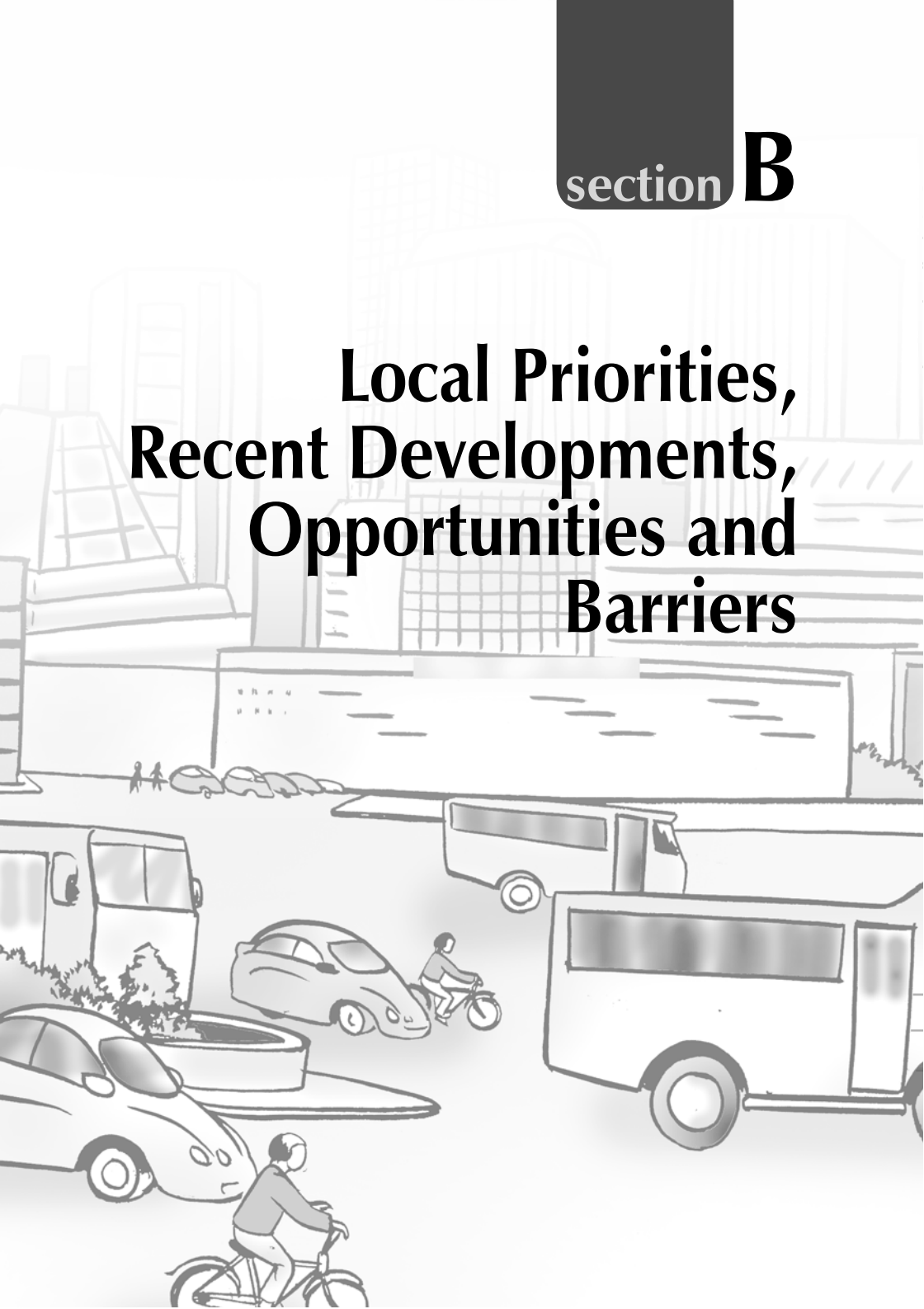


section **B**

Local Priorities, Recent Developments, Opportunities and Barriers



5

City Policy Makers and CO₂ Emissions

Although the primary focus of city and municipal policy makers is on local environmental issues such as the management of solid waste, air quality and wastewater, there is a growing need to incorporate global environmental concerns into local policies. Authorities in cities in developed countries, including those in Tokyo, realise that cities are centres of high population density, much business activity, a high demand for mobility, and upscale lifestyles, and that they must contribute toward reducing energy consumption and CO₂ emissions. Tokyo's volume of CO₂ emissions exceeds that of many smaller nations. Tokyo's contribution to CO₂ emissions¹⁹ is about 1% that of all developing countries (TMG, 2002). While well-placed plans and programmes can simultaneously reduce local environmental concerns, improve energy efficiency, and reduce CO₂ emissions, formulating such multi-purpose strategies is not easy. Given that the developed nations of Annex-I²⁰ are still struggling to formulate their response strategies at national levels, the expectation that cities do the same is premature. Some of the general challenges which cities do need to grapple with follow:

- lack of awareness among local policy makers about global issues;
- lack of scientific studies, inventories of energy consumption and CO₂ emission, and related information;
- limited financial, human and technical resources even to tackle urgent issues such as local air pollution;
- priorities in resources allocation; and
- awareness of global environmental issues amongst citizens.

19 Direct CO₂ emissions as a result of energy use

20 Of the United Nations Framework Convention on Climate Change.

Despite these limitations, urban policy makers in mega-cities, especially those in Northeast and Southeast Asia, are aware, to some extent, of the need to reduce CO₂ emissions. In years to come, mega-cities will have to confront these issues as the growing trend toward decentralisation is empowering local authorities to tackle their own problems.²¹ Power shifts from nations to cities have become evident in the last few decades in both the developed and the developing world. Policy makers in cities, especially large cities, now have more avenues which they can pursue in order to reduce CO₂ emissions and energy demand. Russia's ratification of the Kyoto Protocol in October 2004 paved the way for putting the Protocol's climate policy into effect. The role of cities in international debates will, accordingly, grow. This section presents discussions of the following issues:

- *Local environment priorities and challenges* in Tokyo, Seoul, Beijing and Shanghai and their significance for GHG emissions;
- *Recent developments in policy dimensions* at the city level in relation to GHG emission concerns, with a special focus on Tokyo and Beijing (which represent respectively a developed city and a rapidly developing city); and
- *Opportunities for and barriers to policy integration* for local governments and for different scales of environmental governance. The response and set-up of national governments is important in enabling local authorities to act in Asia because historically speaking national governments have been prime movers. This paper explores several perspectives on domestic policies for GHG reduction in Japan (and, to a lesser extent, in cities) and highlights the role of international institutions.

21 Many nations have already enacted self-governance acts for local bodies. There is a growing trend toward empowering and strengthen local authorities in this tackling of local issues. In terms of the environment, the management of solid waste has already been delegated to local authorities in many developing Asian countries. The areas of air quality and wastewater management are also being gradually addressed. Local governance is well established in East Asia (in countries such as Japan, China, Korea and Taiwan) and is rapidly gaining momentum in Southeast and South Asia.

6

Local-Global Environmental Priorities and Challenges

6.1 Local Air Pollution Priorities and Challenges

Concerns about emissions of a particular air pollutant vary from city to city. Particulates of various sizes are a common concern for many cities in Asia. NO_x emissions have become a more important issue in developed cities in recent years. In industrial cities that use coal as a major source of energy, trans-boundary environmental problems are a serious threat as acid rain may accelerate the problem of desertification on a regional scale. SO_x emissions are usually associated with coal use in stationary sources such as power plants, industries, and domestic and commercial boilers. Mobile sources are becoming increasingly responsible for emissions of NO_x and particulate matter. In general, cities are diversifying their energy mixes to gradually incorporate cleaner energies yet cost, availability and energy security remain big concerns in the need for a speedy transition.

6.1.1 Problems with SO_x , NO_x and particulate matter

Tokyo was successful in drastically reducing its concentration of SO_2 between the mid-1960s and the early 1970s; Seoul did the same after 1988. Beijing and Shanghai have higher concentrations of SO_2 and particulate emissions than Tokyo and Seoul do (see Table 6.1). Since coal continues to dominate the industry and energy sector as a whole in Beijing and Shanghai and the economy is growing at rapid rate, emissions are likely to continue to rise. Serious policy efforts must be developed and implemented if policy makers are to reduce emissions to within acceptable limits.

Table 6.1 Air quality in selected cities, in micrograms per cubic meter

City	Particulates (1997), mg/m ³	Sulphur dioxide	Nitrogen dioxide
Beijing	377 (TSP*)	71 (2000)	126 (NO _x , 2000)
Shanghai	229 (TSP)	46 (2000)	91 (NO _x , 2000)
Tokyo	45 (ward, SPM)	20 (ward 1997)	94 (city centre), 64 (ward) (NO ₂ 1998)
Seoul	72 (TSP), 68 (PM ₁₀)	31 (1997)	62 (NO _x 2000)

*TSP: Total suspended particles

Box 6.1 Issues and concerns in the current development paths and transitions related to energy and transportation in South Asia

Mapping key physical issues

The major energy, environmental, and transportation issues in South Asian cities include increasing energy use; emissions of CO₂ and local air pollutants, especially PM₁₀ and dust, whose concentrations far exceeds WHO guidelines. Key South Asian cities are characterised by rapid motorisation, growing traffic congestion, and increasingly overburdened public transportation systems.

Two- and three-wheelers, the majority of which run on two-stroke engines, dominate South Asian cities. In recent years, some effort has been made in Dhaka, Kathmandu, and a few other cities to phase out these vehicles. In the quest for cleaner air for citizens, the judicial system ordered that CNG be used in public transportation in New Delhi. Similar efforts towards CNG conversion of three-wheelers are underway in Dhaka. In Kathmandu, battery-operated three-wheelers have replaced smoke-belching diesel three-wheelers for commercial operations. These changes do represent a transition towards cleaner vehicles and fuel but, unfortunately, are limited to a small sector of transportation.

Improvements in public transportation systems are progressing at a slow pace in the region as a whole. The number of private vehicles is increasing at an alarmingly high rate, but the efficiency and coverage of public transportation remains poor. Traffic management and road conditions have not kept pace with the growth in the number of vehicles.



Though vehicle emission standards and regulations are in place for new vehicles, it is in-use and old vehicles which pose much of the problems. Old vehicles perform poorly in terms of energy use and emissions. Although they are not desirable, socio-political dynamics and public protest have prevented their being phased out. Often the lack of financial resources are blamed for placing constraints on policy makers, but policy makers have not been able to implement measures that do not demand much funding either. In major cities in the region, levels of local air pollution have worsened to such an extent that the problem is visible even without reference to scientific data. Data confirms what is obvious to all: energy consumption and emissions of local air pollutants and CO₂ are on the rise in all cities in South Asia.

Lack of scientific understanding

The lifestyles of urban dwellers in cities are becoming more and more energy intensive. Consumption of material goods and water is on the rise. Over-motorisation, which is an example of over-reliance on commercial energy use, and dependence on electrical and electronic equipment are common features of cities. There is little understanding of the various forces leading to these changes or of the strategies that can be adopted to mitigate their impact on the environment. The energy footprint of cities (taking into account direct and indirect energy use and emission embedded in consumption) is rarely studied at the city level. Existing policies have typically not addressed the issues using a comprehensive approach.

A huge gap in existing knowledge, credible scientific information and data related to energy use and emissions exists in the region. Some research has been done on urban transportation issues but its depth and coverage is limited. Data on the local emission factors of various transport modes and the number of vehicles, their ages and engine sizes, for example, does not exist in many cities. A number of technical and non-technical gaps in understanding prevail and the roles of technological and non-technological options and measures have not been clarified.

