

4 The growth of metropolitan areas

This chapter provides a new perspective of major trends and recent developments in the growth of metropolitan areas (cities and their commuting zones) over the past four decades. It documents the emergence of new metropolitan areas around the world. It analyses what type of metropolitan areas appear to be growing the fastest and how many and what type of metropolitan areas are shrinking in terms of population. Finally, it assesses some of the main factors that appear to explain the growth and decline of existing metropolitan areas.

Key messages

- Population has grown in metropolitan areas of all sizes but most strongly in larger ones. Large metropolitan areas with over 1 million inhabitants grew half a percentage point faster per year than smaller metropolitan areas and have increased by over 400 million new inhabitants since 2000. The fastest growth occurred in metropolitan areas with populations above 5 million. Due to the growth of smaller metropolitan areas, the number of metropolitan areas with more than 5 million inhabitants doubled in just 25 years.
- Yet, overall population growth in developing countries, particularly in Africa and South Asia has also led to a proliferation of small metropolitan areas. As a result, many towns grew into metropolitan areas of at least 50 000 inhabitants, and more than 100 million inhabitants in Africa and South Asia live in metropolitan areas that have emerged since 1990. This growth in small metropolitan areas presents distinct challenges for policymakers in these world regions, such as how and where to invest in infrastructure, and to maximise growth opportunities and poverty reduction.
- Globally, one-fifth of metropolitan areas shrank in population despite the overall growth of the urban population. Most of these are located in countries of East Asia and Europe where overall population growth is stagnating or the national population is in fact decreasing. Metropolitan areas with less than a million inhabitants are the most vulnerable to population loss; over one-third of them declined or stagnated between 2000 and 2015 in East Asia and Europe.
- A number of factors are associated with the population size and – to a lesser degree – with population growth of a metropolitan area. In particular, political status, access to markets and location are associated with metropolitan area size. Also, capital cities are growing 0.8 percentage points faster annually, on average, even after accounting for their size. Access to markets matters both for past and current growth. Cities on the coast and navigable rivers are not only larger, but in some world regions also continue to grow faster.

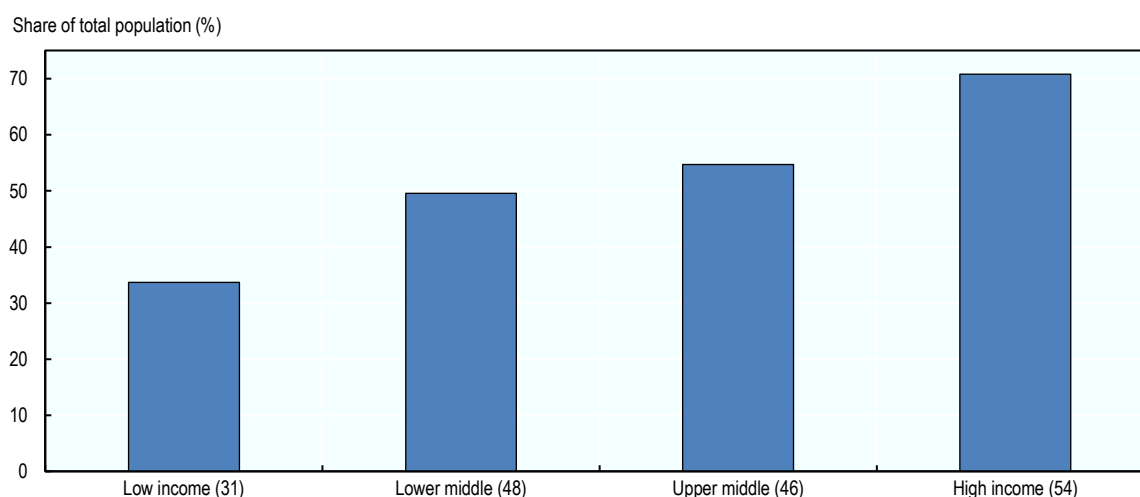
Introduction

How cities are measured is important for understanding their growth. Often, the process of urban and suburban expansion occurs outside of administrative boundaries or outside of the dense urban centre. This chapter uses the concept of functional urban areas (henceforth called *metropolitan areas*) as a unit of observation. Metropolitan areas are composed of a city of at least 50 000 inhabitants and its surrounding commuting zone or travel-to-work area (i.e. the area surrounding a city from which a significant share of the population commutes into the city on a daily basis). Since commuting data is not available for a majority of countries across the globe, the extent of each metropolitan area has been estimated (see Moreno-Monroy, Schiavina and Veneri (2020_[1]) for details). Covering the entire metropolitan area instead of just the city makes a substantial difference. In 2015, nearly 54% of the world lived in metropolitan areas compared to 48% in cities.

When analysing the evolution of metropolitan areas, four distinct patterns become visible. First, more developed countries have a larger population share in metropolitan areas (Figure 4.1). Chapter 3 examines the relationship between economic development and metropolitan areas in detail. Second, the world's population is increasingly concentrated in very large metropolitan areas. How to manage these large cities is of utmost importance since they now house over one-third of the world's population and they will continue to grow. Yet, third, the future does not lie exclusively in large metropolitan areas. Population growth in the developing world has led to the rapid expansion of small metropolitan areas across Africa and Asia. Fourth,

a substantial number of metropolitan areas is experiencing population decline. In OECD countries and parts of East Asia, population growth is stagnating and a significant share of metropolitan areas, especially small- and medium-sized ones, is losing population. How to manage population decline is hence a pressing policy concern.

Figure 4.1. Share of metropolitan population by country income class



Note: This figure depicts the share of the total population that lives in metropolitan areas in 2015 by country income category. The income groups follow the World Bank classification of countries explained in the reader's guide.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Around the world, there are over 9 000 metropolitan areas that are home to almost 4 billion residents according to the global metropolitan area definition. Roughly 70% of these metropolitan areas have between 50 000 and 250 000 inhabitants. Yet, they are home to only 20% of the entire population in metropolitan areas. In contrast, just 1% of all metropolitan have more than 5 million inhabitants but these 94 metropolitan areas are home to 26% of the global population that lives in metropolitan areas. The remaining population in metropolitan areas is roughly evenly distributed between those with 250 000 to 1 million inhabitants and 1 million to 5 million inhabitants (Table 4.1). Since metropolitan areas can contain multiple cities, the number of metropolitan areas can differ from the number of cities.

Table 4.1. Metropolitan areas size and population shares in 1990 and 2015

Size	1990			2015		
	Population (millions)	Number of metropolitan areas	Metropolitan area population share (%)	Population (millions)	Number of metropolitan areas	Metropolitan area population share (%)
<250 000	560	4 545	21	772	6 271	20
250k-1M	751	1 625	28	969	2 088	25
1-5M	821	413	31	1 162	575	29
>5M	520	51	20	1 026	94	26
Total	2 652	6 634	100	3 929	9 028	100

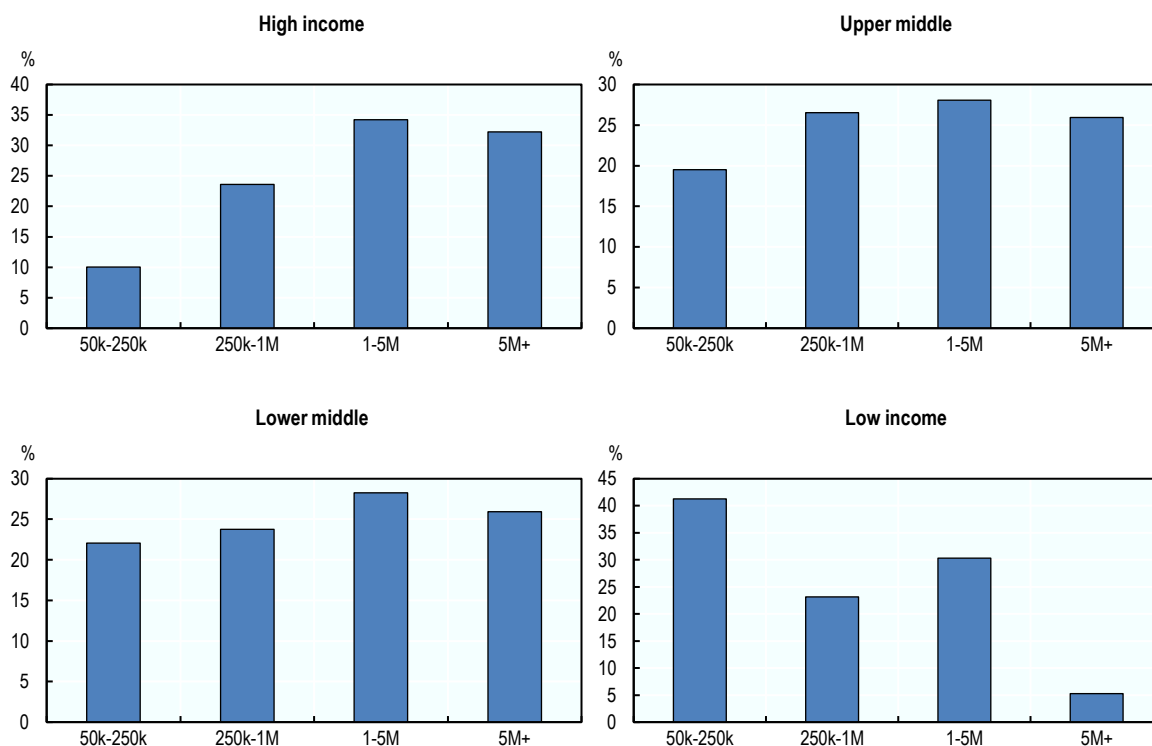
Note: In this table, for 1990, we exclude metropolitan areas that did not have an urban centre in 1990. In 2015, we include all metropolitan areas that have an urban centre in 2015. The boundaries of the metropolitan areas for which population is calculated are fixed in 2015 for both periods.

Source: OECD calculations based on Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

In most world regions, the share of metropolitan area residents living in very large ones has increased since 2000. North America and East Asia have the highest share (36%) of metropolitan area residents living in very large metropolitan areas (>5 million) in 2015. Yet, the high value in North America still represents a relative decline of 4 percentage points since 1990. In contrast, only 11% of Sub-Saharan Africa's metropolitan area population lives in very large metropolitan areas, while nearly 36% still live in small metropolitan areas. The low number for Sub-Saharan Africa reflects two facts. First, large-scale urbanisation in the region is a relatively recent phenomenon and its cities are therefore still smaller than in other parts of the world that have experienced longer periods of urbanisation. Second, it partly reflects the small size of many Sub-Saharan African countries.

