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More on megacities

> Except for the disasters of 1923 and 1945, there have since the end of Meiji been no fires of the good old type, taking away buildings by the thousands and tens of thousands within a few hours. The number of fires did not fall remarkably, but losses, with the two great exceptions, were kept to a few thousand buildings per year.[1]
>
> —Edward Seidensticker, *Tokyo from Edo to Showa, 1867–1989*

> During the 1980s the world's business community was startled by predictions that a large earthquake in Tokyo could precipitate a collapse of the global economic system.[2]
>
> —Dennis J. Parker, 'Disaster Response in London'

Even today it is the earthquake's impeccable timing that receives the blame: two minutes before noon on 1 September 1923. It was as though Mother Nature waited until Tokyo's residents had kindled their lunch fires and the city's breezes stiffened in expectation of the tremors to come.[3] Yet, it was not Mother Nature who had scattered chemical storage sites about the city, built gas mains unable to withstand the shaking and strung

1 Edward Seidensticker, *Tokyo from Edo to Showa, 1867–1989: The Emergence of the World's Greatest City*, Singapore: Tuttle, 2010, 318.

2 Dennis J. Parker, 'Disaster Response in London: A Case of Learning Constrained by History and Experience', in *Crucibles of Hazard: Mega-Cities and Disasters in Transition*, James K. Mitchell (ed.), New York, NY: United Nations University, 1999, 200.

3 Three sources provided material for this vignette: Seidensticker, *Tokyo from Edo to Showa*; Joshua Hammer, 'The Great Japan Earthquake of 1923', *Smithsonian Magazine*, May 2011, available from: www.smithsonianmag.com/history/the-great-japan-earthquake-of-1923-1764539/; and Daniel Hurst, 'This is not a "what if" story: Tokyo braces for the earthquake of a century', *The Guardian*, 11 June 2019, available from: www.theguardian.com/cities/2019/jun/12/this-is-not-a-what-if-story-tokyo-braces-for-the-earthquake-of-a-century.

electrical lines whose sparks found willing tinder in the wood and paper structures built in surrender to the capital's inevitable conflagrations—fires that regularly swept away homes and shops easily destroyed yet so readily replaced. The 1923 earthquake's damage and suffering were thanks not to ill timing alone but to a witches' brew of factors consequent of both humans and nature. The quake shattered Tokyo's wood and shoji-paper structures, creating plentiful surface area for the slightest spark to find a home. Five of the city's 15 wards lost 90 per cent of their buildings; a sixth suffered but a fraction less. Only one was untouched, sheltered as it was in the western hills. Accounts from the period suggest three-quarters of Tokyo's buildings were destroyed or badly damaged in the aftermath, with two-thirds of the total falling victim to fire. Tokyo was not the only major urban area to suffer. The nearby port city of Yokohama—today part of the megacity's unbroken sprawl—felt the same shaking when the Philippine Sea Plate ruptured and slammed into its Eurasian counterpart in Sagami Bay 48 kilometres to the city's south. In took only 14 seconds for nearly every one of the port city's buildings to be flattened. Yokohama's piers gave way—the cars and people on them instantly disappearing into the sea. Minutes later, a 12-metre-high tsunami washed ashore, drowning thousands. Ensuing waves followed, pulsing inland to recede with more men, women and children in their grasp. US Navy Ensign Thomas Ryan was one of many on the ground who saved lives otherwise forfeit. He freed a woman trapped beneath the rubble in Yokohama's Grand Hotel. Realising both of her legs were broken, he carried her to safety as flames consumed the building's tattered remains.

Recovery began even as embers cooled. It was believed that any shop that did not reopen within three days never would. Stalls and emergency markets sprang up almost instantly, many built using lumber stored in fireproof warehouses for just that purpose. 'The Reconstruction Song', sung in the months after the catastrophe, celebrated the recovery. One verse proclaimed: 'Completely burned out, But see: The son of Edo has not lost its spirit.' Resident-driven rebuilding occurred so quickly that intentions for grander redesigns had, at best, to compromise with actions already taken. Many such plans died on design tables, overwhelmed by the pace of grassroots recovery.

The devastation had effects both immediate and reaching deeper in time. The extent of damage again spurred calls to move the national government out of quake and fire-prone Tokyo. It was a recurring argument after any such catastrophe. The emperor quickly laid the appeals to rest: the capital

would rebuild. The quake's consequences nonetheless lingered long after its last aftershocks. Officials blamed the economic panic of 1927 on the quake. Demands to repay debts associated with recovery were repeatedly put off, which weakened the Bank of Japan and, by extension, the country's commercial financial institutions. Historians suggest the relatively democratic national government's mishandling of the recovery fed the rise of autocracy that took the country into World War II.

The next major quake looms over every Tokyo resident's life. Playing of the children's tune *Yuyake Koyake* in the city's Minato ward welcomes the arrival of each evening; it is also a daily test of the community warning system. As in Los Angeles, in Tokyo, residents' bookshelves and other heavy furniture come with brackets to secure them to walls. Governments advise citizens to keep extra water and canned food on hand, ensure they have flashlights and radios with working batteries in homes and offices and maintain a sufficient supply of necessary medications. Stores offer toilet bags to affix to regular commodes when water supplies falter. Numerous publications and permanent signage provide response guidance and identify particularly vulnerable areas. The streets that our notional Haruki Akamatsu knew were designated for post-disaster emergency use also act as firebreaks. Buildings must meet design standards to forever deny a repeat of the havoc wrought by fire in 1923. There are phone apps to instruct Japanese residents in times of disaster. International residents receive invitations to emergency response training; it, like that offered to Japanese speakers, addresses preparations, survival tips and guidance on how to assist victims post quake. It is impossible to overstate the importance of the last. 'After the huge earthquake that struck modern, supposedly quake-proof Kobe in 1995,' writes one author, 'about four in five people requiring rescue were helped by other members of the public rather than the city's official disaster responders.'[4]

What, me worry?

> It was divine nature which gave us the country, and man's skills that built the cities.[5]
>
> —Marcus Tarentius Varro, *On Agriculture*

4 Hurst, 'This is not a "what if" story'.

5 Marcus Tarentius Varro, *On Agriculture. Book III*, London: Loeb Classical Library, 1934, 425, available from: penelope.uchicago.edu/Thayer/E/Roman/Texts/Varro/de_Re_Rustica/3*.html.

> Even among rich, industrialized nations, the size of a city is no longer a measure of its importance.[6]
>
> —Witold Rybczynski, *City Life*

History and common sense tell us that megacities will very likely be the sites of the world's greatest disasters to come. They are, after all, where concentrations of millions upon millions of people live and work. We already noted that they are also in some of the most vulnerable spots on the planet. Humankind has too often done little to make the situation otherwise. If being in the 'wrong' place was not problem enough, we often double the negative by relegating those least able to prepare for or recover from disaster to the most disaster-exposed urban localities. Add a fair dose of human cruelty, as in the 2008 Mumbai terrorist attacks or 11 September 2001 in Manhattan, and it makes it a fool's bet to believe there is not more to come. We fortunately have yet to see a truly devastating megacity disaster in which the casualties measure not in the hundreds or thousands but in the hundreds of thousands or millions. The longer the reprieve, the greater is the opportunity to ensure losses—human, economic and structural—are less than at present. Preparing before the fact ensures fewer buildings topple, are engulfed in flames, suffer flooding or otherwise wreak avoidable deaths.

A few recent catastrophes

> No city is an island. Improving urban infrastructure in one city may attract immigration from other cities, and a negative shock in one location may be mitigated because people can move to another location.[7]
>
> —Klaus Desmet and Esteban Rossi-Hansberg, *Analyzing urban systems*

> Cairo writes. Beirut prints. Baghdad reads.[8]
>
> —Arab proverb

6 Witold Rybczynski, *City Life: Urban Expectations in a New World*, New York, NY: Scribner, 1995, 40.

7 Klaus Desmet and Esteban Rossi-Hansberg, *Analyzing urban systems: Have mega-cities become too large?*, Paper, Princeton University, Princeton, NJ, 20 October 2014, 2, available from: www.princeton.edu/~erossi/WBChapterKD%26ERH.pdf.

8 'The age of mechanical reproduction as a work of art', *The Economist*, [London], 21 December 2019, 23.

In May 2017, Armed Forces of the Philippines units moved into the Mindanao city of Marawi with plans to seize the leader of the Jihadist Abu Sayyaf Group. The arrival surprised the insurgents and disrupted their plans to take over the provincial capital. Fighting in the city wouldn't end until five months later. Much of the city lay demolished in the aftermath, as had been the case in World War II fighting for Manila nearly three-quarters of a century before[9] (in the latter case, noncombatant *deaths*—as contrasted with total casualties—totalled an estimated 100,000, from a population of 1.1 million).[10] Too little had changed since the earlier struggle for the country's capital. Lightly armoured vehicles and infantry advanced in the same deliberate, symbiotic relationship seen in Manila—one later repeated in Seoul in 1950, Hue in 1968, Grozny in 1999 and elsewhere. Foot soldiers advanced beside their steel-encased partners, the former protecting the latter from an enemy who might dash out from an adjacent building to attach a mine or engage with an anti-tank weapon at close range. The fighting vehicles would in turn fire on foes who threatened the vulnerable infantrymen. Filipino soldiers and marines quickly learned what their predecessors worldwide had discovered at the cost of fellow fighters' lives: innovation and adaptation are the key to not joining those unfortunates. Lacking the smoke grenades necessary to blind snipers too well-positioned for vehicle and infantry fire to eliminate, foot soldiers carried long pieces of fabric, sending a runner to dash across alleyway or street with one end to anchor it on the other side of the gap so their comrades could follow unobserved. Their enemy likewise learned to improvise. It took little time for the insurgents to recognise that hiding until aircraft departed to refuel did much to improve one's chances of survival. Validating lessons repeatedly learned and an equal number of times forgotten in those previous urban contests, the attackers found anti-tank and high-explosive tank rounds were not the munitions of choice for holing walls. Another lesson re-realised: rubble created by bombs and artillery hindered both infantry and vehicle progress while sheltering defenders. So much debris clogged Marawi's streets that bulldozers had to clear lanes for trailing fighting vehicles. This delaying power was magnified when an adversary seeded the debris with booby-traps (more recently referred to as improvised explosive devices or IEDs).

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9 Much of this description regarding the Battle of Marawi draws on James Lewis, 'The battle of Marawi: Small team lessons learned for the close fight', *Small Wars Journal*, 23 January 2019, available from: smallwarsjournal.com/index.php/blog/battle-marawi-small-team-lessons-learned-close-fight.

10 Russell W. Glenn, Randall Steeb and John Matsumura, *Corralling the Trojan Horse: A Proposal for Improving U.S. Urban Operations Preparedness in the Period 2000–2025*, Santa Monica, CA: RAND Corporation, 2001, 7.

Also in common with urban combat of decades, centuries and even millennia before, men, women and children huddled in their homes or fleeing lethality could not escape death's reach, maiming or—for the lucky—struggling to survive post battle. World Bank estimates figure Marawi may not recover its pre-disaster standing for two decades. Though the city itself originally housed only 200,000 people, twice that number was displaced thanks to the nearby fighting, manoeuvring and scavenging that accompanied the lengthy battle. Their numbers included 90 per cent of the city's precombat inhabitants.[11] Marawi thus reminds us that while the number of those calling an urban area home is important, cities—especially the world's largest—are equally significant for the influence they have on the communities beyond. Any city is a system. Megacities are systems extraordinaire. Any urban area is a subsystem of one or more larger systems. More-populous cities tend to be the more influential. Just 20 urban areas host the headquarters for one-third of the world's largest companies.[12] More amazing yet: those urban residents who occupy only 3 per cent of our planet's land area draw water from 41 per cent of its ground surface.[13] Obviously, these urban-dwellers have much to give. They take in return. With just less than 8 per cent of the world's total population, megacities tend to both give and take in extraordinary amounts.

The examples of Manila and Marawi reinforce the conclusion that war is particularly unkind to those in urban areas. Fighting and its knock-on effects in built-up areas of Iraq and Syria between March 2017 and July 2018 accounted for eight times more fatalities than that in rural environments in those countries.[14] Manila's 1.1 million people made it a large city in 1945. Even Berlin, the largest city to see street fighting of significance during World War II, housed but 4 million people at the start

11 Joseph Franco, *The battle for Marawi: Urban warfare lessons for the AFP*, SRI Working Paper, Manila: Security Reform Initiative, 4 October 2017, available from: www.researchgate.net/publication/337076300_The_Battle_for_Marawi_Urban_Warfare_Lessons_for_the_AFP.

12 Richard Dobbs, Jaana Remes, Sven Smit, James Manyika, Jonathan Woetzel and Yaw Agyenim-Boateng, *Urban World: The Shifting Global Business Landscape*, McKinsey Global Institute Report, Washington, DC: McKinsey Global Institute, 1 October 2013, 3, available from: www.mckinsey.com/featured-insights/urbanization/urban-world-the-shifting-global-business-landscape.

13 Habitat III, *Urban ecosystems and resource management*, 4.

14 International Committee of the Red Cross (ICRC), 'New research shows urban warfare 8 times more deadly for civilians in Syria and Iraq', News release, Geneva: ICRC, 1 October 2018, available from: www.icrc.org/en/document/new-research-shows-urban-warfare-eight-times-more-deadly-civilians-syria-iraq.

of that conflict.[15] It is a gross understatement to say that the ripples from a major calamity in a megacity today, regardless of cause, would quickly beget a tsunami of consequences.

Megacities and social influence

> Resilient ecosystems have greater diversity of species. It is no accident that successful cities are those that offer a greater spectrum of job opportunities and businesses.[16]
>
> —Geoffrey West, *Scale*

> Whatever brought you here, you are part of the neighborhood now.[17]
>
> —T.R. Reid, *Confucius Lives Next Door*

Urban areas, and megacities in particular, have more varied economic, social and political systems than their rural counterparts—a diversity that offers advantages to those living within. Shoppers have more choice and more opportunity for bargains. Entertainment runs the gamut from sport of all types to live theatre and film, and more base offerings. Employers more readily find the skills they need at competitive wage levels and in the numbers they require. All these touch on a point that provides larger urban areas a resilience those smaller lack: redundancy. The decline, even the complete demise, of a given economic sector in larger cities need not impose undue suffering much less collapse as the affected will find employment in another. Urban areas by their very character practise what nature has long tried to tell a too-often unlistening human race: redundancy is crucial to wellbeing, even survival. Entire banana plantations turned from green to black virtually overnight in Central America when ravaged by Panama disease (or fusarium wilt, for the more botanically minded)—a malady that thrived thanks to the industry's deliberate cultivation of the genetically identical plants preferred by consumers.[18] Smaller populations mean villages and towns cannot match the diversity of religions, languages, ethnicities, work skills, innovation and other features their larger cousins

15 World Population Review, 'Berlin population 2018', [Online], Walnut, CA: World Population Review, 19 October 2018, available from: worldpopulationreview.com/world-cities/berlin-population/.
16 Geoffrey West, *Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies*, New York, NY: Penguin, 2017, 143.
17 T.R. Reid, *Confucius Lives Next Door: What Living in the East Teaches Us about Living in the West*, New York, NY, Vintage, 1999, 75.
18 Rob Dunn, *Never Out of Season: How Having the Food We Want When We Want It Threatens Our Food Supply and Our Future*, New York, NY: Little, Brown & Company, 2017, 7–8.

possess. Experts estimate that New York City is home to some 800 languages. Roughly half the families it counts as resident do not rely on the English tongue at home as their primary means of communication. Students in the City of Los Angeles school system (never mind those in the larger megacity of which that city is the core) speak one or more of 199 languages.[19] With these different voices come different cultures. With varied cultures come the different perspectives fundamental to developing innovative approaches to meeting challenges.