Scientific studies of other urban sectors are scarce. Efficient ways to manage energy use in buildings while keeping the level of amenities intact are rarely studied. Some limited work on CO₂ emissions from municipal waste has been carried out, but, in general, research on city-scale energy use and emissions does

not exist. Since policy makers are largely unaware of the full range of issues, scientific findings seldom influence actual policies. Lack of sufficient research has also limited the influence scientific studies have had on policy making.

Policies and institutions

Policy failure (due to a combination of market failure and institutional failure) is a common phenomenon in South Asia. Institutional arrangements for policy formulation and implementation remains a key issue. Inefficiency of government-affiliated enterprises and related cost-recovery problems hinder public transportation restructuring as well as the provision to the market of the correct signals for private sector participation. Inappropriate systems of incentives distort the market. Most policies have been reactive rather than proactive and an over-dependence on short-term and ad-hoc policies often results in a chaotic situation. Too much emphasis on end-of-pipe solutions has also been witnessed in the region.

Serious reform in public transportation systems, along with an appropriate systems of incentives, is a key need in South Asian cities. In addressing transportation energy use and equity issues, of even more serious concern is the pattern of land development that is beginning to emerge in the region. A policy needs to be in place for appropriate land development patterns that are consistent with transit and non-motorised modes of transportation. The American pattern of suburban sprawl comes packaged with all the seductive powers of Hollywood, but carries with it a tremendous societal and environmental cost for all cities worldwide. Policy makers and researchers need to look toward environmentally sustainable cities like Zurich, Curitiba, and Singapore for measures which divorce economic growth from environmental degradation.

Economic growth in South Asia is slower than that in East Asia and Southeast Asia. This slow pace hinders reforms as transportation issues are intertwined with low-income groups and equity issues. In addition, improvements in processes and productivity related to production and consumption systems are hard to achieve without fast growth.

Since the market for environmental services is not well established, policymakers are unable to utilise market-based mechanisms for influencing changes. This has led to an over-dependence on a command-and-control approach, although more

efforts are being made to use market approaches especially in areas relating to urban physical infrastructure. Regulatory and governance issues are the key issues facing South Asia: current regulations are not adequate and institutional problems hinder policy implementation.

Key transition needs in South Asia and research questions

Below is a list of key observations on the needs for transition in South Asia. They are consistent with the concepts of the IT project.

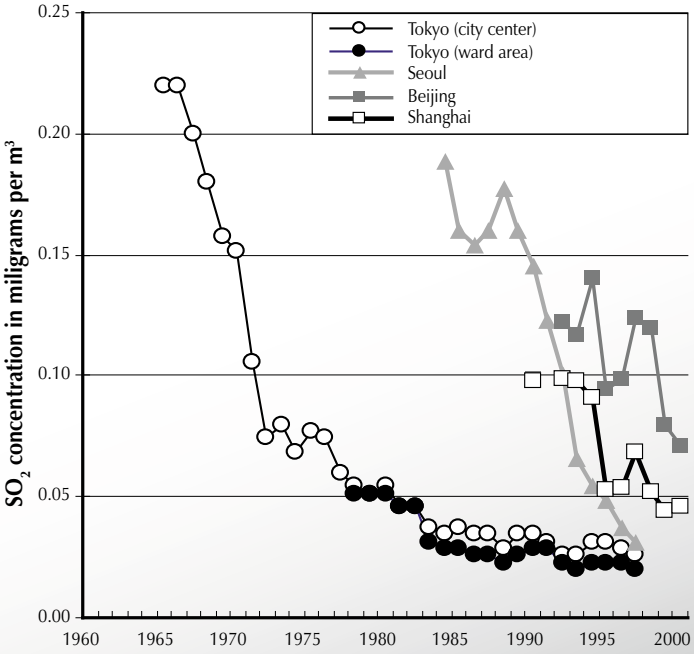
Introducing interventions other than end-of-pipe management: *As mentioned above, most interventions are end-of-pipe, whereas interventions in the system are what is needed, especially from the policy perspective. Shifting from clean vehicles to clean transportation systems, moving towards energy-efficient buildings, adopting a watershed approach to urban water management, and switching to clean energy use are essential. Usually end-of-pipe policy interventions are reactive and systems interventions are proactive in nature. Awareness and research in this direction but the trend is insufficient.*

Shifting from strong government interventions to strengthening multiple-sector and stakeholders: *Some efforts are underway, especially in the public transportation and water sector (infrastructure sector). Awareness creating and capacity building of the society as a whole to address environmental problems is a key need in the region. This shifts the burden of problem solving from the specialists to the society, thus relieving the financial burden and reducing the scale of the problem.*

Changing the management philosophy: *This transition seeks a change in the driving philosophy from minimisation to optimisation. Institutions and policies should play a key role in such changes.*

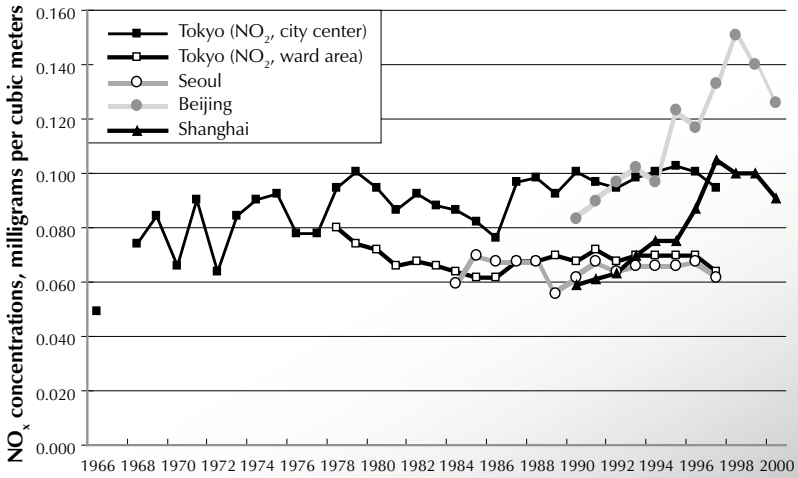
Using a market-based approach while keeping equity issues at the forefront: *The need to create systems for a market-based approach and public-private partnerships is evident in South Asia. This will help overcome some infrastructure-related constraints too. Getting polluters to pay principle-based fees and tariffs and taxes without distorting the market are essential moves. Regulatory and institutional reforms are a necessary prerequisite for this transition.*

Source: Dhakal and Norman (2003)



Source: Internal database compiled from environmental statistics of cities

Figure 6.1 Trends in SO₂ concentrations



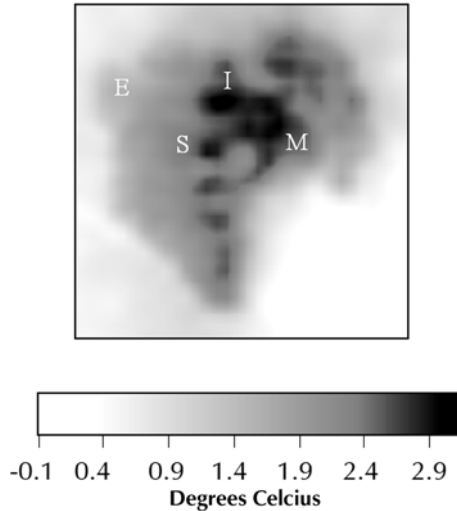
Source: Internal database compiled from environmental statistics of cities

Figure 6.2 Trends in NO_x concentrations

In the last three decades Tokyo has been successful in reducing concentrations of key air pollutants related to industry, including dust, carbon monoxide and sulphur dioxide. However, it struggled to control suspended particulate matters, nitrogen dioxide and photochemical oxidants, most of which are emitted by businesses, households and lifestyle-related activities. Problems other than GHG, such as controlling diesel vehicles, are of the highest priority in Tokyo. Most Japanese cities, including Tokyo, suffer from SPM and NO_x problems. In

Tokyo, diesel vehicles were responsible for almost all particulate matters and about 70% of NO_x emissions in 2003 (TMG, 2003). An earlier estimate shows that in 1995 automobiles were responsible for 67% of total NO_x emissions, of which trucks and buses contributed 73% (TEW, 1997).

In Seoul, SO₂ and PM₁₀ are not a major concern because they are within the WHO recommended guidelines, and, in the last two decades, their levels have been decreasing with the increasing supply of clean fuel, better road paving, etc. However, the level of NO_x (especially NO₂) and ozone are increasing, primarily due to the increase in volatile organic compounds often blamed on the slowing flow of traffic on roads.



Source: Dhakal and Hanaki (2002)

Figure 6.3 Contribution of energy use to urban heat island in Tokyo wards (32x37 km) at 9 P.M. on a typical calm summer day in July (M: Marunouchi, S: Shinjuku, I: Ikebukuro, E: Itabashi), 2000

6.2 Nature of Urban and Global Warming Challenges and Options Available

6.2.1 *Urban warming challenges and options*

Apart from air quality, energy use also affects other local problems, such as urban warming, or the phenomenon of urban heat islands, a condition in which the temperatures of urban areas are about 2 to 7°C higher than those in surrounding rural areas. In the past, this phenomenon was observed during the winter in high latitude cities, mostly in Europe and North America, but today it is increasingly affecting tropical cities during the summer. Excessive energy use is one of the causes of urban warming. Urban warming results in heat stress, an increase in the demand for energy for cooling, an increase in ozone (smog) events and associated economic implications. In Seoul, urban warming is becoming a growing concern, and the number of days each year that exceed acceptable ozone levels is increasing. In 1995, it was reported that only five days exceeded the limit, whereas in 1997 the number had increased to 33 days (Kim, 2004).

While global warming is a distant priority for local policy makers, direct and indirect pressure from the national government's Kyoto commitment and public sensitivity to urban warming has created a favourable situation for local policy makers in Tokyo to act. Tokyo suffers from the urban heat island phenomena, whose impacts are aggravated in the summer (Dhakal and Hanaki, 2002). Measurements made by the Tokyo Metropolitan Observatory indicate that the number of nights over 25°C increased from 14 in the early 1960s to 32.4 in 2000 (TMG, 2003). The vicious cycle of urban warming, which results in the increased use of air conditioners and the consequent high rate of discharge of waste heat into the urban environment, has had a significantly toll on health and the economy.²² Various measures, including interventions in buildings, land use and energy systems, can alleviate heat island effects (Dhakal, 2002). It is significant to note that in Tokyo, key downtown areas such as Marunouchi and Ikebukuro are reported to have significantly higher temperatures than

22 Studies by Lawrence Berkeley National Laboratory in USA estimate the costs in terms of ozone, smog incidence, additional electricity use and the resultant economic valuations. See: <http://eetd.lbl.gov/HeatIsland/>

other parts of Tokyo; the maximum contribution of energy use to the heat island effect recorded is 3.4°C (Dhakal and Hanaki, 2002). In Shanghai, the rural and urban temperature difference is 2.7°C (Shu *et al.*, 1997). Seoul is increasingly affected by urban heat island problems, and in response, the Seoul Metropolitan Government is actively studying various measures to mitigate them. Future increases in energy consumption are likely to aggravate the phenomenon. Interventions which reduce urban warming, such as energy management and greater areas of urban green space can reduce CO₂ emissions and enhance carbon sink.

