# EAST ASIA'S CHANGING URBAN LANDSCAPE

## MEASURING A DECADE OF SPATIAL GROWTH

WORLD BANK GROUP
Social, Urban, Rural & Resilience

Australian Aid

# INTRODUCTION

## EAST ASIA'S CHANGING URBAN LANDSCAPE

### Why Urban Expansion Matters

The pace, scale, and form of East Asia's urbanization will have long-lasting effects on the region's social, economic, and environmental future. As urbanization rapidly transforms the face of East Asia and the lives of its citizens, urban policy makers and planners have an important role to play in ensuring that urban expansion, and the economic growth it brings, is efficient, sustainable, and inclusive. Once cities are built, their urban form and land use patterns are locked in for generations.

Urbanization is a key process in ending extreme poverty and boosting shared prosperity. In the coming decades, urban areas will be the places where millions of East Asians will have the chance to leave extreme poverty behind and to prosper. The benefits of urbanization for economic growth are well known, as are the links between economic growth and poverty reduction. The findings in this study reinforce the connection between economic growth and urbanization (figure 1). Although the growth of urban areas provides opportunities for the poor, urban expansion can also aggravate inequality in access to services, employment, and housing. The spatial expansion of a city directly affects the poor in its path. Land is often taken or bought at cheap prices from poor rural landowners on the urban fringe. The lack of affordable housing and efficient public transportation in large cities can force the poor to live far from work, schools, clinics, markets, and other amenities, and exacerbate problems of social exclusion. Getting urban form, density, and administrative coordination right will be essential to helping achieve the World Bank's twin goals of ending extreme poverty and boosting shared prosperity.

## A New Approach to Measuring Urban Expansion

Urban leaders, policy makers, and researchers trying to understand or respond to urbanization have always been hampered by the lack of internationally comparable data. Each country defines "urban" areas and populations differently, and international comparisons or global estimates of urban populations borrow these incompatible definitions. Therefore, studying urbanization across countries in any consistent way has been difficult. This study uses satellite imagery and other data to better understand urbanization by defining and measuring the physical extent of urban areas and their populations in a consistent manner, across the entire East Asia region, for 2000 and 2010[1].

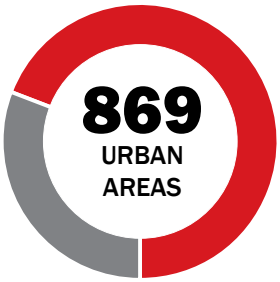
To create maps of built-up areas throughout the region, change-detection methods were applied to the analysis of Moderate Resolution Imaging Spectroradiometer (MODIS) satellite data, using a geophysical definition of built-up areas (Mertes and others, forthcoming)[2]. These built-up areas were combined with the "WorldPop" map, which modeled population distribution using census and other data as inputs (Gaughan and others 2013; Linard and others 2012; Tatem and others 2007). Using this combination of built-up areas and populations, 869 urban areas with more than 100,000 people were identified, and changes in their spatial area and populations were measured. This summary provides a brief overview of some of the findings, which are explored in more depth in the full report, *East Asia's Changing Urban Landscape, Measuring a Decade of Spatial Growth* (World Bank, forthcoming).

# KEY FINDINGS

East Asia experienced rapid urban expansion and urban population growth between 2000 and 2010. The region had 869 urban areas with more than 100,000 people in 2010; 600 of these areas were in China. Although a large amount of new urban expansion occurred (more than 28,000 square kilometers), urban populations grew even faster than urban land. If the region's new urban population from 2000 to 2010, nearly 200 million people, were a country unto itself, it would be the world's sixth largest. However, despite East Asia's large urban population, only 36 percent of its population lives in urban areas, suggesting more decades of urban growth to come. Urban populations in lower-middle-income countries grew the fastest, whereas upper-middle-income countries had the fastest spatial growth[3]. Despite the visibility of "megacities," small and medium-sized urban areas had more urban land and population, as well as more growth.

# From 2000 to 2010, East Asian urban populations grew faster than urban land.

## EAST ASIA'S REGIONAL URBAN POPULATION




URBAN AREAS OVER 100,000 PEOPLE

- China's urban areas
- Other urban areas (269)

WHERE PEOPLE LIVE

- Live in urban areas (36%)
- Live outside urban areas (64%)

**Only 36 percent of East Asia's population lives in urban areas suggesting more decades of urban growth to come.**

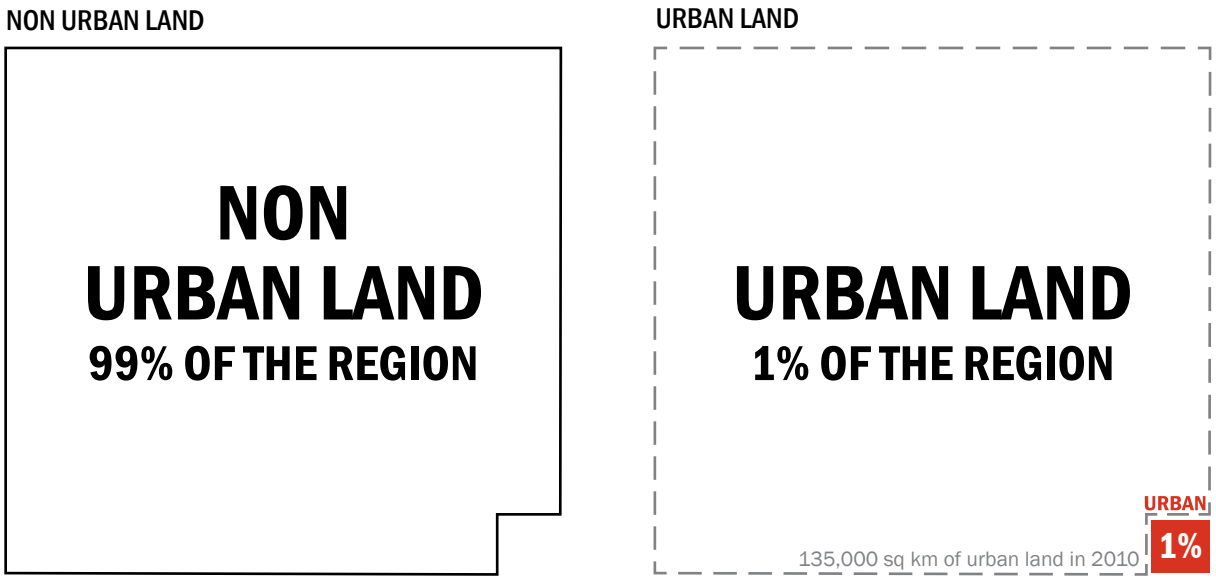
**If East Asia's new urban population from 2000 to 2010 were a country unto itself, it would be the world's 6TH LARGEST**

