reduction (UNISDR) launched the "Making Cities Resilient: My city is getting ready!" Campaign, in order to address issues of urban risk and resilience. One key facet of this campaign are 10 critical steps developed to help build and maintain resilience - the 10 essentials (UNISDR, n.d.).

The ECHO-funded "Urban Scorecard" (UScore) project was developed to pilot the use of a self-assessment Disaster Resilience Scorecard which aligned with the Making Cities Resilient (MCR) campaign to assess city resilience in 5 cities (Amadora, Portugal; Arvika/Jönköping, Sweden and Salford/Stoke-on-Trent, UK). This led to the ECHO-funded "Urban Scorecard 2" (UScore2) project which builds upon the findings and lessons learnt from UScore. Whilst UScore demonstrated the need for, and usefulness of, local governments and communities in assessing policies and practices relating to disaster risk reduction (DRR) and preparedness, it also highlighted the need for additional independent and transparent means of city resilience assessment.

Accordingly, UScore2 focuses on the merit of peer reviews as a tool with which "the performance of one country in the area of disaster risk management/civil protection is examined on an equal basis by fellow peers who are experts from other countries" (EU Peer Review, n.d). This approach facilitates improvements in DRR through the exchange of best practice and mutual learning, whilst also maintaining impartiality and transparency. In particular, attention has been paid to the importance of local governance in managing and reducing risks within cities. The role of local governance is vital as such mechanisms are the first to respond to crises, are adept at delivering local services, and importantly, are well connected to the societies they serve (UNISDR, n.d.).

To develop this document (Deliverable 1.1 for the UScore2 project), an understanding of the term *urban resilience* was necessary. The definition adopted by this research is one commonly cited in DRR and resilience literature, and states that urban resilience is "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions" (Sendai Framework, 2015: 9).

2. Purpose of this Literature Review

The purpose of this literature review is to capture a wide variety of documents pertaining to city resilience peer reviews to provide details of academic and non-academic perspectives in this emerging field. Using the 10 essentials as a framework for analysis, the literature review presents an inquiry into how these essentials are understood and utilised for city resilience peer reviews, and the implications this has on policy, practice and the usability of these concepts. Insights into the ways in which city resilience is conceptualised, and the gaps and implications that arise as a result of this, are also reported captured. In turn, this supports evidence-based learning, and promotes the theoretical underpinning of policies and plans relating to urban resilience.

For UScore2, this review informs the design of the modules which the project will develop to peer review city resilience and inform the design of the impact evaluation method which will be used to assess the impact of the peer review on the city. Drawing on a variety of literatures supports a comprehensive approach to integrating concerns relating to the 2015 Paris Climate Conference, Sustainable Development Goals, and urban resilience. Additionally, this review contributes to the nascent field of city peer reviews, providing foundations for further research, and supporting applicable findings for urban policy makers and stakeholders.

3. Why the 10 Essentials?

From initial evaluations of the literature, it became clear that framing the analysis using the 10 essentials identified by the MCR would be the most appropriate approach: The 10 essentials aligned with global DRR strategies, and run concurrently with the Sendai Framework to strengthen accountability for DRR, safeguard ownership of action and to support DRR implementation. Additionally, the 10 essentials represent a voluntary 15 year

pledge by nation states to improve resilience at a local level; therefore ensuring their commitment and accountability. To date 3560 cities have signed up to the Making Cities Resilient Campaign (UNISDR, n.d,a). Specifically, the campaign encourages resilience-building in cities through increasing commitment and understanding of risk, enhancing capacity, supporting the development of Resilience Action Plans, and assisting cities to access services, such as finance opportunities. Moreover, the Campaign promotes and facilitates city-to-city peer review processes aligned with the local indicators for Sendai Monitoring.

In framing the literature regarding peer review and city resilience in reference to the 10 essentials, this report will present a comprehensive review of current understanding of how city-to-city peer review on resilience has been addressed, therefore informing the ways in which UScore2 could address city-level peer reviews on resilience.

4. Structure of this Report

This report first introduces the nature of the project, and justifies the need for this investigation. The following sections outline the purpose of this literature review and the rationale for framing the findings in reference to the MCR Campaign, specifically the 10 essentials. Section five provides details of the methodological approach, including information relating to how the literature searches were conducted, and the literature was analysed to identify the findings we present. Section 6 presents the findings based on a structured analysis of the 10 essentials in the literature, and addresses the ways in which the essential has been defined, and how it has been conceptualised and understood in the literature; comparatively analysing this against the MCR Campaign literature. Section 7 concludes the report and presents implications for research, practice and for the UScore2 project.

5. Methodology

A systematic literature review (SLR) methodology was employed to take a focused approach to searching and sorting literature relating to city resilience peer review. SLR allows for detailed and unbiased search of literature, also helping to maintain transparency and relevance (Denyer and Tranfield, 2009; Leseure et al., 2004). With the body of humanitarian literature steadily growing, the SLR approach allows for the most relevant documents to be located in a rigorous way. Additionally, SLRs are recognised to be particularly useful in developing new knowledge of relevance to policy and practice (Tranfield, 2003). For transparency, Section 5.1 describes the process by which articles were searched for and selected.

5.1. The Process

Table 5.1 provides an overview of the research process – providing a detailed timeline for various stages of this SLR.

Table 5.1. Timeline of progress

Task	March				April				May				June			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Literature review																
Development of literature review methodology and process		■														
Title abstract screen analysis from search 1			■	■	■											
Title abstract screen analysis from searches 2 and 3						■										
Full paper review and analysis of academic papers							■	■	■							
Full paper review and analysis of non-academic papers										■	■					
Report writing												■	■			
Dissemination of report for feedback														■		
Completion of full draft report															■	■

As part of the SLR approach, a number of key words and search terms were identified to search for the most relevant articles. Initial scoping exercises resulted in the development of core keywords based on three broad categories; context, content and process, displayed in the table below.

Table 5.2. Keyword Searches

Keywords		
Context	**Content**	**Process**
Local-level resilien*	Disaster risk reduction	Peer-to-peer
Urban resilien*	Disaster manage*	Peer∣self review
City resilien*	Emergency manage*	Peer∣self evaluation
City plan*	Multi-risk	Peer∣self assess*
Town	Disaster risk reduction	Peer∣self apprais*
		Peer∣self monitor*
*: any string of characters. ∣: and, or		

Applying these search terms to databases of literature helped us to identify new search terms which allowed us to finalise our initial set of keywords. These keywords were shared with consortium partners and the International Advisory Board for comment and contributions. After a number of rounds of consultations with partners, developments were made to the keyword search terms. Searches were undertaken through "Publish or Perish" which is a software programme that retrieves and analyses academic citations using Google Scholar (Harzing, 2007). As a result, both academic and non-academic literatures were found. A detailed list of the final search terms/strings is available in Appendix A.

A total of 1,658 were retrieved as a result of the searches and, after duplicates had been removed, 1,286 papers were presented for analysis. Figure 5.1 presents the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram (Ostadtaghizadeh, et al., 2015) which details the searching, screening and reporting process.

Figure 5.1. PRISMA Diagram
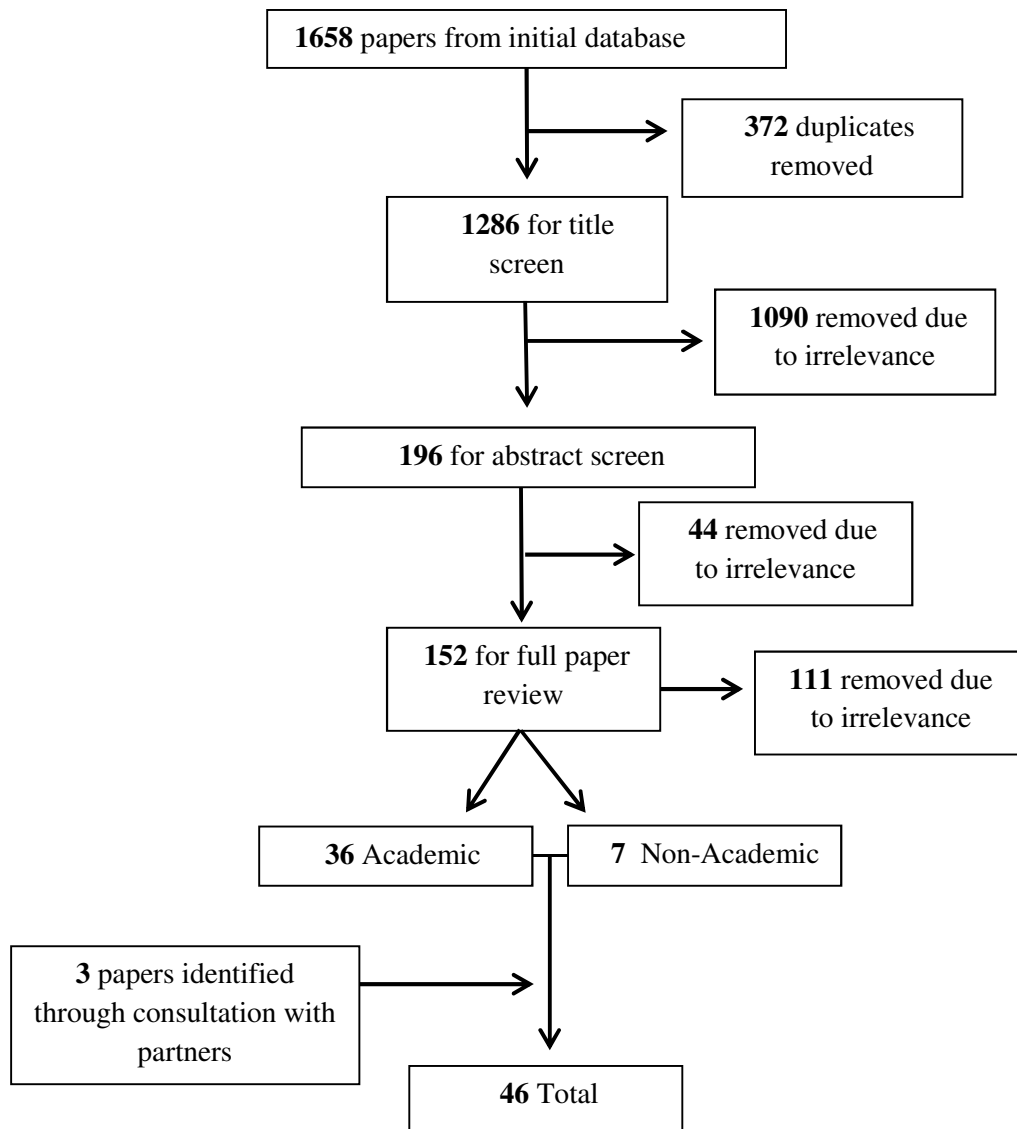
Inclusion and exclusion criteria were developed to ensure reliability and replicability of data (Meline, 2006) and to support further research in this new field. The predominant exclusion criteria stipulated that papers written before 2005 would not be considered, as 2005 marked the introduction of the Hyogo framework for action (2005-2015), therefore launching a commitment to resilience building. Table 5.3 presents the inclusion and exclusion criteria and the justification for the choices made.

