CHAPTER 6

Strengthening urban environmental management in Asia

Urbanisation and its implications to the urban environment

Cities play a central role in the evolution and advancement of society. They serve as focal points for technological innovation, economic growth, societal change, politics and culture. Cities are also the places where concentrated demands for various services (e.g. trade, consumption, and production) emerge, which in turn generate employment. The prevailing wage-gaps with neighbouring areas and disparities in employment opportunities trigger a population flow into cities. This influx of people speeds up the urbanisation process further. It essentially creates a self-reinforcing cycle generating more demand for services. As a result, the urbanisation in developing countries is often described as “compressed urbanisation” with an over-concentration of economic, political and cultural functions in primary cities and the inflow of population that exceeds the limit that a city can productively absorb (Tasaka, 1998).

While urbanisation itself is a global phenomenon, that of Asia for the last five decades has been characterised by an unprecedented speed and size (UN, 2002). Yet, only about 30 per cent of the population in the Asia-Pacific region live in cities (in the year 2000). The other feature that has to be remembered is the significant regional variations in the rate of urbanisation, for example, the rate in East Asia is the highest, followed by Southeast Asia and then South Asia. The share of urban population in Japan, the Republic of Korea (ROK) and China has increased from 63 per cent, 28 per cent and 16 per cent to 79 per cent, 82 per cent and 36 per cent respectively from 1960-2000. In Southeast Asian countries, urbanisation started at slower rates but gained momentum during the 70s and 80s. In South Asian countries, rapid urbanisation is under way at about 3 to 6 per cent per year since the 1960s (World Bank, 2004). One study predicts that by 2015 Asia will host 153 out of 358 cities globally with populations over one million. The same estimate shows that 15 out of 27 mega-cities (over 10 million) by 2015 will be in Asia (HABITAT, 2001).

Asian urbanisation, as in Europe two centuries earlier, has been driven by industrialisation and financial liberalisation. This tendency is particularly noticeable in East Asia and Southeast Asia. Since the 1980s, the economic growth of cities has been helped by increases in foreign direct investment. In some countries, like China, cities themselves have been competing aggressively with one another to attract business and foreign investment.

Rapid urbanisation in Asia has resulted in metropolitan expansion, high-density central business districts, and urban sprawl, especially in the larger cities. It has greatly stretched already limited urban management capabilities and has had to contend with the demands and implications of a large and steady influx of migrants. It has also faced and continues to face the rapid emergence of unplanned settlements and slums. The percentage of urban population living in slums\(^{20}\) has been rapidly increasing in Asia except for West Asia (from 36.4 per cent in 1990 to 41.1 per cent in 2001 in East Asia, from 59 to 63.7 per cent in South Asia, and from 28 to 36.8 per cent in Southeast Asia (UN, 2004). One recent study concluded that 20 per cent of houses in Jakarta, Bangkok and Kuala Lumpur are illegal and that the figure rises to about 50 per cent in Mumbai and elsewhere in India (ESCAP/ADB, 2002).

The rapid and uncontrolled urbanisation in Asia has exerted tremendous pressure on the urban infrastructure. The increased volume of waste-water, rapid motorisation, rising amounts of waste generated, and growing energy demand all require expansion of the urban infrastructure. Against this context, the following
section reviews the major urban environmental problems that Asian cities confront and some key approaches to deal with them.

Key urban environmental issues and challenges in cities

Air pollution

Among the main drivers of Asia’s economic growth are new industries, automobiles and construction of all kinds, all of which are major contributors to air pollution. The defining characteristics of air pollution in Asian cities may be summarised as follows:

- The ambient air concentration of particulate matter now generally exceeds WHO health safety norms, often by dramatic margins (ADB, 2003).
- The trends in some cities are moving in opposing directions. For example, in several Asian cities, industry-related pollutants are decreasing while transportation-related pollution is spiraling out of control. This is true in Japan, in North Asia cities such as Beijing and Shanghai, and in Southeast Asia cities that include Ho Chi Minh, Bangkok, Jakarta and Manila (IGES, 2004).
- Especially in the largest cities, slow but steady industrial relocation to the periphery or beyond the city limits is taking place. The net effects of this may be an improvement in quality in city centres, but only at the cost of transferring the pollution to the suburbs.
- To at least some extent, the composition of Asian urban industrialisation may be shifting towards the service sector. One study, for example, reported evidence of a consistent rise of the tertiary sector and a fall of the primary industry in twenty-two East Asian cities (Dhakal and Kaneko, 2002).