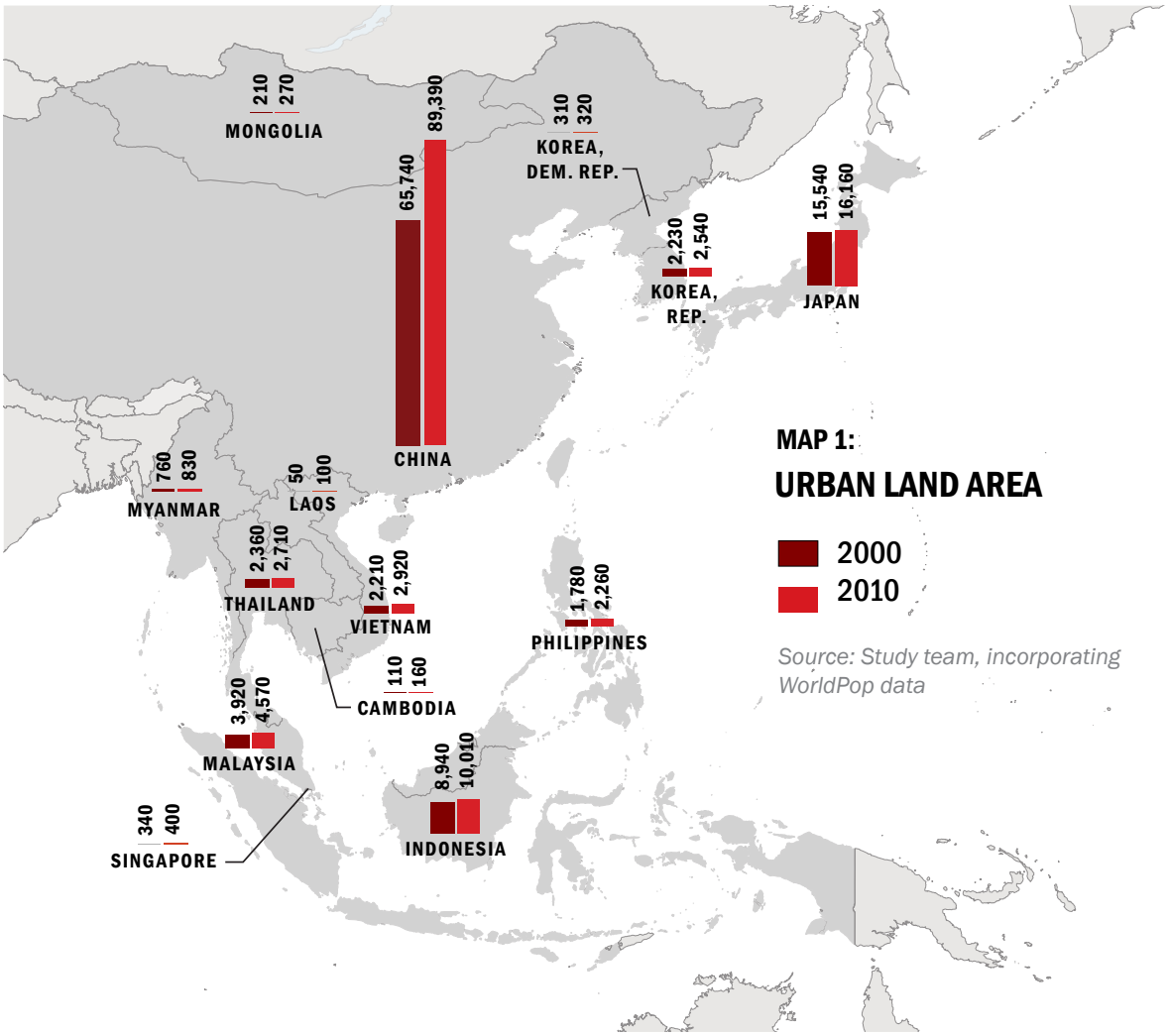
# RAPID URBAN EXPANSION AND POPULATION GROWTH

East Asia saw large amounts of urban expansion between 2000 and 2010. The region had 106,400 square kilometers of urban land in 2000; urban land grew at an average annual rate of 2.4 percent a year, reaching 134,800 square kilometers in 2010. However, still less than 1 percent of the total area of the region was urbanized. Two-thirds of the total urban land and more than 80 percent of the urban expansion in the region in 2010 was in China (Map 1). Japan had the second highest total amount of urban land, but the lowest rate of spatial expansion. Indonesia had the second highest increase in urban land between 2000 and 2010. The fastest annual rates of urban expansion were in the Lao People's Democratic Republic and Cambodia (7.3 percent and 4.3 percent, respectively), which are still mostly rural countries just beginning to urbanize, followed by China (3.1 percent) and Vietnam (2.8 percent).

## REGIONAL URBAN EXPANSION 2000-2010

## TOTAL AREA OF THE REGION (2010)





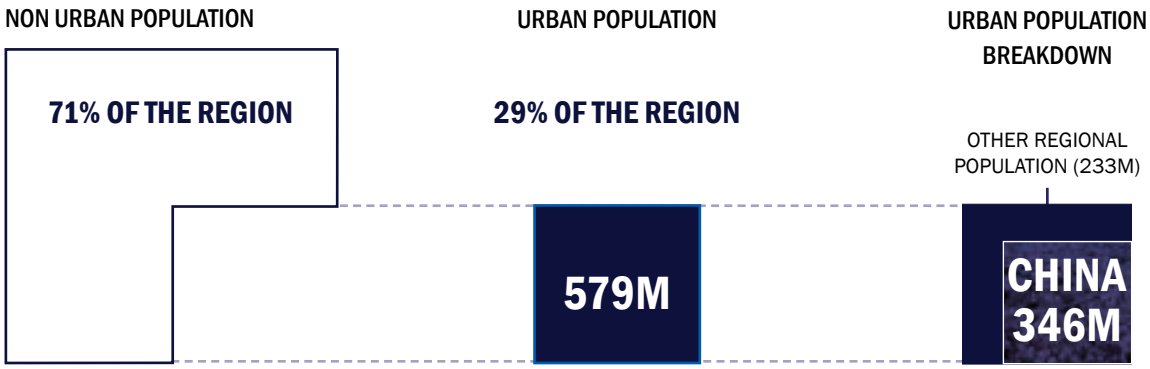
**80%** OF THE REGION'S URBAN GROWTH OCCURRED IN CHINA (2000-2010)

INDONESIA HAD THE SECOND HIGHEST INCREASE IN URBAN LAND AREA.