Table 5.3. Criteria used to identify papers related to city resilience peer review

Criterion	Rationale	Included	Excluded
Publication Type	Screening for publication type will ensure the credibility and reliability of sources.	Scholarly Journals; Conference proceedings; Reports; Books	Editorials and Opinions; Theses
Language	Papers written in English were reviewed due to language limitations	Papers written or translated into English	All other languages
Time Frame	2005 marked the launch of the Hyogo framework for Action (2005-2015)	Documents from 2005 onwards	Documents pre 2005
Paper Content	Using EU guidelines for peer reviews, the objectives of peer reviews, and the types of peer review were identified. This provided a guide for the inclusion and exclusion criteria.	Contributions to policy and action re: DRR, civil protection; Implementation of policy re: DRR; Lesson learnt and good practice papers relating to DRR and civil protection; Assessment of country's disaster risk management and civil protection strategies; Evaluation of implementation, and impact of, specific DRR/ civil protection policies; Assessment of guidelines for risk assessment and frameworks used; Methodologies used to assess risk management and impact; Papers addressing resilience, preparedness and mitigation strategies: training programmes, early warning, public awareness	Documents out of the scope of this research: emergency and development topics not related to resilience building or DRR, risk management or civil protection.

To provide structure to the analysis, a number of research themes were identified, and will be addressed for each of the 10 essentials. These include definition, conceptualisation, measurement and implications. Table 5.4 presents the topics investigated, a description of these issues, and justification for their relevance.

Table 5.4. Structure of 10 essential analyses

Topic	Description	Justification
Definition	How the essential is defined	To understand what the essential encompasses
Conceptualisation	How the essential is defined and understood in the literature	Varying conceptualisations of similar concepts exist within the literature and would benefit from being synthesised
Measurement	How the essential is measured	Exploring varying measurements and indicators will support the formation of a general, coordinated framework
Implications	The implications for: a) research into peer review and DRR; relationships with Sendai; gaps in academia; and b) the UScore2 project	Addressing these implications will provide insights for both academia and practice. New research agendas can be identified and a rigorous framework can be developed, whilst acknowledging the wider aims of global DRR

Section 6 provides an in-depth analysis of the papers identified by the SLR. To provide clear synopsis, Table 5.5 summarises the papers reviewed and the essential(s) explored by each paper. This provides a broad overview of currents trends within the literature including differences and the frequency of the essentials being addressed.

Table 5.5. An overview of the essentials addressed by the literature

Citation	10 Essentials Addressed									
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Armas and Gavris, 2010		X		X			X	X		
Basu, et al., 2013	X	X	X	X	X	X	X	X	X	X
Beccari, 2016	X	X	X	X	X	X	X	X	X	X
Birkmann, et al., 2013	X	X	X	X	X	X	X	X	X	X
Briceño, 2010	X	X								
Cardona, 2005	X	X		X	X	X	X	X		
Cardona and Carreño, 2011		X	X	X		X	X	X		
Dunford, et al., 2015	X	X		X	X	X	X	X		
Elias et al., 2013	X	X								
EMI, 2008		X	X			X	X			
Fleischhauer et al., 2012	X	X	X				X			
Fox-Lent et al., 2015	X	X		X	X	X	X	X	X	X
Gilissen et al., 2016	X	X					X		X	X
Hackl et al., 2015		X						X		
Hamin et al., 2013	X	X							X	
Hamdan, 2013	X	X	X	X	X	X				
Henceroth et al., 2015	X	X	X	X	X	X	X	X	X	X
Henstra, 2010	X	X	X	X	X	X	X	X	X	X
Johansen et al., 2016	X	X				X	X			
Johnson and Blackburn, 2014	X	X	X	X	X	X	X	X	X	X
Kamh et al., 2016	X	X		X	X	X	X	X	X	X

Keating et al., 2016	X	X	X	X	X		X	X	X	X
Kernaghan and da Silva, 2014	X		X				X			
Kim and Kakimoto, 2014	X	X			X	X	X			X
Leitch, and Inman,, 2012		X					X			
Lumbroso et al., 2016	X	X					X		X	
Manyena, 2016	X			X	X					
McAllister, 2013	X	X		X	X	X		X	X	
Menteşe et al., 2015	X	X					X		X	X
Mitchell et al., 2014		X						X	X	
Musa et al., 2015				X	X			X		
Ostadtaghizadeh et al., 2015	X	X	X	X	X	X	X	X	X	
Parsons et al., 2016	X	X		X			X			
Peer Review Turkey, 2015	X	X	X	X	X	X	X	X	X	X
Peer Review Finland, 2014	X	X	X	X	X	X	X	X	X	X
Peer Review UK, 2013	X	X	X	X	X	X	X	X	X	X
Pursiainen, 2016		X						X		
Salami et al., 2017	X	X			X		X	X	X	
Sarmiento et al., 2017	X	X		X	X	X	X	X		
Sharifi et al., 2009	X	X		X		X	X	X		
Simonovic and Peck, 2013		X			X		X	X	X	
Twigg, 2009	X	X		X	X		X		X	
UNISDR, 2008	X	X	X			X	X			
van Niekerk, 2015	X	X					X		X	X
van Riet and van Niekerk, 2012	X	X	X			X	X	X		
Wiering, 2017	X	X	X	X	X	X	X	X	X	X

*E1: organise for disaster resilience; E2: identify, understand and use current and future risk scenarios; E3: strengthen financial capacity for resilience; E4: pursue resilient urban development and design; E5: safeguard natural buffers to enhance ecosystems' protective functions; E6: strengthen institutional capacity for resilience; E7: understand and strengthen societal capacity for resilience; E8: increase infrastructure resilience; E9: ensure effective disaster response; E10: expedite recovery and build back better.

6. Findings from the literature review

This section provides an overview of the findings for each essential and discusses a selection of issues in depth. The essentials include:

1. Organise for disaster resilience;
2. Identify, understand and use current and future risk scenarios;
3. Strengthen financial capacity for resilience;
4. Pursue resilient urban development and design;
5. Safeguard natural buffers to enhance ecosystems' protective functions;
6. Strengthen institutional capacity for resilience;
7. Understand and strengthen societal capacity for resilience;
8. Increase infrastructure resilience;
9. Ensure effective disaster response;
10. Expedite recovery and build back better.

Key themes in this discussion include the ways in which the 10 essentials have been addressed in the literature. This includes how the literature links to the 10 essentials, the measurements and indicators presented in the literature, and the ways in which this corresponds to UNISDR's Disaster Resilience Scorecard for Cities, and the Sendai Framework's four Priorities for Action. Thus, this section analyses the academic and non-academic literature concerning peer reviews and urban resilience; providing an evaluation of the literature against the aim of the MCR Campaign to build resilience, and the objectives set out in the 10 essentials. The review will convey the differences in conceptualisation of disaster resilience, use of terminology, and application of the 10 essentials in academic and non-academic literature.

The analysis of the academic literature retrieved by the SLR demonstrated that the most frequently discussed issues pertain to essential 1, governance and organisational structures; essential 2, identifying and understanding risk; and essential 3, strengthening societal capacity for resilience. Comparatively sparsely covered by literature are: essential 5, mitigation activities through the safeguarding of natural ecosystems, and essential 10, placing those affected at the centre of recovery with a view to building back better.

6.1. Essential 1: Organise for Disaster Resilience

Crucial components in effectively managing and responding to risks include strengthening city administrative capacity, coordination of stakeholders and the formation of legislative frameworks. As will be discussed, the academic literature predominantly focuses on issues of good governance and effective DRR legislation in contributing to urban resilience.

6.1.1. Definition

UNISDR defines the target of organising for disaster resilience as the process by which governments "put in place an organizational structure with strong leadership and clarity of coordination and responsibilities." (UNISDR, 2017a). This essential tackles issues relating to engaging various stakeholders including local government, officials and departments,

academia, businesses and local citizens. Through coordinated participation, organisational through structures and clear processes with the expectation that well-defined urban resilience can be tackled more efficiently and effectively.

Essential 1 is central to managing and responding to risks and also holds important implications for peer reviews of urban resilience. The predominant objective of a peer review is to exchange good practice and recommend improvements for disaster management policy. With this in mind, the strengthening of institutional capacity, coordination amongst stakeholders and implementation of strategies is central to mutual learning and exchange of valuable experience.

6.1.2. Conceptualisation

The MCR Campaign highlights a number of areas within this essential which need to be addressed to bolster urban resilience. Broadly, these include strengthening local level capacity, establishing coordination within the city, building networks, and forming legislative frameworks for resilience (UNISDR, n.d, b).

The literature revealed that concepts relating to organising for disaster resilience predominantly focused on:

- Strengthening institutional capacity
- The coordination, or inclusion, of various stakeholders in decision making processes.

Minimal references in the literature are made in relation to implementing plans and policies for DRR, and building networks.

Under organising for resilience, strengthening institutional capacity is addressed by the MCR Campaign as the implementation of strong leadership and a single point of coordination in the city, the application and understanding of DRR principals, and allocation of responsibility for reducing disaster risk. Constructs pertaining to the strengthening of institutional capacity were conceptualised in the literature in a number of ways, including:

- Institutional arrangements and learning; including allocation of resources for risk governance, strength of municipal services, promotion of best practices and political experience of disasters
- Trust in government and the presence of political will and commitment to DRR
- Structural and organisational commitments such as setting up disaster management councils and committees, and forming institutions so that they fully integrate DRR into policy
    (Beccari, 2016; Cardona, 2005; Cardona and Carreño, 2011; Dunford et al., 2015; European Commission, 2014; Fleischhauer et al., 2012; Gilissen et al., 2014; Hamdan, 2012; Johnson and Blackburn, 2014; Kamh et al., 2016; Lumbroso et al., 2015; ; Manyena, 2016; Ostadtaghizadeh et al., 2015; Salami et al., 2017; Sharifi and Yamagata, 2016; UNISDR, 2008; van Niekerk, 2015).

Issues concerning coordination were also widely covered in the literature; a cross-cutting issue which affects all areas of strengthening institutional capacity. In particular, the coordination of stakeholders from the community, local government and external donors was discussed, including:

- Ensuring the active involvement of stakeholders across and within organisations
- Inclusion of community and civil society groups
- Communication of risk and risk management strategies with all stakeholders
- Engagement with community groups, academics and the private sector
- The efficient sharing of information from project stakeholders

> (Fleischhauer et al, 2012; Hamdan, 2012; Kernaghan and Silva, 2014; Peer Review Turkey, 2015; Sarimento et al., 2017; van Riet and van Nieker, 2012; UNISDR, 2008).

The issue of improving coordination through effective communication was highlighted as collaboration between organisations to facilitate knowledge exchange and resource mobilisation were central themes (Basu et al., 2013; Kamh et al., 2016; Keating et al., 2016; Kim and Kakimoto, 2014; Peer Review Turkey, 2015; UNISDR, 2008). Acknowledgment of the importance of strong structures within governments was also recognised. The distribution of responsibilities and resultant need for coordinated committees was deemed important in improving coordination between stakeholders including across government (Gilissen et al., 2016; Johansen et al., 2016; Johnson and Blackburn, 2014; Dunford et al., 2015).