6.2.2 Nature of GHG management challenges and available options

Commercial and transportation sectors are responsible for the majority of GHG emissions in Tokyo. The commercial sector includes large-scale businesses such as office blocks, department stores, hotels, and retail businesses; office buildings and restaurants are responsible for the majority of energy consumption (TMG, 2002a). Despite the economic slowdown, emissions are rising in Tokyo²³; the fact that the rise comes from non-industrial sectors makes these challenges more serious for local policy makers. Office automation and the increasing use of computers and other office appliances, together with air conditioning systems, are the major sources of CO₂ emissions. In the transportation sector, there has been a structural shift towards larger cars in Tokyo; therefore, despite significant improvements in the fuel efficiencies of different car sizes (which meet existing standards) and stagnant rates of per capita car ownership, CO₂ emissions from automobiles are increasing. In Tokyo, heavy vehicles (gross weights over 2.5 tonnes) account for about one-third of emissions from all automobiles, yet those vehicles are not subject to any standards (TMG, 2002b).

23 This is based on data from 1970 to 1998. At the national levels the peak for CO₂ emissions was in 2000; a 2.7% decline in 2001 from 2000 has been reported. The author did not, however, carry out estimates for Tokyo after 1998. Despite the fact that over 30% of electricity use in Japan comes from nuclear energy located in the north and in Tokyo, the nuclear share must be high. The author used the national average of CO₂ intensity. Since the Tokaimura nuclear accident in 1999 and several other accidents, nuclear plants have been shut down in recent years and the CO₂ intensity of Tokyo's electricity must have increased significantly.

In Tokyo, the major options for policy interventions are in business operations, buildings (particularly office buildings) and the transportation sector. Energy and CO₂ interventions in urban households can be accomplished through improving appliance efficiency, applying fuel pricing mechanisms and using the market to build energy efficiency standards. Lifestyles can be influenced through campaigning and raising awareness. These interventions treat only perceived challenges from direct emissions. In terms of embedded emissions, only those in electricity use are being tackled. City policy makers who aim to reduce direct CO₂ emissions will probably address embedded emission in material use only in the distant future because it is not a local issue. With the recent enactment of a law providing for Material Recycling-Oriented Societal Development in Japan some action may be forthcoming. Despite these challenges, the per capita and per unit of GRP emission performances of Tokyo are better than those of other East Asian cities such as Seoul, Beijing and Shanghai (Dhakal *et al.*, 2002a). Reasons for this could include the compact settlements; the well-developed rail-based mass transportation infrastructure; efficient electric appliances and automobiles; the city's function as a commercial, rather than an industrial hub; and mild winters and summers.

In Seoul, fuel switching in industries and buildings has contributed significantly to reducing CO₂ emissions in the last decade. Unlike Tokyo, Seoul uses central heating systems in buildings. The potential for improving energy efficiency and fuel switching are high because in the past, fuel switches were mainly from coal to oil and, to some extent, from oil to gas. Road transportation and private cars are another area of concern in Seoul. Heating is an area which can reduce emissions by promoting district heating systems.

In Beijing and Shanghai, industry, buildings and urban transportation are sectors with great potential for interventions which reduce GHG emissions. In both cities, fuel switching in industries is a viable option. Insulating buildings, improving the efficiency of electric appliances and switching the fuel used in central heating systems can also play important roles in reducing energy consumption, local emissions and GHG emissions. The use of energy-inefficient building designs, materials and construction

persists despite the construction booms in these cities since 1990. Some improvements have been made in recent years, especially since 2001, when China's Ministry of Construction issued new regulations, yet old practices still continue (Feng, 2002). There are a number of other associated problems such as the discrepancy between heating costs and household income, the lack of market infrastructure and regulations, and the lack of know-how about carrying out energy efficiency improvements (Feng, 2002).

GHG emissions from urban transportation may seem low at the moment for both Beijing and Shanghai, but the massive investment in the transport systems planned for the coming years will increase the potential for energy use, air pollution and CO₂ emissions. Although they have fewer private cars than other mega-cities, Shanghai and Beijing are already suffering from serious air pollution problems due to urban transportation. Furthermore, China's growing economy and WTO membership are likely to increase income, reduce tariffs on automobiles (due to competition and trade barrier reductions) and enhance credit facilitation mechanisms for the purchase of new cars. Thus, urban planners in Beijing and Shanghai are already projecting a three- to four-fold increase in the number of cars and trucks by 2020 (Zhou and Sperling, 2001). Transportation in both cities, but especially in Beijing, is highly dependent on road transportation infrastructure. The Chinese government is increasingly viewing growth in private vehicle ownership, the automobile industry²⁴ and infrastructure development as a driving force which can stimulate personal consumption and thereby economic growth. As a result, policies designed to stimulate private vehicle use, such as purchase loans, reduced fees for vehicle use²⁵ and lengthening the useful life of passenger cars from 10 to 15 years, are being implemented (Lin, 2003). In Beijing, massive growth in the transportation infrastructure is being planned ahead of the 2008 Olympic Games and ambitious goals for environmental management have been set. Key management challenges include controlling two-stroke engine two- and three-wheelers.

24 In 1998, China was ranked 10th in automobile production in the world. It produced two million vehicles in 2000.

25 The Chinese government has stopped collecting 238 different fees related to vehicle use. See <http://finance.sina.com.cn>

Potential countermeasures in the transportation sector include a switch to alternative fuels like compressed natural gas (CNG), promoting electric and hybrid vehicles, increasing average vehicle speed through traffic management, increasing the fuel efficiency of cars and improving fuel quality, improving public mass transportation systems and limiting private cars, and appropriate land-use planning. These measures should reduce travel demand as well as trip length and frequency.

In Beijing, light-duty gasoline trucks and cars are expected to become a key component in future reductions of energy consumption and CO₂ emissions. Limiting the number of new vehicles alone will not suffice in Beijing and Shanghai; greater efforts are needed to control vehicles in use and to reduce vehicle mileage. Operating efficient public mass transportation systems is crucial. Car-limiting policies are difficult to implement in Tokyo and Seoul. In terms of improving fuel efficiency, fuel quality and end-of-pipe technology at vehicle tailpipes, there is limited scope for further drastic improvements in Tokyo and Seoul; the most promising approach is to implement policies that motivate people to change their lifestyles (including their driving behaviour), and to set up a system of economic instruments such as parking fees and congestion pricing.

The prospects for implementing countermeasures in the building sector are also enormous. They include introducing improvements in building insulation, appliance efficiency, and efficient central heating systems. To promoting appliance efficiency, government policies can target building codes, laws, and standards. Simple measures such as changing from incandescent lamps to fluorescent lighting can save a great deal of electricity. The scope for drastically improving appliance efficiency may be much less in Seoul and Tokyo than it is in Beijing and Shanghai. Using renewable energy such as solar panels for hot water production, enforcing appropriate temperature settings for heating and cooling systems and avoiding wasting electricity are other steps which conserve energy.

7

Policy Developments, Countermeasures and Challenges in Cities

7.1 Policy Trends in Cities

Making and implementing policy is a complex process. Although the countermeasures that can address energy demand, local pollution and GHG emissions are many, mobilising just the right mix of different policy instruments suitable for local conditions is difficult. Making and implementing policies in cities in developing countries face the additional challenges of severe technological, financial, regulatory and institutional constraints. A strategy that works well in one city may not work well in other cities due to differences in various prevailing conditions. Even if beneficial policies are in place, institutions may fail to implement and enforce them. In comparison to other cities in the region, Tokyo and Seoul are well-managed. Beijing and Shanghai also have good institutional structures for policy making and implementation. In addition, the decentralisation of environmental governance in Beijing and Shanghai is far better than it is in many cities in Southeast and South Asia. All four cities have constitutional mandates to fully govern the local environment. Despite these advantages, policy barriers and constraints do exist. Better regulations, greater use of economic instruments and market-based approaches, innovative financial mechanisms based on public-private partnerships, and increased institutional capacity to implement policies are necessary developments.

Several successful experiences in building- and transport-related policies implemented elsewhere could be useful for these cities. For example, Singapore has had a successful experience with integrated land use and transportation and vehicle emission control strategies. Singapore

implemented strong policies to control the number of vehicles and used congestion pricing and other policy instruments to limit their use. Shanghai has implemented a similar capping of vehicle numbers with some success. Successful examples in Singapore are described in Appendix A. A successful introduction of battery-operated vehicles in Kathmandu, although on a small scale (by charging batteries with electricity largely produced by hydropower), shows that various niches for clean fuel need to be tapped even if promoting such measures is a complex process (see Appendix B). Appendix C describes the step-by-step implementation of various measures to control SO_x emissions in Kitakyushu. A balance between curative (end-of-pipe approach) policies for short-term problems and proactive approach policies for long-term problems is essential.

Comprehensive policies focused on GHG mitigation do not currently exist at the city level in Asia, but many cities in relatively developed countries such as Japan and Korea have recently started formulating such policies. Japanese cities are obliged by law to prepare countermeasure plans and several cities in other countries have also opted to make such countermeasure plans. Tokyo is ahead of all other cities in Japan although it has not yet enforced mandatory GHG mitigation plans. Tokyo is trying to integrate GHG reduction into a number of areas such as plans for improving building energy performance, urban warming mitigation, appliance efficiency and road transportation. No such concrete plans have been formulated in Seoul, but the Seoul Metropolitan Government is weighing various options and trying to find avenues to begin with. Shanghai's and Beijing's focus is on air pollution and fuel switching from coal to better quality coal or natural gas; in this process, they have the potential to cut back CO₂ emissions without introducing any explicit CO₂ countermeasures. Like other cities in developing countries Asia, they, in essence, do not have any explicit policies or targets for CO₂ reduction.

Thus far, the synergy and conflict between air pollution mitigation and CO₂ mitigation is poorly understood in the four selected cities. Improvements in energy efficiency always reduce CO₂ emissions although a change in fuel and a structural shift in activities and fuel type may not necessarily produce a synergy between air pollution and CO₂ emissions. All four cities have largely neglected such considerations. The use of

market-based mechanisms such as trading are not on the policy agendas Tokyo and Seoul, and countermeasures are likely to rely too heavily on efficiency improvements in the energy sector. The following section describes in detail the policy initiatives in Tokyo and Beijing.

7.2 Japanese Domestic Policies and Their Implications for Local Governments

Japan's commitment to the Kyoto Protocol, which was ratified by the Diet in May 2002, is a 6% reduction in the 1990 levels of GHG emissions by 2010. From 1990 to 2000, GHG emissions increased by 8%, so a 14% reduction in 2000 levels is needed to meet the Kyoto commitment. The burden lies not only with the national government: without cooperation from local governments, it will impossible to meet this goal. Japan's Law Concerning the Promotion of Measures to Cope with Global Warming²⁶ clearly seeks the assistance of local governments. Article 4 identifies the responsibilities of local governments as follows: (1) Local governments shall promote policies to limit GHG emissions and to enhance sinks in accordance with the natural and social conditions of their areas. (2) Local governments shall take measures to limit GHG emissions and enhance sinks in their own business activities, strive to provide information on policies specified in paragraph 1, and adopt other measures encouraging enterprises and residents to limit GHG emissions and to enhance sinks. Article 8 seeks the cooperation of local governments in formulating action plans for their business activities and publishing the plans and their implementation status).

