



City Resilience Index

Research Report Volume 2

Fieldwork Data Analysis

Draft | April 2014

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(Front Cover)

Cape Town: Children
playing in the only
play area near an
informal settlement





Introduction

As the 21st century unfolds, an increasing majority of the world's population will live in cities, where their wellbeing relies on a complex web of institutions, infrastructure and information. Cities must be able to survive and thrive despite numerous pressures that pose a challenge to urban living. These include food, water or energy security; climate change; disease pandemics; economic fluctuations; rapid urbanisation; social conflict; and terrorism, among others. Risk assessments and hazard-specific measures to reduce risk will continue to play an important role, but pressures are still likely to develop and unforeseeable events may occur. Unless our cities are resilient, a range of shocks and stresses may cause decay or collapse, affecting millions of people with far reaching economic consequences.

Cities need a means to determine whether their development trajectories will result in them becoming more (or less) resilient. This is particularly true for rapidly growing cities in developing countries. If governments, donors, investors, policy makers, and the private sector are to foster more resilient cities, they need to understand the factors that contribute positively (or negatively) to resilience at a city scale. They need to identify where action and investment will be most effective. They also need to understand the dynamic networks of control and influence which reach beyond a city's administrative boundary, and influence their ability to take appropriate action. Yet, at present there is no common definition of city resilience, or a framework to guide decision making.

The City Resilience Index (CRI) is the result of an intensive 18 month research project undertaken by Arup with support from the Rockefeller Foundation. Its aim is to create an accessible, evidence-based articulation of city resilience that will ultimately provide a robust basis for measuring resilience at the city scale. Its purpose is to inform urban planning practice and investment patterns, to better enable urban communities - particularly poor communities - to survive and thrive following significant social, environmental, or economic stress and disruption.

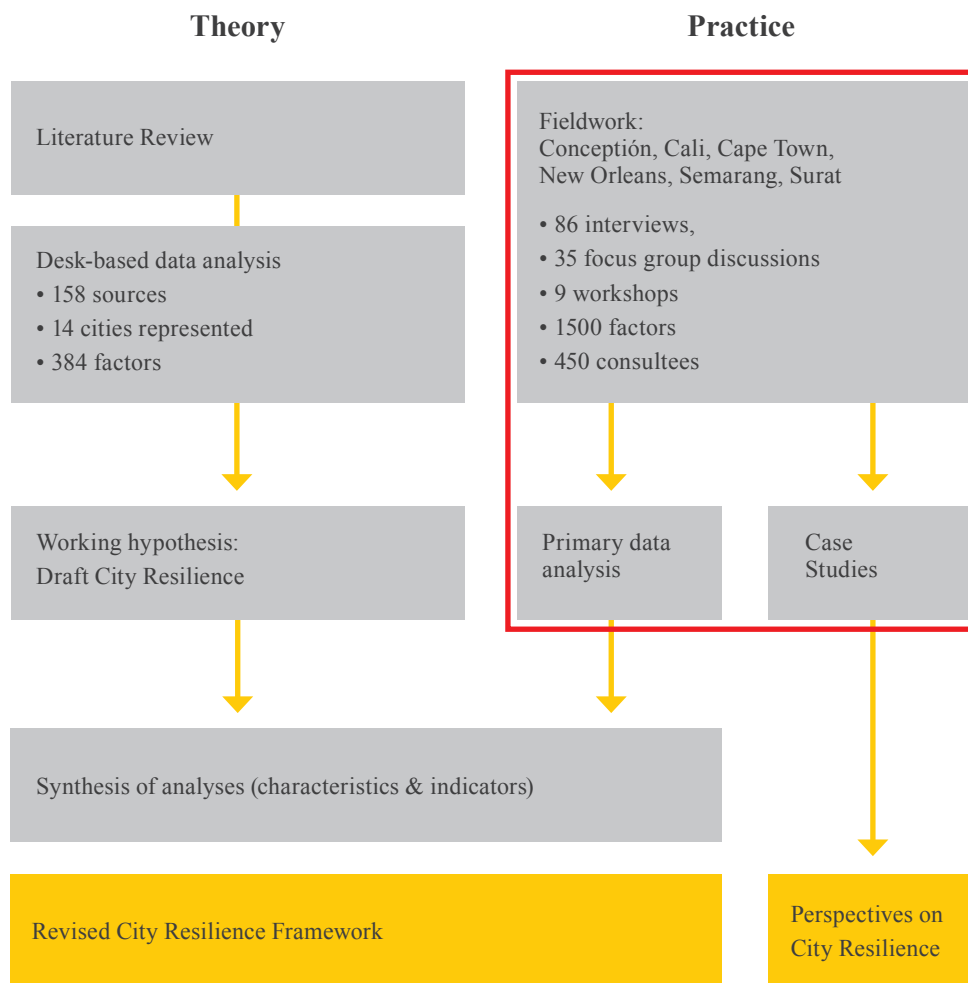
This report - "City Resilience Index: Research Report Volume II: Fieldwork and Primary Data Analysis" - describes the analysis of information generated by the fieldwork for the City Resilience Index. This is a critical process to help define the characteristics (and indicators) of resilience that are applicable to cities at various scales and in different sectors. The findings from the fieldwork analysis are intended to challenge and influence the hypothesis from the desk study (Research Report Volume I) by providing evidence from city stakeholders about what are the most salient issues for them in their contexts.

(Image opposite)

Surat: Wier cum
causeway on river
Tapi

This document summarises the methodology used to process and analyse the fieldwork data ('primary data'), and the key findings arising from the analysis. Figure 1 outlines how this activity fits within the overall research process for the development of a City Resilience Framework.

Figure 1 : Research methodology. This report focuses on the workstreams outlined in red



The fieldwork and primary data analysis were undertaken to fulfil the following objectives, to:

1. Identify further factors that contribute to defining the ‘universe of resilience’
2. Collect anecdotal evidence of measures, or tools, to assess and build resilience
3. Understand how urban resilience is understood from the different stakeholder perspectives of business, government and civil society/public
4. Unearth examples of where stakeholder dynamics have contributed to or limited the ability of particular groups to control or influence their resilience¹.

For the purposes of the fieldwork, the following definitions were used:

Urban Resilience: the ability of a community, business or city, for example, to continue to function and achieve its purpose, to the fullest possible extent in the face of stress.

[resilience] **Factors:** things (physical) or practices/procedures or behaviours (non-physical) that, in the opinion of the interviewees, contribute to the resilience of their cities.

Shock: single unpredictable events (such as a disaster).

Stress: ongoing hardships which a community experiences every day.

How the report is organised

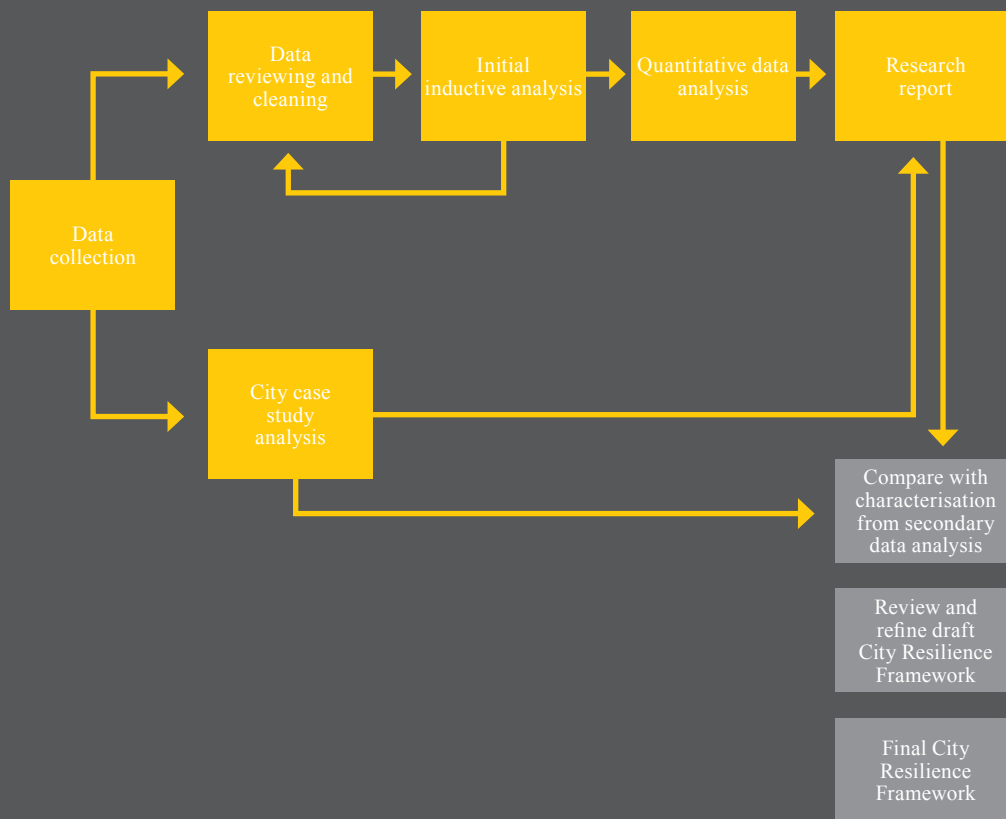
Chapter 2 outlines the methodology used to process the fieldwork data and complete the primary data analysis.

Chapters 3-5 describe the key findings of the analysis. In chapter 3, the key messages from the fieldwork cities are presented. These have been extracted from the longer narratives presented in the “City Perspective” documents. Chapter 4 sets out the thematic analysis of the factors. In chapter 5, these themes are explored through a comparative analysis by city.

Chapter 6 summarises the key findings of the analysis, including what this tells us about urban resilience and how it should be used to guide the development of a City Resilience Framework. Additional supporting data and information are included as appendices.

(1) Arup, City Resilience Index Fieldwork Methodology, November 2013.

Figure 2 : Primary data analysis process



Methodology

Research design

The aim of the fieldwork and primary data analysis was to inform our understanding and characterisation of city resilience. Urban resilience is a relatively new concept, for which there is not a widespread agreed definition (see Research Report Volume I: Desk Study). An evidence-based understanding of resilience was developed by asking city stakeholders how they manage the stresses and shocks their cities face.

The fieldwork was structured to gather information to answer the following research questions:

- A. What does urban resilience mean to different stakeholders? (objective 3²)
 - 1. What do different actors require from the city, both physical and non-physical, in terms of what the city does?
 - 2. What are the ways in which shocks and stresses materialise in cities around the world today?
- B. How is urban resilience achieved by different stakeholders? (objective 1)
 - 1. What do urban actors perceive as being the factors which prevent disruption or enable rapid recovery of urban functions during times of shock or stress?
 - 2. And of these, which are the priority or critical factors? Are they physical or non-physical?
- C. How is urban resilience being measured? (objective 2)
 - 1. What are the tools, metrics or approaches that are currently being used by cities to measure urban resilience?
- D. How do stakeholder dynamics influence resilience outcomes? (objective 4)
 - 1. Who has control and / or influence over factors that contribute to resilience? Who wins? Who loses?

(2) Objectives refer to those presented in Chapter 1, the Introduction

The fieldwork resulted in two types of information:

- an inventory of factors that enable cities to better withstand shocks and stresses, which were extracted from the interview and workshop notes; and
- a set of city narratives created by the researchers about the city and its responses to shocks and stresses.

The factors were treated as objectively as possible and analysed both qualitatively and quantitatively. This method facilitates understanding about how resilience is perceived across different contexts but inevitably loses some of the detail for individual cities. To preserve the richness of the process, the narratives from the interviews were combined into city case studies to describe the aggregated view of each city’s perspective on resilience. As well as telling their own stories, these case studies will be used to check the outcomes from the factor analysis.

Figure 2 illustrates the process. The steps taken to assemble and analyse the fieldwork data are shown in orange. The other project activities that continue on from this analysis are shown in white.

Analysis

Data collection

The primary data comprises observations from the experiences of a diverse set of consultees gathered in six cities. The methods used to gather data and the number of consultees are summarised in the tables below.

Table 1 : Data gathering methods used in each city

<p>Concepción</p> <ul style="list-style-type: none"> - 16 Key Informant Interviews - 6 Focus Group Discussions - 2 workshops 	<p>Cali</p> <ul style="list-style-type: none"> - 14 Key Informant Interviews - 2 Focus Group Discussions - 2 workshops 	<p>Cape Town</p> <ul style="list-style-type: none"> - 10 Key Informant Interviews - 8 Focus Group Discussions - 1 workshop
<p>New Orleans</p> <ul style="list-style-type: none"> - 16 Key Informant Interviews - 12 Focus Group Discussions 	<p>Semarang</p> <ul style="list-style-type: none"> - 16 Key Informant Interviews - 6 Focus Group Discussions - 3 workshops 	<p>Surat</p> <ul style="list-style-type: none"> - 19 Key Informant Interviews - 4 Focus Group Discussions - 1 workshop

Table 2 : Number of consultees consulted in each city

	Number of consultees			
	Government	Business	Civil society/ Public	Total
Cali	17	5	44	66
Cape Town	18	22	16	56
Concepción	15	7	68	90
New Orleans	10	24	31	65
Semarang	30	2	49	81
Surat	18	8	66	92
Total	108	68	274	450

The data was collected by ten researchers with diverse professional backgrounds relating to urban contexts and disaster risk reduction (DRR) and resilience.(Table 3)

Table 3 : Field researchers and expertise

	Country of origin	Professional background					DRR/resilience		
		Architecture/ Master-planning	Engineer-ing	Planning	Economics	Social Science	DRR	Post- disaster	Resilience
Braulio	Chile								
Sandra	Spain								
Andrea	Colombia/ USA								
Flora	UK								
Stephen	USA								
Vicky	UK								
Sam	Australia								
Beth	UK								
Samantha	USA								
Sachin	India								

Key messages from the cities

The narratives from the city consultations were assembled by the fieldwork teams to present a more complete story of the city in relation to the research questions. The case studies are interpretations by the field researchers, intended to capture the most salient messages from the totality of the interviews. The case studies followed the same structure for each city, and encouraged the capturing of as many real examples, or stories, from the interviews as possible. The key messages from the six case studies are summarised in chapter 3 to provide a context to the data analysis.

Data coding

Fieldwork notes were recorded for each city in an Excel template corresponding to the questions asked to consultees in the field. For the purposes of analysis, factors were extracted from specific question responses, including:

- What factors enable the city to recover from disruption? (Questions 2.4 and 3.5³)
- Which factors make more difference? (Questions 2.6 and 3.7)
- What is your greatest need or would have the greatest improvement to the city? (Question 4.1)

1,546 ‘factors’ were initially extracted from the consultations. The wording for each new factor was clarified to ensure it could stand alone without explanation. Where the original text was explicitly positive or negative (e.g. “we all knew about the evacuation procedures” versus “we weren’t told where to go”), the tone was removed to create a neutral factor based on the presence or absence of an asset, practice or behaviour (e.g. “awareness of evacuation procedures”).

Factors were assembled in an Excel database. Excel was selected due to its versatility to store and filter large volumes of information, as well as generate quantitative analyses.

Coding was undertaken to classify factors in preparation for analysis. The

(3) See Appendix F for the list of consultation questions.

analysis team used pre-defined objective and subjective codes (from a drop-down menu of options to ensure uniformity), and emergent codes (defined uniquely for each entry).

- Objective coding was applied by the analyst for classifications that were clearly evident from an outsider’s perspective (e.g. source city, country, region).
- Subjective coding was applied for classifications that were based on the interpretation of the consultee or the analyst, based on their own understanding of the issue.
- Emergent codes are the result of detailed qualitative review by the analyst. The emergent approach allowed insights about resilience to emerge from the primary data, which had not been identified by the secondary data.

Table 4 : Coding methods used for classification. A detailed list is provided in Appendix 1. Grey highlighting indicates classifications that have been used in the analysis in this report.

Classification	Coding method
Source city, country and region	Objective
Source name, organisation and role	Objective
Actor - Source actor by type	Objective
Dominant hazard in source city, and specific shocks and stresses	Subjective (interviewee)
Original text	-
Factor	Emergent
Experienced vs desired/missing	Subjective (interviewee/analyst)
Shock or stress-related factor	Subjective (analyst)
Factor type (Asset/Practice or Behaviour)	Subjective (analyst)
City system	Subjective (analyst)
Meta-theme	Emergent
Theme	Emergent
Sub-theme, sub-sub-themes, micro-themes	Emergent

Data review and cleaning

The analysis team consulted each fieldwork team to verify that the field notes had been processed and coded accurately, which resulted in a new count of 1,518 factors. Field teams advised on:

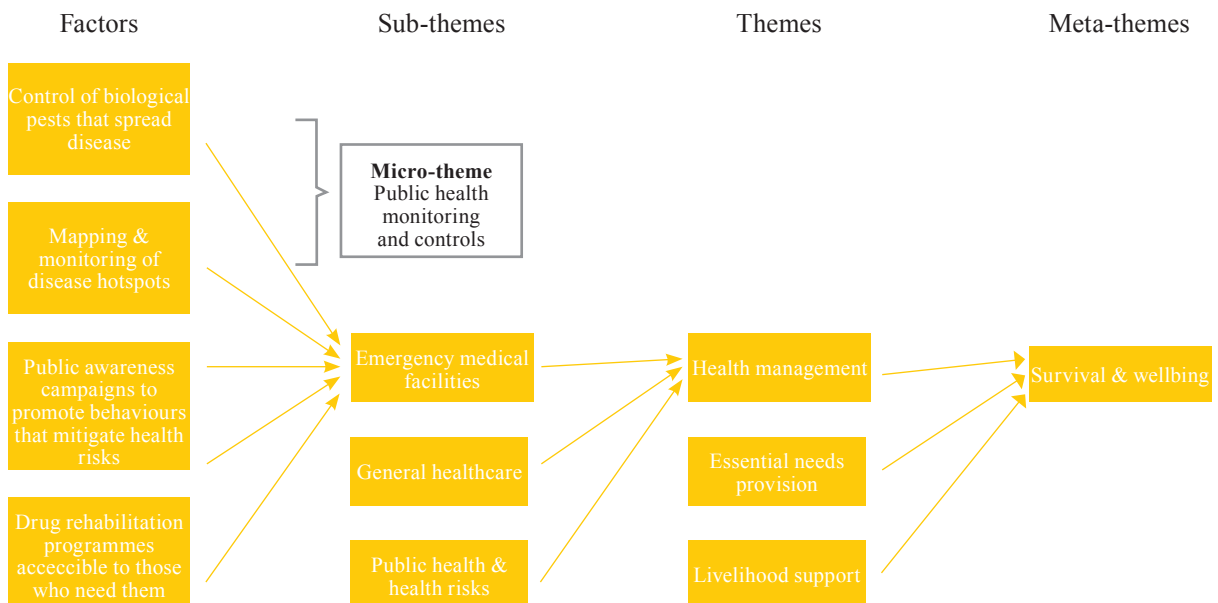
- Edits to the wording of factors, to improve alignment with discussions in the field.
- Factors that conflated a number of issues, which should be divided into multiple factors.
- Entries in the database that could not be reliably described as a ‘factor’, but were a passing remark or unsubstantiated comment from an interviewee.

Factors were also coded to enable a count of ‘unique’ factors (i.e. aggregating nearly identical factors – no factors were deleted). The resulting 1,178 ‘unique’ factors demonstrated that about 25% of the factors were similar to each other.

Initial inductive analysis

A review was undertaken to group factors according to similar themes in order to make the detailed analysis easier and more meaningful. The grouping was done without any preconceived ideas of the city or resilience. Depending on the factors, they might be grouped according to the assets they described, the practice, the behaviour, the implementing party or the beneficiary of an intervention, the level or scale of intervention, or its role before, during or after a shock or stress. The groupings were highly influenced by the numbers of factors that clearly contributed to a common outcome, i.e. the more factors, the stronger the case for a new grouping. The target was to find as simple a structure as possible without losing any key messages from the fieldwork.

Figure 3: Example relationship of factors and grouping logic



This process of grouping was repeated until an overall structure could be applied that fit most of the factors. At each iterative stage, the groupings were presented and discussed within the wider Arup CRI team to check for clarity in the developing logic. An example of the strand of the resulting logic structure is shown in Figure 3.

Additional coding was added to the factors to reflect the final structure which comprises 4 meta-themes, 12 themes, and 47 sub-themes (see Table 6 page 32 for further explanation).

Quantitative data analysis

The structure created in the previous step is subjective and highly dependent on those involved in its development. The next step in the analysis served both to challenge the structure for its applicability in the varied contexts, and to reveal further patterns and insights about the factors.

Using the factor coding, a quantitative analysis was undertaken to reveal further information about the factors, their relationship to each other, and their significance in terms of the number of times they were mentioned by the 450 consultees. Of all the information collected from the fieldwork, a few codes were selected to be used as lenses to be used in the analysis. They were chosen on the basis of their consistency in coding and the varied perspective they could bring to the analysis. They are⁴:

- Factor groupings (themes, sub-themes, micro-themes)
- Consultee group (source of factor)
- City (source of factor)
- Shock or stress related factor
- [Perceived] Experienced vs desired/missing factor(had it been experienced as a positive influence or was it seen as something that would have helped if had existed)^{3&4}

These dimensions were described at the theme level and then further explored through a comparative analysis by city. Detailed observations were gathered from this process and initial interpretations provided. This generated an understanding about how resilience is experienced in the six cities.

The findings of the qualitative and quantitative analyses are presented in Section 5 of this report.

Limitations

The intention of the research design was to use the experiences of multiple diverse stakeholders from differing contexts to build up a holistic perspective of urban resilience. To do so effectively, the stakeholders needed to be engaged in open dialogues about their cities and the shocks and stresses they face⁵. This approach had several limitations:

Selection of cities – both the number of cities (6) and the specific cities that were visited. Cities were selected for their different contexts as well as the presence of existing relationships that would facilitate the engagement of consultees (see section 3 for further information about city selection). The six chosen cities are not intended to be a representative sampling of cities. It is likely that no such sampling could ever be found due to the complexity of city contexts; each has its own socio-economic context, governing structure, physical environment and history of shocks and stresses.

Number of consultees – both the right balance and sufficient numbers. For example, only 10% of the factors could be considered to be sourced from consultees from ‘low income’ backgrounds. Access to vulnerable and minority groups was difficult to achieve in all six cities, and therefore the primary data is highly influenced by the perspectives of more affluent and empowered stakeholders from government and business. Since the field visits were coordinated by local partners, the range of interviewees was influenced by our partner organisations’ existing contacts.

Memory bias of the consultees – The methods relied on consultees reflecting on shocks and stresses they had experienced in order to provide tangible examples. Recollection of events that happened several years ago may have been influenced by the media and other natural common memory constructs. They may also have forgotten many details. Where the event was more severe or more recent, such as in Concepción, this tended to dominate the discussion, overshadowing other challenges the city might be facing.

(5) Concepción was the first city visited, and therefore the “pilot” city. The fieldwork was carried out in a slightly different way from the proceeding cities. For example, more city citizens were consulted through the use of postcards which were filled in by passers-by in the city. These results were not used in the final data analysis. Also, input from workshops was summarised into top factors, rather than collecting the full diversity of factors presented. This should be taken into account when interpreting the findings of the research.

Researchers - both the number of researchers and the diversity of their backgrounds. A common template and standard methods were used to carry out the consultations, to ensure a degree of consistency in the field. However, each team inevitably conducted the interviews in their own style, interpreted consultees' responses with a different perspective, and recorded the consultees' comments in a different way (i.e. prose versus bullet points).

The data collection and analysis process used a balanced approach comprising both objective and subjective perspectives. Factors and other basic data were extracted from the fieldwork reports in an objective way to enable a more reductive analysis. This was complemented by the subjective writing of case studies by the field researchers. Together, these two approaches ensured that all details were recorded.

Language - both how the information was understood by the consultees and how it was captured and recorded. English is not the operational language in three of the fieldwork cities. In every city apart from New Orleans, at least one other language was common in specific groups (e.g. Gujarati, Afrikaans). Where the native language was Spanish, the researchers were also native Spanish speakers, but their data still had to be translated into English to facilitate analysis. In Semarang, the researchers did not speak the local language (Bahasa) and used an interpreter to collect data. All of the consultations were audio-recorded so that researchers could go back and review.

City case studies

A case study has been developed by each fieldwork team to provide a more detailed narrative about their observations and experiences from the consultations in the fieldwork cities. This chapter introduces the cities (for more information refer to the “Perspectives on City Resilience”) in order to provide a broader context for the data in the next chapters. The information presented here did not inform the analysis directly. The chapter summarises the key messages following the research questions outlined in Chapter 2.

The cities

The six fieldwork cities were selected by compiling and evaluating a long list of 59 cities that had undergone a significant shock or a stress in the last ten years. These cities were profiled by region, geographic diversity, type of shock or stress, and population size. Each city was evaluated according to Arup’s ability to undertake fieldwork, by considering the following criteria: the presence of an Arup office; strength of contacts in the city’s public, private and/or civil sectors; language requirements; and availability of local partners. 20 cities were shortlisted and a final review was undertaken to identify the six target cities for the fieldwork.

Figure 4: Six cities chosen for fieldwork .

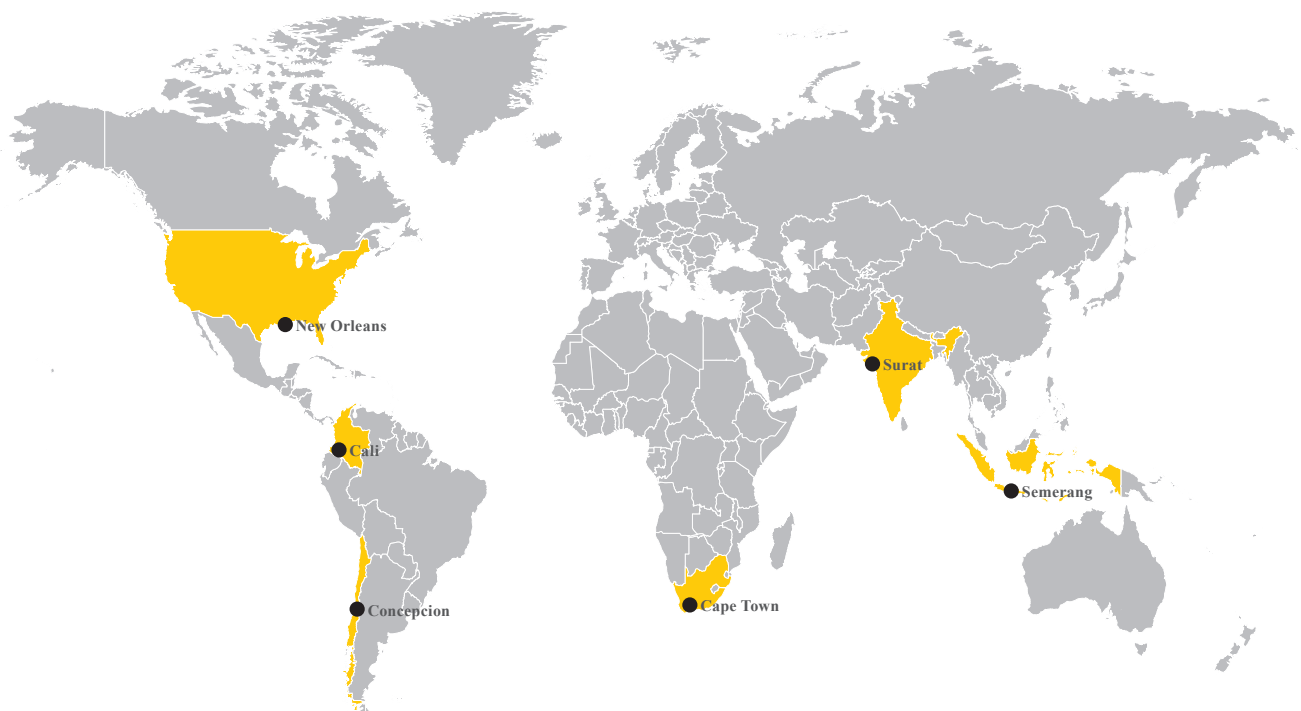


Table 5: Summary contextual data on the cities where fieldwork was conducted. Data taken from City Briefings.

CITY		Economics (Source) - Country GDP, Rank (IMF) - City GDP / Capita (US\$) (McKinsey Data) - Unemployment (Various)	Physical (Source) - Total City Population (Various, 2013) - Climate - Environmental Shocks/ Stresses (Field data)	Social (Source) - Governance Structure (Field Data) - Gini (City – Various Country – World Bank) - Select Social Stresses (Field data)
Call	1	US\$ 327.626 bn – 32nd (2011)	2,895,000 (Metro), 2,352,000 (city) (2010)	Includes decentralised agencies
	2	\$11,000 (2010) \$17,000 (2025) (\$6,179 (2010) – Colombia)	Semi-tropical savannah	Not found, Colombia is 0.559 (2010)
	3	16.4%	Flooding, Landslides, Earthquakes	Corruption, drug trafficking
Cape Town	1	US\$ 402.248 bn – 29th (2011)	3,740,025 (Metro - 2011 census)	Decentralised
	2	\$16,000 (2010), \$26,000 (2025) \$7,266 (2010) - S.A	Mediterranean	0.67 (2005) – COCT 0.674 (2006) – S.A. 0.631 (2009) – S.A.
	3	23.9 % (2011)	Sea-Level Rise, Storms, Floods	Social segregation, inequality, violence, housing shortage
Concepción	1	250.99 bn – 38th (2011)	945,650 (Metro), 214,926 City	(highly) Centralised
	2	\$18,000 (2010), \$31,000 (2025) \$12,685 (2010) – Chile	Mediterranean	Not found, Chile is 0.521 (2009)
	3	8.6% (2012, INE)	Earthquakes, Tsunamis, Floods, Landslides	Crime, decentralization of economy
New Orleans	1	US\$ 15,075.675 bn – 1st (2011)	1,227,096 (Metro, 2012 est.) 343,829 (city) (2010). (Pre Katrina, est. 455k 2005)	Decentralised
	2	\$52,000 (2010) \$65,000 (2025) \$48,000 (2010) – USA	Subtropical (humid)	0.54 (2010) - NOLA 0.45 (2007) - USA
	3	11.6%	Hurricanes/Tropical Storms, Floods, Coastal Erosion	Education, inequity, unemployment, violence / crime
Semarang	1	US\$ 846.159 bn – 16th (2011)	1,556,000 - 2010 (Mckinsey 2013)	Decentralised district (recent)
	2	\$8,000 (2010) \$16,000 (2025) \$2,947 (2010) – Indonesia	Tropical Monsoon/Equatorial	Not Found, Indonesia is 0.381 (2011)
	3	16.8% (Mulyono, S. & Susilo, I., 2012)	Flash, Tidal and River Flooding	Water, Subsidence, Inequity, Services
Surat	1	US\$ 1,838.166 bn 10th - (2011)	6,081,322 (District), 4,849,213 (urban) (2011 census)	Predominately decentralised
	2	\$8,000 (2010), \$21,000 (2025)	Tropical Savanna	not found, India is 0.339
	3	Not Found	Flooding	Disease, water & food scarcity, poverty

ARBOL PROBLEMAS

DESERCIÓN ESCOLAR

ARUP

FALTA EDUCACIÓN

Tráfico drogas

Vivienda

IRRESPONSABILIDAD CON EL SECTOR FAMILIAR

ARUP

Rebelión familiar

FALTA DE COHESIÓN EN LA FAMILIA

ARUP

FALTA DE CONVIVENCIA Y RESPETO

ARUP

Desempleo estigmatización falta de oportunidades

fronteras invisibles

"PALANCAS" y DISCRIMINACIÓN

ARUP

Falta de oportunidades y recursos económicos

Consumo de S.P.A

ASISTENCIALISMO PROGRAMAS INHUMANOS

ARUP

Violencia de pandillos, jóvenes, Intrafamiliar, Asesinatos, "Bata Negra"

VIOLENCIA

ARUP

FALTA DE APOYO (RECURSOS E INFRAESTRUCTURA)

ARUP

COMPETENCIA DE OTRAS ORGANIZACIONES FALTA DE IMPACTO

ARUP

INDIFERENCIA/INTOLERANCIA EN LA COMUNIDAD

ARUP

TEMOR

MIEDO

Salud

INDIFERENCIA DE LA CIUDAD EN LO QUE SUCEDE EN EL BARRIO

ARUP

MAL GOBIERNO

Key messages from the cities

Cali

The main stresses identified in Cali were violence and flooding⁷. All consultation groups identified violence as a significant stress that has reached its worst levels within the last 30 years. The majority of stakeholders perceive that the protection of human life from violence is, or has been, the issue that most affects the city's resilience. Violence is perceived as a shock for more affluent groups, but a continual stress for lower income groups.

Flooding was also named as a critical stress for Cali. At the top of the political agenda is the municipal work to strengthen the levées protecting Cali from the Cauca River.

The research indicates that businesses in Cali consider resilience in terms of the city's ability to create a strong environment for doing business. Businesses perceive that this is outside of their control. In comparison, civil society groups in Cali understand resilience in terms of access to livelihoods, personal security, and access to critical infrastructure such as public transport and adequate waste management. Consultees propose that recent successes in the city have been achieved through improvements to public transport, management of public spaces, environmental information and solid waste management.

The case of Cali highlights political leadership as a key factor for resilience, which has been instrumental to improving the 'performance' of the municipality and creating change. The ability of municipal leaders to create constructive dialogues with the public sector was considered critical to their success. It was suggested that more substantial and effective city improvements could be achieved if the government was better able to understand the needs of the poor. The low income population see themselves as segregated from 'the rest of the city', which they view as a stress. To date, private foundations and local groups in low income areas have been relied upon to represent poorer community groups.

(7) Corruption, rather than violence, was identified as the key stress with flooding emerging in the factors analysis.

(Image Opposite)

Responses in a community workshop in Cali



Cape Town

The fieldwork in Cape Town defines key shocks (fire and flooding) as stresses because they occur frequently and within acknowledged temporal ranges (i.e. seasons). Fire is considered to be a particular danger for the inhabitants of high density informal settlements; use of paraffin stoves, highly flammable building materials and densely-packed buildings give rise to high risks of fire. 'Fire season' has become an annual occurrence in these neighbourhoods. Flooding is also named as a shock for Cape Town, particularly during the winter months in informal residential locations on flood plains (such as the Cape Flats).

Major social stresses in Cape Town are deemed to have arisen from the legacy effects of an apartheid regime. Specific stresses result from spatial planning (including segregation), since the discriminatory and inefficient urban form created by the former apartheid regime is still entrenched in the city. Bad planning coupled with inadequate local development sites (for example on flood plains or sandy soils) mean that people continue to live in unsafe or unacceptable locations. Another related stress is crime. Consultees link this to a widespread sense of fear and lack of social cohesion.