Despite agreement within the literature that coordination is vital for urban resilience, the notions of building networks and implementing plans and policies were relatively under-discussed. One potential explanation for this is the nature of the literature itself. Such issues may be more comprehensively discussed in practitioner and government reports and the like, which provide more scope for practice-based recommendations. Interestingly, network building and policy implementation also shared very little crossover within the literature reviewed; suggesting that despite the positive implications collaborative partnerships may have on applying resilience frameworks, the literature has treated them as separate subjects. In saying this there are some developments which suggests competitive programs for the business sector, and alliance building for DRR with communities and the scientists as a means to effect change in the DRR decision making process (Hamdan, 2012).Beginning first with the effective building of networks, the literature highlighted the importance of:

- Engaging and building relationships with various stakeholders
- Cross city/department learning, and the decentralisation of DRR strategies

> (Dunford et al., 2015; Hamdan, 2012; Kernaghan and Silva, 2014; Kim and Kakimoto, 2014; Sarimento et al., 2017; van Niekerk, 2015).

This is in line with UNISDR guidance on supporting organisational structures and their mechanisms to understand and act upon reducing exposure to risk. Additional topics that the literature draws upon includes notions of trust and the importance of utilising relationships to

mobilise external resources, including the private sector (Fleischhauer et al, 2012; Kernaghan and Silva, 2014; Keating et al., 2016).

Finally, the subject of forming a "legislative framework and action mechanisms for resilience" (UNISDR, n.d, b) is discussed. The MCR Campaign states that central to strong organisational structures and leadership, are strategies to integrate resilience into existing policies. This includes:

- Effective gathering and sharing of data relating to risk amongst all stakeholders
- Routine discussion of policy implications on resilience
- Development and implementation of reporting mechanisms such as the Disaster Resilience Scorecard for Cities

In the small body of literature which directly addressed institutional and structural frameworks issues such as constraints on society to intervene in reducing vulnerability (Birkman et al., 2014), and the need for revised legislation and regulations which encompass DRR objectives and identify resilience levels were addressed (Kamh et al., 2016; Kernaghan and Silva, 2014; Mcallister, 2013; van Riet and van Niekerk, 2012). Interestingly, it was suggested that local level government could find support from national government; ensuring agreed legislative and administrative frameworks are addressed (Johnson and Blackburn, 2014).

The analysis of essential 1 demonstrates clear links between academia and practice. As mentioned this is evident for issues of strengthening capacity and coordination. In part, this may be due to these concepts being well-established in a number of academic fields, therefore allowing for previous investigations across discipline to inform resilience building research. Interestingly, network building and formation is also a recognised field of interest in the academic domain. Its lack of focus within the literature related to urban resilience may be the result of limited investigation into the importance of peer reviews, which help to form such networks and facilitate learning opportunities and the formation of working partnerships.

Lastly, it was also noted that there was a lack of literature relating directly to plans, policies and legislative frameworks for increasing resilience. As the report has already suggested, this may be due to academic works dismissing or deferring topics relating to legislation as they align more closely with issues covered by government or practitioner reports. Despite this, academic literature has an important role in supporting governments in addressing building networks and policy formation, as the application of theory grounds practice in established concepts and provides the base for informed learning and assessment.

6.1.3. Measurement of the essential

This SLR addressed the use and understandings of resilience in reference to the 10 essentials, and also examined how the concepts were measured. In analysing the indicators and measurements used within the frameworks, case studies, and peer reviews, insights into the ways in which key information about resilience is captured could emerge. Measurements of the essential within the literature were evaluated against the Disaster Resilience Scorecard for

Cities due to its interconnectedness with the MCR Campaign. Additionally, it represents the most recent revision of indicators for urban resilience.

In addition, the Scorecard supports the implementation of the Sendai Framework; as such this research has also considered whether priorities 1 to 4 have been addressed by the literature. These priorities cover:

- Understanding disaster risk
- Strengthening disaster risk governance to manage risk
- Investing in disaster risk reduction for resilience
- Enhancing disaster preparedness for effective response.

As this project's emphasis is on urban resilience, the Scorecard focuses on city-scale indicators only. The relevant indicators adopted consider: adoption of the Sendai Framework in the Local Government's Master plan; number of deaths due to hazardous events per 100,000 population/per year; number of people directly (injured or ill, evacuated, re-located) affected due to hazardous events per 100,000 population/ per year; direct economic loss due to hazardous events; damage to critical infrastructure due to hazardous events; and number of people covered by multi-hazard early warning system per 100,000 populations.

First, it is important to note that around 20% of the papers analysed had no measurements or indicators at all, but rather provided conceptual models, case studies or descriptive reports with which to frame urban resilience. Of those which did utilise/provide measurements, the adoption of the Sendai Framework in the Local Government's Master plan, or other relevant strategies or plans, was the most effectively covered by the literature, therefore aligning with the Scorecard.

Most papers broadly addressed the issue, referring to the existence of institutional arrangements for risk reduction (Kamh, et al., 2016; Ostadtaghizadeh et al., 2015; Sarimento et al., 2017) or frameworks or legislation (Basu et al., 2013; Beccari, 2016; van Neikerek, 2015; Johansen et al., 2016; Johnson and Blackburn, 2014; Sharifi and Yamagata, 2016). Interestingly some indicators were more detailed, referring to constructs related to the essential itself. These included:
- Clear delineation of responsibilities regarding DRR, and institutions active to tackle specific risks
- Appropriate funding for government sectors to address issues such as climate change
- Clear prioritisation of resilience within plans, ensuring local partners were well well-equipped to deal with risk reduction activities
- The development of clear timescales for implementation
                    (Fleischhauer et al, 2012; Fox-Lent, 2015Johansen et al., 2016; Johnson and
                         Blackburn, 2014; Kamh, et al., 2016; Kim and Kakimoto, 2014)

Through the development of these indicators, which discuss such a wide range of guides for effective urban resilience building, it is concluded that essential 1 was well-covered. Additionally, the literature review demonstrates a close alignment with both the indicators

developed in the Disaster Resilience Scorecard for Cities and with the four Sendai Priorities for Action.

6.2. Essential 2: Identify, Understand and Use Current and Future Risk Scenarios

Effective disaster risk management relies on a comprehensive understanding of a number of factors. These include disaster risk scenarios, the characteristics of hazards, who and what is exposed, the level of capacity within a society, and its level of vulnerability (UNISDR, n.d, c). Cities must develop risk analysis strategies, risk reduction measures and planning, to support the implementation of meaningful DRR and resilience building programmes. The following subsections will discuss how these issues are defined and understood in the literature, and their implications.

6.2.1. Definition

Understanding risk is defined by the MCR Campaign as the process by which city governments "identify and understand their risk, including hazards, exposure and vulnerabilities, and use this knowledge to inform decision making" (UNISDR, n.d, c). Essential 2 acknowledges the need for technical analysis of current and future threats to be undertaken by multiple stakeholders. This includes identifying worst-case scenarios and developing cross-city learning; therefore supporting the integration of exposure and vulnerability information into the city's long-term development plans (UNISDR, 2017a; UNISDR, n.d, c).

Similarly to essential 1, understanding risk is closely linked with peer reviews of urban resilience. In particular, this essential promotes learning from cities which have similar risk profiles in order to develop programmes which can increase resilience (UNISDR, 2017a). Through the exchange of knowledge based on experience, peer review objectives relating to transferable practices, increased dialogue between cities, and raising awareness can be achieved through the implementation of this essential.

6.2.2. Conceptualisation

Within the academic literature the notion of risk is addressed from two predominant angles. The first links to issues relating to resilience, including concepts such as:
- Exposure
- Susceptibility
- Vulnerability
- Adaptive capacity
    (Beccari, 2016; Birkman et al., 2013; Cardona, 2005; Dunford et al., 2015; Keating et al., 2016; Kim and Kakimoto, 2014).

The second perspective taken commonly refers to structural dimensions of resilience and vulnerability, such as:
- Physical
- Environmental
- Institutional characteristics

(Birkman et al., 2013; Cardona, 2005; Fox- Lent et al., 2015; Kamh et al., 2016; Menteşe et al., 2015; Ostadtaghizadeh, et al., 2015; Salami et al., 2017).

The issues of exposure, susceptibility, vulnerability and adaptive capacity act as crosscutting topics in that they help to tackle concerns relating to both the structural, and social attributes of urban contexts. In this sense, it is argued that if urban resilience is to be addressed holistically, governments must concern themselves with issues of social deprivation and cohesion, alongside detailed information concerning the hazard itself, and the infrastructure it may adversely affect.

In considering the "interdependencies between society and the built environment" (Johansen et al., 2016: 9), the expectations of essential 2 may be managed. Through the consultation of a full range of stakeholders including ethnic and social groupings, understanding and implementing urban risk may be more readily managed. Additionally, in order to prepare for disasters, the MCR Campaign states that certain social indicators should be considered. The indicators relating to social issues are comprised of gathering data on exposed populations, including health, education, the environment, cultural heritage, assets and access to key services such as water (UNISDER, n.d, c).

These topics have been attended to in the literature, which seeks to highlight the need to address social constraints to strengthen the capacity of cities and its people. In particular, Birkman et al's (2013) Methods for the Improvement of Vulnerability Assessment in Europe (MOVE) Framework details a number of key characteristics linked to vulnerability, stating that "its multi-faceted nature is mainly linked to societal conditions and processes" (Birkman et al., 2013: 199). The paper notes that a city's exposure, predisposition to risk, and capacity for response, helps to develop the conceptualisation of who or what is at risk within a society. In turn, this may support better coverage of vulnerable populations, whilst improving the inclusion of various ethnic and social groups in knowledge sharing and decision making processes, and better understanding the conditions "of socioeconomic fragility" (Cardona and Carreño, 2011: 37).

Key ways to reduce vulnerability and improve stakeholder engagement include: of information exchange and engagement with the community (Fleischhauer et al., 2012; Kim and Kakimoto, 2014; UNISDR, 2008), understanding the population's perception of their risks (Dunford et al., 2015; Salami et al., 2017), and developing awareness and education about hazards (Beccari, 2016). It is argued that urban DRR can be substantially advanced through the development of more effective risk communication to all stakeholders (Leitch and Inman, 2012; UNISDR, 2008). Although the literature touches on the importance of community inclusion, it has limited perspectives on the need for timely and accurate dissemination of information regarding hazards and risks from government to local level. This is vital if full stakeholder integration and long-term planning goals are to be met.

Through the mechanisms detailed above, it is argued that a more long-term approach to resilience can be taken, as those most likely to be effected can start to build resources for resilience; beginning with understanding their exposure to risks. This includes a deeper

appreciation of the environmental challenges facing urban environments. This is significant as key components of DRR rely on the ability of societies to manage natural resources, climate change, and matters such as land use (Basu et al., 2013; Briceño, 2010; Henceroth, et al., 2015; Ostadtaghizadeh et al., 2015).

Despite recognising these issues, the outcomes of identifying and understanding risk are still debated. Twigg (2009) argues that attitudinal aspects of resilience remain implicit rather than explicit when addressing characteristics inherently linked with the 10 essentials framework. In relation to understanding risk, there is a general consensus that protecting buildings from damage or collapse is vital. Whether or not this leads to changes in behaviour, or actual preparation activities, remains a difficult facet to assess. It is suggested that peer reviews of cities take into account an attitudinal dimension in order to assess meaningful changes to conduct in governments, communities and businesses.

