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Chapter X. 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.

A rough indication of the urban contribution to GDP is the combined share of GDP produced in the industry and service 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 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).

Table 10.1 Particulate air pollution in the largest cities, 1995

Country	City	City population (thousands)	SPM, micrograms per m^3
Brasil	San Paolo Rio de Janeiro	16 533 10 187	86 139
China	Shangkhai Beijing Tianjin	13 584 11 299 9 415	246 377 306
Egypt	Cairo	9 690	-
France	Paris	9 523	14
India	Mumbai Calcutta Dehli	15 138 11 923 9 948	240 375 415
Indonesia	Jakarta	8 621	271
Japan	Tokyo Osaka	26 959 10 609	49 43
Korea, Rep.	Seoul	11 609	84
Mexico	Mexico	16 562	279
Philippines	Manila	9 286	200
Russia	Moscow	9 269	100
Turkey	Istanbul	7 911	-
Great Britain	London	7 640	-
USA	New York, 1987-1990 Los Angeles	16 332 12 410	61 -

« - » - No data.
Note: Selected are the cities with more than 7 million residents.

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 natural 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 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 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 many urban areas more than 80 percent of lead pollution is caused by vehicles using leaded gasoline. Therefore, since the 1970s- when medical evidence on the adverse health impacts of lead became available- many countries have reduced or eliminated lead additives in gasoline. The elimination of leaded gasoline has been achieved, for example, in Austria, Japan, and Sweden. But in much of the developing world lead additives are still widely used, especially in Africa. Experts suspect that in developing countries all children under 2 and more than 80 percent of those between 3 and 5 have blood lead levels exceeding World Health Organization standards.

Economists have calculated that, with the technological options available today, phasing out leaded gasoline is highly cost-effective. Shifting production from leaded to unleaded gasoline rarely costs more than 2 cents a liter, and countries can save 5 to 10 times as much as that, mostly in health savings from reduced morbidity and mortality. When the United States converted to unleaded gasoline, it saved more than $10 for every $1 it invested thanks to reduced health costs, savings on engine maintenance, and improved fuel **efficiency**. Recognizing the high costs of the damage to human health caused by lead emissions and adopting

appropriate national policy are matters of high urgency for many developing countries.

International experience shows that in most countries air quality deteriorates in the early stages of industrialization and urbanization. But when countries become richer their priorities shift- they recognize the value of their **natural resources** (clean air, safe water, fertile topsoil, abundant forests), enact and enforce laws to protect those resources, and have the money to tackle environmental problems. As a result air quality and other environmental conditions start to improve. Certain experts have even calculated the average levels of per capita income at which levels of various pollutants peaked for a panel of countries between 1977 and 1988. Smoke, for example, tended to peak in the urban air when a country reached a per capita income of about $6,000, after which this kind of air pollution tended to decrease. For airborne lead, peak concentrations in urban air were registered at considerably lower levels of per capita income- about $1,900.

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