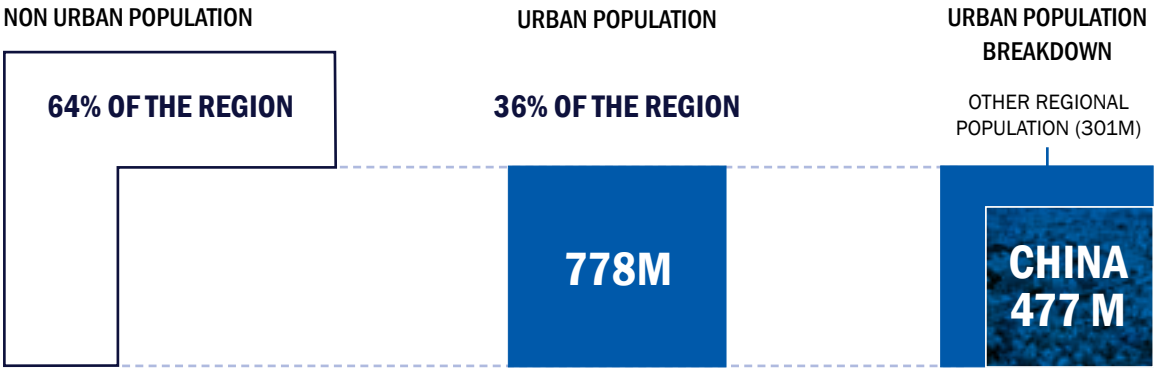
Urban populations in the region have grown even faster than urban land. The total urban population of the region increased from 579 million in 2000 to 778 million in 2010, an average annual growth rate of 3.0 percent. Much of this growth was driven by China, which has the largest urban population in the region (and the world), 477 million urban inhabitants in 2010, more than the urban population of the rest of the region combined. The growth in China's urban population, 131 million people, was twice that of the rest of the region combined. Despite its large urban population, East Asia has an even larger non-urban population, suggesting that more decades of urban growth are likely to follow. By the definitions used here, only 29 percent of the total population of the region lived in urban areas in 2000, increasing to 36 percent in 2010.

## REGIONAL POPULATION EXPANSION 2000-2010

## TOTAL REGIONAL POPULATION (2000)




## TOTAL REGIONAL POPULATION (2010)



## BOX 1. COMPARING URBANIZATION IN EAST ASIA WITH THE REST OF THE WORLD

No global studies have been completed using the same approach and data as in this study, making cross-regional comparisons with these data difficult. However, Angel and others (2010) follow a similar approach, using maps of urban areas with more than 100,000 people (which they term "large cities") for 1990 and 2000, thus providing a sense of how urbanization in East Asia differs from that in other regions. According to their study, countries in East Asia and the Pacific (EAP) had the highest number of large cities of any region in 2000. Although Europe and the group of land-rich developed countries (Australia, Canada, New Zealand, and the United States) had more urban land by area, EAP had by far the world's largest urban population, twice that of Europe, which had the second largest. Urban areas in EAP were more than 1.5 times as dense as the average for the world's urban areas. Urban population densities in the region were equivalent to or slightly lower than in Sub-Saharan Africa, Northern Africa, and South and Central Asia, but 1.3 times the density in the Middle East, more than 1.5 times that in Latin America and the Caribbean, more than twice that in Europe, and nearly four times that in the land-rich developed countries (Angel and others 2010).

## EAST ASIA & THE PACIFIC (EAP) HAS THE WORLD'S LARGEST URBAN POPULATION

POPULATION

POPULATION DENSITY

**2x**

EAP URBAN POPULATION IS 2 TIMES GREATER THAN EUROPE (THE SECOND LARGEST)