Asian efforts in recent years to mitigate air pollution have involved both demand and supply side responses, including the use of clean coal in the industrial sector, increasing use of natural gas, the development of mass public transportation infrastructure and the introduction of regulations, fees and targeted subsidies. Results thus far have not been encouraging, especially with regard to measures aimed at reducing demand, due principally to generalised institutional weaknesses and capacity constraints and to severe inadequacies in public finances.

Fig. 6-1: Annual average air pollution concentrations in Asian cities (1999)

**Water supply and sanitation**

Many Asian urban dwellers are still without access to adequate water and sanitation services. The WHO/UNICEF Global Assessment 2000 Report indicates that over 1,916 million people in Asia do not have access to adequate sanitation. Although the absolute number of people now served by a water supply has increased in recent years, the rate of coverage has dropped due to the rapidly increasing urban population (WHO/UNICEF, 2000). Fig. 6-2 shows the high degree of variability that exists in coverage and availability of water supplies in some of the major cities in Asia. In Pacific coastal cities in the ROK and China, the coverage in 1997 was nearly 100 per cent and water was available twenty-four hours a day. This contrasts sharply with Southeast and South Asian cities where coverage rates are much lower. For example, the coverage in Jakarta was only 27 per cent and the availability was eighteen hours a day. In Mumbai and Chennai (India), the coverage is 100 per cent and 97 per cent respectively, but the water availability is only for five and four hours, respectively.

**Fig. 6-2: Coverage and water availability in Asian cities**

Asian also suffers from a severe lack of and poor systemic efficiency of waste-water treatment. In China, for example, only 16 per cent of waste-water is being treated (Song, 1997). Though countries like India and Thailand enjoy a high percentage of treated waste-water, (83 per cent in Bangalore, India and 70 per cent in Chiang Mai, Thailand), the efficiency of waste-water treatment plants is very low. Other countries
in this region viz., Indonesia (Bandung – 23 per cent), Malaysia (Penang – 20 per cent) Pakistan (Karachi – 10 per cent) suffer from a serious lack of waste-water treatment (UN-HABITAT, 2003).22

The following represent some major and immediate barriers to achieving greater coverage and sustainability of water supply and treatment in Asia:

- Severe capacity problems arising from extensive operational and management inefficiencies.
- In many instances, very low tariffs that act as pernicious subsidies and that encourage the wasteful use of water (McIntosh, 2003).
- Major under-investment relative to other areas of the world.

According to the Global Water Supply and Sanitation Assessment Report 2000 (WHO/UNICEF, 2000), the annual investment in Asian urban water supply is about US$3 billion, of which, US$2 billion is national investment and about US$1 billion is from external support. For sanitation, the total investment is about US$1 billion, where 90 per cent is from national investment. Looking at the share of water supply and sanitation as a percentage of total infrastructure investment, it is lower in Asia than in other regions of the world (i.e., it is 3.6 per cent in Asia compared to 5.3 per cent in Africa and 8.3 per cent in Latin America and the Caribbean).

**Municipal solid waste**

The combination of population growth, rapid urbanisation and intensified economic activity have combined to increase greatly the volume of waste in Asian cities. Fig. 6-3 shows the increase in waste generation per capita against the increase in income in Asia. In cities of Japan, the ROK, and Malaysia, the quantity of waste generated (in excess of 1 kg/person/day) is similar to that found in the most advanced countries. In the large cities of the poorer, developing countries of Asia, the figure is roughly half that amount (i.e., around 0.5 kg/person/day) (IGES, 2001). In addition to the volume difference, the composition of solid waste from the cities in Asia’s more advanced countries poses different challenges in comparison to those that relate to the solid waste from the cities of Asia’s developing countries. Most of the waste from the more advanced countries is highly inorganic and non-recyclable. In the cities of developing regions of Asia, solid waste is generally organic and recyclable with waste management characterised by inefficient collection and with waste treatment and disposal usually consisting of open dumps (although some cities are gradually adopting controlled dumps and partially engineered landfills, with composting and recycling now receiving more attention) (Enayetullah and Sinha, 1999). Due to its high costs, incineration is usually not practiced, except for hospital waste.