Japan's national CO₂ emissions hit a record high in 2000—1.237 billion tonnes, 0.2% higher than in 1999—but dropped 2.7% from 2000 the following year (JFS, 2003). The salient features of the policies of the Japanese government thus far as they relate to the huge task of complying with the Kyoto commitment can be summarised as follows:

26 Promulgated in October 1998. "Shared responsibility" is the key term in Japan's policy; it emphasises the roles and responsibilities of all stakeholders (local governments, citizens and the private sector). The basic policy has four principles: (1) contributing to both the economy and the environment (2) adopting a step-by-step approach in implementing policies and measures (3) sharing responsibility amongst stakeholders, and (4) ensuring international cooperation.

- enactment of a comprehensive regulatory framework. The Law Concerning the Promotion of the Measures to Cope with Global Warming was promulgated in 1998; from 1999, the Japanese Ministry of Environment (then the Environmental Agency) started to implement the law by developing basic policies. A new guideline for measures to prevent global warming was issued in March 2002.
- promotion of domestic discussions, awareness among stakeholders and activity promotion centres
- promotion of voluntary action plans²⁷
- national-local linkages: facilitation of local governments
- promotion of energy efficiency improvements and consolidation of other laws, such as the Law Concerning Rational Use of Energy, and their measures²⁸
- promotion of a package of more than 100 measures

Despite these measures, the core issues related to implementation are not yet clear. In comparison with other developed nations, especially those in Europe, Japan lacks concrete measures. Some of the shortcomings of its domestic policies are listed below:

- lack of realistic and comprehensive policy packages and too much emphasis on a sectoral approach, in which industry and construction (buildings) get priority
- over-reliance on technology interventions and energy efficiency improvement policies; these approaches are too traditional to meet the stipulated commitment
- slow progress towards market-based mechanisms (such as a carbon tax) and mandatory domestic emission trading (likely to start in 2005)
- policies unable to address lifestyle- and consumption-related issues, especially in terms of transportation and households
- slow progress in establishing institutional coordination, especially of various government ministries and their units, towards effective measures.

27 Keidanren (Japan Federation of Economic Organisations) established its voluntary action plan in June 1997.

28 This includes energy management and improvement of appliance efficiency (top runner approach, hybrid vehicles, etc.)

7.3 Policy Trends in Tokyo

Policy makers in Tokyo are well aware of the urgency of implementing CO₂-related policies. Tokyo is working on a comprehensive strategy to simultaneously combat urban and global warming and institutional arrangements inside the Tokyo Metropolitan Government have changed accordingly.²⁹ A recent survey in Tokyo revealed that more than 90% of respondents felt threatened by rising temperatures in the city and were concerned about global warming.³⁰ About 96.3% of respondents indicated that they were willing to cooperate and would accept some inconvenience if necessary.³¹

Even with such an overwhelmingly positive response, framing global issues to suit local interests is not easy. One of the three basic principles set out by the Tokyo Metropolitan Government in its Stop Global Warming Campaign is stimulating Tokyo's economy through anti-global warming initiatives. Its slogan underscores the difficulty that a local government faces in rationalising policies for global problems. Other Japanese cities face the same problem Kitakyushu has tried to promote its concept of constructing an eco-city by attracting environmentally friendly industries. Any action based on global environmental considerations alone is difficult to implement; there must be an accompanying economic benefit or direct local environmental benefit.

Institutional response from the Tokyo Metropolitan Government

Regulatory framework

Unlike many cities in Asia, whose mandates for governing the urban environment are limited, the Tokyo Metropolitan Government is empowered to govern Tokyo comprehensively. This includes making rules, standards and regulations for enforcement. At the national level, the Basic Environment Law of Japan (November 1993) provides a framework

29 The Tokyo Metropolitan Government's Bureau of Environment has had a separate department called Urban and Global Warming Department (translated from the Japanese by the author) since 2001.

30 For details see the Japan-for-Sustainability Information Centre, Update of 10 March, 2003. <http://www.japanfs.org/>

31 Eighty percent said that they were unaware of the TMG's campaigns.

for individual laws related to CO₂ emissions and air pollution, namely, the Air Pollution Control Law (June 1968), the Automotive NO_x and PM Law (June 1992), and the Law Concerning the Promotion of the Measures to Cope with Global Warming (October, 1998).³² Similarly, the Tokyo Metropolitan Government has enacted its own Basic Environmental Ordinance (July 1994) containing basic environmental regulations. The TMG Master Plan for the Environment (January 2002) provides basic plans to support all individual ordinances (some of which, like the Ordinance on Environmental Preservation, were completely revised in December 2000).³³ TMG's Global Warming Action Plan was thereby formulated.

Numerical targets

The Tokyo Metropolitan Action Plan for Environmental Conservation sets numerical targets to reduce GHG emissions from Tokyo by 6% of 1990 levels by 2010. This means a 14% reduction from 2000 levels, or about a 20% reduction from business-as-usual emissions in 2012. While this goal is ambitious, such targets have acted as a prime mover for action towards emission mitigation.

Institutional arrangements

In order to facilitate a comprehensive response to global warming problems, TMG established a separate department³⁴ within the Bureau of Environment which is responsible for drawing up comprehensive plans and overseeing the implementation of integrating global warming concerns into individual sectors such as transportation, urban planning, and buildings. This is a unique institutional arrangement seldom seen in other cities. Although this department is theoretically responsible for comprehensive planning, in reality, it does not include a number of core sectoral issues, such as transportation, primarily because it is politically risky for a city to embark on GHG emission reduction when there is a urgent need to tackle growing SPM and NO_x problems. The newly instituted department was given a mandate for tackling the first

32 Ministry of Environment, Japan, see <http://www.env.go.jp/en/index.html>

33 Personal interview conducted by author at the Local and Global Warming Control Department (tentative translation) of TMG in June 2003.

34 Urban and Global Warming Department (tentative translation by author)

three of the six key challenges identified after Stage I of the TMG's Stop Global Warming Campaign (see below); these deal with energy use in buildings and appliance efficiency. Since this arrangement may create a greater sectoral focus on buildings and appliances at the expense of including automobiles in comprehensive global warming plans, it may cause unwarranted increases in CO₂ emissions. For example, controlling diesel vehicles by strict regulation of SPM and NO_x may increase the use of gasoline vehicles. Since diesel is more CO₂ friendly than gasoline, this substitution may increase CO₂ emissions. Controlling diesel vehicles through fuel quality, in contrast, may not add penalties to users and thereby may not result in a switch to gasoline vehicles. Close coordination is essential if such problems are to be avoided.

Plans, policies and countermeasures

Most of Tokyo's existing plans and policies revolve around energy efficiency improvements that target appliances, building energy use (office buildings contribute over 60% of the total energy use in the commercial sector) and, to some extent, alternative fuel vehicles. The Tokyo Green Plan (December 2000) is expected to enhance sinks in order to offset CO₂ emissions and alleviate urban warming. Under this plan, Tokyo has recently passed mandatory rooftop greening requirements for new private and public buildings.³⁵ To implement the Global Warming Action Plan and the Green Building Program as stipulated by the Ordinance on Environmental Preservation, large buildings (over 10,000 m² in floor space) are required to publicly disclose environmental plans in the planning stage. The ordinance also requires large energy-consuming businesses³⁶ to publicly disclose plans to reduce their energy use (from June 2002).³⁷ In addition to energy considerations, the Green Building Program also looks into a number of other considerations, such as material use and water reuse, and includes a rating system in which buildings receive a grade of 1, 2 or 3.

35 For buildings constructed on land areas of over 250 m² (public facilities) or over 1,000 m² (private facilities). The Tokyo Green Plan (2000) also requires the submission of rooftop greening plans for new buildings with a total floor area of over 10,000 m².

36 For large-scale developers consuming over 1,500 KL/year of crude oil equivalent or over 6 million KWH/year.

37 The Green Building Guideline was issued on 28 March 2002.

The Stop Global Warming Campaign was initiated by the TMG in late 2001 to promote awareness and debates on countermeasures for global warming amongst city residents and the corporate sector. Stage I of this campaign (February 2002 to November 2002) was an information campaign to accelerate discussions about very ambitious five policy proposals:³⁸

- introducing obligatory reduction of CO₂ emissions from large corporations, including businesses and offices
- establishing CO₂ credit-trading markets for promoting wind power and forest management
- requiring new buildings to use renewable energy, such as solar energy
- enforcing and expanding energy efficiency standards for automobiles
- imposing restrictions on buying, selling, and making energy-intensive products

The first stage of the campaign, after a series of discussions, basically highlighted some of the key challenges to be addressed. It developed ideas for a single-policy framework for mitigating urban and global warming and provided a starting point for Stage II (November 2002 onwards). The package includes the following goals:

- making CO₂ cuts mandatory for business operations, including office facilities
- strengthening standards of energy efficiency for new buildings
- creating a system which fully informs consumers about energy efficiency
- strengthening measures to curb CO₂ emissions from road traffic
- promoting a shift to renewable energy
- promoting measures to tackle the heat island effect as part of urban planning

In association with other national institutions, the TMG has initiated its own eco-labelling programme to promote public awareness and allow the public to choose energy-efficient products (Figure 7.1). The programme was started in collaboration with seven prefectures and 149 store chains

38 Press release from the Bureau of Environment of the Tokyo Metropolitan Government, 20 February 2002.

in mid-2002. The label shows the cost of the appliance alongside the energy cost for five years and rates appliances from A to D depending on their performance against set standards (JIS).

Other measures that are under discussion are (1) passing an ordinance calling for the mandatory reduction of CO₂ by large business facilities and especially targeting 1,000 factories and offices which produce 10 million tonnes of CO₂ annually; (2) offering social and economic incentives to businesses with proactive and supplementary measures such as emission trading; and (3) introducing green taxes.

Although exact replication is impossible, some of the measures used in Tokyo could serve as guiding principles for other cities in Japan as well in other countries. Tokyo can be viewed as a front-runner in that many local governments in Japan may follow Tokyo's lead, and ultimately increase the positive impact.



Figure 7.1 Appliance labelling in Tokyo

7.4 Policy Trends in Seoul

Unlike Tokyo, Seoul has not formulated any explicit policies or plans for GHG mitigation. The Korean capital is, however, carrying out basic research to clarify the status of emissions by developing detailed inventories and to assess the prospects of reducing emissions through various options. The city government aims to implement an integrated approach, in which it synergises its measures for reducing air pollution and GHG emissions. Some of the policies being investigated are listed below:

- provision of clean fuel in the energy sector, especially expanding the provision of district heating to 453,000 more households, increasing city gas coverage by 98.3% in 2007 and gradually introducing clean fuel in boilers
- reduction of GHG emissions from waste by controlling waste generation through a volume-based fee system and introducing appropriate waste treatment systems (which will include restricting small incinerators)

- reduction of emissions by controlling vehicle idling, strengthening inspection systems and promoting low-polluting cars
- introduction of environmentally-friendly traffic measures, such as a no-driving-on-one-weekday system
- restoration of certain city areas and enhancement of the city's carbon sink through greening

Korea joined UNFCCC in 1993 and submitted its ratification of the Kyoto Protocol to COP 8 in October 2002. Since the latter date, efforts have been made to form a government-wide coordination mechanism to establish policies for GHG mitigation. This set up would comprise an inter-ministerial committee led by the Prime Minister and supported by several working groups concerned with issues like energy, environment, forestry and research and development. To date, such plans exist only at the national level and have not trickled down to local governments in terms of any pre-defined demands for compliance. In 1998 the national government signed voluntary agreements for energy auditing with 15 companies; in 2001 the number of signatories had reached 374. A few countermeasures in the forestry and waste sectors, such as forest management and landfill gas utilisation, have been implemented. Such small pilot programs are only in their initial stages, however, and are unlikely to affect GHG emissions on a large scale.