**4x**

EAP URBAN POPULATION IS 4 TIMES DENSER THAN LAND-RICH DEVELOPED COUNTRIES

**1.5x**

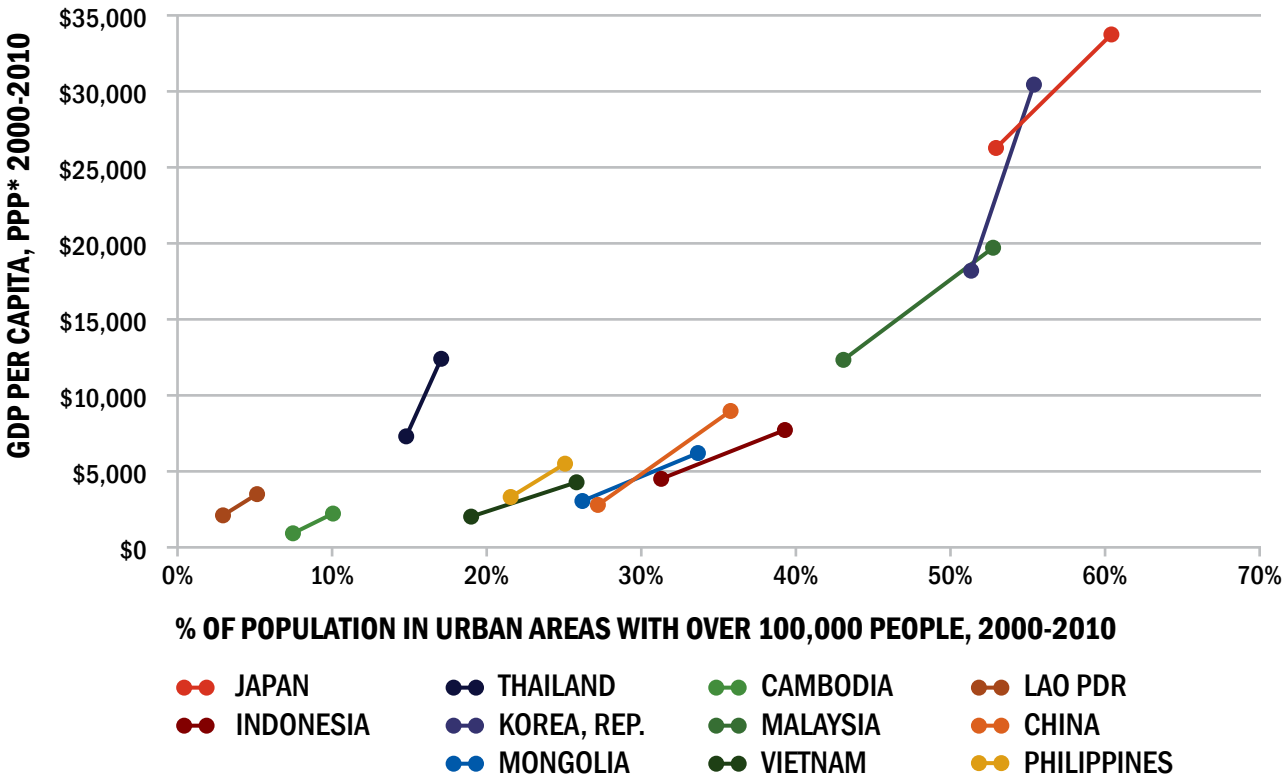
EAP URBAN POPULATION IS 1.5 TIMES DENSER THAN LATIN AMERICA AND THE CARIBBEAN

**1.3x**

EAP URBAN POPULATION IS 1.3 TIMES DENSER THAN THE MIDDLE EAST

**FIGURE 1:**

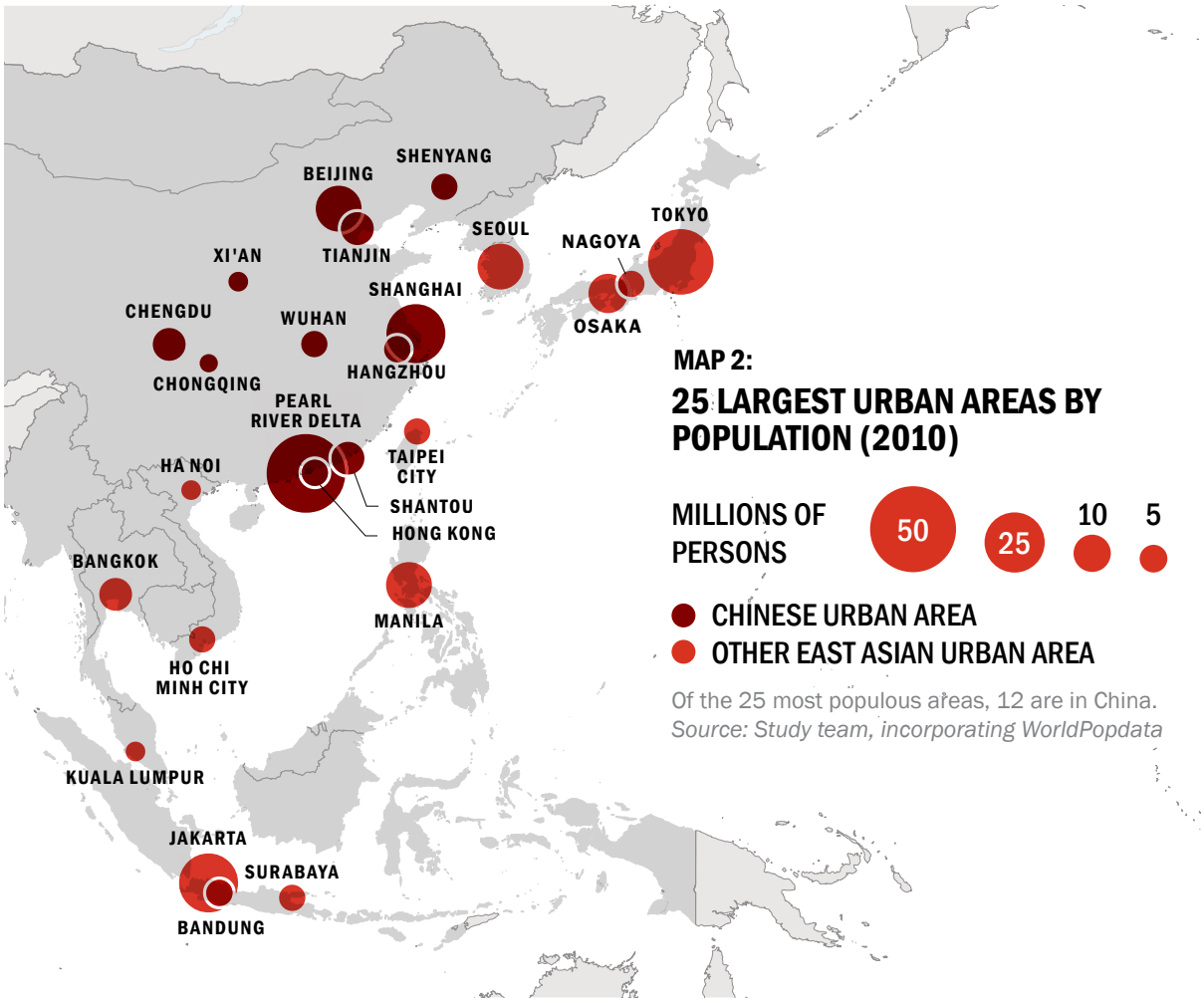
**CHANGES IN PROPORTION OF URBAN POPULATION (URBANIZATION RATE) AND GDP PER CAPITA (2000-2010)**




Source: Study team, incorporating WorldPop data and World Bank Open Data
*PPP: Current International $

Urbanization is associated with increasing incomes. High-income countries in East Asia were the most urbanized, as measured by both land and population. Figure 1 shows the relationship between per capita incomes and urbanization rates, reinforcing the well-established evidence linking urbanization and economic growth.

Lower-middle-income countries had the fastest urban population growth, whereas upper-middle-income countries had faster spatial growth. The urban population growth rate was slightly higher in lower-middle-income countries (3.6 percent) than in upper-middle-income countries (3.3 percent). However, the rate of urban spatial expansion was highest in upper-middle-income countries (3.0 percent), followed by lower-middle and low-income countries (1.7 percent and 1.1 percent)[4]. This may be because while people in lower-middle-income countries move in large numbers to urban areas seeking economic opportunities, and often live in dense slums, resources to expand infrastructure become available only when these countries reach higher levels of income. For both spatial expansion and population growth, high-income countries had the lowest rates of increase.