![Fig. 6-3: Relationship between waste generation rates and per capita GDP in Asia](source: World Bank (1999))
In developing countries, waste management suffers from weak institutional and regulatory capacities and this is further exacerbated by poor communication and a lack of public participation (Ogawa, 1996; IGES, 2001; Zurbrugg, 2002). The largest and most immediate constraint, however, appears to be the lack of financing. At present, waste management services account for a high percentage of municipal budgets in many cities of the region. In some Asian cities, expenditures on solid waste management can reach 40 per cent of the municipality’s operating budget and out of this, 70-90 per cent is spent on waste collection.

Although there are also examples of recycling activities promoted by communities, non-governmental organisations (NGOs), and the private sector, these activities are informal in nature and are not supported by the municipal authorities in Asian developing countries.

**Financial issues for developing urban environmental infrastructure**

To build an environmentally-sound urban infrastructure would require very large-scale capital investments. Access to appropriate technologies for waste treatment is generally not regarded as a problem as these can be obtained quite easily in the international marketplace. The financing that they require, however, is a major barrier, as the financial resources at the disposal of the national and local governments are limited. This is especially the case at the municipal government level which, throughout Asia, is required to assume more and more of the responsibility for urban capital investment and for the management of the urban environment.

A number of factors explain the weak financial base of most Asian municipalities. In the first instance, there are structural factors that impose imbalances in the sharing of tax revenue between central and municipal governments and that pose major barriers to municipal financing. In Asia, the bulk of taxes is usually collected by central governments and relative small percentages are then assigned to municipalities. This continues to occur in spite of the fact that the trend over the past decade has been to decentralise and to assign greater and greater responsibility to the municipal level. In addition, the types of taxation that can be applied directly by municipalities is often restricted by law and this leaves very little margin available to local authorities.

In addition, municipal revenues suffer in Asia as a direct result of intense competition between cities and multinational companies to attract foreign investment. As linkages of cities to the global economy have increased, cities have increasingly looked to multinational companies and foreign direct investment for better employment and economic growth. This is especially true for cities in China and other East Asian countries, a few countries of Southeast Asia (such as Viet Nam and Malaysia) and South Asia (Bangalore and Hyderabad in India). To attract foreign investment, a common practice of cities in these countries has been to provide tax breaks (including extended tax holidays) and direct subsidies in the form of land, utilities and other services.

Finally, financial constraints at the municipal level in Asia are also attributable to very low tariffs and inappropriate fee systems with regard to utilities, including the pricing of energy. Tariffs are low because they are usually highly subsidised and fee collection systems are very weak. Most cities cannot recover the operational costs let alone generate the capital required for new construction costs.

The constraints and limitations summarised above have propelled a recent and increasing emphasis on obtaining new capital investment financing directly from the private sector through Public-Private Partnerships (PPP). The results from such arrangements, however, appear to be mixed (see following section and also Chapter 4, page 69). There is also evidence that PPP may not function well in low-income
cities where widespread poverty is found (Kidokoro, 1998). Finally, there is yet other evidence that local governments in developing countries lack the capacities required to establish the legal and operational frameworks required for effective public-private partnerships (Chang et al., 2001).

The above discussion summarises some of the infrastructure challenges that must be met in the interests of sustainable development in Asia. In addition to financial barriers, attention should focus on how to change the tariff structure so that users have incentives to save resources, how to improve tariff collection systems and how to make regulations workable.

**Experiences of public-private partnerships for urban environmental infrastructure**

Several types of PPPs may be differentiated as a function of the key responsibilities assigned to or assumed by the private sector. Table 6-1 offers a typology, outlining the characteristics of the each partnership. For example, in the case of the service contract, companies have a responsibility only for the operation and maintenance which poses a relatively low risk for them. By contrast, in the case of divestiture, companies have to bear all of the responsibility. Build-Operate-Transfer (BOT) is the most popular form of concession contract in East Asia for the establishment of sewage pipe systems and sewerage treatment plants (Chang et al., 2001). A survey carried out by the Japan Development Finance Institute shows that there were 162 Public Fund Initiatives (PFIs)\(^2^3\) for water supply and sewage projects worldwide in February 1999 and most of these were in the form of concession contracts (Kitano et al., 2000).