Both business and government consultees in Cape Town emphasise the need for a shared vision and plan for the city to increase its density, bring people closer to economic opportunities and concentrate development along key growth corridors. Also mentioned as a factor is the city's ability to maintain and operate assets and infrastructure in a manner that delivers good service for citizens. It is suggested that the city should have the foresight and flexibility to consider reuse and redistribution of assets and resources (energy and water) where needed.

Management of prevalent social stresses is a dominant factor arising from the case study, particularly focusing on violent crime, depression, withdrawal from society, and the use of drugs and alcohol.

(Image Opposite)

Area of
redevelopment in the
Silo-District



Concepción

Community members in Concepción describe how - following the 2010 earthquake – it became clear that the city had no post-disaster plans and procedures in place. The city therefore responded reactively as the disaster unfolded. Consultees refer to the “social earthquake”: the societal chaos following the earthquake that was generated by a lack of communication and basic services, including food.

The case study highlights how the emotional and psychological effects of the earthquake persisted longer than expected. Community members describe how this emotional trauma led to a breakdown in relationships, loss of self-confidence, and aggravated existing medical conditions.

The Concepción case study also highlights that the robustness of assets is only one consideration for a resilient city. Consultees discuss diverse factors such as strong building codes and construction standards; the availability of insurance; the support of family and friends (to provide shelter, childcare, economic and emotional support); and community solidarity, including from faith and religious groups.

The role of the private sector in communications, response and recovery is also emphasised by the case study. The local radio station, Radio Biobío, was the only communication infrastructure that continued to function in the aftermath of the earthquake, due to its business continuity plans. The radio became the only mechanism to understand what was happening in the wider affected area. However, some people view the radio negatively, citing the station’s role in spreading rumours and misinformation.

The chamber of commerce is highlighted as a factor that contributed to resilience in Concepción. Consultees discuss how the chamber helped the city to assess its building conditions and organised the clean-up of debris. Within the business community, the chamber of commerce provided a network for members to offer mutual support for business recovery.

Control of city budgets and infrastructure is discussed in the context of resilience in Concepción, since the structure of government in the city limits its autonomy and ability to act, both in terms of disaster mitigation and post-disaster management. The city government has no control or influence on key infrastructure, such as electricity, water and communications, which is considered a major constraint.



(Image Opposite)

Coastline affected by
the tsunami in Greater
Concepcion





New Orleans

In addition to the shocks of Hurricane Katrina and the BP oil spill disaster, the consultees in New Orleans highlight stresses related to ageing infrastructure and inadequate flood defences. Following the devastation of Hurricane Katrina in 2005, particularly the catastrophic flooding, the levées and other flood defences are points of focus. Some consultees perceive that such devastating failure could not happen again, while others believe the city is at no less risk now than it was in 2005.

Ageing infrastructure is another concern. Consultees suggest that the private energy company focuses on reactive practices such as repairs and customer information, to the detriment of more proactive practices such as investment in preventive measures and upgrades to their infrastructure.

The consultees discussed a wide range of non-physical stresses in New Orleans, including violence, poverty and drug abuse, education, the skills gap (between employment opportunities and the skills available), adult unemployment, public health, access to services, and demographic change.

Underlying all of these stresses is the problem of funding for city government. This poses a significant stress for New Orleans, brought about in part by the significant reduction in the city's population following Katrina. Lack of resources due to reduced revenue is perceived to limit the city's ability to address its social, environmental and physical challenges.

The New Orleans case study emphasises the role of identity and culture in resilience, and the importance of learning from previous events. New Orleans' culture and history is considered to be a strong binding force, which draws people together and contributes to social cohesion. The case study describes how these social ties were tested after Katrina, only to become stronger. Long-serving residents of the city communicate how they felt an 'irresistible urge' to return to the city, despite the risks.

The vibrancy and effectiveness of civic and community organisations in New Orleans is viewed by consultees as a key factor of resilience. There is a high level of activism in all sectors and community groups. Volunteer groups such as the local Community Emergency Response Team are considered to have been fundamental in supporting evacuation and rescue work. Evacuteer is a new volunteer group, still to be tested in an emergency.

The important role of government coordination, planning and management is not overlooked. The consultations reveal government's leadership in emergency planning and management, and the challenges of coordinating multiple public bodies to achieve a shared vision of resource and infrastructure management.

(Image Opposite)

Jazz Culture in the
French Quarter



Semarang

The clear stresses for Semarang are flooding and landslides.

Semarang consultees highlight the importance of government coordination, funding and logistics for resilience. Cooperation and support from government is the only factor noted as essential to consultees across the business, government and civil society stakeholder types. Institutional and organisational structures are considered important to promote inter-government agency coordination and external coordination with other stakeholders, including universities and businesses.

Access to finance is discussed as a key requirement for civil society consultees in Semarang. Organisations describe “resources” as a major variable to enable them to control or influence various other factors. Both of these discussions convey the idea that money is viewed as a main factor of resilience.

Government representatives and business consultees identify access to equipment and supplies of materials as essential factors. Businesses also discuss the importance of access to suppliers and distributors, which relies on functioning city infrastructure, such as roads, rail and telecommunications.

What is particularly interesting from the consultations carried out in Semarang is the emphasis on the interrelationships between stresses, which can lead to unforeseen impacts. The research highlights how the factors that enable an organisation or community to cope in the short term often contribute to alternative stresses in the longer term. For example, river and tidal flooding is noted, as well as their links to water extraction, land subsidence, and lack of critical infrastructure. The scarcity of land in Semarang is another key stress, which in turn forces low income households to settle on steeply sloping land where landslides are a risk.



(Image Opposite)

Flooding on the street



Surat

Surat has experienced several shocks over the last decades, including floods, social unrest and an outbreak of plague. This has strongly influenced their perception of city resilience. The city has taken significant measures to improve their resilience.

Flooding is identified by consultees as the most common stress. It is also cited as a major shock, depending on the scale of impact. Since the major flood event in 2006, many improvements (such as drainage) have enabled the city to manage flooding more effectively. The recent September 2013 floods carried a greater volume of water than in 2006, but the city was able to recover much faster than in the past.

Surat's incredible economic and population growth is considered to be creating new stresses. Inward migration is named as a key stress, with migrants viewed as the most vulnerable section of society. This is especially due to lack of social support (they are predominantly men who have left their families behind), inability to access local knowledge (due to not be integrated into local networks) and lack of access to healthcare.

Surat has seen growing spatial segregation between Hindu and Muslim communities who previously lived alongside each other and enjoyed more interaction. This segregation is viewed by some people to be a stress due to the loss of character and social cohesion. Others perceive that this has contributed to Surat becoming a more peaceful city in the short term.

Surat's success appears to be a product of constant learning. Local government officials describe how the culture of the city and the attitude of its citizens enable them to implement innovative solutions easily, collect taxes effectively, and gain trust. It was noted that citizens are proactive in helping themselves and others after a shock, and do not rely on government to support them.

Funding for many strategic projects in the city has been leveraged by Surat Municipal Corporation through public-private partnerships. This means that the government can implement major improvements without huge capital investment, while still being able to generate revenue through operations. The close relationship between the private sector and the government means that while the private sector funds some projects, the benefits of those projects may also be reaped by the private sector rather than the public. Examples of this could be seen in various water supply projects that serve the local industry but are classified as public projects.

Consultees often refer to leadership as a key factor for the city's ability to deal with its shocks and stresses. The chief minister of the state of Gujarat is often mentioned with regards to his role in empowering the city government to lead the city effectively.

(Image Opposite)

Tapi River bank

Table 6 – Organising the factors by themes

	theme	sub theme
survival & wellbeing	Essential needs provision	housing (for vulnerable groups)
		water supply
		energy supply
		food supply
	Health management	day to day healthcare
		public health
		medical facilities and practitioners for emergency
	Livelihood support	skills and training programmes
		access to finance
		livelihood opportunities
local business development and innovation		
continuity of livelihoods following a shock		
social enablers	Law enforcement	law enforcement to deter crime (preventative & punitive)
		law enforcement approach
		corruption reduction
		policing to promote safety and security
	Social harmonisation	community connectivity
		local identity and culture
		community participation (promoting pride and sense of ownership)
		connected and integrated communities
	Information & knowledge management	understanding - WHY
		data collection and information - WHAT
		sharing - HOW
	Capacity & coordination	multi-stakeholder alignment
		government decision-making & leadership
emergency capacity and coordination		
asset management	Critical infrastructure management	maintenance practice
		demand reduction
		continuity planning
		safeguarding
	Environmental management	environmental policy
ecosystem management (and coastal management)		
flood risk management		
city strategy	Urban strategy & planning	city monitoring and data management
		strategies and plans
		land use and development
		building codes and standards
	Economic sustainability	business continuity planning
		city budgets
		inward investment
		economic structure
		economic integration with regional and global economy
	Accessibility	business logistics and freight infrastructure
		multi-modal passenger transport
		interconnected transport
		communications technology
		emergency communications

Understanding the factors

This chapter presents the key themes and sub-themes that emerged from the primary data as a result of the initial inductive analysis (see Section 2.2). In total, 12 themes and 47 sub-themes were identified. These were further organised under four meta-theme headings (table 6).

The presentation of the categories, themes and sub-themes in this chapter intentionally does not reference how they relate to the concept of resilience. This is implicit, as the consultees understood resilience as the context for the research. It is the sum of this analysis that builds the characterisation of resilience, rather than any particular step. Appendix B presents a specific discussion about how the themes relate to resilience.

Survival and wellbeing of the population

Survival and wellbeing incorporates themes related to the physical subsistence and health of individuals, including their ability to access livelihoods that support their wellbeing. The perspectives that are captured by this concept range from basic provisioning of essential items such as housing, water, food and energy, through to items that enable individuals to provide for themselves through their personal health and access to financial resources. The concept of survival and wellbeing involves services at the city scale, which primarily benefit individuals and communities. The factors nested inside this concept take into account vulnerable individuals, as well as people more generally.



Essential needs provision

Essential needs are the things that enable citizens to meet a basic standard of living on a day to day basis. Based on the fieldwork, essential needs can be defined as housing and food for vulnerable groups, together with sufficient, safe and reliable supplies of water and energy for all. Consultees focus primarily on the provision of these services, rather than their quality.

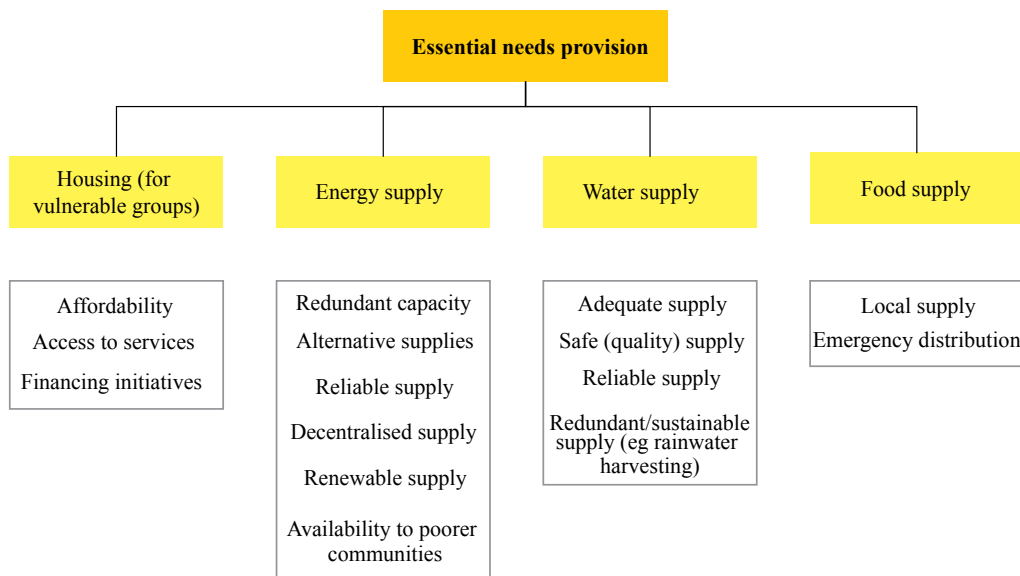


Figure 11 - Essential Needs Theme Tree

Key:

- Theme
- Sub-theme
- Sub-sub theme (likely to have 3 or more factors)
- Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Essential needs provision emerges from four sub-themes, which focus on the user as households or businesses:

Energy supply (27⁸)

Consultees discuss energy largely in terms of affordable provision of electricity to all neighbourhoods. The specific uses of electricity are implied but not identified clearly (e.g. heating/cooling, lighting, cooking). Concerns include the need for surplus capacity in generation and distribution networks to absorb surges in demand; decentralisation of energy generation infrastructure (including building-integrated solutions); and diversification of energy sources, particularly utilising renewable technologies. Access to emergency power supplies is also mentioned.

Food supply (16)

Consultees recognise the indirect role of city governments in enabling access to food. The fieldwork highlights the need for local shops and food markets to be located in proximity to all communities, and for markets to be regulated to avoid increasing food prices. The role of community organisations and NGOs in distributing food to vulnerable people is noted both in relation to general food supplies and in terms of aid following a disaster.

Housing (for vulnerable groups) (33)

Consultees outline the need for all citizens to be able to access housing that is appropriate to their household structure and budget. Government support for vulnerable groups is mentioned in terms of financing for home ownership, design standards for low income housing, and policies to upgrade informal settlements. The fieldwork also highlights the importance of planning for temporary shelter for people displaced by shocks and stresses.

Water supply (22)

The fieldwork highlights the need for adequate and affordable supplies of potable water to households throughout the city, as well as measures to maintain water quality. Diversification of water sources is particularly emphasised, with consultees looking to rainwater harvesting, desalination and greywater recycling to supplement mains supplies and ensure continued reliability. Availability of additional water supplies for post-disaster clean-up is also discussed.

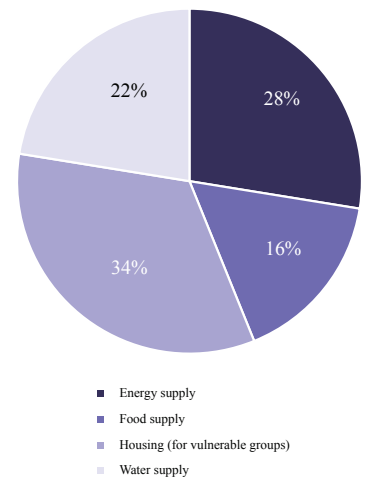


Figure 12 - Essential Needs Provision by Sub-Theme

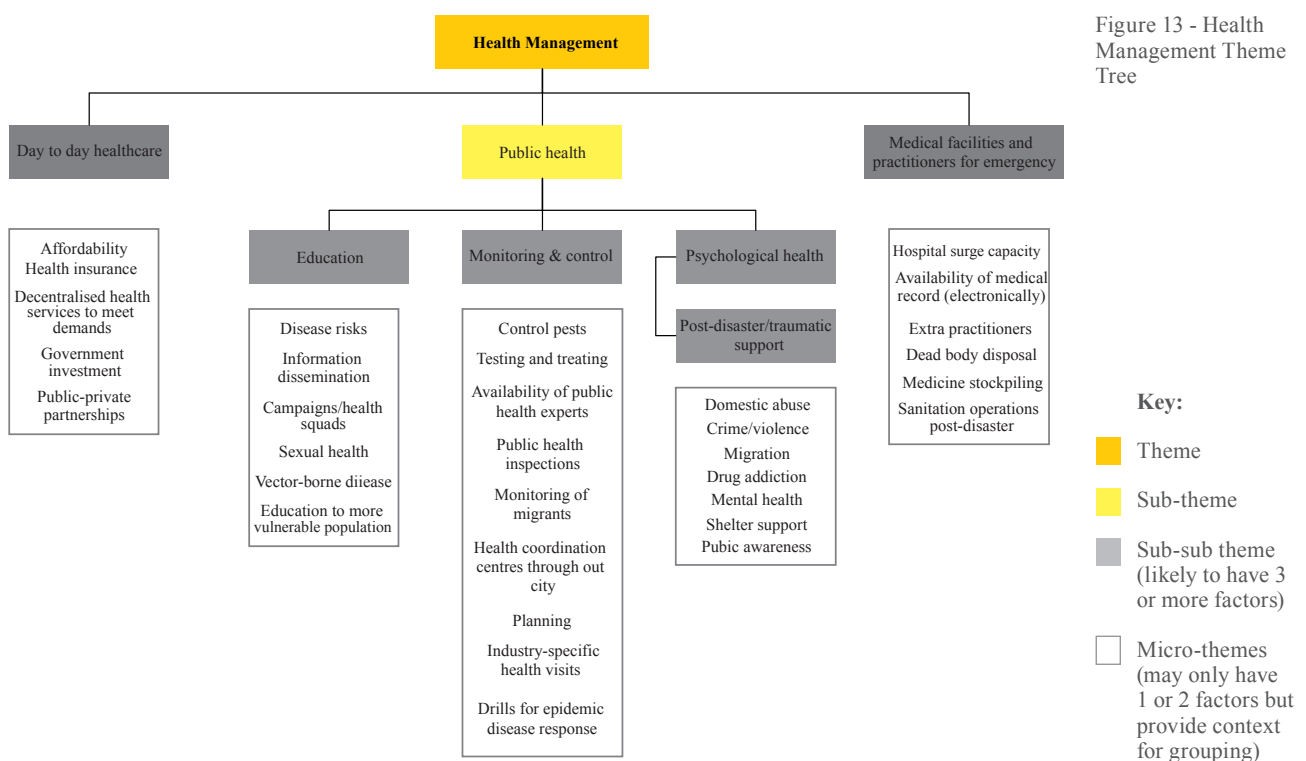
(8) Numbers in parentheses refer to the total number of factors for that sub-theme.

(Image Opposite)

Concepción:
Transporting food



Figure 13 - Health Management Theme Tree



Health management

Health management emerges from the fieldwork as a distinct theme due to the quantity of factors and the different ways in which it is important to cities. Consultees describe health in terms of preventive approaches involving public health education, health risk monitoring and controls, as well as reactive approaches related to treatment and care. Consultees also distinguish between physical and mental health provisions, and general versus emergency care.

Health management is identifiable from three sub-themes.

Day to day healthcare (33)

Consultees highlight the importance of good quality healthcare facilities to support daily health needs. Affordability and sufficient capacity of healthcare services are noted as particular priorities. It is suggested that health services should be evenly distributed throughout the city, with mobile services provided to under-served areas. The need for both government and private sector involvement in healthcare provision is also mentioned.

Public health (65)

Health risk monitoring and control is the dominant feature of public health management, according to the fieldwork. This incorporates factors related to community health monitoring and mapping, inspections, vaccination programmes, and protocols to control the spread of disease. Consultees suggest that these initiatives should be reinforced by public health education and awareness raising initiatives. Mental health services are also included in public health management, which include targeted initiatives to support and rehabilitate communities and individuals who have experienced major events.

Medical facilities and practitioners for emergency (19)

The availability of emergency medical attention is emphasised as a concern. Consultees suggest that hospitals and other facilities must have continuity plans in place and sufficient capacity to respond to surges in demand. Medical records should be widely accessible to enable healthcare providers to respond to the needs of displaced people. Stockpiles of emergency medication should be available, and skilled medical practitioners should be on hand in temporary shelters and in the neighbourhoods affected by disaster.

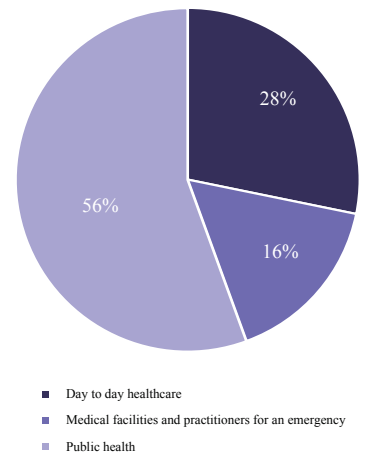


Figure 14 - Health Management by Sub-Theme

(Image Opposite)

Cape Town: Public art installation to raise awareness about domestic violence and child abuse

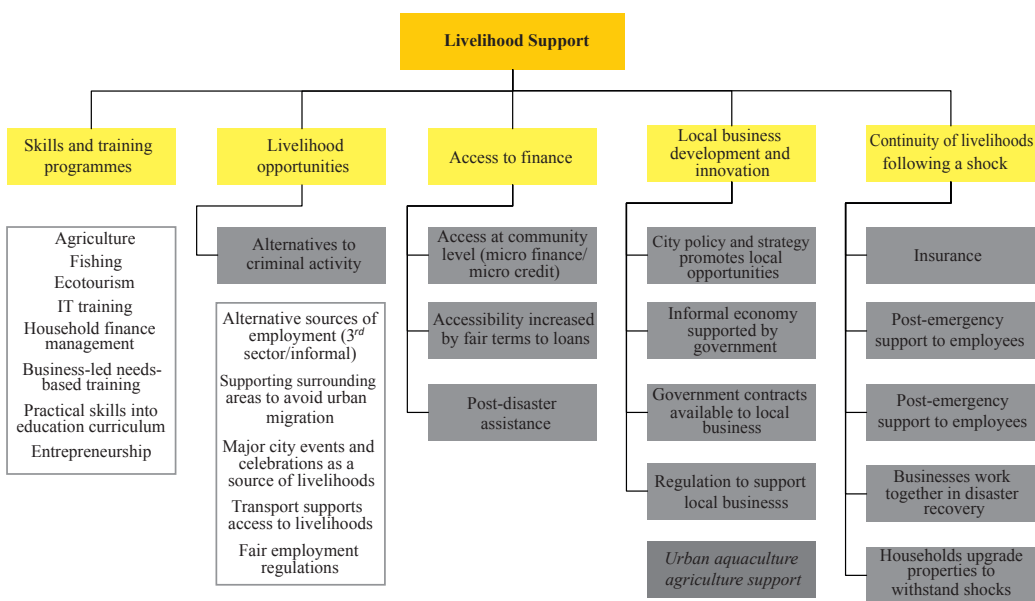


Figure 15 - Livelihood Support Theme Tree

Key:

- Theme
- Sub-theme
- Sub-sub theme (likely to have 3 or more factors)
- Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Livelihood support

The fieldwork research highlights the importance of access to a wide range of livelihood and employment opportunities. Mechanisms through which diverse livelihood and employment opportunities can be generated include training and skills development, microfinance, incentive and innovation programmes, as well as by enabling residents to enjoy a living wage. Supporting livelihoods is also about providing assistance to those whose livelihoods have been affected by shocks or stresses.

Livelihood support is composed of five sub-themes, which largely reflect city-wide initiatives that benefit individuals and SMEs:

Access to finance (24)

Consultees identify a range of financial support mechanisms available to individuals and community groups, including microfinance, government loans, pension schemes, and grants. This also includes compensation and financial assistance following a disaster.

Continuity of livelihoods following a shock (27)

Consultees note the importance of support mechanisms to ensure the continuity of livelihoods after a disaster. This support could be in the form of direct financial assistance to affected businesses, partnerships between businesses, protection of community assets and disaster insurance.

Livelihood opportunities (23)

Consultees note the importance of having universal access to diverse and sufficient livelihood opportunities. This includes opportunities that are legal (even if informal) and accessible across all parts of the city and within disadvantaged communities, as well as fair employment practices.

Local business development and innovation (28)

A number of different factors are identified that could help to promote economic activity, stimulate innovation and develop or grow small businesses. These factors include, for example, incentives to promote local business development, integration of the informal economy, and procurement opportunities targeted at SMEs.

Skills and training programmes (49)

Education, skills development and training programmes are identified as an important means of empowering individuals to pursue different livelihood and employment opportunities. Consultees identify a range of initiatives, such as apprenticeships, entrepreneurial development, household finance and professional development programmes.

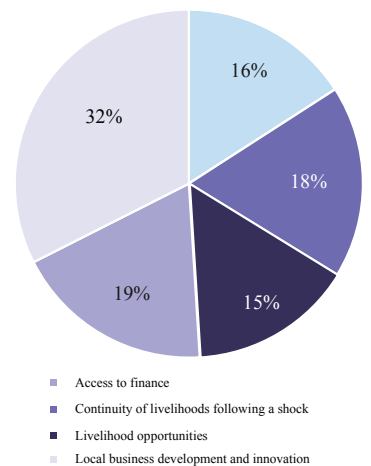


Figure 16 – Livelihood Support by Sub-Theme

(Image Opposite)

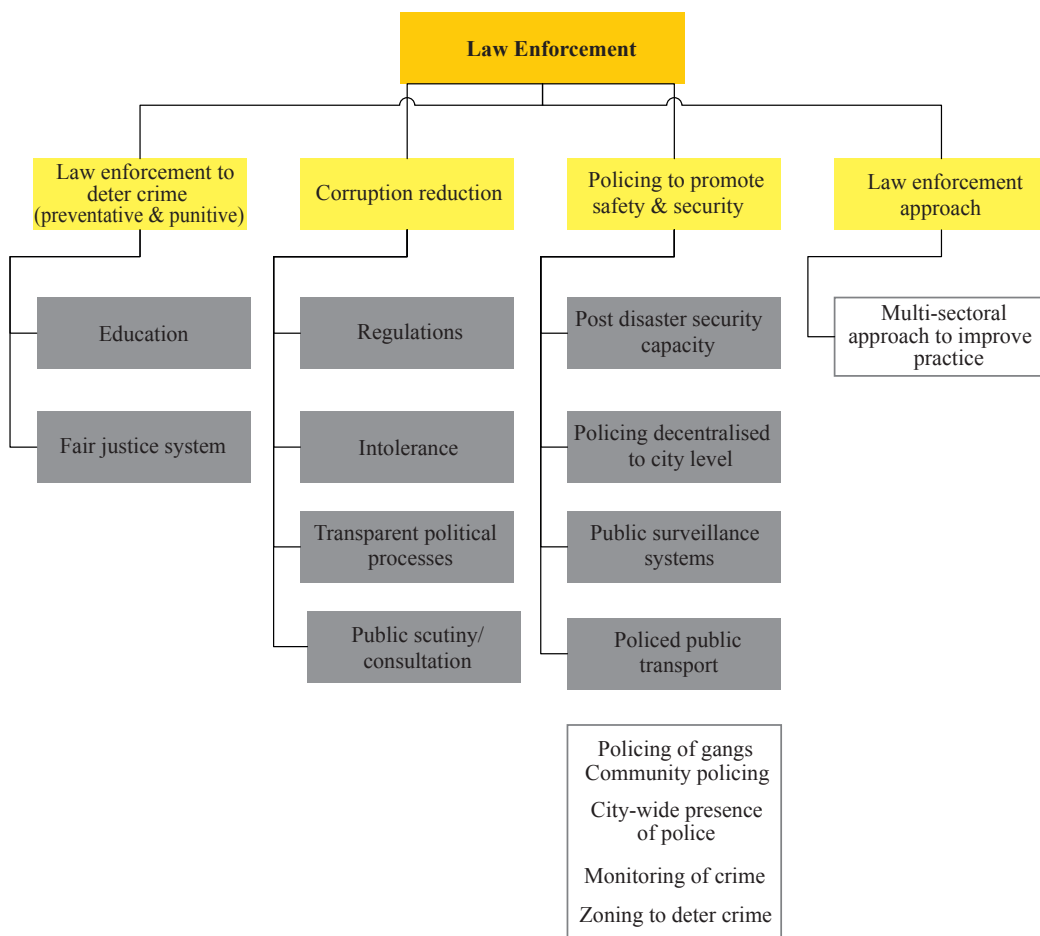
New Orleans:
Unoccupied
commercial unit

Social enablers

Social enablers are a cross-sector group of themes focused at the community and city scale, comprising social practices which facilitate the effective operation of the city and which are critical to securing social order and stability. Information and knowledge, and capacity and coordination are practices which facilitate productive interaction in order to prevent and respond to disasters. Law enforcement serves to reinforce constructive behaviour. Social harmonisation helps to prevent breakdown and encourage positive collective action. The cross-sector nature of social enablers may help to explain why this concept includes more factors than any other (40% of all factors).



Figure 17 - Law Enforcement Theme Tree



Key:

- Theme
- Sub-theme
- Sub-sub theme (likely to have 3 or more factors)
- Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Law enforcement

The fieldwork demonstrates that appropriate law enforcement is fundamental to maintain stability and security in communities, both in times of peace and in the aftermath of a stress or shock. It is suggested that law enforcement should take a preventive and a punitive approach, incorporating social programmes, a fair justice system, effective policing and safe urban environments. Trust and transparency between government, police forces and citizens are highlighted as critical attributes.

Law enforcement is captured by four sub-themes that emerge from the fieldwork. These sub-themes function at a city and community scale. In some cities, the rule of law will also be influenced by state and national level government.

Law enforcement approach (8)

The fieldwork suggests that law enforcement should be a collaborative effort by government, police forces, communities and civil society organisations. Consultees highlight the important role of citizen vigilance and the capacity of community leaders to promote positive values and act as role models. More decentralised policing is also mentioned, both in terms of neighbourhood based forces and sector based approaches to tackle targeted issues like drug trafficking and domestic violence.

Corruption reduction (23)

Government transparency and intolerance to corruption is outlined as a critical aspect of law enforcement and trust in society. Consultees suggest that clear regulations should be in place to prevent corruption, bribery and other 'white collar crime'. It is proposed that transparency can be secured through mechanisms such as education on ethics and accountability, and third-party scrutiny of public projects and investments.

Law enforcement to deter crime (preventative & punitive) (15)

Consultees outline deterrents to crime in the form of civic education and social engagement programmes in targeted communities, with the aim to encourage social cohesion and provide legitimate livelihood opportunities. A transparent and humane justice system is also mentioned as an effective deterrent, particularly one where rehabilitation is prioritised over incarceration.

Policing to promote safety and security (32)

Consultees propose that a city-wide mandate should be in place for policing, with back-up security such as the military on hand to provide support in times of unrest. Monitoring and prediction of crime is viewed as important to effective policing. It is suggested that urban design can support policing by encouraging surveillance and promoting a greater sense of security in public space. Drug crime, violence and looting are specific areas for policing.

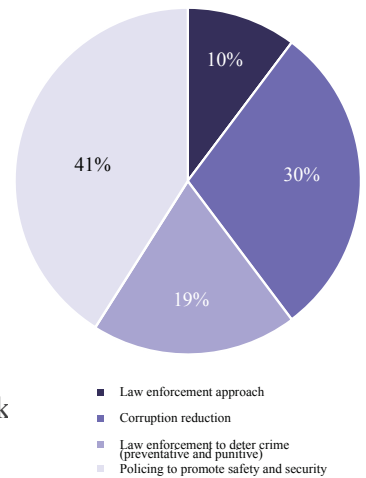


Figure 18 - Law Enforcement by Sub-Theme

(Image Opposite)

Cali: Security on a city centre street



Social harmonisation

The importance of social harmonisation for city resilience is a prominent theme emerging from the fieldwork. Social harmonisation is described in terms of the relationships between individuals and the social supports that these relationships create within and between communities. Consultees highlight the importance of local culture and pride in creating social cohesion, together with the spatial integration of communities and provision of social facilities.

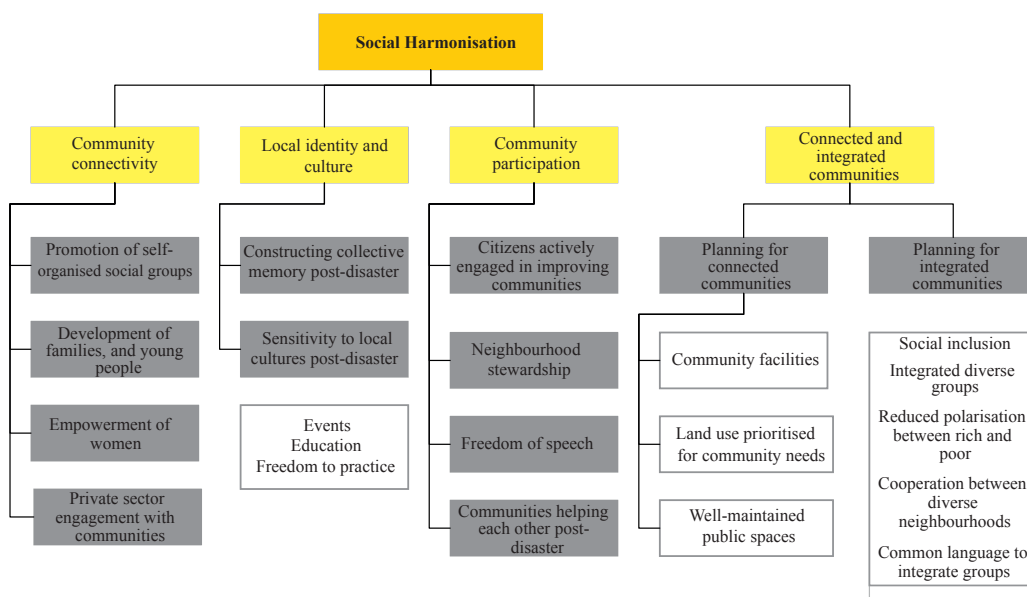


Figure 19 - Social Harmonisation Theme Tree

Key:

- Theme
- Sub-theme
- Sub-sub theme (likely to have 3 or more factors)
- Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Social harmonisation comprises four sub-themes. These operate largely at the community scale, although many will be facilitated by city government and the individual motivation of community members.

Community connectivity (48)

The fieldwork particularly highlights the role of informal community networks in offering social support, distributing information and resources, and providing representation at higher levels of city governance. General self-organised groups are discussed as well as specifically the empowerment of women and vulnerable groups, and the development of children and young people. The role of business in the community is also discussed in this context.

Community participation (60)

Consultees emphasise the importance of active participation in the local neighbourhood, which is deemed to promote a sense of civic pride, ownership and responsibility. This can be manifested by involvement in community development initiatives, health programmes, social activities, environmental improvements and community-based disaster response. Freedom of speech is considered to be an essential aspect of participation. Citizenship and stewardship are important terms in this sub-theme.

Local identity and culture (41)

Local identity and culture is identified as a key contributor to cohesive communities. It is suggested that a shared identity is underpinned by people’s attachment to places, due – for example – to ancestral ties, local customs and traditions (including sports teams), heritage and institutions, language, and religious connections. Cohesion and identity are also influenced by collective memory of historic events, particularly disasters.

Connected and integrated communities (34)

Spatial planning and development programmes are also highlighted as critical to creating strength within society. Consultees discuss the need for sufficient and diverse community facilities that facilitate interaction, including well maintained public spaces, recreation areas, community centres and facilities for children and the elderly. The physical integration of different community groups is also emphasised as a way to reduce segregation and promote cohesion.

