

Companion for Chapter 11

Resilient Cities

SUMMARY

- In 2008 for the first time in all of human history, more than 50 percent of the human population lived in cities. Since their start about 10,000 years ago, cities have engaged in urban manufacturing and services - food processing, light and heavy industry, public administration, religious rites, entertainment, finance, trade, banking - that is traded for food from the countryside.
- Until the Industrial Age, the share of the world's population actually living in cities was consistently around 10 percent or less. In the eighteenth century, with enhanced farm practices, improved access to soil nutrients, and better transport conditions, the farm areas were able to produce more output per farmer and thereby support a much larger population in urban areas.
- The Industrial Age coincided with the start of mass urbanization for at least two reasons. First, the income elasticity of food demand is less than one: this means that food demand increases with income, but much less than proportionately. In other words, as economic development occurs, agriculture will not keep pace as a share of the total economy. Second, agriculture is intrinsically rural (it needs land for growing food) while most industries and services are intrinsically urban (they need close access to suppliers, consumers, and shippers).
- Let's consider the factors that are distinctive about cities: 1) cities have high concentrations of population; 2) industrial and services activities dominate city economies; 3) the average output per person in urban areas is often two or three times higher than in rural areas of the same country; 4) cities are the locus of tremendous amounts of innovative activities; 5) cities are trading centers; 6) major cities are generally coastal or at the estuaries of great rivers; 7) cities are places of rapid population growth; 8) cities are places of glaring inequality; 9) cities enjoy enormous advantages of economies of scope and scale; and finally 10) cities face major challenges of "urban externalities"—pollution of air and water, traffic congestion, transmission of diseases, and crime and violence to name a few.
- As the world economy continues to grow in the twenty-first century, and as rural productivity increases, the world's urban areas are expected to continue growing. By 2030, urban areas are forecasted to have about 60 percent of the world's population.
- There is also a tendency toward convergence of urbanization rates across regions of the world: poor countries tend to urbanize more rapidly than rich countries, which are already nearly completely urban.
- The global distribution of urbanization is shifting in a fundamental way. In 1950, the European and North American populations constituted 53 percent of the world's urban population, compared with around 29 percent of the global population. By 2050, forecasts announce that instead of 53 percent, it will constitute just 15 percent of the world's urban population.
- The dynamics of the world's largest cities have also changed. In 1950, there were only two mega-cities: Tokyo and New York, both in the developed world. In 2015, of the 29 urban

agglomerations with more than 10 million people, only five are from today's high-income world.

- Since most of the world lives in cities, it is important to understand what makes them sustainable. The major features of urban sustainability can be summarized as follows:
 - *Urban productivity*: cities need to be places where individuals can find decent, productive work, and businesses can produce and trade efficiently. A productive infrastructure is therefore needed, including: networks of roads, public transportation, power, water and sewage, waste flows, as well as an effective court system to enforce contracts.
 - *Social inclusion*: cities can either be places that create high social mobility, or places that widen the divides between the rich and the poor. Effective urban planning and politics can lead to cities in which people of different races, classes, and ethnicities interact productively, peacefully, and with a high degree of social mobility and trust.
 - *Environmental sustainability*: because of the high density of population, cities are highly vulnerable to environmental ills. Cities must therefore make two kinds of environmental efforts: reducing their "ecological footprint" (mitigation), and ensuring preparedness and resilience to changing environmental conditions (adaptation).
- Sustainable cities are "green" and resilient. By "green," we mean that the ecological impact of the city is low. By resilient, we mean that cities recognize and plan ahead for the environmental shocks they may experience in the future.
- Population density is a key determinant of a city's productivity and environmental footprint. Densely settled cities tend to be more productive and emit fewer GHGs than sprawling, low-density settlements. This is because higher density often correlates to lower emissions in transportation (more walking and low-emission public transit), more efficient trade, and lower emissions in the heating and cooling of buildings.
- Cities need to make choices about infrastructure. Those who plan and design infrastructure well are able to maximize economic opportunities, improve quality of life, promote public health, and minimize the impact on the natural environment.
- One aspect of this core infrastructure is transportation: relying on the automobile is a recipe for massive congestion and pollution. There are much better options of public transport, such as buses, metro systems, and properly managed biking and walking routes.
- Another key aspect of infrastructure is water supply: every big city has to provide drinking water for its population, as well as water for periurban agriculture, healthy ecosystems, and industrial processes. The challenges of urban water supplies will become far more important, and even dire, in many regions. The continued massive growth in urban populations and industry will raise the demand for water just as climate change and groundwater depletion will lead to reduced availability of fresh water.
- Another crucial aspect of urban infrastructure is waste management. The typical way in which cities handle waste is to put it someplace, such as landfills. However, more and more cities are experimenting with different kinds of recycling programs and innovative waste-to-energy facilities.
- Cities must plan for a future of rising ecological shocks resulting from human-induced climate change: heat waves, storms, floods, and droughts will increase in frequency, and sea levels will be rising. Infrastructure must be designed or refitted to be ready to face these threats.