<table>
<thead>
<tr>
<th>Service Contract</th>
<th>Management Contract</th>
<th>Lease/Affermage</th>
<th>Concession</th>
<th>BOT-type</th>
<th>Divestiture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset ownership</td>
<td>Public</td>
<td>Public</td>
<td>Public</td>
<td>Public</td>
<td>Private/Public</td>
</tr>
<tr>
<td>Capital investment</td>
<td>Public</td>
<td>Public</td>
<td>Public</td>
<td>Private</td>
<td>Private</td>
</tr>
<tr>
<td>Commercial risk</td>
<td>Public</td>
<td>Public</td>
<td>Shared</td>
<td>Private</td>
<td>Private</td>
</tr>
<tr>
<td>Operations/maintenance</td>
<td>Private/Public</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
</tr>
<tr>
<td>Contract duration</td>
<td>1-2 years</td>
<td>3-5 years</td>
<td>8-15 years</td>
<td>25-30 years</td>
<td>20-30 years</td>
</tr>
</tbody>
</table>

Note: Role of private sector is shown by shaded area

Private sector participation in the provision of infrastructure in the Asia-Pacific region reached its peak in 1997. The annual investment in infrastructure projects with private participation in East Asia and the Pacific was US$41.3 billion in 1997, which sharply declined due to the Asian financial crisis, and it is recovering slowly with about US$17 billion in 2001 (Fig. 6-4).
Table 6-2 shows the activities and policies of PPP in a number of East and Southeast Asian countries. The evidence that is available often uses different measurements and indicators of success and this makes it difficult to provide an overall assessment. There appears, however, to be little doubt that, although results have been mixed, there have been a number of significant successes as measured against services improvements. The evidence also suggests that: (i) PPP works especially well with large infrastructure projects (this suggests that issues of economy of scale and relationships between volume and financial rates of return are critical); (ii) sound policies and regulatory authorities are essential components, and (iii) equity considerations should be agreed upon and built-in from the outset. The problem, as some recent research has shown, is that Asian developing countries are generally in need of considerable capacity strengthening (e.g., appropriate laws and regulations, functioning enforcement systems and institutions, and environmental regulatory and management capacity) before PPPs can be expected to function effectively (O’Connor, 1994). Therefore, despite growing interests and many useful experiences, PPP does not offer a panacea; its success is subject to local conditions, including regulatory environments, and, the technical, managerial and professional capacities of national and local governments.

The applicability of PPP further diminishes in cities that are poor, where user charges are difficult to collect. In such cases, small-scale community-oriented environmental projects are considered more feasible than large infrastructure projects because poverty is intrinsically linked to the activities that contribute to urban environmental problems. Also, it is a well-accepted fact that the private sector has difficulties providing environmental services to low income communities. For example, in Phnom Penh, a part of waste collection and street cleaning was contracted out to a private company. The only source of income for the company was the collection of fees from urban households and small businesses. While the urban poor were often unable to pay the fee, the company served only two-thirds of the municipal area where the fee was paid, and it had no incentive to serve the rest of the area (Memon et al., 2004).

**Experiences of community partnerships in urban environmental infrastructure and services**

As indicated previously, a significant proportion of Asia’s urban population live in squatter areas. In such settings, low financial rates of return limit the potential for public-private infrastructure partnerships and a range of community partnership arrangements are emerging to address urgent problems. Examples that are cited as successful include the Orangi Pilot Project in Pakistan (Box 6-1) for developing a wastewater system with full community participation facilitated by an NGO, and the Kampung Improvement Program in Indonesia.

The community partnership as a mechanism to improve urban environmental infrastructure is not limited
### Experiences in East Asia

In China, three national Build-Operate-Transfer (BOT) pilot projects and more than fifty local projects in the form of BOT, Build-Operate-Own (BOO), Transfer-Operate-Transfer (TOT) and others were in progress in the year 2000 (Chang et al. 2001). A number of sewerage plants were constructed using BOT as the financial mechanism, and joint-stock companies in the construction and operation of sewerage and garbage disposal works are increasing. China has issued three ministerial regulations concerning foreign investment in infrastructure projects. The BOT law is now being prepared. China’s local governments are more active than the central government in introducing PPP projects. Public Construction - Private Operation and BOT are expected to be the main trend of PPP in urban environmental infrastructure in China.

In Hong Kong, relevant regulations promoting BOT are available. Under standard Design-Build, and Operate (DBO) contracts, the private sector may collect garbage and dispose of it in landfills. In Macao, garbage collection and disposal facility operations are consigned to private contractors.

In the ROK, private sector participation in the construction and operation of environmental facilities and power generation is increasing. In recent five year plans, the role of the private sector is emphasised. Fundraising for environmental infrastructure began to shift to PPP in about 1996. It aims to increase the share of private financing for infrastructure development by over 40 per cent.