The distribution of people in the different size classes of metropolitan areas is closely linked with economic development. The more developed a country is, the more is its metropolitan population in metropolitan areas of more than 1 million inhabitants (Figure 4.2). High-income countries have the highest share (66%) of metropolitan residents living in very large and large metropolitan areas. In comparison, only 35% of residents in metropolitan areas in low-income countries live in large (1-5 million) or very large metropolitan areas (>5 million).

Figure 4.2. The share of the metropolitan area population by size and income in 2015



Note: This figure depicts the share of the total population in metropolitan areas by metropolitan area size class in 2015. The population is further disaggregated by income category. The metropolitan size categories are defined in 2015, using population within the 2015 borders.

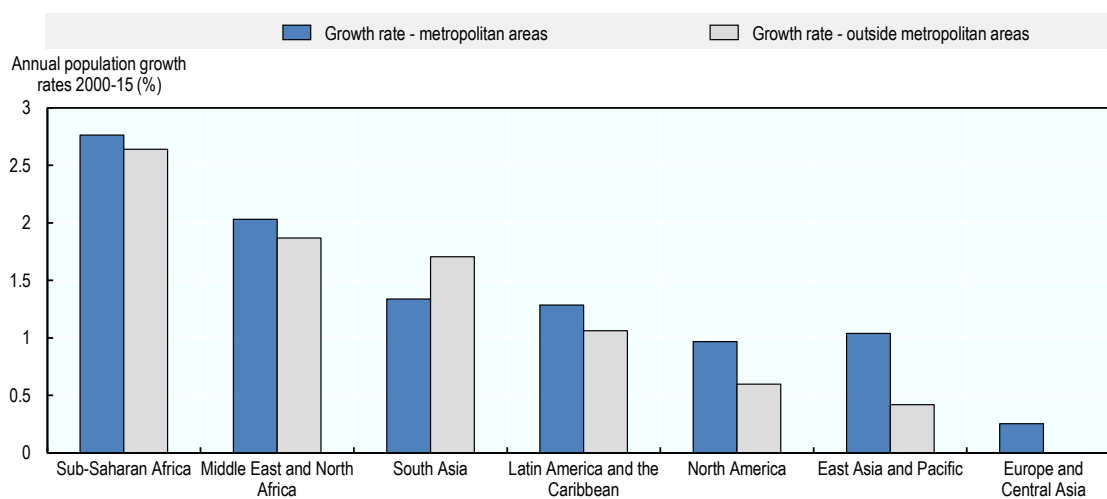
Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

The emergence of 4 000 new metropolitan areas

The world is at a demographic turning point. After five decades of increasing population growth rates, declining birth rates in most parts of the world have led to a marked slowdown in population growth in many parts of the world. Yet, beneath these global dynamics lie major differences in demographic characteristics and trends at the country level. Some countries continue to experience high levels of fertility and population growth. In others, fertility rates have fallen to replacement levels, but population levels will continue to increase for several decades as a large number of young people can expect to live longer lives. In an increasing number of countries, birth rates have fallen below replacement rates and rapid ageing and gradual population contractions are expected in the coming decades, in certain cases compounded by migration to other countries.

Population growth trends at the national level are also reflected in population growth rates of metropolitan areas. Especially in fast-growing countries, population growth at the national level drives the growth of metropolitan areas across the size distribution. Figure 4.3 shows that population growth at the metropolitan level (taking only those metropolitan areas into account that already existed in 2000) mirrors population growth rates in non-metropolitan areas closely in most parts of the world. However, in all regions of the world apart from South Asia, annual population growth in metropolitan areas between 2000 and 2015 exceeded population growth outside metropolitan areas. In North America and East Asia and the Pacific, this difference was most pronounced, with population growth in metropolitan areas almost twice as high as outside metropolitan areas.

Figure 4.3. Total population growth rates and metropolitan area population growth rates by world region, 2000 and 2015



Note: This figure depicts annualised growth rates of the population in metropolitan areas that existed in 2000 and the population outside metropolitan areas by region between 2000 and 2015. The sample of existing metropolitan areas includes those that had an urban centre in 2000. These growth rates are calculated using the total population change by region and are therefore weighted by population. Borders of metropolitan areas are defined in 2015 and all population growth within metropolitan areas takes place within the 2015 borders.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

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Rapid population growth has fostered growth in new and small metropolitan areas in Africa and South Asia

One consequence of rapid population growth in the developing world in recent decades has been the precipitous emergence of new metropolitan areas. Like larger metropolitan areas, towns are growing rapidly in the developing world. This is driven by both natural population growth (due to high fertility rates combined with low mortality) and movement from people in rural areas to towns and small metropolitan areas. Between 1975 and 2015, many towns have exceeded the threshold to be considered a metropolitan area.

Between 1975 and 2015, roughly 4 000 new metropolitan areas emerged. Thus, more than 40% of all existing metropolitan areas emerged over this 40-year period. Low- and lower-middle-income countries experienced the fastest growth in the number of new metropolitan areas over the past four decades. In low-income countries especially, located primarily in Sub-Saharan Africa, over half of the existing metropolitan areas were still a town in 1990 (Figure 4.4). This means that 50 million people in Sub-Saharan Africa are living in metropolitan areas that were towns in 1990.

While the narrative surrounding urbanisation in Africa focuses primarily on the largest metropolitan areas, the growth of small metropolitan areas presents a distinct challenge to urbanisation in Africa (see Box 4.1 for a discussion of the policy challenges of where to invest in Africa). It is a sign of the relatively early stage of urbanisation of the continent, in contrast to more developed world regions that have experienced urbanisation for decades or centuries. In high-income countries, such as countries from the OECD and EU, the majority of metropolitan areas already existed prior to 1975. Put differently, among those metropolitan areas that emerged after 1975, only 9% are located in the EU and OECD.

Box 4.1. Large metropolitan areas versus small towns: Where to invest for greater poverty reduction?

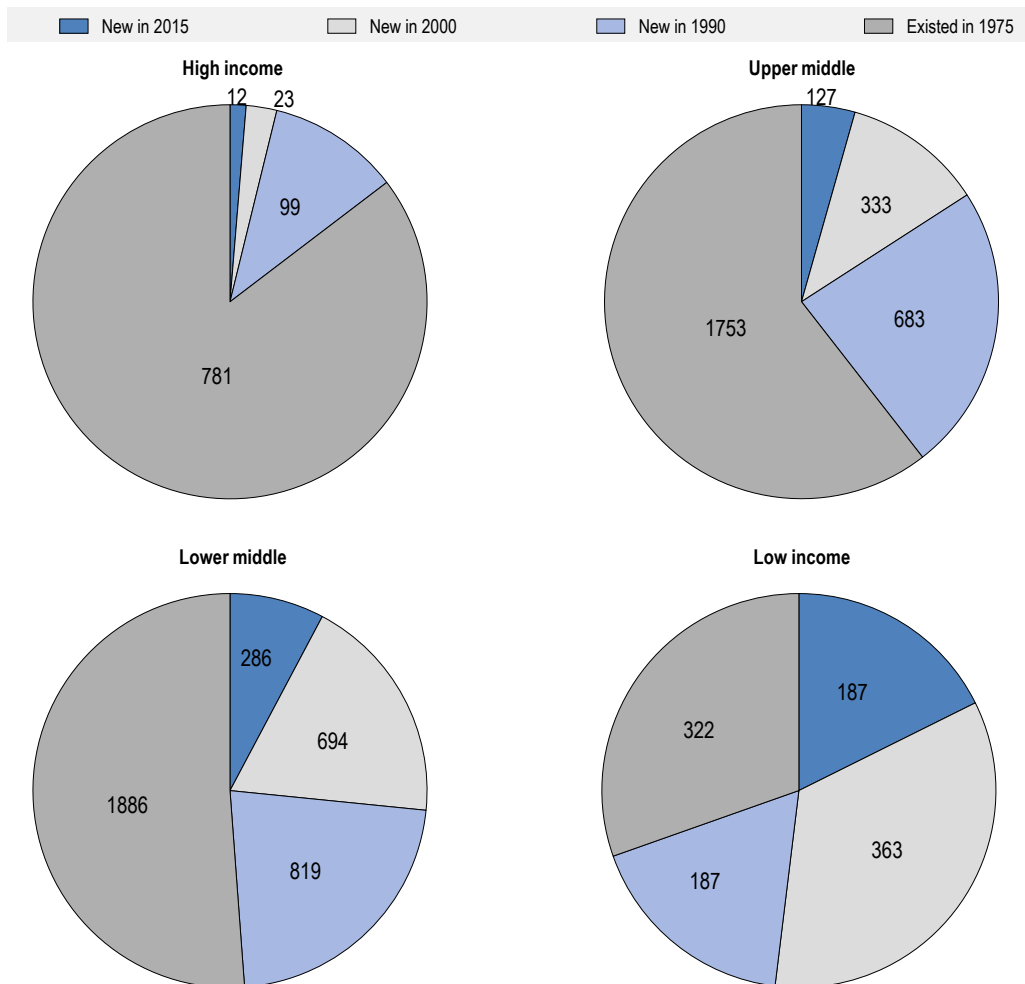
The expansive growth of small metropolitan areas presents a distinct challenge to urbanisation in Africa and the Middle East. Much of the discourse surrounding urbanisation in the developing world involves aggregate measures, with policy debates focusing primarily on the largest metropolitan areas. Yet, as this section has demonstrated, small metropolitan areas are growing rapidly and accounting for large shares of urban growth. In Africa and the Middle East, cities with less than 1 million absorbed over half of new metropolitan residents since 2000.