What drove (and continues to drive) people to live where so many others unlike themselves lived, to leave the comfort of the familiar for the strange, even incomprehensible? For many centuries, it certainly was not the promise of a longer or more pleasant life. Cities were unhealthy in the extreme. With their thousands and tens of thousands and—very occasionally—hundreds of thousands packed together and sharing impure water and one another's waste, disease was the order of the day. British countryfolk lived more than 10 years longer in 1841 than their fellow citizens in the industrial cities of Manchester and Liverpool.[20] A boy born in New York City in 1901 could expect to live seven fewer years than a young American male elsewhere.[21] Cholera was so devastating during the nineteenth century that riots broke out in New York, Liverpool and other urban areas to protest government incompetence in addressing sanitation failures.[22] These death rates exceeded those for births. Continued existence depended on human inflow from elsewhere.[23]

As alien as their populations might be, and as dangerous as they were to live in, cities attracted people anyway. Marked by great differences internally, the largest urban areas nonetheless became distillers that gave countries common languages and shared social standards. One historian offers that London and Paris promoted English and French to the top of their respective countries' language hierarchies thanks to how much

19 Charles S. Heal, 'Best practices for securing a megacity during a major world event 1', Presentation to Current and Future Operations in Megacities Conference, Tokyo, 18 July 2019.

20 As quoted in Thomas J. Bollyky, *Plagues and the Paradox of Progress: Why the World is Getting Healthier in Worrisome Ways*, Cambridge, MA: MIT Press, 2018, 28–29, 115, doi.org/10.7551/mitpress/11750.001.0001.

21 Glaeser, *Triumph of the City*, 10.

22 As quoted in Bollyky, *Plagues and the Paradox of Progress*, 30.

23 Sean Fox, 'Urbanisation as a Global Historical Process: Theory and Evidence from Sub-Saharan Africa', in *Africa's Urban Revolution*, Susan Parnell and Edgar Pieterse (eds), New York, NY: Bloomsbury Academic, 2014, 257–83, at 261, doi.org/10.5040/9781350218246.ch-014.

the two urban areas dominated culturally.[24] People immersed themselves in those urban cultures if they wanted to reach the top in government, business or another part of society. That included learning the local lingo. It seems Frank Sinatra was right when it comes to dominant cities: 'If you can make it here, you can make it anywhere.' Little wonder that urban areas continue to attract now that cities are healthier places to live than those formerly superior rural areas, especially in developing countries.

Urban areas are also more efficient places to work. City infrastructure is built to move people, link them, concentrate them, supply them, serve them, inform them and protect them.[25] Manager and worker, provided and provider, served and server will tend to find they can accomplish sought-after ends more efficiently in terms of labour exerted and time spent than in rural environments. As we noted in terms of entertainment variety, urban mobility, internal connections, proximity to others, availability of goods and services, and limits on exposure to physical harshness also offer a more interesting life during nonworking hours. People do not flee megacities to escape boredom. Sheer volume of resources means urban environments are easier to survive in than rural areas during times of want. We recall that Filipinos flowed into World War II Manila despite the risks associated with closer proximity to the occupiers. Rural-to-urban flight continues to be the order of the day in times of disaster, in part as relief efforts tend to focus first on where the most people live. It should therefore not surprise that up to 95 per cent of internally displaced persons (IDPs) in Iraq, Syria, Jordan, Lebanon, Pakistan, Sudan and Somalia remain in or make their way to urban areas.[26] Common sense dictates the choice. Unless one lives in a paradise where a variety of food literally grows on trees and the climate coddles rather than mistreats, the volume of waste discarded by the well-to-do and the availability of shelter even 'on the street' mean most urban-dwellers can at least survive and perhaps do much better than that, as the poorest cull garbage, hawk their findings and shelter in abandoned buildings or vehicles; beneath bridges or awnings; or within doorways, parking garages or parks. Man, woman and child constantly wrestle with Mother Nature in the countryside. In urban areas, she is kept at bay other than when she throws a tantrum.

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24 Manuel De Landa, *A Thousand Years of Nonlinear History*, New York, NY: Swerve, 2014, 205–6.

25 Elizabeth Ferris, 'Urban disasters, conflict and violence: Implications for humanitarian work', *On the Record*, Washington, DC: The Brookings Institution, 28 February 2012, available from: www.brookings.edu/on-the-record/urban-disasters-conflict-and-violence-implications-for-humanitarian-work/.

26 de Boar, 'Resilience and the fragile city'.

Then there are the additional opportunities available should a poor urban migrant seek to shed poverty's fetters. The best predictor of whether a sub-Saharan African child completes a basic education is his or her parents' level of education. But where that boy or girl lives also influences the opportunities to learn. Those finding themselves in larger urban areas are better positioned than peers elsewhere, other conditions being equal.[27] It shouldn't surprise that breaking free of poverty and the chance to get an education complement each other. In Brazil's *favelas*, for example, education level has been the best predictor of whether someone born in those slums escapes.[28] Urban areas have long been fertile ground for upward mobility and other forms of social evolution.[29] For better or worse, urbanisation in China has done much to change the expectation that children will provide for their parents in old age; a new freedom releases financial, time and social intercourse resources previously bound up in familial obligations. Many of today's urban Chinese live in households akin to those in the West with only two generations under one roof: parents and children (if any). The change obviously comes with downsides, especially in a social system in which the government depends on such traditional providers in lieu of ponying up support itself. The evolutionary 'neglect' to provide sufficient support to parents became a crime in Shanghai at the end of the previous century.[30] China is not alone; a similar transformation has occurred in African urban areas.[31]

That 'if any' of a couple of sentences ago is another trait that distinguishes urban from rural environments. The mean number of children in a family dropped from seven to two in the West over some 200 years in no small part due to urbanisation and the related waning need for children to assist with farming. Unsurprisingly, given how quickly some developing nations have urbanised, a similar decrease in birthrates can now take place

27 'Geography lessons', *The Economist*, [London], 23 February 2019, 50.

28 'Onward and upward: Shanty life in Brazil', *The Economist*, [London], 24 July 2010, 81.

29 It would be wrong to believe, however, that moving from rural to urban living is a guarantee of bettering one's life or further onward movement to more pleasant environs. Up to 80 per cent of India's urban-dwellers live below the poverty line. In Kolkata, where 35 per cent of the megacity's population resides in its slums, more than 70 per cent of those residents have been there for over 15 years and over 40 per cent for more than 30 years. World Vision, *Cities Prepare! Reducing Vulnerabilities for the Urban Poor*, Asia Pacific Disaster Report, Bangkok: World Vision Asia Pacific, 2013, 55, available from: www.worldvision.jp/about/item_img/13_12_en.pdf.

30 Anthony M. Townsend, *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*, New York, NY: W.W. Norton, 2013, 48; and Richard Sennett, *Building and Dwelling: Ethics for the City*, New York, NY: Farrar, Straus & Giroux, 2018, 112.

31 Carole Rakodi, 'Religion and Social Life in African Cities', in *Africa's Urban Revolution*, Susan Parnell and Edgar Pieterse (eds), New York, NY: Bloomsbury Academic, 2014, 82–109, at 87, doi.org/10.5040/9781350218246.ch-005.

in a generation or two. The fertility rate in Kenya's cities is 3.1 births per woman versus 4.5 in rural areas.[32] London's East End—home to many of the megacity's immigrants—had birthrates exceeding the national average in the dawning years of this century. Less than 20 years later, the proportion of immigrant mothers' births is falling; the fertility rate in East End boroughs lags that for the United Kingdom at large.[33] Urbanisation partners with globalisation to influence cultural evolutions in other, admittedly less impactful, ways as well. Hong Kong customers originally shoved their way forward for service as they shouted food orders and thrust payment over the heads of others when McDonald's first opened in 1975. The introduction of restaurant-hired 'queue monitors' saw turmoil give way to polite lines.[34]

While urban areas undoubtedly introduce challenges for those responsible for security, they also offer opportunities less common in other environments. Whereas we in the West might think of cities as the more dangerous environment, escaping rural violence for the better policed and more ordered city has been a driver of rural-to-urban migration in Latin America and elsewhere.[35] Further—and somewhat surprisingly—at least one student of rural-to-urban movements found the percentage of income spent on both food and housing in Egypt was less for urban-dwellers. This freed up money for nice-to-haves such as furniture, nonessential food and entertainment, as well as the very desirable education and medical care on which city types spend more of their wealth.[36]

Whether major or minor, revolutionary or ordinary, these benefits seem to pile on one another.[37] One study looking at urbanisation in 90 developing countries linked living in urban areas to a reduction in poverty in every

32 'A school for small families: Demography', *The Economist*, [London], 2 February 2019, 52.

33 'Hold on: Life on furlough', *The Economist*, [London], 25 July 2020, 38.

34 Donald A. Norman, *Living with Complexity*, Cambridge, MA: MIT Press, 2011, 195.

35 Nina van Rijn, Urbanization in sub-Saharan Africa, Bachelor's thesis, University of Amsterdam, 16 December 2014, 24.

36 Mohamed Asar, 'Going Formal in Egypt: A Way Out for the Urban Poor—Land Titling versus Upgrading in Informal Settlements', in *Shelter for the Urban Poor: Proposals for Improvements—Inspired by World Urban Forum III*, Karin Gundström and Annette Wong Jere (eds), Lund, Sweden: Grahns Tryckeri AB, 2007, 95–110, at 97.

37 Statistics and characteristics of urbanisation in this and the following paragraph, other than those regarding Kenya, come from Peter Engelke, *The Security of Cities: Ecology and Conflict On an Urbanizing Planet*, Report, Washington, DC: Atlantic Council, 18 November 2013, 13, available from: www.atlanticcouncil.org/in-depth-research-reports/report/the-security-of-cities-ecology-and-conflict-on-an-urbanizing-planet/; Ivan Turoc, 'Linking Urbanisation and Development to Africa's Economic Revival', in *Africa's Urban Revolution*, Susan Parnell and Edgar Pieterse (eds), New York, NY: Bloomsbury Academic, 2014, 60–81, at 75, doi.org/10.5040/9781350218246.ch-004; and UN-Habitat, *Urbanization and Development*, 7.

region of the world bar one: sub-Saharan Africa. Yet, there are exceptions even south of the Sahara. Nairobi, Kenya, has among the largest slums in the world. Yet, those who have moved from rural communities conceal the fact they are better off financially for fear of being asked to send funds home. A researcher conducting a recent experiment told select rural-dwellers how much those in the capital made, what the cost of food was and the wages for specific jobs. Two years later, migration from those households was one-third higher than from those not so informed. The same researcher found more than half the capital's slum residents believed their living conditions were better in Nairobi than in rural communities.[38]

The complexity of megacities and the fallacy of the organism metaphor

> Cities are not organisms any more than they are machines … They do not grow or change of themselves, or reproduce or repair themselves. They are not autonomous entities, nor do they run through life cycles, or become infected … But it is more difficult, and more important, to see the fundamental ineptness of the metaphor and how it leads us unthinkingly to cut out slums to prevent their 'infectious' spread, to search for an optimum size, to block continuous growth, to separate uses, to struggle to maintain greenbelts, to suppress competing centers, to prevent 'shapeless sprawl,' and so on.[39]
>
> —Kevin A. Lynch, *Good City Form*

> Although cities have been destroyed throughout history—sacked, shaken, burned, bombed, flooded, starved, irradiated, and poisoned—they have, in almost every case, risen again.[40]
>
> —Lawrence J. Vale and Thomas I. Campanella, 'Introduction: The Cities Rise Again'

38 'Tall tales of the city: Kenya', *The Economist*, [London], 11 April 2020, 39.

39 Kevin A. Lynch (*Good City Form*, Boston, MA: MIT Press, 1984, 95), as quoted in Luís M.A. Bettencourt, *The kind of problem a city is: New perspectives on the nature of cities from complex systems theory*, SFI Working Paper 2013-03-008, Santa Fe, NM: Santa Fe Institute, 2013, available from: studylib.net/doc/8927135/the-kind-of-problem-a-city-is.

40 Lawrence J. Vale and Thomas I. Campanella, 'Introduction: The Cities Rise Again', in *The Resilient City: How Modern Cities Recover from Disaster*, Lawrence J. Vale and Thomas I. Campanella (eds), New York, NY: Oxford University Press, 2005, 3–23, at 3, doi.org/10.1093/oso/9780195175844.003.0004.

The more one looks at our population's densest concentrations, the more it becomes evident that urban areas are complex in character, tough to comprehend and difficult to govern. Many have turned to simplifying models as a result, with one of the most popular being to liken cities to organisms—most often *Homo sapiens*. 'It was common to describe the city as a body' and equate a 'blockage of [traffic] circulation with a seizure or heart attack' as early as the eighteenth century.[41] The metaphor has some value in understanding urban areas at the most simplistic level: roads are veins and arteries. Traffic flows into and out of the 'heart' (central business district, or CBD). Industrial zones, airports and financial centres are 'organs', each with a specialised function. Government is the 'brain' (despite ample examples to the contrary). Garbage, sewage and pollution are, well, you can figure it out. A particularly striking metaphor is Ryuji Takemoto's observation that Tokyo's massive daily flows of commuters going to and returning from work are the megacity's inhalations and exhalations.[42] Cities have relations with each other—some providing specific services (banking, for example), others producing goods not available elsewhere. And there are those 'cancers' that some view as needing excising: slums, gangs, insurgents and corruption, to name a few.

The metaphor quickly breaks down when we look beyond the superficial. Much—likely most—of the flow into and out of an urban area does not pour through the CBD or any other single point. Most instead moves between points offering a function specific to an individual or group rather than the whole.[43] No single force (heart) drives all. Few urban governments are consistently 'of a mind'; the best would be lucky if they were only bipolar. Residents and workers refuse to travel at the same speed, in contrast to blood cells. Nor do those cells kick up their non-existent feet for drinks after a day in the heart, later staggering out to cause a wreck at the intersection of Capillary and Vein. Few would consider it a good thing when a stream of blood cells squirts off for a week's vacation. Interactions between cities will play a significant part in our discussions

41 Jonathan Conlin, *Tales of Two Cities: Paris, London, and the Birth of the Modern City*, Berkeley, CA: Counterpoint, 2013, 15.

42 Ryuji Takemoto [Lieutenant-General, Japan Ground Self-Defense Force], 'The JGSDF role in megacity security operations', Presentation to Achieving Convergence during Humanitarian Assistance and Disaster Relief Operations in the World's Largest Urban Areas Conference, Tokyo, 16–18 July 2019.

43 Horacio Samaniego and Melanie E. Moses, 'Cities as organisms: Allometric scaling of urban road networks', *Journal of Transport and Land Use* 1(1) (2008): 21–39, at 24, doi.org/10.5198/jtlu.v1i1.29.

to come, but urban areas have yet to link up for procreation. Unlike those pre-twentieth-century cities that saw death rates exceed births, humans cannot look to outside sources for regular replacement of demised cells (organ transplants and blood transfusions notwithstanding).[44]

Perhaps the greatest argument against relying too greatly on the metaphor of urban area as organism is each urban area's uniqueness—a uniqueness even more evident when we compare megacities. Cities might voluntarily twin with one another, but no-one will mistake them for siblings, much less doppelgangers. Different as each human is from another, we are far more alike. Head, torso and limbs are in the same general location. Organs are by and large uniform in function. The body and brain age or fall foul of disease, but there is no dramatic physiological evolution within a single organism's lifespan that compares to what Rome, Paris, London, Shanghai or Seoul once was and now is.