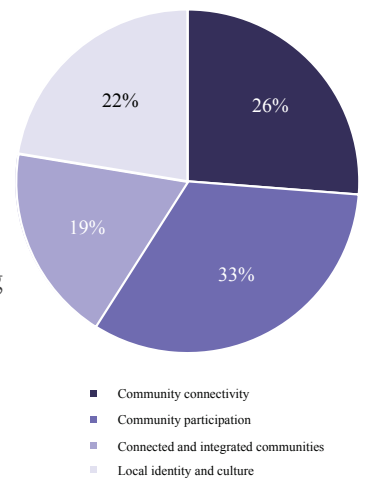


Figure 20 - Social Harmonisation by Sub-Theme

(Image Opposite)

Surat: Interior of a dwelling in an informal settlement



Information and knowledge management

The fieldwork demonstrates the importance of knowledge generation, information sharing and understanding. This theme captures the role of data collection, research, education, government transparency and public access to information. Information and knowledge are considered critical to empower citizens and enable them to adapt to change.

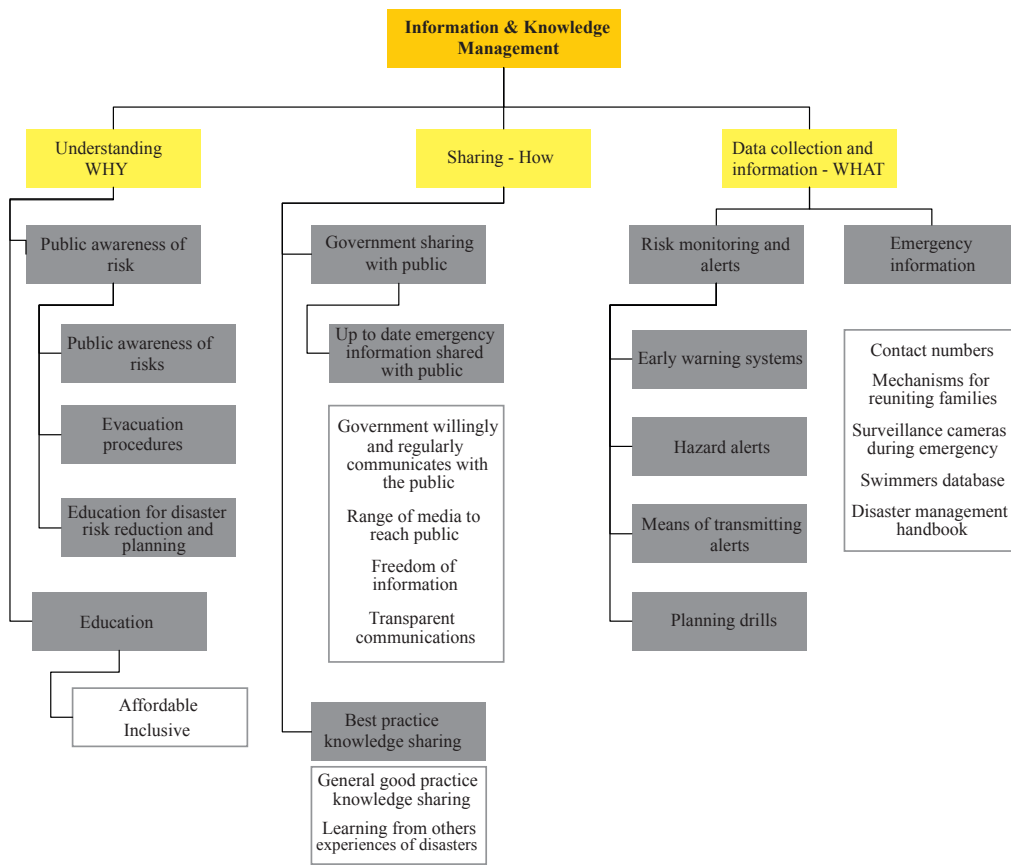


Figure 21 - Information and Knowledge Management Theme Tree

- Key:**
- Theme
 - Sub-theme
 - Sub-sub theme (likely to have 3 or more factors)
 - Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Information and knowledge management includes three sub-themes, which operate at the city scale:

Sharing [how] (31)

Sharing of information is dominated by factors related to communication of information from the government to the public. Consultees emphasise the importance of the government communicating effectively and regularly with citizens, in general and in connection with shocks and stresses. Multiple communication channels are proposed, including meetings between government and community leaders; use of social media; and the importance of media reporting and broadcasting of up to date information from the government. It is suggested that citizens should also have the right to request information from government. Consultees recognise that cities can learn from each other and that there is value in developing relationships between cities around the world to share knowledge and exchange best practice solutions. ‘Twin city’ partnering is one idea. Constructive partnerships between research organisations and cities are also relevant in this respect, ensuring that government knowledge is relevant and continuously updated.

Data collection and information [what] (53)

Risk monitoring is specifically noted by consultees as an important form of data collection, facilitated by human resources and technologies stationed around the city. Consultees highlight that risk data should be translated into accurate and timely early warning information and public alerts. Collection of other emergency information is also mentioned, including registers of contact numbers and known swimmers in the event of flooding. Back-up storage of personal data and documents is specifically recommended to protect vital information from damage or loss.

Understanding [why] (71)

Consultees suggest that high quality education and schooling should be accessible and affordable to all citizens. The role of government is noted with respect to funding education and offering financial support for vulnerable individuals to attend school. Public awareness of hazards and risk reduction is a particularly important aspect of education, enabling communities to take appropriate action to prepare for shocks and stresses. It is noted that education should be provided from trusted sources.

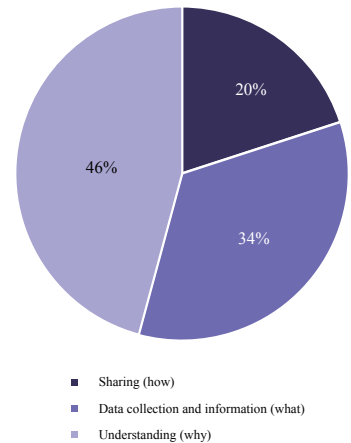


Figure 22 - Information and Knowledge Management by Sub-Theme

(Image Opposite)

Semarang:
Community workshop

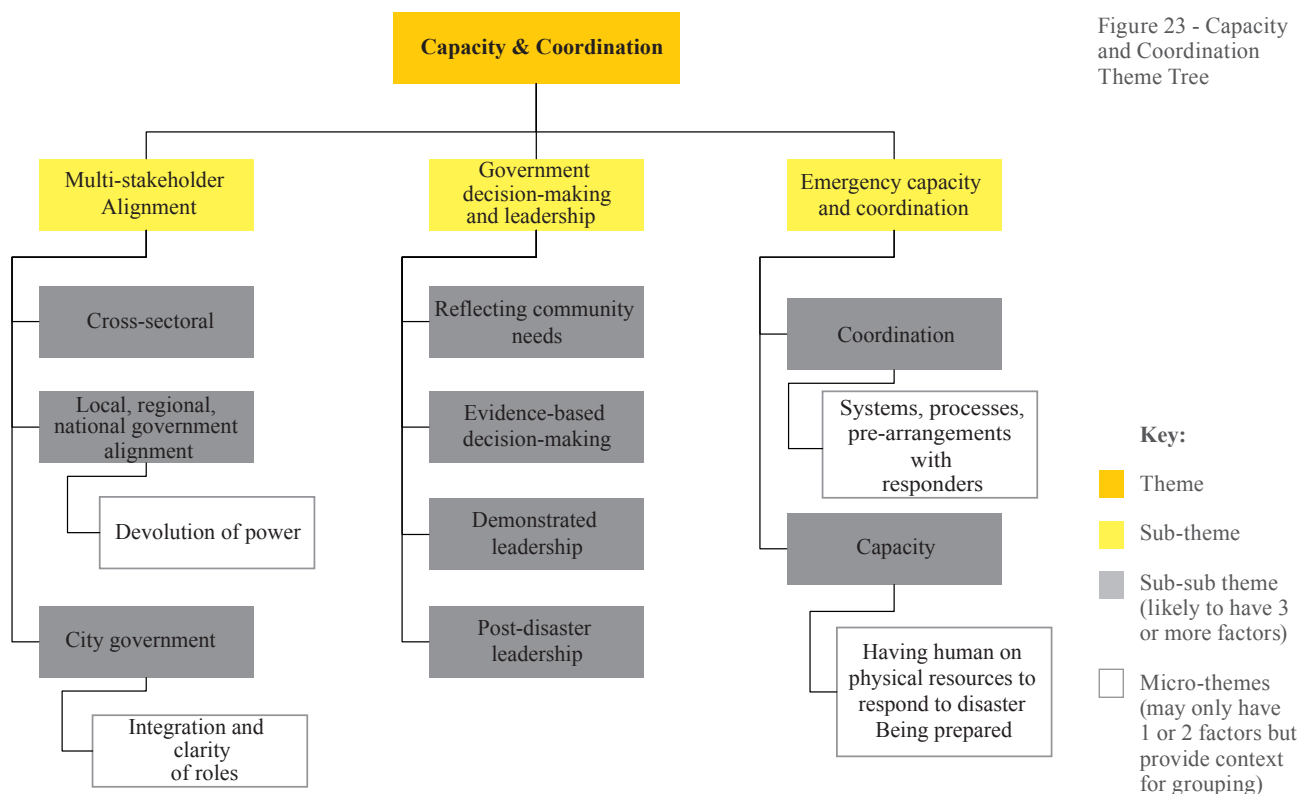


Figure 23 - Capacity and Coordination Theme Tree

Capacity & coordination

Consultees emphasise the critical importance of leadership for coordinating and enabling cities to thrive. This is discussed with respect to a committed city government that takes decisions on the basis of sound evidence. The fieldwork highlights the need for city government to engage with business, citizens and civil society groups, and to align with other governing bodies at the regional and national level. The capacity for all parts of government to collaborate in cross-sector decision making is considered important both in normal conditions and during shocks and stresses.

Capacity and coordination comprises three sub-themes, which operate at the city scale:

Emergency capacity and coordination (78)

Consultees highlight specific attributes of government that are required in the event of stresses and shocks. Rapid response and deployment of government assistance are specifically noted, together with a formal emergency management structure and response plan. It is proposed that legal and contractual arrangements should be in place prior to an event, to allow government to engage skilled third parties in emergency response, including business, NGOs, the military and neighbouring jurisdictions.

Government decision making and leadership (32)

A strong and committed local government leader is considered to be an asset for cities, supported by an effective administration. Government decisions can be improved when they consider research and past experience. It is proposed that policies must be developed in an iterative way and remain adaptable to changing city priorities.

Multi-stakeholder alignment (91)

Consultees propose that city government should engage actively with NGOs, civil society groups and businesses in city decision making and policy development. This is a more participatory process than communication, requiring collaboration through multi-stakeholder forums and partnerships. Consultees recognise the role of business in finding innovative solutions to city challenges, and the role of government in responding to community needs. The fieldwork demonstrates the need for positive relationships and coordination between city, regional and national government. This is thought to promote clarity in leadership agendas and ensure that cities can access support from higher tiers of government when needed. Consultees also recognise that city governments must be given the necessary power to take local decisions and effect local laws. There is an expectation that city agencies will work together effectively, recognising their respective remits while also ensuring joined-up decision making.

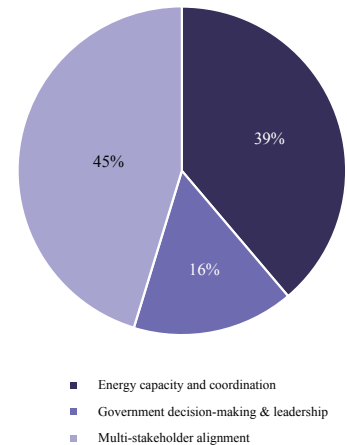


Figure 24 - Capacity and Coordination by Sub-Theme

(Image Opposite)

Concepción:
emergency drills in
Concepción

Asset management

Asset management considers the man-made and natural assets that shape and support the city, including the roads, water pipes, power lines, rivers, forests and wetlands, among others. This meta-theme is focused on the presence of natural assets, the way man-made assets operate and the practices adopted to maintain or improve the performance of both. These assets exist at the city scale, with connectivity at the regional and national level. The services they provide are targeted at the health and prosperity of people and business communities.



Critical infrastructure management

Critical infrastructure describes the physical (man-made) infrastructure that is required to deliver the services that citizens and businesses depend on, such as energy, water and waste management. The fieldwork suggests that proactive monitoring, maintenance, repair and renewal of infrastructure are essential for performance despite disruptions. This includes the practices that prevent systems from deteriorating, the safeguards that protect from failure and ensure service continuity, and the skills that enable infrastructure managers to work effectively.

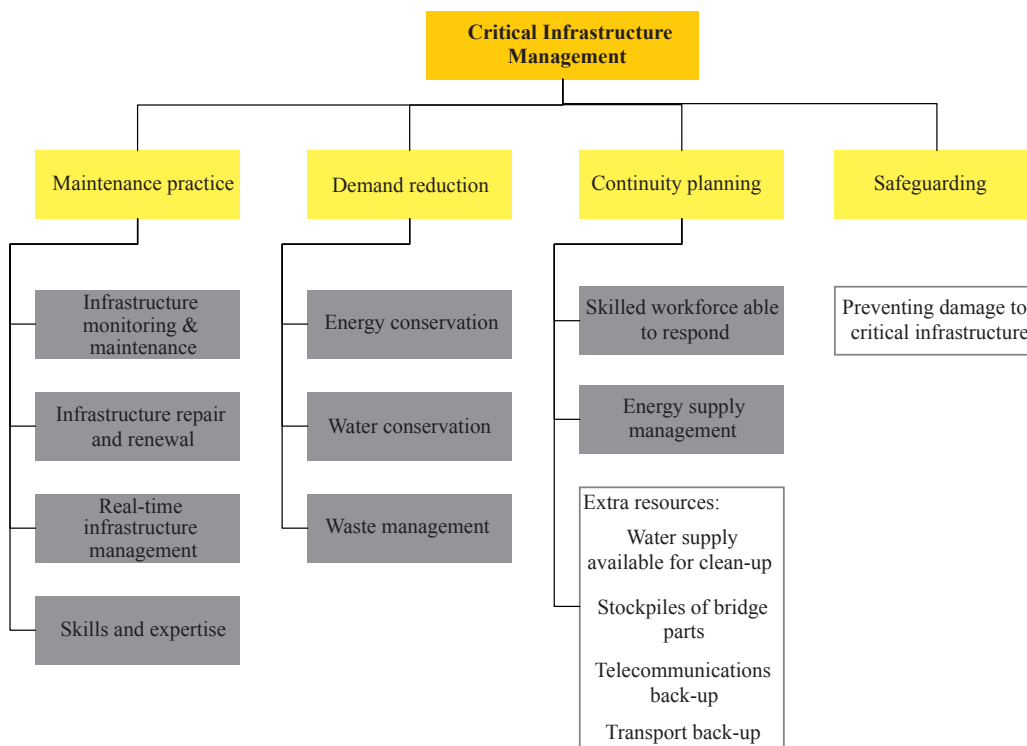


Figure 25 - Critical Infrastructure Theme Tree

Key:

- Theme
- Sub-theme
- Sub-sub theme (likely to have 3 or more factors)
- Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Critical infrastructure emerges from sub-themes focused at the scale of city infrastructure operation and management:

Continuity planning (23)

The fieldwork proposes that emergency plans should be in place for all critical city infrastructure. Plans should ensure that infrastructure staff have the skills to prioritise infrastructure components for recovery, and to restore services rapidly following failure. Specific actions mentioned by consultees include load shedding to maintain service continuity for essential city functions. Stockpiles of materials and water should also be available to support recovery.

Demand reduction [on critical infrastructure] (22)

Consultees recognise the need to reduce demands on critical infrastructure to avoid over-loading systems and to ensure that core services are available to all. Education around resource efficiency is specifically mentioned, together with the adoption of energy and water efficient technologies, and regulatory controls on energy and water use. Effective city-wide solid waste management practices are also emphasised.

Maintenance practice (52)

Consultees mention the requirement to monitor and maintain critical infrastructure as part of a continuous, scheduled programme, and particularly in advance of seasonal hazards. The research also highlights the need to supplement maintenance with a programme of infrastructure repairs, upgrades and renewal. Consultees also suggest that real time management of infrastructure should be enabled with the use of intelligent technologies. It is noted that infrastructure managers should be equipped with the necessary managerial and technical skills to allow this work to be delivered successfully.

Safeguarding (21)

Specific safeguards are proposed to preserve the integrity of infrastructure and buildings during shocks and stresses. Consultees emphasise the need to ensure the durability of infrastructure designs to withstand unexpected events. Suggestions include the selection of appropriate construction materials, burial of power lines, installation of local flood defences around critical infrastructure assets, and development of protected access routes for infrastructure servicing.

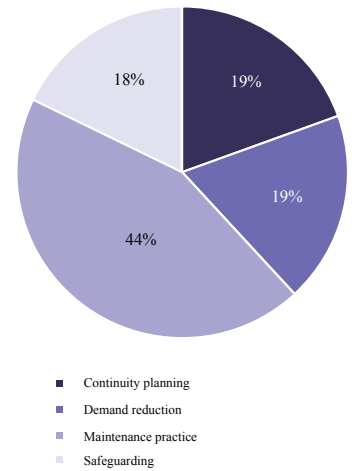


Figure 26 - Critical Infrastructure Management by Sub-Theme

(Image Opposite)

Surat: Flood protection on the wier cum causeway

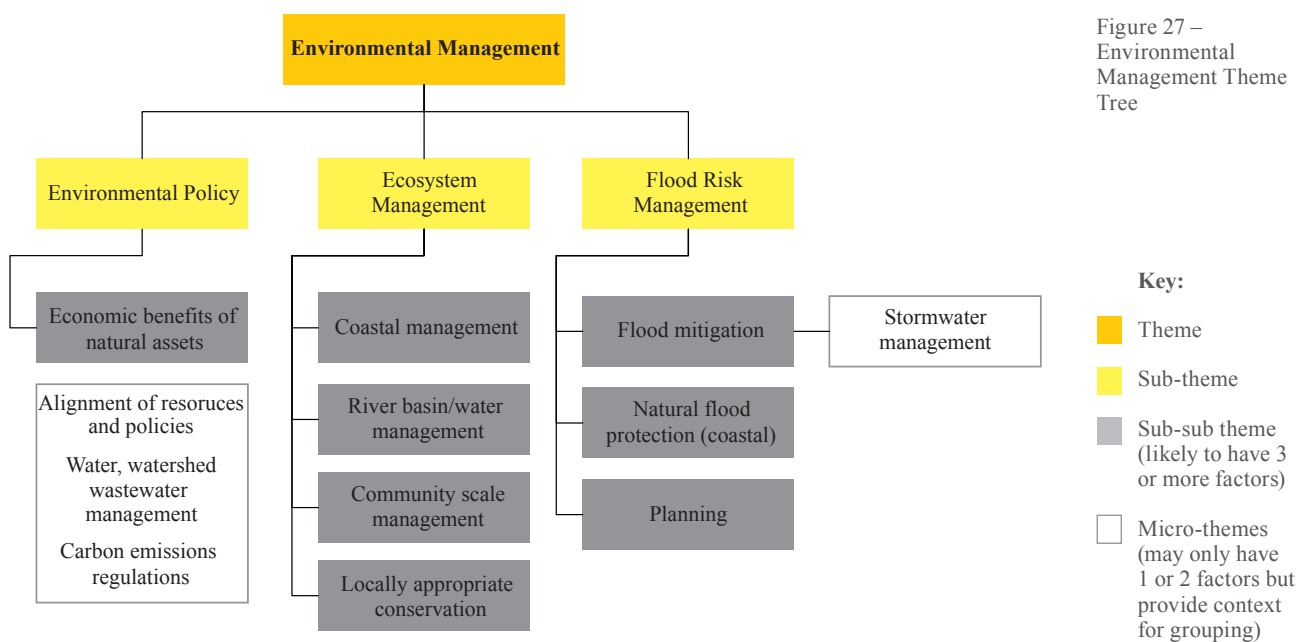


Figure 27 – Environmental Management Theme Tree

Environmental management

The fieldwork highlights the significance of the natural environment to the city's ability to thrive. Consultees propose that a city conserves and enhances its natural environment through effective environmental policy and local ecosystem management activities. Conservation of coastal ecosystems, rivers and watersheds is acknowledged as a particular priority.

Environmental management emerges from three sub-themes, which operate at the scale of local government policy through to the practical application of environmental management actions by service providers and communities:

Ecosystem management (including coastal management) (25)

Consultees note the importance of educating communities about the value of their local environment and empowering community groups to manage local ecosystems and natural resources. Specific target areas for ecosystem management include river basins, coastal wetlands, mangroves, soils and terrestrial vegetation. Management actions include practical conservation initiatives as well as reconstruction or restoration of degraded ecosystems.

Environmental policy (17)

Consultees observe that environmental policy and regulation must be led by government and must operate across sectors. It is suggested that effective policies will be underpinned by quantification and understanding about the economic benefits of the environment. Specific target areas for environmental regulation include coastal conservation, water abstraction, watershed pollution, wastewater management and carbon emissions.

Flood risk management (38)

Consultees recognise coastal and fluvial flooding as a critical and discreet environmental risk. Consultees demonstrate a comprehensive understanding about the management of flood risk, highlighting a varied toolkit of responses ranging from flood mitigation policies, river channel management, flood defences, stormwater drainage and controls, reforestation and natural coastal protection such as mangroves, wetlands and reefs.

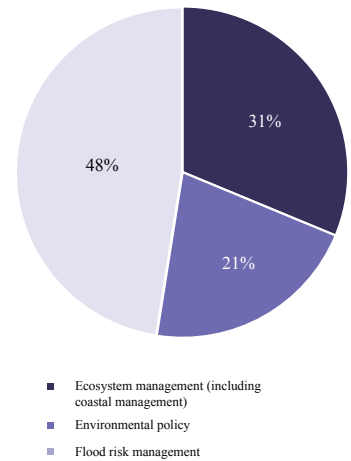


Figure 28 – Environmental Management by Sub-Theme

(Image Opposite)

New Orleans: Flood defence infrastructure on Lake Pontchartrain

City strategy

City strategy consists of themes related to the high level direction of the city, specifically urban strategy and planning, economic sustainability and accessibility. These address the short to long-term [economic] viability of the city and bring together different sectors to help coordinate a common plan. This makes them facilitators of other themes from a strategic, rather than operational, perspective. City strategy themes operate at the scale of the city, but also recognise the city's regional, national and international linkages

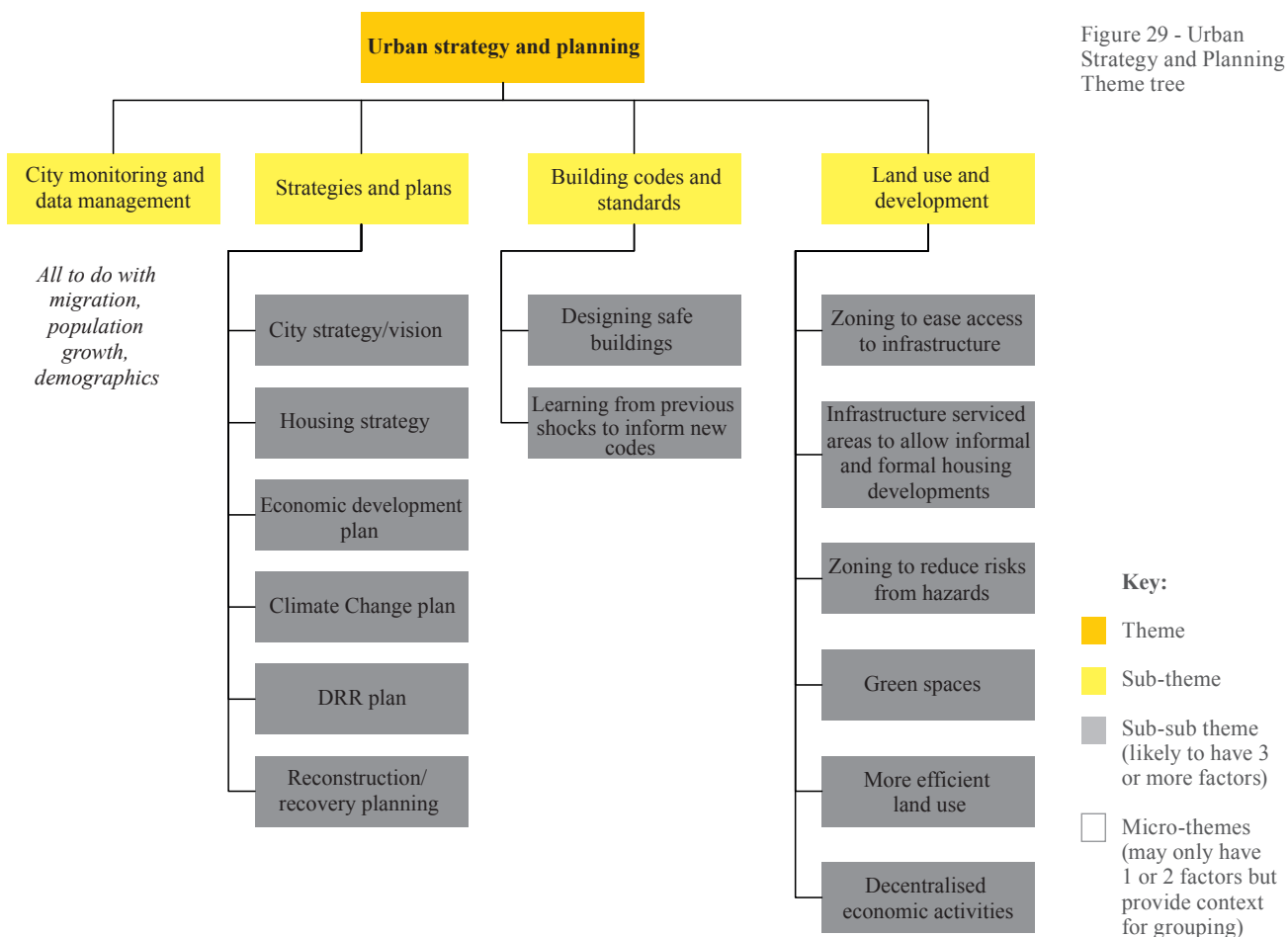


Figure 29 - Urban Strategy and Planning Theme tree

Urban strategy and planning

The fieldwork research highlights the importance of cities having a clear cross-sector framework for their future development. This could be captured in a holistic city vision, strategy or plan. The research suggests that a holistic plan would be underpinned by appropriate data and delivered via policy, regulations, standards and codes.

Urban strategy and planning is made up of four sub-themes, which descend from the city scale down to issues related to specific sites and buildings.

Building codes and standards (16)

Clear codes for design and construction are noted as important to ensure the robustness of buildings and development sites in light of hazards and sustainability issues. Consultees state that codes and standards should be continually updated to reflect experience and knowledge of risk scenarios. It is suggested that traditional building designs may promote greater robustness. Efficient and sustainable design is also specified in relation to codes and standards.

City monitoring and data management (16)

Consultees mention the need for cities to monitor and record demographic change and migration flows as a basis for strategic planning and service provision. Data regarding resource use, health and the uptake of city services are also mentioned in relation to planning. Mechanisms mentioned to manage data include GIS mapping.

Land use and development (63)

Land zoning and planning controls are identified as tools to implement city strategies on the ground. Promotion of higher-density development makes access to essential services more economically viable and mixed use neighbourhoods would offer residents more livelihood opportunities. Planning restrictions in hazardous zones would safeguard people and property from harm; this includes post-disaster restrictions that require relocating communities. Zoning and controls should reflect local priorities.

Strategies and plans (42)

The existence of long-term, cross-sector strategies and plans are highlighted as a key advantage for cities. Consultees recognise the need for complementary plans focused more specifically on land use, climate change adaptation, economic development, housing and disaster management (both preventive and reactive). The clarity, inclusiveness, comprehensiveness and pragmatism of strategies and plans are particularly emphasised.

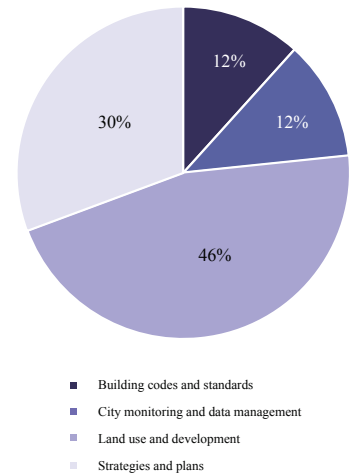


Figure 30 – Urban Strategy and planning by Sub-Theme

(Image Opposite)

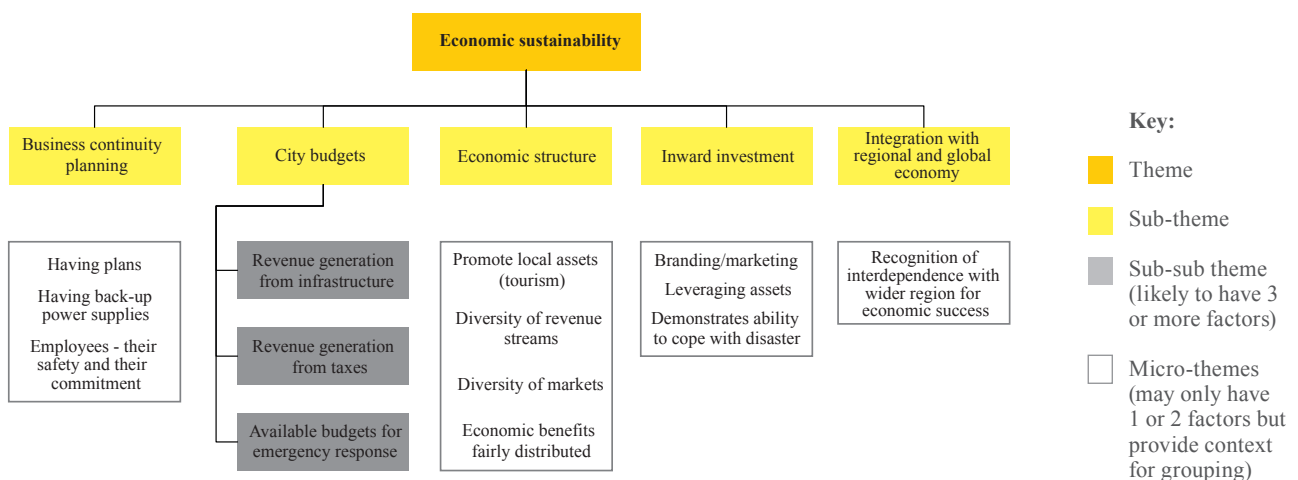
Concepcion:
Community workshop



Economic sustainability

The fieldwork research highlights the importance of a healthy and sustainable economy. The concept of a sustainable economy extends to private sector industry, the city’s own municipal health and the integration of the city’s economy within the broader region. Fundamental to a sustainable economy is the ability of the municipality to have its own revenue base to invest in infrastructure development and direct financial support to the community in times of need.

Figure 31 - Economic Sustainability Theme Tree



Economic sustainability results from five sub-themes, which operate at the scale of the municipality, private industry, and the wider region in which the city's economy operates.

Business continuity planning (30)

The private sector needs to develop its own business continuity plans to enable it not only to keep functioning during shocks or stresses, but also ensure the health and safety of its staff. Business continuity planning needs to engage employees, Small and Medium-sized Enterprises (SMEs) and the community.

City budgets (37)

Consultees note the importance of the city having its own diverse revenue streams and local tax base so that it can invest in its own infrastructure and redirect funding for emergency situations as needed. As funding to cope with disasters tends to come from national sources, cities need to be able to access this funding quickly when needed and use it in an efficient and strategic manner (i.e. build back better). Cities also need to prioritise their spending, considering issues like equity and fairness.

Inward investment (15)

Inward investment is about developing policies, incentives, and marketing campaigns to attract investment to the city. The concept also extends to improving the image of the city through urban renewal, as well as proactively addressing physical risks the city faces to promote investor confidence.

Economic structure (11)

Consultees identify the need for a diverse and balanced economic structure. This concept includes empowering different sectors within the economy and spatially throughout the city, as well as adapting to new trends and changes in the economic environment.

Integration with regional and global economy (5)

Consultees highlight the importance of ensuring the city's economy is well integrated with the broader regional, national and international economy, and developing strong business and economic trading relationships.

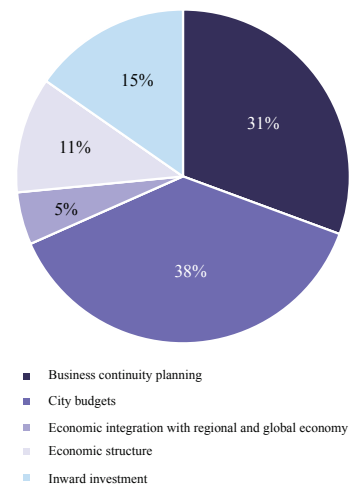


Figure 32 – Economic Sustainability by Sub-Themes

(Image Opposite)

New Orleans:
Marketing effort
by the Downtown
Development
District to encourage
economic growth in
the area



Accessibility

The feedback from consultees highlights the importance of connecting people, goods and information through the planning and design of sufficient, diverse and effective transport links (enabling physical mobility) and of technology for information and communications (ICT). Both elements were expressed by consultees in terms of the economic and social benefits that they yield.