- Pollution is likely to worsen as well, through changing weather patterns, higher proportions of automobiles per household, and an increase in industrial activity. It is possible for cities to overcome such crises, however, with pollution regulations and a shift of energy use from coal to gas and other cleaner sources.
- Earthquakes are another profound threat to cities that lie in seismically active zones. Cities can prepare for them, however: buildings can be reinforced at relatively low costs, and settlements in dangerous areas, such as steep hillsides, can be prevented.
- Each city has distinctive topography, population density, and vulnerabilities. Each city therefore needs to assess its particular challenges. The major hazards are tropical cyclones, droughts, earthquakes, floods, landslides, and volcanoes. We need forward-looking planning that combines ecology, engineering, and public policy to keep our cities resilient.
- Many cities have already made a major effort to become sustainable by adopting sustainability plans. For example, New York City's sustainability plan, PlaNYC, which calls for 10 Sustainable Development Goals was adopted in 2007.

EASY

REVIEW

Concepts and Definition

Can you define or explain the significance of these concepts?

Urbanization	Resilience
Economies of scale	Population density
Economies of scope	Urban sprawl
Urban "externalities"	Federal Aid Highway Act
Urban agglomeration vs. city	Water supply infrastructure
Urban productivity	Waste management
Green cities	Sustainability plans

Check your facts

- 1) When did the global population become mostly urban (>50% urban) for the first time in history?
- 2) In 2012, how many urban agglomerations with 10 million or more people were there in the world?
- 3) According to a UN forecast, approximately what proportion of the world's urban population will Europe and North America account for in 2050?
- 4) Approximately, what was Europe's average urbanization rate in 1800? (with urban areas defined by the threshold of 5,000 people or more)
- 5) Approximately, what was the urbanization rate in the Netherlands in 1800? (with urban areas defined by the threshold of 5,000 people or more)
- 6) Approximately what percent of the world's urban population was in Europe or North America in 1950?

- 7) Approximately, what is the population density in the overall urban agglomeration of New York City?
- 8) Approximately what percentage of all commutes or transit in New York is walking or public transportation?
- 9) Approximately, what was the average level of CO₂ emissions per capita per year in the United States in 2008? In New York City?
- 10) When was the Federal Aid Highway Act adopted?
- 11) Approximately how many vehicles are there in the United States? (The U.S. population is around 316 million people)
- 12) What is the estimated amount of damages caused by Superstorm Sandy (in dollars)?
- 13) What level of GHGs emission reduction target was adopted by New York City?

Answers: 1) 2008; 2) about 30; 3) 15%; 4) about 11%; 5) about 37 percent; 6) 53%; 7) 33,000 people per square mile; 8) 36 percent; 9) 20 tons of CO₂ per person per year and 6 tons of CO₂/person/year; 10) 1956; 11) 250 million; 12) 60 billion; 13) 30% reduction by 2030 (baseline 2005)

Review questions

- What are the patterns of urbanization around the world?
 How are economic development and urbanization related?
 What do we mean by “dynamic symbiosis” of farms and cities?
 What do we mean by “convergence in urbanization”?
 What are some of key characteristics of cities?
 What criteria can we use to say whether a city is sustainable?
 What do we mean by “green cities”?
 What do we mean by “resilient cities”?
 What are the issues related to urban sprawl?
 What do we mean by “urban externalities”?
 What do we mean by “smart infrastructure”?
 What have been some of the impacts of the Federal Aid Highway?
 What kinds of ecological shocks must cities prepare for?
 How can cities prepare for ecological shocks?
 How can cities limit their GHG footprint?
 How has New York City addressed the challenge of providing safe water in a sustainable way and at a reasonable cost?
 What are New York City’s sustainable development goals?