With the potential for smaller metropolitan areas to reduce poverty, governments and policy makers are faced with the question of whether public investment should be targeted towards smaller metropolitan areas or the largest ones. While the largest metropolitan areas allow for higher increases in income and standards of living relative to smaller metropolitan areas, farmers who are taking up nonfarm employment are increasingly opting to move to smaller metropolitan areas. In Africa, some farmers move to cities even without changing their profession, becoming urban-based farmers. The role of these smaller metropolitan areas for poverty reduction is not clear. Recent cross-country and within-country evidence suggests a larger reduction in poverty when people move to large metropolitan areas. But, because of their high numbers and large share of population growth, small metropolitan areas may contribute to greater poverty reduction overall. In Tanzania, while moving to large metropolitan areas provides large income premiums and standards of living relative to smaller metropolitan areas, most people opt to move to smaller metropolitan areas and engage in local nonfarm employment (Christiaensen, De Weerd and Kanbur, 2016^[3]). As a result, secondary metropolitan areas may play a larger role in poverty reduction in the aggregate. In India, econometric analysis using night lights as a

measure of urban growth has shown that growth of smaller metropolitan areas has had a larger impact on reducing rural poverty than the growth of big metropolitan areas (Gibson et al., 2017^[41]).

Source: Christiaensen, L. and R. Kanbur (2017^[5]), "Secondary towns and poverty reduction: Refocusing the urbanization agenda", <http://dx.doi.org/10.1146/annurev-resource-100516-053453>; Christiaensen, L., J. De Weerd and R. Kanbur (2016^[3]), "Urbanization and poverty reduction: The role of secondary towns in Tanzania", *IOB Analyses & Policy Briefs*; Gibson, J. et al. (2017^[4]), "For India's rural poor, growing towns matter more than growing cities", <http://dx.doi.org/10.1016/j.worlddev.2017.05.014>.

Figure 4.4. Age of metropolitan areas across income classes



Note: This figure reports the share of metropolitan areas that achieved that status in each indicated time period as a share of the total metropolitan areas that existed in 2015 by income level.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

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Growth of the metropolitan population

Population growth is concentrated in large metropolitan areas around the world

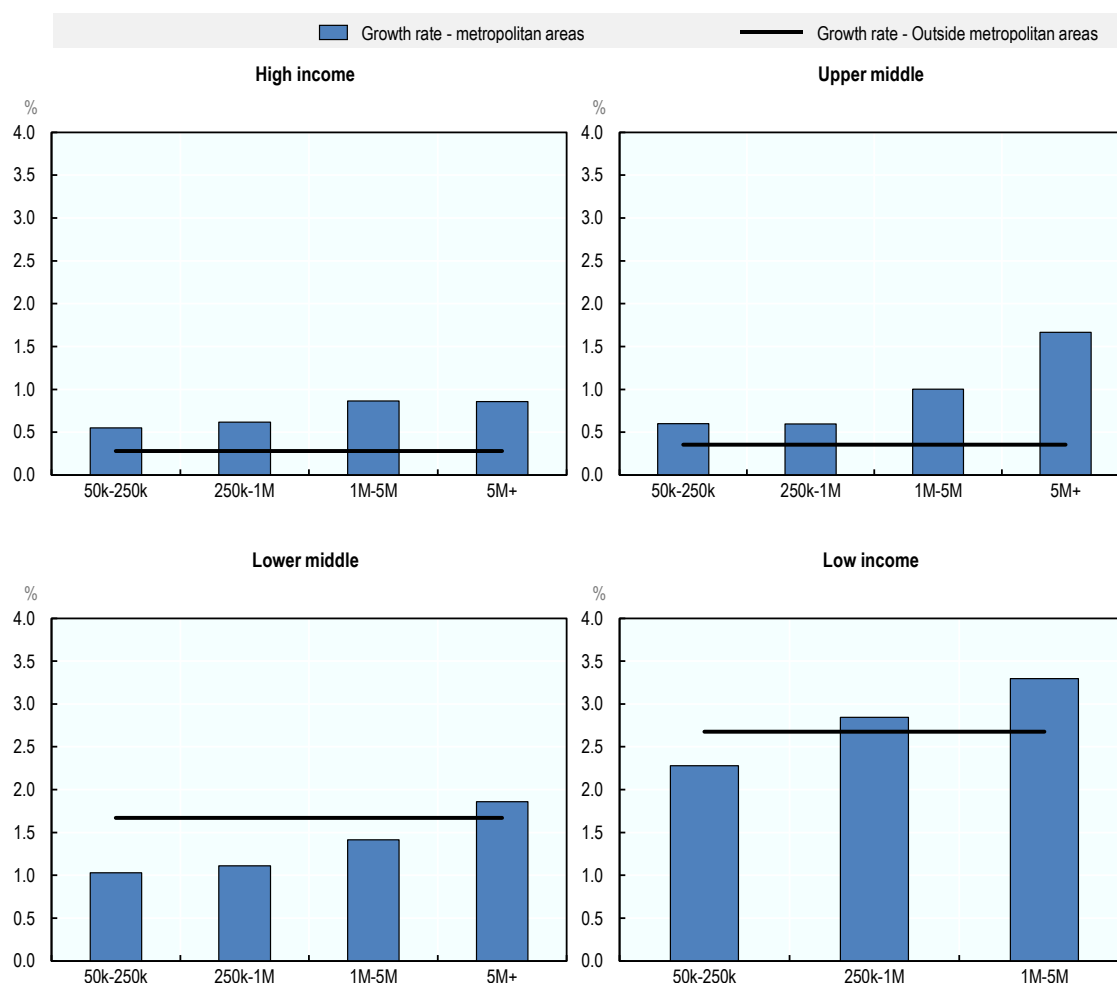
Overall, the world's population is increasingly concentrated in large metropolitan areas. Not only are large metropolitan areas growing faster than medium- and small-sized metropolitan areas, but some medium and small ones also grow into large ones. At a global scale, the majority of metropolitan area population growth took place in large and very large metropolitan areas, regardless of whether countries experienced rapid population growth or population decline. Since 2000, metropolitan areas with over 1 million inhabitants outpaced non-metropolitan growth by 0.4 percentage points. They also grew faster than metropolitan areas with less than 1 million inhabitants (by 0.5 percentage points). As a result, almost 60% of the world's population growth in metropolitan areas occurred in the 542 metropolitan areas that had more than 1 million people in 2000, which represented around 50% of the metropolitan population in 2000. The largest metropolitan areas, those with over 5 million people, grew even faster. On average, these metropolitan areas grew a whole percentage point faster than medium-sized and small metropolitan areas.

Figure 4.5 shows the average annual growth rate of metropolitan area population from 2000 to 2015 by size category and income level. Apart from high-income countries, population growth rates were highest in the largest metropolitan areas, often significantly outpacing non-metropolitan population growth. The relationship between the population growth rates and the size of metropolitan areas is positive in all regions except for Latin America and the Caribbean. Amongst EU and OECD countries, while growth rates seem to be increasing between small and large metropolitan areas, the magnitude of these differences is small (0.12 percentage points) and the differences in growth across metropolitan area sizes are not statistically significant. Similarly, in Latin America, metropolitan areas are growing at similar speeds across the size distribution, on average.

Globally, more than half of the metropolitan areas with more than 5 million people are located in Asia; these are continuing to grow at over 2% annually, despite slower overall population growth across the region. Population growth in these metropolitan areas is outpacing growth in large metropolitan areas (between 1 and 5 million inhabitants) by over 1 percentage point in East Asia and a half of a percentage point in South Asia. The metropolitan areas with more than 5 million inhabitants alone increased by roughly 150 million new people between 2000 and 2015. This represents 22% of global metropolitan growth while they were home to only 15% of the total world population in 2000. Beyond China and India, the fastest growth occurred in lower-middle and upper-middle-income countries such as Myanmar, Pakistan, Thailand and Viet Nam. Countries that experienced natural disasters and conflict have also seen fast growth in large metropolitan areas, this including Afghanistan and Nepal. Growth in large metropolitan areas across East Asia, in particular, has occurred alongside a decline in overall population growth, which has disproportionately affected small- and medium-sized metropolitan areas (see section on shrinking metropolitan areas for a detailed discussion).

In Sub-Saharan Africa, large metropolitan areas have been growing a full percentage point faster than medium-sized metropolitan areas. Very high concentration of people in capital cities has characterised the rapid urbanisation at low-income levels in Africa and the Middle East. In these regions, the largest metropolitan areas are generally capitals with between 1 and 5 million inhabitants. Those that grew faster than 5% include Abuja, Bamako, Beirut, Dar es Salaam, Dubai, Lilongwe, Luanda and Ouagadougou. Continuing at these growth rates, Bamako, Dubai, and Ouagadougou will all surpass 5 million inhabitants in the next decade. While large metropolitan areas are growing the fastest in Sub-Saharan Africa, medium and small metropolitan areas are not far behind.¹ Thus, Sub-Saharan Africa might be moving from an earlier stage of urbanisation that was characterised by the emergence of new metropolitan areas to a stage that could be characterised by increasing growth and concentration in large metropolitan areas (see Chapter 3 for more details).

