

Section II – Issues and Challenges for Urban Environmental Management in Asia

1. Introduction

Asia has been experiencing very high population growth and urbanization as well as migration as discussed in previous section. Asian cities will witness a large population increase, which will have important implications for a variety of urban environmental issues, such as water supply and sanitation, waste and wastewater generation, urban infrastructures as well as mobility. This section presents an overview of major urban environmental problems faced by Asian cities, focusing on challenges and trends on water supply and sanitation, urban transportation, and waste management. These three sectors represent the main urban environmental problems, especially in the developing cities in Asia. The diversity of economic and social condition in Asian cities leads to different realities in these sectors, which are also discussed here.

2. Water supply and sanitation

Water supply and sanitation is historically considered as the most important urban environmental infrastructure, having serious environmental health and socioeconomic consequences. Most of the health concern was averted in Europe and North America by addressing this challenge (Leitmann 1999). In developing countries, as UN-HABITAT (2003) indicates, a considerable number of urban dwellers do not have ‘improved’ access to water supply and sanitation.

2.1 Issues and challenges in water supply and sanitation

Municipal water supplies are considered priority in urban infrastructure; however, municipal water supplies are still insufficient in several areas. Figure 1 shows the coverage and availability of water supplies in some of the major cities in Asia. In Pacific coastal cities of Korea and China, the coverage in 1997 was nearly 100% and water was available 24 hours a day. Southeast and South Asian cities still suffer from serious problem of inadequate infrastructure. For example, the coverage in Jakarta was only 27% and the availability was 18 hours a day. In addition, the coverage is 100% and 97%¹ in Mumbai and Chennai (India) respectively, but the water availability is only for 5 and 4 hours, respectively (McIntosh and Yniguez 1997). Sewage systems, when existent, were developed much later than water supply systems.

¹ There is the possibility that this figure does not include the slum area (Sattethwaite 2003).

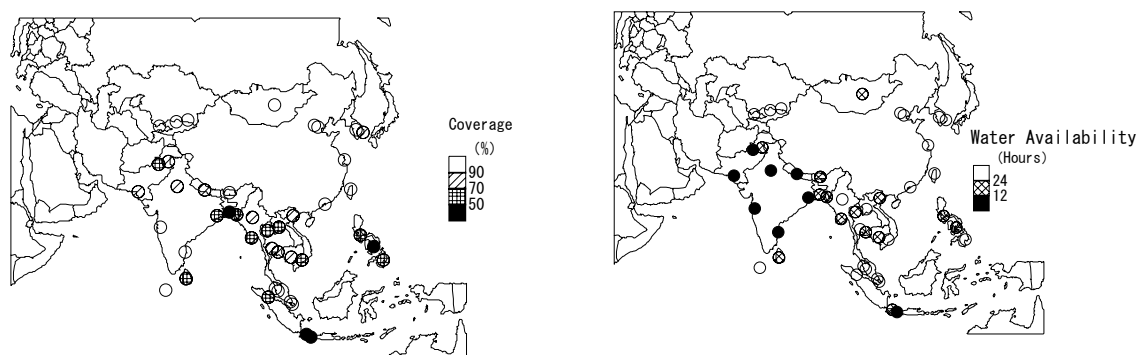


Figure 1. Coverage and water availability in Asian cities

Source: McIntosh and Yniguez (1997)

Realizing the severity of the problem, water and sanitation has been given high priority in the United Nations Millennium Development Goals (MDG)² and the goal to *halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation* was set. In order to realize this target, the water supply connectivity should be increased from the existing 93% to 96% and basic sanitation coverage from the existing 78% to 89%. Hence, 619 million people in cities should be connected with water supply and an additional 675 million people should be connected to sanitation until 2015. The major challenge for the cities is not only to build the new infrastructure but also to improve the situation of the existing water utilities, which are mainly relying on the heavy subsidies from the government. Operational and management inefficiency is also a problem in water supply systems in Asian cities and an immediate action is necessary to improve the overall situation. In short, Asian cities are experiencing major challenges in achieving these urban water supply and sanitation goals in the form of *lack of investment* and *poor governance*.

Most of the cities in this region suffer either lack of infrastructure or poor systemic efficiency in wastewater treatment. Sewerage system and wastewater treatment is still a big challenge even for the developed countries. In Japan, the coverage is about 60 % and the user charges only cover about 40 % of operational costs (Imura et al. 2003). In China, only 16% wastewater is being treated as the standards (Song 1997). Although countries like India and Thailand benefit from a high percentage of their wastewater being treated, the performance efficiency of these plants are very low. Other countries in this region viz. Indonesia (Bandung, 23%), Bangladesh (no record of wastewater treatment), Malaysia (Penang, 20%), and Pakistan (Karachi, 10%) suffers from serious lack of wastewater treatment (UN-HABITAT 2003)³. This number worsens if we look into the figures of the people without ‘adequate’⁴

² Further information on the MDG can be found at <http://www.developmentgoals.org/>

³ Information on wastewater treatment facilities and other water related indicators for major cities in the region can be found in UN-HABITAT (2003).

⁴ There is an argument that most of the statistics for the provision of water supply and sanitation are provided by the government, which includes all the households connected with the facilities

provision of these services, as UN-HABITAT (2003) shows that 98 million and 297 million urban dwellers are without “improved” provision of water supply and sanitation respectively and this number is between 500-700 million and between 600-800 million for “inadequate” water supply and sanitation.

The wastewater management is a critical challenge, as it requires massive investments and efficient wastewater treatment plants. Due to disposal of untreated wastewater, most of the freshwater resources are being depleted further increasing the cost for supply potable water. Therefore, a huge investment is required, besides the policies for wastewater disposal and control of water pollution. The problem of inefficiency of the existing wastewater treatment plants also needs to be addressed. Unlike potable water supply, the willingness to pay for wastewater treatment is too low, requiring intensive awareness raising and regulations on industrial and commercial sectors.

Table 1 summarizes the issues in urban water supply and sanitation according the income level in the city.

Table 1. Water supply and sanitation issues according to the income level

Sector of problem area (per capita income)	Low (less than \$2,000)	middle (2,000-14,999)	High (more than \$15,000)
Water supply service	Low access by poor residents and informal neighborhoods	Generally reliable, but rising demand causing shortages in resource supply	Good supply but high total consumption; some concern with trace pollutants
Sanitation	low coverage of latrines and public toilets, poorly maintained; low sewerage coverage	More access to improved sanitation, but still large numbers of residents in large cities not covered especially in informal settlements; most wastewater discharge untreated	Full coverage; most wastewater treated

Source: Modified World Bank (2003)

2.2 Meeting the challenges: financing and management strategies

The conventional basis to finance and manage urban water infrastructure and services lies with the concept of public goods. Sagasti and Bezanson (2001) briefly traced the basic concept of public goods and indicated that the traditional concept has changed requiring a collective action by various actors. Nevertheless, in most of the countries, public sector is still responsible to provide these public goods. The share of government budget, for urban infrastructure and environmental services, is not

irrespective of whether they can get reliable and effective service. Hence, it is recommended that ‘adequate’ provision should include the reliability and effective services to achieve the environmental health targets, which are related with the provision of these services.

increasing in line with the increasing demand. The gap between supply and demand is widening with rapid urbanization and economic growth. To bridge this gap, the existing proportion of budget may be used more efficiently, and new financial mechanisms should be tested. To improve the situation of urban environmental infrastructure and services, local financial capacity should be strengthened. Most of the local and national governments lack the financial capacity to improve, or even maintain the infrastructure and services. Conventional and new financial mechanisms should be applied to improve the financial capacity. The conventional mechanisms include government budget and recovery of user charges while the new mechanisms include private sector participation, corporatization and commercialisation, municipal bonds, environmental fund, introduction of economic instruments, as well as Foreign Direct Investment (FDI). Other important measures being carried out in this region are *institutional strengthening* and *capacity building*, *autonomy to public sector departments*, and *direct cost-cutting measures*.

The conventional financing sources are mainly local and national governments. The governments provide financial support from their budgets as well as from direct user charges. The problems with conventional financing have emerged during the last decades, as the increased demand for the infrastructure and services require huge investments, the repair and maintenance of aged infrastructure requires substantial funding, the low efficiency requires more finance per each unit of the infrastructure and services; and there are very low user charges coupled with lower recovery rates (McIntosh and Yniguez 1997). All of these concerns need to be addressed to improve the coverage, quality, and efficiency of the infrastructure and services.

In order to use resources more efficiently, many cities in the region are undertaking various measures to reduce the cost of repair and maintenance, as well as to improve the efficiency of operations. One of the most common measure is contracting out repair and maintenance and in many cases operations also, to private sector.

User charges are an important issue for most of the urban environmental infrastructure and services. The level of user charges is quite low in relation with the cost-recovery targets. In many countries, the level of existing user charges is too low even to meet the operation costs alone. In Japan, revenue from user charges covers only about 40 % of the operation and maintenance costs of sewerage system (Imura et al. 2003). Furthermore, due to the socio-political barriers, the recovery of user charges is much lower than the estimated targets. There is a higher willingness to pay in comparison with the existing level of user charges, if quality and reliability of environmental services is improved (Altaf et al. 1997).