To tackle local pollution, the Ministry of Environment of Korea has unveiled an ambitious plan called "Special Measures for Seoul Metropolitan Air Quality Improvement (2003-21012)." Under this plan, PM_{10} and NO_2 will be reduced from 71 to 40 mg/m^3 and 37 to 22 μ/m^3 respectively between 2001 and 2012 (Seong, 2004). The scheme aims to estimate the environmental capacity of pollutant volumes and to allocate the maximum permissible emission of air pollutants to large point sources. The objective is to control air pollutants by volume within the environmental capacity calculated. To control mobile sources of pollution, this scheme focuses on significantly strengthening emission standards,³⁹ making it mandatory for automobile manufacturers to sell clean vehicles by certain rates, making

39 By 2006, gasoline vehicles are to meet ULEV levels; and diesel vehicles, EURO IV levels. By 2010, standards are to be an additional 50% stricter.

it obligatory for selected public agencies to buy clean vehicles, offering economic incentives to promote the market penetration of clean vehicles, and strengthening the emission standards for vehicles in use. Government and private sector cooperation is essential if this scheme is to succeed. The role of the Seoul Metropolitan Government is also very important because although the basic plan is being developed by the Ministry of Environment, the implementing agency in this scheme is the local government.

7.5 Policy Trends in Shanghai

In Shanghai, most interventions which will ultimately reduce CO₂ emissions fall under the restructuring of the energy sector. In 1999, the Shanghai Municipal Government drafted a plan for sustainable development in which energy and environmental policies were addressed. According to this plan, coal consumption will be curbed so that by 2010 there will be a 55% reduction in the use of coal as a primary energy source. The transition involves securing the input of three GW of electricity from the Three Gorges Dam and the nuclear plant at Qinshan and increasing the natural gas share to 10 to 12%. Regulatory measures prohibiting the installation of new coal boilers in core city areas are already in place. The policy also aims to control the number of registered vehicles so that it does not exceed 16 million in 2010 (Shanghai, 1999). Shanghai environmental policy also limits SO₂ emissions to 420 kt/year in 2010 (SEPB, 1998). Car-limiting policies have had some success; since 1998, for example, the city has adopted the Singaporean practice of auctioning registration permits for new vehicles.⁴⁰ A key question is whether or not Shanghai will be able to continue such policies in the future. The 10th Five-Year Plan (2000-2005) aims to stabilise coal consumption in Shanghai; accordingly, changes in the structure of fuel consumption are expected. In particular, Shanghai will benefit from the national programme of transferring natural gas and power from west to east. If distribution infrastructure can be developed in a timely manner, this transfer will compliment Shanghai's plan to establish zero-coal burning zones in the city. To complement these plans, Shanghai

40 In 1998, a cap on the annual registration of new cars and trucks was set at 50,000. See Zhou and Sperling (2001).

has implemented a number of regulatory measures such as the Shanghai Energy Efficiency Regulations, the Shanghai Action Plan on Sustainable Energy Production and Consumption, and Energy-Saving Regulations (Shi, 2004). A number of other measures are being implemented in order to regulate mobile sources. Since the major thrust is on the energy sector, Shanghai can greatly benefit from international funding mechanisms such as Clean Development Mechanisms (CDM).

7.6 Policy Trends in Beijing

In China, decisions about environmental policy are made mainly by three organs (He, 2004). The Environment and Resources Protection Committee (ERPC) of the National People's Congress (NPC) makes policy decisions related to protecting the environment, passes legislation, and supervises its enforcement. The State Environmental Protection Commission (SEPC) of the State Council drafts policies, regulations, and laws for environmental protection. The third body is the State Environmental Protection Agency (SEPA) of the State Council, which supervises and administers environmental protection laws throughout the country. The Beijing Environmental Protection Bureau (EPB) is directly under the SEPA. On 15 September, 1987, the Law on Air Pollution Prevention and Control of the People's Republic of China (LAPPC) was approved by the NPC; it was revised in 2000. The law required that all plants that discharge pollutants into the air must comply with the rules for pollution control. The Beijing government has enacted a series of policies and regulations concerning air quality protection and implemented a series of emergency measures.

In December 1998, the Beijing municipal government announced and started implementing the first of six stages of emergency measures to combat air pollution (BMG, 1999). These measures mainly targeted coal-fired, mobile and dust sources. Coal-fired sources were to be controlled by using high-quality coal, switching from coal-fired to natural gas boilers, and installing central heating systems. Vehicle emissions were to be controlled by developing the transportation system, improving traffic efficiency, tightening emission standards for new vehicles, promoting the scrapping of old vehicles, conducting inspections of in-use vehicles,

retrofitting taxis with dual-fuel engines, and banning vehicles with high emissions from entering downtown areas. In addition, industries were required to apply advanced, low-polluting technologies, and more efficient energy and industrial practices have been adopted to reduce pollution. With these efforts, air pollutant emissions have begun to decrease. Since the six phases of emergency measures were implemented, SO_2 concentrations have dropped a significant 33% to $80\mu\text{g}/\text{m}^3$; PM_{10} concentrations, however, decreased just 8% to $162\mu\text{g}/\text{m}^3$ (Yuan et al., 2002). These emergency control measures alone will not meet the future targets adopted by the Beijing municipal government, which require that the concentrations of major pollutants meet WHO standards before 2008 (see Beijing Olympic Action Plan, Beijing Organizing Committee for the Games of the XXIX Olympiad: <http://www.beijing-2008.org>, 2002). In the future, more comprehensive energy policies and end-of-pipe control strategies will be implemented. Beijing is gearing up for the 2008 Olympic Games and the municipal government is unveiling an ambitious plan to decrease local pollution and to extend its transportation infrastructure.

8

Opportunities for and Barriers to Policy Integration

The analyses of Tokyo, Seoul, Shanghai and Beijing included in this report have demonstrated that dealing with energy-related issues at the local level requires two types of policy integration. The first is the integration of energy-related environmental concerns into the overall urban development policies for all sectors. This is a long-term policy issue in which national governments, because of the governance structure of Asian cities, must play a key role. Energy could be an easy “entry point” for integrating environmental concerns into urban management (OECD, 1995), especially in those cities which are going through rapid energy restructuring. The second type of policy is the integration of air pollution and GHG concerns at the local level. This step is necessary because it is perceived that the policies aimed at reducing at GHG emissions alone are difficult to put into operation if there are no accompanying local benefits (such as improvement in air pollution or the urban heat island effect, an increase in energy efficiency or other economic benefits). Cities such as Tokyo, however, may not need such rationalisations in the future if the national government enforces obligatory reductions in GHG emissions in order to meet Japan’s 6% Kyoto Protocol commitment. Besides, many of the countermeasures have the potential to simultaneously contribute to local as well as global concerns; such countermeasures are likely to gain acceptability among local policy makers, the private sector and the general public. Using Tokyo as a yardstick, this section discusses the barriers to and opportunities for such integration. More emphasis here is given to the second type of integration.

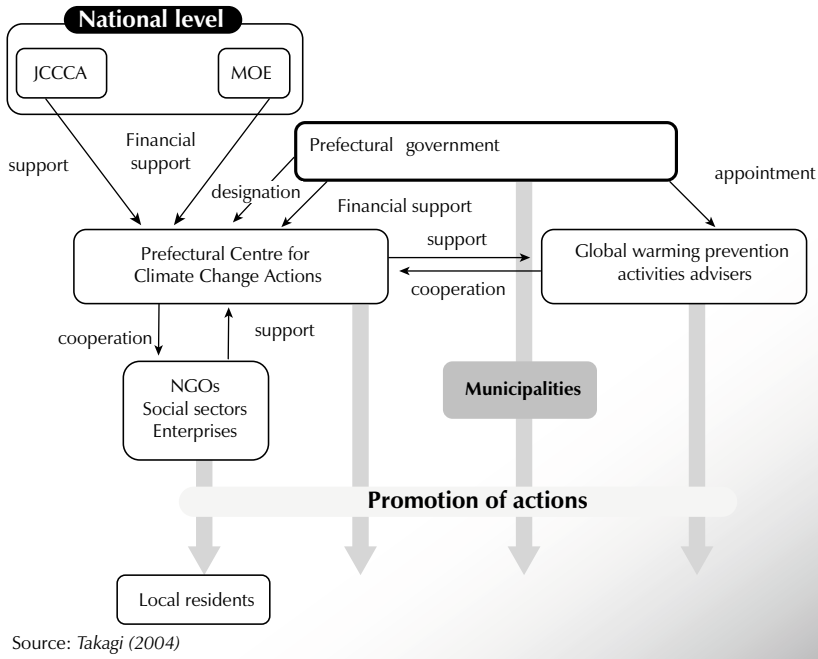
8.1 The Role of National Governments and Local-National Cooperation

National-local cooperation is essential for effective mitigation of GHG emission in cities in developed countries. This is also essential for policy integration of air pollution and GHG emission in cities in developing countries, including those in Asia. Mechanisms for cooperation have been introduced indirectly in a number of areas related to the energy sector, such as energy efficiency improvement programmes, renewable energy developments (solar, wind and fuel-cell based pilot activities in cities) and others in a number of Asian countries. For climate policy, such cooperation is at the developmental stage. As Japan is the front-runner in climate policy in Asia, major references to cooperation in this section are attributable to Japan.

The Climate Change Policy Law of Japan enacted in October 1998 and amended in June 2002 seeks to develop action plans to limit GHG emissions in the business activities of national and local governments. Accordingly, 47 prefectures, 1,017 municipalities and 360 municipal cooperatives had formulated plans as of early 2004 (Takagi, 2004). The Ministry of Environment provided guidelines for the promotion of local action, which included voluntary plans as well as plans to promote actions to reduce GHG emissions and enhance sinks keeping local conditions in mind. By early 2004, 39 prefectures and 43 municipalities had formulated such plans (Takagi, 2004). National-local cooperation is limited to the provision of such guidelines and regulatory frameworks; concrete partnerships in action-oriented activities are lacking. Figure 8.1 outlines the structure of such cooperation in Japan. This system has yet not been operationalised in terms of financial or other supports. The fundamental limitation to running effective programmes to reduce CO₂ emissions in progressive cities like Tokyo comes from the "watch and see" situation in terms of Japan's national climate policy. In line with national policy, interventions are being made in sectors that are relatively easy to tackle such as energy efficiency and construction sectors; but, in other areas, not much progress has been made.

In countries other than Japan (namely China and Korea), the role of national-local cooperation is centred on supporting research, assessing

the technical feasibility of the integrated approach and promoting donor-assisted projects in cities⁴¹. In these countries, the role of the national government is especially important because, as will be discussed in the next section, local governments lack the capacity for policies.



Source: Takagi (2004)

Figure 8.1 Local system in Japan to promote actions for mitigating global warming

8.2 Institutional Capacity and Arrangements for Addressing Policy Integration

Although the institutional capacity and arrangements of the local governments of Tokyo, Seoul, Beijing and Shanghai are better than those of the majority of other cities in Asia, their capacity for integrated policy is not well-developed.

⁴¹ One example is the support for and coordination of the Integrated Environmental Strategies (IES) Program of US-EPA provided by the State Environmental Protection Administration of China and Ministry of Environment of Korea.

