MEASURING FRAGILITY IN CITIES

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BACKGROUND PAPER

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Abstract

Twenty-first century security and stability is contingent on how cities prevent, adapt and respond to risks and stresses. This is due to the increasing concentration of people living in large, medium and small cities, especially in the Americas, Africa and Asia. Cities that are unable or unwilling to deliver core functions - especially basic needs, property rights and the rule of law - can be described as fragile. In these settings children, especially young people living in informal and low-income neighbourhoods, are vulnerable. This article considers the factors that shape urban fragility, including rapid and unregulated urbanisation, income and social inequality, concentrated poverty, unemployment, policing and justice deficits, real and perceived insecurity and natural hazard exposure. It demonstrates how fragility is a dynamic condition rather than an end state and measures fragility risks across more than 2,100 cities with populations of 250,000 or more. The paper shows how fragility is not restricted to poor countries, but is more widely distributed than assumed. It concludes with a number of evidence-based recommendations to reverse fragility risks and promote urban resilience.

Keywords: fragility, resilience, fragile cities, resilient cities, urban violence, urban security, Africa, Asia, Americas.
Introduction

Nation states are not the only, much less most important guarantors of safety, health and wellbeing. Twenty-first century security and sustainable development will be contingent on the risks and stresses affecting large, medium, and smaller-sized cities (Muggah, 2015a, 2015b, 2015c; de Boer, 2015). It also depends on the extent to which municipal institutions and societies are able to prevent, resist, and adapt to complex challenges on the ground. The reason why cities are assuming an ever increasing role in global affairs is straightforward: people, power and profits are increasingly concentrated in the metropole.

The expanding influence of cities is due partly to their enormous size and economic growth. Global urban population growth is currently estimated at 1.8 percent per annum, amounting to more than 65 million new city dwellers a year.¹ There are today close to 30 megacities with populations of 10 million inhabitants or more, and the number will double by 2050. However, there are at least another 50,000 cities on the planet of varying sizes. Smaller and intermediate-sized urban centers with less than half a million people are growing at the fastest rates.² These mid-sized cities are influencing and influenced by the reconfiguration of markets, information, technologies and skills.³

Although there is understandable attention devoted to hyperconnected smart cities in the North, the vast majority of current and future population expansion is occurring in the South. It is Africans and Asians who are moving to cities in staggering numbers over the coming decades.⁴ Indeed, just three countries – China, India and Nigeria – will account for over 40 percent of population growth over the next ten years. And a massive proportion of global population growth will occur in low-income informal areas. These demographic tendencies are acknowledged by diplomatic, defense and development specialists alike.⁵

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² According to the UN (2014: 15) “In general, most of the world’s fastest growing urban agglomerations are smaller cities: agglomerations with 500,000 to 1 million inhabitants in 2014 account for 26 of the 43 fastest-growing cities, while another 16 are medium-sized cities with between 1 million and 5 million inhabitants.” See Sassen (2005) for a review of the concept of global cities. Available at http://www.saskiasassen.com/pdfs/publications/the-global-city-brown.pdf

³ Nigeria will add 212 million new city residents, China another 292 million urban dwellers, and India some 404 million inhabitants.

⁴ See, for example evolving US military doctrine (2013) on city operations at http://www.dtic.mil/doctrine/new_pubs/jp3_06.pdf. See also DFID (2012) reports on cities as the new
Not all cities are moving in the same direction. To be sure, some of them are doing remarkably well—just 600 cities are estimated to account for two-thirds of total global GDP growth by 2025.6 These cities account for roughly one-fifth of the world’s population. While a handful of the world’s megacities are thriving and alliances of predominantly wealthy cities are learning from one another, others are falling dangerously behind. There are at least 1,500 cities over 250,000 people in 20157 and in some of them, the social contract (and associated political settlements) binding municipal governments and citizens is crumbling. In some cases, citizens are resorting to alternative—even illiberal—means of guaranteeing that certain core functions are delivered.

This background considers the scope and scale of fragility in cities. It is intended to stimulate a critical reflection on the risks posed to children, especially those living in informal and low-income settings. Fragility occurs when the legitimacy, authority and capacity of city institutions are unable to fulfill their core functions. Core functions include the guarantee of security and safety of residents, property and infrastructure, the delivery of basic services such as health, education and law enforcement, and the preservation of basic norms. Fragility is not an absolute state—it is an underlying set of conditions and properties. Fragile cities are ones that are particularly susceptible to or experiencing a rapid deterioration of core functions owing to a combination of internal and external risks.

The extent of urban fragility is not conditioned narrowly by risks and stresses manifest in the city alone.8 There is a dynamic interplay of factors and relationships internal and external to the city that influence their real and relative fragility and resilience. Indeed, urban fragility is invariably influenced by conditions in rural settings—it is important to consider dynamics in both settings. Moreover, there are also historical relationships between cities and state making that shape the extent of their fragility (Beall, Goodfellow, and Rodgers, 2011). It stands to reason, then, that changes in the wider international and national security and macroeconomic environment can generate varying degrees of risk at the city scale.