Improvements in conventional financial mechanisms may increase the financial capacity at a considerable level; however, to fill the gap between demand and supply new financial mechanisms are very important, as it is seen in many developed and in some developing countries. Possible financing sources could be generated through property rights, market creation, fiscal instruments, charge system, financial instruments, liability systems, performance bonds, and deposit-refund system (Panayotou 1998).

2.2.1 Private Sector Participation

In the region, private sector participation (PSP) is becoming an important issue. PSP include mega projects involving international private sector, small projects involving local private sector, and community-based projects involving community organizations.

There is a wide literature available on the various aspects of PSP, including pros and cons, types, mechanisms, and risk averting measures for PSP (ADB 2000, Plummer 2002, Budds and McGranahan 2003, and Akinotoye et al. 2003). The recent focus is on pro-poor PSP, as there are various risks involved for private sector, communities, and government to introduce PSP in urban environmental infrastructure and services (Hardoy and Schusterman 2000, and Satterthwaite 2003).

The experiences in the region show that PSP is becoming a major financing source after conventional government budgets; however, to achieve the underlying objectives of urban environmental infrastructure and services through PSP, some measures are vital. The role of actors should be clearly defined. Private sector and governments are the major actors to finalize the agreements; however, the communities or consumers should also be taken into confidence, through information dissemination and public hearing. This would also help to finalize the policies for risk mitigation, as there is variety of risks for each of the stakeholder. These risks could be broadly categorized as political, social, financial, economic, legal, managerial, technical, environmental, and physical (Kwak 2000).

There are some visible projects in the region, which can generate learning for improving PSP in future projects. In water and wastewater sector, Metro Manila in the Philippines, Johor Bahru in Malaysia, and Macau in China are mega projects widely described (ADB 2000 and Chang et al. 2004). Weihai in China is an example of local PSP while Karachi's Orangi Pilot Project in Pakistan is a community-based PSP in wastewater management (KIN 2004).

FDI has also been reported as a source of funds for constructing urban environmental infrastructure including water supply and wastewater treatment infrastructure. Gentry (1999) suggests that FDI is viewed as a desirable form of international private sector investment for achieving the targets of MDG; however, FDI investments on waste and wastewater sector are not following the same level of investments as in other sectors such as telecommunications sector. A reason this lower investment level might be related to the risks involved and the lower willingness to pay for the services (Memon et al. 2003). Government should play a more important role in regulating the sector towards decreasing risks as well as promoting awareness in order to attract FDI. The maximum share of FDI in selected Asian cities is as following: Johor Bahru, 30%, Metro Manila, 40%, and Macau, 85% (Memon et al. 2003).

3. Urban transport and air pollution management

Improvement in transport system promotes economic growth by increasing mobility and improving physical access to resources and markets. Roads are considered as the “veins of urban centres” and urban transportation is the critical link for the economic

development of any city. Asia as a region with promising and rapid economic growth is all set to witness one of the rapid and most surging growths in urbanization as well as urban transportation. Such trends have already been noticed in relatively more developed cities in Asia (World Bank 2004).

Over the last two decades, rapid population growth and spatial expansion has led to a sharp increase in demand for urban transport facilities and services in many cities in this region. However, several factors have hindered the adequate provision of services to match the ever-increasing demand. In many cities, densification and spatial expansion have occurred with little or no development planning, while in some cases the failure of the instruments of governance has resulted in a significant wastage of resources or substandard quality of infrastructure. Furthermore, the huge capital costs and time required to develop high capacity transit systems have prevented the timely implementation of such systems in rapidly growing urban areas (IGES 2003).

Solutions to urban transportation issues are, to great extent, linked with the city and transportation planning. However, unlike cities in Europe, Asian cities lack proper city planning and growth of urban centres has been haphazard. Hence, the transportation issues are addressed “as they come”. In recent years, however, there has been growing recognition of the need to promote sustainability in planning improvements for transport systems and policies. Growing awareness about multiple dimensions to the impact of transport and the costs that it imposes – economic, social, and ecological supports the need for “sustainability”.

3.1 Issues and challenges in urban transportation

Factors influencing urban transportation vary from country to country depending on the economic growth levels. Population growth and urbanization as well as inadequate infrastructure are considered as the major determinants of transportation problems in Asian urban hubs.

As pointed out previously, Asia has been experiencing very high population growth and urbanization as well as migration. This will have important implications for access to mobility, the organization of freight movements and, in particular, the role of interconnectivity among major urban areas as the centres of employment, production, and consumption. Infrastructure development is essential to enable better access to basic services for an increasing population.

Although proper infrastructure is essential, significant infrastructure investment gap in the developing Asian countries has been noticed, amounting to about half of the estimated total investment requirements in the transport sector. Such a gap would have to be filled through a combination of improved productivity and methods of financing. However, globalization, reduced investor confidence and the Asian financial crisis have had significant slowdown effects on investment levels and demand in this region (UN-ESCAP 1994). Increasing inter-regional and intraregional trade as a result of globalization lead to increased transportation activity in this region. This has again stimulated demand for infrastructure, creating new financing challenges. Currently with the recovery of economies, the gap is set to reduce and private sector and International financing agencies have a major role to play in further reducing this gap. However, with overall world trade increasing at around 10 % a year in volume terms, the implications for infrastructure and transport services are

significant, and it has become essential for Governments to find ways to finance new infrastructure, together with ways to increase the capacity of existing assets.

With above forces driving the change, Asia is confronted with variety of transportation problems and challenges. A few such challenges are growing motorization, financial burden on the public revenue, poor and inadequate public transport, severe traffic congestion, air pollution, lack of participation by stakeholders in the planning process, growth of vehicular stock, meeting the travel needs of the poor, institutional weakness and capacity-building (IGIDR 2001, AIT 2002, UN 2001).

3.1.1 Growing motorization, congestion and vehicular control

There has been a considerable increase of motorization in almost all countries in this region with a few exceptions in Central Asian cities (World Bank 2004). However, there are significant variations in the level and rate of motorization among cities, partly due to differences in income levels and government policy. The number of vehicles in Bangkok grew more than sevenfold between 1970 and 1990 where as in Beijing it was threefold increase between 1991 and 2000. Similar trends in growth occurred in Jakarta and Kuala Lumpur. Trends of rapid growth in motorization was observed in Indian cities since mid 90's following the introduction of economic reforms that lowered costs and increased the affordability of passenger cars (Ramanathan 2000). During this phase, Mumbai has registered an annual growth of motorized vehicles of about 10 % in recent years, while between 1995 and 2000, Delhi's total motor vehicle population grew from 2.4 to 3.3 million (Iyer 2001, IGIDR 2001).

Other indicators of increased motorization are vehicle density and cars per 1000 persons. The strong fleet growth compared with low road network growth has resulted in rising vehicle-densities in nearly all countries and thus reflects an increasing pressure on networks. The highest density can be found in Hong Kong, China, at 283 vehicles per road-kilometre. At the lower end, India shows a ratio of only four vehicles per road-kilometre (World Bank 2003b). Brunei, Australia, and Japan have the highest rates of cars per 1000 population, with about one private car per two persons. India, China, Myanmar, Nepal, and Bangladesh have the lowest motorization, with rates of less than five per thousand.

The exponential growth of motorized two- and three-wheelers is another visible trend in Asian cities. In many countries, such as Thailand, Malaysia, and Indonesia, two- and three-wheelers make up over half of all motor vehicles and the number is expected to grow very rapidly in China, Vietnam, India, and other low-income countries (AIT 2002).

Congestion is a common mark of motorization in most growing cities of the region. The central parts of many capitals, such as Bangkok, Delhi, Dhaka, Jakarta, Metro Manila, and Seoul, are particularly congested, with weekday peak-hour traffic speeds reported to average 10 km per hour or less. One estimate put the average travel time for work trips in Asia at 42 minutes. In large cities, this number can be much higher, as in the case of Bangkok, where the average is estimated to be about 60 minutes. The commuting time to work in some cities is as high as 90 minutes (UN-HABITAT 2001, World Bank 2004). Such high level of congestion gives away significant social

loss. A study on Bangkok estimated that the direct economic costs of congestion could be as high as 163 billion baht annually. A recent World Bank study estimated that a 10 % reduction in peak-hour trips in Bangkok would provide benefits of about US\$ 400 million annually (UN 2001).

Controlling vehicular growth needs a two-sided approach. One is appropriate pricing and the other is demand side measures to control the growth and usage of vehicles. Due to imperfect systems of transport pricing, prices do not reflect the true cost of the provision of the transport services and facilities. This is very clearly observed in developing countries of this region like India, Philippines, and so on. This leads to insufficient funds to develop and maintain infrastructure, distortions in modal choice, and the generation of externalities (pollution and congestion).

3.1.2 Inadequate public transport services

Compared with private cars, public transportation is more sustainable on economic, financial, social, and environmental grounds. Public transportation provides the basic transportation for millions of poor and other disadvantaged people in this region. However, the inadequate and poor quality services extended by the public transportation system fails to meet the expectations and leads those people who can afford it to turn to private modes of transport. Another common problem in many cities is that women, people with disabilities, and other disadvantaged groups have poor access to public transport services and that it is found difficult to meet their basic mobility needs.