Another key aspect of identifying and using risk scenarios in order to improve resilience is to acknowledge the most probable and severe cases which threaten urban environments. It is argued that in doing this, mitigating practices and policies can be put in place so that future plans and investments may be used to improve urban resilience (UNISDR, 2017a). The MCR Campaign suggests that decision making regarding risk scenarios should be based on:

- The ways in which hazards may change/repeat/accumulate over time
- On updated databases housing geographical and social information
- On estimated timeframes for risk; culminating in the publication of such information for public and government use

(UNISDR, n.d, c).

Within the literature, themes which best demonstrate the need to prepare for 'worst-case' scenarios are associated with examining the structural attributes of DRR such as the physical and institutional characteristics found in urban environments (Cardona and Carreño, 2011; Johnson and Blackburn, 2014; Kamh et al., 2016; Lumbroso et al., 2016; Mcallister, 2013; Menteşe et al., 2015; Salami et al., 2017; Van Niekerk, 2015). The notion of 'worst case' is not particularly prevalent within the academic literature; rather it focuses on characteristics of cities which may exacerbate the impacts of disasters.

When discussing the physical characteristics in the context of assessing risk scenarios, the literature calls for consideration of indicators such as:

- Population growth
- Building quality and potential damage
- Population density
- Deprivation levels

(Basu et al., 2013; Cardona and Carreño, 2011; Menteşe et al., 2015; Ostadtaghizadeh, et al., 2015; Salami et al., 2017).

Additionally, Mcallister (2013) suggests that identifying "systems by resilience performance categories, such as critical or essential" (ibid: 18) would facilitate deeper understanding of

systems which are able to withstand damage, those which are vulnerable, and the speed at which these systems could recover. Mcallister (2013) goes as far to say that "community and national resilience depends upon the capacity of the built environment to maintain acceptable levels of functionality during and after disruptive events" (ibid: 50).

Alongside consideration of the physical risks facing cities, the literature also addressed institutional strength in preparing for severe cases. Commonly focusing on potential weaknesses in governance, the literature suggested governments should bolster their capacity to mitigate disasters in areas such as forecasting and data quality (Lumbroso et al., 2016). In addition, the development of specific institutions for targeted risk reduction and general governance strengthening was also proposed (Kamh et al., 2016). As evident, there are strong correlations between essentials 1 and 2. The literature advocates that with increased commitment to policies which support DRR, further progress can be made in planning for disasters (Briceño, 2010; Gilisen et al., 2016; Henstra, 2010).

6.2.3. Measurement of the essential

Using the Disaster Resilience Scorecard for Cities, measurement and indicators for using current and future risk scenarios is examined. The notion of understanding urban risk was well-covered by descriptive indicators within the literature, although references to using current and future risks to prepare for disasters were lacking, as were numerical measurements.

The indicators used in the literature aligned well with the Scorecard measurements. Links were made with analysing risk in terms of number of deaths due to hazardous events (Keating et al., 2016; Mitchell et al., 2015) and number of people directly affected (Johansen et al., 2016; Kamh et al., 2016). Whilst Mitchell et al., (2015) establish mortality rates based on events which can be forecasted and those which cannot. Keating et al (2016) provide a comprehensive set of indicators relating to how risk is managed, and how the effects of such management can be measured.

Indicators presented in the literature include:

- Death
- Injury
- Impacts on vital services and infrastructure
- Preparatory actions
- Early warning systems

(Keating et al., 2016; Lumbroso et al., 2016; Menteşe et al., 2015).

Interestingly Mcallister (2013) proposes that metrics should be established for resilience at both the government and community level. In turn, this could support the identification of risk and vulnerability in a tailored fashion; therefore supporting decision making.

Clear relationships between adopting frameworks and legislative plans, and understanding risk, were also noted. These constructs complemented concerns linked to government communication and coordination with stakeholders, financial resources, and planning for risk

scenarios (Basu et al., 2013; Beccari, 2016; Fox-Lent et al., 2015; Johansen et al., 2016; Kamh et al., 2016; Ostadtaghizadeh, et al., 2015).

The notions of mitigation and preparation were also present, raising topics relating to:

- Physical preparation of hazardous areas such as coastlines
- Land-use
- Environmental protection
- Community management of their own natural assets

<div align="right">(Beccari, 2016; Fox-Lent et al., 2015; Johansen et al., 2016)</div>

These issues are inextricably linked with understanding risk, as mitigation and preparation plans rely on clear identification of hazards and their impacts.

Similar to essential 1, essential 2 was addressed in detail by the literature and aligned well with both the indicators developed in the Disaster Resilience Scorecard for Cities, and the four Sendai Priorities for Action. Whilst the MCR Campaign clearly demarcated these essentials as two separate topics, such clear distinctions were not made in the literature. Risk and governance were commonly discussed as overlapping entities due to the robust relationships between strong government and frameworks for DRR and resilience, and the ability of a government to identify risks and utilise knowledge from risk scenarios.

6.3. Essential 3: Strengthen Financial Capacity for Resilience

Progress in building and maintaining resilience is enabled through financial commitments by governments to ensure resources are dedicated to DRR and resilience. Financial resources are integral to ensuring risk related issues can be tackled and can be secured from city revenues, national allocation of funds, public-private partnerships, or other organisations. Financial mechanisms include supporting stand-alone measures and strategies that are embedded in a wider development context. As a result, this section of the report will attend to the ways in which these issues have been addressed in the literature.

6.4.1. Definition

The process of strengthening financial capacity for resilience has been defined as the practice of understanding the economic impacts of disasters and the need for investment in resilience, whilst identifying and developing financial mechanisms which can be used to support resilience activities (UNISDR, n.d, d). It is argued that fiscal issues relating to resilience do not need to exist within a silo; rather, opportunities where resilience building contributes to economic strategy can be recognised (UNISDR, n.d, d). To do this, clear budgeting must take place within governments, and must also include plans for dissemination of risk information and applicable development strategies.

6.4.2. Conceptualisation

This essential is heavily interlinked with notions of good governance and organising for disaster resilience. The literature has conceptualised financial capacity as related to

organisation of city and municipal budgets (Kamh et al., 2016; Kernaghan and Silva, 2014), government allocation of funding and efficient funding allocated for risk governance (Fleischhauer et al, 2012). In addition, this construct has been framed in relation to preparedness and the processes of emergency planning and response strategies, including related funding for:

- Training of personnel and staff resources
- Risk assessments
- Disaster drills and exercises
- Mutual aid agreements

(Fleischhauer et al, 2012; Henstra, 2010; Johnson and Blackburn, 2010).

In addition, in the literature, development and economic issues are heavily tied with financial capacity. The notion of governments committing financially to scalable and adaptive social services and protection systems are viewed as important components of disaster resilience (Manyena, 2016). This strengthens the development strategies of cities to help mitigate the impact of disasters on vulnerable populations and bolster services which are integral to efficient disaster response. Again, clear links can be made between this essential and essentials 1 and 2 which focus on governance and identification of risk scenarios.

The analysis revealed that the subject of financial support to strengthen city resilience is severely underrepresented in the literature. Only four papers explicitly explored this topic in relation to resources for risk governance (not only with reference to vague economic implications) (Basu et al., 2013; Fleischhauer et al., 2012; Johnson and Blackburn, 2010; Manyena, 2016). This lack of academic papers may in part be due to the perception of fiscal issues as being the domain of practitioner-led research.

It was also noted that financial issues were commonly framed in reference to economic issues, predominantly focusing on loss of assets, social deprivation and levels of economic development (Birkmann et al., 2013; Johansen et al., 2016; Kamh et al., 2016; Ostadtaghizadeh, et al., 2015). Similarly, rather than addressing finances in reference to government expenditure, the topic was examined from a community, rather than municipal level; again, encompassing issues relating to individual's insurance of property and possessions, income range of those affected and access to alternative resources (Birkmann et al., 2013; EMI, 2008; Hamdan, 2013; Kamh et al., 2016; Keating et al., 2016). Successful public-private partnerships were addressed by the EMI report which cites cities such as Los Angeles and Bogota as having good relationships with private institutions who are able to provide additional resources, information, and education and communication campaigns (EMI, 2008)

The relationships between the private sector and financial capacity was conceptualised in relation to fiscal support which may be provided by companies directly or by their assets (Kernaghan and Silva, 2014); logistical support or in-kind donations are examples. This is heavily interlinked with the notions of relationship building inherent in essential 1, which looks to bridge sectors in order to increase resilience. Although references to the economic

benefits of business continuity planning as a means of protecting the economy were lacking, and are worth consideration if MCR is to be supported in recognising "opportunities where building resilience contributes to a sound economic strategy" (UNISDR, n.d, d).

As aforementioned, the concept of supporting financial capacity for disaster resilience and organising for disaster resilience are not clearly distinguished within the literature. Despite being developed as two clearly separate entities by the 10 essentials, the literature demonstrates a clouding of agendas in relation to these essentials. The literature addresses issues pertaining to relationships with the private sector and loan agreements as being related to both financial capacity and organising for resilience (Birkmann et al., 2013; Henstra, 2010; Keating et al., 2016; Kim and Kakimoto, 2014). This finding has implications for practice; providing insights into potential areas which may be more difficult to address as the result of blurred conceptions of distinct MCR processes.

6.3.3. Measurement of the Essential

As the notion of strengthening financial capacity for resilience was limited from a municipal perspective, many indicators presented in the literature were related to notions of exposure. This included exposure of people, buildings and assets in the context of communities at risk of, or affected by disasters (Birkmann et al, 2013; Cardona, 2005; Cardona and Carreño, 2011; Mitchell et al., 2015).

As aforementioned, economic losses were a key facet of this essential, and also impacted the ways in which the literature measured resilience. Thus, many indicators were related to:

- Loss of economic value of assets
- Level of disruption to production
- Number of people with insurance
- Level of dependency on state
- Local fiscal loss
- Level of diversified incomes and funding sources
- Population density

> (Beccari, 2016; Birkmann et al, 2013; Cardona and Carreño, 2011; Dunford et al., 2015; Kamh et al., 2016; Keating et al., 2016; : Kim and Kakimoto, 2014; Mitchell et al., 2015; Ostadtaghizadeh, et al., 2015; Salami et al., 2017).

Finally, linking once again with essential 1, indicators were also related to governmental strategies for finances and institutional arrangements; predominantly from a legislative, rather than budgetary, perspective. Issues relating to the development of mutual aid agreements, legislation for financial mechanisms and economic development to reduce risk (Briceño, 2010; Henstra, 2010; Ostadtaghizadeh, et al., 2015; Sarimento et al., 2017) were all addressed. From the analysis, the notion of building economic strategy has been addressed in part by examining government commitments to resilience legislation, and societal attributes which may impact levels of resilience. Developments within the literature concerning budgets for resilience have been minimal; this is inclusive of allocating risk management strategies in

relation to protected budgets. Lastly, the notion of acknowledging the need for financial capacity to disseminate risk information was also minimally addressed by the academic literature.

6.4. Essential Four: Pursue Resilient Urban Development and Design

As a result of rapid urbanisation and climate change, issues pertaining to land-use and urban planning have become increasingly important in supporting resilience. In line with these strategies, crosscutting issues have also been addressed, including the need to understand vulnerability within communities and mainstreaming urban resilience across multiple sectors. The following subsections discuss key findings from the academic literature in relation to these issues.