Fragility is not the preserve of low and middle-income settings. Indeed, most cities around the world exhibit pockets of fragility at the neighbourhood scale. This note highlights a range of factors that are associated and correlated with city fragility.9 It is neither comprehensive nor complete and is...
based on a preliminary review of urban studies, urban geography, urban criminology, development economics and public health literatures. This review is intended to help shape a review for the Know Violence in Childhood Initiative. It builds on previous articles that highlight the distribution of fragility in urban centers (Muggah, 2016a, 2016b).

What Makes Cities Fragile?

The global debate on fragility, conflict and violence is strongly informed by national interests and institutions (World Bank, 2014, 2015; OECD, 2014, 2015). Put succinctly, developed country decision and policy-makers are preoccupied with the degenerative (as opposed to productive) effects of developing country instability on peace and development. Several indices have emerged that are intended to monitor the extent of macro-level or state fragility.10 All of them rank countries according to a cluster of metrics stratified along political, social and economic lines. There is also nascent engagement with the regional and subnational dimensions of fragility.11 The concept of “fragile cities” first emerged in 2012 to draw attention to the metropolitan dynamics of risks and implications for the defense, development and diplomatic sectors (Muggah and Savage, 2012). Subsequent studies have refined the idea, with the intention of helping shape policy and practice (Muggah, 2014, 2015a, 2015b; de Boer, 2015).

Acute forms of fragility emerge at the intersection of poverty, violence and disaster. Whether at the national, subnational or the municipal scale, the ability of state authorities to deliver core functions (security, services, rule of law) are undermined by a cascade and accumulation of risks and stresses.12 Fragility thus surfaces when metropolitan institutions are unable to adequately prevent them, cope or adapt. Fragility is also exacerbated by (and reproduces) weak social cohesion.13 Fragility can manifest rapidly, in the wake of armed conflict or natural disaster. It can also emerge more incrementally, expressed in the deterioration in the credibility, authority and capacity of institutions to deliver governance, services, and overall safety and security.

10 The most prominent indices are the Fund for Peace´s Fragile State Index (formerly the Failed State Index) and the World Bank´s Harmonized List of Fragile Situations. See http://www.oecd.org/dac/governance-peace/conflictandfragility/docs/List%20of%20fragile%20states.pdf for a comparison. See also Carment and Samy (2012) at http://www4.carleton.ca/cifp/app/serve.php/1407.pdf for a comparison of state fragility.
11 The issue of regional and subnational fragility will be one of the main areas of focus for the 2016 OECD States of Fragility report. The World Bank (2015) also now describes new approaches to measuring both regional and subnational fragility combining CPIA scores with other factors, but this process is still under review. See also Alexander et al. (2015) for a review of the regional dynamics in West Africa.
City fragility is exacerbated by the intensity and accumulation of risk. It can be deepened by “internal” technical deficiencies in formal institutions, resource limitations, predatory political dynamics and wider domestic social and economic challenges. For example, underlying vertical and horizontal inequalities and concentrated poverty can potentially expose cities to greater or lesser degrees of fragility. Moreover, fragility can be intensified by “external” climactic, market and contagion effects. Fragility begets fragility: it exacerbates a population’s vulnerability, thus laying the conditions for greater exposure.

Fragility spans low, medium and high-income settings. As such, fragile cities are not confined to the Global South even if risks may be higher there. Irrespective of the location, political, social, and economic schisms between the wealthy and poor are reproduced spatially – even infra-structurally – in cities.14 This is most obvious in the case of informal settlements or slums where as many as 2 billion people will reside by 2030. As a result, the extent of city authorities provision (and commitment to provide) core functions varies, with the most marginal residents often suffering most from repression and neglect.

Poorer urban areas are confronted with accumulated risks, including low quality policing, limited access to basic utilities and services, precarious and insecure housing conditions, and physical and

14 See, for example, the world of Rodgers and Jones on “infrastructural violence” at http://eth.sagepub.com/content/13/4/401.abstract.
spatial segregation and exclusion from formal markets. An anthropological literature also highlights situations whereby slums are more “resilient” than affluent neighbourhoods owing to more robust social networks, informal coping strategies, and lower infrastructural complexity.¹⁵

Fragility and resilience are interdependent, but nevertheless separate constructs.¹⁶ Even in conditions of chronic instability, city institutions can and do exhibit shifts in capability to deliver core functions across time and space. Moreover, sudden shocks—including dramatic shifts in political regimes, food prices or natural disasters—often rapidly undermine the equilibrium of a city. For example, the rapid influx of large populations of refugees, internally displaced people, and migrant populations can generate enormous stresses. Even in otherwise stable conditions, municipal institutions once lauded for their resilience can rapidly degrade.