If we need a metaphor to help us understand cities' complexity, we can find a reasonable if imperfect one in ecosystems (which one author describes as 'populations in continuously changing environments' and another as 'a community of organisms together with their nonliving environment').[45] As complex dynamic systems, ecosystems are 'able to adapt in and evolve with a changing environment … in terms of co-evolution with all other related systems'. A few other relevant ecosystem characteristics include:

- Distributed control: 'There is no single centralized control mechanism that governs system behavior … Overall behavior usually cannot be explained merely as the sum of individual parts … This implies that a decision or action by one part within a system will influence all other related parts but not in any uniform manner.'

44 Comparisons between cities and machines is another popular, although less common, metaphor, and is even less convincing. Such greatly oversimplified comparisons are fine if we need only a very superficial understanding that ignores human emotions and will, constant changes in daily activities and the development (and vagaries) of relationships with others, to mention just a few exceptions (setting aside *Ex Machina* and *Westworld*).

45 The descriptions are, respectively, H.A. Gleason's, as appears in R.V. O'Neill, Donald Lee Deangelis, J.B. Waide and Timothy F.H. Allen, *A Hierarchical Concept of Ecosystems*, Monographs in Population Biology Vol. 23, Princeton, NJ: Princeton University Press, 1986, 26; and James H. Brown, 'Complex Ecological Systems', in *Complexity: Metaphors, Models, and Reality*, George A. Cowan, David Pines and David Meltzer (eds), SFI Studies in the Sciences of Complexity, Proc. Vol. XIX, Boston, MA: Addison-Wesley, 1994, 419–49, at 422.

- Sensitive dependence: 'Small changes can have a surprisingly profound impact on overall behavior … Long-term prediction and control are therefore believed to not be possible.'[46]

Both these characteristics obviously complicate efforts at urban planning. This is especially true for organisations employing a backward planning approach in which one starts by identifying the ultimate goal (military types call this the 'desired end state') and works backward to the present, determining along the way what activities will result in achieving the desired goal. Military or otherwise, the lack of predictability in a city's daily happenings demands flexibility in responding to and successfully influencing events. Maintaining that flexibility while making good decisions requires what leaders in the armed forces call 'mission command', though it is a concept practised in various forms and under various names by both civilian and military organisations. We will look at mission command and how it applies to megacity disasters in coming chapters.

Megacities as ecosystems are particularly rich not only in terms of the organisms that occupy them but also from the perspective of the groups formed by the individuals within them. Each resident is part of ethnic, cultural, economic, functional, social and other collectives that together provide those living in urban areas with a variety of exposures and experiences impossible to replicate elsewhere. Just as individuals interact with others intimately, occasionally or not at all, group connections span a similarly broad and complex spectrum in which members occupy several if not many assemblies and thereby are always initiating relationships unlike anything found within the body of a single organism. These relationships range across a vast spectrum. The metaphor of ecosystems accounts for an urban area's many parts cooperating, competing or adapting as one 'species' is lost and another arrives or evolves to fill vacated or newly discovered niches. Unlike with a single organism, resulting evolutions can take place in very short periods (think of a city rebuilding after a disastrous fire or war) and be dramatic in character. As one writer observed:

> Complexity tends to grow as systems evolve … It may grow by increases in 'species' diversity: under certain circumstances new species may provide further niches that call forth further new species in a steady upward spiral. [In other cases] it may grow by

46 Serena Chan, *Complex adaptive systems*, ESD.83 Research Seminar in Engineering Systems Paper, Cambridge, MA: Massachusetts Institute of Technology, 31 October – 6 November 2001, 2–5, available from: web.mit.edu/esd.83/www/notebook/Complex%20Adaptive%20Systems.pdf.

> increases in structural sophistication: the system steadily cumulates increasing numbers of subsystems or subfunctions or subparts [involving the same 'species' but in evolved relationships].[47]

The 'species' in the case of megacity ecosystems could be new entries into the urban economy that fill a previously unfilled niche—companies offering to change tyres at customers' homes, for example—or ones that meet a demand created by changes in the urban area's makeup, such as vegan restaurants as diet preferences move in that direction. A straightforward example from a notional village helps get the point across. Let's say our very small village has only two residents: a worker and a cab driver who drives him to work in a nearby town. An entrepreneur spots an opportunity and enters the scene, adding a store with a petrol station. Now the cab driver also sees new opportunities. He can increase his offerings to include goods delivery to and from the store to people near or far. Should worker or storeowner add a pet dog, there could be an opening for a veterinary office, the storeowner adding pet supplies and dog wash or the cab driver augmenting his services with pet walking during his driving downtime. We multiply such additions and evolutions by thousands, even millions, in a megacity. The interconnectedness between one urban area and others spurs similar increases in both cities' complexity. (Ironically, though, at some point in our megacity as ecosystem model, individual behaviour may become simpler as complexity increases.[48] Eventually, our cab driver cum deliveryman cum pet walker goes back to focusing on his cab driving as others fill the pet-walking business and delivery services on a permanent basis.)

As the quotations opening this section make clear, cities seem to have found the secret of (nearly) eternal life. With rare exception, they do not die. Today's London, Paris, Mexico City, Istanbul, Cairo and Delhi are among the megacities whose depths include ancient predecessors.[49] They are like good-guy zombies in that sense (if zombies can be good. It's not an area of personal expertise). Cities, especially large cities, survive even the most devastating of tragedies, rising again and often becoming stronger in the years to follow. Empires, countries, governments, even civilisations—cities outlive them all (think Rome, Byzantium/Constantinople/Istanbul, Athens

47 A. Brian Arthur, 'On the Evolution of Complexity', in *Complexity: Metaphors, Models, and Reality*, George A. Cowan, David Pines and David Meltzer (eds), SFI Studies in the Sciences of Complexity, Proc. Vol. XIX, Boston, MA: Addison-Wesley, 1994, 65–78, at 65, available from: sites.santafe.edu/~wbarthur/Papers/Evol%20of%20Complexity.pdf.

48 O'Neill et al., *A Hierarchical Concept of Ecosystems*, 115.

49 Monica L. Smith, *Cities: The First 6,000 Years*, New York, NY: Viking, 2019, 4–5.

and the much-punished Jerusalem). They are far more robust than any human could hope to be. Crank the internal temperature of a human up 10 or 15 degrees above 98.6 Fahrenheit (37ºC) and that individual has breathed their last. Some urban areas experience annual swings of 60, 70 or more than 100 degrees (Fahrenheit, that is). Many have literally risen from the ashes, though only a few are named 'Phoenix'. London survived its Great Fire of 1666 despite five-sixths of the city being destroyed, including almost all its major public buildings and many of its businesses—just another in a series of disasters that could not prevent resurrection. It had been destroyed in earliest form during Boudicca's uprising in 60 CE less than 20 years after being founded, and again 70 years after that event. It then survived the Roman departure.[50] Almost half its residents died during the Black Death in the mid-fourteenth century. London slowly recovered over the following two centuries—just in time for the 1563 plague that removed one-fifth of its population. Plague returned frequently, with especially savage visits in 1593, 1603 and 1625.[51] Then there was the bombing during World War II that killed more than 20,000 civilians and badly damaged or destroyed 300,000 houses.[52] Chicago's 1871 fire devastated the city. Like the Phoenix, it rose again. Unlike the Phoenix, it transformed itself by becoming the world's first skyscraper city. Anthropologist Monica L. Smith concludes that the only way to kill a modern city of reasonable size is 'through a nuclear catastrophe', citing Ukraine's Chernobyl as the only city in the past thousand years to effectively disappear.[53] Perhaps, though disease, biological weapons, chemical agents wielded to kill or other potential causes might someday prove her optimistic. (She perhaps intended her readers to include Pripyat within her construct of 'Chernobyl'. Pripyat once hosted a population of some 50,000. Now devoid of human habitation, it was closer to the nuclear plant than the smaller city of Chernobyl that gave the facility its name.)

Exceptions to this cities-do-not-die assertion include many from the ancient world, but most of their populations numbered in the few thousands—what we would call towns today. Historian Greg Woolf notes that now we live in a world 'where a small city has less than 500,000 inhabitants … A small city in the ancient world had fewer than 5,000

50 Stephen Alford, *London's Triumph: Merchants, Adventurers, and Money in Shakespeare's City*, New York, NY: Bloomsbury, 2017, 26–27; and John Reader, *Cities*, New York, NY: Atlantic Monthly, 2004, 262.
51 Alford, *London's Triumph*, 13, 21.
52 Philip Ziegler, *London at War: 1939–1945*, New York, NY: Alfred A. Knopf, 1995, 161.
53 Smith, *Cities*, 259.

inhabitants'.[54] The chances of a town dying today are far greater than for a city of any reasonable size. The chances are virtually nil if the urban area is a megacity. The past can also be deceptive. Looking back at some of those 'cities' that seemed to disappear, we find they were simply waiting to rise again, as with London, Cairo, Jerusalem and others that today sit atop their ancestors. More importantly in terms of survival, these earlier cities were simple ecosystems compared with their evolved forms, limited in their number of functions and interdependencies. They lacked the robustness of today's larger urban areas in which the removal or 'death' of some economic or other sector sees another stepping in. Alternatively, the remainder of the city might carry on without what proves to be a nonvital part of its environment. Pittsburgh provides an example—flourishing despite the departure of the steel industry.

Evolution helps to explain urban survival. Tokyo was once Edo—little more than a village seat of government terribly prone to fire. It suffered blazes so frequently and destructively they became known as *Edo no hana* (the 'flowers of Edo').[55] Its massive fires burned more than 1,000 homes nearly every winter as village became city. More than 100,000 of its residents died and most of its structures were consumed in the 1657 Great Fire of Meireki. We read of the same happening in 1923, yet Tokyo housed more than 7 million people by the late 1930s. The population dropped sharply during World War II. After the conflict, the remaining 3 million sought refuge in what remained after Allied bombing destroyed 750,000 houses.[56] Today, Tokyo is not only the world's most populous urban area; it is also one of its greatest financial centres. Venice was the hub of Mediterranean maritime commerce six centuries ago. No longer, but it has evolved to become a centre of art, architecture and tourism. Jerusalem was ravaged by Babylonians (in 604 BCE), Romans (repeatedly, including 70 CE), Persians (614 CE) and Christians (1099 CE), with slaughter and expulsion accompanied by

54 Greg Woolf, *The Life and Death of Ancient Cities: A Natural History*, New York, NY: Oxford University Press, 2020, 358.

55 Material in this paragraph comes from the following sources: Carola Hein, 'Resilient Tokyo: Disaster and Transformation in the Japanese City', in *The Resilient City: How Modern Cities Recover from Disaster*, Lawrence J. Vale and Thomas I. Campanella (eds), New York, NY: Oxford University Press, 2005, 213–34, at 216, doi.org/10.1093/oso/9780195175844.003.0016; Max Page, 'The City's End: Past and Present Narratives of New York's Destruction', in *The Resilient City: How Modern Cities Recover from Disaster*, Lawrence J. Vale and Thomas I. Campanella (eds), New York, NY: Oxford University Press, 2005, 75–93, at 77, doi.org/10.1093/oso/9780195175844.003.0008; Mark Twain, *The Innocents Abroad*, Ware, UK: Wordsworth, 2010, 138; and Julian Beinart, 'Resurrecting Jerusalem', in *The Resilient City: How Modern Cities Recover from Disaster*, Lawrence J. Vale and Thomas I. Campanella (eds), New York, NY: Oxford University Press, 2005, 181–210, at 182, doi.org/10.1093/oso/9780195175844.003.0014.

56 Kumagai and Nojima, 'Urbanization and Disaster Mitigation in Tokyo', 58, 61.

deliberate wasting of its buildings. Speaking (or rather writing) of Rome, the city of an estimated 1 million people during the height of empire saw its population fall to about 30,000 during the sixth century CE when Justinian ruled in Constantinople; it is home to nearly 4 million people today and is Italy's capital.[57] Even what passed for large cities in ancient times—Ur and Hierakonpolis (or Nekhen) among them—in most cases had miniscule populations by today's standards. Ur is thought to have had 65,000; Hierakonpolis maybe 10,000 people. Hamburg, Germany, lost 42,600 killed during a single week of Allied bombing in World War II.[58] The pile would have been 12.3 kilometres high if the rubble of 1945 Berlin had been stacked on a US football field after months of bombing and the Soviet invasion in the same conflict;[59] it is thought 35,000 of its citizens died during the war. Few of the no-longer-remaining ancient cities reached a population of 100,000 or more. Central America's Teotihuacan was one. Tenochtitlan, on the site of what is now Mexico City, is another. Only 40,000 of Cologne's pre–World War II population of 700,000 citizens remained before fighting ceased in Germany with the others having lost their lives or fled.[60] Cologne flourishes today.

Adapt or don't date

> The Philadelphia yellow-fever epidemic of 1793 had been as savage as an attack of bubonic plague and doomed the supremacy of Philadelphia among the cities of North America.[61]
>
> —David McCullough, *The Path between the Seas*

> Dense urban conglomerations of humans have the power to exert, on wild animals and plants, novel and unusually strong selection pressures.[62]
>
> —Menno Schilthuizen, *Darwin Comes to Town*

57 Elizabeth Kolbert, 'The spread: How pandemics shape human history', *The New Yorker*, 6 April 2020, 58–61, at 58.

58 Adrian Mourby, 'Where are the world's most war-damaged cities?', *The Guardian*, 17 December 2015, available from: www.theguardian.com/cities/2015/dec/17/where-world-most-war-damaged-city; and Jeffry M. Diefendorf, *In the Wake of War: The Reconstruction of German Cities after World War II*, New York, NY: Oxford University Press, 1993, 10–11.

59 Calculated from statistics provided in Diefendorf, *In the Wake of War*, 15.

60 ibid., 16. A very few ancient cities may have hit the 1 million mark. Angkor Wat, in what is now Cambodia, is thought to have reached that number, in addition to Rome.

61 David McCullough, *The Path between the Seas: The Creation of the Panama Canal, 1870–1914*, New York, NY: Touchstone, 1977, 141.

62 Menno Schilthuizen, *Darwin Comes to Town: How the Urban Jungle Drives Evolution*, New York, NY: Picador, 2018, 94.

No less impressive minds than those of Charles Darwin and Plato hint at Schilthuizen's conclusion above. Darwin observed that the more varied the plants in a plot of land, the greater is the vegetation's cumulative weight of life.[63] Plato believed diversity was the key to a city prospering. Urban areas' variety gives rise to strengths, allowing them to adapt to changing conditions and pull through hard times. Cities are definitive examples of synergy, each being far more than the sum of very different yet complementary parts. New York City today is much different than it was 100 years ago. Less a port of call for ships than in decades past, it is a provider of financial and other services as never before. Its internal and ever-changing variety go a long way towards explaining its successful transformations.

Ecosystems are an effective way of thinking about urban areas because cities are, as we have noted, themselves systems—very complex systems, with megacities the most complex of all. That's why any attempt to simplify by comparing urban areas to simpler systems such as ant colonies or beehives (or the human body) quickly reaches a limit in its value as a model. (If you do buy into the 'a city is like a beehive or ant colony', do you consider yourself a drone, a worker or the queen? No options for manager, executive or professional athlete.) As we saw above, and unlike most organisms, urban areas—and often their components and sub-systems—can adapt quickly to change not only socially but also physically. Those evolutions can see buildings, businesses, communities or select species altered or entirely replaced, as often occurs in nature's ecosystems when climate change or other system-altering events assert themselves. The American cliff swallow, a type of bird, underwent human-inspired, construction-induced evolution in the space of a single generation (admittedly, a single human generation and lots of swallow generations). These birds started nesting in Nebraska's highway bridges and culverts in the early 1980s. At the time, the birds nesting in these humanmade structures had wings about the same length as those choosing to nest in natural features. Researchers studying multiple generations found that, by the 2010s, roadkill carcasses had wings half a centimetre longer than survivors along what is a most dangerous environment for birds (roads, urban or otherwise). The pretty obvious conclusion: long wings kill. Shorter wings provide quicker lift and more agile turning than those on their 767 colleagues (think fighter jets).[64] (This would seem to open a PhD topic for some aspiring biologist willing to do a similar study of metropolitan pigeons and their country cousins. There would be no lack of subjects.)