In Asia, few cities with higher economic power could establish a strong public transport system. Many cities such as Hong Kong, Singapore, and Tokyo, where the modal share of public transport is 70 % or more of total person trips, are deemed public-transportation oriented. In other cities like Bangkok, Jakarta, Manila, and Mumbai the modal share of public transport varies between 40 and 60 % of total person trips (AIT 2002).

Public transport is capital intensive and lack sufficient investment making it a difficult fact to the States. Private sector participation and partnerships are gaining importance in this sector. Another important aspect of public transport is “pricing”. Improper pricing policy can result in significant impacts on real estate value, essential commodities, cost of living and would influence the dynamics of slums in mega-cities.

3.1.3 Increased burden on the State

Providing road infrastructure to meet the growing traffic and vehicles is the responsibility of the state and the failure to charge users for various reasons make it much more difficult to the state to meet these huge investments involved. Consequently, transport infrastructure development has remained mainly the responsibility of the public sector, putting an enormous financial burden on national and urban local governments. Private sector investment has been very marginal even in mega-cities like Bangkok and Mumbai.

3.1.4 Air pollution

Transportation has been a significant contributor to air pollution and 70% of air pollution in Delhi was contributed by transport sector (Ramanathan 2000). In Bangkok, Beijing, Delhi, Dhaka, Karachi, Jakarta, Manila, Mumbai, Seoul, and Tehran, suspended particulate matter (SPM) exceeds the World Health Organization guidelines (World Bank 1997). With respect to the health problems, PM10 and PM2.5 are considered very important and transport sector is a major contributor of these pollutants. The conditions are no different with respect to the levels of other pollutants such as carbon monoxide, sulphur oxides, lead, and nitrogen dioxide. The existence of a large number of vehicles with poor emission control standards and the low quality of available fuel are the two primary reasons for this situation. In some cities, the prevalence of three-wheelers with two-stroke engines has further aggravated the situation. The World Bank has estimated the economy wide costs of air pollution in many Asian Cities and it was surprisingly high, almost matching 10% of the city income in some cases. In developed countries of the region such as Japan, the problem of NO_x pollution is very explicit indicating the role of the transport sector in air pollution.

Figure 2 shows the average concentrations of air pollutants in 15 major Asian cities from 1990 to 1999. Suspended particulate matter (SPM) and PM10 are particularly serious problems. For example, SPM concentrations in Beijing (China), Calcutta (India), and Chongqing (China), are just under four times, and New Delhi just under five times, the World Health Organization (WHO) environmental standards (90 $\mu\text{g}/\text{m}^3$).

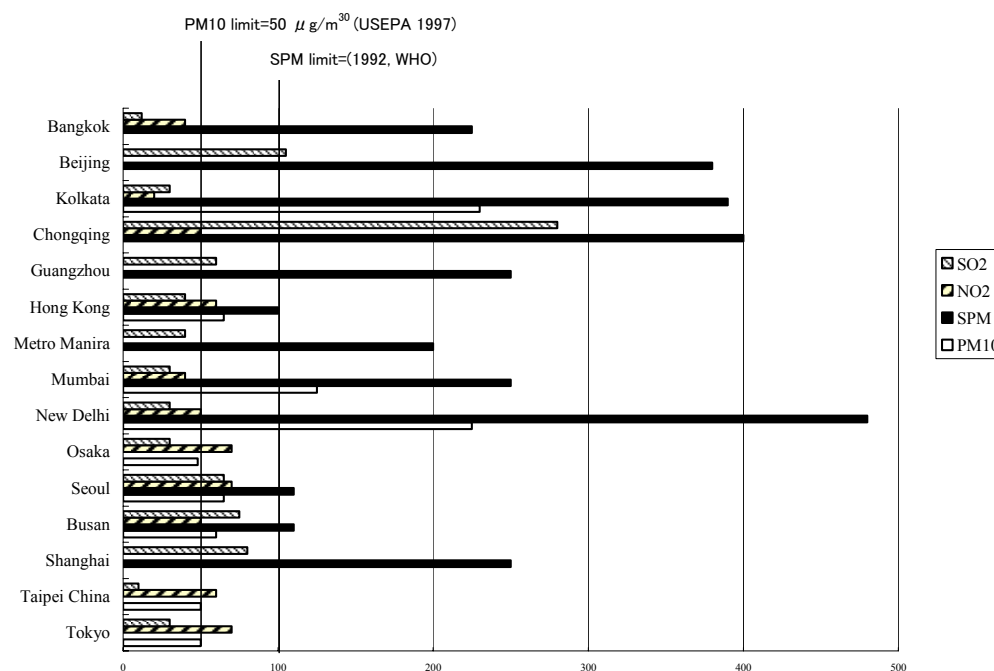


Figure 2. Average annual pollution concentrations, by city (1990-1999).

Source: *Reduce Vehicle Emissions in Asia* (ADB 2003)

Besides combustion and other uses of coal in factories and elsewhere, automobile emissions are also thought to be major causes of these high SPM and total suspended particulate (TSP) levels.

3.1.5 Other issues

Apart from the above direct issues, there exist few very important but indirect issues in transport sector. They belong to institutional aspects and participation of stakeholders. Two of such important issues are *institutional weakness and capacity building* and *lack of participation by stakeholders in the planning process*.

Urban local governments in most cities have serious capacity constraints on planning, developing, and managing efficient transport systems. In many cities, a common problem is fragmented responsibility for transportation among many agencies. This tends to encourage a sectoral approach to planning with plans being prepared with different financing and implementation arrangements and lack effective institutional mechanisms to examine their mutual compatibility or interrelationships. Because of this, urban transport development in many cities confronts serious difficulties, including delays in project implementation, wasteful investment, and so on. Lack of appropriate institutional arrangement to form partnerships with private sector is another major capacity limitation observed in the region. Few cities in the region are in the planning or initial phase of achieving betterment on these aspects of planning and capacity development.

Another common deficiency in the practices of urban transport development is that not all stakeholders are involved in the decision-making process. Although changes have started to take place slowly in some countries, large institutional mechanisms to ensure the participation of all social groups including women, the poor and other marginal groups are still non-existent.

3.2 Strategies and trends in urban transport development

In spite of the low economies, several Asian cities have taken up measures to improve their urban transport systems and initiated measures to integrate urban transport in development planning. The following sections examine some of the major issues in urban transportation.

3.2.1 Improvement in public transport and rail-based systems

With the increased awareness of the advantages of public transport, many cities in the regions have been actively considering to strengthen their public transport system through the improvement of existing services and the introduction of new services. Premium (air-conditioned) bus services are now available in a large number of cities in the region. Cities with relatively higher incomes such as Bangkok, Kuala Lumpur, Shanghai, and Shenzhen have introduced higher-quality buses on their roads. Low-income cities also have started higher quality buses, though on experimental basis.

Cities with more advanced forms of transportation such as Singapore and Hong Kong, China have successfully integrated their various public transport services provided by multiple operators, such as the underground and bus systems. Some low-income cities like Mumbai have successfully implemented metro rail transport system. Delhi has been planning to introduce a metro network system with a network of buses feeding to the newly developed metro rail system (IGIDR 2001).

Many cities in the region have developed rail-based systems and some others are in planning stage in response to the shortcomings of road-based transport systems to meet growing demand in very large cities. Bangkok (Thailand), Busan, Incheon and Seoul (Republic of Korea), Kolkata, Mumbai and Delhi (India), Kuala Lumpur (Malaysia), Beijing, Guangzhou, Shanghai, Shenzhen, Daegu, and Tianjin (China) have implemented projects or are undertaking major extensions for their existing systems, while cities such as Bangalore, Dhaka, Hyderabad, Karachi, and few cities in China are actively considering rail-based systems. Almost all cities having rail-based system are considering possible extension of the existing system to meet the growing demands.

3.2.2 Switching to cleaner fuels to improve air quality

Air quality in many Asian cities has deteriorated and transport sector has been the main culprit. Delhi, Bangkok, Manila, and other mega-cities have experienced tremendous air pollution resulting from vehicular traffic. The present levels of air pollution have prompted many cities to undertake measures to improve air quality. Most common measures across cities include the introduction of lead-free petrol and low-sulphur diesel; the introduction of vehicle emission control standards and a mandatory regular vehicle inspection system; the promotion of cleaner fuels like liquefied petroleum gas (LPG) and compressed natural gas (CNG) for commercial vehicles (Table 2); the banning and phasing out of certain types of vehicles; and restrictions on diesel vehicles.

In such efforts to control pollution, Delhi has banned the operation of all diesel-powered buses and trucks and ordered the conversion of entire bus fleet to compressed natural gas (CNG). At present in Delhi, all public transport vehicles including the feeder services run on CNG. Other mega-cities like Mumbai are following similar conversion programmes (Yedla 2004). India has successfully implemented lead-free gasoline programme all over the country. Few such similar efforts to control pollution from urban transport in different cities are – Bangkok is implementing an air quality management project; Manila has an anti-smoke-belching programme; Jakarta has introduced an inspection and maintenance programme for private cars; Delhi and Mumbai imposing restriction on entry of old vehicles into the city area, ban on older vehicles, mandatory inspection and maintenance programme and Dhaka has undertaken a programme to phase out two-stroke engine three-wheelers (UN 2001). Unleaded petrol is now available in most of the countries. Nevertheless, its market share that is not very high in few developing cities due to improper pricing is slowly gaining momentum.