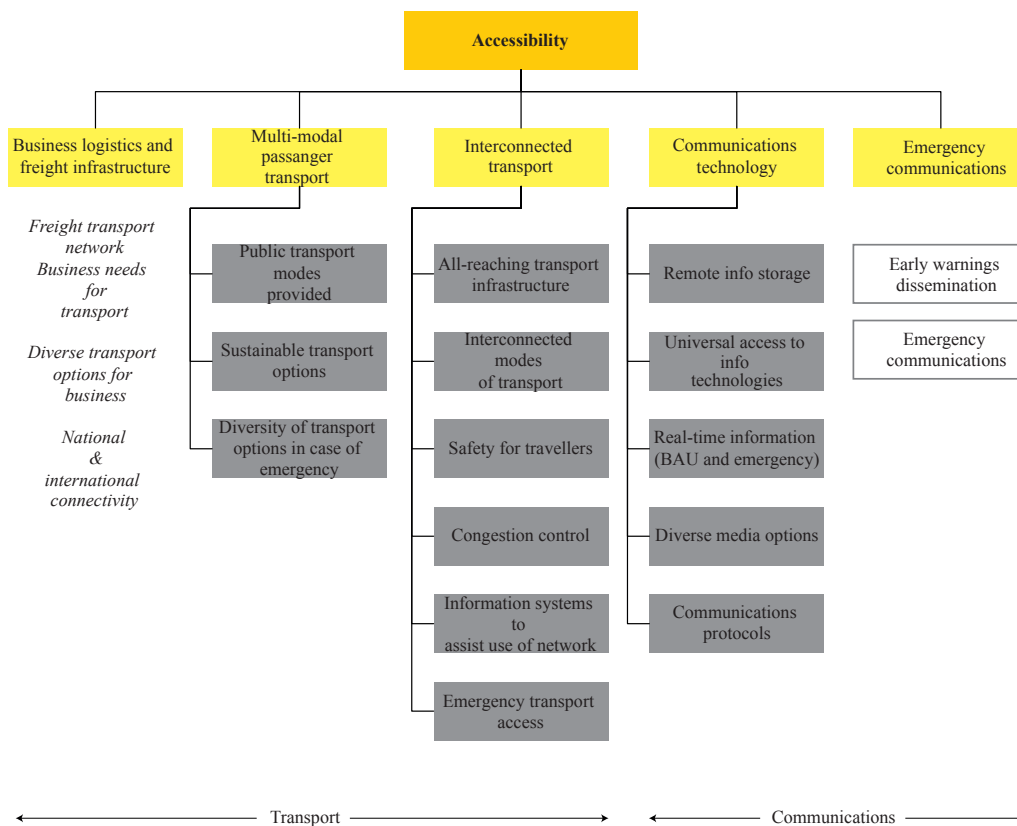


Figure 33 - Accessibility Theme Tree

- Key:**
- Theme
 - Sub-theme
 - Sub-sub theme (likely to have 3 or more factors)
 - Micro-themes (may only have 1 or 2 factors but provide context for grouping)

Accessibility results from five sub-themes, which operate at the city scale of infrastructure provision but rely on connectivity with networks at the regional, national and international scales:

Multi-modal passenger transport (30)

A significant proportion of transport factors refer to multi-modal or diverse options for passenger transport. Safety and affordability are likely to incentivise their use. Several factors (8) refer to the importance of diverse modes of transport in the event of a disaster.

Business logistics and freight infrastructure (6)

Consultees view interlinkages beyond the city through regional, national and international transport links as essential to the city’s economic functioning. Several factors refer to the availability of alternative transport links for freight vehicles. The use of roads, rivers, seas, rail and air links are mentioned.

Emergency communications (19)

The research highlights the need for people responding to or affected by emergencies, as well as people affected by them, to be able to exchange a continuous flow of information. The availability of communications infrastructure to disseminate this information during a disaster is seen as an important means to achieve this. Consultees highlight the need for diverse technologies to disseminate early warnings, enable communication between first responders, display information in public spaces, and to locate missing people.

Communications technology (13)

The importance of functional communications technology is highlighted by the research, together with appropriate protocols to manage communication lines. Radio networks, broadband internet, mobile phones and televisions are cited as basic infrastructure that all households should be able to access. Social media and cloud computing are specific mechanisms proposed for information dissemination and storage.

Interconnected transport infrastructure (34)

Consultees discuss the importance of good quality and widespread transport infrastructure in cities, including roads and railways, rapid transit lanes, pedestrian pathways and bicycle routes. The research highlights that infrastructure should be connected at multiple locations to create a comprehensive city-wide network. Infrastructure capacity, safety and efficiency are essential to smooth operation. The free flow of vehicles along infrastructure routes is imperative. A single ticketing system is suggested as a way to facilitate access between modes.

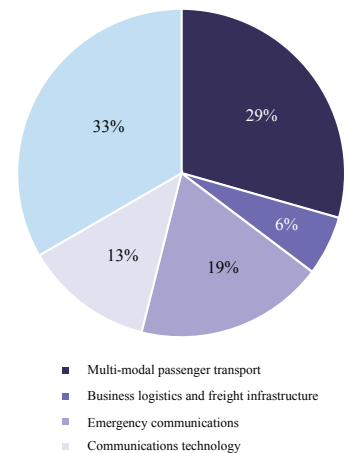


Figure 34 - Accessibility by Sub-Theme

(Image Opposite)

Cape Town: Traffic on roads in Central Cape Town

Figure 35 - Distribution of all factors by city

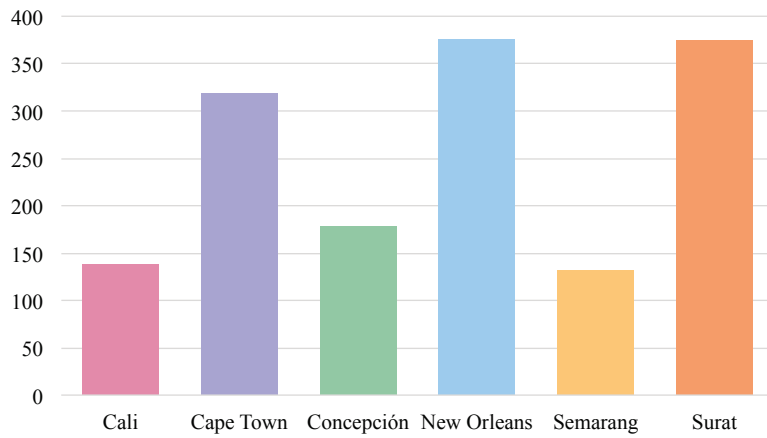


Figure 36 - Distribution of all factors by meta-theme by city

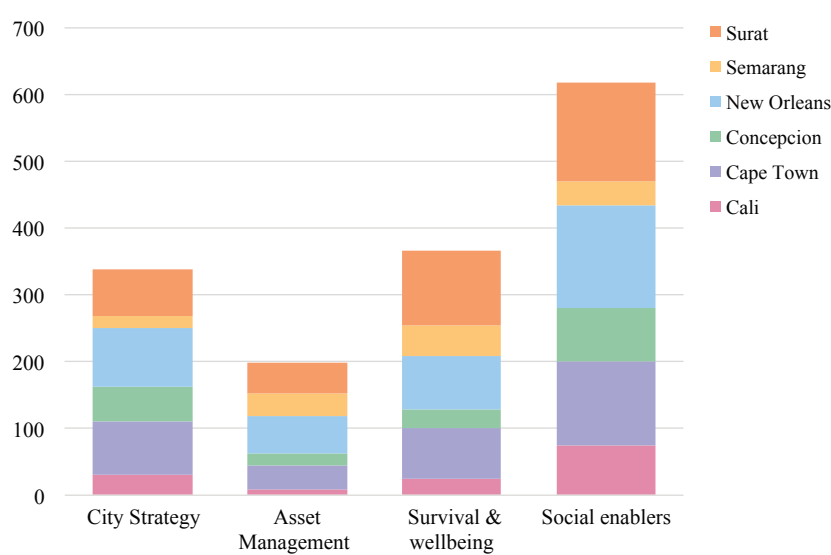
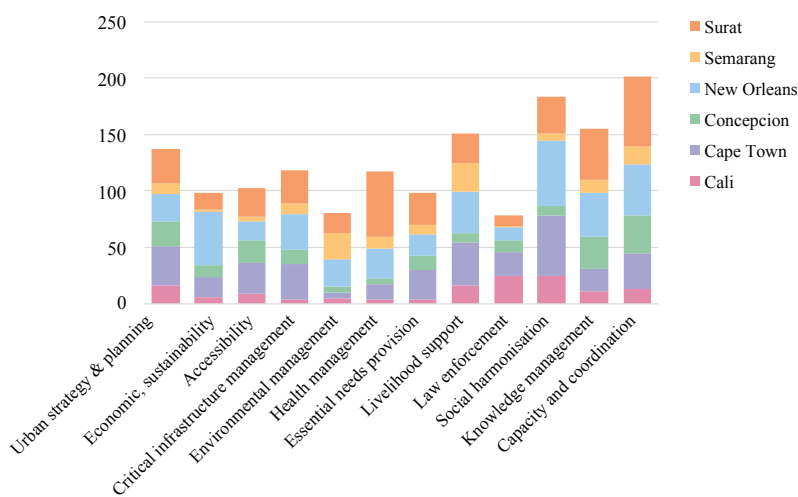


Figure 37 - Distribution of all factors by theme by city



Comparative analysis

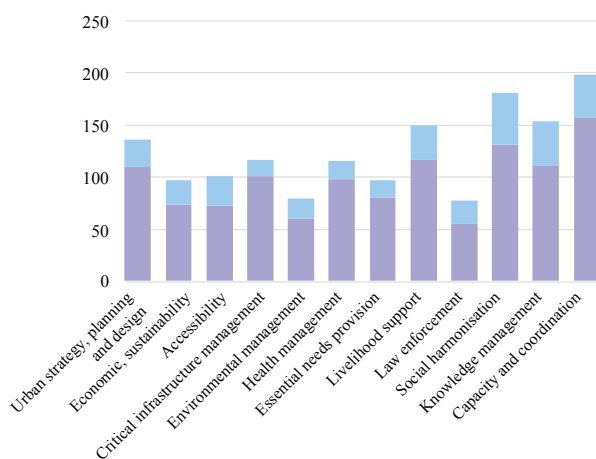
The comparative analysis is the output of detailed quantitative analysis (see Section 2). This analysis compares findings and insights across cities and consultee groups, using the four meta-themes and 12 themes as a framework.

Overview

This series of graphs provides an introduction to the lenses used to analyse the fieldwork data and understand some of the insights available. The same lenses are applied in the detailed comparative analyses that follow.

As described in the methodology, a distinction was made between unique and similar factors. Figure 38 displays the comparison across themes, showing that the ratio of similar factors to unique factors is consistent for each theme. The total number of factors was used for this analysis.

Figure 38 – Relationship of total factors (total column, blue) to unique factors (purple)



Distribution of factors

The number of factors generated from fieldwork in each city is displayed in figure 35. More factors were provided by consultees in some cities than in others.

Overall, Social Enablers is the meta-theme for which the greatest number of factors is recorded (see figure 36). Capacity and coordination is the most common theme, emphasising the importance of government leadership, cross-sector alignment and government skills (see figure 37).

Figure 39 - Number of consultees per consultant group per city

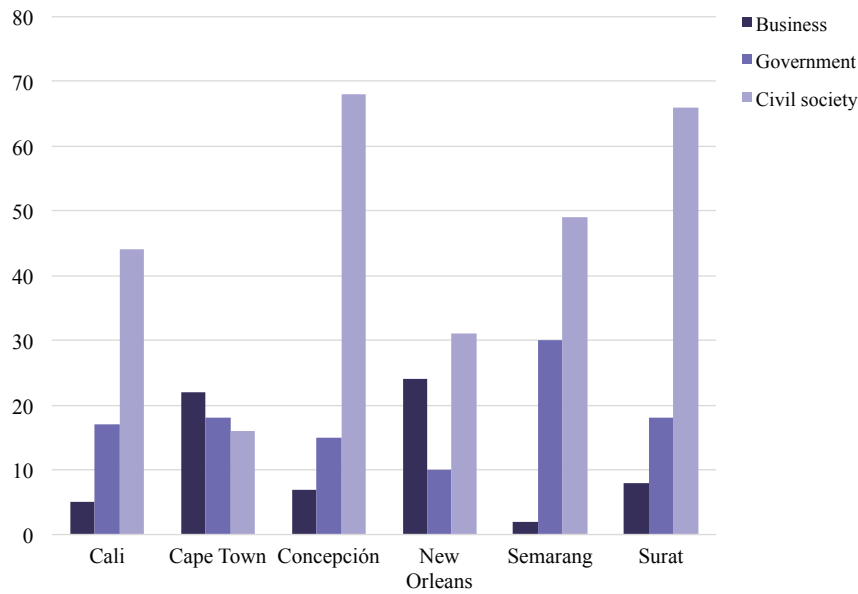


Figure 40 - Source of factors from consultee groups per city

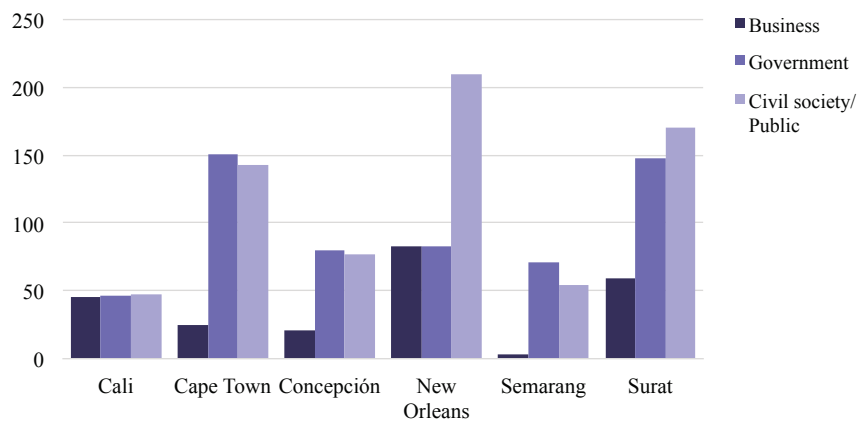
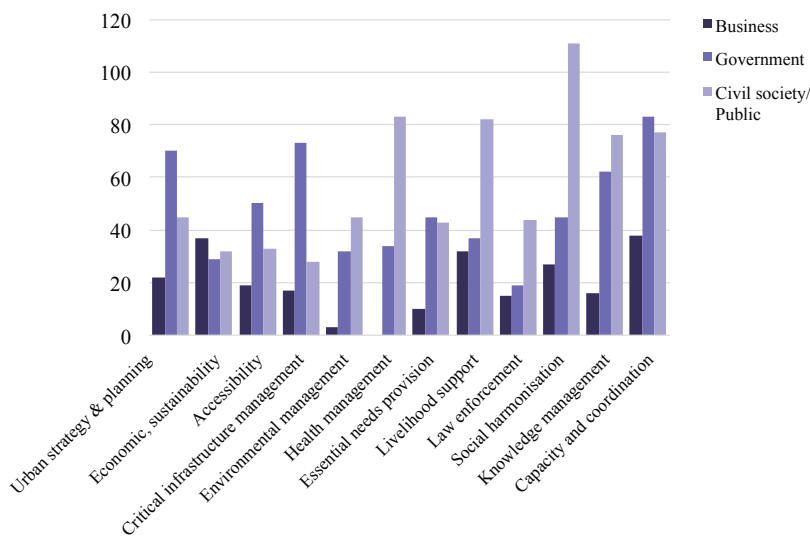


Figure 41 - Source of factors from consultee groups per theme



Consultee groups

The consultees engaged in the research were drawn from business (private sector), government (public sector, government agencies and departments) and civil society (including formal civil society organisations and members of the public).

The number of consultees per city from each consultee group is shown in figure 39. The majority of consultees engaged in the research are from civil society groups. Business consultees are the smallest group.

Figure 40 shows the distribution of factors sourced from each consultee group. It can be seen that while the proportion of civil society representatives consulted is high for all cities, the proportion of factors derived from civil society consultees is smaller. Similarly, while government representatives are a small group relative to the civil society consultees, they contribute a higher proportion of the factors.

Figure 41 shows that each consultee group has different priorities, based on the distribution of factors derived from each group per theme. Social enablers (but not law enforcement) and livelihood support are most important to civil society consultees. For government and business consultees the interest is spread across the meta-themes. Government prioritises Urban Strategy and Planning, Critical Infrastructure Management and both Capacity and Coordination and Information and Knowledge Management. Unsurprisingly, business consultees focus on Economic Sustainability and Livelihoods, but also Capacity and Coordination.

Figure 42 - Proportion of factors generated from lower income civil society-consultees per city¹⁰

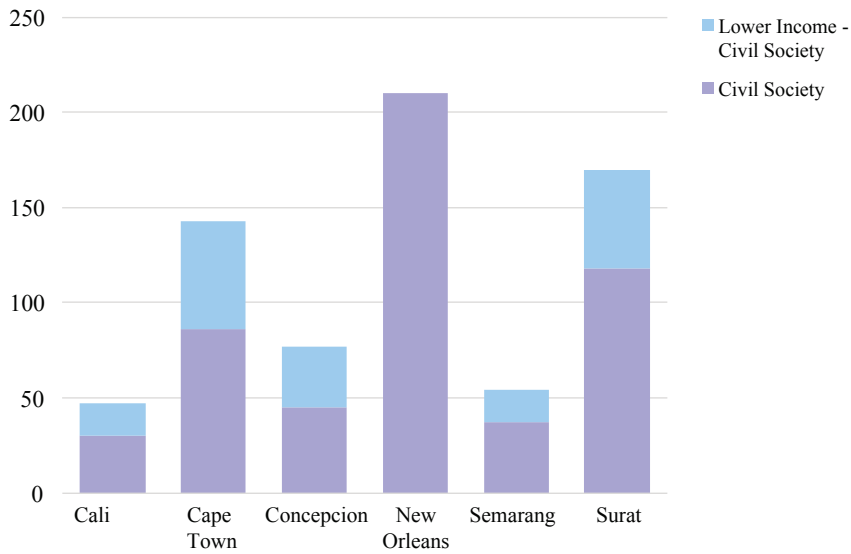
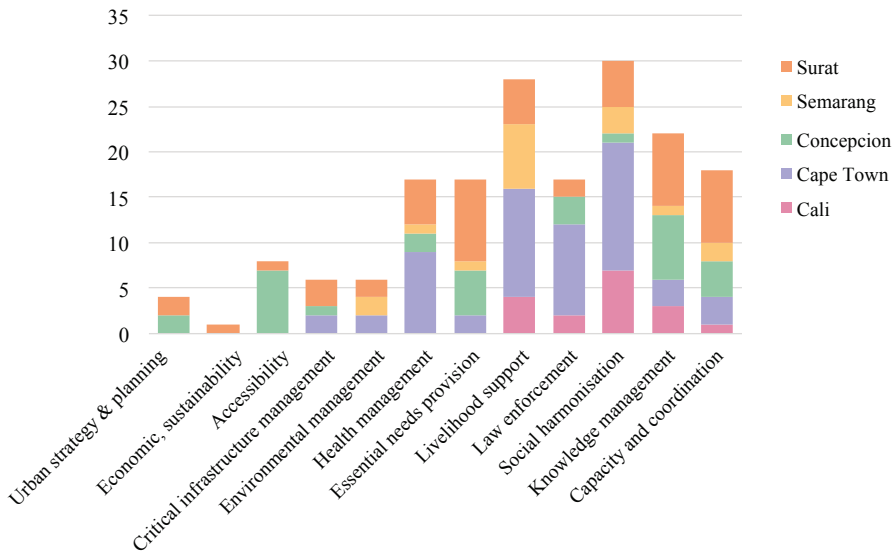


Figure 43 - Distribution of factors sourced from lower income groups, by theme



(10) This includes lower income individuals only, i.e. excluding factors provided by civil society groups that represent the interests of lower income citizens.

Lower income consultees

Lower income consultees are a sub-group of civil society consultees. Consultees that can be defined as ‘lower income’ are identified by each field team for their respective city and concentrate on individuals rather than organisations that may represent lower income groups, such as some NGOs. Figure 42 highlights the proportion of factors sourced from civil society consultees who can be classified as ‘lower income’. As noted in Section 1, this comprises 10% of all consultees across all cities. The small sample size and propensity for an ‘affluent stakeholder’ bias should be taken into account when reviewing the research findings.

The majority of lower income perspectives are gathered from Cape Town and Surat, where the research team were able to reach lower income groups through workshops. By comparison, in New Orleans there are no lower income consultees.

The distribution of factors across themes is quite different from the distribution for all consultees (see figure 43 in comparison to 37). Notably, lower income groups place significantly less emphasis on the city scale themes related to Capacity and Coordination and City Strategy, which are outside their control. Urban Strategy and Planning, Economic Sustainability, Accessibility and Critical Infrastructure Management show a particularly significant fall in emphasis for lower income consultees.

Overall, lower income consultees share similar top priorities with civil society consultees as a whole.

Figure 44 - Number of factors related to shocks versus stresses, by city

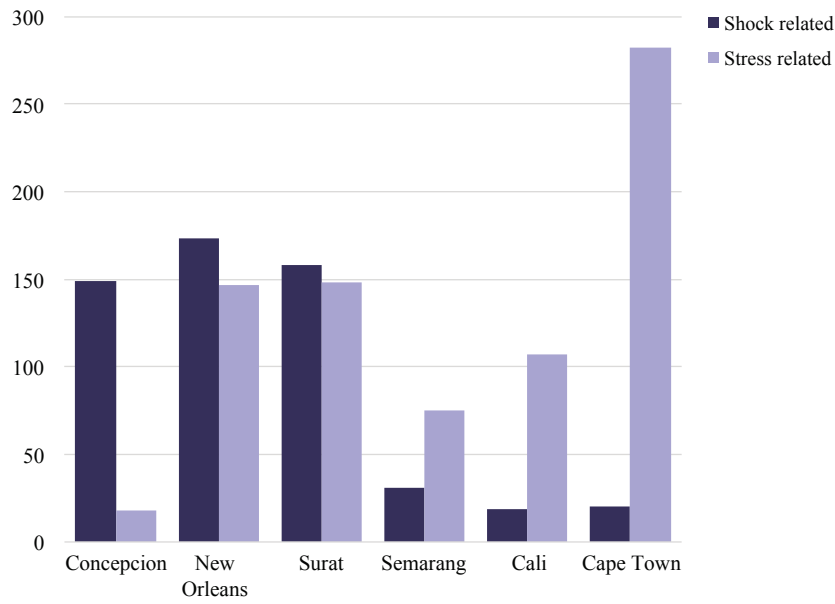
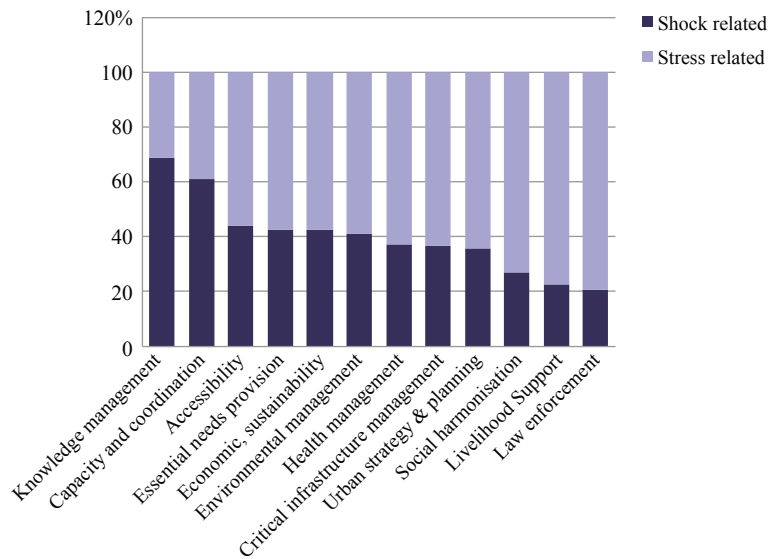


Figure 45 - Proportion of factors related to shocks versus stresses, by theme



Stresses and shocks

A ‘shock’ can be described as a single unpredictable event of significant impact, such as an earthquake or hurricane. A ‘stress’ is defined as an ongoing hardship of lesser magnitude which a community experiences regularly, such as crime or congestion. Where possible when coding the factors, it was noted whether the consultee perceived each factor they suggested to be related to a shock or a stress event¹¹.

Figure 44 clearly shows that Concepción and New Orleans are ‘shock cities’ and Semarang, Cali and Cape Town are ‘stress cities’. Surat is almost equally a ‘stress’ and ‘shock city’, followed closely by New Orleans.

As shown by figure 45, factors that are related to stresses are mentioned significantly more frequently than those related to shocks¹². Only Information and Knowledge Management and Capacity and Coordination are more shock-related than stress-related.

There appears to be little common pattern in the distribution of factors by theme in cities categorised as ‘shock cities’ and in those categorised as ‘stress cities’ at the theme level (see Appendix C for further discussion). A comparison of Concepción with New Orleans (‘shock cities’), and Cali with Cape Town (‘stress cities’), suggests – if anything – an inverse correlation between cities with similar shock or stress histories. However, patterns can be detected at the sub-theme level, as observed in the following sections, particularly for the ‘shock cities’.

(11) Where this was not possible, assumptions were made by the analyst based on interpretation of the original fieldwork text. Much of this was based on whether the consultee was describing a stress (section 2 of the questionnaire) or a shock (question 3 of the questionnaire).

(12) Note that about 10% of the factors were given neither shock nor stress codes as it was not clear enough. This 10% is not shown in the graphs.

Figure 46 - Experienced vs desired/missing factors

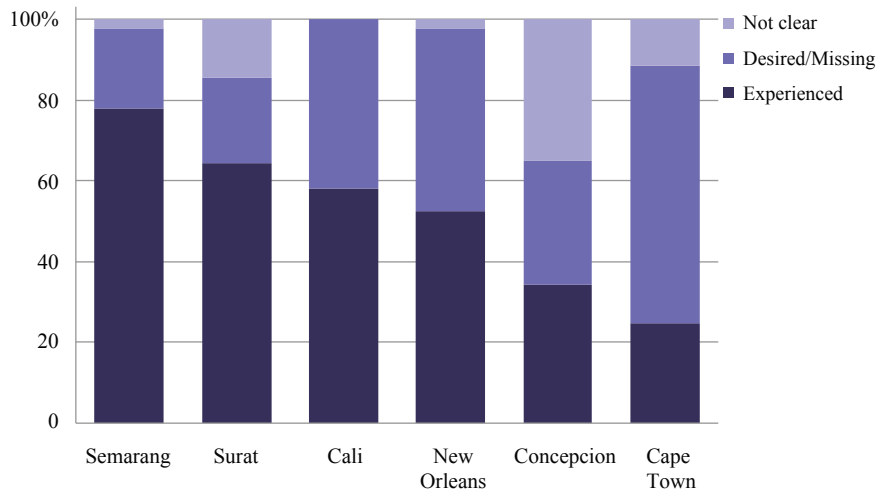


Figure 47 - Proportion of factors experienced vs desired/missing, by theme

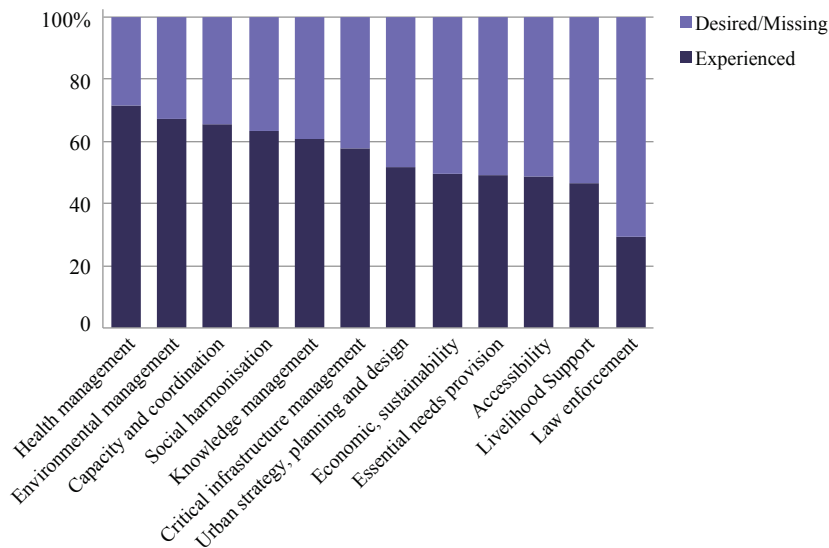
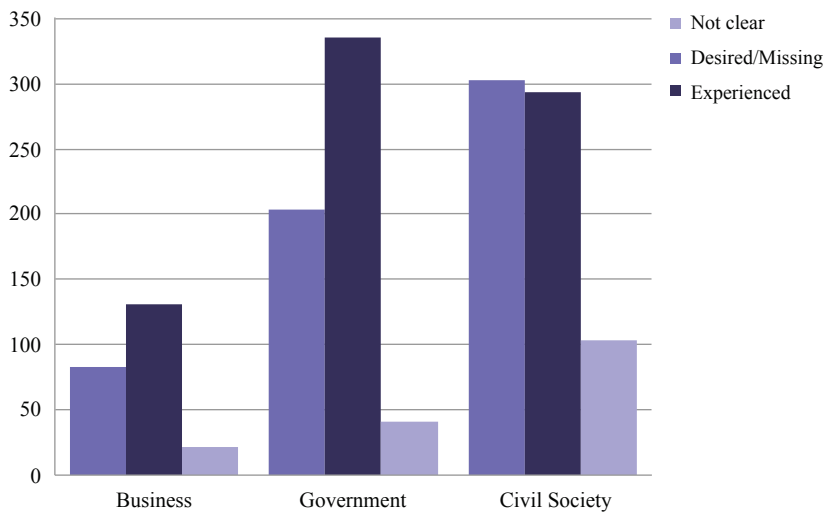


Figure 48 - Number of factors experienced vs desired/missing, by consultee group



Experienced vs. desired/missing

Using the fieldwork notes, it is possible to ascertain whether consultees are proposing factors of resilience that are based on:

- something they have experienced during an event in their city, or that they perceive is present in their city (i.e. a factor, which in their experience has contributed to resilience), or
- something they have observed to be missing from their city, or that they believe would contribute to the city's resilience (i.e. a factor, which in their experience could have helped to improve resilience had it been present).

Figure 46 shows that a higher proportion of factors are sourced from items that consultees have experienced to be present and contributing to resilience. Considering the emphasis in the consultations was on identifying what factors are or have been present, there is a surprising number of factors that the consultees consider to be absent or desired. This lens is very subjective, as it was not always easy to know whether the factor being discussed had truly been present or not. The results perhaps tell us more about the confidence of the consultee in the city, than about how prepared the city actually is.

Consultees highlight a high proportion of factors related to Health Management and Environmental Management that they have experienced to be a positive contribution to resilience (see figure 47). By contrast, consultees suggest that they have experienced the presence of relatively few factors related to Law Enforcement.

Figure 48 shows that civil society consultees are able to suggest more factors that they perceive to be missing or desired, compared with government and business. However, civil society groups also propose a high proportion of factors that they have experienced to be present in their cities.

Figure 49 - Number of factors by city and sub-theme

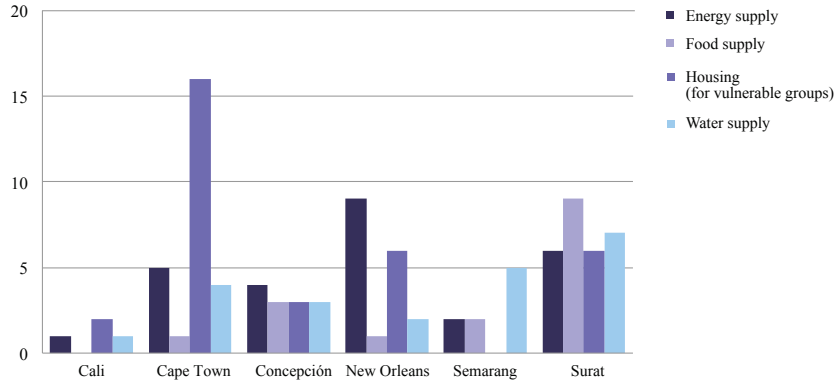


Figure 50 - Number of factors by stakeholder and sub-theme

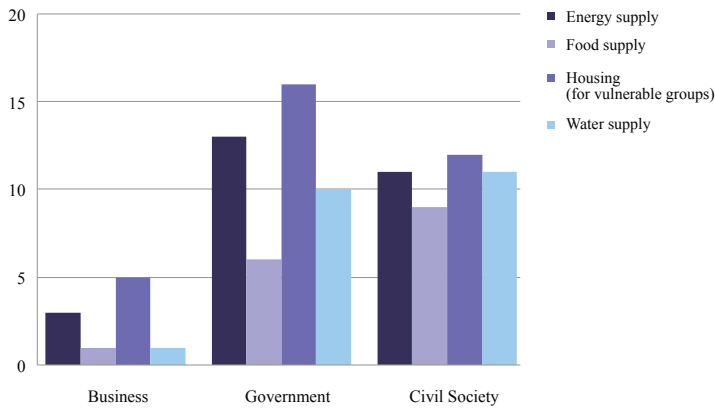


Figure 51 - Number of shock / stress factors by city

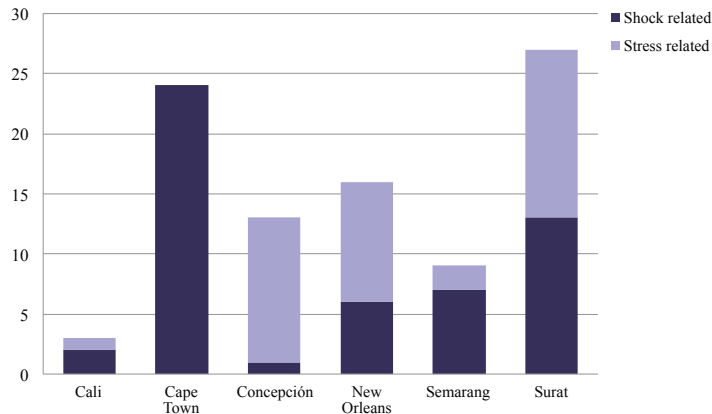
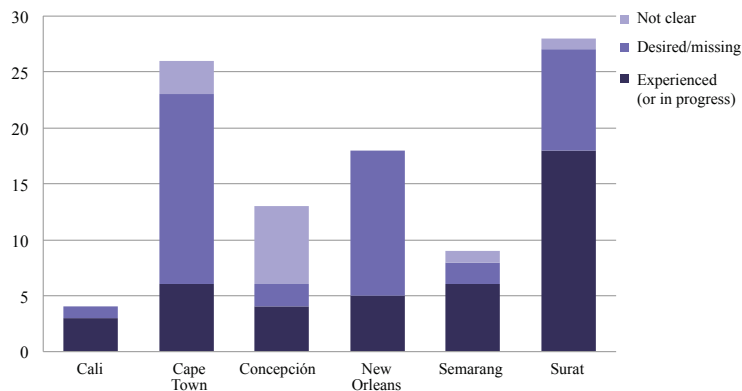


Figure 52 - Number of factors experienced vs desired/missing by city



Survival and wellbeing

Critical infrastructure management

Factors related to Essential Needs Provision comprise 6% of all factors generated by the fieldwork. Most of the factors related to Essential Needs Provision are perceived to be stress related.