63 Reader, *Cities*, 141–42.
64 Schilthuizen, *Darwin Comes to Town*, 99–100.

Swallows (those with shorter wings anyway) are not alone as quick adapters thanks to humans influencing their habitats. Recent studies found urban field mice performed on par with their country cousins on a simple control task of digging through debris to find a treat. Make the task more difficult, however, and the urban-born were successful 77 per cent of the time while the rural mice were so on only 52 per cent of occasions. Nature (heredity) or nurture ('learned' cleverness)? The mice tested had been acclimatised in a laboratory for a year after being captured, but mouse memory could explain the difference if nurture is the reason. Future experiments will raise youngsters born to each group for future testing.[65]

European researchers collected eggs of the triangulate cobweb spider (*Steatoda triangulosa*) from both the Italian countryside and the cities of Milan, Nice and Munich. They put the resultant eight-legged youngsters into boxes with a divider down the middle. One half of the box was lit, the other kept dark, but the arachnids could move to either side with no problem. Two out of three from rural environments built their webs on the Dark Side while half the city types instead chose the Rebel Alliance option. Researchers concluded that urban spiders had evolved to be less afraid of light (and, I venture, further genetic or epigenetic mechanisms could be at play that encourage building webs where lights would attract prey).[66] Reflecting the fact there are plenty of doctoral topics out there for those interested in urban biological studies, another group found that city-bred Túngara frogs (*Engystomops pustulosus*) sing more often and have more complex tunes than their rural cousins. They also stopped vocalising more quickly when a human approached. Rural frogs put in the big city retained their old ways, putting them at the double disadvantage of missing out on dates and being in greater risk of human contact.[67] Urban-dwelling members of a fourth species, *Homo sapiens*, are more likely to have tuberculosis-resistant genes than those from rural communities, demonstrating that while humans might not be able to evolve as quickly as their city, they might—given time—improve their chances of surviving in its environs.[68] Perhaps less exciting than these physiological evolutions,

65 'Country bumpkins and city slickers', *The Economist*, [London], 23 January 2021, 65.

66 'Underneath the lamplight: Evolution', *The Economist*, [London], 10 November 2018, 77–78.

67 'Brekekekex koax koax: Animal behavior', *The Economist*, [London], 15 December 2018, 17. Other species that have adapted to urban living include mosquitoes (in London's subway) and lizards in Los Angeles. The latter have fewer dorsal scales—an apparent adjustment to the megacity's hotter environment. For both, see Brendan I. Koerner, 'Street life', *WIRED*, 27 October 2019, 72–85, at 78, 79.

68 Schilthuizen, *Darwin Comes to Town*, 228.

social changes can also occur over very short timespans. The example of McDonald's gentrifying Hong Kong customers' behaviour has something of a match in the marital arena. Urban folk seek different characteristics in their mates than their rural cousins and are quicker to find those with common backgrounds or qualities—a matter of a bigger selection pool thanks to density and sheer numbers.[69] Jolts to a major urban area can fundamentally spur evolution in its relationship with the country of which it is a part. Before the devastation of Tokyo's 1923 earthquake, Osaka was Japan's centre of railway development. Thereafter, reconstruction of the Japanese capital saw it become a commuter city served by a dramatically expanded rail service, promoting its national primacy.[70]

Defining urban areas and megacities

> Spartans would never have had cities as 'Spartans despised city walls, bragging that "our young men are our walls and our battlements the tips of their spears".'[71]
>
> —Bettany Hughes, *Istanbul*

> For archaeologists and historians the most meaningful difference between a village and a city has nothing to do with size; it is instead a measure of social and economic differentiation … A place occupied exclusively by people who had left the land to become full-time craftsmen, merchants, priests and civil servants was a city, while anywhere occupied principally by farmers was a village. By and large, only farmers lived in villages, while 'a key defining feature of a town or city is that farmers don't live in them'.[72]
>
> —John Reader, *Cities*

> As one distinguished professor remarked, 'a scientist would rather use someone else's toothbrush than another scientist's terminology'.[73]
>
> —Murray Gell-Mann, 'Complex Adaptive Systems'

69 Jeb Brugmann, *Welcome to the Urban Revolution: How Cities Are Changing the World*, New York, NY: Bloomsburg, 2009, 188.

70 Michael Fisch, *An Anthropology of the Machine: Tokyo's Commuter Train Network*, Chicago, IL: University of Chicago Press, 2018, 32, doi.org/10.7208/chicago/9780226558691.001.0001.

71 Hughes, *Istanbul*, 36.

72 Reader, *Cities*, 16.

73 Murray Gell-Mann, 'Complex Adaptive Systems', in *Complexity: Metaphors, Models, and Reality*, George A. Cowan, David Pines and David Meltzer (eds), SFI Studies in the Sciences of Complexity, Proc. Vol. XIX, Boston, MA: Addison-Wesley, 1994, 17–45, at 17.

Spartans aside, walls were among the defining characteristics present in many early urban areas. The Chinese character for 'city' is also that for 'wall'. Other physical structures were key to ancient Greek understandings of what separated a city from a mere village or town. The writer Pausanias turned his nose up at Phoenicians' claims of city status for a small town 'because it had no government offices, no gymnasium, no theater, no market, no piped water supply … It was these buildings and utilities that distinguished a city from a mere huddle of village houses.'[74] Aristotle had his own discriminators. He:

> thought that the ideal city should contain no more than 5,000 citizens which he considered was the largest number of people who could conveniently meet together to govern themselves, and that the ideal size of a city should be one in which a shout at one end could be heard at the other.[75]

(He did not count women, freemen or slaves; obviously, the '#MeToo' movement had a few millennia to go before making itself evident.) Aristotle also recognised the need for a diverse population—one comprising 'different kinds of men; similar people cannot bring a city into existence'.[76] Other definitions require the presence of a cathedral, though author Brenna Hassett pointed to the absurdity of requiring a cathedral as a necessary condition, noting that Chinese urban areas of 15 million people lack both building and bishop. Witold Rybczynski similarly observed that the existence of a cathedral required no minimum population, meaning cities by this definition might otherwise qualify as a mere town.[77]

Aristotle notwithstanding, the definitions above require buildings or other structures of some sort, often ignoring the vital characteristic: the presence of people. People not only build and populate the walls, offices, theatres and cathedrals, but also link cities to the countryside on which they rely at least in part for food, water and other needs and which in turn seeks the goods and services only a city can provide. That did not mean—and does not mean—the urban goods and services provided necessarily originated in the

74 Lewis Mumford, *The City in History: Its Origins, Its Transformations, and Its Prospects*, New York, NY: MJF, 1961, 133–34. Also see Robin Osborne and Andrew Wallace-Hadrill, 'Cities of the Ancient Mediterranean', in *The Oxford Handbook of Cities in World History*, Peter Clark (ed.), Oxford, UK: Oxford University Press, 2016, 49–65, at 49.

75 Rybczynski, *City Life*, 36; and Sennett, *Building and Dwelling*, 82.

76 As quoted in Sennett, *Building and Dwelling*, 6–7.

77 Brenna Hassett, *Built on Bones: 15,000 Years of Urban Life and Death*, New York, NY: Bloomsbury Sigma, 2017, 94, doi.org/10.5040/9781472948311; and Rybczynski, *City Life*, 38.

urban area. Cities have since their earliest existence tended to connect not only with their immediate surroundings but also with other, often distant, population centres. Coastal European, Asian and African Mediterranean cities were less separated by the sea than brought together by the trade its waters allowed.[78] Urban ties represented mutual dependence between the Roman Empire's urban areas. Gaul's wealthy Lyon sent large amounts of financial aid when fire devastated Rome in 64 CE.[79]

It would be nice to think we have cast aside such seemingly random attempts to define urban areas and settled on a uniform understanding of these phenomena in which more than half of humankind now resides. No such luck. Various countries define 'urban areas' as concentrations of anything from 200 people up to 50,000 or more. For the United States, it's 2,500 people.[80] India chooses to be a bit more on the upside with a mark of 5,000; Egypt decided 20 times that is a better choice, its requirement being 100,000, as is China's. India's definition of a city requires 75 per cent or more of the male population to be working in other than the agricultural sector (again, where's the #MeToo movement?).[81] Other definitions simply make the head hurt. The European Commission will tell you that an urban centre is a contiguous stretch with a minimum of 50,000 people and a population density of 300 people per square kilometre or more, which must be interesting to hear in each of the commission's many languages.[82]

But there is much more to urban areas than populations and buildings, as Pausanias, Aristotle and many others realised. A Middle Ages German saying, *Stadtluft macht Frei* ('City air makes you free'), had both social and legal meanings. Larger urban areas were places where society's rigid feudal hierarchy held less sway. A person could advance in social or economic status in ways not possible in rural communities where serfs were bound to the

78 Osborne and Wallace-Hadrill, 'Cities of the Ancient Mediterranean', 49.

79 Susan Ford Wiltshire, *Greece, Rome, and the Bill of Rights*, Norman, OK: University of Oklahoma Press, 1992, 180.

80 Hannah Ritchie and Max Roser, 'Urbanization', *Our World in Data*, 2018, [Updated 2019], available from: ourworldindata.org/urbanization; and Lewis Dijkstra, Ellen Hamilton, Somik Lall and Sameh Wahba, 'How do we define cities, towns, and rural areas?', *Sustainable Cities Blog*, Washington, DC: The World Bank, 10 March 2020, available from: blogs.worldbank.org/sustainablecities/how-do-we-define-cities-towns-and-rural-areas.

81 Gregory Scruggs, 'How much public space does a city need?', *Next City*, [Philadelphia, PA], 7 January 2015, available from: nextcity.org/daily/entry/how-much-public-space-does-a-city-need-UN-Habitat-joan-clos-50-percent; and William H. Frey and Zachary Zimmer, 'Defining the City', in *Handbook of Urban Studies*, Ronan Paddison (ed.), London: Sage, 2001, 15–35, at 26, doi.org/10.4135/9781848608375.n2.

82 ibid.

land and its owner. Economic success in a medieval town or city could raise one's place in the social hierarchy in ways unheard of in rural environments, as could assuming responsibilities in support of the local government. A serf who fled to such a built-up feature and managed to remain free of his or her master for the magic period of one year and a day legally became a part of the town or city and was no longer responsible to their rural master. Thereafter, they were largely free of bonds (unless they entered another subordination such as apprenticeship). Women, in particular, found their lives opened to new opportunities unavailable in rural communities.[83]

Several recent attempts to define urban areas draw on more-than-population or more-than-buildings features. In so doing, they have added a deluge of descriptions—ones pertaining to the world's largest and most interconnected cities. 'Global cities' are principal points in the world's economic system, some of which are less competitors than complements to one another as urban areas specialise in functions necessary to others' products or services.[84] (Others prefer the term 'alpha cities' to global cities. Perhaps urbanists are sometimes like those scientists who 'would rather use someone else's toothbrush than another's terminology'.)[85] As one author put it, global cities collectively offer 'a set of financial, legal, and other specialized service tasks which the global economy performs; these "global functions" are parcelled out to different cities in a network in which each city plays a particular role'.[86] Global cities contrast with those known by another term: 'world cities'. Whereas 'global cities are commanding nodes of the global economic system, world cities articulate large national economies into the global system'[87] (I'm not sure I fully grasp the difference either). Others are 'gateway cities'—distinguished by being thoroughfares for migrants to other countries.[88] Then there are

83 Sennett, *Building and Dwelling*, 120–21.

84 Aaron M. Renn, 'What is a global city?', *New Geography*, 6 December 2012, available from: www.newgeography.com/content/003292-what-is-a-global-city.

85 Gell-Mann, 'Complex Adaptive Systems', 17.

86 Sennett, *Building and Dwelling*, 101.

87 James K. Mitchell, 'Introduction', in *Crucibles of Hazard: Mega-Cities and Disasters in Transition*, James K. Mitchell (ed.), New York, NY: United Nations University, 1999, Note b to Table 1.2, p. 5. See also Saskia Sassen, *The Global City: New York, London, Tokyo*, Princeton, NJ: Princeton University Press, 2001, 349, doi.org/10.2307/j.ctt2jc93q.

88 For discussions of these various city types and even variations on some of these definitions, see Sassen, *The Global City*, 27–43; Parag Khanna, 'When cities rule the world', *Featured Insights*, McKinsey & Company, 1 February 2011, available from: www.mckinsey.com/featured-insights/urbanization/when-cities-rule-the-world; and International Organization for Migration (IOM), *Migrants and Cities: New Partnerships to Manage Mobility*, World Migration Report 2015, Geneva: IOM, 2015, available from: www.iom.int/world-migration-report-2015.

'critical cities', so labelled because of their security importance either to a foreign power (Cairo is cited as an example for the United States) or to their own national government (as instability, financial troubles or some other problem in these cities could undermine the viability of national authorities).[89] Still other definitions seek to discriminate between a physical expanse of built-up and densely populated terrain (an 'urban area') and a 'metropolitan area' that includes a built-up/densely populated area and all the surrounding territory linked to it economically. A metropolitan area therefore can be—and generally is—much larger than the urban area that is a part of it. Paris, the urban area, for example, is only one-fifth the size of Paris, the metropolitan area.[90] Adding to the potential confusion (and that potential is considerable), the United States uses the term 'urbanised areas', Australia uses 'urban centres', Canada 'population centres' and the United Kingdom 'built-up urban areas' (as somehow contrasted with built-up nonurban areas or non-built-up urban areas?). Adding to our enjoyment: what is meant by identical or nearly identical terms can differ depending on who is speaking. New Zealand's 'urban areas' include rural terrain—as do many areas of what China refers to as urban, with their claims of having massive urban agglomerations that exceed Tokyo or Jakarta in population incompatible with most usage and our definition to come.[91] Some claim Chongqing, China, has the largest population of any city in the world given an administrative area that is roughly equivalent in size to Austria. Much of what falls within those boundaries, however, is rural and thus does not qualify as an urban area by most definitions. For any still not convinced that one could drown in this sea of descriptions, a Strategic Studies Group on Megacities convened by the chief of staff of the US Army chose 'context, scale, density, connectedness, and flow' to describe a megacity, further muddying the waters by concluding that 'one of the hallmarks of megacities is rapid hetero and homogeneous

89 P.H. Liotta and James F. Miskel (*The Real Population Bomb: Megacities, Global Security and the Map of the Future*, Kindle edn, Dulles, VA: Potomac Books Inc., 2012, 48), as quoted in Phil Williams and Werner Selle, *Military Contingencies in Megacities and Sub-Megacities*, Carlisle, PA: Strategic Studies Institute and US Army War College Press, December 2016, 28.

90 Wendell Cox, 'Largest 1,000 cities on Earth: World urban areas—2015 edition', *New Geography*, 2 February 2015, available from: www.newgeography.com/content/004841-largest-1000-cities-earth-world-urban-areas-2015-edition. China's broad definition of urban area—one that allows considerable interspersion of expanses of rural terrain—may in some cases be better understood in terms of metropolitan areas. That is particularly true as commuters take fast trains, allowing them to travel to and from work from distant locations that are noncontiguous with those places of employment. For more on the increasing number of Chinese commuters choosing to rely on this mode of transport, see 'Build it and they will go', *The Economist*, [London], 27 February 2021, 35.

