



Urbanization and Urban Air Pollution

Urbanization is a process of relative growth in a country's urban population accompanied by an even faster increase in the economic, political, and cultural importance of cities relative to rural areas. There is a worldwide trend toward urbanization. In most countries it is a natural consequence and stimulus of **economic development** based on **industrialization** and **postindustrialization** (see Chapter 9). Thus the level of urbanization, as measured by the share of a country's urban population in its total population, is highest in the most developed, **high-income countries** and lowest in the least developed, **low-income countries** (see Data Table 2).

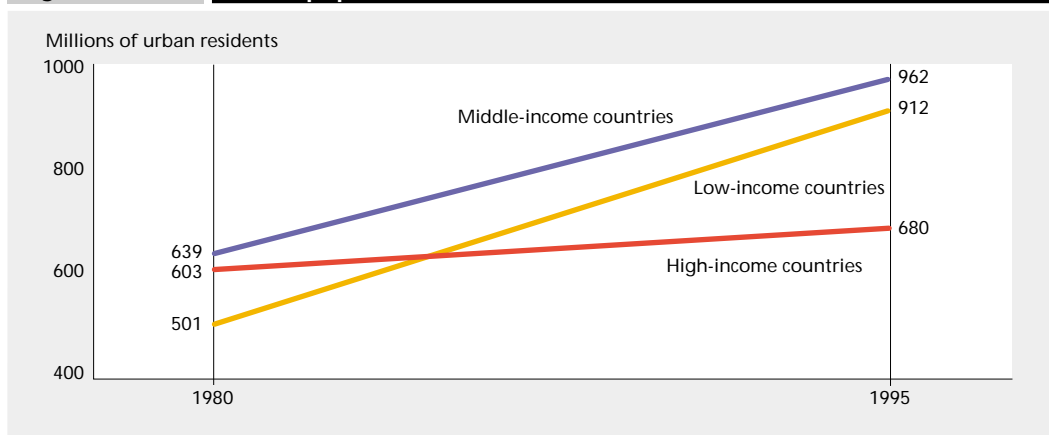
At the same time, urbanization is progressing much faster in **developing countries** than in **developed countries**

(Figure 10.1). In 1990–95 the average annual growth of the urban population in low-income countries was 3.8 percent and in **middle-income countries**, 3.1 percent, compared with 0.1 percent in high-income countries. Because the developing world has a larger population, percentages of its population also represent more people. As a result, by 1995 almost three-quarters of the world's 2.5 billion urban residents lived in developing countries. The share of the urban population in the total population of low- and middle-income countries increased from less than 22 percent in 1960 to 39 percent in 1995 and is expected to exceed 50 percent by 2015.

Can urbanization serve as an indicator of development?

A rough indication of the urban contribution to GDP is the combined share of GDP produced in the industry and ser-

Figure 10.1 Urban population, 1980 and 1995



Why is urban air pollution often higher in developing countries?

vice sectors relative to agriculture. Judging by this indicator, cities in developing countries are already more economically important than rural, primarily agricultural areas, because more than half of the developing world's GDP originates in cities. (This is not yet true for every country, as you can see in Data Table 2.)

While urbanization is characteristic of nearly all developing countries, levels of urbanization vary quite significantly by region (Figure 10.2). Most Latin American countries are as urbanized as Europe, with 74 percent of the population living in urban areas. But South Asia, East Asia, and Sub-Saharan Africa remain predominantly rural, though they are urbanizing rapidly.