Figure 4.5. Annual population growth rates of metropolitan areas by size and income, 2000-15



Note: This figure depicts the annual growth rates of metropolitan areas between 2000 and 2015. The sample excludes metropolitan areas that were classified as such in 2015, but not yet in 2000. The borders for the metropolitan areas are fixed in 2015. Growth rates are calculated by annualising the growth of the total population within each metropolitan area size and income group between 2000 and 2015. Metropolitan area size categories are calculated using the definition in 2000. Very large metropolitan areas (greater than 5 million inhabitants) are combined with large metropolitan areas in low-income countries due to the small numbers of observations in these countries.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

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One driver of the growth of large metropolitan areas in Sub-Saharan Africa is urban natural population increase. The so-called “urban push” is due to persistently high fertility in urban areas, while mortality has fallen to low levels. While fertility levels have traditionally fallen alongside urbanisation, they remain above 4 children per woman in African cities (see Box 4.2 for more details). Combined with migration from smaller metropolitan areas and rural areas, these trends are contributing to rapid metropolitan population growth in Sub-Saharan Africa. Researchers and policymakers have raised concerns that this growth can create a disconnect between urbanisation and growth (Jedwab, Christiaensen and Gindelsky, 2017^[6]). First, poor metropolitan areas may expand even without an increase in standards of living. Second, because natural population increase accelerates urban growth, it can give rise to urban congestion effects, which may reduce the benefits of agglomeration. All in all, urban natural population increase in poor countries may

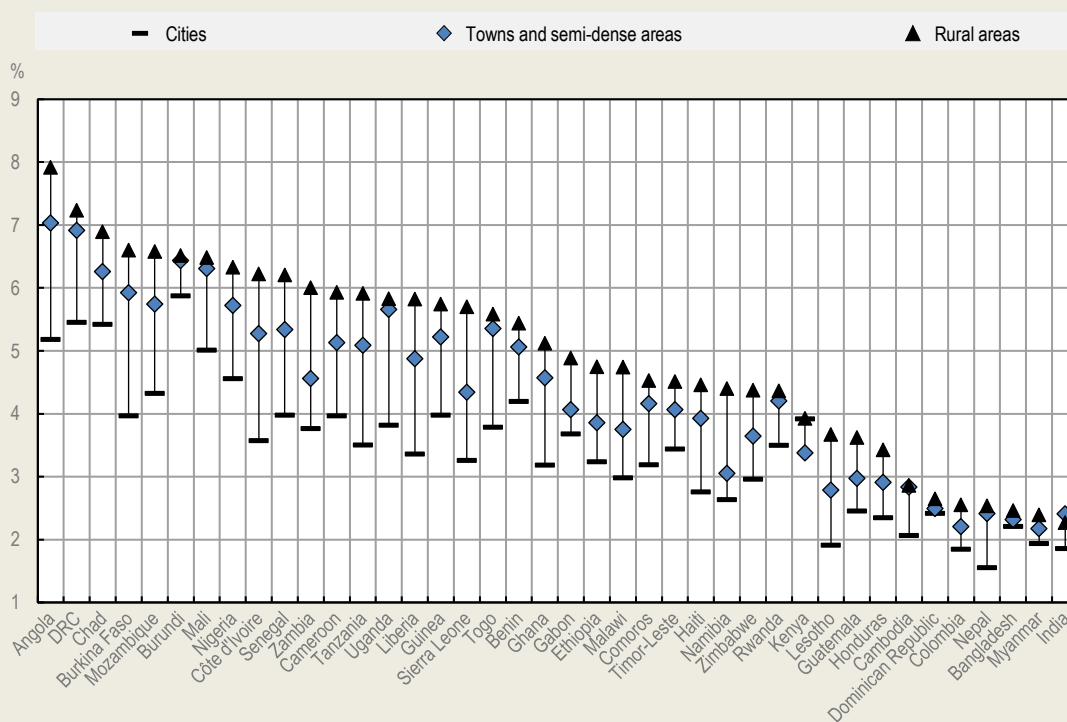
directly contribute to the “urbanisation of poverty”, the fact that the share of the world’s poor living in urban areas has been rising over time. Although most existing research seems to alleviate this concern, urban-rural wage and income gaps in developing countries remain significant (Ravallion, 2002^[7]; Ravallion, Chen and Sangraula, 2007^[8]).

Box 4.2. Fertility rates in cities in developing countries

Fertility rates have fallen in most areas but remain very high in Africa, especially in rural areas but also in cities. Assessing fertility rates across the different degrees of urbanisation in 41 developing countries shows that fertility rates are up to 50% higher in rural areas than in cities. In general, fertility rates follow a clear rural-urban gradient, with highest rates in rural areas, the lowest in cities, and towns and semi-dense areas in between (Figure 4.6). In Sub-Saharan Africa and Latin America, spatial differences in fertility are particularly large. With differences of more than 2.5 children per woman, Angola, Burkina Faso and Côte d’Ivoire record the largest city-rural differences in fertility rates. In contrast, in Bangladesh and the Dominican Republic, the available data would suggest no considerable differences in fertility rates across the degree of urbanisation.

Figure 4.6. Total fertility rates in cities, towns & semi-dense areas, and rural areas

Fertility rates across 41 developing countries in 2015.



Note: TFR: sums the recent (past three years) fertility experience of women across five-year age groups (15-19, 20-24, 45-49) to measure the total number of children born to a hypothetical woman experiencing current-period, age-specific fertility levels throughout her childbearing years.

Source: DHS (ICF, 2016^[9]); Henderson, V. et al. (2019^[10]), “Urbanisation and demographic and health outcomes: Perspectives from a new classification of urban areas”.

While fertility rates have fallen markedly in many areas, they remain extremely high in Sub-Saharan Africa, especially in rural areas. Average fertility in rural Africa still exceeds 5.5 children per woman in

2015, though down from 6.2 in 2000. Even in African cities, total fertility rates average almost 4 children per woman, partly explaining the rapid growth of African cities and metropolitan areas. In contrast, in South Asian cities, fertility rates are approaching the replacement rate, falling from 3.0 to 2.1 between 2000 and 2015.

One consequence of fast-growing large metropolitan areas is the rise of megacities (i.e. metropolitan areas with more than 10 million inhabitants). Between 1990 and 2015, 10 new megacities emerged, located primarily in Sub-Saharan Africa and Asia. Six metropolitan areas over 5 million people grew faster than 3% annually, all of which are located in Asia. These are Bangalore, Beijing, Dhaka, Bangkok, Shanghai, and Ho Chi Minh City. In all six cases, total population growth in the country slowed down between 2000 and 2015, while population in the largest metropolitan areas continued to increase dramatically, suggesting a concentration of people in the largest metropolitan areas.

The 20 largest metropolitan areas in 2015

The largest metropolitan areas in the world are primarily located in Asia. Of the 20 largest metropolitan areas in 2015, 13 are in East Asia and the Pacific or South Asia (Table 4.2). These 20 metropolitan areas alone are home to more than 443 million inhabitants. Tokyo is the largest metropolitan area in the world with a population of more than 36 million, followed by Delhi and Jakarta with a population of around 30 million. The metropolitan areas outside of Asia among the 20 largest in the world are Cairo (23 million), Sao Paulo (22 million), Mexico City (21 million), New York-Newark (20 million), Moscow (16 million), Los Angeles (16 million) and Buenos Aires (15 million).

Table 4.2. Largest metropolitan areas of the world

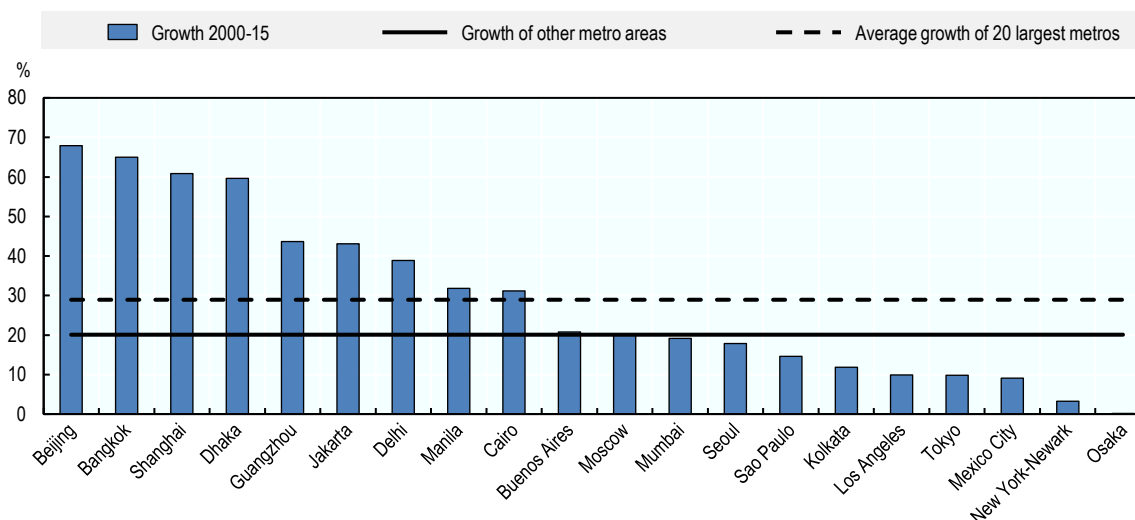
Rank	Metropolitan area	Population in 2015	Country	Region
1	Tokyo	36.5 million	Japan	East Asia and the Pacific
2	Delhi	30.1 million	India	South Asia
3	Jakarta	29.8 million	Indonesia	East Asia and the Pacific
4	Shanghai	26.9 million	China	East Asia and the Pacific
5	Manila	25.0 million	Philippines	East Asia and the Pacific
6	Seoul	24.3 million	South Korea	East Asia and the Pacific
7	Cairo	23.5 million	Egypt	Middle East and North Africa
8	Kolkata	23.1 million	India	South Asia
9	Mumbai	22.3 million	India	South Asia
10	Sao Paulo	21.7 million	Brazil	Latin America and the Caribbean
11	Mexico City	21.4 million	Mexico	Latin America and the Caribbean
12	Beijing	21.3 million	China	East Asia and the Pacific
13	Dhaka	20.4 million	Bangladesh	South Asia
14	New York-Newark	19.5 million	United States	North America
15	Osaka	17.6 million	Japan	East Asia and the Pacific
16	Guangzhou	16.7 million	China	East Asia and the Pacific
17	Moscow	16.4 million	Russia	Europe and Central Asia
18	Bangkok	16.3 million	Thailand	East Asia and the Pacific
19	Los Angeles	15.7 million	United States	North America
20	Buenos Aires	15.0 million	Argentina	Latin America and the Caribbean

Note: This figure depicts the 15 largest metropolitan areas in the world in 2015.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Most of the 20 largest metropolitan areas of the world are growing faster than other metropolitan areas. Between 2000 and 2015, they grew on average by 29%, which compares to 20% for other metropolitan areas around the world (Figure 4.7). Beijing, Bangkok, Shanghai and Dhaka grew the fastest between 2000 and 2015, recording a respective population increase of 68%, 65%, 61%, and 60%. Osaka is the only metropolitan area among the 20 largest in the world that did not grow, instead stagnating in terms of population.

Figure 4.7. Growth of 20 largest metropolitan areas, 2000-15



Note: This figure depicts the total growth between 2000 and 2015 of the 20 largest metropolitan areas in the world in 2015. It compares the average growth in 2000-15 of the 20 largest metropolitan areas of the world with the average growth of all other metropolitan areas over the same period.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Very fast population growth of the largest metropolitan areas in Asia has changed the ranking of the world's largest metropolitan areas markedly. In 1975, there were only nine Asian metropolitan areas among the 20 largest in the world; now there are 13 (Table 4.3). Instead, with London, Paris and Chicago, two European and one North American metropolitan areas were among the largest in 1975 but by 2015 had dropped from this list, being surpassed by various Asian ones. New York was the second-largest metropolitan area in 1975 but just made it into the largest 15 metropolitan areas in 2015.