91 Cox, 'Largest 1,000 cities on Earth'; and *Demographia World Urban Areas*, 15th edn, 5n.9.

population growth that outstrips city governance capability'.[92] Then there are definitions that ignore the reality on the ground as well as trouble the mind. A contiguous built-up area otherwise meeting a population threshold might not qualify as an urban area if it spills across a state, provincial or some other administrative boundary. The Philippine Government grossly underestimates what constitutes the megacity of Manila as an urban area. Indistinguishably blended though they are with the greater mass of urbanisation, contiguous spaces that would otherwise be considered urban are not because they lie in Rizal, Bulacan, Laguna or Cavite provinces rather than the National Capital Region.[93]

So, it appears safe to conclude that definitions and terms for 'urban area' or 'city' are anything but consistent. Some seem not to survive beyond the single article that proposes them. 'Dragon kings' are built-up areas described as extraordinarily large, wealthy or otherwise exceptional[94]—'dragon' because they are exceptional beasts even though they share some characteristics with other cities and 'king' as they possess disproportionate wealth compared with other of a country's urban areas. Numerous and unnecessarily convoluted as these and other labels seem to be, they can help us understand just how varied, influential, complex and powerful are urban areas.

Seeking a practical and easy-to-envision definition rather than inventing yet another one, for the purposes of this book, an urban area is 'a continuously built-up landmass of urban development containing no rural land—one best thought of as the lighted area that can be observed from an airplane (or satellite) on a clear night'.[95] It is a definition whose character is not new. The Romans used the term *extrema tectorum* to define a city, which meant the expanse of a contiguous built-up area.[96]

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92 Marc Harris, Robert Dixon, Nicholas Melin, Daniel Hendrex, Richard Russo and Michael Bailey, *Megacities and the United States Army: Preparing for a Complex and Uncertain Future*, Chief of Staff of the Army Strategic Studies Group, June 2014, 11, 12, available from: www.army.mil/e2/c/downloads/351235.pdf.

93 Cox, 'Largest 1,000 cities on Earth'.

94 V.I. Yukalov and D. Sornette, 'Statistical outliers and dragon-kings as Bose-condensed droplets', *Physics and Society*, 7 May 2012, available from: arxiv.org/abs/1205.1364.

95 Adapted from *Demographia World Urban Areas*, 15th edn, 5.

96 *Atlas of Urban Expansion: Monitoring Global Urban Expansion Program*, [Online], Paris: Sciences Po Urban School, n.d., available from: www.sciencespo.fr/ecole-urbaine/en/actualites/atlas-urban-expansion.html.

What, then, is a megacity and what makes it stand out among other urban areas? Extraordinary complexity is part (but not all) of it—complexity such as that found in Chicago a little more than a century ago:

> Let us take a tour down Halstead Street, the center of Chicago's great immigrant ghetto, around 1910. The street was twenty-two miles [35 km] long, and for the most of it filled with a teeming population. Were we to start at its northern end and move south, we would be conscious that it was filled with 'foreigners,' but at every place with different kinds of foreigners, all mixed together. A native might tell us that a certain few blocks were Greek or Polish or Irish, but were one actually to look at particular houses or apartment building[s], one would find the ethnic groups jumbled together.[97]

Heterogeneity of population might be—and in most cases is—characteristic of a megacity. But it, too, is not on its own sufficient to make an urban area a megacity. The many different authorities immersed in those oceans of people add additional complexity that moves us nearer to an understanding of these phenomena. The megacity/urban area of Manila encompasses at least 85 municipalities spread over seven provinces (the Philippine Government's definition of Manila notwithstanding). (The National Capital Region includes only 17 local governments.)[98] This is impressive, but it pales in comparison with Tokyo's 2,400 separate governments of one kind or another distributed over seven prefectures.[99] The megacities of Jakarta and Mexico City are among those that formally changed their names to recognise the multiplicity of governments that combine to make up the whole. 'Jabodetabek' calls on the quintet of primary cities that are among its parts for this moniker (Jakarta, Bogor, Depok, Tangerang and Bekasi).[100] Mexico City has officially become Zona Metropolitana del Valle de México or Valley of Mexico. The megacity of

97 Richard Sennett, *The Uses of Disorder: Personal Identity & City Life*, New York, NY: Alfred A. Knopf, 1970, 53–54.

98 Brian H. Roberts, 'Risk and resilience in Asian cities: Case study of Manila', n.d., available from: www.academia.edu/9265596/Risk_and_Resilience_in_Asian_Cities_Case_Study_of_Manila.

99 The World Bank, *East Asia's Changing Urban Landscape: Measuring a Decade of Spatial Growth*, Urban Development Series, Washington, DC: The World Bank, 2015, 33, 56, 57, available from: www.worldbank.org/content/dam/Worldbank/Publications/Urban%20Development/EAP_Urban_Expansion_full_report_web.pdf, doi.org/10.1596/978-1-4648-0363-5.

100 Deden Rukmana, 'The megacity of Jakarta: Problems, challenges and planning efforts', *Indonesia's Urban Studies Blog*, 29 March 2014, available from: indonesiaurbanstudies.blogspot.com/2014/03/the-megacity-of-jakarta-problems.html; and Wendell Cox, 'The evolving urban form: Jakarta (Jabotabek)', *New Geography*, 30 May 2011, available from: www.newgeography.com/content/002255-the-evolving-urban-form-jakarta-jabotabek.

Tokyo is likewise technically Tokyo–Yokohama, just as Japan's second-largest urban area is Osaka–Kobe–Kyoto.[101] The City of Los Angeles—the political entity at the core of the megacity that draws on its name—is home to but 4 million or so residents. The megacity of Los Angeles includes a much larger collection of smaller cities such as Santa Monica, Pacific Palisades, Hermosa Beach, Burbank, Port of Los Angeles, Beverly Hills, Simi Valley, Moorpark, Calabasas, Anaheim, Hollywood, and many more. Together, they are home to more than 15 million people. Most of those somewhat smaller administrative entities have their own mayors, city councils, police, fire and recreation departments, and many other elements of government.[102] Some instead choose to share capabilities in the interests of cost and practicality. Virtually all have some form of cooperative agreement in place so their collective resources can come together should a situation overwhelm one or more of those many parts.

Whether because of a natural disaster, insurgency or combat operations, those leading and managing the various organisations lending a hand can be the difference between anarchy or order and survival for members of a population. General Charles Krulak, former commandant of the US Marine Corps, described how a military force in a city might find itself providing relief to suffering citizens on one block, dealing with demonstrations on an adjacent block and fighting with an enemy force on yet another—what he called the 'three-block war'. Given the presence of both formal and social media representatives in the largest and most influential of the planet's cities, decisions made by even the most junior leader can have consequences that reverberate around the world and impact on an undertaking's ultimate success, leading Krulak to also coin the term 'strategic corporal'.[103]

Massive populations spread between multiple authorities; vast geographic spread (Tokyo covers more than eight times the land area of Hawai`i's island of Oahu); complexity born of those many administrative officialdoms, mixes of ethnicities and many languages; myriad internal and external

101 Cox, 'The evolving urban form: Jakarta'.

102 Russell W. Glenn, 'Megacities: The good, the bad, and the ugly', *Small Wars Journal*, 17 February 2016, available from: smallwarsjournal.com/jrnl/art/megacities-the-good-the-bad-and-the-ugly.

103 Charles C. Krulak, 'The strategic corporal: Leadership in the three block war', *Marines Magazine*, January 1999, available from: apps.dtic.mil/sti/pdfs/ADA399413.pdf; and George F. Will, 'Winning the "three-block war"', *The Washington Post*, 14 April 2004, available from: www.washingtonpost.com/archive/opinions/2004/04/14/winning-the-three-block-war/f72ecf07-870b-4d5c-8ce1-a54562d1546c/?noredirect=on&utm_term=.8a82c56fb9bb.

economic, political, social and diplomatic connections; and a related influence that reaches far beyond local rural areas and very likely beyond national borders and nearby countries to extend to locations worldwide—all these are features found in many of the planet's largest urban areas. One must take all into account when planning for or responding to a disaster. Relying on longstanding definitions of a megacity based on population alone (at one time, any urban area with more than 1 million; later, any with more than 5, 8, then 9 and now 10 million, although at least one organisation still goes with 8 million) fails to take these other vital considerations into account.[104]

Avoiding the temptation to add another urban term to the already too many, we will, as said, instead retain a definition for 'urban area' already in use but recognise that a megacity is much more than merely a large population, defining it as '*an urban area of extraordinary population size, geographic spread, physical and social complexity, interconnectedness, and similarly exceptional characteristics, to include influence with at least national and broader regional scope*'.[105] More wordy than desirable, perhaps, but this is a definition that captures the varied aspects that make megacities stand out from less exceptional cities.

Some cities of more than 10 million do not qualify for megacity status using this definition. Though China's Tianjin and Chengdu have populations of more than 13 and 12 million, respectively, their broader regional and worldwide influence are limited. Tianjin's primary role is to act as Beijing's port; Chengdu's claims to fame are its popularity as a tourist destination and related status as home to giant pandas. The same might be argued for Dhaka, Bangladesh, which, with its 14.6 million residents within 324 square kilometres, is the most densely populated large city in the world.[106] Its influence beyond Bangladesh's national boundaries and other countries in the immediate vicinity, however, is rather limited.

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104 Mitchell, 'Introduction', 14n.7. TomTom still considered a city of 8 million or more to be a megacity as of 2019. TomTom International BV, 'TomTom Traffic Index: Ranking 2019', [Online], Amsterdam: TomTom, 2019, [Updated 2021], available from: www.tomtom.com/en_gb/traffic-index/ranking/.

105 Definition from Russell W. Glenn, 'Ten million is not enough: Coming to grips with megacities' challenges and opportunities', *Small Wars Journal*, 25 January 2017, available from: smallwarsjournal.com/jrnl/art/ten-million-is-not-enough-coming-to-grips-with-megacities%E2%80%99-challenges-and-opportunities. [Emphasis added.]

106 A.M., Jacob, A. Allen and Larry P. Graham, Megacities and the proposed urban intervention model, Thesis, Monterey, CA: Naval Postgraduate School, June 2016, 8, available from: apps.dtic.mil/sti/pdfs/AD1026697.pdf.

In stark contrast, Singapore's population is just under 6 million. The populations of nearby Malaysian and Indonesian urban areas geographically, economically, socially and otherwise intertwined with Singapore are insufficient to take the total for the whole anywhere near 10 million. Yet, the city-state is the world's largest bunkering (ship refuelling) port, second-largest port in terms of volume and numbers of shipping containers, a port of call for 130,000 vessels annually, a significant economic power and a vital player in maintaining order in the Strait of Malacca—one of the world's busiest waterways through which almost one-third of the planet's sea trade transits annually (including 80 per cent of China's energy imports).[107] Singapore's interconnectedness, influence and other features qualify the island nation and its immediate urban surrounds in Malaysia and Indonesia as a megacity. While its population does not exceed 10 million, its numbers in that regard are nevertheless significant (it is, interestingly, an urban area that can by no means take its security for granted, dependent as it is on external sources for water, food and energy.[108] The systems approach to planning practised by the

107 'The long game: The road', *The Economist*, [London], 8 February 2020, 9; Demographia, *Demographia World Urban Areas*, 13th annual edition, Belleville, IL: Wendell Cox Consultancy, April 2017; *Demographia World Urban Areas*, 15th edn; Maritime and Port Authority of Singapore, 'Port statistics', [Online], Singapore: MPA, 2021, available from: www.mpa.gov.sg/who-we-are/newsroom-resources/research-and-statistics; Ship & Bunker News Team, '6 countries are responsible for almost 60% of all bunker sales', *Ship & Bunker*, [Vancouver, BC], 5 January 2016, available from: shipandbunker.com/news/world/608701-6-countries-are-responsible-for-almost-60-of-all-bunker-sales; World Shipping Council, 'About Liner Shipping', [Online], Washington, DC: World Shipping Council, 2018, available from: www.worldshipping.org/about-liner-shipping; and Marcus Hand, 'Malacca and S'pore Straits traffic hits new high in 2016, VLCCs fastest growing segment', *Seatrade Maritime News*, 13 February 2017, available from: www.seatrade-maritime.com/news/asia/malacca-and-s-pore-strait-traffic-hits-new-high-in-2016-vlccs-fastest-growing-segment.html. *Demographia World Urban Areas* (15th edn), from which we adapted our definition of 'urban area', confines urban areas to single nations except when 'there is virtual freedom of movement (principally labor) between the adjacent nations'. Including nearby Malaysian and Indonesian urban areas in the Singapore urban area thus breaks with the publication's definition twice over: once because movement between the pair of close countries does not qualify as sufficiently free and, second, as water separates them from Singapore and thus they are not strictly contiguous (there would be breaks in the illumination as viewed from above). Two points: first, I would argue that Singapore and those nearby Malaysian and Indonesian urban entities are so closely intertwined that we need to give a little slack here and recognise the inclusive Singapore urban area. Second, if the question is whether Singapore is a megacity, there is a strong argument that it so qualifies even if we deny membership to those two countries' urban parcels. For more, see discussion of 'International urban areas' in *Demographia World Urban Areas*, 16th edn, 6. For discussion of why movement within the so-called growth triangle of Singapore and nearby Malaysian and Indonesian urban areas is not free, see Philippe Revelli, 'Singapore, Malaysia, and Indonesia: A triangle of growth or a triangle of inequality?', *Equal Times*, [Brussels], 4 October 2016, available from: www.equaltimes.org/singapore-malaysia-and-indonesia-a?lang=en#.Xzq7xkl7kyk. Singapore material from the sources cited just above and Barber, *If Mayors Ruled the World*, 142.

108 Kent E. Calder, *Singapore: Smart City, Smart State*, Washington, DC: Brookings Institution Press, 2016, 123.

city-state's leaders makes sense given the interwoven dependencies in so many realms).[109] Whether or not one agrees that our more demanding definition of 'megacity' is appropriate, the following pages should make it clear that those urban areas so qualifying are fundamentally different to other cities in ways aside from the number of residents alone.

Understanding these exceptional urban areas requires understanding the systems of which they are a part and the many systems of which each of them is made. There may be no better example of a whole being more than the sum of its parts than a megacity. They are synergy at its finest.

More on megacity exceptionality

> Size begets complexity.[110]
>
> —Richard Sennett, *Building and Dwelling*

> London also attracted incomers on a conspicuous scale because it possessed a set of attributes that individually were not unique, but that were combined within this vast metropolis to an exceptional degree … London was also a financial centre, *the* financial centre … incontestably still the world's richest and most tentacular metropolis.[111]
>
> —Linda Colley, *The Gun, the Ship, and the Pen*

> A study of London during the Second World War sets some particularly complex challenges. First, what is London? Before the war the Greater London or Metropolitan Police area covered 700 square miles [1,800 sq km]; the Greater London Town Planning or London Transport area 2000 square miles [5,200 sq km]; the County of London 116 [300]; the City of London 1; the London Telephone area 1200 [3,100]; the London Postal area 232 [600]; the London Electricity District 1840 [4,800]; the Metropolitan Water Board area 573 [1,500]; the London Main Drainage area 159 [410].[112]
>
> —Philip Ziegler, *London at War*

109 ibid., 111.
110 Sennett, *Building and Dwelling*, 101.
111 Linda Colley, *The Gun, the Ship, and the Pen: Warfare, Constitutions, and the Making of the Modern World*, New York, NY: Liveright, 2021, 221, 370. [Emphasis in original.]
112 Ziegler, *London at War*, 2.