Table 2. CNG buses in different cities around the world (2000)

City	Total buses	CNG buses	% of CNG buses
Los Angeles	2,638	795	30.1
New York	5,675	358	6.3
New Jersey	3,094	55	1.8
Toronto	1,500	125	8.3
Berlin	1,700	10	0.6
Paris	4,000	53	1.3
Rome	2,383	40	1.7
Madrid	1,000	15	1.5
Athens	1,500	40	2.7
Sydney	3,900	254	6.5
Brisbane	1,100	12	1.1
Melbourne	1,400	24	1.7
Shanghai	18,500	330	1.8
Beijing	10,000	1,640	16.4
Seoul	8,200	880	10.7
Delhi	12,000	6,175	51.5

Source: NGV Statistics (2002)

Most of the cities with air quality management programmes have identified priority areas for improvement. Most of the cities in Asia, Bangkok and Delhi for instance, have identified particulates as the main target for improvement of air quality, and are therefore concentrating on interventions to target diesel-powered buses and trucks, since they are the major sources of PM₁₀.

3.2.3 Private sector participation and partnerships

The increased participation of the private sector in providing urban transport infrastructure and services is an encouraging feature of transport development in many Asian cities. Major toll roads and rail transit systems have been developed in Bangkok, Kuala Lumpur, and Manila with private sector participation. The private sector is also assuming a greater role in providing transport services. The number of standard (non-air conditioned) buses operated by private operators in Bangkok has increased during 1996-2001. The deregulation of bus fares has encouraged private operators in Dhaka to introduce a large number of buses. Because of a new franchising scheme in Pakistan, the private corporate sector has introduced large fleets of buses in Lahore and Rawalpindi/Islamabad (UN 2001). Partnerships among major actors like public and private, national and international governments in providing urban environmental infrastructure is on rise and gaining momentum in Asian Cities (Chang et al. 2001).

3.2.4 Applications of Intelligent Transport Systems technology

The application of Intelligent Transport Systems (ITS) technology is an important mark of transport development in cities with relatively advanced systems of transportation. The major application areas of ITS technology include electronic road pricing, traffic management, integrated ticketing systems for different public transport modes, and traveller information. Typical applications like en-route traffic information systems using Variable Message Sign, traffic surveillance and incidence management are quite common, especially for the management of expressways. Electronic Toll Collection (ETC) is in use in many developing countries such as China, Malaysia, Philippines, and Thailand. Hong Kong and Singapore have introduced more comprehensive electronic toll and parking fee management systems. The introduction of smart card integrated ticketing systems for public transport systems is another significant development, with the first large-scale smart card integrated ticketing system introduced in Hong Kong in 1997. The contact less cards offer a common ticketing system for more than 30 transit operators providing bus, ferry and rail services (Frost 2001). A similar system is currently used in Singapore.

3.2.5 Participatory approaches to integrated comprehensive urban transport planning

The faster growth experienced in Asian cities and the trends of urbanization and expansion of already over crowded mega-cities sends alarming signals to the city planners and urban transport departments. The conventional approach of handling environmental problems in sectoral basis needs to be replaced by a “metropolitan” approach (IGES 2003). Such integrated approach is necessary in urban transportation. Involving community in planning process provides a better scope for the successful implementation of projects. These principles have been guiding the implementation of a pilot project in the Rattanakosin area of Bangkok, which is being jointly implemented by UN-ESCAP and the Bangkok Metropolitan Administration in close collaboration with the Government of the Netherlands (UN 2001). In contrast to top-down approaches, integrated approaches are based on methodologies that develop a broad-based consensus on an achievable vision of the future and clearly articulate the means by which the visions can be realized.

3.2.6 Integration of local pollution control measures and GHG mitigation measures

Urban transport sector in Asia has been contributing substantially to greenhouse gas (GHG) emissions and an action to control it is necessary. However, it is difficult to consider GHG mitigation in urban transportation planning because the developing cities in Asia do not have any obligation to control their GHG emissions. In addition, the policy makers are more towards controlling local pollution resulting from transportation. However, GHG mitigation presents a “win-win” situation for local policy makers with better financing opportunities from overseas actors. Hence, with the possibility of FDI and Clean Development Mechanism (CDM) projects in urban transportation, which is capital intensive, it was found that Asian cities are working actively in integrating GHG mitigation strategies and local pollution control strategies

while devising their urban transportation strategies. It was found that such integration results in substantial co-benefits; for instance, TSP and SO_x could decrease in different scenarios for CO₂ mitigation (Yedla et al. 2003).

4. Municipal solid waste management

4.1 Issues and challenges on MSW management in Asia

Population growth, urbanization, and economic development are main driving forces for municipal solid waste management (MSWM) issues in Asia. The high population growth and urbanization together with economic growth greatly accelerate consumption rates in Asian developing cities; it also accelerates the generation of waste, as well the changes in waste components. The amount of waste rises to levels that are difficult and costly to manage. However, poor and developing cities of the region still lack the proper management capacity to deal with the increasing volume of waste and its changing characteristics. On the other hand, waste management in economically developed Asian countries is overwhelmed due to overpopulation and economic affluence (Mendes and Imura 2004a).

The volume of waste disposed tends to rise along with economic growth, but the current situation in developing countries may be worse than what Japan experienced in the past. Figure 3 shows a comparison of the garbage volume and GDP-PPP per capita for Asian countries and major cities. In Japanese cities, the waste problem attracted attention as a social problem in the 1970s, and then infrastructure improvements were promoted. Recycling and waste reduction were strongly encouraged after the “oil shock” of 1973. Municipal solid waste daily generation in Japan in 1970 was about 830 grams per capita. In countries and regions including Thailand, Malaysia, Sri Lanka, Shanghai and Hanoi, the income levels are still lower than Japan’s was in 1970, but their waste daily generation have already exceeded 800 grams per capita.

4.1.1 Institutional, managerial, and regulatory aspects

Institutional deficiencies, inadequate legal provisions, and resource constraints are among common problems for MSWM in Asian developing countries. Long- and short-term plans are lacking due to capital and human resource limitations and there is a need for financing instruments for MSWM, training specialists and capacity building (Ogawa 1996, IGES 2001, Zurbrugg 2002, Mendes and Imura 2004a). In some areas, such as the Indian sub-continent, planning and management are strongly affected by bureaucracy; however, there is a trend for decentralization, i.e., municipalities are expected to play a major role in the management of waste. In cases where laws and regulations exist to deal with MSWM in developing Asian countries, they are inadequate. National policies are now being formulated in several countries; however, lack of authority to enforce effectively environmental regulations is a major problem.

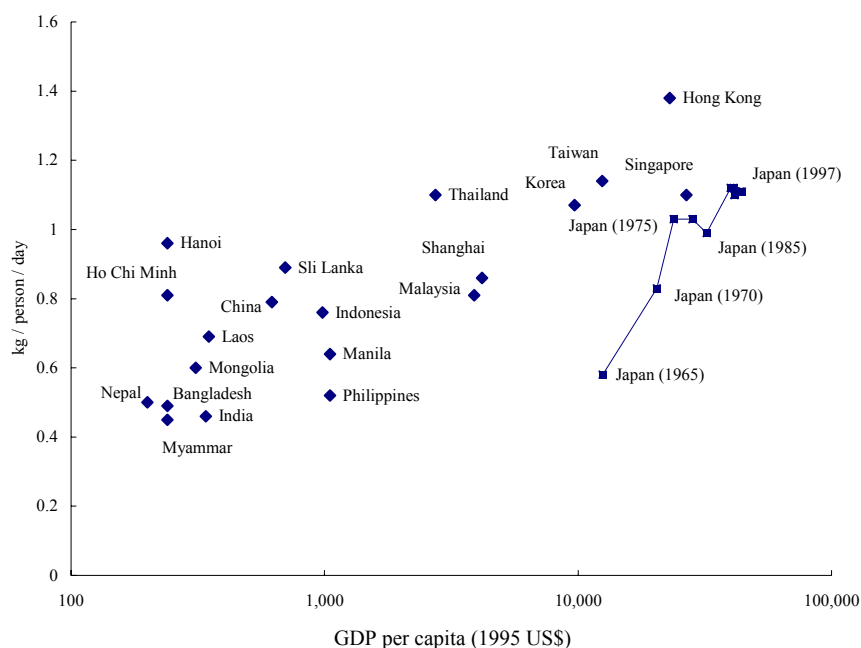


Figure 3. Waste Generation Rates for Selected Asian Cities

Source: World Bank (1999) and Nakagawa (2003)

In developed areas of the region, such as Japan, South Korea, Singapore, and Taiwan, the picture is different. Financial resources and skills are available, and plans are set up with short-, medium-, and long-term objectives. Although the waste is well managed, the large amount of waste as well as land scarcity poses challenges to waste managing authorities. The treatment usually consists of incineration of combustible waste and landfilling of inerts and residues from incineration. There are well-structured programs to monitor waste management operations, including leachate and gas emissions from landfill. Since the late 1990s, Japan, South Korea, Singapore, and Taiwan have been implementing policies for the promotion of recycling and more efficient use of resources in order to decrease the amount of waste for treatment.

Table 3 summarizes the conditions regarding urbanization, economic indicators, and waste management for cities at different per capita income level.