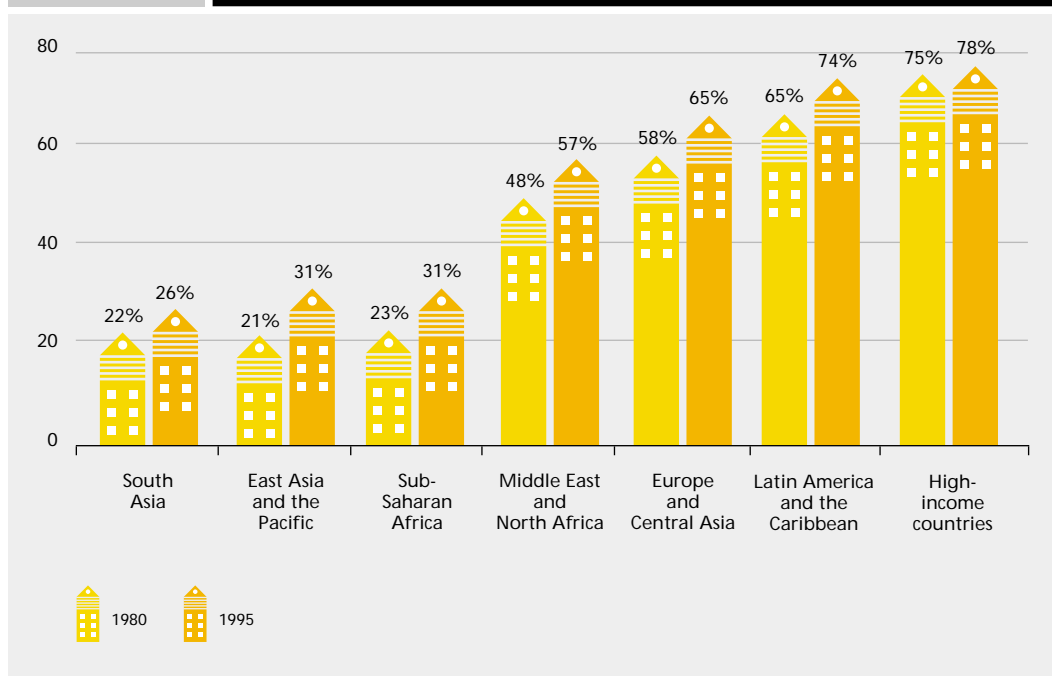
Most of the world's most populous cities are in developing countries. Many of these cities are in Asian countries with low per capita incomes but big populations, such as China, India, and Indonesia. These cities have high concentrations of poor residents and suffer from social and environmental problems including severe air pollution (Table 10.1).

Particulate Air Pollution

Suspended particulate matter is made up of airborne smoke, soot, dust, and liquid droplets from fuel combustion. The amount of suspended particulate matter, usually measured in micrograms per cubic meter of air, is one of the most important

Figure 10.2

Urban population as a percentage of total population, 1980 and 1995



indicators of the quality of the air that people breathe. According to the World Health Organization's air quality standards, the concentration of suspended particulates should be less than 90 micrograms per cubic meter. In many cities, however, this number is several times higher (Map 10.1; see also Table 10.1).

High concentrations of suspended particulates adversely affect human health, provoking a wide range of respiratory diseases and exacerbating heart disease and other conditions. Worldwide, in 1995 the ill health caused by such pollution resulted in at least 500,000 premature deaths and 4–5 million new cases of chronic bronchitis.

Most of the people at risk are urban dwellers in developing countries, especially China and India. In many Chinese cities air quality is so poor that nationwide, the costs of excess morbidity and mortality for urban residents are estimated at 5 percent of GDP. According to estimates for 18 cities in Central and Eastern Europe, 18,000 premature deaths a year could be prevented and \$1.2 billion a year in working time lost to illness could be regained by achieving European Union pollution standards for dust and soot.

The level of air pollution depends on a country's technology and pollution control, particularly in energy production. Using cleaner **fossil fuels** (such as nat-

Table 10.1 Particulate air pollution in the largest cities, 1995

Country	City	City population (thousands)	SPM (micrograms per m ³)
Brazil	São Paolo	16,533	86
	Rio de Janeiro	10,187	139
China	Shanghai	13,584	246
	Beijing	11,299	377
	Tianjin	9,415	306
Egypt, Arab Rep.	Cairo	9,690	—
France	Paris	9,523	14
India	Mumbai	15,138	240
	Calcutta	11,923	375
	Delhi	9,948	415
Indonesia	Jakarta	8,621	271
Japan	Tokyo	26,959	49
	Osaka	10,609	43
Korea, Rep.	Seoul	11,609	84
Mexico	Mexico City	16,562	279
Philippines	Manila	9,286	200
Russian Federation	Moscow	9,269	100
Turkey	Istanbul	7,911	—
United Kingdom	London	7,640	—
United States	New York		
	(1987–90)	16,332	61
	Los Angeles	12,410	—