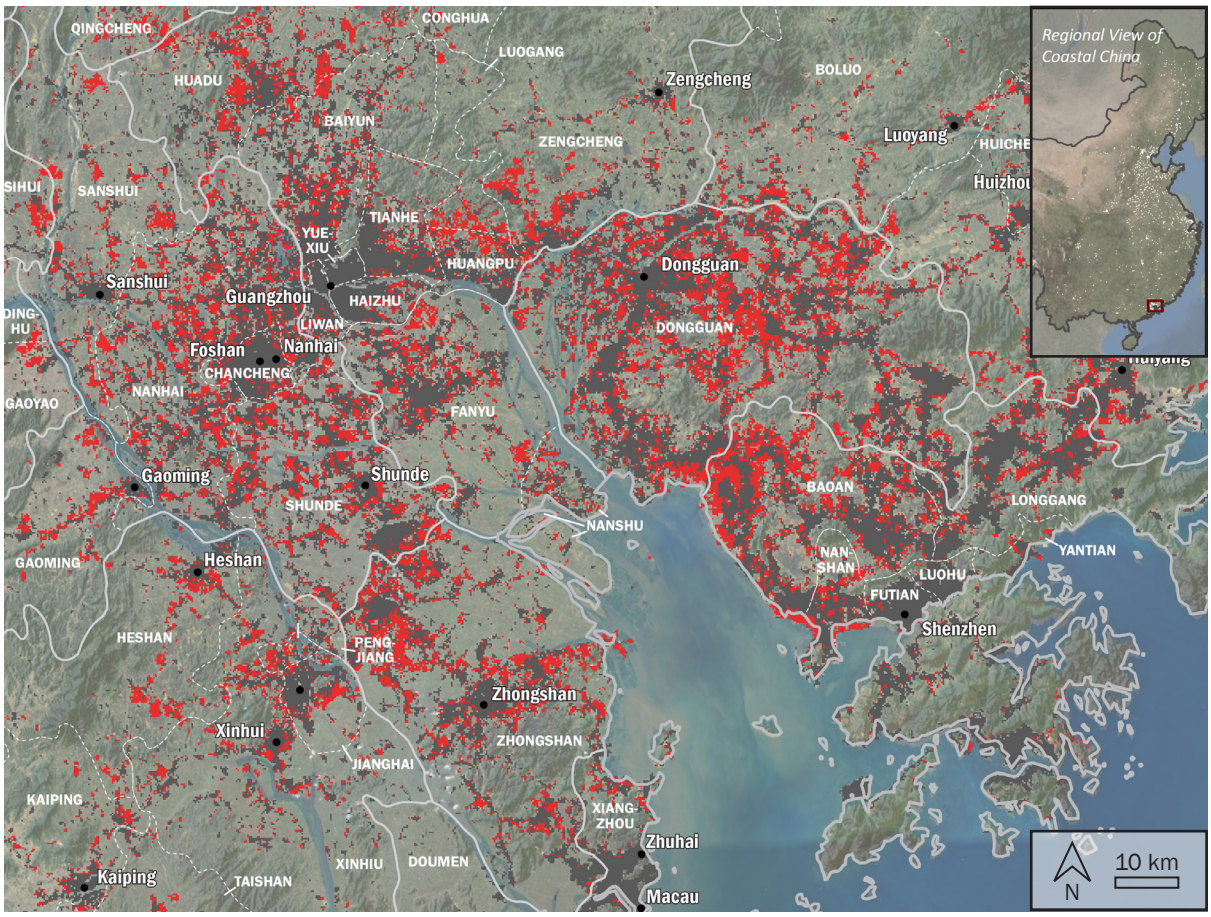

**MAP 2:**
**25 LARGEST URBAN AREAS BY POPULATION (2010)**

Of the 25 most populous areas, 12 are in China.
*Source: Study team, incorporating WorldPopdata*

China is home to the majority of the region's largest and fastest-growing urban areas (see Map 2). Of the 869 urban areas in the region with more than 100,000 people, 600 were in China, followed by 77 in Indonesia and 59 in Japan. Of those with more than a million people, those expanding the fastest were in China, with 12 doubling in area during the decade. The urban areas outside China growing at the highest rates were the Johor Bahru urban area in Malaysia and the Phnom Penh urban area in Cambodia. Vietnam's two large urban areas, Ho Chi Minh City and Hanoi, expanded rapidly during this period, with both growing more in absolute land area than any other urban area in the region outside China. As with urban spatial expansion, urban population growth rates among large urban areas were highest in China.

**URBAN AREAS WITH >100K PEOPLE**

| | |
|---|---|
| 600 | CHINA |
| 77 | INDONESIA |
| 59 | JAPAN |
| +133 | OTHER EAST ASIAN COUNTRIES |
| 869 | TOTAL URBAN AREAS |




## MAP 3: URBAN EXPANSION IN THE PEARL RIVER DELTA, CHINA 2000-2010

URBAN EXTENT c 2000 URBAN EXTENT c 2010

China's Pearl River Delta urban area has surpassed Tokyo.

*Source: Maps produced by University of Wisconsin-Madison, Sept. 2013; Administrative boundaries from University of Michigan - China Data Center*

If considered a single urban area, the Pearl River Delta in China is now the largest in the world, as measured by both area and population. This urban area, which includes Guangzhou, Shenzhen, Foshan, and Dongguan (Map 3)[5], overtook Tokyo to become the largest in East Asia, as well as in the world[6]. It is more than twice as large as the Shanghai urban area, four times the size of the Jakarta urban area, and five times the size of the Manila urban area. The Pearl River Delta urban area had 42 million inhabitants in 2010, more than some countries, including Argentina, Australia, Canada, and Malaysia.

Despite their global notoriety, East Asia's megacities account for only a part of the overall urban landscape[7]. Urbanization in East Asia tends to be discussed with respect to its massive megacities of 10 million or more people. However, there are only eight such urban areas in the region, but there are 572 urban areas with 100,000 to 500,000 people, accounting for two-thirds of the urban areas in the region. The megacities accounted for about a quarter of the total urban population of the region, but the largest amount of urban population and urban population growth in the region was in medium-sized urban areas. Spatially, although the average megacity is more than 50 times as large as the average urban area in the smallest class of cities, in fact, urban areas in the smallest class and in the class of 1 to 5 million people have more land than do urban areas in the megacity class. Both these classes also had greater absolute amounts of new urban land area than the megacity class. However, the larger classes grew at slightly faster rates than the smaller ones.

# THE PEARL RIVER DELTA URBAN AREA IS THE LARGEST IN THE WORLD FOR AREA AND POPULATION.

## AREA COMPARISON

**5x** THE PEARL RIVER DELTA URBAN AREA IS 5X LARGER THAN THE MANILA URBAN AREA

**4x** THE PEARL RIVER DELTA URBAN AREA IS 4X LARGER THAN THE JAKARTA URBAN AREA

**2x** THE PEARL RIVER DELTA URBAN AREA IS 2X LARGER THAN THE SHANGHAI URBAN AREA

## POPULATION COMPARISON

The Pearl River Delta urban area had 42 million inhabitants in 2010, more than some countries.