Low-income Asian cities, such as Dhaka, Kathmandu, and Phnom Penh, are challenged by urbanization and industrialization trends, increases in population, and consequent increases in waste. Poor government policy and response, lack of political will, lack of appropriate economic and human resources, technical inefficiency, and weak institutions at the local level, result in poor management of waste, especially in large cities. Another common problem is lack of transparency in budget use and corruption (personal communication). As a result, these cities face major problems related to public health and environmental pollution. Additionally, there is not enough experience and expertise on waste management.

Waste problem has been gradually recognized as an important issue in the policy arena of rapidly developing cities (middle-income cities). Despite the recognition of the importance of proper SWM, lack of funds, low capacity management, and

inefficient regulation enforcement together with the increasing amount of waste are barriers for a proper management (Mendes and Imura 2004a). Several national and local governments are structuring policies towards proper waste management, as in the Philippines and Indonesia; however, enforcement and monitoring has been deficient. Moreover, waste management plans, when existing, are somehow short-lived; their length depends on the political will and interests of the decision makers when there is a change on power.

Table 3. Overall MSW management issues in Asian cities by income level

	Low-income	Middle-income	High-income
PPP GNI per capita 2002	Less than 2,000	2,000-15,000	More than 15,000
Barriers	Poverty Financial constraints Poor management capacity	Urban growth Low management capacity	Excess of waste Varied waste composition Land scarcity
Waste characteristics	High bulk density High organic content	Evolving or changing characteristics (transition)	Low bulk density High plastic content
Waste management	Priority to collection and transportation	Gradual improvement of final disposal	Advanced treatment Appropriate and well monitored final disposal
MSW collection rate (%)	<70	80-95	95-100
Rate of expenditure in total budget (%)	15-40	5-25	1-5
MSW generation per capita (kg/p/d)	0.3-0.7	0.5-1.5	>1.0
Recycling	Informal	Formal + Informal	Formal
Examples	Dhaka, Kathmandu, Karachi, Phnom Penh	Beijing, Shanghai, Guangzhou, Bangkok, Kuala Lumpur, Manila	Tokyo, Taipei, Seoul, Hong Kong, Singapore, Macao

Note: a) GNI-PPP per capita is the gross national income in purchasing power parity.
Source: Mendes and Imura (2004a)

Although high-income Asian cities have the necessary skills and resources for SWM, it is a demanding activity due to the high amount of waste and lack of disposal sites. Developed cities across the region are highly populated, land prices are costly, and oppositionist reactions towards waste facility siting are strong (“Not In My Backyard” (NIMBY) syndrome) making the development of disposal sites difficult. In smaller cities, local governments involve the population in activities towards reuse and recycling of waste aiming at minimizing the amount of waste to be disposed. In larger cities, however, unsustainable lifestyles, characterized by high consumption patterns, busy lifestyles, and low incentives for reuse and recycling, have created a “throw-away” consumer culture, in which the amount of waste generated has increased in scale.

Table 4 presents a comparison of the institutional aspects of MSWM in Asian cities according their per capita income level. There is a clear distinction among the cities in several aspects of planning and management.

Table 4. Institutional aspects in Asian cities by their per capita income

	Low-income (< \$2,000)	Middle-income (\$2,000 – 15,000)	High-income (> \$15,000)
Management capacity	Poor	Need of further capacity building and financing	Appropriate
Planning	Lack of planning	Short term plans	Medium and long term plans
Regulation	Lack of legal requirements (if any, poor enforcement and monitoring)	Some regulation on SWM and environment, but poor monitoring and enforcement	Well monitored and enforced legislation

4.1.2 Financial constraints and increasing expenditures

Financial constraints are one of the main barriers to proper SWM in less developed and developing Asian cities.

Particularly in low-income cities, there is a need for financing and improvements in management capacity. In these cities, despite MSWM services account for a high percentage of municipal budgets, the waste collection is inefficient. In some Asian cities, the expenses on MSWM can reach 40% of the municipal operating budget, and of this, 70-90% is spent on collection. For instance, Kathmandu spends 38% of the municipal budget in MSWM, while 93% of this is spent in sweeping, collection, transfer, and transport of the waste (Manandhar 2002). Financial options vary; in Phnom Penh, for instance, part of the collection service is performed by a private company, which directly issues the waste collection fee to households in their electricity bill. In Surabaya, the waste transport and disposal fee is collected together with the water bill in those households that are connected to water supply system.

Figure 4 shows the relationship between the per capita expenditure for municipal solid waste management and per capita income in Asian countries. It suggests that the increase in per capita income will accelerate the demand for both public and private services for MSW management. Larger expenditures will be necessary for collection services as well as construction and operation of treatment and disposal facilities (IGES 2001). Therefore, financing methods for the improvement of MSWM have become important for cities that have achieved a certain level of economic development.

4.1.3 Inadequate treatment and systemic inefficiency

There is a relationship between per capita income and status of the waste management. Municipal solid waste management tends to be more efficient in those cities with higher income as indicated in Figure 5, which presents the collection rate in selected Asian cities. It is worthy to point out that this corresponds to national average income; per capita income in the main cities tends to be higher than in remaining cities of the country. For instance, Shanghai's GRP is much higher than in other parts of China.

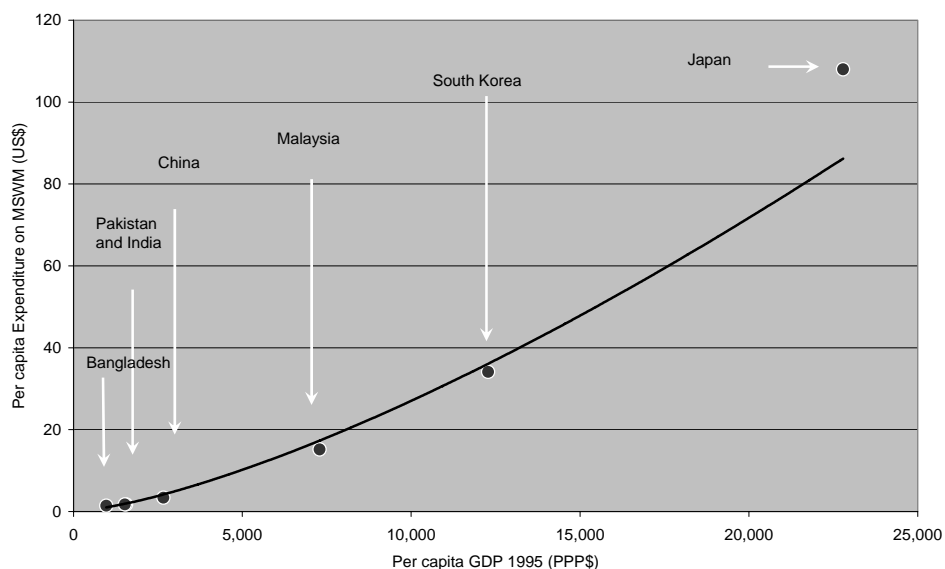


Figure 4. Relationship between expenditure on MSWM and PPP in Asian countries

Note: National data is used for the following countries: Japan, China and South Korea (1995). Data on selected cities is used for other countries: Kuala Lumpur, Malaysia (1994); Lahore, Pakistan (1985); Madras, India (1995) and Dhaka, Bangladesh (1995).

Source: IGES (2001)

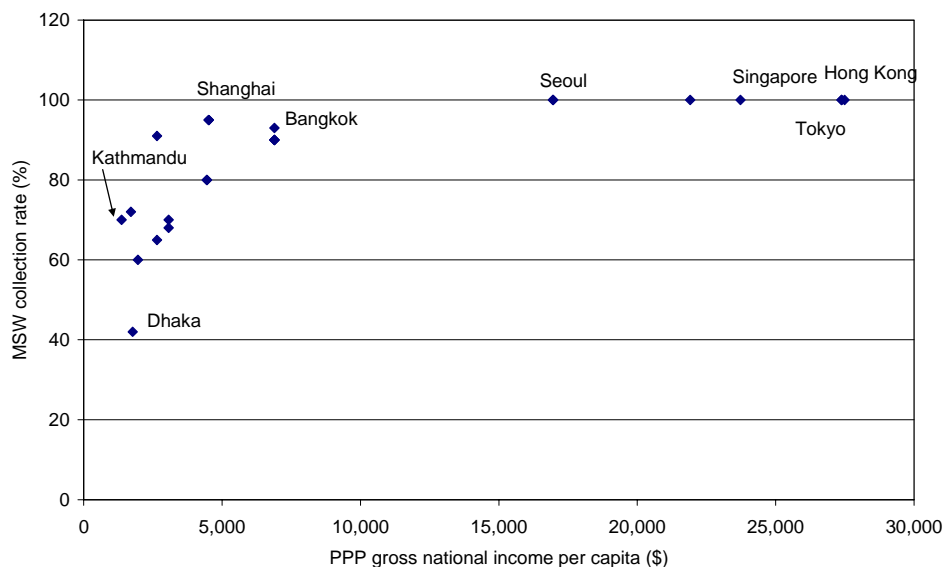


Figure 5. MSW collection rate vs. the national per capita income (PPP) for selected Asian cities

Source: IGES (2002) and Mendes (2005)

Inefficient waste management is common in several low-income cities. Reasons for this include lack of management capacity and economic resources as discussed previously. In these cities, waste collection can be very inefficient, i.e. with a low collection rate. For instance, Dhaka, a city of 10 million inhabitants, has a collection system with no more than 40% efficiency. Furthermore, the collected waste is not properly disposed.