The interest in essential needs is divided relatively evenly between government (46%) and civil society (44%) consultees. The priority interests of these two groups are consistent with one another: housing is the major concern, followed by energy, water and food supply. The order of these priorities is the same for business stakeholders, however factors from this source form only 10% of all essential needs factors.

The distribution of factors across cities follows a similar pattern to that shown for Critical Infrastructure Management (see figure 77).

Surat has the highest number of essential needs factors overall, followed by Cape Town. In Surat, the factors are distributed quite evenly across all four sub-themes; although food supply is slightly more dominant (32% of essential needs factors).

In Cape Town, there is a strong focus on housing (62% of essential needs factors), and discussion of food supply is negligible. This pattern is also shown for Cali.

In Surat, most of the factors are items that have already been experienced by consultees, or which already exist in the city. By contrast, most of the factors in Cape Town are related to items that are currently either absent from the city or perceived by consultees to be desirable (65%). New Orleans is also dominated by factors that are currently absent or desired (72%).

Semarang is the only city for which water supply is the most significant sub-theme (56%), and the only city where housing is not mentioned at all.

- The distribution of factors across cities follows a similar pattern to that shown for Critical Infrastructure Management.
- Housing, energy, water and food supply are identified as essential needs. Food supply is surprising because it is not typically covered by a city role.
- Key needs vary for different cities.

Figure 53 - Number of factors by city and sub-theme

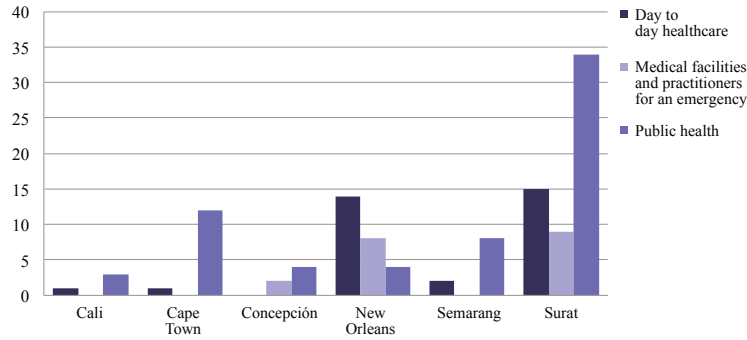


Figure 54 - Number of factors by stakeholder and sub-theme

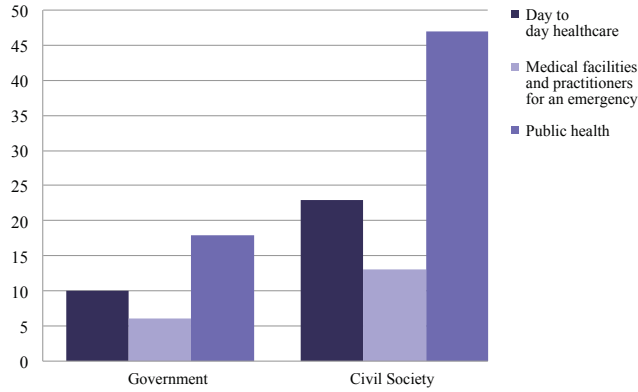


Figure 55 - Number of shock / stress factors by city

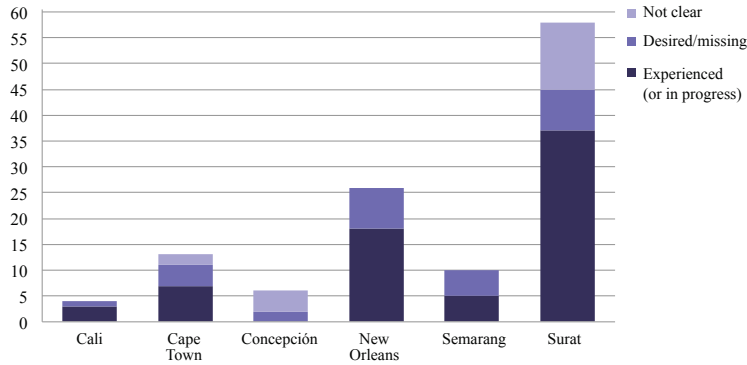
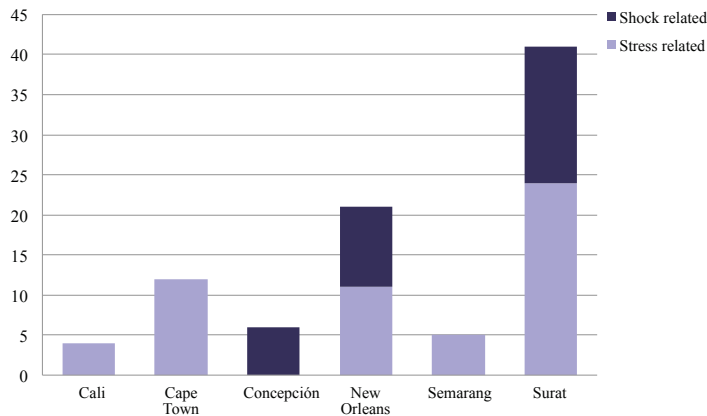


Figure 56 - Number of factors experienced vs desired/missing by city



Health management

Factors related to Health Management comprise 8% of all factors generated by the fieldwork. Factors related to Health Management are predominantly distributed across stress related sources.

Consultees' interest in Health Management is derived predominantly from civil society (71%) representatives. Business stakeholders do not suggest any factors related to health. The priority interests of government and civil society are consistent with one another: public health is the dominant sub-theme, followed by day to day healthcare.

The distribution of factors across cities suggests some important trends. While consultees in all six cities propose factors related to day to day healthcare and public health, only Concepción, New Orleans and Surat highlight factors related to emergency medical facilities and practitioners. These are the three 'shock cities' in the research, where emergency access to medicine has been experienced most tangibly. Notably, none of the factors mentioned in Concepción are items that have been experienced by the consultees as a positive contribution to resilience.

Out of all cities in the research, consultees in Surat generate the greatest number of factors related to health (50% of all health related factors). This reflects the health experiences of Surat, which experienced plague in 1994. Given this history, it is unsurprising that 59% of health related factors arising from Surat are related to public health and health risks; the city has a strong focus on mitigating future health risks. Around two thirds of factors mentioned in Surat are items that are already in place, based on the consultees' experience.

Day to day healthcare is considered most important to consultees in New Orleans and Surat. In New Orleans, access to general healthcare is considered the most important aspect of health management (54% of health factors in New Orleans). This is indicative of a city located in the United States, where affordable and equitable access to healthcare is a high profile political issue. Day to day healthcare is not mentioned by any consultees in Concepción.

- Emergency healthcare only appears as a significant issue in 'shock cities'
- The experience of a health emergency greatly increases the level of awareness of public health issues
- Business stakeholders did not mention healthcare

Figure 57 - Number of factors by city and sub-theme

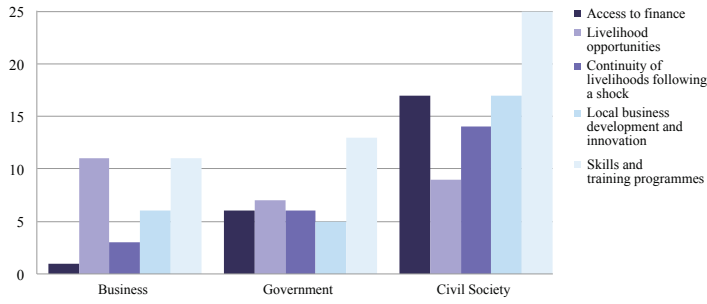


Figure 58 - Number of factors by stakeholder and sub-theme

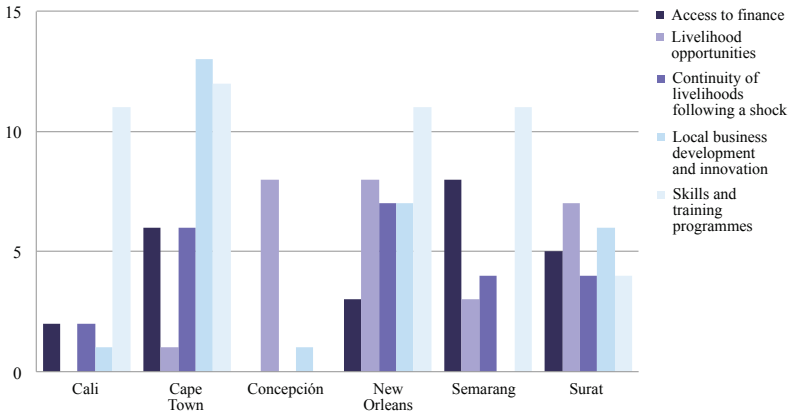


Figure 59 - Number of shock / stress factors by city

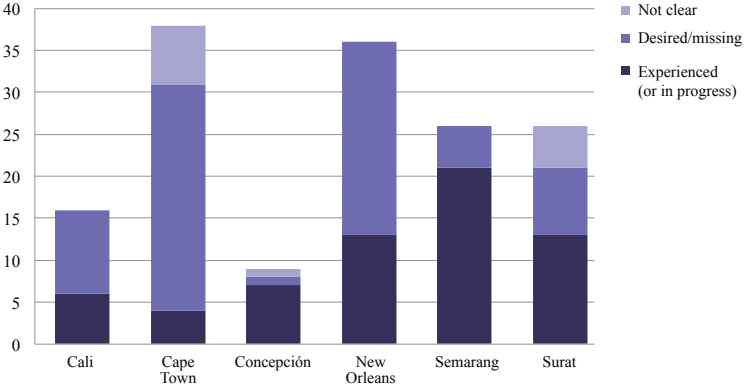
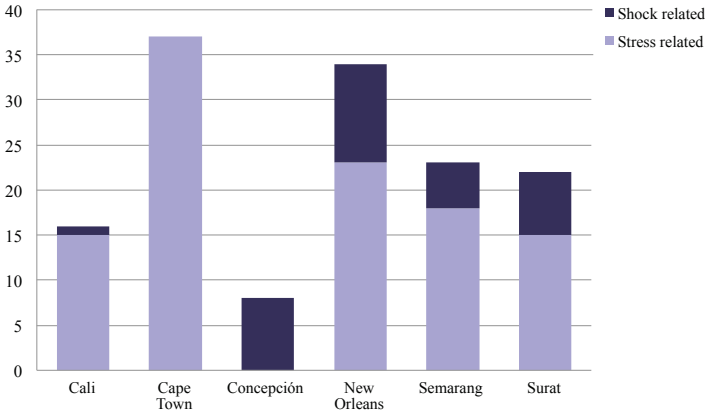


Figure 60 - Number of factors experienced vs desired/missing by city



Livelihood support

Livelihood Support represents 10% of all factors generated by the fieldwork. Significantly more of the factors related to Livelihood Support are perceived to be stress related compared with shock related (77% to 23%), and more factors are contributed by civil society stakeholders (54%) - the people who represent those directly affected by lack of access to livelihood opportunities.

Skills and training programmes is the sub-theme with the greatest number of factors across all cities, representing 32% of factors under this theme. This sub-theme is evident in the factors for all cities, apart from Concepción.

Cape Town is the city with the highest number of factors related to livelihoods. Notably, Cape Town is also the city with the highest rate of unemployment (23.9%, 2011 figures). Consultees are largely focused on factors related to local business development and innovation (34%), followed closely by skills and training programmes (32%). Factors related to the continuity of livelihoods following a shock are mentioned in only 3% of factors, suggesting that consultees in Cape Town are more concerned about livelihoods in the here and now, rather than in the future.

It is notable that the majority of factors proposed for this theme in Cape Town are items that are currently not in place in the city, within the consultees' experience. This suggests that lack of livelihood supports may be viewed as a stress for Cape Town. New Orleans and Cali also display more factors that are currently absent, compared with items that are in place.

Continuity of livelihoods is most significant for consultees in the three 'shock' cities – Concepción, New Orleans and Surat, for whom post-disaster access to livelihoods has been a major recent concern.

Factors relating to access to finance are generally more frequent in 'stress cities' than in 'shock cities'; 58% of these factors are generated by consultees in Cape Town and Semarang alone. This may reflect the ongoing difficulties faced by residents in 'stress cities'.

- Factors relating to access to finance are generally more frequent in 'stress cities' than in 'shock cities'.
- Factors relating to livelihood continuity are more prevalent in 'shock cities'.
- Livelihood factors are a priority for business consultees but have been predominantly generated by civil society.

Figure 61 - Number of factors by city and sub-theme

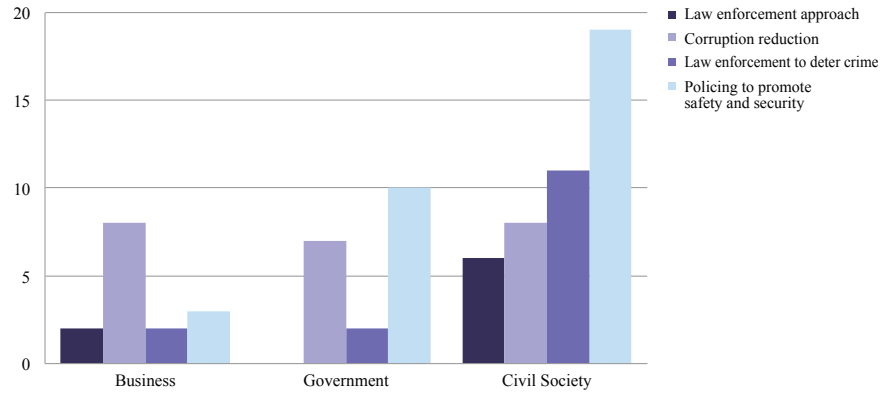


Figure 62 - Number of factors by stakeholder and sub-theme

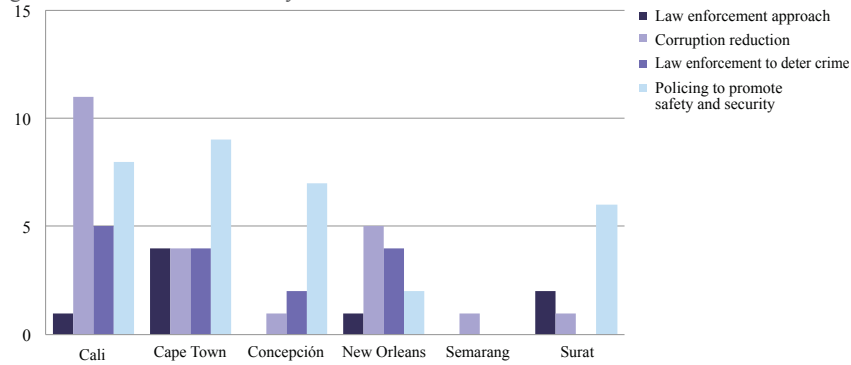


Figure 63 - Number of shock / stress factors by city

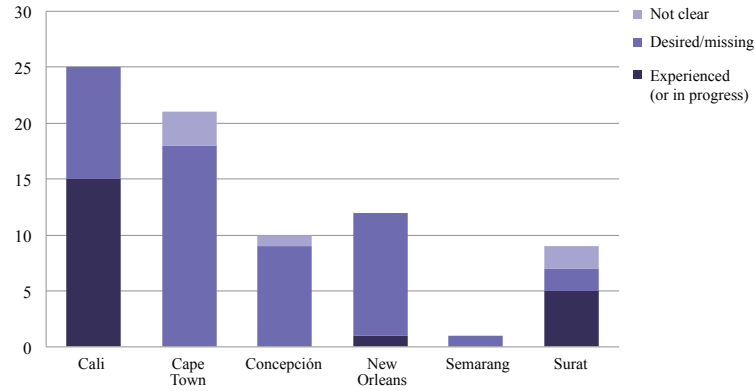
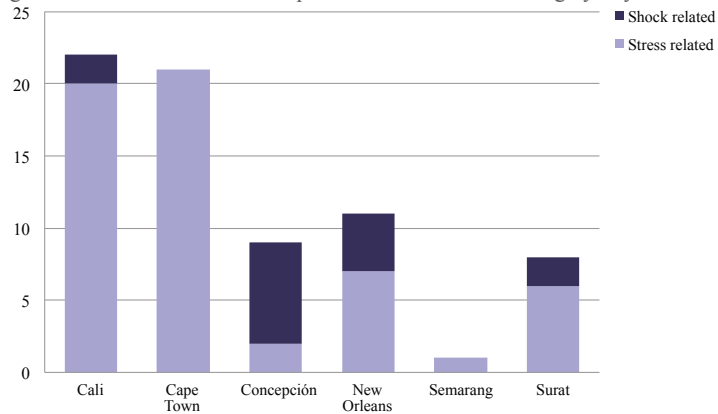


Figure 64 - Number of factors experienced vs desired/missing by city



Social enablers

Law enforcement

Law Enforcement represents 5% of all factors generated by the fieldwork. Within the Social Enablers, Law Enforcement comprises 13% of factors. Significantly more Law Enforcement factors are perceived to be related to stresses than shocks (79% to 21%). A majority of factors within the theme of Law Enforcement are proposed by civil society consultees.

Policing to promote safety is the sub-theme with the highest number of factors, comprising 41% of all factors under Law Enforcement. This is the dominant sub-theme arising from factors proposed by civil society (43%) and government (53%) consultees. However, business consultees highlight the greatest number of factors related to corruption reduction (53% of all factors from business).

Cali is the city with the greatest number of factors related to Law Enforcement overall (32% of all Law Enforcement factors). This finding is consistent with the history of crime and corruption in Cali. Cape Town places the second greatest emphasis on Law Enforcement, and also has a history of unrest.

Consultees in Cali suggest that their city is doing a lot to tackle issues of crime, since most of the proposed factors are items that the consultees have already experienced or which are in place in their city. Surat shows a similar proportion of factors that have actually been experienced. By contrast, the factors proposed by consultees in Cape Town (86%), Concepción (90%) and New Orleans (92%) are overwhelmingly absent from, or desired by, these cities. Overall, the theme shows a significant absence of these factors and therefore a desire for action.

Corruption reduction is the only sub-theme for which factors are identified by consultees in all six cities. In Semarang, no factors are suggested in connection with any other sub-theme. Corruption is the most frequently cited sub-theme by consultees in Cali (44% of Cali's Law Enforcement factors) and New Orleans (42%). In Cape Town (43%), Concepción (70%) and Surat (67%), policing is the most pressing concern. This suggests that unsafe streets are a significant issue for people in these three cities.

The use of crime deterrents is highlighted in the factors mentioned in just four of the six cities. This is not perceived to be important by consultees in Semarang and Surat. In Surat, the greater focus on policing could suggest that Law Enforcement there takes a more reactive than proactive approach. This could also be inferred from the factors generated from Cali, Cape Town and Concepción. Only in New Orleans is deterrence a greater focus for consultees than policing.

- Security is the strongest issue out of security, crime, and corruption.
- Tackling corruption is the only sub-theme for which factors are identified by consultees in all six cities.
- The significant number of factors that are desired implies an overall need for action in the area of Law Enforcement.

*Social enablers is the category with the highest number of factors arising from the fieldwork, comprising 40% of all factors.

Figure 65 - Number of factors by city and sub-theme

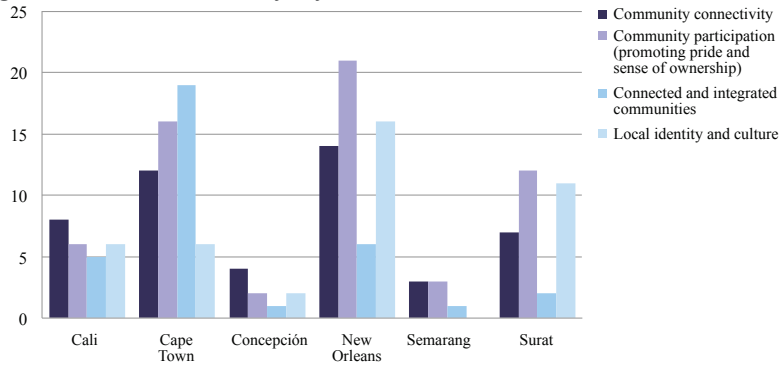


Figure 66 - Number of factors by stakeholder and sub-theme

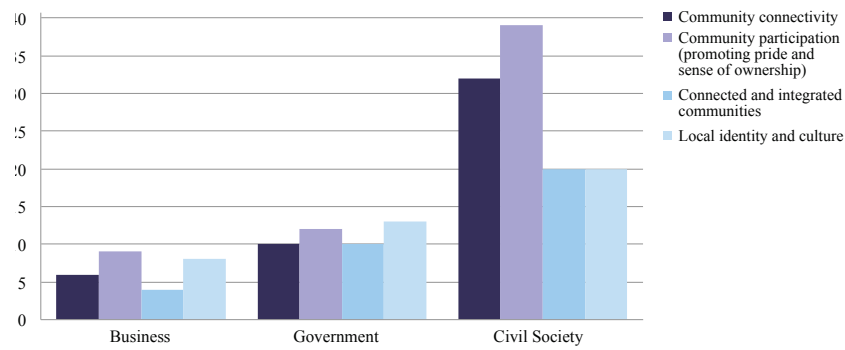


Figure 67 - Number of shock / stress factors by city

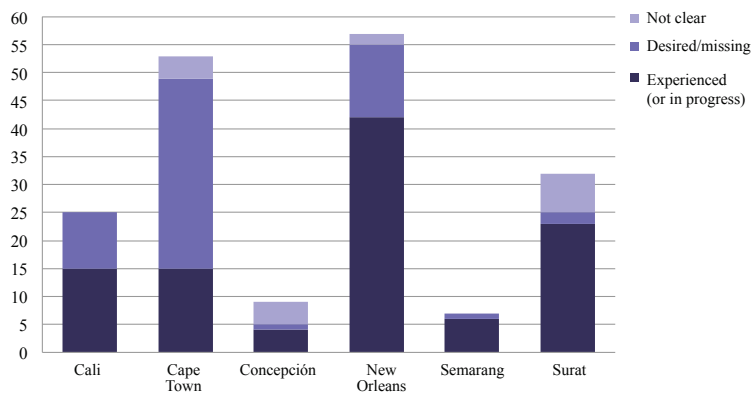
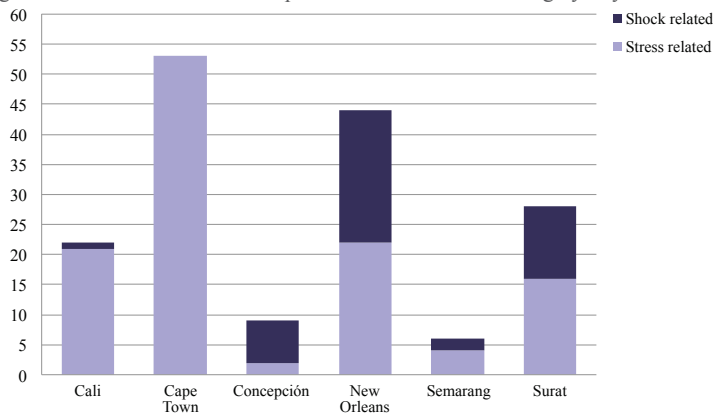


Figure 68 - Number of factors experienced vs desired/missing by city



Social harmonisation

Factors related to Social Harmonisation comprise 12% of all factors arising from the fieldwork. Significantly more of the Social Harmonisation factors are perceived to be related to stresses rather than shocks (73% to 27%). 61% of factors within this theme are proposed by civil society consultees; the group that uses informal networks to a greater extent to influence formal organisations.

Community participation is the dominant sub-theme of Social Harmonisation, comprising 33% of the factors. This sub-theme receives the greatest emphasis from civil society (35%) and from business (32%). For government consultees, local identity and culture is a slightly greater focus (29% of government sourced factors). Nevertheless, all sub-themes feature strongly in the factors arising from all stakeholder groups.

Consultees in New Orleans and Cape Town provide the greatest number of factors related to Social Harmonisation. These two cities alone represent 60% of all factors in this theme. While consultees in both cities focus strongly on Social Harmonisation, the relative level of implementation is very different. 64% of factors highlighted by consultees in Cape Town are items that are absent from the city, or perceived to be desired. In New Orleans, 74% of factors are items that have been experienced by the consultees, or which are already in place in the city. This suggests that consultees in Cape Town consider the existing level of Social Harmonisation to be insufficient. Notably, Cape Town is the city with the lowest proportion of its factors already in place for this theme.

Connected and integrated communities is the dominant sub-theme of Social Harmonisation in Cape Town, representing 36% of factors. This reflects the consultees' concerns about physical segregation of communities. Cape Town is the only city for which this sub-theme arises so significantly from the factors.

In both New Orleans and Surat, community participation is the strongest sub-theme emerging from the factors. These two cities display the same sequence of prioritisation: local identity and culture is the second most cited sub-theme, followed by community connectivity and community participation. These are both affluent cities with a distinct heritage and identifiable cultural groupings within their population.

Community connectivity is a strong sub-theme for all six cities, suggesting the universal importance of social networks. This is the dominant sub-theme for consultees in the Latin American cities of Cali and Concepción.

- The emphasis placed on community participation highlights the importance of community pride and ownership.
- The importance of community connectivity for all six cities suggests a strong recognition of the role of social networks in a city's resilience.

Figure 69 - Number of factors by city and sub-theme

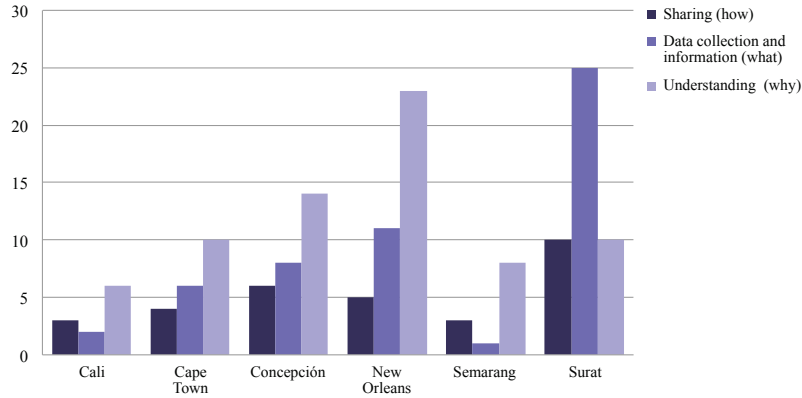


Figure 70 - Number of factors by stakeholder and sub-theme

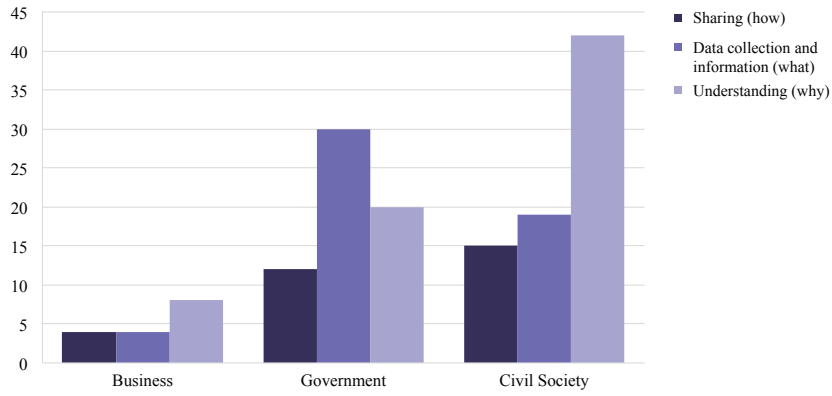


Figure 71 - Number of shock / stress factors by city

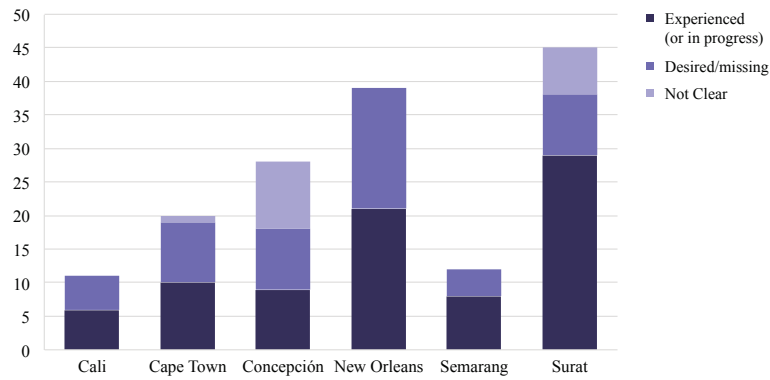
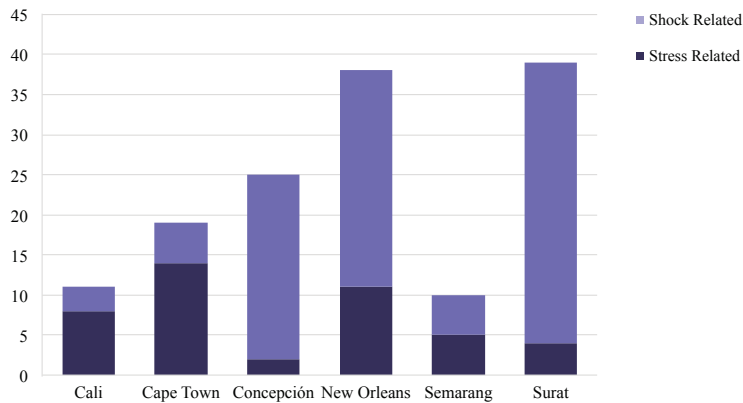


Figure 72 - Number of factors experienced vs desired/missing by city



Information and knowledge management

Factors related to Information and Knowledge Management make up 10% of all factors generated by the fieldwork. 61% of Information and Knowledge Management factors are perceived to be related to shock events, as opposed to stresses (31%). Together with Capacity and Coordination, these are the only themes for which shock related factors exceed stress related factors.

The majority of factors related to Information and Knowledge Management (62%) are provided by government consultees. Most of the factors generated from civil society consultees are related to understanding information, while government stakeholders emphasise data collection and information. This finding appears accurate in light of the relative roles of government and civil society groups in collecting and receiving information. Business consultees propose only 11% of the factors in this theme, with a minor emphasis on understanding information, in common with civil society.

Taken together, most of the understanding information factors provided by business and civil society consultees are concerned with awareness of risk. This is comparable with government's emphasis on risk monitoring and alerts, which makes up 70% of factors within their data collection and information factors. This outlines the perceived roles of government and other groups in distributing and receiving risk information in cities.

New Orleans and Surat are the cities generating the greatest numbers of factors related to information and knowledge management. Slightly more of these factors have been experienced (rather than desired) by consultees. This implies that both cities have reasonable systems in place for information management, but there is nevertheless the perception that more that can be done.

The emphasis of factors generated in New Orleans and Surat is very different. Most of the factors from Surat are related to data collection and information, whereas consultees in New Orleans focus on understanding information. The other four cities also prioritise understanding information.

It is notable that the three 'shock cities' in the analysis (Concepción, New Orleans and Surat) are the cities from which the greatest numbers of factors are generated. This is consistent with experiences of the preparation and response to a major event, when accurate information is critical. The majority of factors from these three cities are related to emergency information, risk monitoring, and public awareness of risk.

- Information and knowledge management is a key issue for shock cities.
- Business and civil society consultees are most concerned about awareness of risk.
- Government consultees emphasise the importance of predicting risks and communicating these effectively.

Figure 73 - Number of factors by city and sub-theme

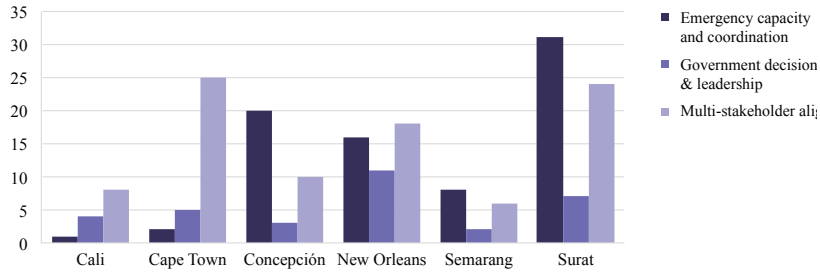


Figure 74 - Number of factors by stakeholder and sub-theme

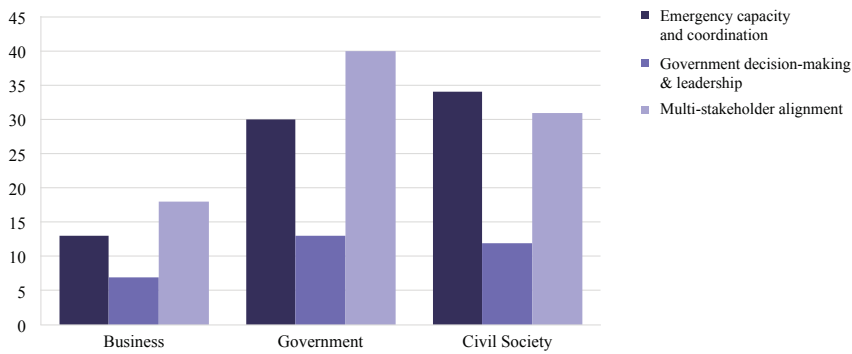


Figure 75 - Number of shock / stress factors by city

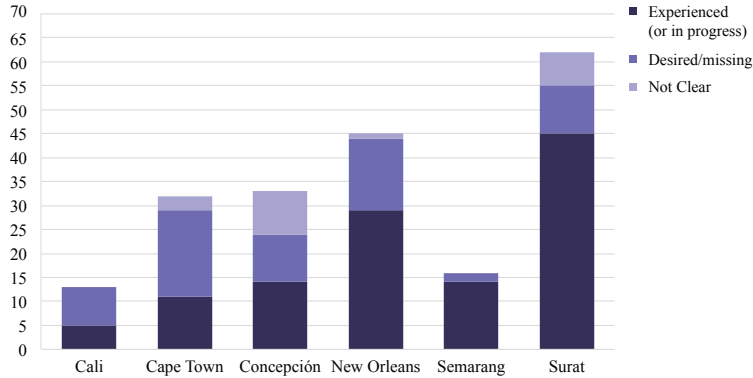
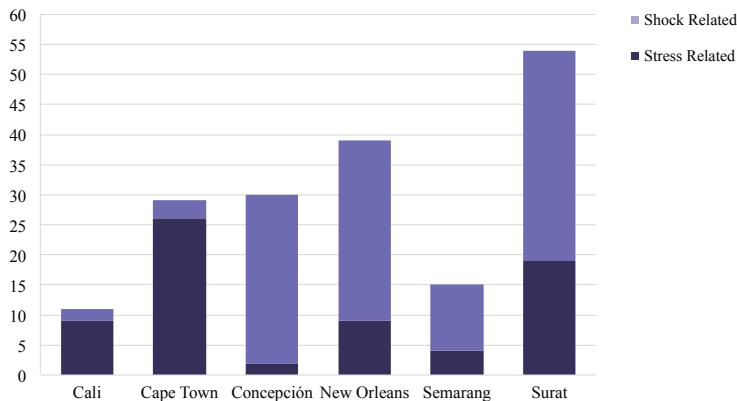


Figure 76 - Number of factors experienced vs desired/missing by city



Capacity and coordination

Factors related to Capacity and Coordination make up 13% of all factors generated from the fieldwork. Most factors related to Capacity and Coordination are perceived to be related to shock events. Together with Information and Knowledge Management, these are the only themes for which shock related factors exceed stress related factors.