**THE PEARL RIVER DELTA URBAN AREA**

42 MILLION PEOPLE

**ARGENTINA**

40 MILLION PEOPLE

**CANADA**

34 MILLION PEOPLE

**MALAYSIA**

28 MILLION PEOPLE

**AUSTRALIA**

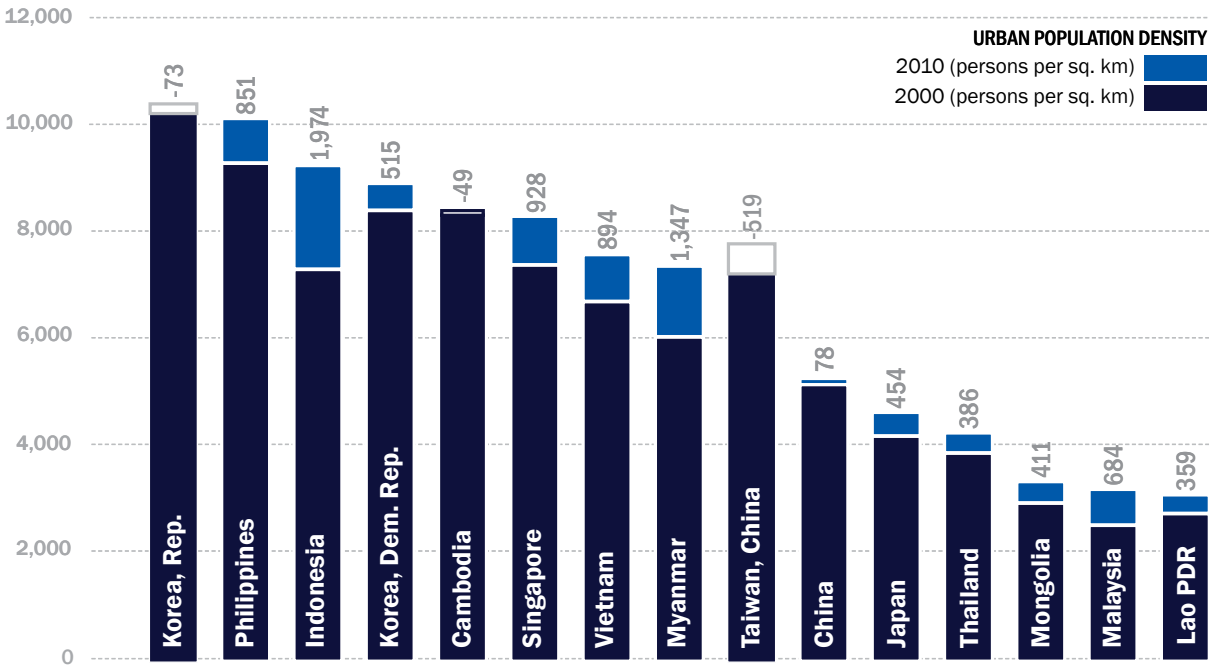
22 MILLION PEOPLE

# DENSITY: HIGH AND INCREASING ON AVERAGE

Despite the perception of sprawl, urban population densities in most countries have increased on average. Urban areas in East Asia were more than 1.5 times as dense as the average for the world's urban areas. This high average urban population density (more than 50 times the average density of Metropolitan Statistical Areas in the United States, for example [Wilson and others 2012]) is an asset to East Asian cities that potentially gives them an advantage over cities in other regions. One of the unexpected findings of this analysis is that, despite the large amount of urban growth leading to perceptions of sprawl and declining densities, urban areas in East Asia in fact appear to be getting slightly denser on average (from 5,400 people per square kilometer in 2000 to 5,800 people per square kilometer in 2010). However, this high, increasing density is not a uniform trend across all countries in the region (figure 2). Low- and lower-middle-income countries had much higher densities and larger increases in density. Despite the huge growth in its urban population, China's urban population density (5,300 people per square kilometer in 2010) remained stable, and lower than the average for the region because of the accompanying rapid urban spatial expansion as well as barriers to migration. By contrast, in Indonesia, which saw a large jump in urban population density, and in many other countries, populations migrate freely, while the constraint is on producing new urban area with infrastructure and housing.

Outside China, 92 percent of urban areas in the region became denser during this period. However, more than 60 percent of China's urban areas declined in density, including Shanghai, Tianjin, Chongqing, and others. Density in Hong Kong SAR, China, declined slightly, but it remained the densest urban area in the region, with an extremely high average density of 32,000 people per square kilometer in 2010. In the EAP region as a whole, larger urban areas were denser, but medium-sized urban areas saw the greatest density gains.

URBAN POPULATION DENSITY BY COUNTRY 2000-2010



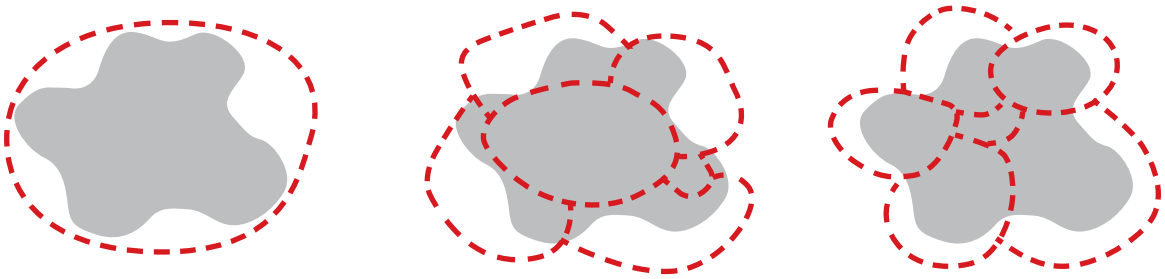
Hong Kong is the densest urban area in the region with 32,000 people per square kilometer in 2010.

# INCREASING METROPOLITAN FRAGMENTATION

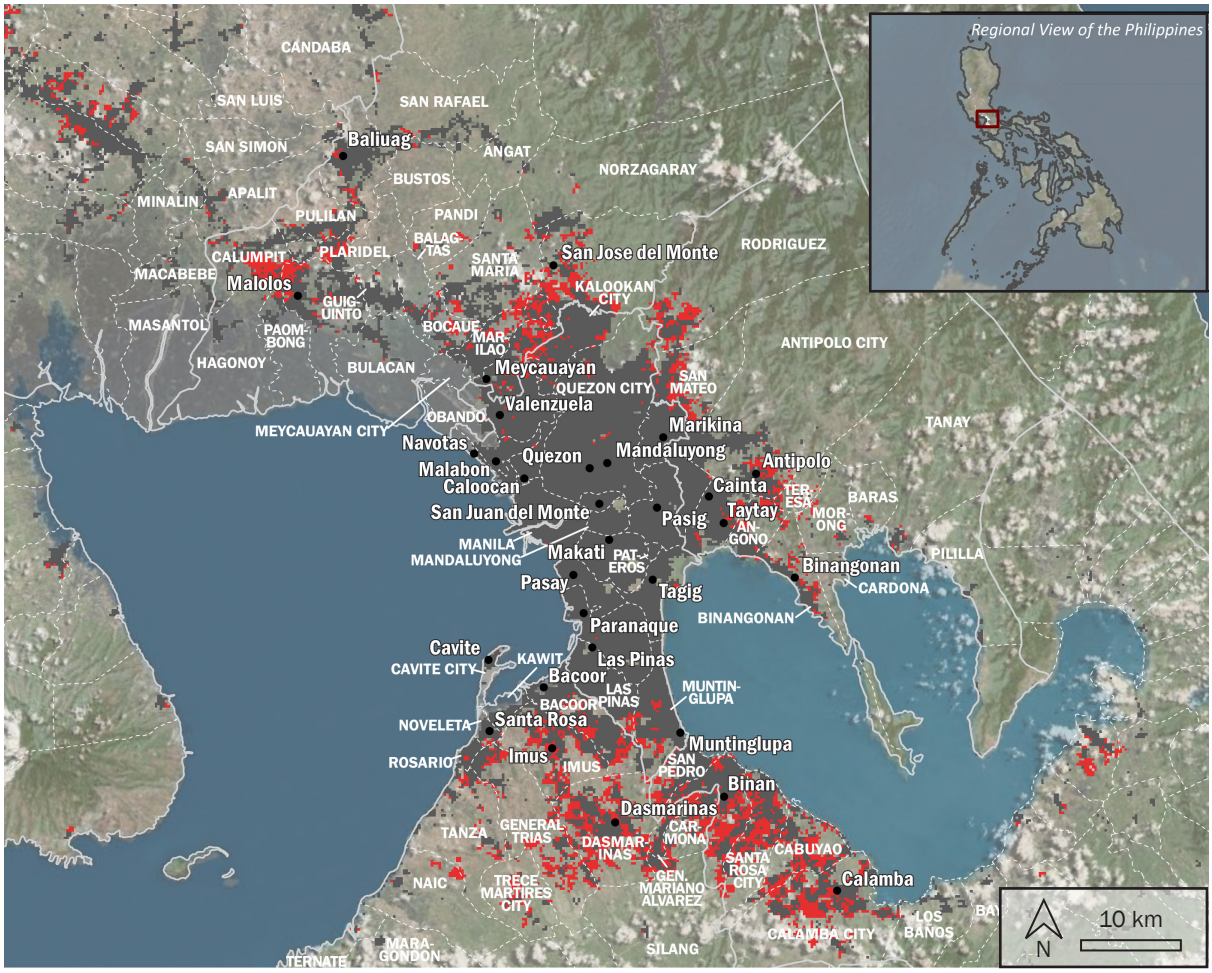
About 350 urban areas in East Asia spill over local administrative boundaries. In 135 of these, no single jurisdiction has even half of the total urban area within it. Less than 40 percent of the built-up land and population of the Jakarta urban area are within Jakarta's provincial boundaries. The Manila urban area in the Philippines includes 85 municipalities and cities in seven provinces (map 4). The Greater Tokyo urban area in Japan includes 240 municipalities in seven prefectures.