Table 4.3. The largest metropolitan areas in 1975

Rank	Metropolitan area	Population in 1975	Population in 2015	Region
1	Tokyo	25.1 million	36.5 million	East Asia and the Pacific
2	New York-Newark	16.4 million	19.5 million	North America
3	Osaka	15.5 million	17.6 million	East Asia and the Pacific
4	Kolkata	14.5 million	23.1 million	South Asia
5	Ciudad de Mexico	14.2 million	21.4 million	Latin America and the Caribbean
6	Seoul	13.6 million	24.3 million	East Asia and the Pacific
7	Mumbai	12.6 million	22.3 million	South Asia
8	Sao Paulo	11.7 million	21.7 million	Latin America and the Caribbean
9	Delhi	11.0 million	30.1 million	South Asia
10	Cairo	10.4 million	23.5 million	Middle East and North Africa

Rank	Metropolitan area	Population in 1975	Population in 2015	Region
11	Los Angeles	10.1 million	15.7 million	North America
12	Jakarta	9.6 million	29.8 million	East Asia and the Pacific
13	London	9.3 million	12.6 million	Europe and Central Asia
14	Paris	8.9 million	11.2 million	Europe and Central Asia
15	Moscow	8.7 million	16.4 million	Europe and Central Asia
16	Buenos Aires	8.5 million	15.0 million	Latin America and the Caribbean
17	Nagoya	7.8 million	9.6 million	East Asia and the Pacific
18	Chicago	7.6 million	8.8 million	North America
19	Surabaya	6.5 million	10.8 million	East Asia and the Pacific
20	Rio de Janeiro	6.4 million	10.8 million	Latin America and the Caribbean

Note: This table presents the 15 largest metropolitan areas in the world in 1975 and depicts their population in 1975 and 2015.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Shrinking metropolitan areas

The number of shrinking metropolitan areas is on the rise across the globe. Rapidly shrinking metropolitan areas may experience a reduction of economic activity, a decline in employment and increasing numbers of vacant and abandoned buildings. Numerous factors can influence where and when metropolitan areas decline, including outmigration, the loss of an industry and exhaustion of natural resources. In countries experiencing slow population growth, competition has increased amongst metropolitan areas for economic and intellectual resources and may have exacerbated the decline of some metropolitan areas. Larger metropolitan areas often attract population and productive workers while many small- and medium-sized metropolitan areas are experiencing outmigration and outflows of capital and human resources. Such a dynamic results in an increased concentration of metropolitan population (Table 4.4).

Table 4.4. Shrinking metropolitan areas, 2000-15

Size	Total number of metropolitan areas	Share of shrinking metropolitan areas by size class (%)	Number of shrinking metropolitan areas	Share of metropolitan areas with a total decline of				Total (%)
				more than 10%	10% to 5%	5% to 2.5%	less than 2.5%	
<250k	6 256	19	1 181	37	29	17	17	100
250k-1M	2 086	20	426	37	32	13	18	100
1-5M	574	14	78	10	40	17	33	100
>5M	94	2	2	50	50	0	0	100
Total	9 010	19	1 687	7	6	3	3	

Note: This table provides the number of metropolitan areas that are shrinking by size between 2000 and 2015. Further, it includes a breakdown of the share of shrinking metropolitan areas in each size category by the total decline over the period. The size definitions are determined by the population in 2000 and only metropolitan areas that were classified as such in 2000 are included in the statistics.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

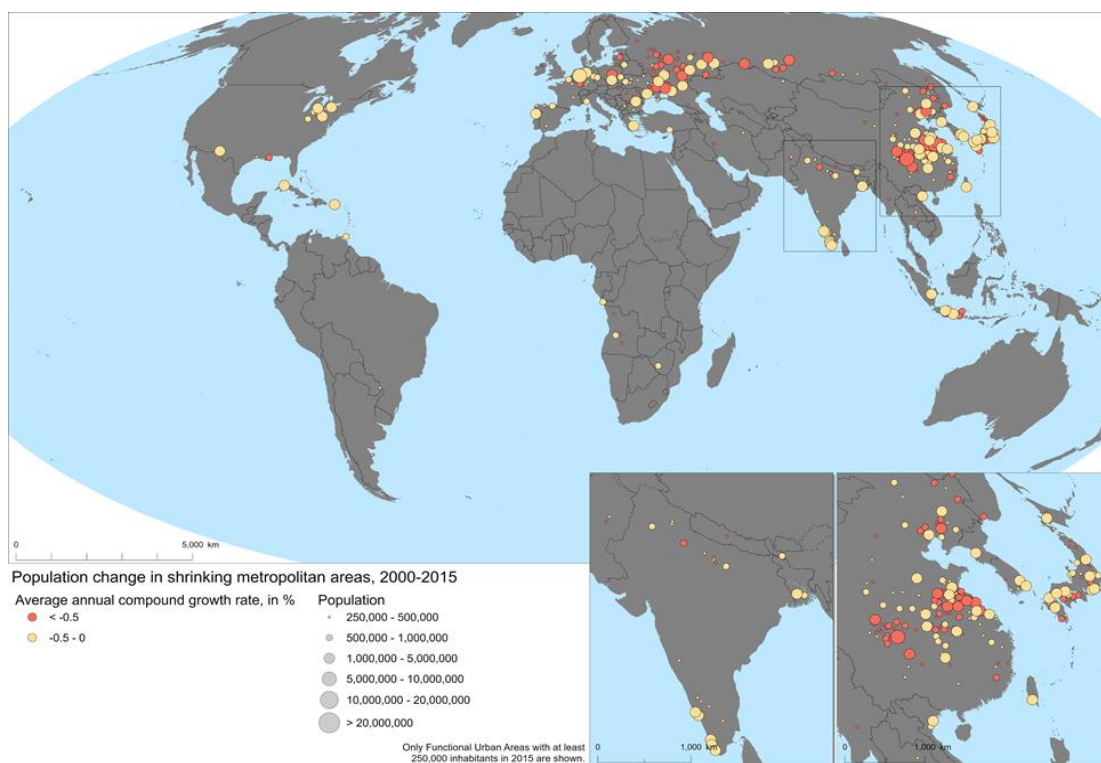
The vast majority of shrinking metropolitan areas have a population of less than 1 million inhabitants. Small- and medium-sized metropolitan areas also tend to shrink at a faster pace (see next section for more details). Among the almost 1 700 metropolitan areas that recorded population loss between 2000 and 2015, 95% have a population of less than a million inhabitants. Thirty-seven percent of the shrinking small-

and medium-sized metropolitan areas have lost more than 10% of their total population since 2000. Another 30% lost between 5 and 10% of their population over the same period.

Unsurprisingly, the decline of metropolitan areas often goes hand in hand with demographic trends at the national level, particularly natural population loss and outmigration. As described at the beginning of the chapter, over the last half-century, global fertility rates have fallen dramatically. In many countries in Europe and the OECD, fertility rates have been below the replacement level for over two decades. Similar reductions in fertility have occurred in parts of East Asia, though fertility still mostly remained above the replacement rate. By 2002, the total fertility rate was below its “replacement” level in all OECD countries except Mexico and Turkey.² The timing and pace of decline, however, varies widely from country to country. At the same time, international outmigration has reinforced demographic transitions in Central and Eastern Europe, as well as in some countries in South East Asia, furthering population loss and thereby metropolitan area decline.³ Combined, natural population increase or loss and migration rates at the national level alone explain 52% of Europe and Central Asia’s metropolitan area population growth variance (Restrepo Cadavid et al., 2017^[11]).

Globally, almost 20% of metropolitan areas declined in population over the past 15 years. These declining metropolitan areas had 45 million less people in 2015 than they did in 2000. Due to their large populations, over 70% of the 1 700 metropolitan areas that declined since 2000 are located in just 6 countries – China, India, Indonesia, Japan, Russia and Ukraine (Figure 4.8). The issue of metropolitan area decline is not an isolated issue, but matters to hundreds of millions of people. As of 2015, 440 million people lived in metropolitan areas that are experiencing population decline, which raises considerable challenges and implications for policymakers.

Figure 4.8. Shrinking metropolitan areas across the world

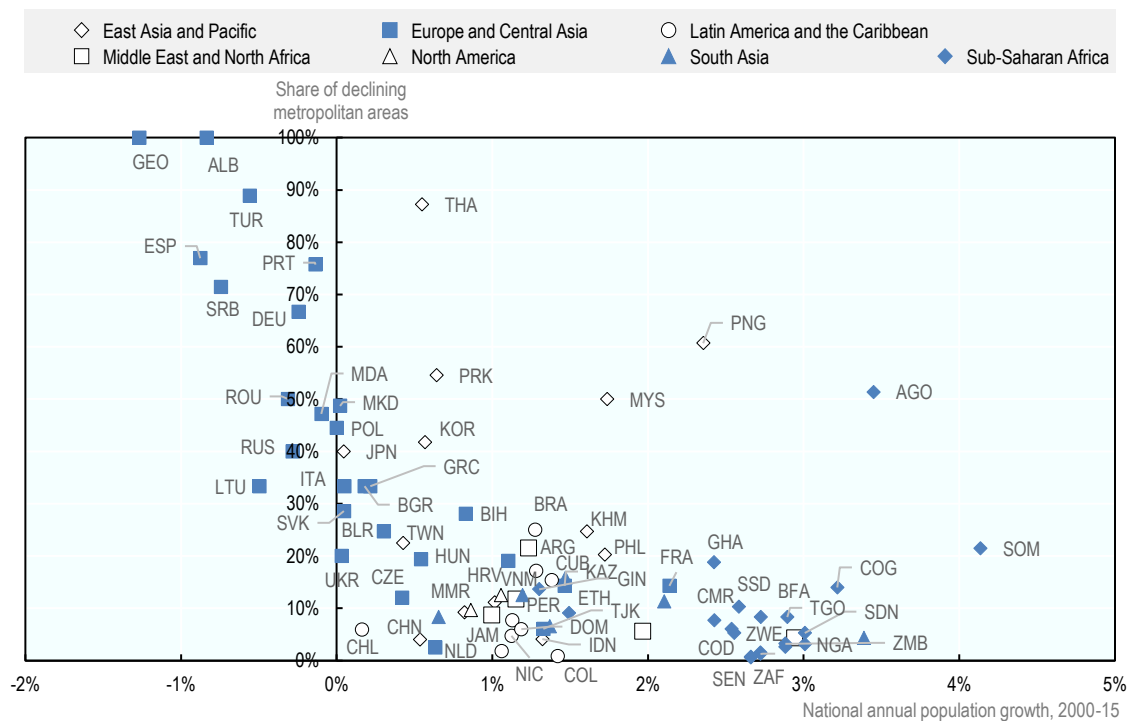


Note: This map shows all metropolitan areas with a population above 250 000 that experienced population decline between 2000 and 2015. The annual population growth rate is calculated as the annual compound growth rate.