6.4.1. Definition

Pursing resilient urban development and design has been defined as the process of assessing the built environment to make it as resilient as possible following the risk analysis undertaken in accordance with essential 2 (UNISDR, n.d, e). The purpose of these assessments is to implement disaster mitigation strategies. In turn, these measures support resilience capacity, and help to minimise the disruption and destruction of critical infrastructure; ultimately protecting societies from social and economic consequences (UNISDR, n.d,e). Thus, development plans will also be safeguarded therefore protecting communities and cities.

6.4.2. Conceptualisation

One key issue identified when exploring how this essential was conceptualised within the literature was the poor distinction made between urban design and planning and essential 8, increase infrastructure resilience. Whilst the two are linked, clear differences between these two essentials (as demarcated by the MCR Campaign) are not well acknowledged in the literature. The MCR Campaign states that essential 4 aims to address land-use and planning, vulnerability mapping and development concerns, whilst essential 8 is concerned with retrofitting and the capacity of infrastructure and services.

Many issues addressed in the literature relating to essential 4, had significant overlaps with subjects concerning structural design and accessibility to key infrastructure (Ostadtaghizadeh, et al., 2015; Parsons et al., 2016; Sharifi and Yamagata, 2016), both of which are more closely aligned with essential 8. Predominantly these crossovers lie in the literatures conceptualisation of land-use and urban planning, which are not addressed as separate topics but rather as an amalgamation of environmental management and physical structural issues (EMI, 2008).

As with other overlaps identified between essentials, there is a concern that "one will over-separate the different elements and overlook the linkages between them. These connections across the different themes and components must be kept in mind" (Twigg, 2009: 13) so that "artificial distinctions between different aspects of the subject" (ibid) are not over-emphasised.

However, without a clear distinction between essentials, the aim of placing land-use planning and their effects on vulnerable societies at the fore of urban resilience will be a challenge.

Not least because clear distinctions must be made between practices, the types of spaces people inhabit, and the services and structures available within that space. Not only will this support city resilience, it will also ensure comprehensive peer reviews, with common points of reference, are undertaken.

Inherently interlinked with the notions of habitable space is the concept of vulnerability. This issue was conceptualised independently, and as a facet of exposure (Birkmann et al., 2013; Kamh et al 2016). One key notion raised in relation to reducing exposure was to ensure that urban design had the capacity to absorb and adapt to risks (Dunford et al., 2015; Fox-Lent et al., 2015). These processes were also acknowledged to be linked with mitigation and preparation activities (Beccari, 2016; Henstra, 2010). In turn, this could support vulnerability mapping processes where preparedness and mitigation activities could include locating and potentially relocating at-risk groups, supporting alternative livelihood/building strategies, and supporting communities in reducing both the hazards and risks that they face.

Also identified were issues pertaining to investing resources into types of resilience to effectively utilise funds (Briceño, 2010), and defining and monitoring performance goals associated with urban planning (Mcallister, 2013). It became increasingly clear that these constructs were heavily interlinked with essential 1, organising for disaster resilience. This was noted in relation to the emphasis in the literature on the central role of policy and legislation in addressing:

- Planning regulations
- Building regulations
- Land-use regulations
- Development and DRR activities
- Resilience and vulnerability mapping
- Infrastructure protection and upgrading
- Resource allocation
- Monitoring and performance

(Basu et al., 2013; Briceño, 2010; Johansen, 2016; Johnson and Blackburn, 2014; Kamh et al., 201; Mcallister, 2013; Parsons et al., 2016; Pursiainen et al., 2016; Salami et al., 2017),

This section demonstrates, essential 4 is not as well defined within the literature as by the MCR Campaign. Drawing on a multitude of topics, including infrastructure resilience and governance, the notion of urban development and design must be clearly differentiated, if city resilience goals are to be met. As will be demonstrated next, this merging of topics also impacts the ways in which the indicators have been defined.

6.4.3. Measurement of the Essential

Given the findings, unsurprisingly many of the indicators relating to urban design and planning were closely related to supportive government legislation. Measures relating to urban planning and governance included:

- Land-use regulations
- Planning regulations
- Building codes
- Laws to enforce building codes
- Environmental improvement policies
- National and local risk assessments
- Management of human settlements
- Management of slums
- Levels of deprivation

> (Basu et al., 2013; Briceño, 2010; Cardona, 2005; Cardona and Carreño, 2011; Johansen, 2016; Johnson and Blackburn, 2014; Kamh et al., 201; Mcallister, 2013; Ostadtaghizadeh, et al., 2015; Parsons et al., 2016; Salami et al., 2017)

These indicators align well with the Scorecard, in that they address issues such as population displacement, urban design solutions and building codes. However, tackling issues such as land-use and settlement building may also be beneficial from a community perspective. Indicators relating to levels of community education, training and awareness of urban planning issues may be of use, therefore supporting resilience building and protecting societies from hazards and avoidable risk.

6.5. Essential 5: Safeguard Natural Buffers to Enhance Ecosystems' Protective Functions

The predominant goals of essential 5 are to protect and manage critical ecosystems with a view to mitigating the impacts of environmental change and reducing risk. To effectively address this, the literature has clear distinctions between human and natural systems, representing a positive step forward in differentiating between differing types of risk and vulnerability, and the relationships between society and ecosystem. This analysis raised questions relating to the role of preparation and mitigation strategies within the literature, and the importance of addressing DRR, climate change and sustainable development as associated, yet separate, entities.

6.5.1. Definition

Essential 5, has been defined as the process of safeguarding "natural buffers to enhance the protective functions offered by natural ecosystems" (UNISDR, n.d, f). This process includes:

- Raising awareness of the impacts of environmental change and degradation of ecosystems
- Promoting better management of critical ecosystems to strengthen resilience to disasters
- Strengthening existing ecosystem management based on risk scenarios assessments

> (UNISDR, n.d, f)

The purpose of these endeavours is to improve DRR through protecting the critical services provided by ecosystems which act as protective barriers against hazards. An example of this may be through mitigation of flood risks by reducing deforestation and protecting floodplains; many of which may even be outside a city's geographical area. The resultant impact of these practices enhances the resilience of communities whilst supporting recovery from disasters through the subsequent availability of clean drinking water as the result of reduced contamination from flooding. Not only this, ecosystem protection has economic benefits as the result of "reducing risks and contributing to urban resilience and sustainability" (UNISDR, n.d, f).

6.5.2. Conceptualisation

As a result of urban expansion, city's ecosystems have been transformed to accommodate the influx of people into an area; often creating risks. Whilst the literature made clear distinctions between human and ecological systems, that is to say the social context and the natural environment, crosscutting issues were identified. In particular, a lack of resilience, or societal response capacity, is determined by limitations relating to access and mobilization of a community's resources or social-ecological system when responding to an identified hazard (Birkmann, et al., 2013; Hamdan, 2013). In essence, it is argued that resilience can be bolstered through improving risk reduction and mitigation strategies, and through learning from past disasters (Birkmann, et al., 2013). In this case a number of issues relating to human systems need to be understood in order to support ecosystem protection. These may include addressing:

- Societal inequalities such as deprivation levels
- Early warning systems
- Training and education
- Stakeholder engagement

Although some distinctions were made between society and ecological issues, the literature blurred the line when referring to physical systems, or the built environment. Despite being interlinked, the issue relates back to poor differentiation between essential 5 and essential 8. Often, the issue of land-use was referenced as an matter relating to building and infrastructure; conceptualising these issues as the physical, rather than natural environment.

Risk-based land-use and planning was addressed by a number of papers (Basu et al., 2013; Beccari, 2016; Dunford et al., 2015; Henstra, 2010; Johnson and Blackburn, 2014; Kamh et al., 2016; Keating et al., 2016; Manyena, 2016; Musa et al., 2015; Ostadtaghizadeh, et al., 2015; Salami et al., 2017; Sharifi andYamagata, 2016) but the majority addressed this issue as a concept relating to governance or institutional capacity, urban development, or and infrastructure, rather than making links to the impacts on ecosystems. Topics relating to degradation of ecosystems and management of ecosystems were very limited. As mentioned, a very social perspective was adopted in relation to community relationships with ecosystems which, interestingly, are not a focus in the Scorecard.

This provides an insight into the complexity of ecosystem protection, which not only acknowledges the exposure, risk, and behaviours of the human systems with which they coexist. As a result of its multifaceted nature, addressing essential 5 can be complicated, not least because many studies do not adequately address how communities' can specifically anticipate, cope with, adapt, recover and learn from disasters but rather focus on their characteristics (Ostadtaghizadeh, et al., 2015).

Another issue identified in the literature was the poor distinctions being made between DRR, climate change and sustainable development in relation to ecosystem protection. Although interrelated, these three constructs serve to address specific attributes of risk management. DRR "aims to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through an ethic of prevention" (UNISDR, n.d, g). Sustainable development is concerned with meeting the needs of the present without compromising the ability of future generations to meet their own" (IISD, n.d). It comprises of meeting the needs of the world's poorest, whilst acknowledging the limitation of technology, society and the environment in meeting future needs (IISD, n.d). Finally, ecosystem protection addresses issues such as poor land management and unsustainable use of natural resources (UNISDR, 2017b) and is inextricably linked with climate change adaptation. Although heavily interlinked, the distinct goals of these commitments must be understood to ensure relevant strategies and targets are implemented. The peer review process is able to facilitate this as it can actively engage questions relating to climate change and sustainability; providing directed but complementary analysis of these important issues (Henceroth et al., 2015).

6.5.3. Measurement of the Essential
Due to the complex nature of this essential and its links with the environment, society and governance, a number of mixed descriptive indicators were used to measure the essential in the literature. These included:

- Human and physical exposure
- Environmental improvements/policies
- Land-use; legislation, and community use of land
- Evacuation plans
- Existence of infrastructure to cope with environmental issues such as flooding
- Frequency of natural hazards
- Disaster defences, including natural defences

Whilst these indicators align with those set out in the Scorecard in reference to land-use regulations, what was missing in the academic literature were indicators relating to awareness of ecosystem services, ecosystem health, agreements relating to ecosystems outside of the city's boundaries, and the identification of critical environmental assets. However, the societal aspects of ecosystem protection (such as exposure due to deprivation i.e. settlements on the banks of rivers) and land-use practices (such as deforestation) have not been addressed by the Scorecard. This may be explained by the lack of focus on attitudinal perspectives in global frameworks such as the 10 essentials (Leitch and Inman, 2012; Salami et al., 2017; Twigg, 2009). Instead both the framework and the indicators lean towards inputs and outputs,

rather than results and impacts which help to measure change at beneficiary level in social, as well as economic, terms (European Commission, 2014).

This is important as a multi-stakeholder approach to resilience building is imperative. This suggests that addressing topics such as land-use from both a regulatory perspective and a community perspective may provide more holistic and sustainable solution to ecosystem protection.

6.6. Essential 6: Strengthen Institutional Capacity for Resilience

Strengthening institutional capacity for resilience centre on the notion that understanding the institutional background of a city, and supporting it, can help to bridge gaps in local capacity and can support coordination during mitigation, prevention, recovery and response (UNISDR, n.d, h). Through this approach, the most effective means of bolstering the capacity of relevant institutions can be identified.