There is nevertheless an implied relationship between fragility and resilience. It stands to reason that reductions in the risks of city fragility should have positive knock-on effects on urban resilience and vice versa. However, it is not necessarily the case that measures to prevent city fragility are the same as those to maximise urban resilience processes and outcomes. Nor is it always the case that strengthening city resilience will necessarily reduce internal or external risks and stresses associated with fragility. Resilience can be positive or negative and may in some cases lead to greater fragility.¹⁷

**Measuring Fragility in Cities**

There is no single or monolithic determinant that renders cities more or less fragile. Rather, several factors are associated with a higher risk in determining the character and intensity of fragility. While these factors are not necessarily invariant – that is, universal across space, time and groups – there are compelling empirical grounds for their consideration. The following assessment accounts for risk factors for which there is credible scientific evidence of a relationship with fragility. The selected factors are considered on the basis of (a) the empirical strength of their association or correlation and (b) the extent of structured and unstructured data availability for cities around the world.¹⁸

¹⁵ See for example, Ahmed (2014), Hawkins (2015) and Patel (2015), among others, for a review of resilience, including in low-income settings.

¹⁶ See Muggah, Patel and de Boer (2015) for a review of the “double helix” of fragility and resilience.

¹⁷ For example, if the resilience of city inhabitants is embedded in social cohesion and networks facilitated by armed gangs to cope with a shock/stress, the authority and legitimacy of city officials and institutions is weakened, potentially increasing the overall fragility of the city. See Davis and Muggah (2012).

¹⁸ Currently, most initiatives designed to measure fragility are still aspirational in nature, or focussed reservedly on a small selection of proxy metrics at the national scale.
### Mapping city fragility – preliminary indicators

<table>
<thead>
<tr>
<th>Fragility Factor</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Rapid and Unregulated Urbanisation</td>
<td>Population growth (percent) over 10 years</td>
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<tr>
<td></td>
<td>Size of informal settlements as a proportion (percent) of the city area</td>
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<tr>
<td>Income and social inequality</td>
<td>Gini coefficients</td>
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<td></td>
<td>Proportion of population lacking access to basic services</td>
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<td></td>
<td>Proportion of population without registered legal title</td>
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<td></td>
<td>Extent of ethnic fragmentation/minority marginalisation</td>
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<tr>
<td>Concentrated Poverty</td>
<td>City population under the poverty rate</td>
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<tr>
<td>Youth Unemployment and underemployment</td>
<td>Percentage of male residents in full time employment</td>
</tr>
<tr>
<td>Policing and Justice</td>
<td>Policing and judicial presence (per 1,000 residents)</td>
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<tr>
<td>Deficits</td>
<td>Public confidence in local police forces and judicial systems</td>
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<tr>
<td>Real and Perceived Insecurity</td>
<td>City homicide rates (per 100,000 residents)</td>
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<td>Combined metric for incidents of riots, conflict &amp; terrorism</td>
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<td></td>
<td>Perceived insecurity in the city (and gender based violence)</td>
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<tr>
<td>Natural Hazard Exposure</td>
<td>Proportion of city populations living in coastal flood plains</td>
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<td>Proportion of city populations living in landslides zones</td>
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<tr>
<td></td>
<td>Location in/close to earthquake zone/fault lines/areas with past quakes</td>
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<td></td>
<td>Economic and mortality loss from disasters</td>
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There are obviously several limitations when it comes to the quantitative (statistical) study of city fragility. For one, there are likely unobserved heterogeneity issues owing to the diversity and divisiveness within and between cities. Cities are highly complex ecosystems with specific historical, political, social and economic traditions. As is the case undertaking statistical analysis of country-level data, there are invariably constraints in what can be inferred from city-level data. Moreover, there are real challenges when it comes to defining the geographic or administrative metropolitan unit under observation. The geographic parameters and population size of cities vary across structured datasets. Related, there are very significant questions related to data availability, quality and comparability across cities. As such, quantitative measurement of city fragility and resilience should, where possible, be accompanied by qualitative or mixed method approaches.

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19 For the purposes of the United Nations University/World Bank initiative, the author is relying principally on UN-defined city units, including those projected by the UN Urbanization Prospects reports.

20 This is particularly important in light of on-going processes to identify the most at risk cities to natural and human made disasters at the United Nations in preparation for the World Humanitarian Summit as well as Habitat III. The adoption of ASD2030 goal 11 on “Making Cities Inclusive, Safe, Resilient and Sustainable,”
At a minimum, fragile cities exhibit institutional deterioration in their legitimacy, authority and capacity to deliver core services. At the most extreme, they are cities convulsed by real and perceived instability and violence. Fragility itself is expressed spatially across a defined administrative area or metropolitan unit. It is also exhibited institutionally whereby delivery mechanisms are overwhelmed by stresses and shocks. The direct and indirect consequences of urban fragility are far-reaching, including the fragmentation of public and private space, erosion of social capital and cohesion between neighbourhoods and households, reduced domestic investment and capital flight and the reproduction of insecurity and heightened exposure to disaster risk.

There are several external and internal factors emerging from the literature that are associated with a heightened risk of fragility in cities. These include high rates of income and social inequality, concentrated poverty, the speed, distribution and unregulated nature of urbanisation, the proportion of young under-educated and unemployed youth, the quality and capacity of security and justice service delivery, the distribution of lethal and non-lethal intentional violence, and the relative exposure to natural hazards, including those associated with climate change and disasters. There are undoubtedly others wherein there are strong associations and even correlations with urban fragility. The extent of fragility depends on the ways in which these factors are anticipated, managed and reduced. This does not necessarily result in “resilience”.