Waste treatment is still missing or inadequate in most of the Asian cities. Open dump is still a main form of waste disposal in most less developed and developing cities; however, sanitary landfill is increasingly being adopted in cities in economic transition. Inadequate waste disposal leads to various health-related, environmental, and social impacts, such as spread of diseases, water and soil contamination, toxic and greenhouse gas emissions, loss of economic value of properties, and so on. Incineration is common in more developed areas such as Singapore as well as Taiwan, Japan and South Korea. Table 5 summarizes the current waste treatment and recycling options adopted in Asian cities at different income level.

Table 5. Technologies on SWM in Asian cities

	Low-income	Middle-income	High-income
Current status	Low technology, low costs	Intermediate situation, tendency to adopt higher cost technology	High technology
Waste treatment technology	Open dumps Community based or yard composting	Open dumps Composting Semi-engineered landfill Sanitary landfill Incineration	Mainly incineration Offshore landfilling Gas extraction from old landfill Electric home composter Ash treatment
Recycling	Low technology Low costs Collection by informal sector		High technology High costs Collection by formal sector, mainly municipalities

4.2 Meeting the challenges in waste management

As described previously, developed and developing cities are facing different sets of issues in MSW management. The major new trends of MSWM in developing cities are improved community participation and private-sector involvement in service provision. Trends in developed cities are toward strategies to realize a “sound material-cycle society”.

4.2.1 Private sector participation

As financing is one of the major constraints in MSW management, along with lack of efficiency, appropriate partnerships between the public and private sectors is potentially one of the most viable solutions, bringing in new resources and business know-how. Efforts are being made to introduce such partnerships in several Asian cities.

In East and Southeast Asian countries, the private sector is playing an increasing role in construction and operation of MSW-disposal facilities under lease and concession contracts. MSW-related business in Malaysia, including construction and operation of waste collection and disposal facilities, has been transferred to several private companies under concession contracts. Similar contracts have been tendered to private companies for construction and operation of MSW-disposal facilities, such as landfill and incineration plants, in the Philippines, Thailand, Hong Kong, Macao, and Singapore. However, the requirements for advanced technology and emissions control in such projects tend to be stricter than for those operated by local governments (IGES 2001). For this reason, the role of the private sector is mainly limited to collection and transfer of waste (Table 6).

Table 6. PSP examples in MSW management in selected Asian cities

Municipality	Private Sector Role
Bangkok ¹⁾	Transfer and disposal
Bhopal ²⁾	Composting (20% of waste, 120ton/day)
Chiang Mai ¹⁾	Collection of waste
Kathmandu ²⁾	Pilot project on privatization of the collection and transfer
Lampang ¹⁾	Collection and disposal of waste
Macao ³⁾	
Pattaya ¹⁾	Collection and transfer of waste
Phnom Penh ³⁾	Collection in central area
Phuket ¹⁾	Collection of 50% of waste, incinerator operation and fee collection
Ulaanbaatar ²⁾	Collection and transfer
Yangon ²⁾	Collection

Sources: 1) World Bank 2003a; 2) IGES 2002; 3) Memon et al. 2004

Two more examples demonstrate how much the success of private-sector participation in MSW management waste depends on context. Since 1994, the Municipality of Phnom Penh has entrusted its waste-management services to private contractors with franchise agreements allowing them a monopoly. However, the service provider has changed six times, mainly due to financial constraints (JICA 2003). Macao, with less than half a million population, has effectively involved the private sector in MSW collection and disposal. Since 1992, the collection and transportation of MSW and incineration have been contracted out to two private companies. This has improved both systemic and financial efficiency (UN 2003).

Another initiative receiving considerable attention is waste composting in Dhaka, Bangladesh. Waste Concern, a research-based NGO, started an initiative to promote

community-based efforts for primary collection of waste, as well as to encourage composting to reduce final waste disposal quantities. By developing a partnership with a private fertilizer company, they have managed to market successfully their compost, which is a key to the success of any composting project (Zurbrugg et al. 2002).

Although most of the initiatives described here have been relatively successful, they have faced many bottlenecks in their implementation. Moreover, such measures are situation specific and need to be devised on a case-by-case basis. For the most part, the public sector is likely to continue playing the dominant role in MSW management.

4.2.2 Promoting public awareness and participation

Municipal solid waste management is a complex activity due to its direct relation with people's behaviour. Therefore, environmental awareness and public participation are key factors in identifying long-term solutions for this problem. Management of solid waste in both developing cities and developed cities cannot be considered isolated; it has to be analyzed in the context of other issues, such as urbanisation level, stage of economic development, and educational level of the population (Mendes 2004).

In less developed cities, where sanitation is poor, waste problems emerge; for these cases, it is necessary to build awareness of hygienic and sanitary conditions. In rapidly industrialising cities, rapid urbanisation and a constant change in consumption patterns and social behaviour cause massive waste generation beyond the management capability of the local governments. Many local municipalities with their limited human, technical, financial, and institutional capability demonstrate low capacity to cope with the multi-dimensional problems of solid waste management. This leads to inadequate sanitary conditions in communities, creating a need for the involvement of other institutions, the private sector, NGOs, and residents to deal with these problems effectively and efficiently. In developing Asian countries, NGOs could play a more effective role in the improvement of solid waste management if they were given more recognition by the municipal authorities or if they were involved in the decision-making. Community participation in waste management is vital for improvement. Traditionally, decision-making has been top-down, with little or no input from local communities. However, a grass-root movement has started in places where the municipal authority does not carry out primary collection; in these areas, residents have created community organizations to collect waste (Mendes and Imura 2004a). Community-based waste collection has been adopted in several localities, for instance, Bangladesh (Dhaka), India (Bangalore, Madras, Mumbai), Indonesia (Jakarta), Sri Lanka (Colombo), Pakistan (Karachi), Nepal (Patan, Kathmandu), and the Philippines (Manila, Cebu, Quezon). The Philippines is among the countries that adopt a bottom-up approach towards environmental issues, including waste management; NGOs are active in the decision-making process of the local government. Increasing public participation at the collection stage is crucial to improve waste management. In Asia, there is a general trend towards raising public awareness and increasing participation, though significant public participation is still far from a reality.

Developed cities faced problems similar to those of developing cities in the past, and their population possess the experiences of coping with environmental issues,

including waste management. However, since the municipal authorities have now the necessary skills and resources to manage MSW, the management approach is centralized, and NGOs are not directly involved in the management of waste. In Japan, for instance, NGOs restrain their activities to awareness-raising and recycling activities (Mendes and Imura 2004a).

As an example of raising public participation, there is the case of Nonthaburi City, Thailand. The government of Nonthaburi City on the outskirts of Bangkok launched a pilot project under the Kitakyushu Initiative,⁵ to reduce final waste by increasing the level of recycling through public participation. Through active dialogue with the public; distribution of information materials to every household about recycling through source segregation; and providing plastic bags and bins for recyclable material to every household, a 20-% reduction was achieved in the waste that needs to be disposed (UN 2003). Some similar efforts that have been documented include one by Waste Concern in Dhaka (Enayetullah and Sinha 1999), Stree Mukhthi Sanghatan, and Exnora in Mumbai, India (Yedla and Kansal 2003).⁶

The incentives for public participation in MSW management include improvement of the sanitary and environmental conditions, transparency of the decision-making process, and opportunities to provide input on decisions that affect the communities. Municipalities that implemented recycling programs report that the return of the revenue from selling recycled items to the community is one of the major incentives for participation in source separation. Table 7 shows an analytical framework for public participation in MSW management.

Table 7. Analytical framework for public participation in solid waste management

Driving forces	Forms	Approaches	Activities
Political will, governance, institutions: decentralization and regulation, economy and market, public pressure	Community participation, NGO and NPO involvement, participation of business owners, and other stakeholders	Grass-root (bottom-up) or top-down	Awareness campaign, source separation and recycling, cost sharing for waste treatment and disposal, site selection for waste treatment and disposal, decision on type of waste treatment

Source: Mendes (2004)

⁵ More information on different cases of private sector participation in the countries listed can be found on the Kitakyushu Initiative home page: <http://www.iges.or.jp/kitakyushu>. The Kitakyushu Initiative was adopted during the Third Ministerial Conference on Environmental and Development held in Kitakyushu, Japan, in 2000.

⁶ Most of these efforts are local in nature and carried out by NGOs and community-based organizations. However, the role of the state in such efforts is not inconsiderable. More information on such “best practices” can be found at <http://www.iges.or.jp/kitakyushu>.

4.2.3 Efforts towards achieving sound material- cycle society

In developed cities, the need has been felt for waste minimization and resource recovery in order to cope with the increasing volume and variety of waste, increased difficulty of processing, and shortage of landfill space. In several places, the 3 Rs – Reduce, Reuse, and Recycle – approach are being adopted (Mendes and Imura 2004a); better use of natural resources has been incorporated into national policy agendas with the intention of moving toward a “sound material-cycle society” or “cycling economy” (Figure 6).