Japan introduced the Law Concerning Public Facilities Construction by Use of Private Capital in 1999. A PFI promotion committee was established to provide policy consultations and suggestions. In June 2001, water regulations were revised to give the private sector a greater role in the sewerage business. The revised regulations allow the private sector to participate in water treatment and purification. However, despite this, only a few domestic PFI cases can be found in waste management and sewerage plants.

### Experiences in Southeast Asia

In Malaysia, privatisation policy was adopted in 1983 to reduce the government’s financial and administrative burdens. It created the Privatization Master Plan in 1991 and launched large-scale privatisation of government enterprises before 1994. The whole country has been divided into four regions for privatised garbage disposal. The regulations regarding PFI are relatively well developed in Malaysia. PFI projects cover many areas such as power generation, communication, transportation, water supply, sewerage works, solid waste management and even air and water pollution monitoring.

In Thailand, the “1992 National Environmental Protection Act” and the “Royal Act of Private Participation in State Affairs” have set the trends for PPP. The legal system for construction and operation of infrastructure by the private sector was developed and within that legal framework, PPP for sewerage and industrial wastewater treatment were implemented. During 1995-2000, the government, getting assistance from multilateral financial agencies, increased the amount of investment for environmental infrastructure substantially. Thailand created the Privatization Master Plan in 1998. Bangkok has made major improvements in its water supply systems along with the construction and upgrading of waste-water treatment facilities under a public-private partnership initiated by the Bangkok Metropolitan Administration and the Metropolitan Waterworks Authorities.

In Indonesia, the government has high expectations for PFI because of significant public debt and the decrease in ODA since the 1990s. This has given way to private sector participation and it has formulated relevant regulations and policies for promoting PFI in many areas. The major activities include a BOT projects for drinking water in Jakarta.

In the Philippines, the first BOT law was established in 1990. A BOT centre was established under the Department of Treasury for the implementation of BOT projects. However, risk prevention policies, government guarantees for BOT projects, and long-term plans for the introduction of PFI are generally not in place. Privatisation of the municipal water supply and sewerage treatment started in 1997. Through BOT it has succeeded in securing funds for some environmental infrastructure projects. PFI projects are also promoted in areas such as power generation, communication, transportation, and garbage-fuelled power plants.

In Singapore, the collection of municipal solid waste is consigned to the private sector.

In Viet Nam, BOT laws were issued in 1993 and significant foreign capital inflow was observed. Current BOT projects cover areas such as water supply, port development and power generation.

Source: Chang et al. (2001)
to only squatter areas. In many Indonesian cities, the local community plays a key role in solid waste management. In Dhaka, community-based waste management programmes have been reported successful. Community partnership programmes aimed at improving the livelihood of the community, such as the Community Mortgage Program in Philippines (Porio et al., 2004) and the Urban Community Development Office in Thailand (Boonyabancha, 2004) are often cited as successful. Although all projects are often termed as community partnership projects, the partnership characteristics and the role of the local communities vary greatly from relatively passive information-sharing campaigns to full empowerment in planning, execution and management of projects.

To what extent might community partnerships, such as the ones mentioned above, provide solutions to the urban infrastructural needs of Asian communities including squatter settlements? Caution is needed in answering this question as the potentials and limitations of this model remain very unclear. The examples of ‘successes’ are few and time will be required to judge their true effectiveness, sustainability and durability. In several cases, there are already indications that the levels of community participation have been exaggerated. Gardner (2002), for example, carried out a detailed study on Indonesia and found that community meetings were often cited as community participation and that, while apparent successes were documented and highlighted, failures and limitations were not. Neither were the reasons for failures and shortcomings investigated. There is clearly a need for both deeper and more extensive time-series analysis before the community-based environmental infrastructure modality can be claimed as a general success and a basis for replicability.

**Box 6-1: Provision of public goods by community: Orangi Pilot Project (OPP) in Pakistan**

The Orangi Pilot Project (OPP) is based in Karachi, Pakistan. Orangi is Karachi’s largest informal settlement, extending over some 4,160 hectares, and it had a population of 1.2 million in the late 1990s (Alimuddai et al., 2004). The project was established in 1980 as a community-based programme for waste-water management with the cooperation of an NGO.