6.6.1. Definition

Strengthening institutional capacity for resilience has been defined as the process by which all institutions relevant to a city's resilience have the capabilities they need to effectively complete their roles. The strategies associated with this include the ability of institutions to:

- Identify the specific nature of each vulnerability and map against the respective institution(s)
- Build local capacities and strengthen participation in disaster management and resilience improvement
- Ensure the consistence of data and disaster risk information among the stakeholder

(UISDR, n.d, h)

This approach utilises a multi-stakeholder perspective by recognising the importance of private sector organisations, industrial facilitators and operators, private and corporate building owners, NGOs, employers and civil society organisations in reducing vulnerabilities and supporting government measures. Despite its wide remit, this essential was infrequently addressed by the literature; as will be discussed in the following subsections.

6.6.2. Conceptualisation

Predominantly, strengthening institutional capacity was addressed from a legislative perspective by focusing on: frameworks for learning (Gilisen et al., 2016; Parsons et al., 2016; Salami et al., 2017; Sarimento et al., 2017), the character of institutions and their ability to adapt (Birkmann et al., 2013; Parsons et al., 2016; Salami et al., 2017), and the division of responsibilities within institutions (Ostadtaghizadeh, et al., 2015; Wiering et al., 2017).

One issue succinctly noted by Wiering et al (2017) is that "often there is not one coherent and overarching governance arrangement to be found in flood risk management, but many different and sometimes fragmented institutional constellations" (Wiering et al., 2017: 18), and this can create barriers to accessing data and maintaining cooperative, participatory partnerships. Concerns were also raised regarding outsourcing disaster management strategies

to support an overarching governance arrangement, as this diminishes local government capacity (van Riet and van Niekerk, 2012). Instead it is suggested that it would be useful to focus on notions of centralised coordination where a national DRR platform operates to support decentralised implementation in which local plans and frameworks can be applied, and multiple stakeholders can be involved (EMI, 2008; van Niekerk, 2015).

Some mention was made in relation to communities; noting that the strengthening of institutions has to take place at all levels to provide systematic support for building resilience (Briceño, 2010). As with many other essentials, the community perspective was framed as relating to exposure and access to participation in decision making processes. This includes access to information and the dissemination, and management, of risk information; together with managing the expectations of the public and ensuring government transparency (Hamden, 2012; Wiering et al., 2017).

The issue of access to information was made evident by the literature; linking to essential 2. The need for credible and timely access to information by all stakeholders was noted as a key facet of institutional capacity. This included:

- Accurate risk data
- Effective training and education
- Early warning systems
- Participatory decision making processes
- Accessible evaluations of prior projects

(Basu et al., 2013; EMI, 2008; Henstra, 2010; Salami et al., 2017; Sarimento et al., 2017)

These issues link with the notion of establishing a shared understanding of roles and responsibilities in relation to DRR. It has been noted that peer reviews are useful in creating platforms where discussions can take place amongst multiple stakeholders; helping to build trust and bringing stakeholders together, especially those who would not otherwise interact (Henceroth et al., 2015). In this way roles can be delineated and relationships built for future resilience building.

However, there were limits to the focus on vulnerability mapping of institutions in the academic literature. As aforementioned, issues pertaining to training and legislation have loosely been identified, but the direct division of responsibility to address vulnerability was lacking. As a result, specifics relating to the ways in which local capacity could be built and participation increased, were also minimal. These attributes are central to ensuring all sectors of society are collaborating on disaster resilience; and may be facilitated by the peer review process.

6.6.3. Measurement of the Essential
The notion of exposure was inherent in measuring institutional resilience, as were issues relating to organising for resilience and understanding risk. Indicators addressed included issues such as:

- Understanding of risk and assessment
- Human exposure to risk- socioeconomic considerations
- Building and land exposure to risk- assessment of structures and design
- Public education and training
- Presence of government legislation
- Data relating to risk and risk management
- Information flow

The indicators within the scorecard address the notion of exposure to public resilience information and DRR awareness, but not the exposure of people or infrastructure. On explanation for this may be as a result of this essential being framed in terms of institutional character and adaptation, which may link more closely with essentials four, five and eight. The scorecard also addresses relationships with the private sector in helping cities to build resilience, although the literature has focused more closely on public-private partnerships as a means of supporting organising for resilience, financial capacity, and societal capacity. This identifies possible gaps in the ways in which strengthening institutional capacity is addressed in academia and may translate to practice as the links between vulnerability mapping, building local capacity and data consistency and the private sector may not be readily apparent.

6.7. Essential 7: Understand and Strengthen Societal Capacity for Resilience

The role of understanding and strengthening societal capacity for resilience ensures that all citizens are able to participate in making their cities resilient. Through education, training and public awareness programmes, the aim is to ensure the whole community is aware of the hazards and risks to which they are exposed (UNISDR, n.d. i) so that they can prepare for potential disasters. By considering the community in all 10 essentials, citizens can be mobilised in all disaster phases whilst fostering a culture of mutual help to benefit DRR and response strategies (UNISDR, n.d., i).

The notion of societal capital was particularly well addressed by the academic literature, drawing on a variety of topics. Broadly three main categories were identified and include participation, education, and information and awareness. Having provided an overview of the ways in which this topic was discussed, the following section will provide the definition and core principals of societal capacity as presented by the MCR Campaign.

6.7.1. Definition

Understanding and strengthening societal capacity for resilience has been defined as cultivating an "environment for social connectedness, which promotes a culture of mutual help, through recognition of the role of cultural heritage and education in disaster risk reduction" (UNISDR, n.d, i). This aim includes a number of objectives for improving resilience amongst the public, including:

- Establish well-equipped response units at local level

- Develop risk reduction and resilience information
- Integrate disaster risk reduction and resilience into formal education and other orientation programs
- Improve public education and awareness through dissemination of information through business sector and media
- Build and maintain open-access data for disaster preparedness and response

(UNISDR, n.d, i).

The following subsection will discuss the ways in which these issues have been addressed within the academic literature and will explore these topics in light of other areas raised during the analysis of these papers.

6.7.2. *Conceptualisation*

This issue was particularly well addressed by the academic literature, as categorised into three main themes. Beginning first with participation, a number of key topics were identified from the literature including:

- City champions/entrepreneurs, engaged government leaders, and academia, private sector, and civil society
- Stakeholder engagement
- Stakeholder representation
- Level of access to resources
  (Armas and Gavris, 2010; Dunford et al., 2015; Fleischhauer et al., 2012; Henceroth, et al., 2015; Kernaghan and Silva, 2014; Lumbroso et al., 2016; Sarimento et al., 2017; van Niekerk, 2015; van Riet and van Niekerk, D. (2012).

They key messages here relates to the importance of engaging a variety of stakeholders in the resilience process, from businesses, household level, and those most at risk within a society. As a result, resilience and response at local level can be better equipped at dealing with hazards and risk. Incorporating varying sectors of society also helps to improve the reach of education and awareness programmes designed to reduce the risks associated with disasters. Finally, the inclusion of such groups helps cross-sector collaboration and understanding; helping to build government, and societal understandings, of needs, behaviours and risk management processes. As mentioned, this can be facilitated by peer reviews designed to draw various sections of society together to stimulate dialogue (Henceroth, et al., 2015). Issues relating to education and information and awareness were also prevalent within the literature. Themes associated with these categories include:

- o Education
    - Risk knowledge
    - Knowledge: local experiences and actions, mechanisms for learning and exchange

- o Information and awareness

- Community preparedness
- Emergency public information
- Information sharing
- Awareness of role in relation to DRR

(Basu et al., 2013; Beccari, 2016; Birkmann et al., 20; 13; Briceño, 2010; Cardona and Carreño, 2011; Dunford et al., 2015; EMI 2008; Henstra, 2010; Johnson and Blackburn, 2013; Kamh et al., 2016; Salami et al., 2017).

These issues align well with the strategies set out in the MCR Campaign as increased education and public awareness will support the development of local-level response units with clear understandings of risk management and response. Additionally, increased DRR and resilience information will help to strengthen mitigating practices at local-level, helping to inform communities about the best ways to protect themselves and their environment against hazards.

Interestingly, there is still a discrepancy between the literature and the MCR Campaign/the Disaster Resilience Scorecard for Cities when addressing incorporating the private sector. This is an issue identified in relation to a number of essentials, where the concept of engaging businesses as partners in city resilience is lacking in the academic literature. This review has suggested that this may be the case due to the relationships between business, legislation and fiscal issues being associated with the non-academic domain; resulting in their underrepresentation in the academic literature.

In saying this, it is a focus of the country-wide peer reviews captured by the SLR, although this has not been observed at city level – perhaps due to focus on economy and business at a national level. In the case of societal capacity, it is suggested that the literature has not associated peer reviews for city resilience with the private sector, but rather understands community to embody civil society, distinct from both government and the business sector. This is an issue which needs to be addressed in order to ensure conceptualisations of societal capacity are consistent and uniformly understood.

6.7.2. *Measurement of the Essential*

Some measurements of this essential were once again addressed using descriptive indicators, many of which centred around the key issue of exposure and vulnerability, and their impacts on human and physical loss. Additionally, indicators were also identified relating to:

- Deprivation levels
- Economic status of households
- Levels of public participation in drills and training
- Education Levels
- Information dissemination
- Government engagement of the community in hazard and risk perception/management

(Basu et al., 2013; Beccari, 2015; EMI, 2008; Fox-Lent, 2015; Kamh et al., 2016; Keating et al., 2016; Parsons et al., 2016; UNISDR, 2008).

The Scorecard also comprehensively addresses the connectedness of various facets of society; analysing the connections between the community and grassroots organisations, neighbourhoods and community networks, and the roles of the private and public sector in disseminating information and utilising their connections in order to support wider society. An additional aspect highlighted is related to engaging the most vulnerable populations and ensuring risk information is widely dispersed. The Scorecard identifies neighbourhood organisations and charities as a means of liaising with vulnerable groups, and the use of mobile and social computing systems as a way of widely communicating information to the public. Ensuring the most marginalised groups have access to, or can be accessed by, organisations and information designed to reduce their vulnerability is vital if resilience and development goals are to be achieved.

6.8. Essential 8: Increase Infrastructure Resilience

The notion of critical infrastructure encompasses all the services, systems and suppliers which enable a city to run in periods of normalcy, and which support a city during times of crises. Critical infrastructure includes facilities such as:

- Transport, including roads, rail, airports and seaports
- Suppliers of vehicle and heating fuel
- Telecommunication systems
- Utilities
- Hospitals and healthcare
- Education
- The food supply chain
- Emergency services such as fire, police, ambulance

(UNISDR, n.d, j)

Not only are these areas considered to be vital for a functioning city, they are also central to supporting relief and recovery efforts post-disaster. As mentioned, this essential was related to other essentials in how it has been addressed by the literature. Exploring this topic further provides valuable insights into how infrastructure resilience has been conceptualised as a construct in its own right.

6.9.1. Definition

Beginning first with the definition presented by the MCR Campaign, infrastructure resilience is characterised as the process by which the capacity and adequacy of critical infrastructure is identified, with a view to upgrading systems as necessary. Data gleaned from essential 2, understanding risk, should be utilised in order to support these processes. Having outlined some of the key facets of critical infrastructure above, it is also important to identify the areas

which need to be addressed in order to support these systems. The MCR Campaign identifies three priorities for cities:

- Strengthen/retrofit the vulnerable infrastructure
- Establish alliances with environmental managers and the private sector
- Recognize the relevance of priority services and operations during and after a disaster

(UNISDR, n.d, i)

Next the key issues identified by the literature will be explored to explain how this topic has been understood within the academic domain.