DATA ACTIVITIES

EASY

A. The world's largest cities

Explore the interactive data visual on cities on the website of the International Institute for Environment and Development (<http://www.iied.org/cities-interactive-data-visual>) and answer the following questions:

- 1) In 1800, which cities had more than half a million inhabitants?
- 2) Which cities in sub-Saharan Africa were the first ones to have more than 500,000 inhabitants?
- 3) In 1900, how many cities had more than half a million inhabitants?

- 4) In 2030, how many cities will have more than half a million inhabitants?
- 5) In 2010, which country has the greatest number of the world's 100 largest cities?
- 6) In 2010, which city was the largest and how many inhabitants did it have?

Answers: 1) London, Beijing, Guangzhou, Istanbul and Paris; 2) Johannesburg, Cape Town; 3) 46; 4) 1350; 5) China; 6) Tokyo, about 37 million

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B. The world's fastest growing cities

Explore the table on the world's fastest growing cities and urban areas from 2006 to 2020 on the following website: http://www.citymayors.com/statistics/urban_growth1.html

- 1) At what rate is the fastest city growing?
- 2) How many of the top 20 fastest growing cities are in high-income countries?
- 3) Approximately, what proportion of the 20 fastest growing cities is in Africa?
- 4) Approximately, what proportion of the 100 fastest growing cities is in either China or India?

Answers: 1) About 10%; 2) Zero; 3) About 50% (9/20); 4) 33/100

EASY

C. Urban population growth rates

Use the World Bank's online data portal (<http://data.worldbank.org/indicator>) to find data on urban population growth rates and answer the following questions.

- 1) In 2014, which country had the highest urban population growth and how much was the growth rate?
- 2) In 2014, on which continent were the top 20 countries with highest urban population growth?
- 3) In 2014, how many countries experienced "de-urbanization" (i.e. a negative urban population growth rate)?
- 4) In 2014, on which continent were most of the countries experiencing de-urbanization?

Answers: 1) Oman, 8.4%; 2) Africa; 3) 18; 4) Europe

MEDIUM

D. Urbanization and Development (from Chapter 2)

Use data from the World Bank Database to answer the questions that follow.

- 1) Plot a cross-section of "agricultural workforce as a fraction of total" against GDP for 1960. Label the countries.
- 2) Do the same for 2000. Comment on any changes.
- 3) Choose five countries, and plot "agricultural workforce as a fraction of total" against GDP for 1960, 1970, 1980, 1990, and 2000. Comment on the trends you see.
- 4) **Hard:** Are the patterns you see consistent with the predictions from models of structural change? Are there any anomalies? Can you think of explanations for the anomalies?

MEDIUM

E. Accessibility

Explore the Urban Observatory comparison application at www.urbanobservatory.org/compare. Choose three cities and investigate how they compare in terms of the various indicators listed under "Movement."

HARD

F. Case study analysis

Select a policy, program, or project related to urban design that has already been implemented or is in the process of being implemented. Write a paper (about 15 pages) to analyze the project. You will first briefly introduce the project. Then, spend most of the paper evaluating strengths and weaknesses, and conclude with lessons for the future.

DISCUSS AND DEBATE

- 1) Discuss some of the differences between the earlier wave of urbanization (that which occurred between 1750 and 1950) and the current wave of urbanization (that which has been occurring since 1950)?
- 2) Using the example of New Orleans and Hurricane Katrina and New York City and Superstorm Sandy, discuss some of the barriers to implementing public policies that could improve urban resilience?
- 3) Using the examples given in the book, discuss the role of transportation in building smart infrastructure.
- 4) Look at figures 11.20: "PlaNYC's Sustainable Development Goals for New York City" and 11.22: "PlaNYC Sustainable Development Indicator Dashboard" in the book. Comment on the use of specific goals and specific metrics. Discuss which of the goals will be the most challenging to achieve.
- 5) Using the case study below, discuss the importance of risk management and early warning systems.