**Income and Social Inequality**

All cities are home to a spectrum of wealthier and more deprived populations. In more fragile urban settings, there are especially sharp disparities in urban incomes, assets, levels of service provision, political influence and social status that exceed the gap between rural and urban averages. Urban inequality implies more than income measures and access to services. National poverty lines can mask the higher cost of living in cities and the dependence on a cash economy. Macro-level metrics of water, sanitation and energy can also under-report access in densely populated settlements. A priority is developing a sophisticated understanding of how deprivation is distributed in urban settings.

provides additional impetus to this exercise as States begin to focus their efforts on cities that are most in need of support (http://www.un.org/sustainabledevelopment/cities/)

21 Other factors that are important to consider include the extent of social cohesion, corruption, population displacement, domestic investment, capital flight, mobility, and other disaster risks and losses (e.g. earthquakes, floods, etc.), the extent of Internet and telephony penetration, and more. These are worth exploring in more detail as part of the UNU/WB advisory group.

22 See Muggah, Patel and de Boer (2015) for an explanation.

There is a comparatively robust literature linking vertical and horizontal inequality to the risk of city fragility. Of course, material and social deprivation in income, property, service provision and social status are unevenly distributed in cities. Even so, the association between varying degrees of inequality and crime/violence is as robust in urban areas as it is across countries (Daly, Wilson, and Vasdev, 2001; Fajnzylber, Lederman, and Loayza, 2002). Crime rates are higher in unequal cities (Glaeser et al., 2009) and those registering more equal distribution of income and social services tend to exhibit a lower risk of violence.

Proxy measures of income and social inequality in cities are comparatively straightforward. A key index is Gini inequality, a measure of the income gap created by unequal resource distribution (a coefficient of less than 0.299 is considered low while a ranking of more than 0.4 is considered very high). Some Gini inequality data was reproduced for a selection of cities by UN-Habitat (2011). Another measure relates to the proportion of the population with access to basic or essential services as set out by the Global Cities Indicators Facility. Other measures include the proportion of city residents living without registered legal title and homeless population per 100,000.

**Concentrated Poverty**

Poverty exists in all cities, though in certain settings it is endemic. There is some evidence that the clustering and concentration of poverty – neighbourhoods where the poor exceed 40 percent, for example – is associated with higher rates of crime, underperforming schools, poor housing and health conditions and incarceration. In other words, frayed capabilities to deliver (and access) essential services and guarantee law and order. These areas suffer disproportionately from deprivation in social capital, but are also sites of low public investment, aggressive policing, sub-standard housing and poor services (Jargowsky, 2003; Hipp and Yates, 2011).

Concentrated poverty is typically measured as “extreme” or “high” levels of socio-economic deprivation – that is a federally-determined poverty line. The most obvious metric is the percentage of the city population under the poverty rate. These populations are often located in “inner cities” – often consisting of minority populations living in public housing. Alternatively, they include residents of informal slums that may be located in city “peripheries” or the “peri-urban” area. There is research highlighting the micro-neighbourhood effects and externalities of concentrated poverty when it reaches a specific threshold (Galster, 2010; Retsinas and Belsky, 2004).

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Rapid Unregulated Urbanisation

The speed and unregulated nature of urbanisation is a correlate of city fragility (Patel and Burkle, 2012). While the correlation between city size and crime rates is uncertain (Litman, 2013; Nolan, 2004), city growth has a generally positive and statistically significant effect on crime in most settings. On average – an increase of 1 percent in the rate of population growth can increase victimisation by up to 1.5 percent. Likewise, it is the unregulated nature of urbanization – owing to weak or non-existent urban planning or rapid and sharp upticks in migration – that may also contribute to instability. There are several datasets mapping out urban population growth by country, including the World Bank (populations of the largest city and population in urban agglomerations of more than 1 million) as well as the UN World Urbanization Prospects for 2014.

An ideal metric of the pace of urbanisation is a longitudinal measure of the speed of population growth per city. This is available for a selection of 485 large and medium sized cities albeit from 1960-2010. A useful visualisation of the speed and scale of urbanisation was also recently developed by the IIED for cities with more than 500,000 people (based on UN data noted above). The Global Cities Indicators Facility is also proposing measures to gauge the size of informal settlements as a proportion of the city area and green areas per 100,000 population.