6.8.2. *Conceptualisation*

The issues explored in the literature were aligned with the MCR Campaign. Topics which arose from the literature included exploration of the following issues:

- Upgrading of infrastructure and exposure of critical buildings
- Levels of technical capacity for upgrading and within the systems
- Performance categories of systems i.e. critical or essential facilities damage levels, importance to recovery, and time it takes for system to recover
- Developing performance goals for design, functionality, and recovery of building and infrastructure systems to support DRR

(Basu et al., 2013; Beccari, 2016; EMI, 2008; Keating et al., 2016; Manyena, 2016; Mcallister, 2013; Musa et al., 2015; Pursiainen et al., 2016).

Contingency planning was also addressed but only from a financial and administrative perspective (Briceño, 2010). Issues relating to building partnerships with the private sector in order to utilise their expertise and resources within cities was notably lacking. This included establishing alliances with environmental services as a means of supporting resilience and infrastructure protection.

This reflects the findings from essential 1, which lacked discussions of network building to implement plans and policies. Seemingly, whilst coordination is recognised as a key component to risk reduction, response and recovery, the notion of actually building partnerships is not well developed in the literature. Although issues relating to technical capacity and equipment available to cities were discussed, it was in relation to where cities were lacking in technical capacity (Briceño, 2010; Lumbroso et al., 2016; Manyena, 2016), rather than which and how cities could collaborate with to leverage support.

This is worthy of note as it indicates the ways that establishing alliances with other sectors is addressed; suggesting that the predominant focus within the literature has been on what cities could not do, rather than what they could do. The importance of peer reviews therefore comes to the fore, as it provides cities the opportunity to assess disaster resilience, whilst being provided insights into what worked well and how things may be improved.

In a similar way to contingency planning and relationship building, developing performance goals for critical infrastructure was loosely addressed, but key issues such as the surge capacity of a system, or the parallel impacts a disaster may have on other systems, was not. These particular subjects are vital as they hold the key to mitigating the chances of a second tier disaster. This is where the first impact is compounded by potentially life-threatening complications such as:

- The system's capability of coping with law and order issues
- The system's capability of coping with casualties
- Road access to deliver supplies
- Impacts on hospitals if there is no access to water or electricity

(Kamh et al., 2016; Keating et al., 2016; Menteşe et al., 2015; Ostadtaghizadeh, et al., 2015; Salami et al., 2017; van Niekerk, 2015).

The concept of protecting sites of historical or cultural interest were also not conceptualised as institutional capacity issues by the literature. In fact the protection of such assets were not recognised within the literature at all, with minimal references being made to culture and heritage in relation to their impacts as drivers of resilience (Birkmann et al., 2013, Salami et al., 2017); either attitudinal (Leitch and Inman, 2012; Salami et al., 2017; Twigg, 2009), or in relation to exposure (Birkmann et al., 2013).

6.8.3. *Measurement of the essential*

Many of the measurements for this essential focused on access to critical services such as electricity, water, roads and bridges, transport, shelters in times of flooding, health facilities and schools (Fleischhauer et al., 2012; Henstra, 2010; Kamh et al., 2016; Johnson and Blackburn, 2014; Salamai et al., 2012; Sharifi and Yamagata, 2016). Indicators relating to the state of waste management services, drainage systems during floods, water quality, transport capacity, building capacity and sanitation were also highlighted as a means of gaging the capacity of a system. Relatedly, mortality rates as a result of poor infrastructure capacity were also presented as important measurements of a city's capacity (Briceño, 2010; Cardona, 2005; Keating et al., 2016; Mitchell et al., 2015).

The Disaster Resilience Scorecard for Cities mentions a number of key indicator categories relating to assessing the level of infrastructure resilience including:

- Protective infrastructure i.e. ecosystems
- Water and sanitation
- Energy such as gas and electricity
- Transportation
- Communication
- Healthcare
- Education
- Law and order
- Administrative operations
- Computer systems

- Data

Whilst providing a comprehensive overview of the issues facing various systems and sectors, the indicators within the Scorecard present a top-down approach looking at institutional ways of measuring and strengthening services. The literature however, presents a more societal perspective, measuring capacity from the viewpoint of those utilising the services. Where the scorecard conceptualises healthcare for example, as an issue related to whether there are sufficient capabilities to deal with expected major injuries, the literature comments on the ability of vulnerable populations to access the resources they need (Fleischhauer et al., 2012; Henstra, 2010; Kamh et al., 2016; Johnson and Blackburn, 2014; Salamai et al., 2012; Sharifi and Yamagata, 2016).

It is clear that both of these understandings play a central role in increasing city resilience, but that as of yet, these topics have not been amalgamated to provide a holistic, multi stakeholder approach to measuring infrastructure resilience and its associated impacts.

6.9. Essential 9: Ensure Effective Disaster Response

One key component of successful disaster management is effective preparedness and response strategies to save lives and livelihoods. Such plans also support resilience building and help mitigate the severity of disaster impacts on cities. Inclusive of communication systems, prepositioning and early warning systems, preparedness efforts support the mobilisation of people and resources in order to reduce injury, loss of life and damage to property and fragile environments (UNISDR, n.d, k).

6.9.1. Definition

Ensuring effective disaster response is defined as the process of disaster response planning, whilst ensuring such plans are informed by risks identified in essential 2. In addition, response strategies need to be effectively communicated to all stakeholders through use of organizational structures identified in essential 1 (UNISDR, n.d, k).

These aims can be achieved through addressing the following:

- Create and improve preparedness plans
- Strengthen early warning system
- Upgrade the city's emergency response services

Through such actions it is argued that sustainability can be achieved, and that the risk of disasters can be reduced. Central here is the commitment and understanding of communities and local authorities to addressing the importance of, and need for, local emergency preparedness and response.

6.9.2. Conceptualisation

One issue which emerged from the literature relates to limited discussion pertaining to the types of financial mechanisms to support response. Through deeper analysis it became evident that this issue was underrepresented in the MCR Campaign. Although links have been made to this essential in relation to organising for resilience and improving understanding of risk, the role of finances in supporting response is overlooked. However, the Scorecard does refer, in essential 3, to "contingency fund(s) for post disaster recovery" (UNISDR, n.d, 2017c). This is not however reflected in the indicators for essential 9, and may be a possible area to consider when addressing how cities are going to response to crisis.

The notions of adaptation and access were central to the discussion within the academic literature. The notion of engaging and communicating plans with all stakeholders was commonly addressed; drawing on the idea that if citizens do not have access to preparedness or response activates their levels of resilience will be adversely affected (Basu et al., 2013; Beccari, 2015; Briceño, 2010; Dunford et al., 2015; Fox-Lent et al, 2015; Kamh et al., 2016; Ostadtaghizadeh, et al., 2015; Salami et al., 2017). This was closely related to the need for cities to have access to, and knowledge of, vulnerable populations through clear identification of resilience and exposure levels within communities (Basu et al., 2013; Beccari, 2016; Briceño, 2010; Dunford et al., 2015).

Additionally, the notion of adaptation as a facet of effective response came to the fore (Basu et al., 2013; Birkmann et al., 2013; Fox-Lent et al., 2015; Simonovic et al., 2013). This was conceptualised as a central component of effective response and is addressed by Birmkann et al (2013: 201) as:

> "The techniques, assets and strategies applied or available for use in changing the institutional and structural frameworks that constrain human action to intervene in vulnerability; that is, manage exposure, susceptibility and resilience at any one moment in time."

Here a clear relationship can be identified between organising for disaster resilience, and understanding risk, and the adaptive capacities cited in the literature. One could also argue that this allows for consideration of financial issues, with the notion of assets as a means to tackle vulnerability through earmarked funds for response activities. However, this is not explicitly addressed in the MCR campaign where the predominant reference is to response plans without links being made to response budgets or possible support from public-private partnerships in ensuring effective response.

One last issue raised concerns the management of citizens during response (Henstra, 2010). Though the Scorecard and MCR Campaign make reference to liaising with voluntary organisations and networks, no consideration has been made in relation to managing spontaneous volunteers and unsolicited acts of help at disasters. Whilst altruistic motivations are recognised, such influxes can complicate supply chain issues due to resources spent sorting donations. Additionally, spontaneous volunteers also pose logistic challenges and potential security risks, and strain critical services and infrastructure. Part of managing these

challenges is interlinked with effective communication during this phase so that additional help complements, not strains, the response system. Through a peer review process, these potential issues could be communicated to all stakeholders; ensuring these concerns were mitigated through dialogue with businesses, citizens and policy makers.

6.9.3. Measurement of the essential

The measures within the literature drew on both preparedness levels of cities, taking into account early warning systems and preparation activities, and also the impacts on cities post disasters. Indicators covered issues such as:

- How effective early warning systems are
- How effective preparation activities taking place at local and household level including drills and training are
- Level of risk analysis management and data collection re: vulnerability
- How many people have been effected by a disaster i.e. number of people evacuated, number of people who have lost homes
- Number of deaths

The Scorecard comprehensively covers additional issues such as coordination of resources, collaboration with partners, and provisions of food, non-food items and services (UNISDR, 2017c). It is however arguable that issues relating to staffing, equipment, food, shelter, staple goods and fuel supply could be further strengthened by more developed links with essential 3.

6.10. Essential 10: Expedite Recovery and Build Back Better

Expediting recovery and building back better is complex and needs to balance speed and responsiveness for rebuilding, and safety, sustainability and affordability (Keating et al., 2016). The notion of participation is central to effective recovery and reconstruction as the process "helps the city reactivate itself, restore and rebuild its damaged infrastructure and recover its economy, empowering citizens to rebuild their lives, housing and livelihoods" (UNISDR, n.d, l). This process requires some preparation in that the timeliness of rebuilding can be facilitated by city's establishing the needs, operational mechanisms and resources needed, before a disaster strikes. Functioning leadership, coordination and finances are key to effective recovery and rehabilitation (UNISDR, n.d, l).

6.11.1. Definition

Expediting recovery and building back better is defined by the MCR Campaign as the processes by which sufficient pre-disaster plans are identified according to recognised risks. Additionally, it stipulates that the needs of the affected are at the centre of recovery and reconstruction; inclusive of the support of the affected population in designing and implementing rebuilding activities (UNISDR, n.d, l). Specifics of these processes include:

- Providing shelter, food, water, communication systems
- Addressing psychological needs post-event

- Limiting and planning for any use of schools as temporary shelters
- Identifying the dead and notifying next of kin
- Conducting debris clearing and management
- Taking over of abandoned property
- Including the affected population in the definition of needs and recovery plans
- Improving development through recovery
- Seeking out resources for recovery and reconstruction
- Strengthening alliances to support recovery and reconstruction
- Ensure sustainability of recovery and reconstruction

(UNISDR, n.d, l).

6.10.2. Conceptualisation

Aside from essential 3, essential 10 was the most under-addressed essential within the academic literature. This may be due to limited differentiation between the issue of preparedness, response and recovery activities by MCR. For example, the MCR definition for this essential refers to the need for pre-disaster plans to be identified, in relation to relevant risks, in order to meet recovery needs. This is closely related to the definition for essential 9 which includes preparedness and response activities which also require pre-disaster plans based on risk analysis to be identified. As a result, this particular disaster phase may not have been as well addressed by the literature which assumes a more generalised view of risk-assessed disaster planning.