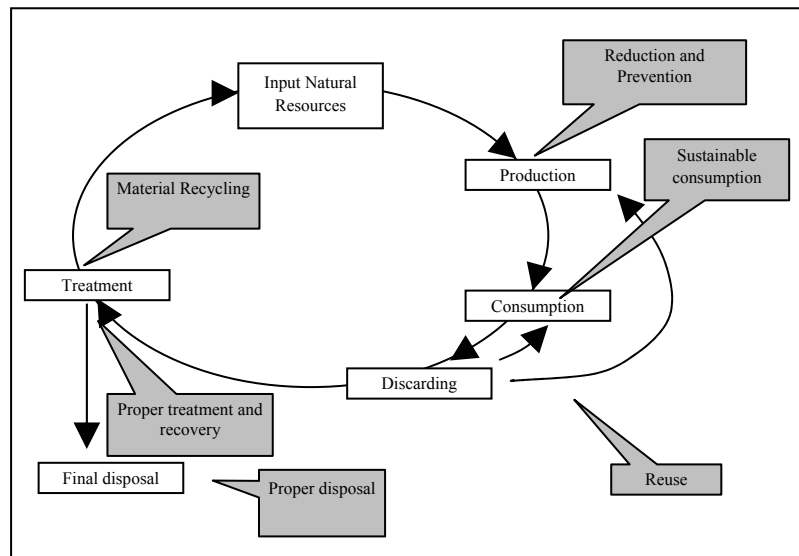


Figure 6. Concept of a sound material-cycle

Source: Modified MOE (2003)

The sound material cycle is an extension of the traditional waste management line both backwards, including the stages before the resource became waste (that is, consumption, production, natural resource extraction); and forwards, through recycling. A sound material-cycle society is characterized by the cycling of resources, by a lower input of natural resources, smarter design of products, more efficient manufacturing, and more sustainable consumption, as well as reuse, recycling, and proper treatment of materials that cannot be further utilized. Strategies towards a sound material-cycle society affect all stages of the life-cycle of a product, influence several industrial segments, and involve several actors, including governments, the private business sector, development organizations, media, public groups, and individual consumers (MOE 2003).

Since the late 1990s, Japan, South Korea, Singapore, and Taiwan have been implementing policies for the promotion of recycling and more efficient use of resources. Japan enacted the Law for the Promotion of the Recycling Oriented Society in 2000 (MOE 2003), renamed as Promotion of the Sound Material Cycle Society in 2003. In South Korea, the Act relating to Promotion of Resources Saving

and Reutilization was revised in 1999 with stronger fines and regulations (Seoul Metropolitan Government 2000). Singapore and other developed regions in Asia are following the same trend by launching specific policies promoting waste minimization and recycling. China, as well, has developed an ambitious development plan with the objective of attaining an overall well-off (*sha kong*) society involving the concept of a circular economy by the year 2020 (Cleaner Production China 2004, China Council for International Cooperation on Environment and Development 2004). However, these visions are still a long way from the reality, and developed cities continue to be confronted with very high waste-generation rates.

Specifically in Japan, the promotion of the sound material-cycle society has been involving policy actions towards (1) changes in lifestyle, (2) reduction of waste, and (3) changes on business activities. In order to achieve that, the Japanese Government is carrying out public-opinion surveys, has set targets on the amount of household and industrial waste disposal, and has been promoting green purchasing and environmental business management. Targets related to the material flow indicators, such as Resource Productivity, Cyclical Use Rate, and Final Disposal Amount, were set. Moreover, efforts are being done in order to promote the expansion of the discharging person's responsibility and extended producer responsibility (EPR); prevent illegal dumping; and utilize economic instruments to encourage self-management (MOE 2003). The manufacturing sector is being encouraged to promote changes in the production system such as promotion of industrial symbiosis, Design for Environment (DfE), and reverse manufacturing. Local governments are expected to enforce laws and regulations in order to adjust the flow of materials at urban level and to have a sound waste management. They are also expected to promote changes in lifestyle among residents and to play the role of coordinator among various entities, such as communities, non-governmental organizations (NGOs), and business and private organizations (MOE 2003). Local governments will play an important role in order to reach the targets on reduction of household waste generation.

At urban level, measures for a sustainable cycle of resources should focus on raising awareness and promoting sustainable patterns of consumption and waste minimisation strategies. Sustainable consumption and changes in lifestyle are a broad topic involving several fields of study and this report does not attempt to discuss them.

On the other hand, strategies for waste minimisation (EEA 2002, OECD 2002) are the main strategies for promoting the Sound Material-cycle and are expected to give a new realm to the field of MSW management. There is not a strict definition for waste minimisation; the Organisation for Economic Cooperation and Development (OECD) working definition includes various concepts.

Measures for waste minimisation can be categorized under the following classification: producer responsibility, voluntary agreements, legislative requirements, information programs (awareness campaign, dissemination of activities, promotion of waste minimisation clubs), and economic instruments, such as waste taxes and fees (OECD 2002). These measures are being carried out in developed cities and in high-income developing cities; however, their effectiveness is still limited. In less developed communities, the major potential for waste minimisation are the reuse of products, source separation of organic waste, composting, and improvement of conditions for waste pickers. Other examples of measures for waste minimisation are the awareness campaigns and the activities towards creation of cooperatives for waste pickers in several developing cities in Latin America and Asia. Some of these

measures can entail significant economic costs as pointed out by Braathen (2004); he discusses the economic impacts of some waste policy instruments such as ‘pay as you throw’ schemes, take-back and EPR schemes, DfE, and taxes on final disposal.

4.3 Outlook

Despite the challenges for managing the huge amounts of waste generated in Asia, as described in here, there is a trend towards a more sustainable approach – the so-called sound material-cycle society. This approach is extending from Japanese cities to other developed Asian cities. Therefore, there is a need to develop local strategies so these cities can advance from current unsanitary conditions to a “cycle economy”. It is expected that developing and poor cities in the region will learn from the experience of developed cities and somehow benefit from later development, not facing such strong polluting stages in their waste management evolution.

The choice of processes and technologies for waste management are important, but not enough so ensure the sustainability of the system. Other aspects such as legislation, political will, partnerships, and public participation play a fundamental role. International cooperation related to urban environmental issues among cities will be a way to transfer the experiences of mature cities to developing cities. In Asia, such initiatives towards improvement of the urban environment have already started. From the experience from developed countries, there is an indication that legislation and institutional arrangements would be necessary to achieve higher levels of waste reduction and recycling.

Finally, it is important to emphasize that developing cities in Asia should observe the example of developed cities, and find and establish their own appropriate approaches for MSWM, taking into account their local and unique conditions.

5. Concluding remarks

As has been discussed in this section, cities in Asia are starting to take the initiative to improve environmental quality. Alongside sector-specific changes, there are some more general trends as following:

- promotion of public awareness and participation in environmental planning and provision of environmental services;
- relocation of heavy manufacturing industry out of cities;
- support to private-sector participation in civic and environmental services to increase investment and efficiency;
- multi-stakeholder partnerships;
- introduction of innovative finance mechanisms;
- improvement of environmental governance and environmental management capacity at different levels; and

- South-South cooperation for better exchange of information and cooperation.

Although these trends are often only in the initial stages of testing and are sometimes facing implementation bottlenecks, there is evidence to show that Asian cities are learning from one another, with increasing frequency. Continuous and persistent efforts in these directions are essential to achieve better environmental management and services.

According to the literature on the EKC discussed in Section I, these are the kinds of trends that should be able induce an earlier turning point, allowing economic development to continue and at the same time reducing the environmental cost. As already observed, the development of Asia's cities is unpredictable and diverse. The fate of environmental quality and services in Asia will depend on sound judgment and realistic measures. Most likely the key challenges currently facing Asian cities are to find how best to devise and execute multi-stakeholder partnerships with appropriate role and risk sharing; and how to find the ideal balance between provision of public goods and user charges in light of the ever-increasing populations of urban poor with high levels of insecurity in their lives. Urban environmental management strategies in this region needs to be focused not just on improving basic services but also on how to make those services reach the urban poor.

Note: Text written by Dr. Mara Regina Mendes, Dr. Mushtaq Ahmed Memon, and Dr. Sudhakar Yedla from the Urban Environmental Management Project of IGES.

6. References

- ADB (Asian Development Bank). 2000. Developing best practices for promoting private sector investment in infrastructure. Manila: ADB.
- . 2003. Reducing vehicle emissions in Asia. Manila: ADB.
- AIT (Asian Institute of Technology). 2002. *Analysis of technical options for mitigating environmental emissions from the urban transport system in selected Asian countries*. Bangkok: Swedish International Development Agency-AIT.
- Akintoye, A., M. Beck, and C. Hardcastle 2003. *Public-Private Partnerships: Managing Risks and Opportunities*. Blackwell Science.
- Altaf M. A., D. Whittington, H. Jamal, and V. K. Smith. 1997. Rethinking rural water supply policy in the Punjab, Pakistan. *Water Resources Research* 29 (7): 1943-1954.
- Braathen, N. A. 2004. Addressing the Economics of Waste - An Introduction. In *Addressing the Economics of Waste*. Edited by OECD (Organisation for Co-operation and Development). Paris: OECD.
- Budds, J. and G. McGranahan. 2003. *Privatization and the provision of urban water and sanitation in Africa, Asia and Latin America*. London: IIED.