Youth Unemployment and Under-employment

High rates of youth unemployment are strongly correlated with a rise in the risk of fragility, conflict and violence. Populations with a high proportion of young males out of work are especially susceptible: a country with more than 40 percent of its population under 29 is 2.3 times more likely to experience conflict onset and longer duration of conflicts than those with more evenly distributed

26 In theory, rapid urban growth may raise crime for many reasons, including a higher concentration of richer individuals attracted by rising opportunities in cities, congestion of law enforcement and social services, massive unemployment, and increasing poverty. See Gaviria and Pages (2002).
30 Contacted Gordon Mulligan, lead author, to review datasets. He explained that information was dated no more recent than 2000.
population pyramids (WHO, 2015). City populations registering a high proportion of young males – especially unemployed youth – are susceptible to higher risks of fragility. More specifically, there are robust relationships between city unemployment and homicidal violence. The World Bank has examined the issues of demographic youth bulges and labour market dysfunctions, albeit also with a critical perspective.

While there is national data available on employment ratios from the ILO and World Bank, there is no publicly available standardised data available for cities in all low, middle and upper-income settings. The Global Cities Indicators Facility has provisions to identify the percentage of persons in full time employment as well as measures of school completion rates/percentage enrolled. The availability of standardised city unemployment data is varied. What is most likely is the use of regional tables developed by related organisations such as the OECD, EU, OAS and others. Specific data at the country level may need to be mined on a case-by-case basis drawing on census data.

**Police and Justice Services**

Another measure of city fragility is the extent of coverage and confidence in essential public services, including security and justice. The presence of police on the street (measured per capita or 100,000 population) is not necessarily a robust measure of safety or security – and may in fact indicate a higher likelihood of repression. Nor are the number of judges, prosecutors or defenders since the effectiveness of service delivery depends not just on the quantity, but the quality of service. A more effective measure relates to impunity (and clearance) rates for specific crimes, however, comparative data is often unavailable at the city scale.

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33 For example, populations with over 40% of their (male) population under 30 are more predisposed to organised violence. See for example Raphael and Winter-Ebmer (2004) from the US.
34 There are also strong relationships between education and homicidal violence, with highly educated metros tending to feature lower levels of all types of gun-related death and violence. See https://nextcity.org/daily/entry/urban-nation-narrowing-the-gun-violence-map and http://www.citylab.com/crime/2012/12/geography-us-gun-violence/4171/.
37 See http://data.worldbank.org/indicator/SL.UEM.1524.ZS.
38 See http://www.cityindicators.org/themes.aspx#Governance.
40 See, for example, tables from the US at https://www.worldwewant2015.org/node/284033.
41 See http://www.cityindicators.org/themes.aspx#Governance.
Nevertheless, there are measures of police and justice effectiveness and efficiency that may offer an indicative appraisal of fragility and resilience. If police per capita is a ratio that is desired, then it may need to be developed via UNODC/UNICRI datasets or from national statistical offices reporting on police and justice service coverage. A more profitable avenue of enquiry might be perception data. For example, Gallup poll asks “in the city where you live, do you have confidence in the local police force?” Likewise, there are questions regarding trust and faith in judicial and military institutions with data disaggregated by age, gender, income level, ethnicity, religion and more.

Real and Perceived Safety

A clear expression of urban fragility is the extent of real and perceived insecurity within and between cities. In most cities violence is hyper-concentrated in specific street segments/neighbourhoods and particular population subgroups, notably young males (Mejia et al., 2015; Vilalta and Muggah, 2014). Yet the distribution of fear and unease tends to be broader, affecting a wider segment of a city population. This disparity in real and perceived insecurity varies from setting to setting (Boulange and Armada, 2011), yet both profoundly affect everything from livability and mobility to real estate pricing and investment decisions.

Insecurity can be measured through administrative data, including police and public health institutions. A particularly robust measure is homicide rates per 100,000 of the population. While quality and coverage inevitably vary from place to place, there is reasonably complete homicide data for primary and secondary cities with the UNODC. It can also be represented through perception based data, including through polling surveys as well as social media. Gallup collects data on the extent to which people “feel safe walking in their city at night” as well as victimisation in its World Polls.

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44 The author is in contact with Gallup International and consulting their crime team to acquire disaggregated city-level data.
45 What is more, the Global Cities Indicators Facility provides a simple measure of the number of local officials elected to office. See [http://www.cityindicators.org/themes.aspx#Governance](http://www.cityindicators.org/themes.aspx#Governance).
Natural Hazard Exposure

There are growing risks to cities due to both slow onset climate change and fast-onset disaster events. Flooding, storm surges, high winds and other risks are increasing.\(^47\) A review of over 1,300 cities by one private firm determined that 56 percent are at risk.\(^48\) Many of these are especially prominent for cities in coastal locations (especially in Asia), including as many as 40 million people in poor cities.\(^49\) Climate models anticipate varying rises in sea levels from under 50 centimeters to 2 meters over the coming decades.