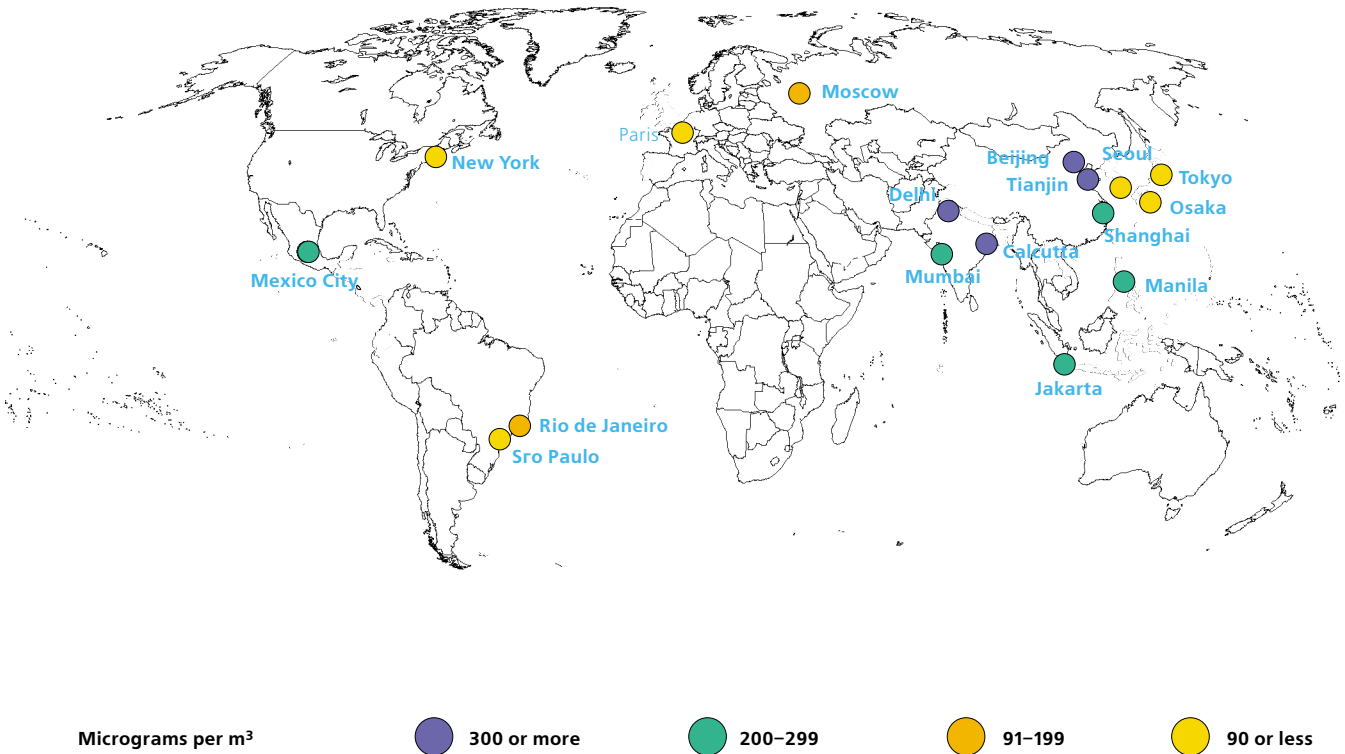
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Note: Selected are the cities with more than 7 million residents.

ural gas and higher-grade coal), burning these fuels more efficiently, and increasing reliance on even cleaner, renewable sources of energy (hydro, solar, geothermal, wind) are some of the best ways to control and reduce air pollution without limiting **economic growth**. See Figure 10.3 for the main sources of electricity in China, Russia, and the United States. Compare these data to the concentrations of suspended particulates in the

