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Chapter 7

New Directions: Air pollution and road traffic in developing countries

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Motorized road vehicles are the primary means of transporting passengers and freight throughout the developing world because of their versatility, flexibility, and low initial cost, as compared to other transport modes. In all but the poorest developing countries, economic growth, rising incomes and urbanization are contributing to a rapid increase in vehicle ownership and use. Over the last two decades, motor vehicles have emerged as a critical source of urban air pollution in much of the developing world. For example, motor vehicles are the largest source of PM_{10} emissions in most Asian cities, exceeding the contributions from resuspended road dust, heavy fuel oil and coal combustion, and refuse burning. The incidence of other transport-related pollutants (e.g. CO, NO_x, SO_2, O_3) in developing countries also exceeds international and national norms. The associated human health and welfare costs run into hundreds of millions of dollars and far exceed the prevention costs in terms of the control measures.

Air pollution is a serious public health problem in most major metropolitan areas in the developing world. Pollutant levels in megacities such as Bangkok, Mexico City, and Cairo far exceed those in any city in the industrialized countries. Epidemiological studies show that air pollution in developing countries annually accounts for tens of thousands of excess deaths and billions of dollars in medical costs and lost productivity. These losses and the associated degradation in quality of life, impose a major burden on people in all sectors of society, but especially the poor. The air pollution problem is particularly serious in the rapidly urbanizing cities of South and East Asia (especially in mega cities such as Bombay, Calcutta, Delhi, Dhaka, and Karachi in South

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Asia, and Bangkok, Beijing, Shanghai, Jakarta, and Manila in East Asia). Here a growing number of urban dwellers are exposed to unacceptable levels of atmospheric pollutants from a variety of sources. In addition, the problem is rapidly spreading to other urban centers (such as Colombo, Dhaka, Lahore, Jaipur, Kathmandu, Kuala Lumpur, Surabaya and numerous regional cities in China). Air quality in several Asian megacities is approaching the dangerous levels recorded in London in the 1950s. In these cities, pollution levels often exceed World Health Organization (WHO) air quality guidelines by a factor of three or more (World Resources: A Guide to the Global Environment 1998–99, Oxford University Press, New York, 1998, and Urban Air Pollution in Megacities of the World, Blackwell, Oxford, 1992). In China's major urban centers, particulate levels are as much as six times the WHO guidelines. The rapid and continuing increase in motorized and polluting forms of transport combined with inadequate transport infrastructure, lax environmental legislation and enforcement, weak institutions, and lack of skilled manpower, have resulted in poorly planned urban growth with severe air pollution problems.

With economic prosperity and urbanization, there has been an unabated increase in motor vehicles bringing unprecedented mobility to the burgeoning middle class in many Asian countries. Although per capita vehicle ownership in most Asian countries is low compared to OECD countries (for example, in China there are about 8 vehicles per 1000 persons and in India only 7 vehicles per 1000 persons compared to 750 vehicles per 1000 persons in the US), vehicle growth in the region has been phenomenal. The growth of motor vehicles in China has averaged about 11% annually in the last 30 years doubling every 5 years, and in India the growth has been around 7% per annum for the past 10 years. The motor vehicle fleet is predominantly concentrated in urban areas and the growth of the urban fleet tends to be much faster. This concentration of the motor vehicle fleet, particularly cars, in major urban centers has led to severe traffic congestion as well as concomitant problems of air pollution and road accidents. It is estimated that over 90% of the urban population in Asia is exposed to particulate matter (PM) concentrations above the WHO guidelines.

In terms of human exposure to harmful emissions, motor vehicle traffic has become a major problem in large cities. As reported cases of lung disease and breathing disorders increase, many governments are beginning to search for solutions to the problem of air pollution. Although it is difficult to isolate air pollution-related health impacts, estimates have been made of the health and related economic toll of air pollution in Asian cities. For example, it has been estimated that about 10,000 people may die prematurely due to air pollution in Delhi and many hundreds of thousands of cases of respiratory illnesses have been attributed to poor air quality (Anand, Proceedings of the Workshop on Integrated Approach to Vehicular Pollution Control in Delhi, Central Pollution Control Board, New Delhi, pp. 110–117, 1998). Recent surveys in Thai-

land have found that Bangkok residents have a much higher occurrence rate of pollution-related respiratory diseases (19%) as compared to rural cities with lower levels of air pollution (8%). Blood lead levels remain high in urban residents in Asia, especially in children, although unleaded gasoline is becoming widely available in parts of Asia (e.g. Thailand, South Korea) and has been mandated for use by governments in China, and India. Diesel in most developing Asian economies continues to have high levels of sulfur, with high costs being the primary hurdle to switching to low-sulfur diesel.

Experimentation with alternative fuels (Faiz et al., Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions, World Bank, Washington, DC, 1996) such as electricity, LPG, CNG, etc., has met with varying degrees of success. Factors such as higher initial costs and subsidies, relative fuel prices, public inertia and acceptance, and lack of a policy framework, impede the widespread implementation of alternative fuel technologies in transport vehicles. As the smaller and medium Asian cities continue to grow economically and physically, many of them will experience the same problems that have so far plagued the large metropolitan centers. Planning and management, as well as regular monitoring and evaluation of air quality, vehicle emissions, and health impacts are essential if human health and productivity in these countries are to be protected. These actions need to be supported by technical measures involving the vehicle–fuel complex to reduce automotive emissions. In addition, transport demand management and market incentives, and urban transport and road infrastructure improvements are also required.

Air pollution is, of course, a problem that has yet to be solved even in industrialized countries. Unabated demand for transportation, as reflected in increasing personal mobility and globalization of industry and services, has counterbalanced the technical improvements in vehicle and fuel technologies to reduce vehicular emissions. Although impressive improvements in vehicle emission controls have been achieved in industrialized countries for CO, SO_2, and lead, ambient concentrations of NO_x and tropospheric ozone still remain at high levels, and the problem of fine particulate matter is yet to be resolved.