To establish effective interventions with regard to climate policy, the institutional mechanisms within the Tokyo Metropolitan Government need to be strengthened. The existing set-up is such that the Urban and Global Environment Division is unlikely to have a significant influence on other divisions within the Bureau of Environment or on other powerful sectoral bureaus, such as taxation, housing, construction, and city planning. The Department of City Planning can play a more effective role in policy integration than can the Department of Urban and Global Warming, which has a limited mandate. Institutional coordination and the development of comprehensive measures is indeed a challenge. Because influencing stakeholders is a difficult task, existing programmes in Tokyo focus on voluntary mechanisms and shy away from mandatory measures. In the case of buildings, for example, most countermeasures involve the voluntary disclosure of information. While the corporate culture in Japan may force big businesses to comply, this may not be true for medium-size or small businesses. Mandatory measures are being discussed in Tokyo but their implementation, in light of the absence of national-level policies, is a key challenge. The first step is to build consensus among stakeholders for enforcing obligatory emission reductions.

The extent of the benefits which Seoul could derive from the integration of policy measures for reducing emissions of both local air pollutants and GHG is largely unknown due to the lack of information about and detailed studies of various options. Chinese cities are in a better position than Seoul for integrated policy because of their massive energy-restructuring plans for industries. Since the majority of big industries (and energy industries) in Beijing and Shanghai are state-owned, these cities have the institutional capacity to force companies to comply with government policy.

8.3 Exploiting Market Mechanisms

Considering how important a role the corporate sector plays in the city's emissions, it is clear that Tokyo ought to exploit market mechanisms in order to reduce CO₂ emissions. However, establishing obligatory or trading mechanisms will not be easy, especially as the national government has not done so. The Japanese national government is expected to

implement strong measures like the establishment of an emissions trading system, and thus of credit markets and obligatory emission reductions only after 2005. Exploiting market mechanisms as early as possible is a key challenge for Tokyo. Tokyo has acted with greater alacrity than the national government has in areas like introducing low-sulphur fuel; similar swiftness is warranted in climate affairs.

It cannot be expected that other cities will implement market mechanisms for reducing CO₂ emissions. However, various economic and regulatory instruments that provide the market with appropriate signals for promoting an integrated approach can be introduced. In the case of mobile sources, Singapore's practice of auctioning licenses for new vehicles through competitive bidding, congestion pricing through electronic road pricing (or a less technical method, the area licensing system) and other fiscal measures are good examples (see APPENDIX A). Among other measures, regulating parking charges, promoting public transportation, and creating a niche market for clean vehicles such as battery-operated electric vehicles⁴² or hybrid cars can reduce local air pollution and GHG emissions simultaneously.

8.4 Prospects for Sharing Experiences

In a number of other areas, too, sharing experiences amongst cities would be beneficial. The cities identified below could initiate profitable exchanges in the itemised areas of experience:

- **Seoul and Beijing:** district heating
- **Seoul:** reduction in waste volume and utilisation of landfill gas
- **Tokyo:** development of mass transportation
- **Shanghai:** control over the registration of new vehicles
- **Tokyo:** incentives to low-and ultra-low emission vehicles

The flow of information and sharing of lessons should go both ways, from developed to developing cities and vice versa. For example, Tokyo could learn a lesson about district heating and cooling as it is practice in

42 Depending on the fuel mix used to generate the electricity for charging batteries.

Beijing and Seoul. By mid-2001, 72 districts in Tokyo with an estimated area of 1,366 hectares (13.66 km²) were designated as district heating and cooling zones; the system is now in operation in 63 districts⁴³. Since places like Marunouchi and Shinjuku have large concentrations of office blocks (in Marunouchi, Dhakal *et al.* (2004) estimated that the density of building floor area in a one-km grid was as high as 3.5 times more than land areas in the mid-1990s), the potential for district heating and cooling is tremendous. In 2001, over 350,000 households in Seoul were using district heating; the number is expected to increase to over 430,000 households by 2007 (Jung, 2004). Similarly, other cities in East Asia, notably Beijing and Shanghai, have large shares of district heating and cooling systems. Tokyo can learn from the experiences of these Asian cities and of European cities. The box below shows the potential for, barriers to and lessons contained in the success of district systems in European cities.

**Box
8.1**
Lessons derived from successful district cooling and heating systems in European cities

- *If cooling and heating systems (CHS) are to be developed, there must be appropriate municipal ownership and planning regulations, such as the requirement that building designers demonstrate the feasibility of CHS.*
- *The heating and electricity prices of alternative supply systems must be competitive.*
- *Technically and economically reliable energy must be supplied to all connected consumers under a variety of external conditions.*
- *Connection rates must be high because the marginal cost of connecting additional consumers is relatively low.*
- *Local efforts must be strong not only so that the connection rate will be high but also so that economic investments will be fully utilised and paid for.*
- *Both the local and global environment must be improved.*
- *Stakeholder participation must be ensured.*

Source: *Urban Energy Handbook: Good Local Practices*, OECD, 1995.

43 Tokyo Metropolitan Government: <http://www.kankyo.metro.tokyo.jp/kouhou/english2002>

8.5 Strengthening CO₂ Concerns Related to Transportation

Responses to CO₂ emissions in Tokyo's transport sector are weak, especially because of its focus on existing problems with SPM and NO_x. Most local emissions come from diesel vehicles, which are more CO₂ friendly than gasoline. Adopting diesel has been eyed as one of the major options for limiting CO₂ emissions from automobiles in Europe, among other places. Regulating diesel vehicles in Tokyo (in particular, light-duty trucks) to control NO_x and SPM, however, has the potential to push automobile manufacturers towards introducing more gasoline vehicles and thus towards creating an eminent threat to attempts to reduce CO₂ emissions. Engaging in active dialogue with the automobile industry is key to enforcing climate-friendly policies. Despite the fact that fuel efficiencies have improved over the time and the number and utilisation rate of vehicles is relatively stagnant in Tokyo, one of the major reasons for the increase in CO₂ emissions is the structural shift towards cars with larger engines. Since emission standards for small and large cars differ, even if individual automobiles meet the standards, the net emission volume will still increase. To counter this phenomenon, a separate emission standard based on the average emission factor for an automobile fleet⁴⁴ needs to be implemented in addition to the emission standards for individual vehicles. With this mechanism, automobile retailers (or big buyers) would be required to sell (or buy) a good mix of vehicle sizes or hybrid vehicles, in order to keep the total volume of emissions down. Different forms of such emission standards exist in other parts of the world, and Tokyo can learn from their example.

The majority of modern rail networks in East Asian cities are electricity-based. Thus, the fuel mix of electricity generation plays an important role in determining a city's volume of CO₂ emissions. Strategically locating a national gas pipeline network and tapping more hydro power may help Beijing and Shanghai to reduce the GHG intensity of the electricity used in public transportation in the future.

It is essential that mega-cities develop new modes of mass transport and strengthen existing modes. For example, Beijing, as described above,

44 Introduction of Corporate Average Fuel Economy (CAFE)

is planning a massive subway development by 2008. In addition, road development should also include environmental considerations and the strengthening of public transportation is essential. Financial capacity is often a serious constraint for such policies, but sound public-private-partnership in transportation services has the potential to overcome such limitations. New international financial mechanisms aiming at improving the environment are also being developed. The Global Environmental Facility (GEF) provides financial support towards infrastructure projects based on “environmental additionality” criteria. CDM, which is under considerable debate and negotiation, may open a new avenue for financing infrastructure projects aimed at integrating air quality policies and reducing GHG emission in cities.

8.6 Creating Momentum for Change by Targeting Available Niches

The integrated approach can get a boost by capturing opportunities existing in specially niches. Though the real effect of narrowly focused measures may be small, directing measures and campaigns toward niches can provide the momentum needed to encourage wider actions. Buses which run on CNG and liquid petroleum gas (LPG) taxis have long been used and their numbers in cities across Asia now run in the several hundreds of thousands. Other niche opportunities exist in promoting demonstration projects and pilot experiments in areas like clean vehicles (see Kathmandu’s experience of battery-operated three wheelers in Appendix B), renewable energy technologies, biomass utilisation and waste reduction schemes, all of which would create awareness and impart environmental education. One obvious opportunity for Tokyo to save energy is to use natural lighting as much as possible and to integrate renewable energy technology in building systems. Government policies need to support opportunities in niches as otherwise they cannot take off.

Tokyo has the potential to be a front-runner in CO₂ mitigation and to foster positive changes in the attitudes of other local governments in Japanese with regard to CO₂ emissions. Several other cities, such as Kyoto, are planning to enact an ordinance tentatively called Ordinance on

Global Warming Prevention to promote effective measures against global warming. The city is planning to enforce the ordinance from the fiscal year 2004.⁴⁵ Kitakyushu, which is historically an industrial city, is active in global issues and may follow suit. Although the measures currently existing in Tokyo will not suffice if Japan is realistically to meet its 6% reduction target, Tokyo can act as a catalyst for positive change.

8.7 Transition from a Sectoral Approach to Holistic Planning

In general, urban planning-related policies which tackle air pollution and GHG emissions are weak. General observations of East Asian mega-cities reveals the following facts.

- Cities are expanding and extended metropolises put tremendous pressure on urban planning and management. As seen in Beijing, Bangkok, and Shanghai urban sprawl towards the periphery is detrimental to the integrated approach. Containing growth requires new approaches in urban planning, such as growth management and transit-oriented development (TOD), alongside the traditional methods of land use, zoning and building control.
- Traditional urban planning practices do not adequately take into consideration urban environmental considerations, such as waste, air pollution and the urban heat island effect. The development of peri-urban areas due to the dynamics of socio-economic change and the relocation of industries from the city centre is cause for great concern.
- Sound urban planning practices set up a holistic system under which all aspects of a city operate. In this scenario, reducing CO₂ emissions is possible by optimising energy use in urban transportation and households and by choosing appropriate energy supply systems.

Although past efforts to reduce air pollution and CO₂ emissions have, in general, focused on individual sectors, the need for a holistic approach is being realised. Tokyo has begun holistic planning but a few sectors,

45 For details see <http://www.city.kyoto.jp/kankyo/ge/> (in Japanese)

such as transportation, have responded weakly. Since Seoul is developing GHG mitigation plans, developing comprehensive urban-scale plans by consolidating existing plans and by setting clear goals will be necessary, as will ensuring that there are proper institutional arrangements in the municipality. In rapidly developing mega-cities such as Beijing and Shanghai, provisions for a holistic approach must be made soon as the window of opportunity to act is rapidly closing. Once Beijing and Shanghai are locked into a particular urban structure, remodelling will be extremely difficult.

Comprehensive interventions can only be achieved with political or institutional leadership. This requires a number of logical steps, as are listed below.

- preparation of a detailed inventory of selected strategies and their effects
- implementation of selected GHG emission-reducing measures
- establishment of a GHG emission reporting system
- development of a climate action plan and follow-up and monitoring systems

8.8 Unclear Prospects for Synergy and Impediments to Policy Integration

Unlike air pollution, which is widely studied, what opportunities for and barriers to integrated approaches exist is largely unknown. All countermeasures optimising air pollution benefits may not necessarily be the best ways to reduce GHG emissions. When there are several choices for controlling air pollutants, a carefully crafted policy might yield benefits for GHG. The possibilities for and constraints on synergy are unclear to policy makers although many studies have been carried out to evaluate the effects of specific countermeasures on specific pollutants.⁴⁶ Table 8.1 shows both how selected local countermeasures against air pollutants can synergise and conflict with global GHG emission control. Since policies

⁴⁶ For example, what is the impact of measures and policies which have successfully reduced PM₁₀ in many cities on GHG emissions?

are implemented in the form of a package of measures, the cumulative effect of such measures must be clarified so that policy makers can be guided towards choosing the most effective combinations.