According to some estimates, approximately 30 cities account for 80 percent of global exposure. Many of them are located in deltas.\(^50\) It is likely, however, that the real risks are much higher for vulnerable populations living in coastal locations next to flood plains.\(^51\) A plausible metric to establish fragility risk would be the proportion of city area and populations living within a prescribed area of the coastal area. This would be generated in an automated fashion based on either GIS/satellite imagery. Likewise, the World Bank City Strength project also applies qualitative assessments in selected cities to assess vulnerability and exposure to shocks.\(^52\)

Data Quality and Availability

A starting point for visualizing fragility in cities is to determine with precision what constitutes a “city”. This is a perennial challenge for urban geography. There are diverse definitions and categorisations of cities around the world (Frey and Zimmer, 2007). There are competing typologies and new hierarchies including hyper cities, super cities, mega cities, megalopolises, conurbations and more. There are also new city forms that confound definitions, including the Beijing–Hanoi–Hubei conurbation, for example, which is expected to include some 130 million residents.\(^53\) For its part, the Demographia group has developed a comprehensive baseline of over 1,000 cities with populations over 500,000 people for 2015.\(^54\)

\(^{48}\) The 100 cities with the greatest exposure to natural disasters included the Philippines (21), China (16), Japan (11) and Bangladesh (8). See [https://maplecroft.com/portfolio/new-analysis/2015/03/04/56-100-cities-most-exposed-natural-hazards-found-key-economies-philippines-japan-china-bangladesh-verisk-maplecroft/](https://maplecroft.com/portfolio/new-analysis/2015/03/04/56-100-cities-most-exposed-natural-hazards-found-key-economies-philippines-japan-china-bangladesh-verisk-maplecroft/).
Not surprisingly, the coverage and quality of city data is highly uneven. There is no central repository with complete information. Very generally, there are reasonably standardised metrics across 34 OECD member countries. Some information for cities in these countries is available in publicly and privately available international, regional and national datasets and are reasonably straightforward to access. Data from cities in middle and lower-income settings is more dispersed and of variable quality. Data for cities in such environments can be obtained through international (United Nations) sources, as well as some isolated data collection initiatives developed by research institutes and universities.

Moreover, it is important to distinguish between data on urban trends and information available on cities in particular. For example, information produced by the United Nations Urbanisation Prospects, UN-Habitat World Bank often consists of data on urban characteristics at the national scale. This is changing. The UN-Habitat, for example, has compiled data for 103 metrics for a selection of 741 cities over a selection of years, albeit with varying levels of standardisation. The UNISDR has also collected data on “resilience” variables for over 2,000 cities, though information is piece-meal and largely focussed on the existence (or not) of legislation/emergency plans. The Economist Unit’s Safe Cities Index also provides data across 4 themes for 50 cities.

Meanwhile, there are many aspirational frameworks and data collection initiatives focussing on collecting data for cities, including to benchmark progress. Arguably the most comprehensive framework indexing fragility and resilience is the ARUP/Rockefeller 100 Resilient Cities model.

57 The author is in contact with the director of the UN-Habitat Research division and the UNFPA statistics division to procure available information.
58 An interesting proposal is also to consider data from refugee and IDP camps, including Dadaab in Kenya and the Zatari camp in Jordan. UNHCR and the IDMC generate data on refugee camp populations, including protracted situations lasting for a decade or longer.
59 This includes UNODC data, but also UNICRI data – see ICVS data for selected cities up to 2000 at http://www.unicri.it/services/library_documentation/publications/icvs/data/.
61 The author has consulted with UNISDR (Abhilash Panda) and is collaborating to review and standardise its data.
63 See http://rsa.tandfonline.com/doi/pdf/10.1080/21681376.2014.983149. The author consulted with Rob Kitchin (lead author) to review datasets. There were no comprehensive city data compilations known to him.
though no city data is currently available and future assessments will be based on self-assessments generated by “resilience officers”. A promising initiative is the Global Cities Indicators Framework (GCIF) which is developing standardised data using ISO 37120 criteria. Together with partners, the GCIF is collecting information for 46 ISO categories, but the extent of data collection is still extremely limited and exclusive to members.

There are also private and academic city data collection initiatives that are generating information across a range of themes. For example, the Centre for Risk Studies at the University of Cambridge collects data for 20 “risks” in over 300 cities. McKinsey’s Global Center includes data on 600 cities. Gallup International collects perception based data for 170 countries, including through its Global Poll: there are possibilities of disaggregating data on city safety and perceptions of security. Other groups such as the World Cities database claim to have information on over 2 million cities, while the Smart City Index, Sustainable Cities Indicators and Crime City Index with 416 cities all report varying types of information and metrics.

There are intriguing opportunities to draw on Big Data, notably unstructured data from satellite, transportation, telephone or social media platforms such as Facebook, Twitter, Instagram and others. For example, satellite data correlates more strongly with population density than with economic measures, with close statistical associations between luminosity levels and population levels, population density, the number of establishments, and the number of employees. Likewise, groups