Most of the factors under this theme are generated by government consultees. The business sector accounts for a minority of factors. Nevertheless, the emphasis is very similar for all three stakeholder groups. Government and business propose the greatest number of factors related to multi-stakeholder alignment and this is important across all six cities. This sub-theme also receives a high degree of focus from civil society, although emergency capacity and coordination is a slightly higher priority.

The greatest number of factors in this theme is generated from Surat, the majority of which have been experienced or were possibly being implemented. Consultees in New Orleans and Concepción also provide a high number of experienced factors related to capacity and coordination.

There is a clear distinction between ‘stress’ and ‘shock’ cities under this theme. Concepción, New Orleans and Surat (the ‘shock cities’) generate a higher proportion (74%) of factors than the ‘stress cities’. The ‘shock cities’ also place a much greater emphasis on emergency capacity and coordination.

It can also be observed that consultees in Cape Town (56%) and Cali (62%) provide the highest proportion of factors that are currently perceived to be absent from the city, or desired. These two cities are also those that have experienced the most recent political tensions.

- Capacity and coordination is recognised to be critical in shock cities.
- Multi-stakeholder alignment is a major emphasis for all six cities.
- The majority of emergency capacity and coordination factors are sourced from the ‘shock cities’.
- The majority emergency capacity and coordination factors are proposed by civil society consultees.

Figure 77 - Number of factors by city and sub-theme

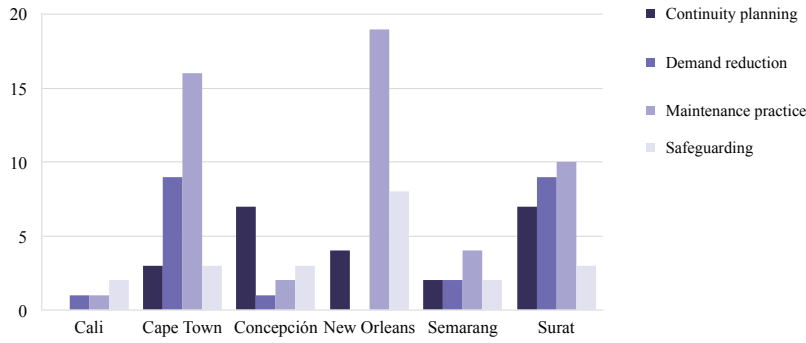


Figure 78 - Number of factors by stakeholder and sub-theme

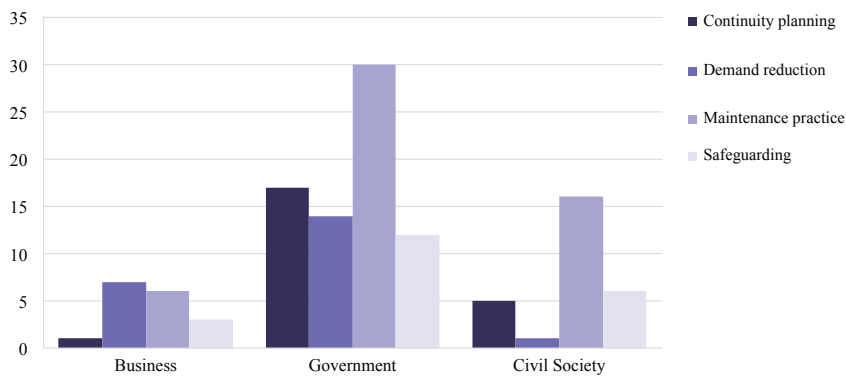


Figure 79 - Number of shock / stress factors by city

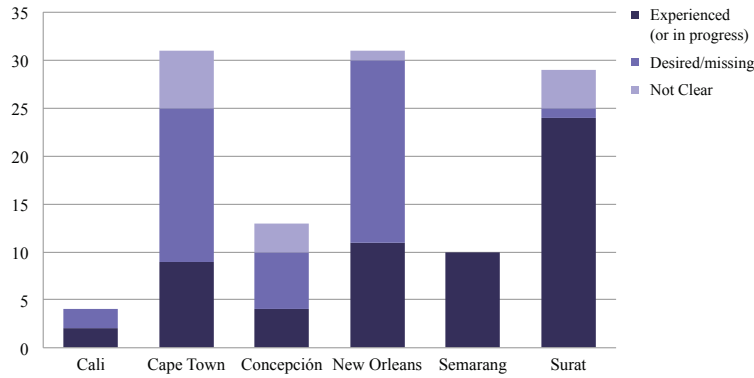
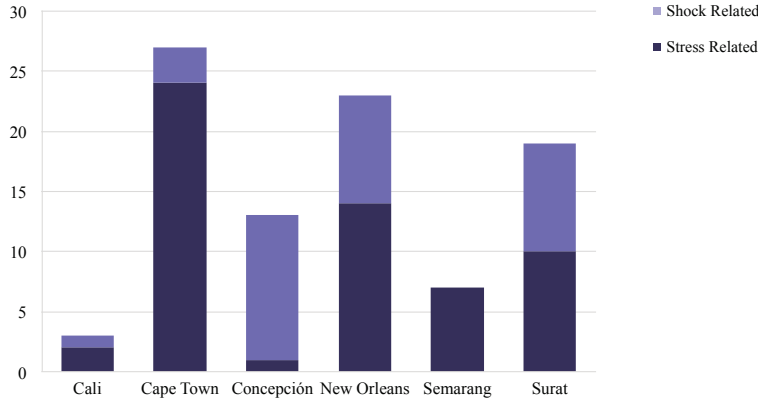


Figure 80 - Number of factors experienced vs desired/missing by city



Asset management

Critical infrastructure management

Critical Infrastructure Management includes 8% of all factors arising from the fieldwork. The majority of factors in this theme are perceived to be related to stress events, rather than to shocks. The majority of factors in this theme have emerged from consultation with government stakeholders. Both government and civil society stakeholder groups emphasise maintenance practices over any other sub-theme.

In contrast, business consultees propose only 14% of factors related to Critical Infrastructure Management, and prioritise demand reduction on critical infrastructure above the other sub-themes. Demand reduction is also a significant concern for government. For both groups, this would mean a reduction in capital investment required.

Cape Town, New Orleans and Surat have the highest emphasis on Critical Infrastructure Management. Each of these cities has more than twice the number of factors than the next highest city (Concepción) but each has different drivers, including apartheid legacy (Cape Town), ageing infrastructure (New Orleans) and insufficient capacity due to rapid growth (Surat).

While consultees in Surat emphasise Critical Infrastructure Management on the basis of items that they have experienced or which are present in their city, Cape Town and New Orleans focus on items that are perceived to be absent or desired by the city.

Continuity planning and safeguards for critical infrastructure are cited most frequently by consultees in Concepción, New Orleans and Surat – the three ‘shock cities’ in this study, where sudden disruption of critical services has been experienced most tangibly. By contrast, continuity planning is not evident in the factors gathered from Cali, and it is the least mentioned sub-theme by consultees in Cape Town.

- The focus on management of infrastructure rather than the presence of infrastructure suggests that basic infrastructure is in place but cannot meet changing needs and growing demand.
- The stresses of meeting growing demands on city infrastructure are perceived to be more critical than the impact of shocks.
- Government and business are concerned with managing and reducing demand in order to reduce requirements for capital investments.
- Continuity planning and safeguards are critical in shock cities and still relatively unrecognised in stress cities.

Figure 81 - Number of factors by city and sub-theme

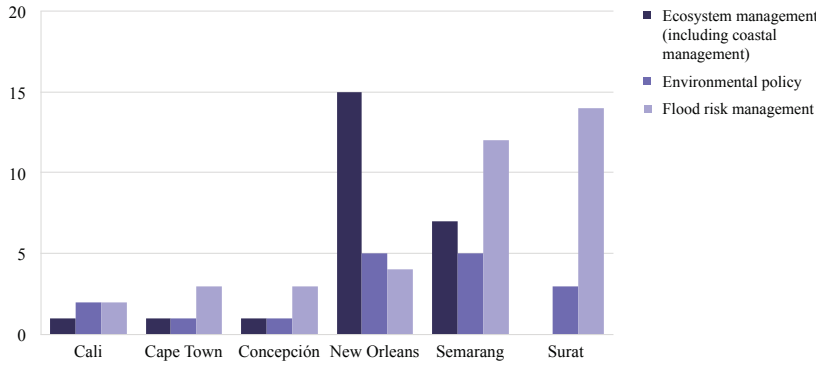


Figure 82 - Number of factors by stakeholder and sub-theme

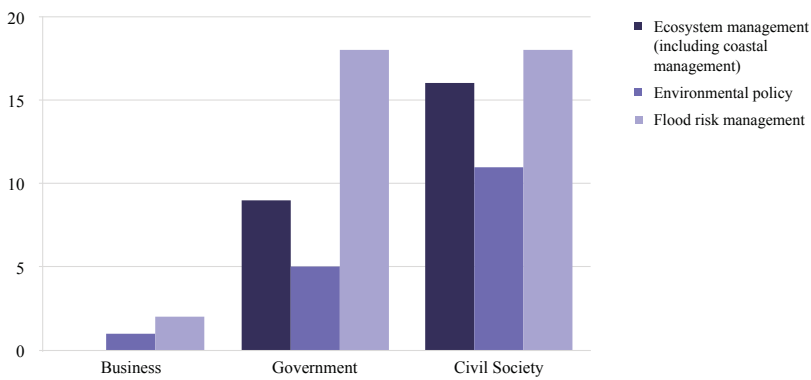


Figure 83 - Number of shock / stress factors by city

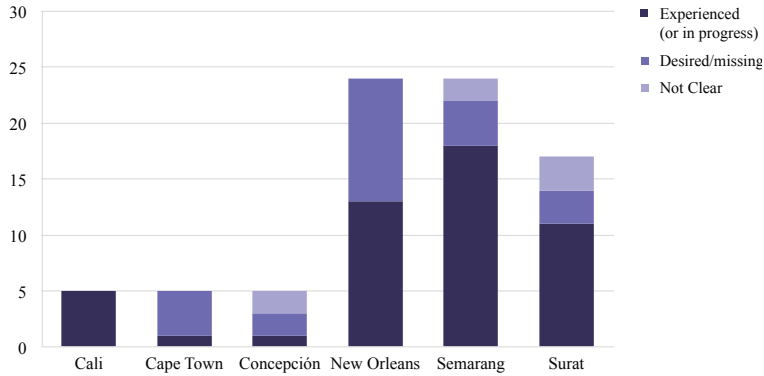
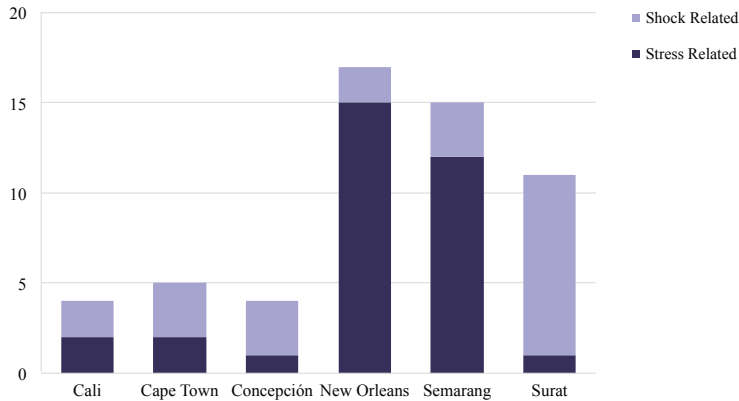


Figure 84 - Number of factors experienced vs desired/missing by city



Environmental management

Environmental Management makes up 13% of all factors arising from the fieldwork. The majority of Environmental Management factors are perceived to be related to stresses, as opposed to shocks.

Civil society consultees place the greatest emphasis on Environmental Management. 40% of factors are proposed by government consultees, while only 4% are from the business community.

Across all consultee groups, Flood Risk Management is the major focus, comprising 48% of Environmental Management factors. To some extent, this reflects the fact that three out of the six cities have had recent experiences of severe flooding. However, it should be noted that consultees in all cities propose factors related to flood management, regardless of the city's history.

81% of the Environmental Management factors are generated by consultees in three cities: New Orleans, Semarang and Surat. In all three cities, the majority of factors mentioned are items that the consultees have already experienced, suggesting that they are addressing these issues, unlike in Cape Town and Concepción.

While in Surat, consultees focus almost exclusively on direct Flood Risk Management (82% of factors), New Orleans and Semarang show a broader appreciation of other Environmental Management factors. For example, in Semarang there were several factors (29%) related to Ecosystem Management. For New Orleans Ecosystem Management covered the majority of factors, 29% of which were specifically related to coastal ecosystems.

Environmental Policy receives a degree of attention from consultees in all cities, however this sub- theme includes the fewest factors within the theme as a whole (21% of all Environmental Management factors).

- The management of the environment is primarily perceived as an issue by civil society.
- Flood risk management is noted by all cities, but is a priority to those that have suffered severe flooding.

Figure 85 - Number of factors by city and sub-theme

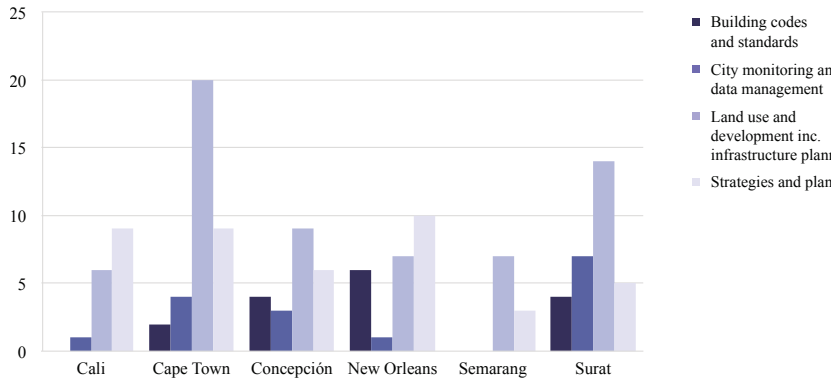


Figure 86 - Number of factors by stakeholder and sub-theme

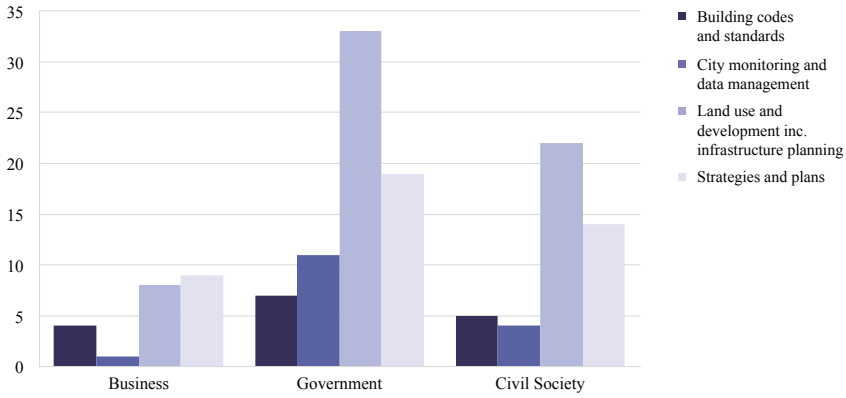
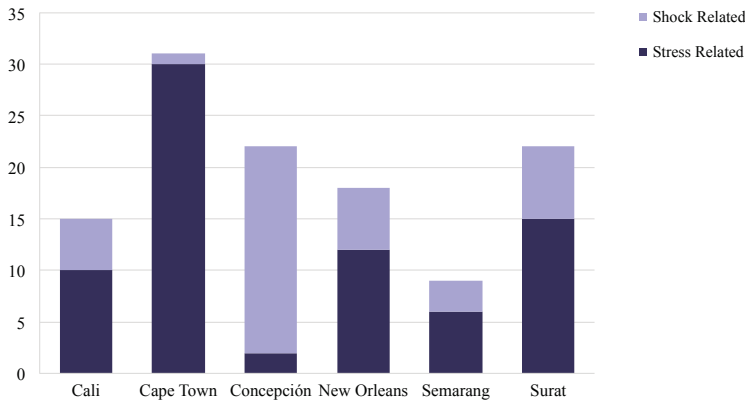


Figure 87 - Number of shock / stress factors by city



Figure 88 - Number of factors experienced vs desired/missing by city



City strategy

Urban strategy and planning

Of all the themes, Urban Strategy and Planning represents 9% of the factors mentioned by consultees in the field. Within City Strategy, Urban Strategy and Planning attracts the greatest number of factors (41%). More than half of the factors within this theme are sourced from government consultees. The majority of factors within this theme are perceived to be related to stresses, rather than to shocks.

Land use and development and strategies and plans are strong sub-themes in every city, suggesting the importance of clear urban strategies and development plans as perceived by the consultees.

Urban Strategy and Planning features most strongly in the factors generated by fieldwork in Cape Town and Surat. While consultees in the other cities speak relatively broadly about this theme, the factors from Cape Town and Surat highlight some very specific local challenges. Consultees in Cape Town display their concern for the overall planning of the city, including the spatial segregation of communities and the availability of services and employment in proximity to homes. In Surat, concerns are raised in relation to informal settlements and general development on flood plains.

Consultees in Semarang highlight the fewest factors related to Urban Strategy and Planning out of all six cities. Notably, 100% of the factors mentioned in Semarang are items that have already been experienced or are present in the city. City monitoring and data management is not mentioned at all for Semarang, possibly because the city is already active in this area so it is not perceived to be an issue.

Consultees in neither Cali nor Semarang propose factors related to building codes and standards. This may reflect the types of stresses and shocks to which they have been exposed, and the ways those stresses and shocks have been experienced. For example, the prevailing stresses named by consultees in Cali are corruption, crime and civil unrest – none of which have clear implications for the robust design of buildings.

It is notable that the majority of Urban Strategy and Planning factors (87%) proposed by consultees in Cape Town are items that are considered absent from or desired for the city, suggesting that consultees consider there is a lot of work to be done in this area. In Surat, there is more balanced reporting of factors already experienced by the population or currently present, versus those that are considered absent.

- Land use and development, and strategies and plans are strong sub-themes in every city, suggesting the importance of clear urban strategies and development plans as perceived by the consultees.
- Cities undergoing significant recent change perceive a greater need for strategy and planning than is currently in place.

Figure 89 - Number of factors by city and sub-theme

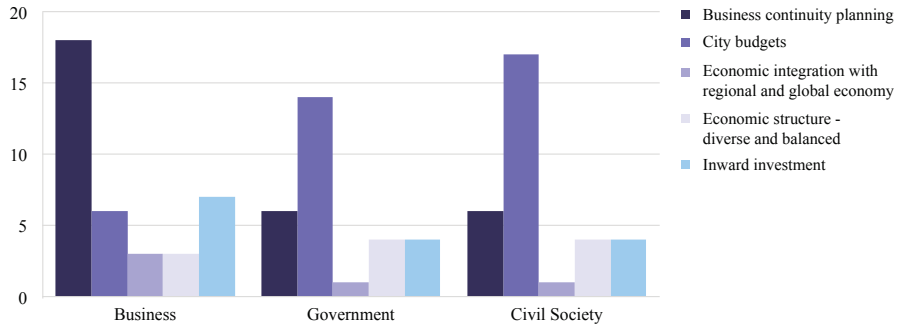


Figure 90 - Number of factors by stakeholder and sub-theme

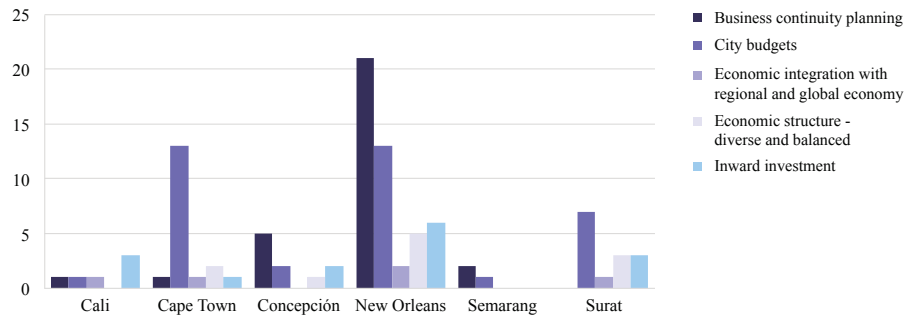


Figure 91 - Number of shock / stress factors by city

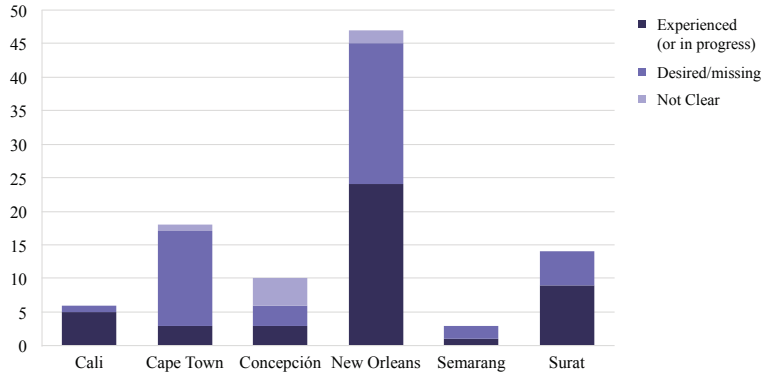
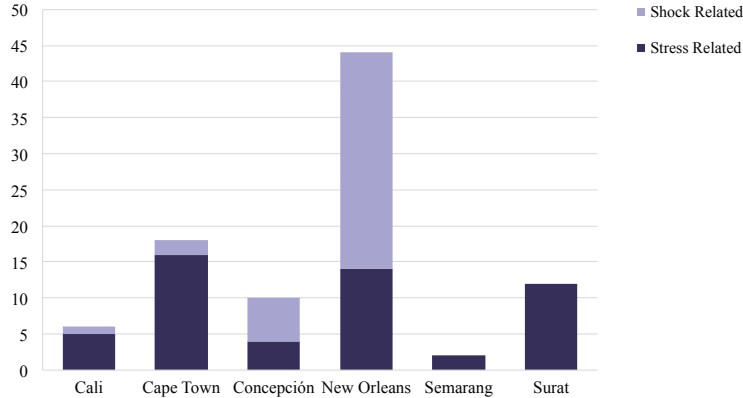


Figure 92 - Number of factors experienced vs desired/missing by city



Economic sustainability

Of all the themes, Economic Sustainability makes up only 6% of factors arising from the fieldwork. Over a third of factors within this theme were generated through consultation with business stakeholders. The majority of factors in this theme were perceived to be related to stress events, rather than to shocks.

City budgets is the only sub-theme of Economic Sustainability that all cities have in common (38% of all factors). Factors in this sub-theme incorporate both city government revenue streams and the equitable management of public spending.

The greatest emphasis on Economic Sustainability comes from New Orleans (48% of all Economic Sustainability factors). New Orleans is the most developed economy out of all six cities, and the only city located in the Global North. Notably, around half of factors within this theme in New Orleans are items that are considered to be absent, based on the consultees' experience.

Business continuity planning attracts the highest number of factors for New Orleans (45%). Concepción ranks business continuity similarly highly: this sub-theme represents 50% of factors highlighted by consultees there. Notably, these two cities have experienced major shocks that disrupted businesses and livelihoods. In 'stress cities' such as Cali, Cape Town and Semarang, business continuity planning is mentioned by only a few consultees.

Consultees in Semarang highlight the fewest factors related to Economic Sustainability. Only business continuity and city budgets are mentioned, with no importance placed on economic integration, diversity or inward investment. This finding may be influenced by the lower number of business consultees engaged in the fieldwork in Semarang.

- All cities emphasise the importance of city level budget management.
- Business continuity planning is a greater concern for 'shock cities'.

Figure 93 - Number of factors by city and sub-theme

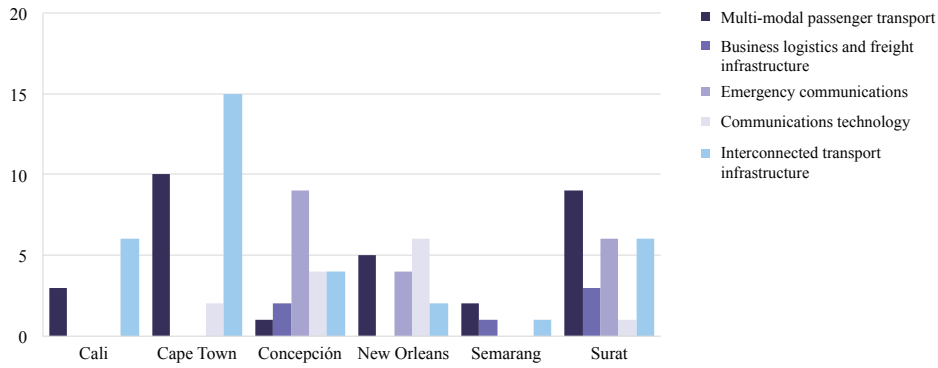


Figure 94 - Number of factors by stakeholder and sub-theme

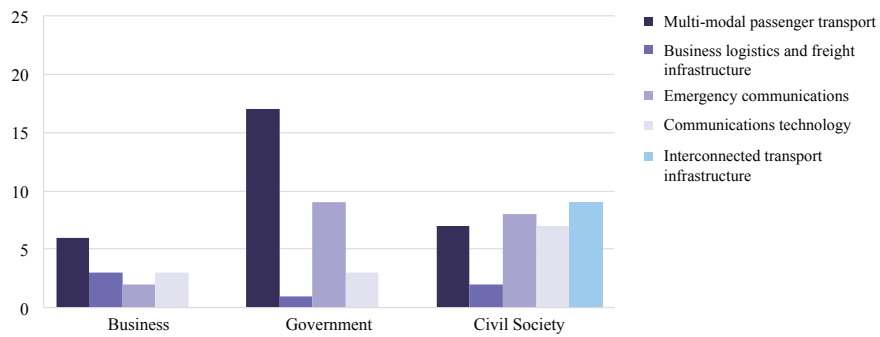


Figure 95 - Number of shock / stress factors by city

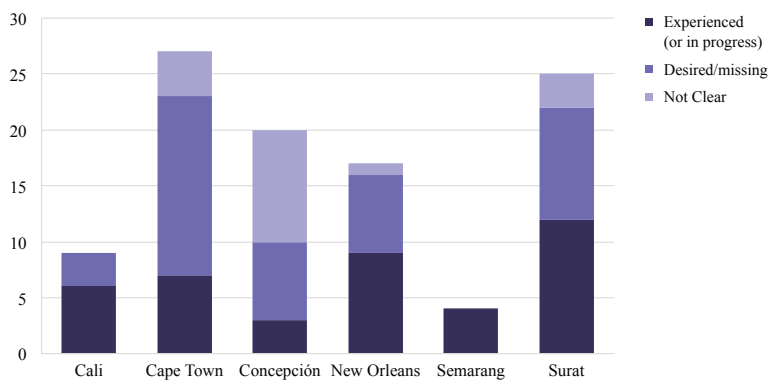
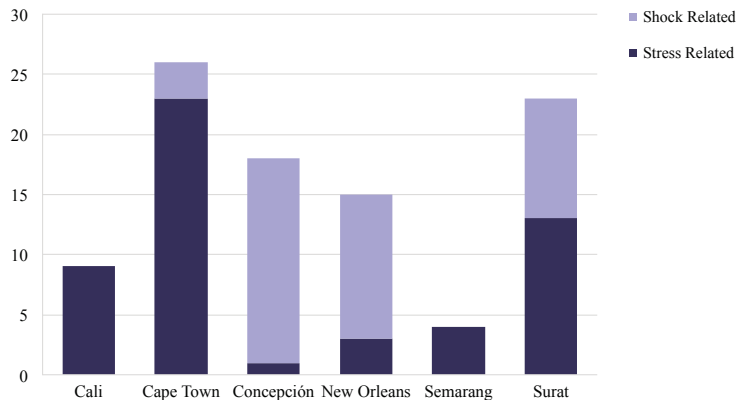


Figure 96 - Number of factors experienced vs desired/missing by city



Accessibility

Of all the themes, Accessibility makes up 7% of the total factors. Within the Strategy concept, 30% of factors are related to Accessibility. Cape Town and Surat dominate this theme, together comprising 51% of all Accessibility factors. A slight majority of factors within this theme are perceived to be related to stress events, rather than to shocks. Government stakeholders contribute the greater number of factors (49%) for this theme. Business consultees appear less concerned than others about factors relating to Accessibility.

The demand for effective interconnected transport is reflected in 33% of all factors under Accessibility. A further 30% of factors consider the diversity of passenger transport options. These two sub-themes are the only ones mentioned in relation to Accessibility in Cali. A similar pattern is evident in Cape Town, where comments from consultees show a high level of concern about connectivity around the city. Almost all of the Accessibility factors in Cape Town are related to the transportation sub-themes. Over half of Accessibility factors in Cape Town are related to items that consultees perceive are absent from or desired for their city, suggesting that transport is currently a source of stress for the city.

Notably, only the ‘shock cities’ of Concepción, New Orleans and Surat place any importance on communications infrastructure. In Concepción, emergency communications alone makes up 45% of the factors mentioned for Accessibility. This reflects the aftermath of the 2012 earthquake, when the lack of communications infrastructure caused significant disruption and unrest. Emergency Communications also feature strongly in the factors generated from New Orleans and Surat.

Communications Technology appears to be of least importance to business consultees, although all three groups tend to prioritise transportation related factors over communications.

- Communications is emphasised mainly by shock cities.
- Diversity and redundancy are dominant issues within the transport sub-themes.
- Business consultees appear less concerned than others about factors relating to Accessibility.

Conclusion

Key observations

There is a number of important findings within particular themes identified from the fieldwork.

In general,

There is significant variation in the way different cities prioritise themes. There is little correlation, even between ‘shock cities’ and ‘stress cities’. There are stronger links at the sub-theme level, especially for shock cities, where experience is likely to have emphasised their critical needs.

Different stakeholder groups prioritise different themes, with minimal overlap between them. This highlights the importance of understanding resilience from different stakeholder perspectives, as no individual group will fully reflect the priorities of all.

A large amount of factors (39%) are identified by consultees as absent from their city. This is surprising given that the research was designed to collect evidence of what had worked (what was existing, or present), rather than what could work (what was missing, or absent).

Civil society consultees comment more than other stakeholder groups on what is absent or needed. Considering their role as advocates for community issues, they are also surprisingly balanced in identifying an almost equal amount of factors that had been experienced.

In particular,

The number of factors relating to infrastructure and other physical assets is lower than expected. They are also more related to stresses, suggesting that the speed of urban growth is perceived to be a greater problem than the infrequent impacts of severe shocks.

The factors about critical infrastructure are dominated by issues related to efficient management of existing systems and reducing demand. This suggests a perception by government and the private sector that management rather than capital investment in new assets brings a better return on investment.

There is a greater volume of health related factors than was anticipated.

Many of these are concerned with preventing emergencies through effective public health management.

Information and Knowledge Management factors show a very practical focus around awareness and understanding of risks.

Across cities, there is a strong emphasis on factors related to Urban Planning, Information and Knowledge Management, and Capacity and Coordination. The vital role of city leadership, coordination and decision making is clearly recognised by all six case studies.

There is an unforeseen volume of transport and communication factors. Their focus is strategic rather than taking an operational perspective on critical infrastructure.

Flood risk management is important to all cities, regardless of their previous history of flooding.

Food supply is identified as an essential factor, despite the fact that this is not usually seen as a centralised responsibility of a city.

Sub-themes around Law Enforcement show interest in approaches to enforcement, and not just the results.

Community participation is linked to increased pride and ownership in the city. This is believed to contribute to improved cohesion and a willingness to support others in times of stress.

Factors related to traditional disaster risk reduction and disaster management are applicable within most themes, clearly demonstrating the broader scope of resilience.

Factors of resilience

There is a clear hierarchy in the way consultees discuss the factors of resilience across the fieldwork cities. Of the four meta-themes, Asset Management is the least frequently discussed¹³, with around half as many factors as City Strategy and Survival and Wellbeing. In turn, Social Enablers comprises around twice as many factors again. This prioritisation is also evident from the case studies. **This suggests that the social and strategic factors are considered more crucial for urban resilience than the physical factors. Alternatively, the implication may be that there is more to be done to create resilience in the social and strategic elements of city operations, than there is in the city's physical assets.**

The distribution of factors across consultee groups follows a pattern that could be expected. For example, government stakeholders mention Strategy and Asset Management more frequently, since these areas are clearly within their remit and experience. However, lower income stakeholders are largely interested in factors related to Survival and Wellbeing and Social Enablers, which are far more within their realm of experience. **This highlights a disparity between the way different groups prioritise factors, and the need to appreciate the full range of values held by individuals across the city when developing a strategy for resilience.**

It is clear from all of the case studies that there is an important role for government, business and civil society in creating urban resilience. Consultees have a clear understanding about when, and in what capacity, each group could contribute to resilience efforts. For example, business interests in economic sustainability make the business community ideally placed to help with recovering business activity and restoring livelihoods. In a resilient city, it is suggested that all three groups will complement each other in developing a comprehensive approach to manage shocks and stresses. Their roles are seen to align with their core interests and areas where they have the greatest capacity.

Further insights are available from the terms used by consultees to define factors of resilience. Trust is highlighted across all cities in a number of different contexts, including trust in government; trust in communities; trust in information/communications; and trust in law enforcement. This is an important finding, demonstrating the essential importance of **trust as the foundation for many factors of resilience.**

⁽¹¹⁾ Even taking into account other physical factors found in other themes (due to their purpose rather than their quality) physical assets represent less volume of factors.

Shocks and stresses

More of the factors generated by the fieldwork are related to stresses than to shocks. However, the understanding of shocks and stresses varies both by city and by consultee. For example, consultees in Cape Town note that fires and floods in informal settlements may be viewed either as a shock or a stress, since they are such regular occurrences. Similarly in Surat, some consultees view flooding as a stress while others view it as a shock. In Semarang, consultees highlight the interaction between stresses, which can trigger a tipping point whereupon a shock occurs. The shifting interpretation of shocks and stresses highlights the need to discuss both concepts together, and not to disaggregate conversations about shocks from those about stresses.