Table 8.1 Possible synergy with and conflict between local pollution measures and GHG emission reductions (indicative only)

Local countermeasure	Synergy with global concerns	Conflicts with global concerns
Urban transportation		
Introducing CNG or propane Interventions	CNG has been introduced for air quality improvement in cities such as Delhi, Beijing, Bangkok, etc. CNG or propane vehicles, in general, emit less NO _x and PM, and at the same time are more CO ₂ friendly than conventional vehicles.	While CNG reduces CO ₂ emissions, it may also outweigh CO ₂ benefits by increasing un-burnt CH ₄ (due to poor maintenance) in heavy-duty engines such as those of buses and trucks. A city's inspection and maintenance system may have an important role in determining the level of gains in GHG emissions. Thus, engine and fuel management technologies need to be balanced. Effects could be different for the dual, retrofitted exclusively designed vehicles.
Controlling NO _x and SPM released by diesel vehicles	High-quality diesel with a maximum sulphur content of 50 PPM diesel may help reduce CO ₂ emissions if additional CO ₂ emissions at refineries do not offset such gains.	Diesel is now CO ₂ friendly than gasoline. Since diesel vehicles are major contributors to NO _x and PM, stringent measures to control diesel vehicles (such as diesel cars, which are small) may result in increasing the number of gasoline vehicles.
Promoting electric and hybrid vehicles	Electric vehicles have no tailpipe emissions of air pollutants or CO ₂ . Hybrid vehicles reduce air pollutants and CO ₂ significantly.	Electric and hybrid vehicles perform poor and are expensive. CO ₂ benefits from electric vehicles depend on the fuel mix of electricity generation. If a major share of electricity is generated by coal, the CO ₂ benefit may be negative. Only life cycle assessments can provide a clear picture.
Introducing vehicle category-based emission/fuel efficiency standards	Such standards reduce local air pollutants and CO ₂ emissions per vehicle-km for particular vehicle categories (type or size).	If vehicle-km per vehicle increases or if people switch to vehicles with bigger engines, the total volume of CO ₂ might increase even if such emissions/fuel efficiency standards are met. To reduce the risks of increasing both local pollutants and CO ₂ emissions, additional standards based on the average fuel/emission efficiency of a fleet of vehicles (or corporate average fuel efficiency) would be useful.

Local countermeasures	Synergy to global concerns	Conflicts to global concerns
Promoting mass transport and discouraging private cars	Usually such measures reduce CO ₂ emissions, as they improve energy performance and reduce gasoline use, which emits a large volume of CO ₂ . Mass transport reduces congestion and associated CO ₂ penalties from vehicles.	Inefficient operation of mass transportation such as metro and bus systems tend to reduce their occupancy and promote private modes which are usually more CO ₂ intensive per passenger-km.
Introducing reformulated gasoline for reducing smog, VOC and toxic air pollutants		Reformulated gasoline compromises fuel economy nominally by 1% or 2%; therefore, CO ₂ might increase.
Improving fuel quality	Little effect	Little effect
Improving inspection and maintenance systems, changing driving conditions and driving behaviours	May improve fuel efficiency and thereby reduce CO ₂ .	Rebound effect needs to be watched.
Congestion pricing and traffic management	Reduces congestion, discourages car use and results in fuel savings; however, the exact impact on CO ₂ depends on various factors.	
Energy sector interventions		
Energy efficiency improvements (demand side management, improvement in residential and commercial buildings, industrial processes and boilers)	Contributes reducing CO ₂ emissions.	
Switching to natural gas	Helps reduce CO ₂ emissions.	
Using low-sulphur coal (clean coal)	Helps reduce CO ₂ emissions.	
Promoting renewable energy	Reduces the need for fossil fuels, which are major sources of CO ₂ .	In some cases only life cycle analyses determine how much gain is really made.
Waste sector interventions		
Reducing waste volume	Reduces the volume of waste to be incinerated or landfilled, GHG emissions will decrease and thus results in lower GHG emissions.	

Local countermeasures	Synergy to global concerns	Conflicts to global concerns
Promoting recycling	The overall impact is not very clear and depends on a number of factors such as the type of recycled products, the amount of energy consumed in making products from recycled materials and the method of disposal.	
Promoting landfill over incinerator usage	Reduces CO ₂ from incineration.	Increases methane, whose greenhouse effect is 22 times greater than that of CO ₂ .
Urban planning interventions		
Controlling sprawl and promoting a reasonable level of urban population density	Potentially may reduce energy use (and CO ₂) from urban transportation and households.	Not very clear
Promoting urban green spaces	Enhances carbon sink.	

8.9 Role of International Institutions in Policy Integration

International institutions such as UN organisations, various inter-governmental panels, international research institutions and NGOs play a major role in directing international environmental debates and formulating action plans, such as those governing climate policy and trans-boundary air pollution. Such action plans influence the cooperative international activities of bilateral and multilateral institutions that provide support to developing countries.

GHG and air pollution are both caused by burning fossil fuel in industrial, building and transportation sectors. Recently, international institutions have started to take an interest in the promotion of integrated approaches in industries and power plants, which improve energy efficiency and promote new financial mechanisms, such as CDM. Such measures currently exist only on a limited, pilot-project basis. Although it is fairly accepted that integrated approaches are necessary and have multiple benefits, most international institutions have not operationalised explicit policies to promote such approaches. For mobile sources, in particular, integrated approaches are still at the conceptual stage. Unlike stationary sources, mobile sources are diffused into physical space and involve a wide variety of stakeholders.

For integrated approaches to take off, international institutions should promote the incorporation of mobile sources in international financial mechanisms, such as CDM, and set simple and appropriate rules in association with rules for stationary sources. In addition, the creation of funding windows for promoting integrated approaches in multilateral and bilateral institutions would allow developing countries to operationalise such approaches. To lobby for such measures necessitates, the consolidation of studies and research findings, the promotion of policy dialogues, and the advocacy and development of institutional networks.

9

Conclusion: Pathways to a Sustainable Future

9.1 General Observations of Cities

The nature of energy use in and GHG emissions from cities in Asia is not well understood. Limited research on energy use by industrial and urban transportation sectors from the viewpoint of managing air pollution does exist, but an overall energy picture is missing. Since energy-related decisions are usually made at the national level, energy management at the city level was not a priority or even an important topic until recently. In some cities, especially those in coal-dominated countries such as China, energy restructuring is on the policy agenda of local governments. At the global scale, the scientific community has made a concerted effort to understand climate change. International frameworks such as the United National Framework Convention on Climate Change (UNFCCC) have been devised to promote the reduction of GHG emissions. Recently, due to the growing concern about GHG emissions at the global level, efforts have been made to understand this phenomenon at the city level in greater detail. Consequently, city policy makers are under growing pressure to take GHG emissions, especially CO₂ emissions, into consideration while planning, although any policy measure solely aimed at CO₂ reduction is unlikely to be adopted soon by any city in Asia except the most developed. The role of CO₂ emissions, especially in rapidly developing mega-cities, is significant, and integrating energy considerations into policy, either by integrating energy concerns into overall urban development or by synergising measures to reduce air pollution and CO₂ emissions, is very important. Efforts should be directed towards providing support to cities by building their understanding of the problem and their

capacities to identify measures to tackle it and to implement sound policies.

In Asia, the high density pattern of urbanisation has led to the evolution of compact and expanded metropolises. As a result, a large volume of energy is utilised in a relatively small area and the concentration of local air pollution is high. In the case of CO₂, urban density may open up possibilities for managing emissions effectively by exploiting compactness itself and by promoting energy efficiency in small physical spaces. Current and future trends indicate that the number of mega- and medium-size cities in Asia will increase drastically. Recent ratification by Russia has already paved the way for Kyoto Protocol to be in-effect by early 2005. In consequence, the challenges for local policy makers to manage air pollution as well as to reduce the CO₂ will increase.

To tackle these challenges effectively, it is important to conduct studies on the role of energy and the determinants of energy use in cities, especially mega-cities. This report discussed energy use, CO₂ emissions and their determinants in two mature mega-cities in Asia, Tokyo and Seoul, and two rapidly developing mega-cities, Beijing and Shanghai. It also analysed policy trends regarding energy, air pollution and CO₂ issues and provided insight into opportunities and obstacles for these cities.

9.2 Clarifying the Nature of CO₂ Emissions and Their Determinants in Selected Cities

Driving forces

A number of factors influence the energy use in and resulting CO₂ emissions from cities: the degree of compactness of urban settlements, urban spatial structure and urban functions, the nature of transportation systems, income and lifestyle, the energy efficiency of key technologies, industrial processes, building technologies, climate, and waste disposal methods. The analyses in this study showed that the impact of population and demographic changes on CO₂ emissions is nominal in Tokyo, Seoul, Beijing and Shanghai; instead, income and lifestyle have a major influences

on energy use in all four cities. This also shows that improvements in energy intensity (energy use per unit of activity), which reflect positive technological change and more productive energy use, have played the most important role in reducing energy use and associated CO₂ emissions. The role of improvements in fuel quality and of fuel switching in reducing CO₂ emissions has become important in Seoul in recent years, but their effect in Beijing and Shanghai over the last two decades has been surprisingly little. In the latter two cities almost all CO₂-related benefits have come from increasing energy efficiency. In the transport sector, a rapid increase in the number of vehicles is the major contributor towards increased CO₂ emissions. In Tokyo, rail networks work toward stabilising emissions, but the increase in the number of large cars has the opposite effect. In the household sector, household income and changing lifestyles are responsible for increases in emissions. Interestingly, decreasing household size and the resultant increasing number of households are primarily responsible for increasing emissions in Seoul's household sector.

Waste treatment methods affect GHG emissions: CO₂ is emitted by incinerators and methane by landfills. Unarguably, waste reduction at the source is the best option. Despite huge income differences, Tokyo, Seoul, Beijing and Shanghai have small differences in per capita waste generation (1.13, 1.06, 1.107 and 1.04 kg/person/day, respectively). Because their waste management systems are weak and there is little effort to reduce waste at the source, GHG emissions from Beijing and Shanghai are poised to increase dramatically.

CO₂ emissions

It is not easy to estimate urban CO₂ emissions. First, data is often unavailable, and even if it is, it is problematic from a number of viewpoints. For example, data is often inconsistent because definitions of a city (political, functional, agglomerative, etc.) vary, different aggregation techniques are used to prepare energy balance tables, only aggregated local emission factors are available, and political boundaries change frequently. These factors render inventory making difficult and time-consuming.

Since commercial energy use and income are directly correlated, the per capita energy use has increased in Tokyo, Beijing, Seoul and Shanghai with the rise in incomes in the last three decades. The trend of per capita energy use of all four cities is converging towards a common point (between 1.3 and 1.6 TOE/person). Per capita CO₂ emissions, however, are disproportionately high in Beijing and Shanghai. This suggests that their existing policy interventions have relied too heavily on energy efficiency improvement with little consideration of carbon emissions. In 1998, per capita CO₂ in Tokyo was 4.84 tonnes, or 1.3 times the rate in Seoul; the respective rates in Beijing and Shanghai, on the other hand, were 1.3 and 1.6 times higher than that of Tokyo. The economic recession in Tokyo in the mid-1990s did not reduce its CO₂ emissions as it did in Seoul. This is partly because CO₂ emissions in Tokyo are affected more by lifestyle factors than changes in disposable income. Beijing and Shanghai, in contrast, moved from a phase of low economic and high emission growth in the 1980s to a phase of high economic and low emission growth in the 1990s. The shift can be attributed to technological advancements, increases in market competitiveness, the reform of inefficient state enterprises, the emergence of a strong tertiary sector and massive energy efficiency improvements.