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64 See [http://www.arup.com/cri](http://www.arup.com/cri). The author has met with the 100 Resilient Cities director and their team to discuss cooperation in June 2015.
65 See also [http://www.dataforcities.org/about](http://www.dataforcities.org/about) and [http://open.dataforcities.org/](http://open.dataforcities.org/).
66 See [http://www.cityindicators.org/themes.aspx](http://www.cityindicators.org/themes.aspx) and [https://www.google.com/fusiontables/embedviz?q=select+col1+from+15seNKcGXQv6dj9cxfMIYjSzS4af9Ub6zoouqe11&viz=MAP&h=false&lat=37.83603575356448&lng=2.622271618749892&t=1&z=5&l=col1&v=2&tmplt=2&html=GEOCODABLE](https://www.google.com/fusiontables/embedviz?q=select+col1+from+15seNKcGXQv6dj9cxfMIYjSzS4af9Ub6zoouqe11&viz=MAP&h=false&lat=37.83603575356448&lng=2.622271618749892&t=1&z=5&l=col1&v=2&tmplt=2&html=GEOCODABLE). The author contacted the lead researcher of the GCIF and was told no data was yet available.
68 The author contacted Jaana Remes, lead author of McKinsey’s city work to acquire more data access. The author is also in contact with Jenny Sternberg who oversees the Infrastructure and Cities team.
69 The author reviewed the Gallup Global Law and Order report. He is also in contact with Justin Elliott, from Data Solutions, who is exploring possible collaboration across three to four selected variables. See [http://www.gallup.com/services/185807/gallup-global-law-order-2015-report.aspx](http://www.gallup.com/services/185807/gallup-global-law-order-2015-report.aspx).
75 See, for example, [http://www.raytheon.com/capabilities/products/viirs/](http://www.raytheon.com/capabilities/products/viirs/).
such as MIT and others have the Senseable City Laboratory which focuses in on open datasets for some cities. GDELT, a large-scale incident mapping initiative with information on literally thousands of cities in real-time, also offers a critical avenue for new forms of unstructured data collection.

Mapping Fragility in Cities

First, city fragility does not appear to be restricted to poor developing countries. There are of course clusters of chronically fragile cities in sub-Saharan Africa and Central, South and Southeast Asia, especially in Afghanistan, Bangladesh and Pakistan as well as the Democratic Republic of the Congo, Nigeria and South Africa. The data visualisation suggests that there are at least as many cities ranking high on the fragility scale (scoring at least 4 or 5) in high and upper-middle income settings (n: 84) as in lower-middle and low income ones (n: 62).

![Map of Underdevelopment and Fragility](image)

*Source: Muggah (2016) – includes information on 2,137 cities.*

Second, fragile cities are not confined to countries wracked by armed conflict. There were roughly 40 war-affected and 33 fragile states in 2015. There is little doubt that cities in countries such as Iraq,

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76 The author communicated with Carlo Ratti, director of the MIT Senseable Lab, along with Ethan Zuckerman at the Citizen Lab.

77 The author is collaborating with GDELT founder Kalev Letaru on a partnership to map out physical risks, sentiment and emotional markers in cities drawing on thousands of news outlets in over 100 languages.
South Sudan or Syria are especially at risks of instability. But cities in these countries are not the only ones at high risk. In fact, there were twice as many at risk cities (4-5 on the fragility scale) outside of war zones (n: 111) than in them (n: 35). What is more, there were almost five times more fragile cities outside of so-called “fragile states” (n:122) than in them (n: 24).

Third, it is not necessarily the largest cities that are most susceptible to fragility. Rather, it is smaller and medium-sized cities that are most at risk. The data visualisation demonstrates that just three megacities (over 10 million people) and three very large cities (with between 5 and 10 million people) are at high risk of fragility (4-5 on the scale). These include Baghdad, Dar es Salaam, Johannesburg, Karachi, Lagos and Shanghai. But there are another 56 large cities (1-5 million people), 42 medium cities (500,000-1 million people) and 40 smaller cities (250,000-500,000 people) that are classified as “fragile”.

Source: Muggah (2016) – includes information on 2,137 cities.
Fourth, the fastest growing cities appear to be especially vulnerable to fragility. Most cities around the world are growing at between 0-3 percent. The data visualisation detects 87 cities – most of them in the rust belt of the United States, in the United Kingdom, France, Germany, Russia and Ukraine, and parts of China – that are shrinking in size. Yet the most at-risk cities are those that are growing at a pace of 4 percent or more. The risks are especially prominent in sub-Saharan Africa, the Middle East and South and East Asia where the vast majority of future city population growth is projected.

Source: Muggah (2016) – includes information on 2,137 cities.
Fifth, the most violent cities in the world are not where you think they are. While some research organisations rank cities according to homicide, their assessments are often heavily biased due to variation in reporting rates. The fragile cities data visualisation tracks both homicide and reported incidents of violence from a review of over a thousand media outlets. While homicide is highly clustered in Latin American and Caribbean cities, reported violence is more widely distributed in North and Central American, sub-Saharan African, Middle Eastern, and South Asian urban centers.

![Map of Reported Violence](image)

*Source: Muggah (2016) – includes information on 2,137 cities.*

**Reversing Urban Fragility**

Fortunately, enlightened city planners, civil society leaders and the private sector are exploring ways to prevent and mitigate risks of fragility and promote resilience. Cities like Bogota, Medellin, Rio de Janeiro, alongside Baltimore, New York, Philadelphia, and Los Angeles have made a remarkable turn-around in recent years. Other cities such as Amman, Beirut, Kabul or Ndjamena are persevering against considerable external and internal risks and stresses. Their resilience did not come about by accident, but as a result of the leadership of mayors and private actors together with focussed and adequately resourced strategies emphasizing prevention, risk reduction and a focus on strengthening protective factors. A key area of focus is on identifying and then resourcing improvements in institutional legitimacy, authority and capability to deliver on core functions (Muggah, Patel, and de Boer, 2015).