Source: OECD and EC based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

As expected, differences in the patterns of decline of urban systems are correlated with overall population change (Figure 4.9). East Asia and Europe have been hit the hardest by population loss in metropolitan areas due to demographic trends and internal migration as well as emigration to other countries. Countries such as Estonia, Romania and Serbia have experienced population loss in nearly all of their metropolitan areas. Yet, many metropolitan areas decline even in countries that have overall population growth, for example in France, Germany, Italy, Korea and Spain. Likewise, numerous Latin American and East Asian countries have experienced similar patterns of population loss in metropolitan areas alongside slow to moderate overall population growth.

Figure 4.9. Share of declining metropolitan areas relative to national population growth, 2000-15



Note: This figure shows the relationship between national annual population growth over the period from 2000 to 2015 and the total share of declining metropolitan areas over the same period. The calculations include metropolitan areas that had an urban centre in 2000. Countries with less than five metropolitan areas are excluded from the figure.

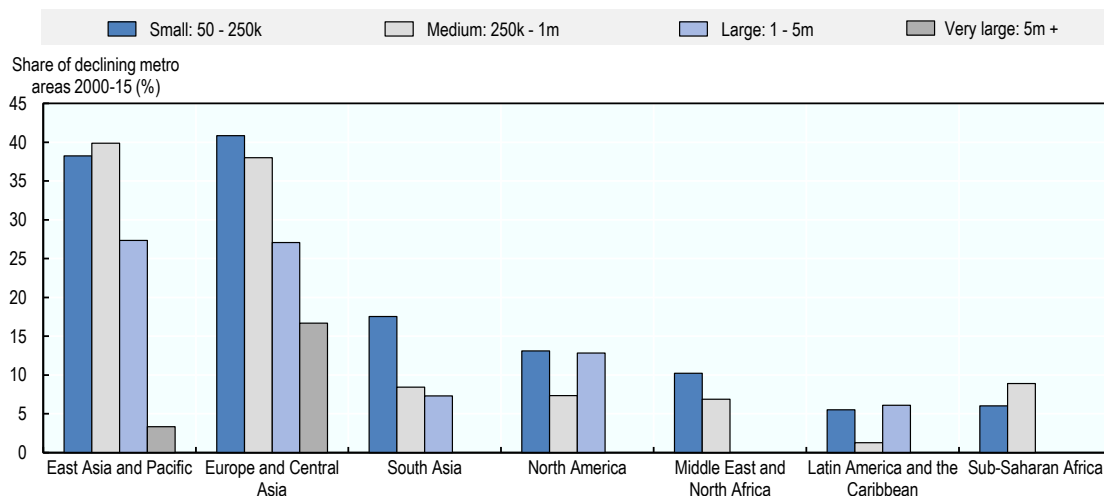
Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Metropolitan areas with less than 1 million inhabitants are the most likely to decline

Whereas capital metropolitan areas, as well as larger metropolitan areas in general, have an advantage in attracting populations, smaller metropolitan areas are at risk of shrinking. With the exception of the Americas, metropolitan areas with less than 1 million inhabitants are at a much higher risk of shrinkage than larger ones (Figure 4.10). Yet, even large metropolitan areas in East Asia and Europe are at risk. The share of declining small- and medium-sized metropolitan areas is roughly the same in East Asia and Europe (36% on average). Surprisingly, the share of declining large metropolitan areas is also similarly high (around 27%) across those two world regions. Only very large metropolitan areas are shielded from

the risk of population decline. Just two metropolitan areas with over 5 million inhabitants experienced decline: Chongqing in China and the Ruhr region in Germany (Restrepo Cadavid et al., 2017^[11]).

Figure 4.10. Share of declining metropolitan areas by size and world region, 2000-15



Note: This figure shows the share of metropolitan areas in each region, by population size, with negative population growth between 2000 and 2015. Metropolitan areas with no urban centre in 2000 are excluded from the calculations. Populations in 2000 and 2015 are defined as the total population within the extent of the 2015 border.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Box 4.3. Policy options for managing smart decline

Managing urban decline takes place at both the local and national levels and must be carried out through a participative process between businesses, property owners, residents and different levels of government. Below is a list of recent policy options that countries have taken to manage their declines.

- Adapting land use.** Metropolitan areas in the United States are adapting to population decline through adaptive land-use planning. In an effort to minimise property vacancy and urban blight, cities such as Flint, Michigan and Youngstown, Ohio, have focused public investment in providing services in high density neighbourhoods while converting vacant areas into green space. By providing more green space, these metropolitan areas have made the urban environment more liveable, stemming the tide of urban decline. In addition, Flint has established a land bank meant to ease the metropolitan area's ability to acquire vacant land and manage its usage. Rather than allowing for land speculation, the land bank combines vacant properties to be resold to developers.
- Finding new angles to increase metropolitan area competitiveness.** Many declining metropolitan areas have tried to reorient their economic base by focusing on emerging economic sectors, such as technology, creative industries and/or tourism. A successful reorientation of the local economy can give declining cities new opportunities to manage decline in a smart way, even though it might not be sufficient to revert population decline altogether. One successful example of this approach is Bilbao, Spain. Bilbao had to make an enormous effort to transform its economic base, which had been suffering since the 1980s with the decline

of the steel and heavy metal industries. A dedicated agency, Bilbao Metropoli 30, was created to implement the strategic development plan for the metropolitan area that aimed for a service-oriented economic base. One of the most well-known symbols under this development plan was the construction of the Guggenheim Museum. Under the plan, the metropolitan area also invested in the regeneration of old factories, such as converting them into art centres, and supported the development of complementary tourism infrastructure, technology parks and cluster associations to boost the consolidation of creative industries (e.g. information and communication technology [ICT] cluster, design and furniture).

- **Revitalising inner metropolitan areas through private-public partnerships.** Pittsburgh, United States, also faced decline and suburbanisation, with the inner metropolitan area suffering from population loss, segregation and poverty while the broader metropolitan region gained population. In the beginning of the 1980s, the metropolitan area switched its strategy towards a diversified economic foundation through services with an emphasis on higher education (using Carnegie Mellon University as a magnet) and healthcare.

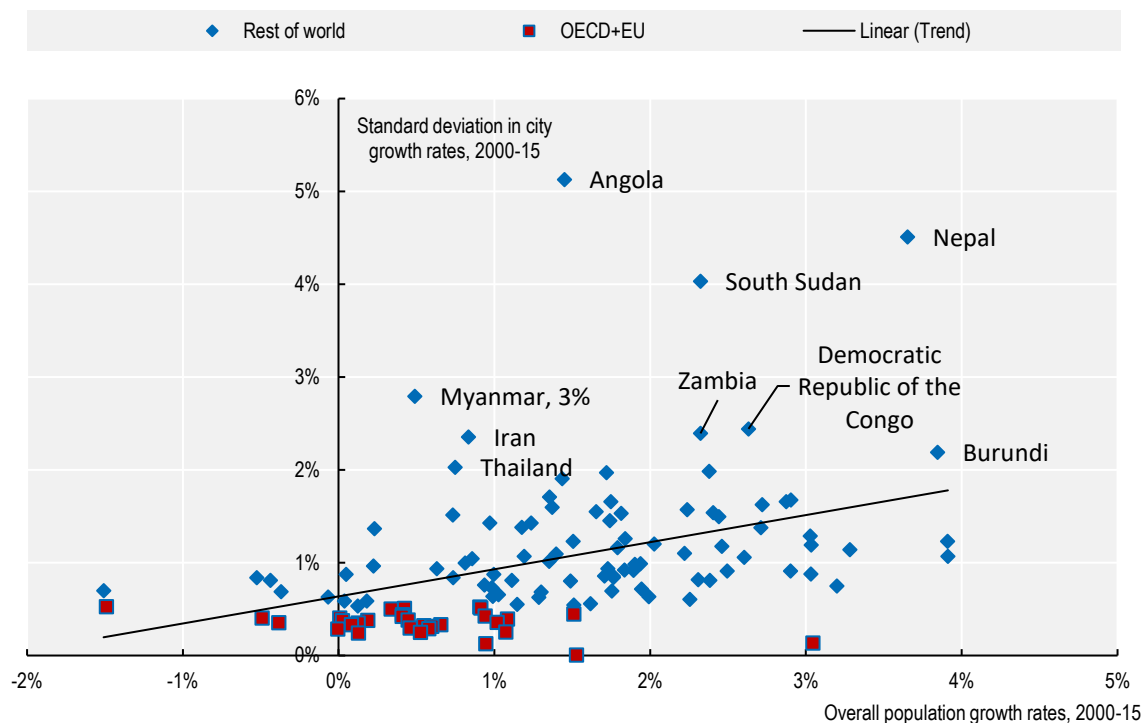
Source: Cadavid, P. et al. (2017^[12]), *Cities in Eastern Europe and Central Asia: A Story of Urban Growth and Decline*, <http://documents.worldbank.org/curated/en/319131510892209158/Cities-in-Europe-and-Central-Asia-a-shifting-story-of-urban-growth-and-decline>.