The sources of CO₂ emissions in the four cities differ markedly. In Tokyo, commercial and transport sectors are most responsible, while industry contributes less than 10%, a substantial drop from 35% in 1970. In Seoul, household and transport sectors are dominant, while in Beijing and Shanghai industrial emissions are greatest. In the latter two cities, the transport sector contributes just 5 to 6%, but is growing rapidly, at a rate of over 10%. The transportation sector in Beijing and Shanghai is expected to continue to grow with economic growth, financial market liberalisation (more credit mechanisms will be available to buy cars) and WTO accession (tariff barrier will be reduced). Since transportation-related air pollution is already serious, the growth in the number of vehicles is alarming for local policy makers. The impact of structural changes in the various fuel types CO₂ emissions have been nominal in Beijing and Shanghai over the last two decades. However, they have ambitious plans to tap clean energy such as that from the Three River Gorge Dam project and from the national

government's massive natural gas pipeline plan. In Tokyo and Seoul, coal usage has been almost eliminated in recent years and electricity is gradually playing a greater role. Oil dominates the market in Seoul because it fuels massive district heating and cooling systems, which are lacking in Tokyo.

A comparison of the emissions of these four cities with those of OECD and major non-OECD countries based on per capita and per unit economic activity reveals that Tokyo's performance is outstanding. None of the four cities performs well in terms of per capita rates although their performances in emission per unit economic activity are promising. Tokyo does well for several reasons: compact settlements, a well-developed rail-based mass transportation system, low dependency on automobiles, relatively clean energy, high technological efficiency of equipment, good governance, and strong institutional capacity.

Perspectives on the indirect responsibilities of cities

While direct emissions are impossible to miss, emissions embedded in consumption goods are often overlooked in CO₂ debates. Especially in the case of emissions, such as CO₂, which are not bound to certain localities, the true environmental load or footprint of a city needs to be clarified in order to explore alternative pathways for urban development. The role of consumption activities in cities and their effects on upstream production processes and natural resources use must be taken into account. To do so requires conducting a detailed analysis of the consumption activities of urban dwellers. In the absence of such detail analyses, studies using industrial I-O tables can provide some insight into the size of a city's environmental footprints. I-O analyses in this study have shown that the indirect emission of CO₂ in cities such as Tokyo and Shanghai could be over three times that of their direct emissions. Cities do not just consume goods also export them. Taking this fact into account, it is seen that the CO₂ emissions for which Tokyo, Beijing and Shanghai are actually responsible are about 70% of total emissions (direct and indirect). Although this estimate may not truly reflect all consumption-oriented indirect emissions, it provides a sound basis to show that indirect emissions from mega-cities are great and that policy makers should start to consider this issue.

The future of CO₂ and implications for air quality and options

Even the most optimistic scenario, this study found that CO₂ emissions from these four cities will not decrease. On top of that, whether or not optimistic scenarios themselves can be implemented is questionable. The results from bottom-up models show that the numbers of vehicles in Beijing and Shanghai are each about one-tenth the number in Tokyo, but that their total fuel consumption is one-third to one-half that of Tokyo because of lower fuel efficiency and greater per vehicle mileage among other reasons. As a result, the smaller vehicle fleets in Beijing and Shanghai emit a larger amount of local pollutants and CO₂ than is the case in Tokyo. Moreover, light-duty gasoline vehicles are expected to contribute to a drastic increase in CO₂ emissions, and a more than twofold increase in fuel consumption by road transportation is expected in Beijing between 2000 and 2020. Studies done in this project shows that policy measures that intervene in lifestyles and appliance usage will be the most important measures for reducing the volume of emissions from households and businesses, which is the major contributor in Tokyo.

Apart from CO₂ emissions, the concentrations of several local air pollutants in the four cities are already above desired limits. Even in developed cities such as Tokyo, NO_x, SPM and ozone levels are high; controlling them is already a major challenge for local policy makers. In Beijing and Shanghai, TSP, PM₁₀ and SO_x levels surpass WHO guidelines. Existing countermeasures in Beijing are not likely to meet WHO standards before the 2008 Olympic Games. Further increases in energy use in these cities would drastically increase the health risks posed by local air pollutants. Such energy use would also accelerate the urban heat island effect, from which Tokyo and Seoul already suffer significantly.

Tokyo, Seoul, Beijing and Shanghai have a number of options available for tackling CO₂ emissions. Some include improving energy efficiency improvements in buildings and boilers, switching fuel, improving fuel quality, delivering efficient public transportation by improving supply side infrastructure and demand side management, and intervening in the corporate sector. As detailed accounts for each city are described earlier in the report, the discussions below focus on broad issues.

9.3 Policy Directions and Challenges

Efforts to reduce GHG emissions are hampered because local governments are often not aware of global issues; even if they are aware, they assign a little priority to them. In addition, human, technological and financial resources in cities are limited, and cities already face many challenges for local environmental management. With the exception of Tokyo, no city has an explicit policy about reducing GHG. In Tokyo policy measures jointly tackle urban warming and GHG emission issues and interventions have been mostly in terms of implementing changes in the building sector, encouraging the voluntary disclosure of information and conducting energy efficiency improvement programmes. Implicit considerations of GHG mitigation, through the implementation of local air pollution measures and energy sector restructuring have been observed in Seoul, Beijing and Shanghai. However, all air pollution improvement measures do not necessarily contribute to the reduction of GHG. Broader policy agendas, such as emissions trading and mandatory reductions in the corporate sector, do not exist in any of the cities; all market mechanisms. In order to be able to influence powerful stakeholders, such as the corporate sector, local policy makers need to build consensus about the formulation of plans. Institutional barriers to mainstreaming concerns about GHG in overall policy agenda exist even in developed cities such as Tokyo, where the mandate and role of responsible units are limited not only by issues of local priority but also by the institutional structure.

9.4 Promoting Opportunities and Removing Obstacles in Cities: Lessons from Selected East Asian Mega-cities

This section highlights some of the major opportunities for reducing CO₂ emissions and methods for removing barriers.

- In terms of major infrastructure and energy-emission related indicators, the gap between the developed cities of Tokyo and Seoul and the developing city of Beijing is about 20 years. This gap may assist Beijing in learning from the past successes and failures of

Tokyo and Seoul. However, exchanging experiences from both sides is essential. For example, Tokyo can learn from the district heating and cooling programs in Seoul, while Beijing can learn from the mass transportation and energy efficiency improvement programmes of Tokyo. Seoul’s volume-based system of charging for waste and its utilisation of landfill are other model lessons. For such sharing of experiences, it is essential to promote forums that can facilitate information exchange, inter-city cooperation, and the creation of an information base.

- Local authorities must be empowered as, especially in South and Southeast Asia, their role and jurisdiction in environmental management is often too little. Building their capacity to support GHG issues, partly by improving institutional arrangements, is crucial.
- Improving local-national coordination mechanisms and generating concrete national support is essential if GHG mitigation measures are to be effectively implemented.
- Some policies and policy instruments related to emission efficiency of economic activity and emission per unit of vehicular travel have been successful but they have largely failed to control the scale of activity or to encourage a structural shift away from environmentally damaging choices (Figure 9.1). In the transportation sector, for example, existing standards based on emission per km are not sufficient; they must be supplemented by standards based on the average emissions of fleets of vehicles handled by the corporate sector and auto sellers.

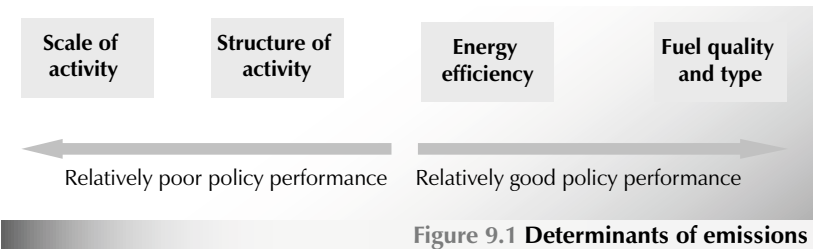


Figure 9.1 Determinants of emissions

- Making the transition from sectoral planning, the current focus of most cities, to urban-level integrated planning, in which an overall urban structural set-up for handling individual sectors is created, is

essential. Urban planning practices must accommodate the serious challenges proceeded by metropolitan growth, dense population, dense infrastructure and urban activities. In addition, planning must be able to accommodate newer energy efficiency and CO₂ concerns.

- Developing an energy and emission-efficient transportation infrastructure is essential. Depending on the city, a number of measures can be used, including promoting bus networks, restricting private cars, providing bus lanes, and developing rail-based mass transportation. Investment may pose a challenge, but new financial mechanisms such as public-private partnership schemes and foreign investment can share the costs with the government if the government can facilitate a good working environment from a regulatory, institutional and financial viewpoint. Many Asian cities, especially mega-cities, are rapidly developing infrastructure. Once construction is complete, these cities will be in no position to significantly alter it; to avoid future lock-in, policy makers should incorporate the concepts of energy efficiency and environmental friendliness now, during construction. Although windows are rapidly closing, it is not too late for policy makers to develop visionary policies to make energy-efficient cities in terms of infrastructure.
- In developed cities, securing stakeholder consensus is a key factor in the implementation of any plausible GHG mitigation policy. If mandatory mechanisms do not work in the initial stages, efforts should be made to promote voluntary mechanisms. Using market-based mechanisms such as emissions trading is essential as interventions in the energy sector alone cannot deliver meaningful reductions in the long run.
- Because their priorities are elsewhere, cities in developing countries cannot, at this time, be expected to adopt explicit GHG policies. Instead, promoting integrated approaches—measures which can reduce GHG without seriously compromising air pollution priorities—is a key first step. In the past, the synergy and conflicts between such measures have been inadequately evaluated. Even in cases where it was evaluated, the results were not incorporated in policy implementation due to the lack of serious consideration given to the issue. While industries and power plants have shown some interest in integrated approaches in

terms of CDM and other financial and pollutant-reducing benefits, efforts to evaluate the benefits of an integrated approach have been fewer in the transportation sector. Identifying barriers and opportunities at different scales of environmental governance (local, national, international) is necessary, as is lobbying at the national and international level for extended support for integrated approaches. In their capacity-building efforts, cities need to make an especial appeal to bilateral and multilateral funding agencies.

- Mega-cities need to address indirect CO₂ responsibility, too, as they are hotbeds of consumerism, income growth and lifestyle change. As more mega- and medium-size cities develop in Asia, this issue will increase in importance. Though it may not be possible at present to have explicit policies, indirect emissions can be addressed from other viewpoints, including waste management and the creation of a society with a sound material cycle (such as is found in an advanced form in Europe and has penetrated Japan and Korea). These steps not only reduce emissions but also reduce the consumption of precious natural resources. Policymakers, NGOs and other concerned organisations, such as the media, must run campaigns to promote awareness.
- Economically viable technologies will have a bigger role to play in the future of all mega-cities. The promotion of alternative fuel, new transportation, renewable energy, and efficient building technologies is necessary, as is the dissemination of existing high technology to developing mega-cities. Improvements in technology and its management as well as in lifestyle changes are essential for realising a sustainable future.

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