Metropolitan fragmentation has emerged as a significant challenge in the East Asia region. Fragmentation of metropolitan areas refers to the spillover of urban growth from original boundaries into neighboring jurisdictions, or the merging of multiple cities into a single entity, while they continue to be administered separately. Among the urban areas examined in this study, 521 were contained within a single municipal boundary, 213 were "spillover" urban areas (with up to half spilling over, but still mostly within one boundary), and 135 were "fragmented" urban areas (with no municipal boundary encompassing even half the total urban area; see Figure 3 for diagrams of these concepts)[8].

**FIGURE 3:**
**"CONTAINED," "SPILLOVER" AND "FRAGMENTED" URBAN AREAS**



| CONTAINED | SPILLOVER | FRAGMENTED |
|---|---|---|
| **521** | **213** | **135** |
| 521 WERE CONTAINED WITHIN A SINGLE MUNICIPAL BOUNDARY. | 213 WERE "SPILLOVER" URBAN AREAS (WITH UP TO HALF SPILLING OVER, BUT STILL MOSTLY WITHIN ONE BOUNDARY). | 135 WERE "FRAGMENTED" URBAN AREAS (WITH NO MUNICIPAL BOUNDARY ENCOMPASSING EVEN HALF THE TOTAL URBAN AREA). |




**MAP 4: URBAN EXPANSION IN MANILA URBAN AREA, PHILIPPINES 2000-2010**

URBAN EXTENT c 2000 URBAN EXTENT c 2010

Note: In this map, only labeled areas are counted as part of the Manila urban area.

*Source: Maps produced by University of Wisconsin-Madison, Sept. 2013. Administrative boundaries from GADM, levels 1 and 2.*

# Metropolitan fragmentation has emerged as a **significant challenge** in the East Asia region.

# WHAT CAN POLICY MAKERS DO TO FACILITATE EFFICIENT, SUSTAINABLE, AND INCLUSIVE URBAN GROWTH?

Despite appearances, urban expansion in East Asia has been relatively compact. Despite the appearance of vast sprawl and uncontrolled expansion, East Asian cities are an efficient form of human settlement, with an urban population twice that of Europe residing in a smaller amount of urban land (see Box 1)[9].

Policy makers at the national and municipal levels have an important role to play in ensuring that urbanization proceeds in an economically efficient, sustainable, and inclusive manner. Urbanization in the region has largely been driven by market forces, which are sensitive to demand for urban growth and adept at responding to this demand. However, market forces left to themselves do not always adequately manage the positive and negative externalities of urbanization, or provide the public goods that are necessary to support urbanization. A lack of government support to urbanization can lead to uncoordinated and inefficient development, and to irreversible spatial patterns that result in congestion, pollution, and lost productivity.

## Preparing for Future Spatial Expansion

Governments should facilitate access to land for future urban growth. Governments are crucial to facilitating the supply of urban land so that urban expansion can occur efficiently and smoothly. The government's function is particularly important in lower-middle-income countries, which have seen rapidly increasing urban populations and are likely to see rapid spatial expansion as incomes rise. In these countries, the failure to plan in advance for urban expansion typically results in haphazard, fragmented, and inefficient urban growth. By contrast, in upper-middle-income countries, where urban areas are growing more expansively, cities can identify underutilized or infill sites within or proximate to built-up areas and help bring them into the urban land market. Governments in the region can use numerous potential mechanisms, such as guided land development, land pooling and readjustment, land sharing, and transfer of development rights, to facilitate access to new urban land while still allowing the private sector to lead construction (Lipman and Rajack 2011).

## Ensuring That Urbanization is Economically Efficient

National governments can help foster the economic benefits of urbanization through national urbanization strategies that address the entire system of cities at once. Across the region, national governments have recognized the importance of urbanization to their overall economic growth, and are starting to think about urbanization strategies on a national scale. A key question they face is how to support public investment in a range of cities to foster a diversity of economic activity. It is important for national and regional governments to address the entire system of cities in a coordinated manner. Welfare gains in a single city may be crowded out by new migrants, while this is less likely to happen if equivalent improvements are made in a range of cities (Duranton 2014).

Economic differentiation between cities of different sizes can benefit the entire system of cities. Large cities are characterized by agglomeration and urbanization effects arising from a concentration of firms. These effects are much more important for services and high-tech industries than for basic manufacturing, which is land intensive, and so benefits more from the lower costs of locating in small and medium-sized cities instead. However, these industries often remain in large cities because of inadequate infrastructure or access to labor in other cities, or limited connectivity between cities. This lack of dispersal of manufacturing makes it difficult for large cities to develop industries that add higher value. Addressing the needs of small and medium-sized cities and making it easier for them to specialize, while simultaneously fostering positive agglomeration effects in large cities, can help bring about a more efficient distribution of industries in cities.

## Making Urbanization Inclusive

Spatial planning can help reduce inequality in access to urban opportunities and amenities. Urbanization has been associated with economic growth, but it does not necessarily reduce inequality. The pattern of urban form is one of many factors that affect the ability of the urban poor to access economic opportunities in their cities. Ensuring a spatial match between jobs, affordable retail, public transportation, health and education services, recreational areas, and affordable housing is one of the means of fostering such access, thereby contributing to goals of inclusion.

Land acquisition for urban expansion can be disruptive but can also help bring opportunities to peri-urban residents. How to bring peri-urban land into the urban land market in ways that respect the rights of the original occupants of the land and do not disrupt their livelihoods is a concern faced by governments throughout the region. Evidence in China indicates that relocating rural farmers to high-rise towers in new towns as a way to acquire land can have negative social and psychological consequences[10]. Land pooling and readjustment and land sharing are among the mechanisms that have been used in countries such as Japan and the Republic of Korea to allow original land owners to share in the benefits of extending urban infrastructure and services to peri-urban areas by retaining some of their land.