Determinants of metropolitan growth

While population growth is a good indicator that a metropolitan area is attracting people and economic activity, it is unclear what determines such growth. In fact, metropolitan areas grow for a variety of reasons. Traditionally, the process of urban growth resulted both from *push* and *pull* factors. Productivity gains in agriculture reduced employment in rural areas and *pushed* it towards metropolitan areas. The rise of industrial sectors – for example driven by enhanced international trade – *pulled* people towards metropolitan areas as those sectors stand to gain from agglomeration economies. In addition to strong economic incentives, metropolitan areas provide access to numerous amenities that are valued by people that are willing to move there, including favourable climate, access to healthcare, public transportation, education and cultural opportunities (see Chapter 2). Some metropolitan areas also grow because the regulatory environment is more favourable to urban expansion than in other metropolitan areas within the same country.

While national population growth or decline strongly affects the growth of metropolitan areas, there remains substantial dispersion in growth rates within countries. The majority of countries have a measure of dispersion (the standard deviation) in metropolitan area growth rates of just below 1%. While this does not sound much, it is important to consider that in many countries, average population growth rates are well below 1% (Figure 4.11). Thus, the average dispersion in growth rates is just as high as the average growth rate. This is especially true in the EU and OECD, where most countries recorded low total population growth and small differences in the growth rate of metropolitan areas.⁴ Countries with faster population growth tend to have less uniform growth across metropolitan areas, especially in Sub-Saharan Africa. Countries with a very high dispersion in growth rates (above 2%) tend to be affected by either protracted civil conflict or recent natural disasters including the Democratic Republic of the Congo, Myanmar, Nepal and South Sudan. The following subsections examine key factors that enhance or inhibit the growth of metropolitan areas.

Figure 4.11. Relationship between dispersion in metropolitan area growth rates and national population growth, 2000-15



Note: This figure shows the standard deviation in metropolitan area growth rates by country. The sample in this figure consists of countries with at least four metropolitan areas in 2000. Metropolitan areas with no urban centre in 2000 are excluded from the calculations.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Administrative status of metropolitan areas

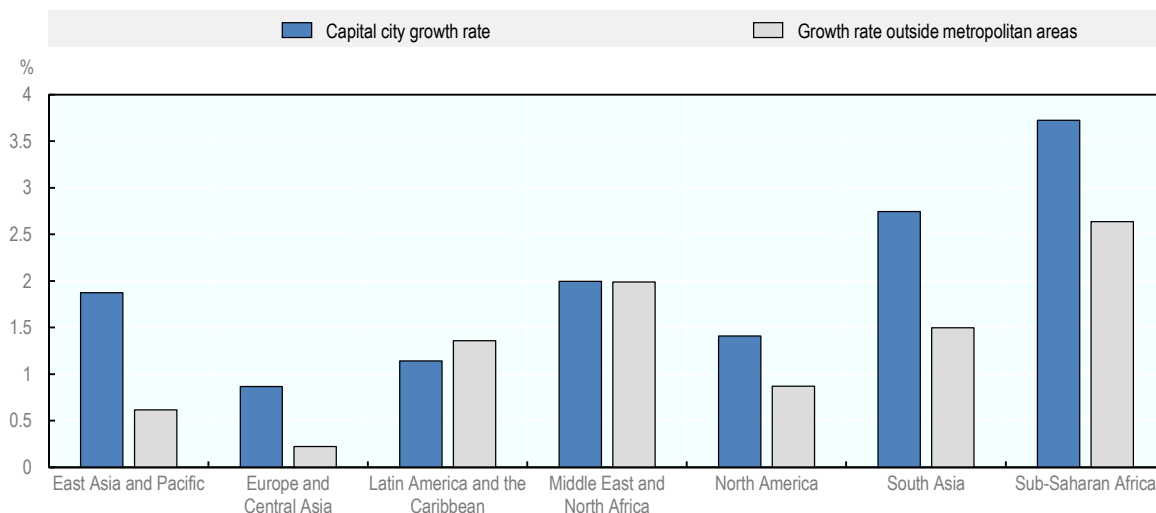
In over 80% of countries in the world, capitals are the largest metropolitan area in the country and are roughly twice as large as the largest non-capital metropolitan area, on average. The world region with the largest capital metropolitan areas relative to the largest non-capital metropolitan area is Latin America and the Caribbean, followed by Sub-Saharan Africa and East Asia. In around 20 countries, capitals outsize the largest non-capital metropolitan area eightfold or more (Figure 4.13).⁵

Capitals grew faster between 2000 and 2015 in all world regions except for within the OECD. Capital metropolitan areas grew 0.8 percentage points faster annually, even after taking into account the fact that they are larger than other metropolitan areas. While it has been shown previously that capital metropolitan areas are larger globally, it is unclear why they continue to grow faster even after controlling for size. The largest growth premium in capital metropolitan areas exists in Sub-Saharan Africa and South Asia where capitals grow 1.7 percentage points faster annually (Figure 4.12).

Capital metropolitan areas tend to be much larger than the rest of the metropolitan areas in a country for a number of reasons. First, capital metropolitan areas provide access to jobs or amenities that are not available in other metropolitan areas. The government and numerous agencies and organisations that locate in the capital metropolitan area, such as international organisations, media and lobby groups, generate well-paid jobs. In addition, these workers bring their families along with an increased demand for services and amenities, including schools and restaurants.

Figure 4.12. Capitals grow faster than the national population in most world regions

Annual population growth rate, 2000-15



Note: This figure shows the average population growth in capital metropolitan areas and national population growth between 2000 and 2015. The growth rates are averaged at the level of world regions.

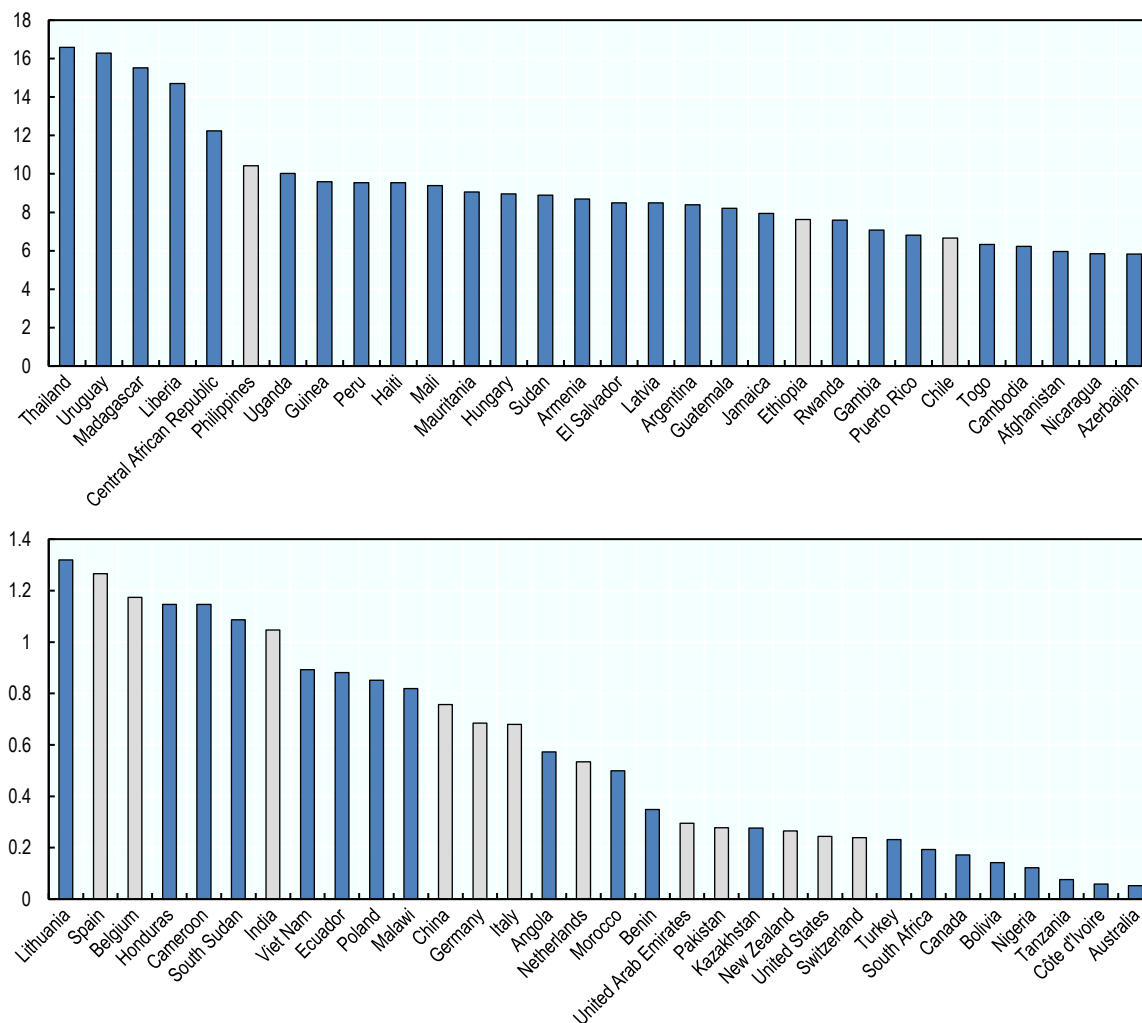
Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Political institutions offer another explanation for the primacy of capitals. The size advantage that capitals enjoy is particularly large in non-democratic or more centralised countries, such as in certain parts of Africa or in centralised Western democracies. In autocratic regimes, where rent-seeking is especially strong, a large capital metropolitan area provides leaders with a political base where rents can be distributed easily (Ades and Glaeser, 1995^[13]). This concentration further encourages people to move to the capital to take advantage of these rents.⁶ In democratic countries, demands from other regions lead to a more equitable distribution of resources, thus diminishing the primacy of the capital metropolitan area (Karayalcin and Ulubasoglu, 2020^[14]). This finding is also confirmed by the new data on and global definition of metropolitan areas used in this report.

Evidence from OECD countries suggests that - even in democratic countries - more centralised governments tend to have larger capitals relative to federal countries (OECD, 2015^[15]). Figure 4.13 shows that unitary countries tend to have capitals with a larger population relative to other metropolitan areas in the same country, compared to federal countries (lighter bars). This pattern is true also when controlling for country size.⁷ While it could be that federal countries place their capitals in smaller cities, the pattern is consistent with the explanation that capitals that host more powerful governments tend to become larger.