Consultees in ‘shock cities’ identify quite different factors of resilience than those cities that are viewed as ‘stress cities’. Understandably, there is greater focus in ‘shock cities’ on factors related to emergency preparedness and response (e.g. emergency communications, emergency medical support). In ‘stress cities’, there is a focus on factors related to the particular stresses that have been experienced locally (e.g. law enforcement in Cali, urban planning in Cape Town). **Cities define their own entry point into the discussion. There is a need to promote a more integrated approach to resilience and understanding of potential risks, to ensure that cities are prepared to deal with uncertainty rather than targeting unique recent issues.**

What this says about urban resilience

The analysis shows that urban resilience is a complex universe of themes, with further themes, trends and ideas nested within it. This universe encompasses elements of sustainable cities, liveable cities, smart cities, and DRR, but combines these through a particular lens.

Appendix B provides a narrative describing how each of the themes identified from the fieldwork can contribute to urban resilience. It is clear that there is a considerable level of interaction between the themes, in terms of the outcomes they can help to promote for city resilience. For example, Essential Needs, Health Management, Livelihood Support, Community Connectivity and Economic Sustainability all converge to enable individuals to access the resources needed to support themselves and their families through periods of shock or stress. **This demonstrates that urban resilience cannot be approached in silos. The definition of resilience demands a cross-sector perspective. This also suggests that shrewd cities can capture multiple social, economic and physical resilience benefits from individual actions.**

(13) Even taking into account other physical factors found in other themes (due to their purpose rather than their quality) physical assets represent less volume of factors.

The fieldwork supports the qualities outlined in the Research Report Volume 1: Desk Study. Physical themes can commonly be described in terms such as diverse, integrated and robust, while resourceful, inclusive and reflective are more often applicable to the social and strategic themes. Themes of all types can comfortably be described as adaptive and accepting of uncertainty and change, indicating the universal importance of these qualities.

The fieldwork demonstrates that no city perceives that it has done all that it can to promote resilience. While the attitude of consultees is more positive in some cities than others (for example, more of the factors generated in Semarang and Surat are items that individuals feel are already present in their city, compared with items that are absent), it is clear that there are gaps in every city's approach. **This suggests that resilience is an ongoing process, rather than a fixed end-point.**

The research also confirms that resilience can be evident at multiple scales, from the individual, to the neighbourhood or community, to the city scale and beyond. Each of these scales – and the relationships between them – are seen to be critical to the overall resilience of a city. The research highlights that the interaction between scales is bi-directional. For example, consultees in Surat speak of how the government benefits from actions at the community level, while individuals benefit from the support provided by government. **This highlights the importance of actions taken at every scale to create an integrated approach to resilience.**

Key messages for the City Resilience Framework

The analysis highlights items that should be captured in the key functions of a resilient city. The sub-themes and other trends can inform the definition of ‘indicators’ and ‘variables’.

Particular messages to be considered for the City Resilience Framework (CRF) include:

There is a need for the functions to recognise the capacities, or capabilities, of a city with respect to resilience, in addition to physical aspects of the city. For example, the city’s capacity and coordination, strategic planning capabilities, and ability to leverage knowledge and financial resources, are as significant (if not more so) than elements like physical infrastructure and resource availability.

The indicators of the framework should endeavour to capture the various themes and sub-themes. For example, the fieldwork highlights that there are many disparate factors within a broad characteristic like ‘Safeguards human life’¹⁴ (e.g. health management, urban planning, information and communication, etc.), which are clearly important to cities in their own right and should not be hidden by a succinct, high level title.

The articulation of indicators should ensure that the full ‘universe’ of resilience can be captured by the CRF, incorporating the values of all city stakeholders. For example, an indicator related to ‘cross-sector alignment’ should be articulated in such a way as to enable the inclusion of variables relevant to business, civil society and government sectors.

The CRF should be communicated in a way that captures the interrelationships between characteristics. These interrelationships are critical to enable an integrated and comprehensive approach to urban resilience, and will help cities to understand how their actions in one domain can contribute to resilience elsewhere.

The CRF should capture the multiple scales at which resilience can be perceived, including individual, community/neighbourhood, and the city level. Different scales may be perceived within a single characteristic. For example, the provision of government-funded housing may occur at the city scale or above, while the benefits are received by households and individuals. The relationship between activities at different scales should be understood through the CRF.

(14) City Resilience Index, Arup, December 2013.

Opportunities for further research

The limitations of this research are outlined in Section 2. These limitations influence the completeness of the information that can be derived from this piece of work alone, and open opportunities for further research.

There are some widely recognised factors of resilience that have not been identified through this fieldwork. For example, the use of remittances as a form of individual financial support is not mentioned in any of the case study cities, but may be relevant in other locations. The context of the chosen cities also excludes major shock and stress situations, such as terrorism (for example), which in other cities may give rise to additional specific factors of resilience. Further investigation of these “missing factors” is needed to ensure a comprehensive set of resilience indicators and variables. Future research could focus on a wider range of cities across all continents and with more varied experiences of shocks and stresses. Work with the 100 Resilient Cities will help to support validation of the findings.

The differences in participation rates for consultees from different sectors is another important limitation to take into account. Further targeted research would be useful to gather deeper insight into the priorities of different groups. It is particularly notable that only 10% of consultees were from lower income groups. This research exercise could be repeated with low income groups, leveraging relationships with organisations working specifically with these groups (for example, Slum and Shack Dwellers International). This could also be applied to deeper research into the private sector.

Appendices

- A. List of codes applied to factors
- B. The themes and resilience
- C. Comparing shock and stress cities
- D. Cities and their priority themes
- E. Checking themes
- F. Fieldwork consultation questions

Appendix A - List of codes applied to factors

- Source city, country and region, i.e. where the interview, discussion or workshop took place
- Exact source name, organisation and role, i.e. who was the speaker
- Source actor by type (business, government, civil society/public), i.e. affiliation of the speaker
- Dominant hazard in source city, and specific shocks and stresses, i.e. the hazards, shocks and stresses that the interviewee perceived were most significant in their city
- Type of factor, i.e. Asset or Practice/Behaviour
- System in the city that is most affected by the factor, e.g. Transport, Education, Housing, etc.
- Concept with which the factor aligns, i.e. Strategy, Asset Management, Survival and Wellbeing, Social Enablers
- Theme with which the factor aligns, i.e. Urban strategy, planning and design, Economic sustainability, Law enforcement, etc.
- Cluster with which the factor aligns, i.e. City monitoring and data management, Livelihood opportunities, Policing to promote safety and security, etc.
- Trend with which the factor aligns.

Appendix B: The themes and resilience

Essential needs provision

Access to housing, water, energy and food is as critical for survival during normal conditions as it is during a shock or stress. Where provision of essential needs is inadequate to meet daily requirements, individuals will be exposed to ill-health that undermines their ability to support themselves and their families. In the event of a shock, provision of essential needs will be reduced immediately in all areas of the city, but disproportionately affecting communities who already face hardship. Sufficient resources and services are essential at all times to protect human life and allow communities to thrive. Essential needs provision is therefore both a *preventive* and a *reactive* approach to resilience, since it seeks to ensure that people are healthy and strong enough to resist the impacts of shocks and stresses both in preparation for and in response to an event.

Essential needs provision embraces qualities such as:

- **Accepting of uncertainty and change**, by ensuring that citizens can access the basic resources that will help to support them through unanticipated changes.
- **Robust**, since it emphasises the safety and durability of the housing and infrastructure that supplies essential resources to people.
- **Resourceful**, since it considers decentralisation and redundancy in systems to enable sustained access to essential supplies.
- **Diverse**, since it considers access to alternative supplies of resources.
- **Inclusive**, since it emphasises the ability for all communities to access essential resources, particularly the most vulnerable groups.

Health management

A resilient city supports the health and welfare of its citizens, ensuring their ability to maintain the strength and independence needed to survive and thrive through disruption. General maintenance of physical and mental health is a *preventive* approach. Healthy people will be better prepared to withstand a sudden shock or gradual stress that challenges their welfare. Healthy people are also better able to retain a livelihood and participate in social networks, which help to equip them with the financial resources and social relationships that will support them through troubled times. Health management is also a *reactive* approach to resilience, since it considers the availability and adequacy of emergency medical facilities, practitioners and medications that are required to restore health and save lives following an event.

Health management exhibits qualities of resilience such as:

- **Accepting of uncertainty and change**, since general healthcare provision has the objective to maintain a population that has the strength to cope with unexpected events.
- **Resourceful**, due to the availability of surplus capacity in health services to absorb surges in demand following a disruption.
- **Diverse**, due to the range of activities involved in mitigating health risks through education, monitoring and controls, physical and mental health support, and emergency treatment.
- **Inclusive**, due to the widespread and affordable provision of decentralised health services.
- **Integrated**, since individual health management activities form part of a coherent programme of prediction, prevention, treatment and cure.

Livelihood support

Shocks and stresses can have a strong impact on the ability of city residents to earn a living and provide for the essential needs of their families; the poor in particular are disproportionately affected. Fostering the development of new businesses and economic activity and equipping residents with the tools to seek different livelihood opportunities can help them to accept or adapt to change. Providing financial support after a shock also helps residents whose livelihoods may be damaged or destroyed. Decent livelihoods are thus essential to the resilience of individuals and their ability to cope with

shocks and stresses.

This theme includes preventive practices, such as skills development and microcredit to help individuals pursue diverse livelihood opportunities, as well as reactive practices like providing financial support after a disaster. It embodies the qualities of **diverse** livelihood and employment opportunities, **inclusive** programmes that enable equal access to opportunities, and skills and capacity development that enables individuals to **accept uncertainty and change** and pursue alternative livelihood opportunities.

Law enforcement

Social unrest, crime and disruption are divisive to communities, causing a breakdown in social cohesion which the fieldwork shows is essential to city resilience (see 'Social capital' for further explanation).

Law enforcement is therefore a *preventive* mechanism to avert the social stresses caused by crime and promote a culture of unity, community efficacy and trust. This is more conducive to the economic and social development of the city. Safety, security and stability mean that communities are better prepared to help themselves and each other during wider stresses and shocks.

Law enforcement is also a *reactive* approach to ensure that safety, security and stability are maintained or quickly restored during a shock or stress. This is intended to ensure that people and property are protected from further harm, and able to collaborate in the recovery process.

Law enforcement promotes qualities such as:

- **Resourceful**, due to its use of multiple human resources and programme types to provide social support and regulation throughout the city.
- **Inclusive**, due to its consideration of local social vulnerabilities and provision of targeted support in at-risk areas of the city.

Social capital

Social capital represents a *preventive* approach to resilience. Integrated, cohesive and well organised communities are better prepared to collaborate in the event of a stress or shock. Individuals who are already involved in local community initiatives are more likely to mobilise during times of stress to help their neighbours. Operating collectively, communities are better able to access essential resources and leverage support from government, business and NGOs. Social capital can manifest itself *reactively* in the aftermath of an event in the form of ad hoc community organisation, however this is more likely in neighbourhoods that already exhibit a degree of social capital.

Social capital promotes qualities such as:

- **Accepting of uncertainty and change**, because supportive communities are better able to absorb the impacts of stresses and shocks.
- **Resourceful**, because individuals are able to share resources within their networks and collaborate to access support from outside of the community.
- **Inclusive**, because – by definition – social capital implies an ability for all individuals to participate, regardless of socio-cultural identity.
- **Integrated**, because social capital seeks to avoid segregation of community groups.

Information & knowledge

Information and knowledge is both a *preventive* and a *reactive* approach to resilience. Under normal conditions, education provides citizens with the skills and knowledge needed to obtain a livelihood and secure the financial resources that will help them to meet essential needs and provide support through periods of stress or shock.

Combined with access to information, education also enables people to understand risks and adapt to change. This is likewise important for city governments, businesses and service providers. Timely and accurate information will help all stakeholders to take the actions necessary to protect people and property from harm. By sustaining the flows of information during and following an event, people will continue to know how to react. The fieldwork suggested that information can help to maintain social

stability and deter civil unrest during a disaster (such as in the case of Concepción).

Information and knowledge promote qualities such as:

- **Adaptive**, because education enables people to understand alternative possibilities for the future and adjust behaviour accordingly.
- **Resourceful**, because information and knowledge provide people with greater capacity for decision making and planning.
- **Diverse**, because information is channelled through a range of media.
- **Inclusive**, because information and knowledge are targeted to the needs of all members of the community.

Capacity and coordination

The capacity and coordination of city leadership influences a *preventive* and *reactive* approach to resilience.

An open, transparent and committed leadership promotes trust in government. This can help to foster a spirit of collaboration between government, business and civil society, which supports social stability and prevents disintegration of the city's social fabric during periods of stress or shock. A collaborative approach also encourages innovation in cities, which can lead to efficient solutions that may improve city operations and promote resilience.

Joined-up decision making between government agencies helps to facilitate knowledge sharing, encourage mutually supportive and cost-effective city initiatives, and enable rapid identification and rectification of potential problems. Each of these outcomes will contribute to better city management and an improved ability to react to stresses and shocks. A well-resourced and coordinated city government is better prepared to respond quickly and effectively on the ground, and to access support from external organisations.

Capacity and coordination bring qualities of resilience such as:

- **Adaptive**, because joined-up government increases knowledge sharing between agencies and identifies the most effective solutions in response to changing conditions.
- **Resourceful**, because an open and collaborative city government has broader access to the ideas, resources and expertise of business, civil society and other tiers of government.
- **Integrated**, because coordination discourages a silo-ed approach to decision making and actively promotes integrated planning and response.

Critical infrastructure management

A resilient city relies on robust physical infrastructure systems, which are capable of delivering essential services efficiently, withstanding shocks and stresses, and absorbing unusual surges in demand. Infrastructure can be designed and constructed for robustness, but regular maintenance, management and emergency planning are necessary to secure a consistent level of good performance for the long term. This is a *preventive* approach to avoid failures in the delivery of essential city services.

The fieldwork suggests that critical infrastructure management will promote city systems that are:

- **Accepting of uncertainty and change**, since infrastructure managers are equipped with the skills to manage uncertainty and prepare for unpredictable events.
- **Robust**, as a result of infrastructure design, construction, operation and maintenance practices.
- **Adaptive**, due to an established cycle of infrastructure refurbishment and renewal.

Environmental management

Environmental management is proposed as a *preventive* approach to urban resilience, which helps to moderate the impacts of natural hazards and thereby safeguards people and property from harm. For example, green environments can help to mitigate excessive urban heat; facilitate stormwater drainage; absorb the impacts of storms and tidal surge; and remove dangerous contaminants from air

and water. Conservation of ecosystems within and surrounding cities is essential to retain the absorptive capacity of the natural environment and to avoid the escalating costs of man-made remedies or defences. This can be viewed as an 'ecosystem services' approach to resilience. Based on the primary data, environmental management has the following qualities that are relevant to city resilience:

- **Adaptive**, meaning that changing circumstances can be absorbed within the normal structure and function of the ecosystem. Some ecosystems also neutralise changing conditions by filtering contaminants.
- **Robust**, to withstand the impacts of hazard events without sustaining significant damage or loss of function.
- **Diverse**, meaning that they offer multiple attributes that contribute to risk mitigation. For example, a coastal wetland displays a gradual ecological succession from an emergent swamp stage through sedge grass, shrubs and woodland. Each stage of succession offers different capacities to absorb the impact of tidal surge.

Urban strategy and planning

Urban strategy, planning and design are relevant to city resilience due to their role in anticipating future change and potential stresses, and promoting a shared understanding of local risks, challenges and priorities across government, business and civil society. This facilitates coordination between sectors; provides guidance for decision making; and ensures that policies, regulations, codes and standards are mutually supportive in moving the city towards a common goal. This is manifested in land use, development and design decisions that safeguard people and property from harm. By their nature, strategy, planning and design are *preventive* practices, with the intention to avoid the onset of severe stresses or shocks to the city (a 'leading' attribute of resilience). However, the research also highlights the need to be *reactive*.

The primary data gives rise to desirable qualities of urban strategy, including:

- **Reflective**, due to the iterative nature of planning which learns from past experience and responds to new evidence or understanding.
- **Robust**, due to the objective for urban planning to ensure safe, well-conceived and constructed places and spaces.
- **Inclusive**, due to emphasis on equity in the way all communities are planned and provided for.

Economic sustainability

A city with a strong, healthy economy that is integrated with the regional and global economy will be better able to tolerate the impact of shocks and stresses. Municipalities need to have a degree of economic self-sufficiency so that they can invest in their own future and respond to shocks and stresses, but they also need to be able to access funding quickly from central government for major disasters. The private sector also needs to be prepared to cope with shocks and stresses through risk management and business continuity planning; this will also help to ensure the health, safety and livelihoods of employees are protected.

This theme includes preventive practices, such as business continuity planning, inward investment programmes and regional/global economic integration, as well as reactive practices like accessing and utilizing disaster funds efficiently and effectively following a disaster. It embodies the qualities of **diverse, integrated** and **robust** economy, and business continuity planning to help businesses **accept uncertainty and change**.

Accessibility

Accessibility and interconnectivity are relevant to city resilience both as a *preventive* and a *reactive* approach.

As a preventive approach, the availability of strong transport and communications infrastructure within a city enables citizens to access livelihoods, key services, information, friends and family. This means that citizens are better able to accumulate the financial and social supports that will sustain them through a stress or shock. In parallel, good transport and communications infrastructure help the city

to attract new businesses that will contribute to economic growth and diversification (see 'Economic Sustainability' for further explanation).

As a reactive approach, transport networks are essential to support evacuation from cities in the event of a shock, and to allow emergency services to access affected areas. The importance of communications systems in advance of and following a disaster is also highlighted by the 'Emergency communications' cluster detailed above.

Based on the primary data, urban accessibility and connectivity will exhibit the following qualities that are relevant to city resilience:

- **Robust**, to withstand the impacts of hazard events without significant damage or loss of function.
- **Diverse**, to ensure that there are multiple ways for the system to meet a given need and fulfil its function.
- **Inclusive**, to provide sufficient service levels to meet needs in all areas of the city.
- **Integrated**, to enable different infrastructure systems to work collectively and in mutual support of one another.

Appendix C – Comparing shock and stress cities

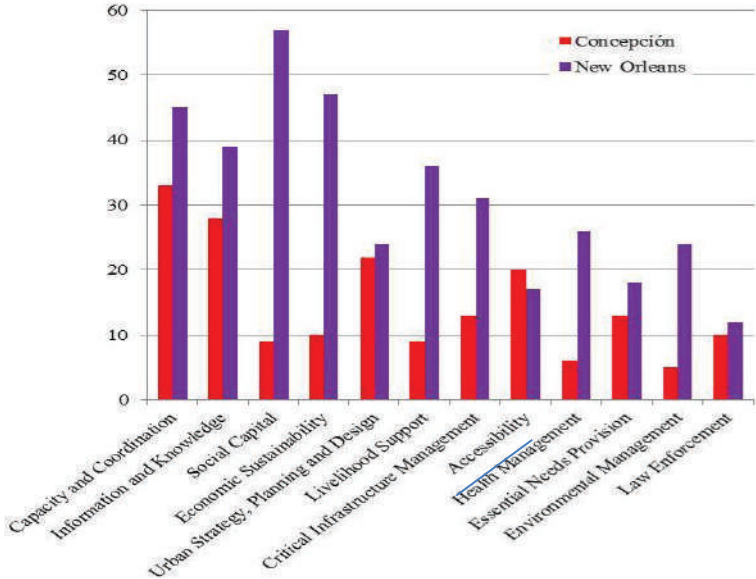


Figure C1: number of factors per theme per city (shock cities)

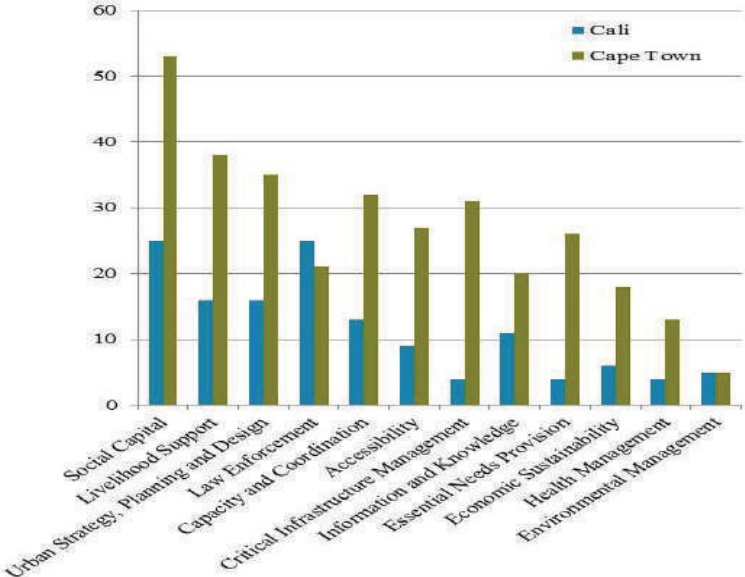


Figure C2: number of factors per theme per city (stress city)

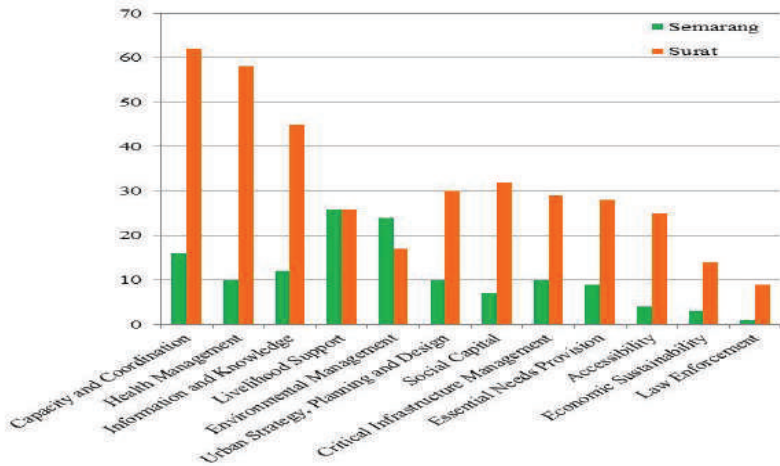


Figure C3: number of factors per theme per city (assumed stress city)

Appendix C – Comparing shock and stress cities

This section looks at whether there may be any correlation in priority of themes depending on whether cities are shock or stress cities¹. The figures show the number of factors per theme arranged in the order of total factors combined for each city.

Shock cities

Capacity and Coordination is the theme with the greatest number of factors and has a similar proportional representation in both shock cities. Strategy and planning, accessibility and law enforcement also have similar proportions although not so many factors. Otherwise there is an inverse relationship suggesting a negative correlation.

Stress cities

Law enforcement which has a moderate amount of factors, and environmental management, which has fewer share similar proportions. There is a possible negative correlation stronger than the positive correlations.

Assumed stress cities

Livelihood support has the strongest correlation. Environmental management is also high and appeared in the stress cities above, but this time there are more factors attributed to it.

Conclusion

Shock cities appear to have more common emphasis on themes than stress cities (50% compared to 17%). However, there is no obvious relationship between the themes and whether the city has more shocks or stresses. From this simple analysis there is an indication that there may be an inverse relationship between the selected cities. This could imply that other contextual factors are significantly more important.

The simple analysis has been carried out comparing number of factors grouped under each theme but the cities being compared had significantly different total numbers of factors. The study would therefore be improved if the proportion of factors per city was compared.

It should be noted that this is just an initial indicator of possible correlation. For further analysis, a statistical analysis looking at all six cities for correlations between cities would be helpful. The possible benefit of carrying out this analysis should be assessed with the fact that the six cities do not make a large enough sample size to draw any generalizable conclusions.

¹ The classification was based on our initial understanding before carrying out the fieldwork. The shock cities were the ones that had suffered extreme shocks.

Appendix D - Cities and their priority themes

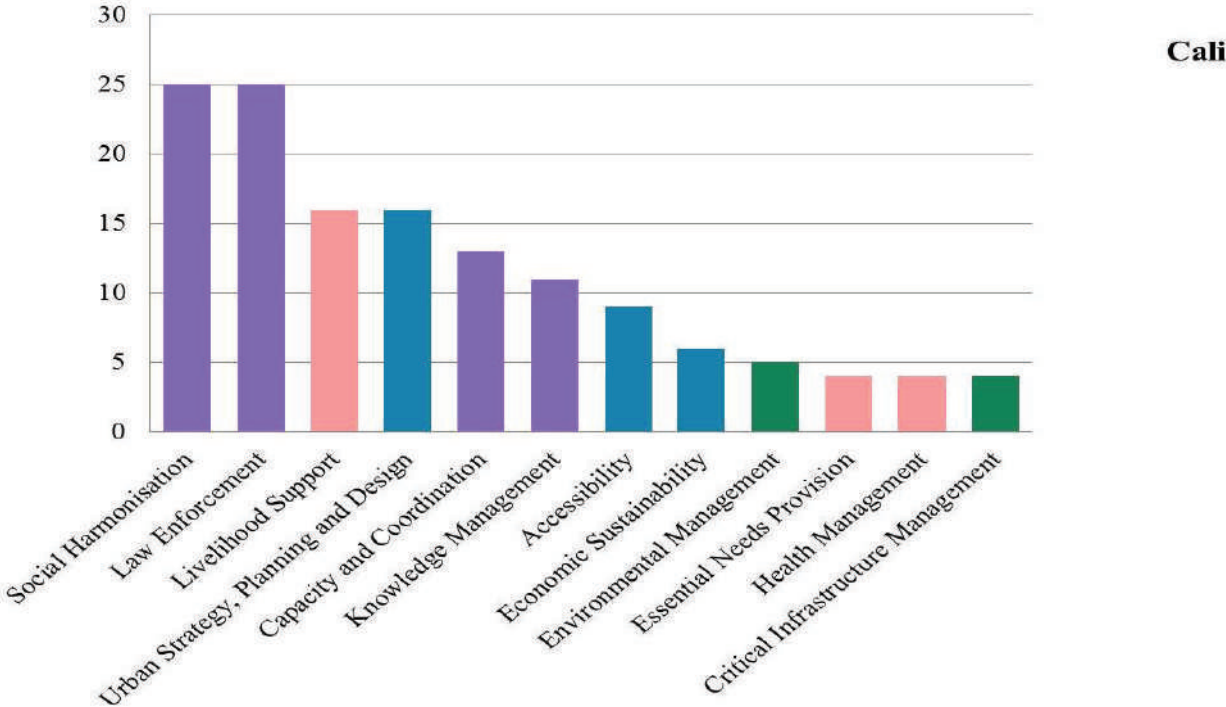


Figure D1: Cali – number of factors per theme

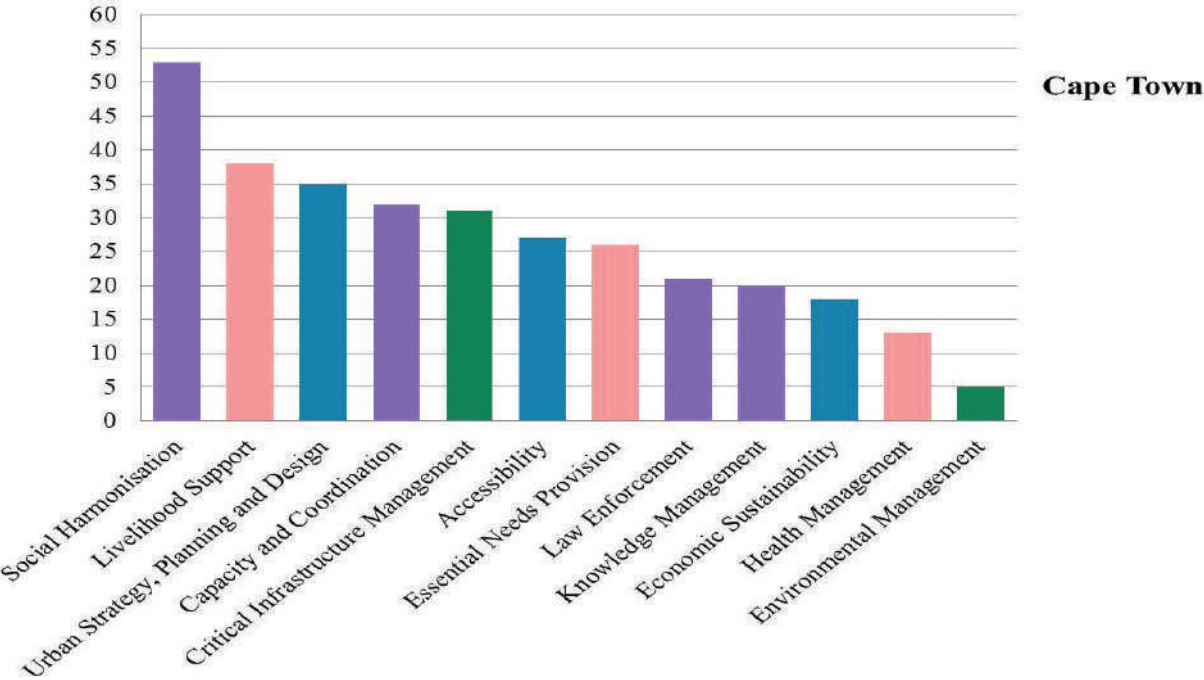


Figure D2: Cape Town – number of factors per theme

Appendix D - Cities and their priority themes

The figures included in this section look at the themes in order of number of factors by city. It forms a cross check of the themes against what was most critical to each city as perceived by the researchers. Themes are organised in order of the number of factors attributed to each of them.

Cali

- Social Enablers are the main area of focus for consultees in Cali.
- The dominance of Social Harmonisation and Law Enforcement reflects the experiences of civil unrest, violence and corruption in the city.
- Physical factors are rarely discussed by consultees in Cali: Environmental Management, Essential Needs Provision, Health Management and Critical Infrastructure Management are the themes for which the fewest factors were proposed.

Cape Town

- There is an even distribution of factors across meta-themes (illustrated by the alternating colours) in Cape Town. No single meta-theme dominates any other.
- The dominance of factors relating to Social Harmonisation may be due to the high proportion of civil society consultees engaged in the research in Cape Town.
- Factors related to Environmental Management receive significantly less attention than any other, with fewer than half the factors of Health Management (the second lowest).
- Individual level Livelihood Support is a major focus for Cape Town, whereas city-scale Economic Sustainability is one of the least discussed themes.
- Aside from Livelihood Support, consultees in Cape Town speak mainly about factors occurring at the city scale, and especially those in which government plays a major role (e.g. Urban Strategy and Planning, Capacity and Coordination, Critical Infrastructure Management)

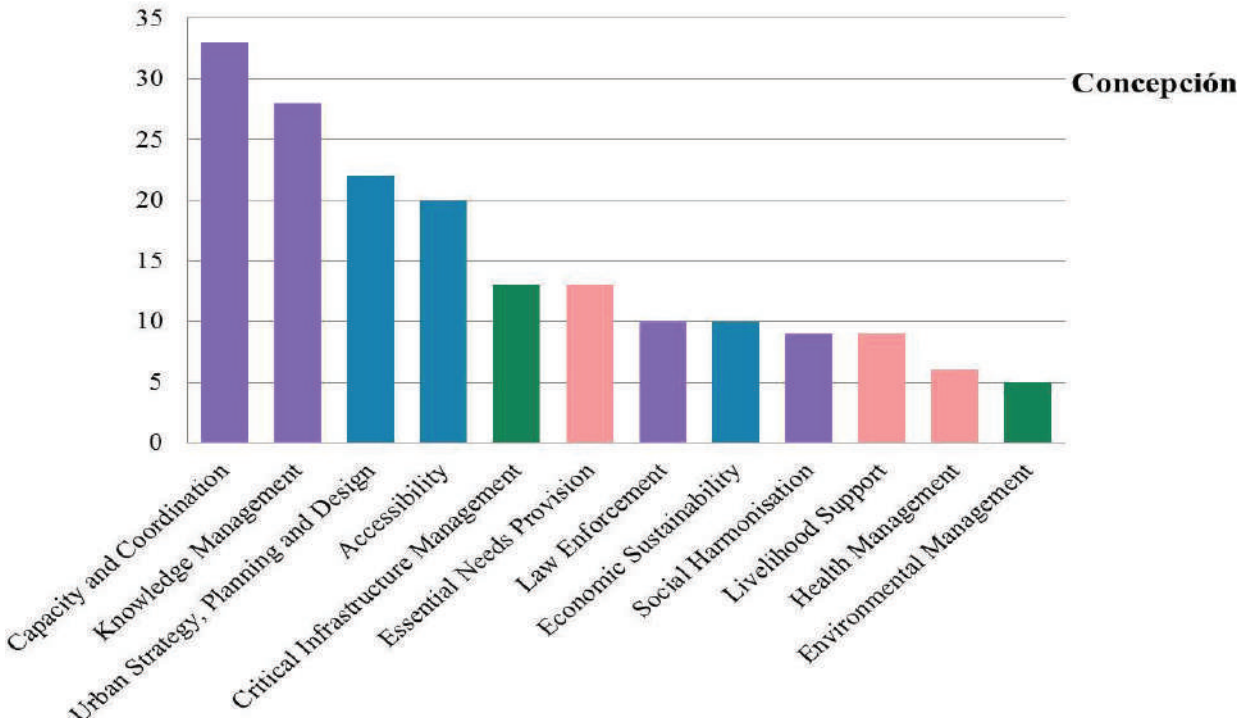


Figure D3: Concepción – number of factors per theme

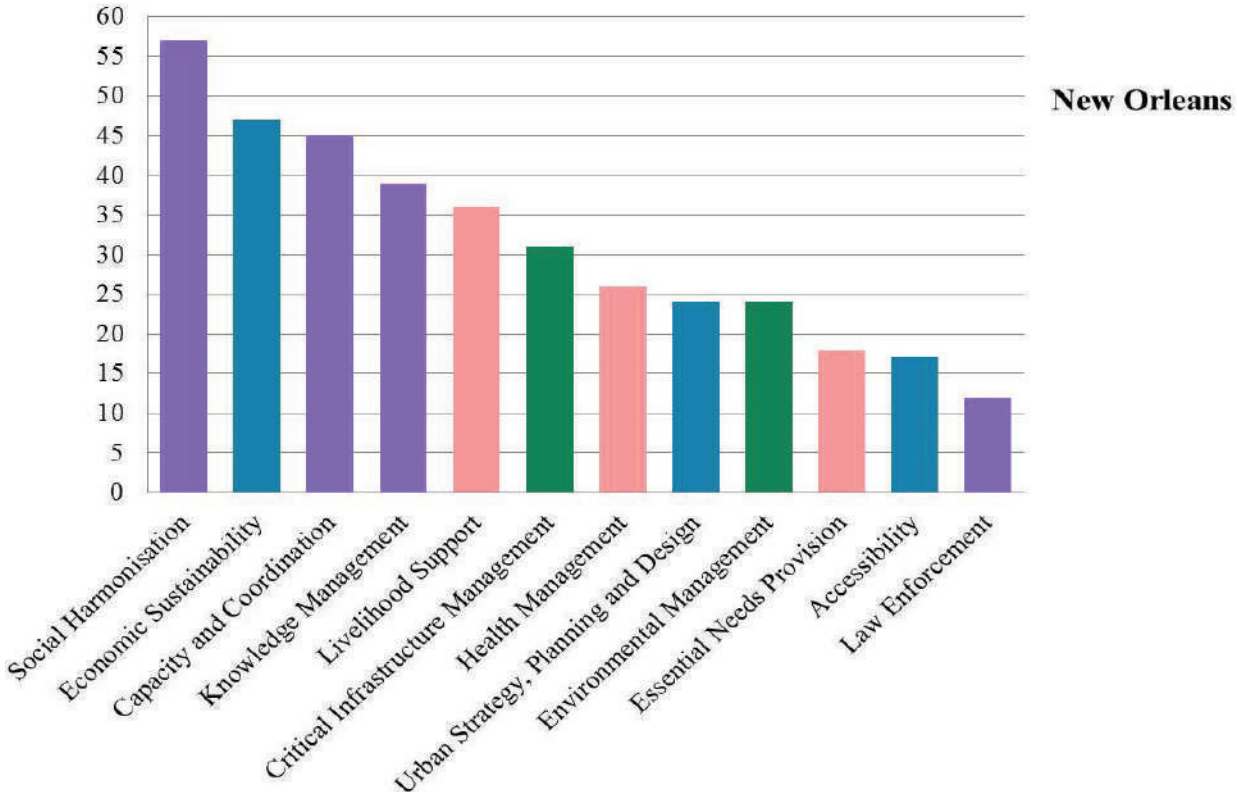


Figure D4: New Orleans – number of factors per theme

Concepcion

- Factors related to Social Enablers are prevalent in the data from Concepcion, which corresponds to the emphasis that came out in the interviews.
- The volume of Strategy factors and the minimal number of Survival and Wellbeing is more surprising.
- The emphasis on Capacity and Coordination and Knowledge Management is strongly reflected in the case study of Concepcion, which speaks of the breakdown in flows of information from government in the aftermath of the 2012 earthquake.