There are a host of factors that contribute to reversing fragility. They may not necessarily be the reverse of the proposed city fragility metrics above. Indeed, some cities have managed to strengthen
the capabilities and legitimacy of institutions in spite of moderate to high rates of violence, unemployment, urbanisation and coastal location. All cities have differentiated abilities to resist varied forms of shocks and stresses over time and space. While of course a focus on mitigating structural risk factors is necessary, it may not necessarily always be sufficient to promoting urban resilience.

There are clearly important investments required across a range of sectors. A precondition is investment in safety, health and wellbeing. This implies at a minimum preventing humanitarian crises and building-in disaster response capacities. Efforts to reign in violence, promote meaningful employment, and ensure access to basic services are also critical (World Bank, 2011). Other fundamental areas of investment include functional infrastructure and environmental improvements. Reliable public transportation, adequate communications coverage, social services for vulnerable populations and risk mitigation are all critical strategies to strengthening urban resilience.

Additional areas that require intensive focus are in relation to inclusive urban governance, social and economic management and leadership and strategy. Cities that are capable of generating a satisfactory tax-take, guarantee property rights, cultivate neighbourhood representation, and sustain financing (including contingency funds) tend to be more successful. Likewise, sustained public leadership, robust city councils and legislatures, adequate mechanisms for consultation and annual strategic planning and budgetary capacities are all health indicators of a resilient city.

There are other strategies that can help shift a city from a fragile to a more resilient equilibrium. The first step is to generate data and evidence about the scope and scale of fragility. This can also be facilitated by information sharing between cities – both fragile and resilient – about their common risks and protective factors. Courageous leaders borrow ideas and practices from around the world and work with different layers of government to solve municipal challenges. Indeed, this is the purpose of the newly launched Global Parliament of Mayors, as well as networks such as the United Cities and Local Governments network. In some cases, cities may “twin” with others to hasten the exchange of experiences and expertise.

At the level of operational interventions, another approach to countering risks and stresses associated with fragility in cities is by focussing on hot spots and hot people (Muggah, 2015a). There are a relatively small number of cities in selected countries that account for a disproportionate amount of

78 See http://www.globalparliamentofmayors.org/.
79 See http://www.uclg.org/.
80 Initiatives such as Mayors for Peace, Cities for Peace, and the Municipal Alliance for Peace in the Middle East assembled hundreds, if not thousands, of cities to share ideas and good practice. Big foundations are also getting into the act by contributing to the Millennium Towns and Cities Campaign, the New Cities Foundation, and others.
fragility. Moreover, fragility is unevenly distributed within these settings. Hot-spot policing requires investing in real-time data collection and problem-oriented law enforcement, including training in proximity or community policing. Addressing hot people requires working with young unemployed males with a record who are statistically more likely to perpetrate crime or be a victim.

Resilience is also fostered by investing in and supporting new technologies while attracting talent and consolidate their place as hubs of innovation, creativity, and connectivity. Internet penetration and new information communication technologies are already closing the digital divide between and within cities. Governments are already harnessing Big Data for predictive analytics, remote sensing, and body cameras to positive effect, and civil liberties groups and hackers are already beginning to crowdsource security solutions.

Far and away the most far-reaching and sustainable strategy to promoting safer cities involves purposefully investing in inclusive public spaces, community and social cohesion, and mobility. Civic leaders must insist that the public good prevails over the private interest. One demonstrated approach is to seek to design out crime from the onset rather than seeking to deter crime as an afterthought. Some academic critics are justly concerned with the tendency to “secure” cities and their wealthy suburbs for the exclusive benefit of the elite and middle class against the urban poor. There is comparatively less focus in policy and practice on addressing structural factors that give rise to fragility, not least questions of urbanisation, youth bulges, inequality, and impunity.

**Concluding Reflections**

Fragility does not just “occur”: it consists of underlying properties that are always present. There are different intensities, scales and speeds at which underlying factors determine fragility in cities. Any effort to map the extent of city fragility will suffer from limitations. Part of the challenge is innate to cities themselves – they are hyper-complex systems. Describing, much less predicting, the manifold way that risk and stress factors interact with complicated formal and informal institutions and relationships requires (at a minimum) a mixed method approach.

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What is clear is that cities are points of convergence for many risks. The risks facing each city vary as do capacities to cope with these risks. A first step in understanding what defines a fragile city is to agree on the conceptual parameters of the risks that shape city fragility based on empirical evidence. Once this has been agreed to, it becomes possible to start thinking about the correlates of city fragility and resilience, which will enable us to assess not just the degree of fragility or resilience in a city but also the pathway to more sustainable security and development locally, nationally and internationally.
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Know Violence in Childhood

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