- Chang, M., Y. Ren, and H. Imura. 2001. Financing urban environmental infrastructure in East Asia: Current situation, challenges and strategies. *International Review for Environmental Strategies* 2 (1): 79-105.
- Chang, M., and M.A. Memon. 2004. *Financial strategies for urban environmental infrastructure in Asia – Development of public-private partnerships*. Hayama, Japan: IGES.
- China Council for International Cooperation on Environment and Development. 2004. Strategy and mechanism study for promoting of circular economy and cleaner production in China. <http://eng.cciced.org/> (retrieved August 27, 2004).
- Cleaner Production China. 2004. The circular (recycling) economy in China. <http://www.chinacp.com> (retrieved August 27, 2004).
- EEA (European Environment Agency). 2002. Case studies on waste minimisation practices in Europe. Copenhagen: European Environment Agency.
- Enayetullah, I., and A. H. M. M. Sinha. 1999. *Community based decentralised composting—Experience of Waste Concern in Dhaka*. Delhi: All India Institute of Local Self Governance.
- Frost, M. 2001. The future of ticketing. *Public Transport International* 50 (May): 12-14.
- Gentry, B. 1999. Foreign direct investment and environment: Boom or bane? In: *Foreign direct investment and the environment*, Paris: OECD.
- Hardoy A., and R. Schusterman. 2000. New models for the privatization of water and sanitation for the urban poor. *Environment and Urbanization* 12 (2): 63-75 (13)
- IGES (Institute for Global Environmental Strategies). Urban Environmental Management Project. 2001. Urban environmental challenge in Asia: Current situations and management strategies. Part I: The summary of UE first phase project. Hayama, Japan: IGES.
- . 2002. In *Proceedings of Kitakyushu Initiative Seminar on Solid Waste Management*. September 19-20, 2002, Kitakyushu, Japan. Kitakyushu: IGES.
- . 2003. In *Proceedings of the IGES-KEI International Workshop on the Role of Planning Practices towards Sustainable Urban Environment in Asia: Environmental Consequences of Metropolitan Expansion in Asia*, March 11, 2003, Seoul, Korea. Hayama: IGES.
- IGIDR (Indira Gandhi Institute for Development Research). 2001. *Analysis of technological options for mitigation of environmental emissions from the urban transport systems in selected Asian cities*. Mumbai, India: IGIDR.
- Imura, H., A. Morishima, and T. Inui. 2003. *Japan's environmental policy: Financial mechanisms*. Unpublished paper for the World Bank Institute.
- Iyer, N. V. 2001. Measures to control vehicle population: The Delhi experience. Paper presented at the Workshop on Fighting Urban Air Pollution: From Plan to Action, Bangkok, February 12-14, 2001.

- JICA (Japan International Cooperation Agency). 2003. *The Study on Solid Waste Management in Dhaka City in the People's Republic of Bangladesh - Inception Report*, Dhaka: DCC and JICA
- KIN (Kitakyushu Initiative Network). 2004. *Kitakyushu Initiative for a Clean Environment Webpage*, April 15, 2004 [retrieved May 2004]. Available from <http://www.iges.or.jp/kitakyushu/>.
- Kwak, Y. H. 2002. Analysing Asian infrastructure development privatization market. *Journal of Construction Engineering and Management* 128 (2): 110-116.
- Leitmann, J. 1999. *Sustaining Cities: Environmental Planning and Management in Urban Design*. New York: McGraw-Hill.
- Manandhar, R. 2002. Private Sector Participation in Solid Waste Management in Kathmandu. Paper read at Kitakyushu Initiative Seminar on Solid Waste Management: 1st Thematic Seminar, September 19-20, 2002, Kitakyushu, Japan.
- McIntosh, A. C., and C. E. Yniguez. 1997. *Second water utilities data book – Asian and Pacific Region*. Asian Development Bank, Manila.
- Memon, M. A., M. Chang, H. Imura. 2003. Foreign Direct Investment for Urban Water Management: Private Sector Participation to Provide Public Goods, In *Proceedings of JASID Conference*, November 29-30, 2003, Nagoya, 376-381.
- Memon, M. A., T. Kleiss, H. Imura, and H. Shirakawa. 2004. Private Sector Participation in Solid Waste Management in Asian Cities, In *Proceedings of JASID Conference*, November 27-28, 2004, Tokyo.
- Memon, M. A. 2004. Public private partnerships for environmental management structures: Analysis of three models from Asian cities. Paper presented at the Second International Symposium on Southeast Asia Water Environment, December 1-3, 2004, Hanoi.
- Mendes, M.R. 2004. Public Participation and Municipal Solid Waste Management in Selected Asian Cities. In *Proceedings of the 5th Thematic Seminar on Public Participation for Urban Environmental Management*. January 20-21, 2004, Kitakyushu, Japan, 209-213.
- Mendes, M. R., and H. Imura. 2004a. From end-of-pipe approach to the creation of a sound material-cycle society: Asian cases. Paper presented at ISWA World conference, October 18-21, 2004, Rome, Italy.
- . 2004b. Municipal solid waste management in Asia. *Waste Management World* 4 (4): 145-154
- Mendes, M. R. 2005. Solid waste management in Asian cities. unpublished report.
- MOE (Ministry of Environment Japan). 2003. *The challenge to establish a sound material-cycle society*. Tokyo: Government of Japan.
- Nakagawa, H. 2003. Present situation of waste disposal in Asian countries and directions of Japanese companies (in Japanese). *JWC* 11: 33-37.
- NGV Statistics. 2002. International Association for Natural Gas Vehicles, New Zealand.

- OECD (Organisation for Economic Cooperation and Development). 2002. Waste Prevention: Toward Performance Indicators. In *Proceedings of an OECD Workshop*. Paris: OECD.
- Ogawa, H. 1996. Sustainable solid waste management in developing countries. Paper presented at the 7th ISWA International Conference and Exhibition, October 28-31, 1996, Yokohama, Japan.
- Panayotou, T. 1998. *Instruments of Change: Motivating and Financing Sustainable Development*. London: Earthscan.
- Plummer, J. 2002. *Focusing Partnerships: A Sourcebook for Municipal Capacity Building in Public-Private Partnerships*. London: Earthscan Publications.
- Ramanathan, R. 1999. Urban transportation. In *India Development Report 1999-2000*. Edited by K. S. Parikh, Mumbai, India: Oxford University Press.
- Sagasti, F., and K. Bezanson. 2001. Some Implications of the Conceptual Framework. In *Financing and Providing Global Public Goods: Expectations and Prospects*. Stockholm: Sweden Ministry for Foreign Affairs.
- Satterthwaite, D. 2003. The Millennium Development Goals and urban poverty reduction: Great expectations and nonsense statistics. *Environment and Urbanization* 15 (2): 181-190.
- Seoul Metropolitan Government. 2000. *Waste management in Seoul*. Seoul: Waste Management Division, Office of Environment.
- Song, X. 1997. Urban infrastructure development in contemporary China. In *Urban infrastructure development: Proceedings of the First International Expert Panel Meeting on Urban Infrastructure Development*, June 21-22, 1996, Jakarta, Indonesia. Edited by Y. Yeung and H. S. Sheng, UNCRD Proceedings Series 15: 31-51. Nagoya, Japan: UN Centre for Regional Development.
- UN (United Nations). 2001. *Review of developments in transport and communications in the ESCAP region 1996-2001*. Bangkok: UN-ESCAP .
- . 2003. *Cities and sustainable development: Lessons and experiences from Asia and the Pacific*. Bangkok: UN-ESCAP.
- UN-ESCAP. 1994. *Infrastructure Development as Key to Economic Growth and Regional Economic Cooperation* (ST/ESCAP/1364). Bangkok: UN-ESCAP
- UN-HABITAT (United Nations Centre for Human Settlements). 2001. *The state of the world's cities 2001*. Nairobi: UN-HABITAT.
- . 2003. *The challenges of slums*. London: UN-HABITAT.
- World Bank. 1997. Infrastructure notes, Urban No. FM-8b, February 1997.
- . 1999. *What a Waste: Solid Waste Management in Asia*. Washington, D.C.: World Bank.
- . 2003a. *Thailand environment monitor 2003*. Washington, D.C.: World Bank.
- . 2003b. *World development indicators 2002*. Washington, D.C.: World Bank.
- . 2004. *World development indicators 2003*. Washington, D.C.: World Bank.

- Yedla, S., J. K. Parikh, and R. M. Shrestha. 2003. Sustainable urban transportation: Impact of CO₂ mitigation strategies on local pollutants. *International Journal of Environment and Pollution* 19 (5): 475-482.
- Yedla, S., and S. Kansal. 2003. Economic insights into municipal solid waste management in Mumbai: A critical analysis. *International Journal of Environment Pollution* 19 (5): 516-527.
- Yedla, S. 2004. Urban transportation trends, alternatives and policy issues. In *India Development Report 2004-2005*. Edited by K. S. Parikh and R. Radhakrishna. Mumbai, India: Oxford University Press.
- Zurbrugg, C. 2002. Solid Waste Management in Developing Countries. Working paper SANDEC. Zurich: SANDEC.
- Zurbrugg, C., S. Drescher, I. Rytz, M. Sinha, and I. Enayetullah. 2002. Decentralized composting in Dhaka, Bangladesh, production of compost and its marketing. Paper presented at the ISWA 2002 Annual Congress, Istanbul, July 8-12, 2002.