Addressing the vulnerabilities of recent rural-to-urban migrants can help ensure that rapid urbanization is inclusive. It has been suggested that "the urbanized villager may turn out to define the future of Asia[11]." Nearly 200 million people became urban residents in East Asia between 2000 and 2010. These newly urban residents, and the millions that will follow them, are economically and socially vulnerable as they adapt to new sources of livelihoods and lifestyles, often without traditional social and economic support networks. By extending opportunities to new migrants and ensuring that policies are nondiscriminatory, local governments and other institutions can help foster inclusive urbanization.

## Fostering Sustainable Urbanization

Ensuring that East Asia's high-density urban areas are well located, planned, and coordinated will allow them to contribute to sustainable outcomes. The density of East Asian cities gives them a valuable comparative advantage and confers the potential to put East Asia on a less carbon-intensive urbanization path than other regions, by reducing the number and length of vehicle trips as well as other energy savings (Dodman 2009; Glaeser 2013; Glaeser and Kahn 2003). Planners, policy makers, and developers should foster density where there is demand for it by coordinating it with the location of jobs, services, and public transportation, and should design density so that it produces a walkable, livable urban environment.

Not all density is equally sustainable. For example, "superblocks" of purely residential high-rise buildings surrounded by multilane highways, a common development type in China, have high density without many of the benefits of well-designed urban spaces, and have been criticized as high-density sprawl[12]. Healthy and sustainable urban density involves not just a high density of population, but of street intersections, transportation nodes, public spaces, and other amenities such as schools and clinics, along with a mix of land uses. In the few East Asian countries with low or declining population densities, policy has a role for creating or maintaining a certain level of density, using regulation and the location of infrastructure as levers of influence in local land markets, to avoid the environmental costs and the inefficiencies in service provision associated with urban expansion at low densities.

Risk-sensitive land use planning can guide future development to reduce exposure to climate and disaster risks. Rapidly growing cities in developing countries often expand into unsafe areas such as flood plains, water catchments, and steep hillsides, exposing those who live in these areas, typically the urban poor, to hazards and weakening the resilience of the city as a whole. Ensuring that new urban growth is channeled away from high-risk areas can save lives and prevent property damage.

## Overcoming Metropolitan Fragmentation

The prosperity of East Asia's urban areas in coming decades will depend largely on tackling the challenge of governing metropolitan regions effectively. International experience suggests that regional government authorities and other mechanisms can help coordinate urban service provision across municipal boundaries (see box 2 for examples). Solutions to metropolitan fragmentation include creating new metropolitan government structures, annexing adjacent territories, and dissolving the lowest tier of government, none of which is a universal solution. Overcoming issues related to metropolitan fragmentation requires considering tradeoffs between localized and centralized administrative authority. Cities must adopt flexible approaches that adapt to urban growth and evolve to meet the changing needs of citizens.

## BOX 2. MODELS OF METROPOLITAN GOVERNANCE

Several metropolitan areas have attempted some form of metropolitan governance. Large Canadian cities have dissolved lower tiers of government (for example, Toronto) or annexed adjacent towns (Montreal and Quebec). Similarly, Cape Town, South Africa, consolidated various local governments into a single "unicity" in 2000. The Bangkok Metropolitan Administration in Thailand was created by merging Bangkok and Thonburi.

Metropolitan authorities have varying degrees of power. The Seoul Metropolitan Government is run by a mayor and an assembly that is elected by the people, and encompasses 25 districts. The Community of Madrid and the Grand Paris Region have greater powers than their constituent municipalities; the Greater London Authority is a slightly weaker form of metropolitan governance, with power mostly over transport and police functions. Parastatal bodies in India created by state governments, such as the Mumbai Metropolitan Region Development Authority, are more technocratic than political institutions, and are growing in importance, but have had mixed success so far.

Other metropolitan areas have created special bodies to provide specific services to the entire area, for example, the metropolitan areas of Sydney, Australia; and Lima-Callao, Santiago du Chile, and Bogota in South America; as well as metropolitan transit agencies in several metropolitan areas in the United States. The urban wards within the Tokyo prefecture deliver services on behalf of the Tokyo Metropolitan Government, which is one of many players involved in regional governance, along with prefectures, regional ministerial offices, Japan railway, and private companies. The Regional Plan Association provides long-term integrated planning for the metropolitan region of New York, and despite being a nongovernmental organization, has a strong influence on planning decisions for the region.

Sources: Bahl, Linn, and Wetzel 2013; Sellers and Hoffmann-Martinot 2008.

## Notes

[1]The data used in this study were developed by a team at the World Bank, the University of Wisconsin-Madison, and WorldPop.

[2]Built-up land refers to places dominated by the "built environment," which includes all nonvegetative, human-constructed elements (for example, roads, buildings, and the like) with greater than 50 percent coverage of a landscape unit (here, a 250 meter pixel).

[3]As of 2014, Cambodia, Dem. Rep. of Korea (North Korea), and Myanmar are low-income economies; Indonesia, Lao PDR, Mongolia, Philippines, Vietnam, Timor-Leste, and Papua New Guinea are lower-middle-income economies; China, Malaysia, and Thailand are upper-middle-income economies; Brunei, Japan, Rep. of Korea (South Korea), Singapore, and Taiwan (China) are high-income economies. All analysis in this report uses this classification, and does not recategorize countries if their status differed in 2000 or 2010.

[4]Note that this is specifically a function of China's high spatial growth rate. When China is excluded, the rate of spatial growth in lower-middle-income countries is higher than in upper-middle-income countries.

[5]The definition of the Pearl River Delta sometimes includes Hong Kong SAR, China, but in this report, Hong Kong SAR, China, is considered a distinct urban area.

[6]No definitive claim can be made because there are no directly comparable data for other regions of the world. However, if Tokyo was the largest in the world in 2000, and if no other urban area surpassed Tokyo during this period, the Pearl River Delta is the largest urban area in the world as of 2010.

[7]Patterns in China heavily influence this observation. When China is excluded, there is more urban land and urban population in the megacity categories than in other categories.

[8]Outside China, there are, in fact, more spillover urban areas than contained urban areas.

[9]The entire urban population of East Asia, 778 million people, resides on urban land that could fit comfortably within the area of Lao PDR, Cambodia, or the United Kingdom. All the new urban expansion in the entire region between 2000 and 2010, which accommodates nearly 200 million people, would fit on the island of Taiwan, China (which is home to just 23 million people).

[10]I. Johnson, "New China Cities: Shoddy Homes, Broken Hope," New York Times, November 9, 2013. http://www.nytimes.com/2013/11/10/world/asia/new-china-cities-shoddy-homes-broken-hope.html.

[11]P. Mishra, "Urban Villagers Are Asia's New Force," Bloomberg News, January 14, 2014. http://www.bloomberg.com/news/2014-01-14/urban-villagers-are-asia-s-new-force.html.

[12]B. Dumaine, "Rethinking China's Cities," CNN Money/Forbes, December 3, 2012.

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