CASE STUDY

Disaster Resilience - Japan's experience

In the past five years alone the world has witnessed an earthquake in Haiti (2010), a heat wave in the Northern Hemisphere (2010), a tsunami in Japan (2011), a drought in East Africa (2011–2012) and a typhoon in the Philippines (2013). These adverse natural events have caused large human casualties and had considerable economic costs. Human development progress has been weakened by these impacts and, in some cases, hard-won gains have been reversed. Japan is a disaster-prone country that can provide important insights on disaster resilience. In 2011 a powerful earthquake off the east coast of Japan triggered large tsunami waves that killed more than 15,000 people and caused extensive damage to economic and social infrastructure. It also led to a nuclear disaster in Fukushima. But despite the large loss of human life and record financial costs—estimated at \$210 billion—the impact could have been dramatically worse. The Tohoku earthquake, estimated at magnitude 9.0, was the world's fourth strongest since records began in 1900, and the ensuing tsunami waves reached heights of up to 40 meters and travelled up to 10 kilometers inland. Japan's early warning system prevented a much larger death toll. As soon as seismic activity was detected, television, radio and mobile phone networks broadcast alerts. This enabled many people to prepare and mitigate the impact, such as moving to higher ground, while the country's rail network and factories quickly came to a halt—thus avoiding greater damage. Emergency sirens, clearly marked evacuation routes and public education programmes were also critical in saving lives. Strict building codes ensured that tall buildings withstood the earthquake, while forested green belts and concrete barriers provided some protection against the tsunami. State institutions have traditionally engaged with local communities to improve disaster preparedness and devise evacuation plans. Japan's longstanding investments in technology and public awareness were essential to averting an even bigger disaster. Even if debates in Japan about preparedness and recovery have been critical, the case of Japan highlights that risk is inherently a development concern and that comprehensive risk reduction and recovery must be integral components of overall governance. Early warning systems, evacuation routes, strict building codes and engagement with local communities all need to stem from institutional, legal and governance systems that prioritize disaster risk reduction and recovery. In March 2015 the third UN World Conference on Disaster Risk Reduction will take place in Sendai, one of the cities affected by the 2011 Tohoku earthquake and tsunami. The conference will allow member states to review the implementation of the Hyogo Framework for Action and adopt a post-2015 framework for disaster risk reduction. The framework, a 10-year plan to build the resilience of countries and communities to disasters agreed at the 2005 World Conference on Disaster Reduction, has five key priorities for action: make disaster risk reduction a priority, know the risks and take action, build understanding and awareness, reduce risk, and be prepared and ready to act. Nonetheless, building disaster preparedness takes time, requiring significant long-term investments in education, technology and infrastructure, as well as adequate institutions and regulatory frameworks. Learning from recent experiences with disasters will be crucial to build a forward-looking global agenda that enables resilient and sustainable human development.

Source: United Nations Development Program, Human Development Report 2014. Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience. Box 3.4.

FURTHER READING

This document discusses and proposes post-2015 Sustainable Development Goals for cities. SDSN Report: The Urban Opportunity: Enabling Transformative and Sustainable Development, (2013), http://urbansdg.org/wpcontent/uploads/2013/12/SDSN_TG09_The_Urban_Opportunity.pdf

This article investigates the relationship between urbanization and the rate of economic growth. Bloom, D. E., Canning, D., & Fink, G. (2008). Urbanization and the wealth of nations (2008), *Science*, Vol. 319 (772).

This article describes what the human population will look like in the next half century. Cohen, J. E., *Human population: the next half century* (2003), *Science*, 302 (1172).

This paper describes the situation from the beginning of the industrial revolution when levels of urbanisation were dependent on geography and the historical situation and when the general level of urbanisation was low, through the nineteenth century in which agricultural productivity and industrialisation determined the levels of urbanisation.

Bairoch, Paul, and Gary Goertz. 1985. "Factors of Urbanisation in the Nineteenth Century Developed Countries: A Descriptive and Econometric Analysis." *Urban Studies* 23: 285–305.

This article shows that density measured in different ways tells divergent tales about urban form. Eidlin, Eric. 2010. "What Density Doesn't Tell Us About Sprawl." *ACCESS* 37: 2–9.

- **PlaNYC documents**

PlaNYC. 2009. *Inventory of New York City Greenhouse Gas Emissions: September 2009*. New York: Mayor's Office of Long-Term Planning & Sustainability.

PlaNYC. 2011. *Update April 2011: A Greener, Greater New York*. New York: Mayor's Office of Long-Term Planning & Sustainability.

PlaNYC. 2013. *Progress Report 2013: A Greener, Greater New York*. New York: Mayor's Office of Long-Term Planning & Sustainability.