Why do megacity disasters merit a book? We've already partly crossed the bridge to an answer. Just as a town has a greater variety of worker types, commercial enterprises and buildings than a village, our definition tells us that megacities have many more such parts, relationships and interdependencies, greater complexity and broader variety than cities not qualifying for the label. Just as it is easier for the rich to get richer faster than the rest of us due to their existing wealth, with a megacity's diversity, interconnectedness and resultant influence come opportunities not accessible to other urban areas. Where have major corporations tended to choose to locate their research facilities and headquarters (and subordinate offices for that matter)? A cosy city populated by those representing a limited set of skills or a labour magnet that has attracted many of the talents it needs to perform at its peak? It is no coincidence that the top eight urban areas in terms of global company headquarters locations are megacities.[113] Where, in turn, are the most talented in a field likely to seek work? Where but in a city that offers frequent contact with those of similar interests, abilities and education—characteristics important in both professional and personal partnerships? There are simply fewer chances for opportunity to knock on your door when there are fewer people who need your skills.

This is no revelation. It was the larger urban areas that made possible what would have been impossible in villages or towns even in America's pre-revolutionary times. Sara Rogers of Boston asked to be freed from her membership of the city's First Baptist Church so she could join another of the same denomination.[114] Her request was granted—something a good deal less likely in a rural environment or smaller urban area where social strictures tended to be tighter and where finding a second church of her chosen faith could entail lengthy travel. Megacities are in a class of their own—like but in important ways unlike others. And, yes, while size is only one of the characteristics that makes a megacity stand out, it is a significant one as the first pair of quotations opening this section makes clear. Activities taking place in them will draw more attention—be it praise or condemnation—regardless of the undertaking at hand. The punishment dealt to Puerto Rico by one of 2017's major hurricanes was in many ways more devastating and longer felt than that dished out by those

113 Dobbs et al., *Urban World*, 9, 37.

114 Benjamin Carp, *Rebels Rising: Cities and the American Revolution*, Oxford, UK: Oxford University Press, 2007, 114, doi.org/10.1093/acprof:oso/9780195304022.001.0001.

storms in Houston, Miami and Tampa–St Petersburg, but it was the last three that received the bulk of US federal government attention.[115] Bigger urban areas draw more consideration and resources when disaster strikes.

Megacities are also a relatively new phenomenon—exceptional but no longer unusual given the existence of 35 in 2020. Babylon—perhaps humankind's first great city—had a population of between 200,000 and 300,000 people. The tremendously influential Athens batted way above its numbers of approximately 100,000 people. We know Rome achieved the 1 million mark; it did so just before the birth of Christ and that number does not include the many smaller cities in its nearby environs.[116] It wouldn't be until the first half of the twentieth century that a city reached a population of 10 million (New York City).

There are towns, perhaps even the occasional city, that are largely self-sufficient. Not so megacities. A megacity is both feeder and fed. It has far greater reach, requirements and relationships than other urban areas. Feeder because it offers more opportunities for the talented. Fed because it benefits from those talents. Feeder because it is more willing to accept individuals of differing demography than populations in more conservative environments. Fed because it provides acceptance and jobs elsewhere less likely to be at hand. Prejudice unquestionably raises its ignorant head in these exceptional urban areas, but those demonstrating the backward practices within tend to be a marginalised minority; their proportions skew towards larger values when raw population numbers are smaller. Feeder, too, as the outputs of megacities in terms of goods and services find their way to consumers elsewhere even as the urban folk are fed on what those outside locations offer in the way of food, water and other essentials.[117] There are many more of these symbiotic relationships when a megacity is involved. Understanding this will help us better appreciate megacities and their challenges when it comes to handling catastrophes.

115 Smith, *Cities*, 258–59.

116 Bollyky, *Plagues and the Paradox of Progress*, 22.

117 'Heterogeneous' can be a relative term. China, Japan, Republic of Korea and other countries with megacities are shockingly homogeneous in terms of countrywide population ethnicity. Their megacities reflect the lack of diversity, which pales in comparison with Los Angeles, London, Paris and several others, but Shanghai, Tokyo, Seoul and other megacities in the less-diverse countries are nevertheless more socially disparate than their national demographics generally.

Even if we ignore the international ties, we cannot escape being impressed by the vastness of megacities' supremacy, some aspects of which hold surprises. The world's largest urban footprint in terms of physical spread? New York City, with Boston–Providence and Tokyo–Yokohama next in line.[118] The world's least-dense megacity? Also New York City (followed by Los Angeles, which in turn significantly leads third place, Moscow).[119] New York City's primacy in terms of density is unsurprising given it is also the most spread out. And while we might envision Manhattan's shoulder-to-shoulder sidewalk congestion or Times Square on New Year's Eve, we recall that its suburbs are a good deal less dense than its cross-country sports rival and economic partner despite Los Angeles being spread over five counties, 160 municipalities and having nearly 40 per cent of California's population (California being the United States' most populous state by a good measure).[120] Demographers like to tell us that megacities are not the fastest-growing urban areas in the world. That statistic belongs to cities with populations between 100,000 and 500,000 people. What they are less likely to pass on is that the statistic does not mean smaller cities are catching up to the largest. We might find that the city of Mediumburg is growing at a rate of 10 per cent a year. With a population of half a million, that means it picks up another 50,000 next year. In the meantime, a megacity of a modest 15 million picks up a mere 1 per cent—which translates to 150,000 people. Several of the world's 35 megacities are growing at rates faster than a single percentage point—one reason that helps to explain why we can easily find writers claiming Lagos, Cairo, Dhaka, Jakarta or some other developing-world megacity is on the razor's edge of collapse. All those cities have their challenges, but it would be a sucker's bet to expect any to implode in coming months.

That should not be taken to mean that megacity status is permanent. A good argument can be made for Hong Kong being in the ranks of megacities as this book goes to print thanks to its role as a financial and trade bridge between the relatively free economies of the developed world and that of China. That status is increasingly under siege due to the heavy-handedness of the mainland government. According to *Bloomberg*, 2017's top-five financial centres were London, New York, Hong Kong, Singapore and Tokyo. *The Economist* notes Hong Kong 'is disproportionately useful to China [and] has a status within a body of international law and rules that

118 *Demographia World Urban Areas*, 16th edn, 40.
119 ibid.
120 Cox, 'Largest 1,000 cities on Earth', 376–77.

gives it seamless access to Western markets'.[121] As of 2019, its stockmarket was the fourth most highly valued in the world, behind only those in the United States, mainland China and Japan. The number of firms with regional headquarters grew from 744 when Hong Kong was still a British colony to 1,333 in 2019. The same *Economist* article reports growing concerns among international firms about China's influence in the city, with Singapore an attractive regional alternative. The tale of killing the goose that lays the golden eggs comes to mind. We will consider the oft-cited fragility of today's megacities further in later pages using Lagos as an example, looking at how it avoided medical disaster after a passenger with Ebola collapsed on entering a city airport terminal in 2014.

Imagine trying to coordinate with even a fraction of the 160 governments in Los Angeles in the aftermath of a massive earthquake much less with individual subauthorities within those governments such as police, fire, human services, parks offices, city engineers or community groups. NGO, IGO or assisting military leaders might consider themselves lucky to find their destination is Mexico City, Buenos Aires, London or São Paulo, where the number of jurisdictions is measured in the dozens. A phone call dispatching their organisations to Abidjan, Côte d'Ivoire, could be looked on with less joy once the leaders realise the number there is in the hundreds despite its population being only 5 million.[122] Areas administered by informal authorities (addressed later as 'other-governed areas') also make megacities exceptional. While a single criminal, dubiously legitimate political or other informal group might dominate a town or small city, no one such organisation is likely to rule a megacity. As in Karachi, Pakistan, the situation will tend to be multiple such enterprises dominating select slums, neighbourhoods or public and private sectors to extents varying over time and space.[123]

121 Gavin Finch, 'London retains its crown as world's top financial center', *Bloomberg*, 11 September 2017, available from: www.bloomberg.com/news/articles/2017-09-11/london-still-tops-financial-centers-despite-brexit-survey-says; and 'Seeing red: Turmoil in Hong Kong', *The Economist*, [London], 10 August 2019, 17–18.

122 Intergovernmental Panel on Climate Change (IPCC), 'Urban Areas', in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Working Group II Contribution to the IPCC Fifth Assessment Report*, Cambridge, UK: Cambridge University Press, 2014, 535–612, at 577.

123 Laurent Gayer, *Karachi: Ordered Disorder and the Struggle for the City*, Noida, India: HarperCollins, 2014, 205. Examples throughout this book make it apparent just how dynamically the struggle for control of population sectors, physical terrain or functions such as water delivery evolved as groups competed for influence.

Jane Jacobs took on New York City's most powerful when authorities tried to route roads through neighbourhoods and parks, coming to the rescue of the city's underrepresented communities by arguing that progress should not spew communities aside like slush cast right and left by a snowplough's blade. She was not oblivious to the possible irony in her arguments, recognising that:

> great cities are not like towns, only larger. They are not like suburbs, only denser. They differ from towns and suburbs in basic ways, and one of these is that cities are, by definition, full of strangers … Strangers are far more common in big cities than acquaintances.[124]

What is a stranger? Certainly, it is the London visitor in Tokyo or Manila, but it is also the Manhattanite in Brooklyn's Red Hook or even another Manhattanite living but two blocks distant seen only through a Lyft driver's window during the daily commute to work.

Megacities' national, regional and global links reduce vulnerability to economic downturns. Downturns in one economic sector do not sink the whole as they might in smaller urban areas. New York, Tokyo and London weathered the recession of this century's first decade without undue long-term consequences. They will likely do so again as the world comes out of the Covid-19 crisis. And, for all the pollution urban areas put out and all their residents consume, there are environmental efficiencies inherent in city living, with larger cities offering more in this regard. The carbon footprint of residents in New York City is 71 per cent smaller than the average American's thanks to reliance on public transportation, the proximity of goods and services that means there are fewer reasons to drive, shorter distances to workplaces (10 per cent of workers walk to their jobs) and the efficiencies of vertical living.[125]

Breadth in the sources of residents' incomes means shoppers from a segment less affected by a downturn still have the financial means to provide enough custom to keep afloat merchants who would go under in smaller urban areas. An *Economist* article recognised this value in larger (and, importantly, more diverse) customer bases, noting that London's New Bond Street continued to flourish in 2017 while stores in smaller British

124 Jane Jacobs, *The Death and Life of Great American Cities*, New York, NY: Vintage, 1992, 30.
125 Sadik-Khan, *Street Fight*, 23–24.

cities and towns struggled.[126] Interestingly, there is a physical robustness to accompany the economic one. I recall being in Tel Aviv during the Second Intifada. Although Tel Aviv falls well short of megacity status (the urban area's population was somewhere between 3 and 4 million at the time), a bombing in one part of the city had no effect on the welfare of other parts. It more likely than not went unnoticed until the evening news broadcast or the next morning's papers arrived. Life moved on much as it would for a rainforest after a lightning strike caused a few acres of trees and their related ecosystem partners to perish. Megacities are sponges. They absorb any but the most violent of blows, quickly rebounding to form. New York City's recoveries from 9/11 and Hurricane Sandy come to mind while now, years later, Mosul, Iraq, labours to recover from the fighting in 2016–17, as does Marawi in the Philippines from its similar tragedy.

There is incongruity in this robustness. Megacity authorities will be less intimately familiar with their population than those in smaller urban areas. The mayor of a town or small city will not know each of their citizens by name, but they will be sufficiently in touch with representatives of its several communities and business interests to have a sense of their needs and demands. Not so for leaders in a megacity. First, as we have already noted, there will be no mayor whose duties span the entire metropolis. There will instead be tens or hundreds of mayors or their equivalents, each more or less familiar with their city while no-one knows the whole. In contrast, police leaders in urban areas of more limited size can less afford to assign officers to a single beat, instead giving them citywide or ever-changing responsibilities while a megacity counterpart might spend years in the same neighbourhood getting to know its residents, habits and quirks. Wise assignments will keep that officer's long-time beat in their jurisdiction even as promotions increase the expanse of the population looking to that officer for support. The same can be true of 'outsiders' whose jobs take them from city to city. An agent in the San Francisco Federal Bureau of Investigation (FBI) office recalled that while he was a street agent in New York City for 12 years, he tended to 'deal with local, lower-level authorities' whom he therefore grew to know well.[127] His position in the smaller Bay City and also during his time in Seattle

126 'Vacant spaces: Retail property', *The Economist*, [London], 16 December 2017, 58.
127 Bertram Fairries, Interview with Dr Russell W. Glenn, San Francisco, CA, 12 April 2016.

did not allow him the same intimacy of understanding as he often found himself coordinating with high-ranking urban officials in lieu of those on the street.

Urban urban legends: Myths of the megacity

> Meliboeus, stupidly I used to think that the City they call Rome
> was just like this town of ours here, the place we shepherds often
> bring the tender young lambs of our flocks.
> Just as puppies are like dogs, and kids are like mother goats,
> so I used to compare the great with the small.
> But Rome has lifted her head as high among other cities,
> as cypress trees tower among the weeping willows.[128]
>
> —Virgil, *Eclogue II*, 19–25

> Mega-cities may appear chaotic but most have life expectancies and provision for piped water, sanitation, schools and healthcare that are well above their national average—even if the aggregate statistics for each megacity can hide a significant proportion of their population living in very poor conditions. Some of world's fastest-growing cities over the last 50 years also have the best standards of living within their nation … City life can bring significant health benefits. Cities where environmental health hazards are reduced through provision of a safe water supply, sanitation, waste management and adequate shelter, and in which pollution is monitored and controlled, have lower mortality and morbidity rates.[129]
>
> —International Federation of Red Cross and Red Crescent Societies, *World Disasters Report 2010*

Imagine a pool table. It's a good metaphor for explaining megacity relationships given their complexity. Let's say that three numbered balls on the table represent the population in a rural environment, or maybe a few market towns tied to each other economically. We might hit one, two or maybe all three of that trio after striking the cue ball. Each could in turn impact others. Regardless, the consequences of our strike are

128 Virgil, *Eclogue II*, 19–25, as appears in Woolf, *The Life and Death of Ancient Cities*, 379.
129 International Federation of Red Cross and Red Crescent Societies (IFRC), *World Disasters Report 2010: Focus on Urban Risk*, Geneva: IFRC, 2010, 34, 95, available from: www.theisrm.org/public-library/IFRC%20(2010)%20World%20Disaster%20Report%20-%20Urban%20Risk.pdf.

easy to guess beforehand. Now let one rack of numbered balls represent 1 million people in a population. Tokyo's population becomes 38 racks of balls dispersed across the table's felt surface (that's 15 x 38 = 570 balls, for those wondering). Manila is 25 racks (375 balls), Los Angeles 15 (225). Strike that cue ball now. Determining just the second-order effects (the secondary collisions of any initial balls impacted by the cue ball) begins to boggle the mind. Figuring out third, fourth or higher-order effects would send you (or those on your staff, to which you wisely assign the task before going to lunch) fleeing the room. But while the effects of an event can be thought of as those pool balls knocking against each other, a lot of those balls are never jostled or even touched unless the strike of the cue ball is truly colossal, as would be the effects of a mammoth earthquake or attack with a weapon of mass destruction. The density of balls means they absorb the impact of any but these massive-effect events, containing the consequences to a limited space and portion of the population. Unless you are within hearing or sight of an explosion (which means being close, as buildings shield sound, sight and concussion waves, in addition to a city's near-constant ambient noise drowning out all but close or hugely loud events), chances are you will remain as unaware of the event as I was in Tel Aviv. You might hear the sirens or see the police, ambulance or fire vehicle race by, but you are unlikely to know what emergency it is responding to. The residents of a village or small town are far more prone to be aware of an event involving their population than those in a megacity. We might call the belief that everyone is quickly in the know regarding a disaster in larger urban areas the myth of instant knowledge. It is far from the only urban 'urban legend' misunderstanding of life in a megacity. The misleading models of urban areas as humans and slums as cancers could be considered others.