One way in which this topic was conceptualised was in relation to the notion of rapidity, which is defined as a city's "capacity to contain losses, recover functionality, and avoid future disruption" (Keating et al., 2016: 85); this encompasses the aim of recovery and building back better, combining efficient recovery and development goals. This is also supported by Basu et al., (2013) who note the importance of integrating DRR measures into post-disaster recovery and rehabilitation processes.

Recovery and rehabilitation have also been addressed in relation to specific phases and characteristics. That is to say that recovery must also incorporate the physicality of reconstruction and the actual time it may take to rebuild infrastructure and ecosystems in order to mitigate future disasters (Fox-Lent et al., 2011). Additionally, the importance of communication with the public in relation to guidance and guidelines pertaining to building back better, and with a view to incorporating their needs was recognised to be integral to the recovery process and strengthening city resilience (Fox-Lent et al., 2011; Johnson and Blackburn, 2014).

Some additional actions were identified by the literature including:

- Arrangements to support the affected population, psychosocial support
- Continuity of operations, provision of routine services
- Debris management
- Inventories of personnel and equipment

- Financial planning and feasibility for recovery, sustainability and development programmes

(Fox-Lent et al., 2011; Gilisen et al., 2016; Henstra, 2010;
Keating et al., 2016; Kernaghan and Silva, 2014).

Some interesting examples of financial incentives for recovery and rehabilitation were highlighted and included promoting urban greening techniques such as planting trees, or rebuilding using solar panels in order to address sustainability issues, and more long-term development issues such as improving household access to energy (Kernaghan and Silva, 2014).

6.10.3. Measurement of the essential

In relation to indicators within the academic literature, the notion of governance and legislation came to the fore, aligning well with the Scorecard which calls for "comprehensive post-event recovery and economic reboot plans" to be in place (UNISDR, 2017c). The literature also highlighted the need for such legislation to be integrated into DRR policies (Johnson and Blackburn et al., 2014). Similarly with essential 9, the notion of risk analysis and vulnerability mapping arose, in this instance with a view to building back better, whilst conscious of risks and vulnerabilities which may be addressed or mitigated (Kim and Kakimoto, 2014; Menteşe et al., 2015).

Additional measurements referenced:

- The number of people affected/displaced
- The length of time people were affected or displaced
- The percentage of rebuilding money dispersed after a year
- The level of community participation in city recovery planning meetings

(Basu et al., 2013; Fox-Lent et al., 2011; Johnson and Blackburn et al., 2014;
Keating et al., 2016; Kim and Kakimoto, 2014; Leitch and Inman, 2012;
Menteşe et al., 2015).

The Scorecard also addresses financial arrangements and stakeholder consultation, but also highlights the need for learning loops in which what went well, not so well, and what can be learnt from response and post-response events, are documented. In this way cities can understand how they can build back better, and will aid in the understanding or the risks they face. The peer review process is particularly useful in this regard, providing additional insights which can support cities' comprehension of risk and risk management, ultimately helping to inform future risk management strategies.

7.   Conclusion

The findings from the literature relating to peer reviews and urban resilience have a number of implications for research into DRR in urban environments, and the UScore2 project. The overarching implications are identified for each essential and presented below.

Essential 1: Drawing on the findings from essential 1, it became clear that the concepts addressed by the academic literature in relation to this essential were well-established, particularly in relation to strengthening capacity and coordination. It was noted however, that there was only partial recognition of network building, legislative frameworks and implementing DRR plans in the academic literature, which may be as the result of limited recognition of the importance of peer reviews. Further investigation into these relationships would help to inform policy implementation through support from credible theory, and would also provide bridges between academic and practice-orientated research.

Essential 2: As demonstrated in essential 1, essential 2 was also addressed in detail by the literature and aligned well with pre-existing indicators. It was noted however that clear distinction between these first two essentials were not adequately made in the academic literature, with the issues of understanding risk and governance often overlapping. Using the concept of exposure, which translated well as a concept across all essentials, increased understanding of who or what is at risk, and the type of risk faced was acknowledged. In turn, vulnerability reduction and effective information exchange can be supported, increasing stakeholder engagement and facilitating more-long term approaches to strengthening city resilience.

Essential 3: The analysis of this essential revealed that it is very under-represented in the academic literature in relation to peer reviews in the context of risk governance. Whilst economic issues were discussed, the concept of allocating financial resources with a view to supporting government-spending on DRR and resilience building was not addressed. When monetary issues were deliberated, they were often discussed at the household level; tackling issues such as property insurance, income level, and loss of assets. Relationships between finances and improving resilience were heavily interlinked with issues relating to governing issues, which may have implications on effectively applying specific strategies which directly support strengthening financial capacity.

Essential 4: In relation to essential 4, it was found that crossovers existed between pursuing resilient urban development and design, and essential 8: increase infrastructure resilience. This is important to note as this may have ramifications on the ways in which these issues are addressed at government and community level. Predominantly, this related to conceptualisations of land-use and urban planning, merging notions of environmental management and structural issues. This demonstrates potential pitfalls to be avoided as understanding the differences between these issues will impact how these are implemented, and translated into other domains.

Essential 5: Similar issues were identified between essential 5 and essential 8, whereby differences between natural systems and the built environment were poorly conceptualised. The issue of land-use in particular, was predominately framed as a construction issue; overlooking vital environmental concerns associated with it. As a result, subjects addressing the degradation of ecosystems or management of ecosystems were limited. Interestingly, the academic literature took a very societal perspective in relation to ecosystems, exploring patterns of human behaviour and the impact this may have on the natural environment. This

particular stance was not present in the Scorecard or MCR Campaign, but could be a useful way to examine how hazards develop into risks and what can be done to avoid this.

Essential 6: Again, adequate legislation was heavily interlinked with this essential, including frameworks and plans to effectively coordinate varying bodies in order to improve cooperation and inclusive participation. Cautionary discourse was used in relation to heavy reliance on outsourced organisations when trying to strengthen institutional capacity, due to the limited control and potential learning that could be undertaken by local governments. Institutional strengthening was also recognised to be imperative at all levels, and was associated with sharing information regarding DRR and risk management strategies.

Essential 7: Alongside essential 1 and 2, strengthening social capacity was one of the most comprehensively addressed essentials within the literature. Broadly covering community participation, education, and information, the literature related to this essential demonstrated clear links between engaging with multiple stakeholders, and improved education and information dissemination regarding risk. Subsequently, local-level response and vulnerability reduction can be developed as the result of improved understanding and inclusion. Discrepancies were apparent however, when addressing the private sector as it became clear that this domain was not framed by the academic literature as a component of societal capacity. This provides interesting insights into which sectors are, and should be included within this definition; suggesting that further consensus may be needed to ensure all stakeholders are engaged in strengthening societal capacity for resilience.

Essential 8: The issue of increasing infrastructure resilience with a view to developing alliances with environmental manages and the private sector was lacking presence; reflecting similar issues identified in essential 1 with reference to network building. This is a particularly important gap to address as it highlights the focus on where cities have lacked capacity, opposed to who they could collaborate with in order to strengthen such capacity. This further supports the need for the peer review process, as lessons from good practice can be shared. Alongside the issue of collaboration, it was noted that contingency planning and developing performance goals for critical infrastructure were loosely addressed, but issues relating to surge capacity, the parallel impacts of a disaster, and protecting sites of historical or cultural interest were not. These are areas which attend to increasing response and mitigating damage to stem human and physical losses, and as a result require further attention.

Essential 9: Ensuring effective response, similar to many of the essentials, received limited discussion relating to the types of financial mechanisms which would support it. There was also a lack of information regarding the monetary implications of response in the MCR Campaign. This is an important issue as this essential is heavily related to organising for resilience and improving understanding of risk, and part of addressing this essential is pre-event planning. Whilst contingency funds for response were mentioned, this was only in relation to essential 3, suggesting it may be an area which needs to also be specifically addressed by essential 9. The issue of managing spontaneous volunteers was also addressed as a means of reducing additional strains on cities during times of crisis; strategies to manage

such influxes may be useful to address so that cities are able to mitigate further stresses on the system.

Essential 10: Finally, essential 10 addressed the issue of recovery and rehabilitation, and was sparsely represented in the literature. It is suggested that this may be due to poorly defined terms, and as a result of varying conceptualisations regarding the disaster phases in which pre-disaster recovery planning should take place. What was clear within the literature was a need for timely operations which also encompassed long-term visions for safer and more sustainable futures. The notion of time was also incorporated into recovery plans, with emphasis on the need to establish how long recovery would take, and the amount of time people and services may be displaced. As a result the continuity of service provision came to the fore; although neither of these issues were addressed by the Scorecard. The issue of money was also raised, whilst the Scorecard referenced the need for arrangements for processing and distributing funds, the literature addressed the issue from a development perspective, focusing on incentives for sustainable rehabilitation. An approach which integrates these two perspectives may be of use to meet the long-term aims of resilience building in cities.

Through analysis of the literature, information regarding implementation of the 10 essentials in peer reviews can be assessed. Particular trends relating to how essentials are addressed and conceptualised have been attended to. In turn, this provides insights into how the essentials relate with one another, in which areas they overlap and the impact this has on their utilisation in peer review contexts.

This systematic review also delves into the use of indicators and measurements within the literature; demonstrating links with pre-existing scorecards and objectives which aim to assess levels of urban resilience. The research highlights a general lack of indicators and measurements in many papers, especially measurements with numerical values. This helps to inform this project as it reveals discrepancies in how resilience is measured. This is particularly notable in that the Disaster Resilience Scorecard for Cities assesses resilience from a retrospective stance, whereas much of the literature focuses on indicators related to exposure or vulnerability, pre-disaster.

This report addresses the objectives of the UScore2 project by collating and analysing information from a variety of sources in order to support the development of an easy-to-use tool based on contributions from both theory and practice.

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Appendix A. List of 'Publish or Perish' Google Scholar Search Strings

(local-level OR urban OR city) plan* (disaster OR emergency) manag* ("peer review" OR "peer evaluation" OR "peer assessment" OR "peer appraisal" OR "peer monitoring")

(local-level OR urban OR city) plan* "Disaster risk reduction" Peer-to-peer (review OR evaluation OR assess* OR apprais* OR monitor*)

(local-level OR urban OR city) resilien* (disaster OR emergency) manag* ("peer review" OR "peer evaluation" OR "peer assessment" OR "peer appraisal" OR "peer monitoring")

(local-level OR urban OR city) resilien* (disaster OR emergency) manag* ("self review" OR "self evaluation" OR "self assessment" OR "self appraisal" OR "self monitoring")

(local-level OR urban OR city) resilien* (disaster OR emergency) manag* Peer-to-peer (review OR evaluation OR assess* OR apprais* OR monitor*)

(local-level OR urban OR city) resilien* "Disaster risk reduction" Peer-to-peer (review OR evaluation OR assess* OR apprais* OR monitor*)

(local-level OR urban OR city) resilien* "Disaster risk reduction" ("self review" OR "self evaluation" OR "self assessment" OR "self appraisal" OR "self monitoring")

(local-level OR urban OR city) resilien* "Disaster risk reduction" ("peer review" OR "peer evaluation" OR "peer assessment" OR "peer appraisal" OR "peer monitoring")