The OPP introduced a low-cost sanitation programme, targeting low-income families to construct and maintain an underground sewage system with their own funds (Alimuddai et al., 2004). The NGO developed several low-cost technologies, such as a sewage pipe with a diameter that was smaller than usual, and supported community organisation activities. Residents interested in this project elected their representatives, and contracted and maintained sewage systems while getting advice from the NGO.

As a result, in 1991, 94 per cent of households had a lavatory connected to the sewage system. Infant mortality declined from 130 per thousand in 1980 to 37 per thousand in 1991 (Hosaka, 2002). The main factors for success of this project were:

- The technological aspect: adoption of a simple design for the sewage system using standardised technologies.
- The economic aspect: cost-cutting utilising the power of the residents for the construction and maintenance.
- The social aspect: organisation of residents by lanes, effective size of the organisation (20 to 40 households), and transparency of the organisation.

This programme is being replicated in seven cities in Pakistan by NGOs and CBOs, and in 49 settlements in Karachi by the Sindh Karachi Abadi Authority (Alimuddai et al., 2004).
Beyond infrastructure: Tackling the demand side

The rise in income in Asian cities has produced dramatic increases in per capita car ownership, per capita waste generation, per capita levels of water use, energy consumption, sewerage and industrial waste. Effective and environmentally well-targeted supply-side responses to this may be essential, but there is overwhelming evidence that the net result of such responses is mainly to create more demand and yet further environmental stresses. For this reason, any prospects for longer-term success will require interventions that constrain and reduce demand. This is particularly obvious in the case of urban transport where more roads create more demand and a concomitant increase in urban energy use and air pollution.

In this regard, top-down approaches, including regulations and standards, are proving effective in at least some Asian urban settings. The case of urban transportation in Singapore has attracted interest world-wide. Singapore exercises tight controls through a combination of measures such as high taxation and tariffs on new vehicles and a vehicle quota system that allows people to bid for a limited number of licenses to own vehicles. Singapore has also introduced an electronic road pricing system which automatically charges fees for vehicles entering core business districts (Dhakal, 2002). Although there has been extensive debate on whether Singapore’s approach would function in other urban settings in Asia, there appear to be no compelling arguments as to why this should not provide effective elsewhere. A second regulatory, top-down approach seems already to be working well in controlling air pollution in Delhi. The Delhi programme derives from a decision of the Supreme Court of India on the grounds of protecting public health which mandates the use of compressed natural gas in heavy-duty diesel buses and trucks. Other Asian cities have also recently introduced new regulatory measures. Shanghai now has a Singapore-style vehicle cap and has also introduced regulatory measures that prohibit the installation of new coal-fired boilers in core cities. Beijing has announced a range of new and strict regulations to bring air quality to acceptable levels and to meet the immediate milestones set for the 2008 Olympic Games (IGES, 2004). Similarly, South Asian cities such as Kathmandu, Delhi and Dhaka have banned two-stroke and diesel three-wheelers successfully to control air pollution.
Box 6-2: The case of Singapore

Singapore’s transport policy is characterised by following major instruments:

Fiscal measures: Fiscal measures for restraining car ownership in Singapore include import duties levied through the Customs and Excise Department, a tax on goods and services, a registration fee, the Additional Registration Fee (ARF), and road/fuel taxes. A tax on diesel fuel was lifted in late 1998. The annual road tax varies from 70 cents (Singapore) per cubic centimetre (cc), for cars with 1000 cc engines, to 175 cents per cc for vehicles with engines exceeding 3000 cc. To ensure that the high registration fee promotes new and better vehicles, a preferential ARF was launched in 1975. In this scheme, the government reduced ARF rates for the registration of new vehicles when owners simultaneously scrapped older vehicles of the same class and size.

Electronic Road Pricing (ERP): ERP was implemented in September 1998, replacing the Area Licensing System (ALS). ERP is an innovative scheme for implementing congestion pricing. The basic idea of ERP is similar to ALS, but ERP is technologically-sound so that charges can be varied over time and location, reflecting the true cost of vehicle use in central business districts. In this system, all 33 ALS “gantries” (entry points) were replaced with ERP gantries for the 720 ha core area and each vehicle to enter into the restricted zone must be fitted with an “In-vehicle Unit” (IU). At the moment, charges do not fluctuate depending on the traffic conditions in Singapore. ERP charges are subject to review every three months to suit changing traffic conditions, and the charges are basically tied to prevailing speeds with the aim of maintaining traffic speeds around 45-65 km per hour on expressways and 20-30 km per hour on arterial roads.