On the other hand, while instant knowledge is a myth, we must account for what complexity theory calls the 'butterfly effect'. Keeping it short and simple, experts tell us that some complex systems are vulnerable to even the tiniest of disturbances. The butterfly effect uses the example of one of those insects flapping its wings in Brazil later influencing the timing, size and even the creation or absence of a tornado in the United States through the many connections between the two events. It was the brainchild of a theorist whose research demonstrated that seemingly inconsequential actions in one location could influence gigantic results

distant in time and place.[130] Unsurprisingly, it would be all but impossible to trace the connection between trigger and outcome, especially given the event involved is only one of many influencing the eventual result. But it does help us understand megacity complexity in terms of second, third and higher-order effects, even when the original trigger is more significant than insect wing–flapping. The 1923 earthquake that so devastated Tokyo resulted in violence against Koreans whom local Japanese blamed for the event. The quake also accelerated movement of the more well-to-do out of central Tokyo to the city's periphery. That movement in turn motivated the building of new roads and rail lines to these outskirts (second-order effects), to include new stations in places like Shibuya and Shinjuku that became major commercial hubs away from the city core. Their development was a third or higher-order effect influenced by or influencing many other intermediate events, decisions, motivations and ambitions.[131]

(Let's take a short break for a few seemingly random effects far removed from the initial cue-ball strike represented by the 1923 earthquake. Shibuya Crossing, the intersection outside the community's main railway station, is today said to be the busiest pedestrian intersection in the world, with some 2,500 people crossing from all directions at the same time. [Lights stop traffic so that pedestrians can cross in any direction they like. There is a coffee shop in a nearby shopping mall where you can sit and watch from above; it does a booming business.] That comes to about 1 million people a day. Shibuya Station is also where Tokyo's famous dog, Hachiko, waited every day for years to greet his master after the man died at work, never to return. His statue depicts a healthy-looking animal; kind locals must have made sure he did not lack for daily sustenance.

130 Edward N. Lorenz, 'Predictability: Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?', Paper presented to American Association for the Advancement of Science 139th Meeting, Washington, DC, 29 December 1972, available from: eapsweb.mit.edu/sites/default/files/Butterfly_1972.pdf. The underlying concept for the butterfly effect came from Professor Edward Lorenz's 1961 runs on an early computer involving fluid flow in conjunction with weather forecasting. Wanting to analyse a particular run's solution in greater detail, he inserted the variable values into a subsequent run at an intermediate point, entering them with only three digits after the decimal instead of the six-digit accuracy used previously. This meant the variables were still accurate to the closest thousandth. For example, using a notional example regarding the probability of a given wind speed, initial runs used a probability of 46.909045, which in the later run was entered as 46.909. To his surprise, when the model was run with the truncated numbers versus the originals, the results were so different Lorenz thought it must have been a mistake. It was not. Instead, it was apparent that even very slight changes in initial conditions can have major effects in certain system types. Kerry Emanuel, 'Edward Norton Lorenz, 1917–2008', *Science* 320(5879) (23 May 2008): 1025, doi.org/10.1126/science.1159438; and Robert W. Reeves, 'Edward Lorenz revisiting the limits of predictability and their implications: An interview from 2007', *Bulletin of the American Meteorological Society* 95(5) (2014): 681–87, doi.org/10.1175/BAMS-D-13-00096.1.

131 Hein, 'Resilient Tokyo', 223; and Reid, *Confucius Lives Next Door*, 236.

Hachiko might be less happy with the situation today; two cats sheltered on the statue when I last passed by. All these and many, many more are effects countless orders removed of the 1923 quake—an event now nearly a century past.)[132]

Another misbelief—one sometimes innocently but mistakenly taken as true and other times deliberately used as a scare tactic by demagogues or corrupt others—is that of the urban immigrant as criminal. Those who have studied the situation find that crime rates are *lower* among this group than an urban area's long-time residents.[133] A look at a specific type of immigration being the major source of population growth in world megacities—that of individuals coming from other countries—falls by the wayside as well. While some large urban areas have foreign-born populations exceeding one-quarter of their total (Los Angeles, New York City and London among them), others are surprisingly sparse in this regard. Only 2.4 per cent of Tokyo's residents were born outside Japan. Seoul, Jakarta and São Paulo have even smaller percentages, with Mexico City falling below all these as recently as 2005. Less than 0.5 per cent of those living in Mexico's capital could stake claim to recent foreign origins.[134] Meanwhile, Sydney, Australia, alone reportedly had more foreign-born residents than did all of mainland China, as of 2019.[135]

The largest things in life attract mythmaking. One more among the small sample provided here deals with the belief that slums are just transition points that their residents seek to escape when opportunities or resources allow. Some residents certainly do want to move, but believing that slums are inherently unattractive places to live, to be fled at the first opportunity, is simply untrue. Slum living has attractions for many. Criminals find their densely packed living spaces and twisting passageways amenable to hiding from or escaping law enforcement. Informal forms of government often deliver services 'real' officials do not. These other-governments may protect slum residents from the worst of police abuses or other outsider incursions—

132 Makita Brottman, 'Richard Gere and Hachiko, the most faithful dog in history', *The Telegraph*, [London], 25 October 2014, available from: www.telegraph.co.uk/lifestyle/pets/11183010/Richard-Gere-and-Hachiko-the-most-faithful-dog-in-history.html.

133 Christopher Dickey, *Securing the City: Inside America's Best Counterterror Force—The NYPD*, New York, NY: Simon & Schuster, 2009, 254.

134 Lisa Benton-Short, Marie D. Price and Samantha Friedman, 'Globalization from below: The ranking of global immigrant cities', *International Journal of Urban and Regional Research* 29(4) (2005): 945–59, at 952, doi.org/10.1111/j.1468-2427.2005.00630.x.

135 Robert Guest, 'The Anglosphere and the Sinosphere drift apart', [*The World in 2020*], *The Economist*, [London], December 2019, 19, available from: worldin.economist.com/article/17310/edition2020anglosphere-and-sinosphere-drift-apart.

admittedly at a price. There are those in Egypt who remain in slums at least in part to evade paying taxes.[136] Others run successful businesses, earning a living without what would otherwise be hours-long commutes to work. Better to live comfortably poor in a slum than elsewhere impoverished.

The myth of fragility

> The microbe that felled one child in a distant continent yesterday can reach yours today and seed a global pandemic tomorrow.[137]
>
> —Joshua Lederberg, 1958 Nobel Prize winner in physiology or medicine

> Had the index case gotten the opportunity to contact persons in Lagos or Calabar—[another Nigerian city] where he was to deliver a lecture—it may have been a complete disaster.[138]
>
> —Folorunso Oludayo Fasina, senior lecturer, University of Pretoria, South Africa

It does not take long to find declarations of impending doom for developing-world megacities. Nearly two-thirds of Lagos's residents occupy slum dwellings,[139] as do about 72 per cent of all African city and town residents.[140] Some one-third of the population of Dhaka, Bangladesh, lives in slums, many in areas highly exposed to floods. It is true that many slum residents live a precarious existence, but the communities and cities of which they are a part tend to be far more robust than Chicken Littles would have us believe.[141]

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136 Asar, 'Going Formal in Egypt', 101.

137 As quoted in Bollyky, *Plagues and the Paradox of Progress*, 7.

138 As quoted in Katherine Harmon Courage, 'How did Nigeria quash its Ebola outbreak so quickly?', *Scientific American*, 18 October 2014, available from: www.scientificamerican.com/article/how-did-nigeria-quash-its-ebola-outbreak-so-quickly/.

139 Shagun Mehrota, Claudia E. Natenzon, Ademola Omojola, Regina Folorunsho, Joseph Gilbride and Cynthia Rosenzweig, 'Framework for City Climate Risk Assessment', in *Cities and Climate Change: Responding to an Urgent Agenda. Volume 2*, Daniel Freire Hoornweg, Mila Lee, Marcus J. Bhada-Tata and Belinda Perinaz Yuen (eds), Washington, DC: The World Bank, February 2013, 182–241, at 193, available from: documents1.worldbank.org/curated/en/321111468182335037/pdf/626960PUB0v20B0iesClimateChangeVol2.pdf.

140 ActionAid International, *Unjust Waters: Climate Change, Flooding and the Protection of Poor Urban Communities*, Report, 5 March 2007, Johannesburg, South Africa: ActionAid International, 5, available from: actionaid.org/publications/2007/unjust-waters-climate-change-flooding-and-protection-poor-urban-communities.

141 Clare Stott and Mohammed Nadiruzzaman, *Disaster Risk Reduction in Dhaka City: From Urban Landscape Analysis to Opportunities for DRR Integration*, Uxbridge, UK: World Vision, 2014, 11; and Asif Ishtiaque and Md. Sofi Ullah, 'The influence of factors of migration on the migration status of rural–urban migrants in Dhaka, Bangladesh', *Human Geographies* 7(2) (2013): 45–52, at 50, doi.org/10.5719/hgeo.2013.72.45.

Roughly 60 per cent of Mumbai's population (known as Mumbaikars) lives in slums. The megacity is in fact home to Asia's largest slum, Dharavi, which has between 600,000 and 1 million residents and an estimated one toilet for every 1,000 people living there. Do not expect Mumbai officials to fess up to this, however. A Mumbai slum residence isn't officially recognised unless the house is 'jury-rigged by the inhabitants. No formally built structures, no matter how run down' can qualify—this in a city that has done little to upgrade much of its infrastructure since the Raj period of British rule.[142] The number of slum residents combined with official neglect help explain why the megacity fails to have superior life expectancies compared with the rest of the country. As of 2007, the average Mumbaikar could expect to live 56.8 years while others in India had an average life expectancy of 63.7 years.[143]

Lagos is another city frequently cited as circling the drain. Our earlier walk through history's examples of urban areas surviving the worst that humans or Mother Nature has thrown at them suggests such alarmists need to look beyond initial impressions. Lagos proved its toughness when Liberian-American lawyer Patrick Sawyer collapsed in its Murtala Mohammed Airport during West Africa's 2014 Ebola crisis.[144] Taken to

142 Daniel Brook, *A History of Future Cities*, New York, NY: Norton, 340–42.

143 Mahesh Narvekar and Gita Kewalramani, *City Profile: Greater Mumbai*, Mumbai, India: Municipal Corporation of Greater Mumbai Disaster Risk Management Master Plan, 2010, Executive summary, 1, 91.

144 Overview of Lagos's response to the arrival of the infected patient adapted from Russell W. Glenn, Eric L. Berry, Colin C. Christopher, Thomas A. Kruegler and Nicholas R. Marsella, *Where None Have Gone Before: Operational and Strategic Perspectives on Multi-Domain Operations in Megacities. Proceedings of the 'Multi-Domain Battle in Megacities' Conference, April 3–4, 2018, Fort Hamilton, New York*, Fort Eustis, VA: US Army Training and Doctrine Command, 20 July 2018, 13–15, available from: community.apan.org/wg/tradoc-g2/mad-scientist/m/multi-domain-battle-mdb-in-megacities/244661. Additional information from F.O. Fasina, A. Shittu, D. Lazarus, O. Tomori, L. Simonsen, C. Viboud and G. Chowell, 'Transmission dynamics and control of Ebola virus disease outbreak in Nigeria, July to September 2014', *Euro Surveillance* 19(40) (9 October 2014), doi.org/10.2807/1560-7917.ES2014.19.40.20920; Centers for Disease Control and Prevention (CDC), *2014–2016 Ebola Outbreak in West Africa*, Washington, DC: US Department of Health and Human Services, 8 March 2019, www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/index.html; and International Federation of the Red Cross and Red Crescent Societies (IFRC), *Emergency Plan of Action Final Report: Nigeria—Ebola Virus Disease*, Geneva: IFRC, 2 September 2014, available from: reliefweb.int/sites/reliefweb.int/files/resources/MDRNG017FR.pdf. Another source states that 894 people were exposed and 19 infected, with one additional possibly affected. See Faisal Shuaib, Rajni Gunnala, Emmanuel O. Musa, Frank J. Mahoney, Olukayode Oguntimehin, Patrick M. Nguku, Sara Beysolow Nyanti, Nancy Knight, Nasir Sani Gwarzo, Oni Idigbe, Abdulsalam Nasidi and John F. Vertefeuille, 'Ebola virus disease outbreak—Nigeria, July–September 2014', *Morbidity and Mortality Weekly Report* 63(39) (3 October 2014): 867–72, Atlanta, GA: Centers for Disease Control and Prevention, available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm6339a5.htm. A third author wrote that officials made 18,500 in-person follow-up visits 'to find any new cases of Ebola among a total of 989 identified contacts'—no easy task in a city where many residences lack street numbers. Courage, 'How did Nigeria quash its Ebola outbreak so quickly?'.

hospital at a time when many of the city's medical personnel were on strike, Sawyer stated he had not had contact with any Ebola patients or medical personnel—even though Sawyer's travel had originated in virus-infested Liberia. (At the time of Sawyer's collapse in Lagos's airport, the 2014 Ebola crisis was killing thousands in the West African countries of Sierra Leone and Liberia, which together have a population several million fewer than Lagos.)[145] Doctors immediately began treating him for malaria—a disease with many symptoms similar to those of Ebola.[146] One doctor, Stella Ameyo Adadevoh, nonetheless concluded Sawyer was instead suffering from the infectious haemorrhagic disease.[147] She refused to allow his departure from quarantine, directing that, for public safety reasons, he remain isolated despite the patient's efforts to leave the hospital and 'immense pressure' from Liberian Government officials. She insisted a barrier be put on his door to ensure compliance. Investigators would later find Sawyer had lied. Not only had he been exposed to Ebola; he had also left Liberia against doctors' orders after being in proximity to a relative with the disease who had died on 8 July. Sawyer had therefore carried the deadly virus to Africa's second most populous urban area (Cairo is first). Thanks in part to his poor judgement and deceit, 891 people were exposed to the disease, a good number of them having travelled to areas well beyond Lagos as several passengers on his flight continued their journeys beyond the megacity.

Fortunately—we might even say miraculously—despite nearly 900 individuals being directly exposed or determined to have had contact with others exposed, the combined efforts of Lagos and broader Nigerian medical personnel, rapid action by public officials, diligent identification and testing of those with first-order or later contacts, participation by key elements of the country's private sector and IGOs such as the United Nations and the US Centers for Disease Control, and no little luck in the initial victim collapsing in the airport before he could enter the city's

145 Worldwide, the outbreak would see more than 28,000 people infected, of whom more than 11,300 died. Akaninyene Otu, Soter Ameh, Egbe Osifo-Dawodu, Enoma Alade, Susan Ekuri and Jide Idris, 'An account of the Ebola virus disease outbreak in Nigeria: Implications and lessons learnt', *BMC Public Health* 18(3) (2018), doi.org/10.1186/s12889-017-4535-x.

146 Early symptoms of Ebola virus disease appear from two to 21 days after exposure, with an average of eight to 10 days. Centers for Disease Control and Prevention (CDC), 'Signs and symptoms', *Ebola Virus Disease*, [Online], Washington, DC: US Department of Health and Human Services, 22 May 2018, available from: www.cdc.gov/vhf/ebola/symptoms/index.html; and Otu et. al, 'An account of the Ebola virus disease outbreak in Nigeria'.