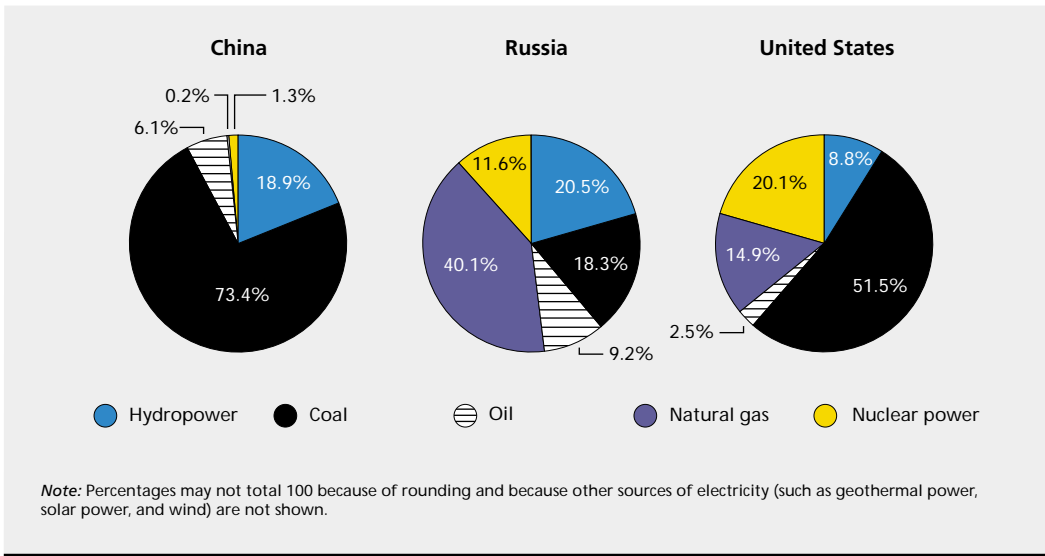
Map 10.1

Particulate air pollution in selected cities, 1995 or most recent estimates



biggest cities of these three countries as shown in Table 10.1. Note that coal is considered to be the “dirtiest” of the sources shown, although a lot depends on its quality and methods of combustion. In many ways nuclear energy is one of the “cleanest” sources of electricity, but safe disposal of nuclear waste and the risks of radioactive pollution in case of a serious accident are of major concern. Sources with the least environmental impact, such as solar energy, are not shown because they account for only a small fraction of generated electricity worldwide.

Fuel combustion by motor vehicles is another major source of suspended particulate emissions in urban areas. These emissions are particularly detrimental to human health because pollutants are emitted at ground level. Motor vehicles are much more common in developed countries: in 1996 there were 559 of them per 1,000 people in high-income countries compared with just 8 per 1,000 people in low-income countries and 91 in middle-income countries. (See Data Table 2 for the number of motor vehicles in individual countries.) But motor vehicles in developing countries

Figure 10.3 Sources of electricity in selected countries, 1995

**Is it possible to
reduce air
pollution without
slowing economic
growth?**

still cause serious air pollution because they are concentrated in a few large cities, many are in poor mechanical condition, and few emission standards exist.

According to World Bank estimates, demand for gasoline in developing countries tends to grow 1.2–1.9 times faster than **GNP per capita**. If per capita income growth rates of 6–8 percent a year are typical of industrializing and urbanizing countries, growth rates in motive fuel consumption of 10–15 percent a year are possible. In many transition countries in the late 1980s and early 1990s, the number of cars in use grew rapidly despite the contraction in economic activity and reduced per capita incomes. In Moscow (Russia) the passenger car fleet grew 10 percent a year during 1984–94 and 17.5 percent a year during 1990–94. Without effective policies to curb motor vehicle emissions,

such dynamics can lead to grave health consequences for urban populations.

Airborne Lead Pollution

Airborne lead is one of the most harmful particulate pollutants. Young children are especially vulnerable: lead poisoning of children leads to permanent brain damage, causing learning disabilities, hearing loss, and behavioral abnormalities. In adults lead absorption causes hypertension, blood pressure problems, and heart disease. The main sources of airborne lead are motor vehicles using leaded gasoline, industrial processes such as ferrous and nonferrous metallurgy, and coal combustion.

While governments increasingly control large industrial sources of pollution, motor traffic is rapidly growing. In