Public transportation system: Efforts to organise public transportation were made by the government by the forceful merger of many service providers in 1973 into a single company held by the government, which floated its shares on the Singapore Stock Exchange in 1978. To introduce competition, the government later allowed one more bus company and today two bus companies and four taxi companies are operating in Singapore in parallel with the rail-based MRT services.

Vehicle Quota System (VQS): The VQS was announced in February 1990 with the intent to cap the number of newly registered vehicles. The VQS is an innovative mechanism to limit the number of vehicles and uses a market-based approach. In the VQS, the government fixes the number of allowable vehicles and prospective vehicle owners must obtain a Certificate of Entitlement (COE) through open bidding to allow ownership of a vehicle for 10 years. The bidding is opened each month and a list of bidders is arrayed in descending order. The bid quoted by the last bidder of a designated quota is called the “quota premium,” which is then levied on all successful bidders to obtain a COE. Beyond 10 years of COE ownership one should either de-register or acquire a new COE at the price of the 12-month moving average quota premium of that category.

Source: Dhakal (2002)

With regard to vehicle emissions, new emissions standards have recently been adopted in several locations in Asia. EURO-I standards (or similar standards adapted to national circumstances) for new vehicles have already become the norm in many of the Asian developing countries. In a number of countries, standards stricter than EURO-I have been introduced to selected cities. In five metropolitan cities of India, the EURO-II fuel quality standards have been implemented. In Beijing, Environmental Protection Bureau has formally adopted EURO-III (150 and 350 PPM sulphur for gasoline and diesel respectively from July 1, 2005). The State Environmental Protection Administration of China has adopted EURO III and IV for light duty vehicles for 2007 and 2010 respectively for the entire country. The adoption of standards is one thing, but their effective implementation is quite another. A recent study confirmed that in many cases imple-
mentation has been quite ineffective due to the prevalence of old and inefficient vehicles, low penetration rate of new vehicles, poor inspection and monitoring systems, and widespread institutional problems related to the enforcement of in-use vehicles-emission-standards (Dhakal and Schipper, 2005).

Box 6-3: Major orders of Supreme Court of India in 1998 for measures to improve air quality in Delhi

- Augment public transport to 10,000 buses by 1 April 2001.
- Introduce unleaded petrol in New Capital Territories Delhi by 1 September 1998.
- Convert all pre-1990 autos and taxis to clean fuel by 31 March 2000.
- Ban on buses aged eight years or older except for those adapted to use clean fuel by 1 April 2001.
- Entire city bus fleet to be converted to CNG by 31 March 2001.
- Expand Indraprastha Gas Limited’s CNG network to 80 by 31 March 2000.
- Comprehensive I&M programme to be started by 31 March 2000.
- Central Pollution Control Board to set up new air quality monitoring stations by 1 April 2000.

Source: Mehta (2001)

Towards better urban environmental management

Discussions in earlier sections indicate that Asian urbanisation is unprecedented in terms of size, speed and level of urban transformation and that this is pushing the social, environmental and political ingenuity of policy-makers to its limit. Historically, measures to contain urban growth and associated problems have not been successful in Asia, except in very few unique instances. Asia, therefore, has no clear model or prescription to follow but must find its own solutions. New and appropriate technologies will play an important part, but the main problems and barriers are not technological. They are institutional, organisational and matters of policy. Far from resolving problems and generating effective responses, the devolution and decentralisation of environmental responsibilities from national to regional to local levels serves in many instances to underscore capacity weaknesses, both in policy formulation and, most often, in execution and follow-through. The constraints of endemic management weaknesses and the economic disincentives of subsidy distortions, non-economic tariffs and environmentally-perverse user charges are not resolved by decentralisation alone. The crux of Asia’s urban environmental problems lie in improving the governance base for the formulation and management of appropriate policies and practices, whether at the local, municipal, regional, national or trans-national levels. The evidence from Asia and elsewhere also confirms that, however valuable the notions of inclusion and full citizen participation, the “top-down” role of regulations, standards and norms is essential to the prospects for success. Finally, the issue of adequate finance for urban environmental infrastructure is critical and will need to be addressed on a case by case and situation-specific basis. While the exploding cities of Asia can and should learn from one another, the variations in Asia’s urban reality are such that there are no “one-fit-for-all” solutions.