New Orleans

- There are a high volume of Social enablers for New Orleans as well as a focus on economic sustainability. This finding is in keeping with the interviews.
- The other themes are very mixed.

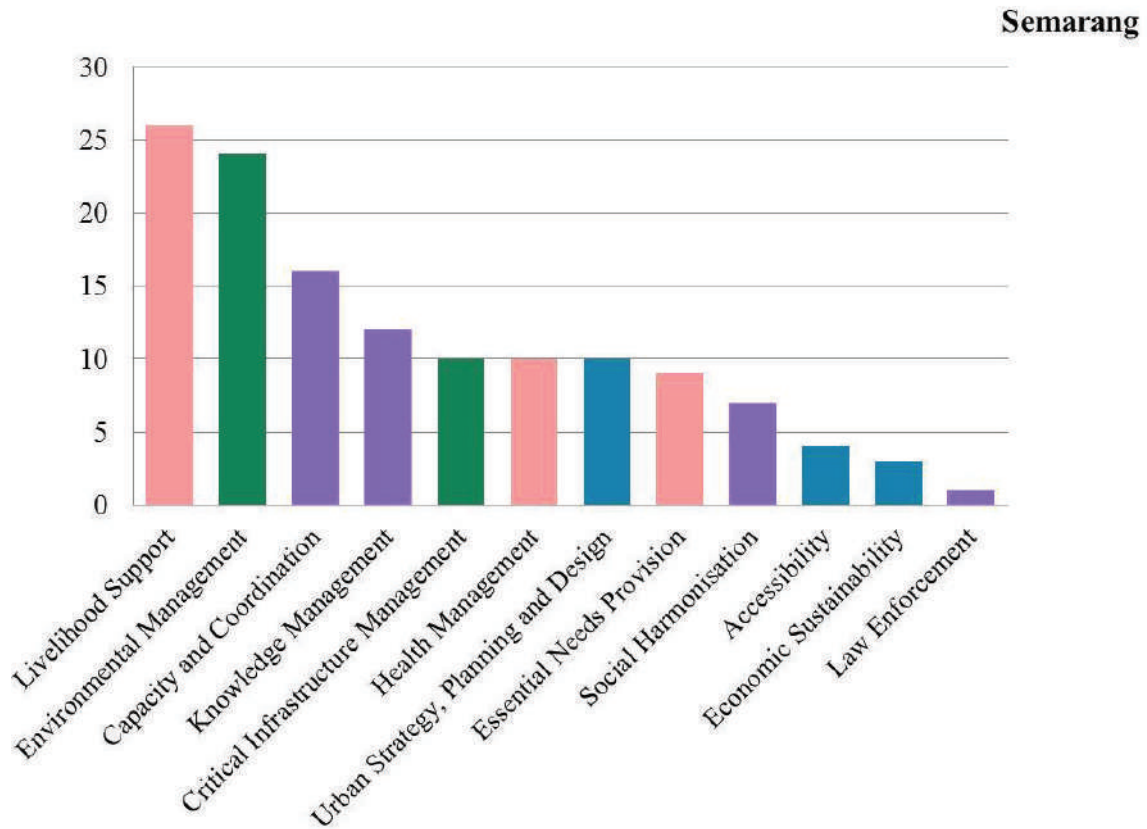


Figure D5: Semarang – number of factors per theme

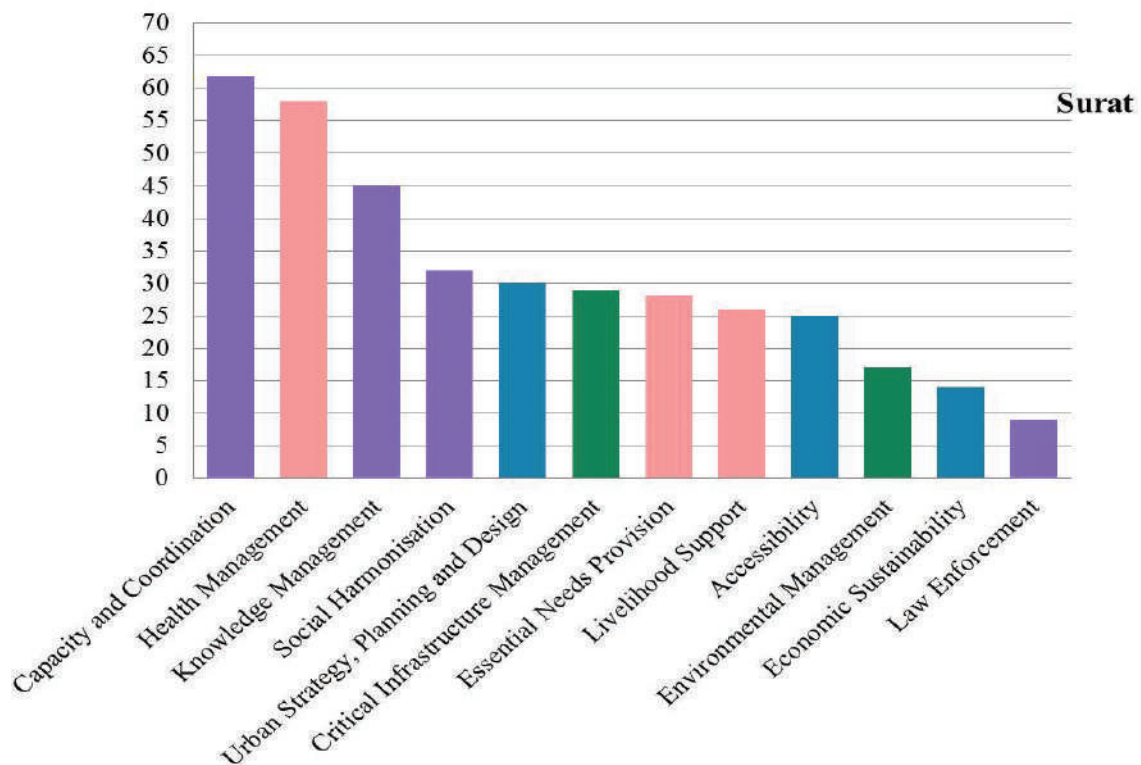


Figure D6: Surat – number of factors per theme

Semarang

- Semarang shows a very mixed combination of theme priorities.
- There are surprising few social enablers compared to other cities, although still a strong emphasis on Information and knowledge management and capacity and coordination.
- Livelihood support is the highest theme by volume. This is similar to the other stress cities, Cali and Cape Town.
- Environmental management is the second strongest theme. This is surprising given that it has been relatively unimportant to all the other cities. The researchers found that the consultees were highly aware of climate change and environmental issues, particularly the flooding. This was perhaps to the detriment of an awareness of other possible stresses. This may explain its dominance.

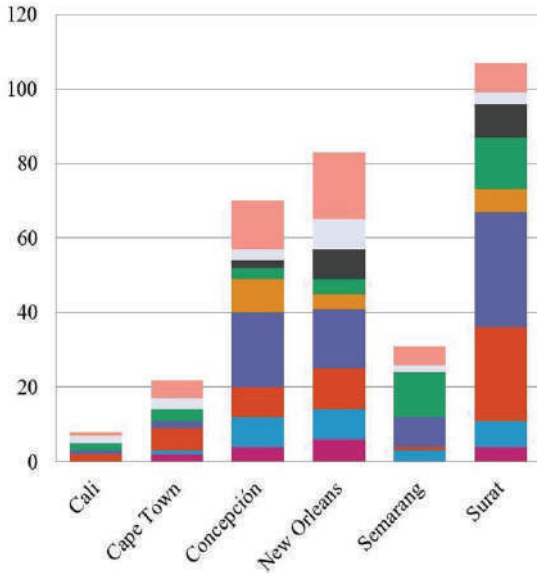
Surat

- High social enablers and health with corresponded to the interviews.
- Economic sustainability and law enforcement are low and probably relates to the relative confidence the consultees had in this area.
- Environmental management is low and while this is surprising given the issues that the city has with flooding, it does correspond to the interviews. The city has been very proactive in trying to control the flooding in recent years. There was very little mentioned about potential environmental benefits for the city.

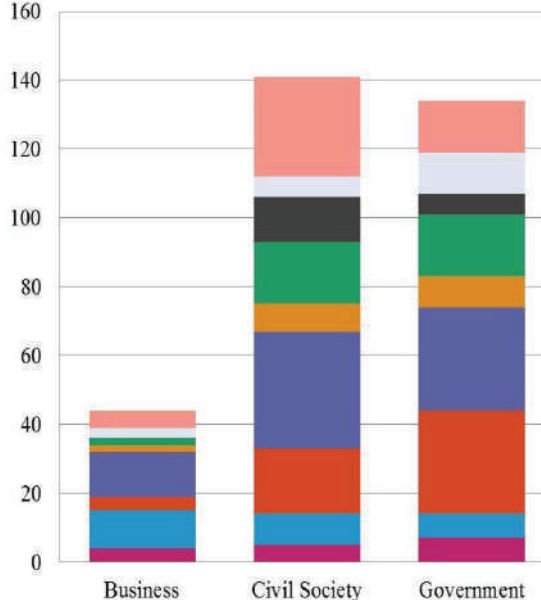
Appendix E - Checking themes

Disaster Risk Reduction (selective)

Number of Factors by City & Sub-theme

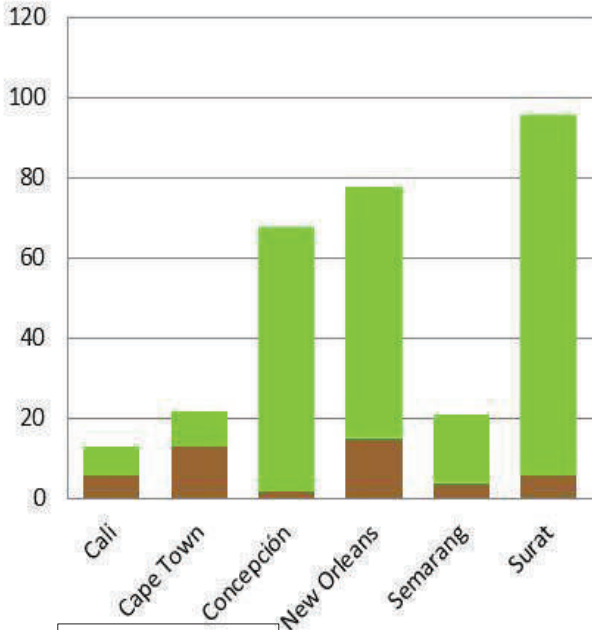


Number of Factors by Stakeholder & Sub-theme



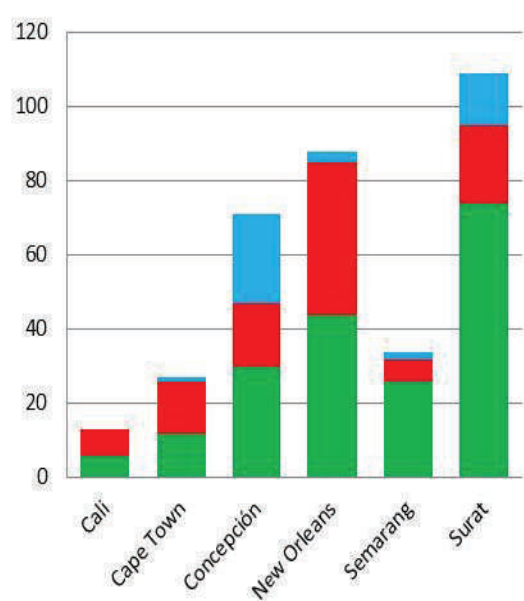
- Understanding information (why)
- Safeguards for critical infrastructure
- Medical facilities and practitioners for an emergency
- Flood risk management
- Emergency communications
- emergency capacity and coordination
- Data collection and information (what)
- Continuity of livelihoods following a shock
- Building codes and standards

Number of Shock / Stress Factors by City



- Shock-related
- Stress-related

Number of Factors In-Place or Missing by City



- Desired/Missing
- Implemented
- Not Clear

Appendix E - Checking themes

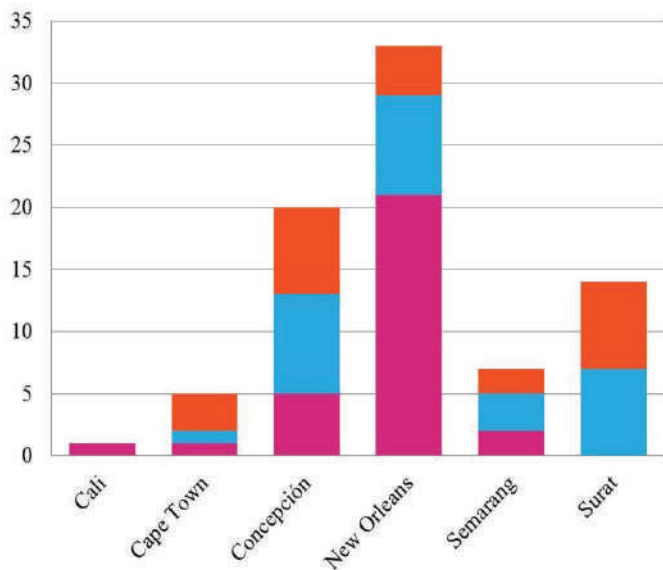
Several sub-themes could fit in other themes than where they have been placed. Some could have made their own themes. The following pulls together sub-themes found in different themes and analyses them with the same lenses as the comparative analysis. This gives us further insight into the factors and checks whether anything has been lost through the current structure of themes.

Disaster Risk Reduction (selective)

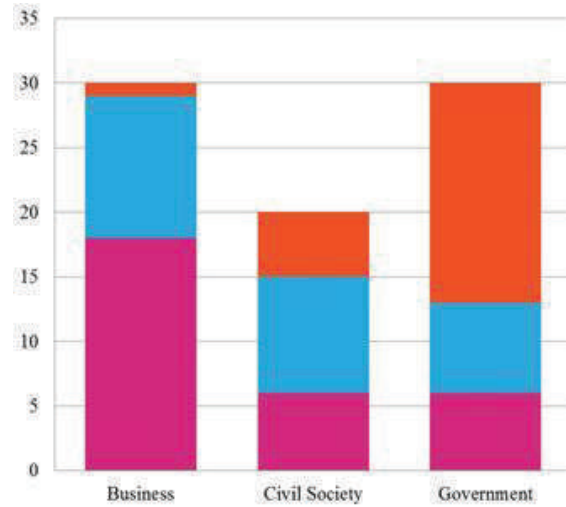
- This compilation combines all disaster prevention and management issues together.
 - Understanding information (IK&M)
 - Safeguards for critical infrastructure (CIM)
 - Flood management risk (EM)
 - Medical facilities and practitioners for an emergency (HM)
 - Emergency communications (Acc)
 - Emergency capacity and coordination (C&C)
 - Data collection and information (IK&M)
 - Continuity of livelihoods (ES)
 - Building codes and standards (USP)
- The shock cities have considerably more factors for this theme than do the stress cities.
- Civil society contributes slightly more factors than government, but both contribute significantly more than business.
- Overall there is a slight majority of factors seen as being in place rather than desired, although for New Orleans this is balanced (this tallies with the feedback from the interviews that some felt that the city was safer since Hurricane Katrina but equally others did not think so).

Continuity Planning

Number of Factors by City & Sub-theme

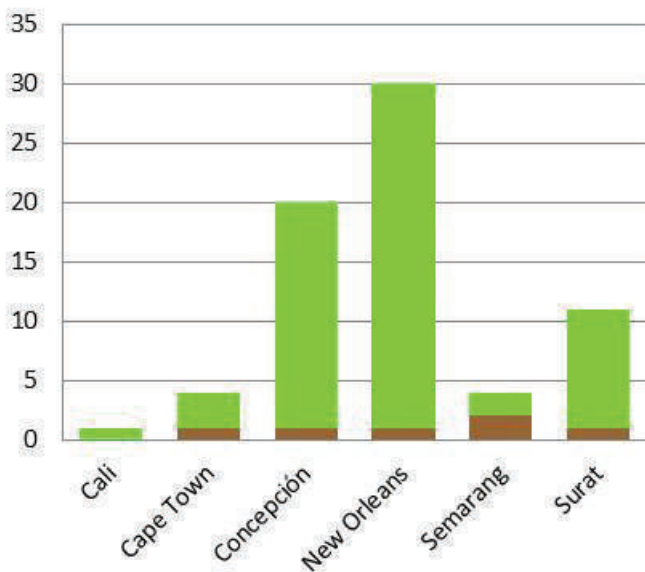


Number of Factors by Stakeholder & Sub-theme

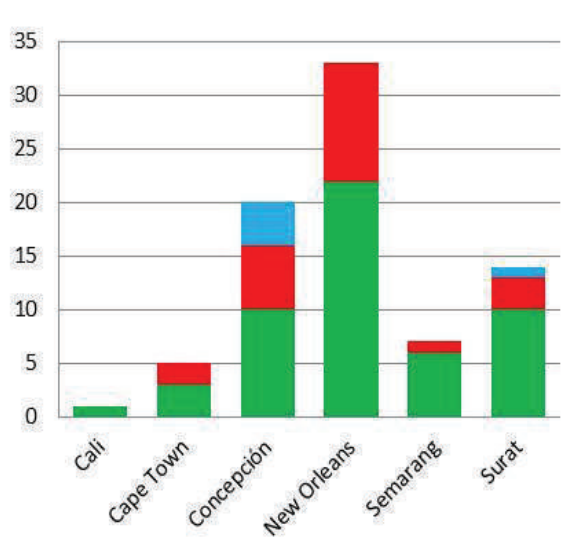


■ Continuity planning for critical infrastructure
 ■ Continuity of livelihoods following a shock
 ■ Business continuity planning

Number of Shock / Stress Factors by City



Number of Factors In-Place or Missing by City



■ Shock-related
■ Stress-related

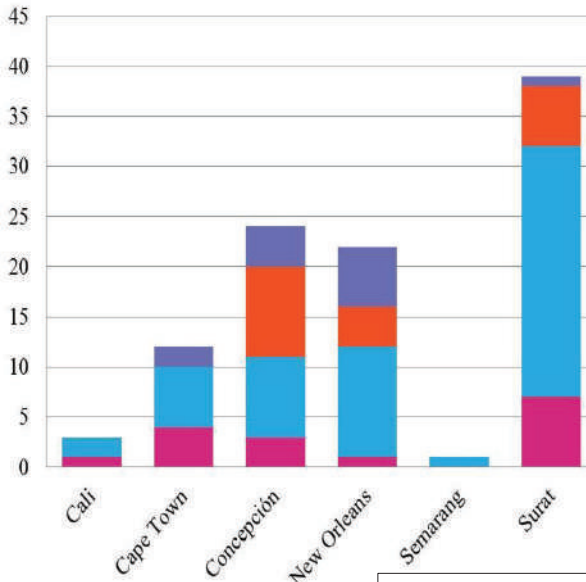
■ Desired/Missing
■ Implemented
■ Not Clear

Continuity planning

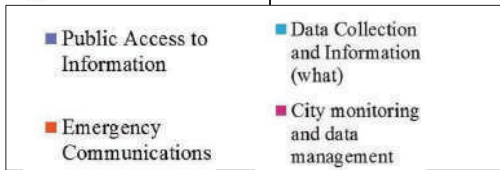
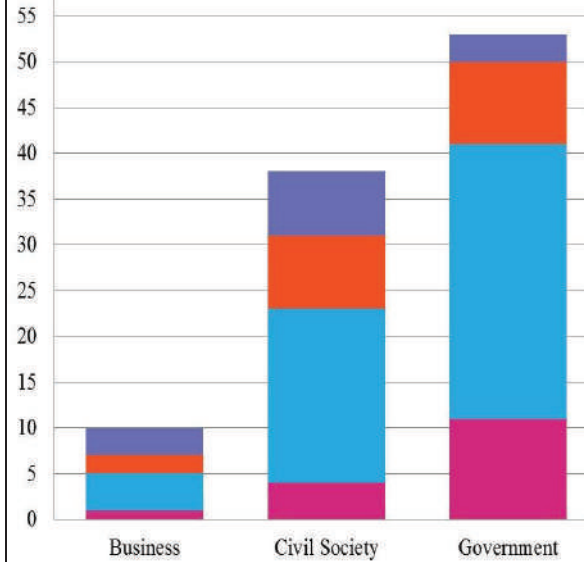
- This combination draws on continuity planning from 3 other themes: critical infrastructure management, livelihood support, and economic sustainability. It is highly dominated by relationships to shocks which is unsurprising given the purpose of continuity planning to keep things running during disturbances. Similarly, it is also seen as most critical by the shock cities.
- Business and government stakeholders see this as equally important but emphasise different aspects – business interests are largely to do with the economic sustainability as well as livelihoods, whereas government consultees focussed on critical infrastructure.
- There is a confidence in the cities that these measures are already in place.

Information

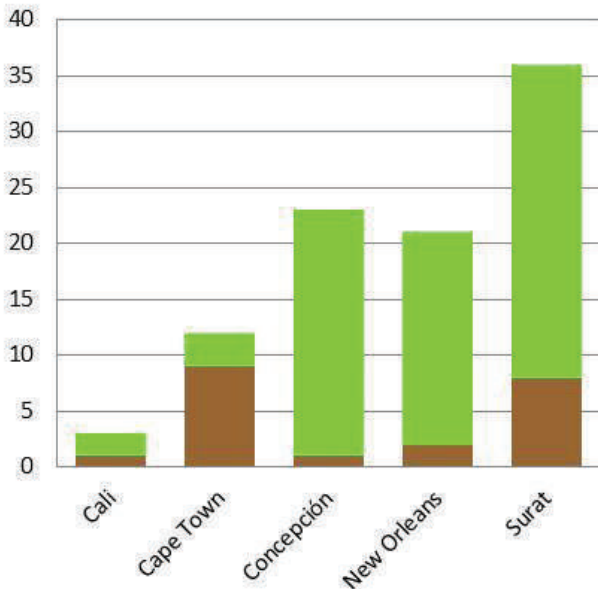
Number of Factors by City & Sub-theme



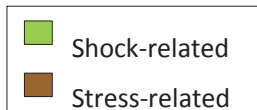
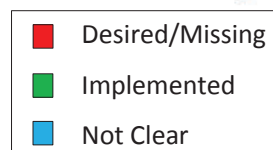
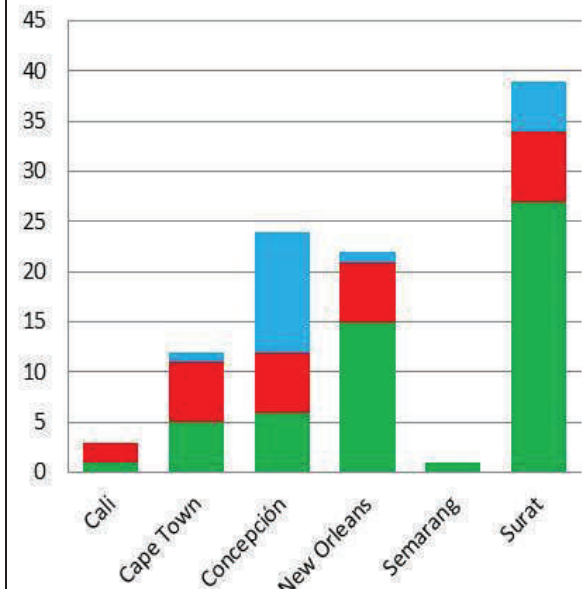
Number of Factors by Stakeholder & Sub-theme



Number of Shock / Stress Factors by City



Number of Factors In-Place or Missing by City

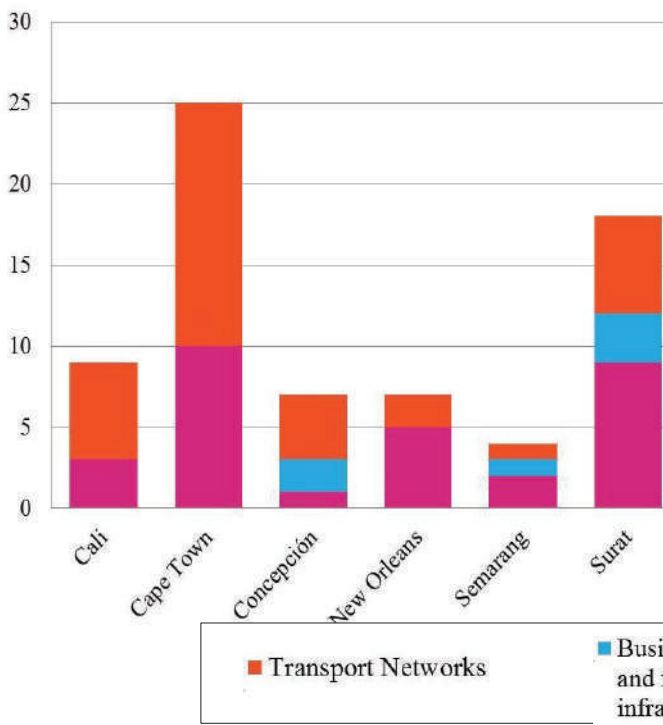


Information

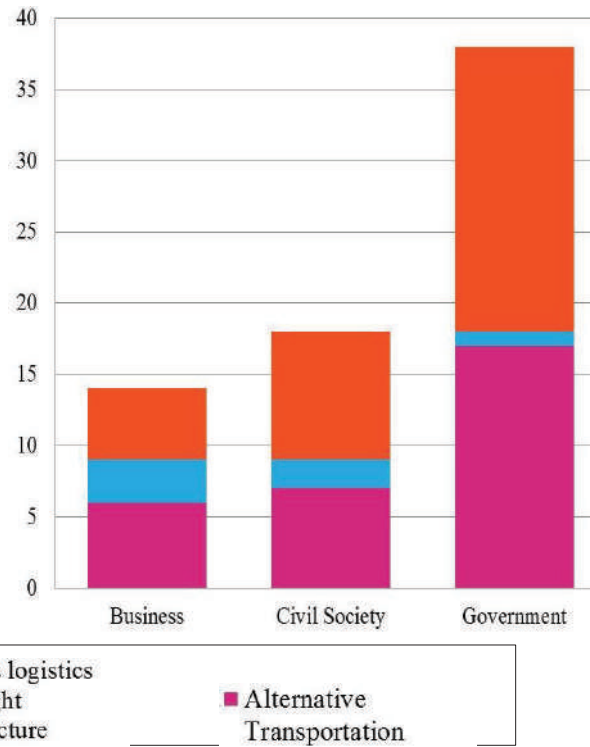
- Combines all of the information themes, including communication themes from Accessibility.
- This combination shows that Concepcion's value on information is higher than we might have seen in its disaggregated forms.
- It is still very related to shocks except in the case of Cape Town.
- New Orleans, Semarang and Surat are confident about measures being in place, but the others are more neutral. Concepcion especially, has a high number of factors which are unclear as to whether they were experienced or desired.
- Overall the emphasis by stakeholder group doesn't change.

Transport

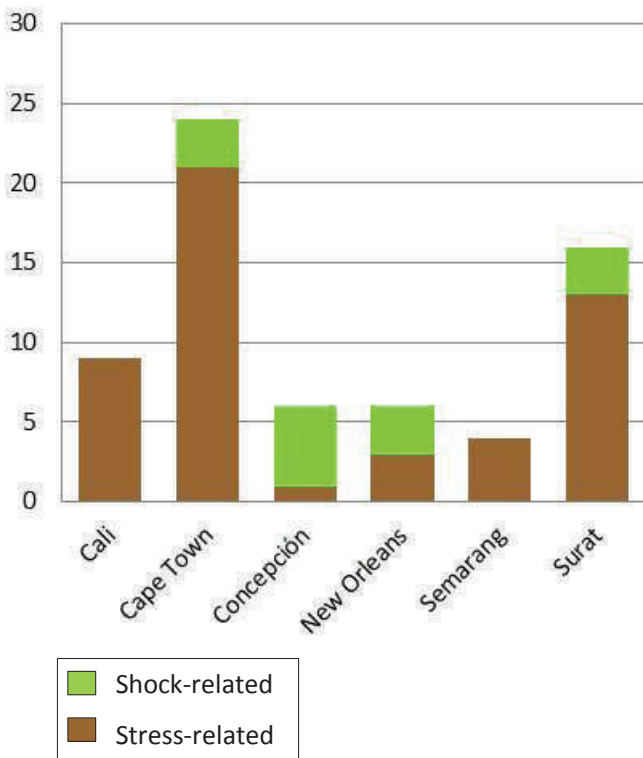
Number of Factors by City & Sub-theme



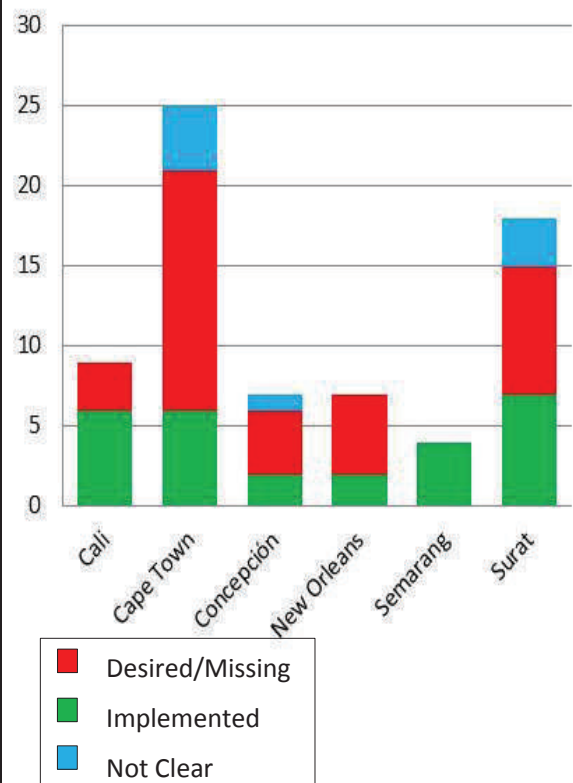
Number of Factors by Stakeholder & Sub-theme



Number of Shock / Stress Factors by City



Number of Factors In-Place or Missing by City



- Combines business logistics with other transport themes from accessibility and doesn't address communications.
- This mainly changes the emphasis of the shock cities of Concepcion and New Orleans which are not as focussed on transport as they are on communications.

Appendix F – Fieldwork consultation questions

1	Section 1: Who is talking?
1.1	Whose voice are they articulating?
1.2	What is his/her/their role in the city? What was his/her role during the studied event?
1.3	What does he/she require (both physical and non-physical) from other actors/functions of the city?
1.4	Is the performance of the city functions measured? If so, how?
2	Section 2: What are the stakeholder type perspectives of city <u>stresses</u>? (present)
2.1	What are the current stresses that the city suffers from? – emerging, permanent, and recurrent?
2.2	Do the stresses interfere with the functioning of the city? – if so, which functions?
2.3	How do the stresses impact your role? Others?
2.4	How are those stresses managed? What were the factors (physical and non-physical, positive and negative) that contribute to resilience?
2.5	Are there attempts to measure how the stresses are dealt with?
2.6	Which factors make more difference?
2.7	Who has control over these factors?
3	Section 3: What are the stakeholder type perspectives of city <u>shocks</u>? (past)
3.1	Please define the event/shock – what happened? What was the severity of this shock? Disruption or collapse?
3.2	How did the event play out over time? Go through a timeline that includes the following stages:
	o First 72 hours
	o Up to 6-8 weeks after
	o From 2-12 months after
	o 12-24 months onwards
3.3	How did it affect the functioning of the city?
3.4	How did it affect your role? Others?
3.5	What were the factors (physical and non-physical, positive and negative) that contributed to resilience?
3.6	Are the factors measured?
3.7	Which factors made the difference?
3.8	Who has control over these factors?
4	Section 4: Close Out (future & priorities)
4.1	What would you spend your last dollar on? What would you invest in? What is your greatest need or would have the greatest improvement to the city?

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