Figure 4.13. Ratio of the population of the capital metropolitan area of a country relative to the largest non-capital metropolitan area

Federal countries are depicted in a lighter shade and non-federal countries are depicted in a darker shade



Note: This figure shows the population of the capital city divided by the population of the largest non-capital city. In some cases, capital cities are more than 16 times as large as the largest non-capital city in the country. Federal countries are shown in a lighter shade.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

Impact of trade and market connectivity on size and growth

Besides national demographics and administrative status, location is one of the primary determinants of the size of metropolitan areas. The location of a metropolitan area determines numerous factors that have affected population growth and economic development throughout history. Yet, the role of traditional factors of location is most likely declining. As a result of technological and economic change, the interaction between location and the success of a metropolitan area has evolved. Over time, changes in the cost of transportation, technology and how goods are traded changed the attractiveness of a given location. For example, as trade costs decline, food can be imported from greater distances, which lowers the importance of proximity to productive land, water resources and other geographic features. Recent evidence at the

global level finds that the suitability of a region for agriculture as a determinant of economic activity has declined over time while the importance of its suitability for engaging in international trade has grown (Henderson et al., 2018^[16]).

Globally, access to maritime and naval trade boost metropolitan area population size as both coastal metropolitan areas and metropolitan areas located on navigable rivers are larger than comparable metropolitan areas elsewhere (Annex Table 4.A.1 in Annex 4.A). Coastal locations provide potential economic opportunities associated with shipping and tourism, as well as higher quality of life. Even today, shipping continues to be the primary means through which countries send their products to customers overseas, as air transport remains too expensive for the majority of goods. Thus, proximity to ports provides a relative advantage for metropolitan areas by reducing the transport costs associated with exporting goods. Consequently, in most parts of the world, coastal metropolitan areas are on average 20% larger than metropolitan areas located in the interior. In Sub-Saharan Africa and South Asia in particular, coastal metropolitan areas are 30% larger, even after controlling for other characteristics including whether the metropolitan area is a capital. In the EU and OECD, coastal metropolitan areas have a smaller size advantage and the difference between coastal and inland metropolitan areas is only weakly significant.

Metropolitan areas located on navigable rivers are larger across the globe, especially in the EU and OECD. Historically, roads and railways were not widely available and goods were transported by water or overland. As a result, metropolitan areas were built along waterways when possible to facilitate trade. For example, every large metropolitan area in the United States at the beginning of the 20th century was located on a waterway. Unsurprisingly, the largest impacts of being close to a river were found in world regions and countries with large river systems. In Argentina, Brazil, Egypt and Venezuela for example, metropolitan areas located on rivers are 30% to 100% larger than other metropolitan areas in the respective country.

While being located on a coast and navigable river are strong determinants of metropolitan area size, their impacts on recent population growth are mixed (Annex Table 4.A.2 in Annex 4.A). Being located on the coast is associated with metropolitan area growth in some world regions but correlated with a decline in others. Coastal metropolitan areas are growing in world regions undergoing urban change and structural transformation. In contrast, threats posed by climate change and globalisation have constrained the growth of coastal metropolitan areas in other world regions.

In recent decades, the decline in transport and communication costs has led to an expansion of international trade and globalisation. As a result, coastal metropolitan areas in Africa, Latin America and the Middle East benefit from easier access to trade routes where transport conditions are more favourable to growth. For example, coastal metropolitan areas in Africa and the Middle East grew a half of a percentage point faster per year between 2000 and 2015. However, in world regions where coastal metropolitan areas are prone to natural disasters and where there has been industrial decline, being on the coast is correlated with slower growth. For example, the slowest growing coastal metropolitan areas in India and the United States are located in areas that have been hit by large natural disasters in the past two decades. Metropolitan areas such as Biloxi and New Orleans were amongst the slowest growing metropolitan areas in the United States between 2000 and 2015, while numerous Indian metropolitan areas along the coast of Andhra Pradesh and Tamil Nadu had negative growth in places that have been affected by cyclones. Further, metropolitan areas on navigable rivers are growing considerably slower than other metropolitan areas, especially in Africa, North America and South Asia.

Market potential, as measured by the number of people living within a certain radius around a metropolitan area, affects metropolitan area growth across the globe.⁸ Surprisingly, metropolitan areas that have a large number of people living within a certain radius grew slower globally than those that had fewer people living nearby. This result probably illustrates the trade-off of having more metropolitan areas nearby. More neighbours can act as competitors that can attract away both customers and human capital.

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Notes

¹ Cities and metropolitan areas in Sub-Saharan Africa are projected to grow the fastest compared to other world regions until 2050 (Jones et al., forthcoming^[18]). Most African cities have grown and will continue to grow further beyond their administrative boundaries, which highlights the need to use a spatial, grid-based definition such as the metropolitan area to fully understand their evolution (OECD/SWAC, 2020^[17]).

² The replacement rate is 2.1 children born per woman. A cohort fertility rate of 2.1 would ensure the replacement of the previous generation and therefore population stability, under assumptions of no immigration and of no change in mortality rates.

³ For several decades, Western Europe has attracted a significant number of migrants from Central and Eastern Europe.

⁴ Only three OECD countries have a standard deviation in the growth rate of metropolitan areas above 1%: Chile, South Korea and Turkey.

⁵ To analyse the determinants of metropolitan growth in recent decades, metropolitan population growth rates between 2000 and 2015 are regressed on a geographic characteristic that measure the suitability of metros for living, engaging in domestic and foreign trade, and proximity to productive agricultural land. In addition, a measure of initial market potential is included to understand how access and proximity to surrounding urban agglomerations promotes or restricts metropolitan growth. The variables include measures of ruggedness, an index of malaria stability, proximity to the coast and large rivers, rainfall, precipitation, land suitability for agriculture and soil biome type. Country-fixed effects are included so that the results capture comparisons of the impact of geographical variation and market potential on metropolitan growth within the same country.

⁶ See Henderson and Wang (2007^[19]) for further discussion on the role of institutions in metropolitan growth.

⁷ To analyse the impacts of political system on capital city size, the ratio of the capital city size to the next largest city is regressed on an indicator variable that equals 1 if the country is federal. Controls include the total population of the country and regional dummies.

⁸ Market potential used in this analysis is defined by summing the total population within a five-hour driving distance from the centre of the metropolitan area. The own population of the metropolitan area is excluded from the calculation.

Annex 4.A. Regression tables

Annex Table 4.A.1. Regression results on the determinants of metropolitan area size in 2015

Dependent variable is Log(Population in 2015)

	(1)	(2)
	EU+OECD	Rest of world
Capital	2.268*** (0.182)	2.374*** (0.122)
Log(TT capital)	-0.314* (0.155)	-0.285** (0.143)
Malaria	0.244*** (0.042)	0.005 (0.008)
Ruggedness	0.075 (0.063)	-0.214*** (0.063)
Coast<25k	0.094 (0.100)	0.279*** (0.062)
Log(Coast dist.)	-0.099 (0.189)	-0.154 (0.184)
Lake<25k	0.148 (0.372)	-0.303** (0.149)
River<25k	0.278** (0.113)	0.269*** (0.069)
Harbor<25k	0.027 (0.107)	0.339** (0.137)
Temp.	0.151*** (0.041)	0.029 (0.028)
Temp. sq.	-0.005*** (0.001)	-0.001 (0.001)
Precipitation	-0.266 (0.195)	0.122* (0.063)
Growing days	0.209** (0.084)	-0.099 (0.115)
Land suitability	0.008 (0.130)	0.300** (0.127)
Min elevation	-0.219 (0.179)	-0.132** (0.055)
Country fixed effects	Yes	Yes
No. of metropolitan areas	1 340	7 590
R-squared	0.279	0.222

Note: This table provides estimates of the impact of geographical characteristics on metropolitan area size in 2015, differentiated by EU+OECD and the rest of the world. The dependent variable is the log of the metropolitan area population in 2015. The controls included but not shown are indicators for the biome (natural vegetation expected in an area, based on research by biologists). Standard errors in parentheses are clustered at the country level. Asterisks denote the statistical significance level: * p < 0.1, ** p < 0.05, *** p < 0.01.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.

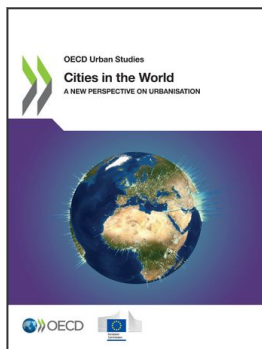
Annex Table 4.A.2. Regression results on the determinants of metropolitan area growth between 2000 and 2015

Dependent variable: Annual population growth 2000-15

	(1)	(2)
	EU+OECD	Rest of World
Log(Pop. 2000)	0.045 (0.040)	0.186** (0.079)
Log(Mkt. potential)	-0.006 (0.093)	-0.383*** (0.138)
Capital	0.220** (0.089)	0.813 (0.497)
Log(TT capital)	0.328 (0.229)	-0.607** (0.286)
Malaria	-0.142 (0.121)	0.023 (0.030)
Ruggedness	0.060 (0.131)	-0.149 (0.221)
Coast<25k	-0.212** (0.078)	0.084 (0.138)
Log(Coast dist.)	-0.116 (0.252)	-0.375 (0.398)
Lake<25k	-0.475*** (0.084)	0.445** (0.194)
River<25k	-0.242 (0.156)	0.060 (0.164)
Temp.	-0.009 (0.091)	0.478** (0.228)
Temp. sq.	0.030 (0.070)	0.070 (0.049)
Precipitation	0.002 (0.002)	-0.001 (0.002)
Growing days	-0.078 (0.117)	0.103 (0.266)
Land suitability	-0.279* (0.140)	-0.149 (0.217)
Min elevation	0.027 (0.137)	0.175 (0.252)
Country FE	0.536***	0.203
No. of metropolitan areas	(0.093)	(0.200)
R-squared	0.263	0.558

Note: This table provides estimates of the impact of geographical characteristics on metropolitan area population growth between 2000 and 2015, differentiated by global macro-region. The dependent variable is the annual metropolitan area population growth from 2000 to 2015. The controls included but not shown are indicators for the biome (natural vegetation expected in an area, based on research by biologists). Standard errors in parentheses are clustered at the country level. Asterisks denote the statistical significance level: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: OECD calculations based on the Urban Centre Database GHS-UCDB R2019A, Florczyk, A. et al. (2019^[2]), *GHS Urban Centre Database 2015, Multitemporal and Multidimensional Attributes, R2019A*, <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>.



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