147 Will Ross, 'Ebola crisis: How Nigeria's Dr Adadevoh fought the virus', *BBC News*, 20 October 2014, available from: www.bbc.com/news/world-africa-29696011.

general population helped to reduce the number endangered. In addition, authorities had to contact embassies and travel agents to determine the complete manifest as the plane on which Sawyer arrived had an incomplete passenger list. A researcher would later observe:

> [T]he involvement of the private sector and spirited individuals in the health education awareness campaign and screening/scanning of the temperature of every customer that enter[ed] into their business premises was very helpful. Even banks, public eatery places and supermarkets in Nigeria were involved in scanning the temperature of their customer[s] before they were allowed in after due consent was obtained. Those that had a temperature more than the normal temperature of 37°C were booked and subsequently referred to Ebola operation centres for further detailed diagnosis and investigation.[148]

Educating the population of the city and countryside alike was critical, but that education could not begin until audiences were listening. This became evident to officials in Liberia's capital of Monrovia when the country sought to contain Ebola's spread when:

> clashes erupted Wednesday [20 August 2014] as security forces sealed off a sprawling seaside slum in the Liberian capital in a bid to prevent the spread of the deadly Ebola virus … Over the weekend, residents angry about the placement of an Ebola screening center in Monrovia's West Point slum attacked the facility, chasing away sick patients and carrying off bloody sheets and other possibly contaminated items … It is unclear how many more people may have been exposed to the disease.[149]

Lagos brought multiple public information services to bear, including 'social media, bulk Short Messaging Service (SMS), Ebola Alert, mainstream media' (including creation and use of a television jingle) and the establishment of an Ebola hotline.[150] Residents near the hospital where Sawyer was quarantined expressed concerns that they might be in danger

148 Obioma Azuonwu, 'Emergence and re-emergence of 2014 Ebola outbreak in sub-Sahara Africa: "Challenges and lessons learned" from Nigerian epidemic outbreak', *Scholars Journal of Applied Medical Sciences* 3(8A) (2015): 2802–14, at 2807–8, available from: www.researchgate.net/publication/326381400_Emergence_and_Re-emergence_of_2014_Ebola_outbreak_in_Sub-_Sahara_Africa_%27Challenges_and_lessons_learned%27_from_Nigerian_epidemic_outbreak.

149 Alexandra Zavis and Christine Mai-Duc, 'Clashes erupt as Liberia seals off slum to prevent spread of Ebola', *Los Angeles Times*, 20 August 2014, available from: www.latimes.com/world/africa/la-fg-africa-liberia-ebola-quarantine-curfew-20140820-story.html.

150 Otu et al., 'An account of the Ebola virus disease outbreak in Nigeria'.

of contacting the disease; officials provided 'community enlightenment activities' addressing their worries.[151] Nigeria's popular *Story Story* soap opera became another effective education initiative:

> Unlike many Nigerian soaps, however, *Story Story* has never been available on TV. It's proudly and exclusively a radio show, funded by the BBC's development charity, BBC Media Action, and listened to by about 13 million people … Most recently, one character returned from Liberia and fell ill with a mystery disease. A false rumor spread in the market that he was an Ebola carrier, based on a flawed understanding of how the disease is spread. As the series develops, the truth emerges and the real facts about Ebola are revealed.[152]

Pop music was likewise recruited in the information campaign, letting listeners know they were not alone in their concern.

It is thought the 891 individuals identified represented 95 per cent of those possibly exposed.[153] Only 20 became infected, 11 of whom were healthcare personnel. Nine of these were exposed to Sawyer before identification of the disease. A bit of luck, perhaps, but the response drew on Lagos's status as a hub for the country's most expert, capable, responsive and well-equipped professionals to stay what could have been a blossoming of the disease in Africa and beyond.[154] Despite the ongoing strike, Lagos's medical community, city officials and others responded effectively, containing the spread such that the resultant deaths numbered but eight. One, unfortunately, was the tenacious Dr Adadevoh; Sawyer also died.[155]

Lagos's robustness in the face of what could have been an Ebola crisis of mega-proportions puts the lie to those suggesting developing-world megacities are inherently on the cusp of collapse. Apocalyptic quotes such as the following overlook the well-functioning systems within these urban areas:

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151 ibid.; and Azuonwu, 'Emergence and re-emergence of 2014 Ebola outbreak in sub-Sahara Africa'.
152 Leo Hornak, 'It's not just a soap opera, it's a "radio movie"', *The World*, [Boston, MA], 8 September 2014, available from: www.pri.org/stories/2014-09-08/its-not-just-soap-opera-its-radio-movie.
153 Sarah Dwyer, 'Why Nigeria's response to Ebola succeeded', *CapacityPlus Blog*, October 2014, available from: www.capacityplus.org/why-nigerias-response-to-ebola-succeeded.html.
154 Glenn, 'Megacities'.
155 Shuaib et al., 'Ebola virus disease outbreak'.

> [T]he half-abandoned skyscrapers of downtown Lagos Island loom under a low, dirty sky. Around the city, garbage dumps steam with the combustion of natural gases, and auto yards glow with fires from fuel spills. All of Lagos seems to be burning … Lagos was a prospect of millions of 'people squeezed together and trying to survive like creatures in a mad demographer's experiment gone badly wrong'.[156]

So, too, do comments by those who suggest large slum populations and poverty intrinsically imply a city on the precipice, as did one author who found Lagos 'barely managed or manageable. It has great wealth and great poverty. Two out of three Lagos residents live in slums with no reliable access to clean drinking water, electricity, waste disposal—even roads.'[157] Yet, sub-Saharan Africa's most populous urban area manages to absorb 6,000 new arrivals every day. Many—likely most—of them find their quality of life a step up from that in rural Nigeria or other cities from which the country's urban-to-urban migrants come. An urban area of 16-plus million residents, Lagos has considerable economic, social, political and other influence nationally, being described as 'the commercial nerve centre of West Africa with two domestic airports, an international airport and two seaports which have been adjudged to be the largest and busiest in the continent'.[158]

Other megacities are similarly likely to have in place emergency response procedures and other resources key to effective crisis response when compared with smaller urban areas or rural surrounds. Expanding on our theme that disaster preparations of any type hold value regardless of the eventual calamity, a good number of those manning Lagos's emergency operations centre during the Ebola crisis had demonstrated talent and gained valuable experience two years earlier as part of Nigeria's response to the World Health Organization Nigeria's call to redouble efforts to eradicate polio.[159] Access to information of better quality than is often available

156 George Packer ('The megacity: Decoding the chaos of Lagos', *The New Yorker*, 13 November 2006, 62–75), as quoted in Dayton McCarthy, *The worst of both worlds: An analysis of urban littoral combat*, Australian Army Occasional Paper: Conflict Theory and Strategy 002, Canberra: Australian Army Research Centre, April 2018, 9, available from: researchcentre.army.gov.au/sites/default/files/the_worst_of_both_worlds.pdf.

157 James Canton, 'The extreme future of megacities', *Significance* 8(2)[SI: Megacities] (June 2011): 53–56, at 54, doi.org/10.1111/j.1740-9713.2011.00485.x.

158 Otu et al., 'An account of the Ebola virus disease outbreak in Nigeria'. The estimates of Lagos's population vary widely, with some stating more than 30 million. That used here is from *Demographia World Urban Areas*, 15th edn, 23.

159 Courage, 'How did Nigeria quash its Ebola outbreak so quickly?'.

elsewhere, experienced authorities and supporting bureaucracies and other key resources will assist megacity planning and response regardless of the crisis. Knowing likely hotspots for problems and identifying the resources essential for effective action do much to make manageable the apparently overwhelming.[160] In the future, identifying such hotspots might benefit from analysing census information, marketing survey results and property records. Call data specifying users' phone numbers, times of calls and mobile tower locations have already been used to track malaria outbreaks in Africa. Captured in a timely fashion, they could similarly help trace the flow of commuters who are later found to have been contaminated in the aftermath of a biological-agent attack or disease outbreaks similar to Covid-19 in 2020.[161] The last tells us that concerns about privacy will be an issue for which officials need to better prepare. Possible solutions include pre-event agreement by residents to have select data made available during times of crisis, passing laws akin to 'information eminent domain' when the welfare of the whole requires use of specific data types or other approaches that could be developed in cooperation with citizen groups.

The outcome in Lagos was by no means assured. Many among the Nigerian public did not originally understand how to protect themselves from Ebola. Like the distribution of misinformation during Tokyo's Fukushima Daiichi threat (on which more to follow), early word provided by the Nigerian media in advance of official information from health authorities was sometimes inaccurate, creating a nationwide scare. As a result, several people resorted to extreme, ineffective and sometimes harmful measures to protect themselves, such as consuming large quantities of saltwater.[162] Similar misinformation plagued US health guidance during the Covid-19 crisis—again demonstrating that rumour, ignorance or misunderstanding can be no less damaging than deliberate manipulation of communications. Such missteps make Lagos's handling of the Ebola threat even more impressive. Perhaps naysayers predicting the doom of developing-world megacities confuse urban areas with the sometimes excessively corrupt and poorly run countries of which they are a part. As one author noted:

> Nigeria's hopelessly corrupt federal government simply can't handle the tribal and religious rivalries that are tearing the country apart. But Lagos is a different story. A succession of efficient regional

160 Glenn, 'Megacities'.
161 ibid.
162 Shuaib et al., 'Ebola virus disease outbreak'.

> governments, major Chinese investments, and corporate interest in the city's low-wage workforce and its emerging middleclass are transforming the city and the region.[163]

There is no doubt that some megacities operate at the edge of chaos in one manner or another. Yet, perhaps those seeing this as evidence of imminent collapse should re-evaluate their looking at the glass as half-full. Others view the edge of chaos as the optimal point for dynamism in a system.[164] Megacities' performance as fonts of innovation and growth lends credence to this less pessimistic perspective.

It is worth noting one more myth before moving on (or perhaps it is more an assumption than a myth): disaster responders speak the same language when the language they speak is the same. General James Delk, who was the California Army National Guard field commander during the 1992 riots in Los Angeles, recalled:

> [I]n Compton [part of the Los Angeles megacity], which was marine territory, two Compton police officers took a squad of marines with them and headed out to a domestic dispute. The cops walked up to the door, knocked, and the next thing you know someone fired bird shot through the door. One policeman was hit, but not hurt. His partner grabbed him and as he pulled him back he hollered to the marines 'Cover me!' Now to a cop, that was a very simple command. That means aim your rifle and use it if necessary. To a marine, and there were some well-trained young patriots in that squad, it meant something entirely different. They instantly opened up. A mom, a dad, and three children occupied that house. I later asked the Compton police department to count the bullet holes for me because there was a rumor going around there were 50 or so rounds fired. The police told me there were over 200 bullet holes. In some cases you couldn't tell how many bullets had gone through. They didn't hit anyone, but the point is, those great young marines did exactly what they're trained to do, but not what the police thought they requested. You need to understand the differences in language.[165]

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163 Darrell Bricker and John Ibbitson, *Empty Planet: The Shock of Global Population Decline*, New York, NY: Crown, 2019, 155.

164 Fisch, *An Anthropology of the Machine*, 106.

165 James Delk, 'MOUT: A Domestic Case Study—The 1992 Los Angeles Riots', in Russell W. Glenn (ed.), *The City's Many Faces: Proceedings of the RAND Arroyo-MCWL-J8 UWG Urban Operations Conference, April 13–14, 1999*, Santa Monica, CA: RAND Corporation, 2000, 79–156, at 135.

Back to reality

> Workers in big cities are more productive than those in small places.[166]
>
> —'An outsized punch', *The Economist*

> You need to know who's halal or vegetarian and who wants turkey wings.[167]
>
> —Paul Ford, 'Tech support'

Whether developing or developed world, megacities are hubs of talent, economic vibrancy and influence. They also attract the fertile seeds of growth: youth. More than one-quarter of Japan's population are seniors; it is the most aged society in the world.[168] As in many other developed nations (and, increasingly, developing nations), in Japan, birthrates are below replenishment levels and people are living longer. Unlike the United States, Japan has very little immigration to keep its blood young. Ageing it might be, but Tokyo suffers the consequences less than the rest of the country. More of those living in the capital are aged between 15 and 55 than in Japan as a whole; many of those megacity residents are in their twenties or thirties.[169] That means a larger pool of individuals is available for employers to hire, there is more innovation and more income to support local commerce, the arts and other of life's amenities that in turn continue to make the capital attractive to Japanese of working age.

Money moulders without vibrancy. Vibrant money seeks new spaces and creates niches where it can multiply more quickly while promising to multiply yet further. Megacity shoppers looking for produce can choose from tens of nearby markets, meaning those markets reach out to a greater range of suppliers to meet the needs of their diverse population (diverse in tastes even if largely homogeneous ethnically, as is sometimes the case). These large urban areas therefore not only have a greater number (quantity) of commercial offerings, but also those offerings differ in type (quality). Generic markets compete with the more upscale and others focusing on organic produce, locally grown goods or ones specialising in a particular ethnic cuisine. Larger cities have more media companies

166 'An outsized punch', *The Economist*, [London], 25 July 2020, 3.
167 Paul Ford, 'Tech support', *WIRED*, September 2020, 14–15, at 15.
168 Bricker and Ibbitson, *Empty Planet*, 80.
169 Seidensticker, *Tokyo from Edo to Showa*, 575.

of a type and more types of media companies. Increasingly, megacities become home to more eclectic populations attracted by this variety of offerings that in turn promote further increases in quantity and niche providers. Visitors in a megacity at any point tend to represent a wider spectrum of geography, functions and professions than found elsewhere, just as do its residents. A further irony touched on above: where more is a characteristic of an urban area, it means less consumption of many goods and services per resident, and therefore greater efficiency. The costs of urban water treatment, streetlights or policing are spread over many instead of fewer. Scale favours urban and though at some point increases in population mean increases in the number of amenities (eventually an increasing population will need two water treatment plants instead of one, for example), it still holds that costs per resident tend to be lower. The density of urban areas means a kilometre of street serves more people, the streetlight illuminates more walkers and the bus carries more passengers. Though megacities consume huge amounts of energy, more people and enterprises benefit for each unit of energy generated.[170]

No wonder youth are attracted to megacity life, where they find an exotic mix of work and play featuring more individuals like themselves in addition to many others unalike. Seoul is a good example. More than 40 per cent of South Korea's population lives in the megacity thanks in part to the capital also being home to 'the vast majority of attractive jobs, schools, and entertainment options. Few people with any ambition can afford not to move there' despite high property prices for both rentals and purchases.[171]

That megacities are a wonder has consequences for those tasked with their security. There are more people who might be a source of willing or coerced supplies, shelter or information for criminals, terrorists or other miscreants. There are also more routes adversaries can use; more buildings and subterranean passageways offering the prospect of undetected movement; more locations from which they can engage with their weapons, locate explosive devices or hide themselves or illicit resources; and more types and sizes of and ways to use those resources. Perhaps the biggest difference is one challenging leaders at higher echelons: determining the

170 Geoffrey West concludes that benefits and negative elements (for example, crime) do not double in an urban area as population does, but rather increase by a factor of 2.15; however, West fails to address reasonable challenges to these findings in his scale despite them being published well before the book's release. For one discussion of these challenges, see Townsend, *Smart Cities*, 312–14.
171 'The high-rise life: Housing in Seoul', *The Economist*, [London], 29 August 2020, 60.

details of a megalopolis's expansive interconnectedness and vast influence knowing that even the seemingly inconsequential decision or most minor of actions can have unforeseen and dramatic implications. Barring the salting of the earth as in 146 BCE Carthage, the devastation imposed on rural features can generally be rectified with the harvest of the following year's crops. A developed-world megacity government cannot focus only on challenges within its own space of contiguous light at night. It must do what it can to ensure that the effects of its actions do not unduly damage the urban area's far-reaching relationships and responsibilities. A megacity disaster is inherently also a catastrophe for many beyond.

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