

# Urban Environmental Management Project

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## 1. Overview

### 1.1. Background

Rapid economic growth and increasing urbanisation have become typical characteristics of the cities of Asia. Industrialisation is the major driver of economic growth in many countries. The more developed cities of Asia have been undergoing a shift to a more materially balanced society, whereas the still developing cities are undergoing a process of increasing industrialisation. Substantiating this pattern, the changing trends of market globalisation are bringing about considerable change in the environmental status of these cities. Cities of the region testify to these changes with contradicting aspects of economic development and environmental degradation. Economic growth, on one hand, causes various environmental problems, but on the other hand, it enhances the capability of making investments and mobilising resources that are necessary for overcoming such problems. With cities at various stages of economic growth and industrialisation, Asia is essentially experiencing an increasing consumption of energy and materials and the resulting environmental problems. The trends of energy consumption and emissions need to be understood to a greater degree in order to develop future policy options and control measures with the necessary precision.

Spatial growth is another characteristic of these cities that is driving the environmental changes, and understanding the trends of such growth, especially in peri-urban areas, is important for growing cities and their environmental management. Poor environmental infrastructure has been the root cause of many environmental problems, which is observed in many Asian cities, due to the status of economic growth and differential competing priorities. Under these circumstances, cities have to resort to innovative mechanisms in order to cater to the need for improved urban environmental infrastructure in order to achieve better urban environmental management. Understanding the best environmental practices and adapting lessons from successful practices to other similar cities is a key, and requires substantial networking at the city level as well as the national level. Given these needs, the Urban Environmental Management Project (UE Project) in the second phase made efforts to understand the situation in Asian cities and tried to develop innovative mechanisms to substantiate environmental management and urban environmental infrastructure. The project also carried out a study on successful practices in order to improve urban environmental management with extensive networking among cities.

### 1.2. Goal and targets

#### 1.2.1. Objective

The goal of the UE Project is to propose and examine innovative ideas and models, and also to provide a baseline for improved urban environmental management policies for the cities in Asia placed under diverse economic and social conditions. To achieve this goal, the UE Project conducted research in the second phase, based on comparative analysis and evaluation of the present conditions and past experiences of urbanisation as well as environmental problems in Asian cities. The research conducted in this phase was tailored towards showing examples of policy options, institutional systems, technical options, urban planning, infrastructure development, and financial mechanisms for better urban environmental management. In this phase the UE Project attempted to achieve this by using the information set generated in the first phase as background material. As a mechanism to

“trickle down” the impacts of the research results, the UE Project, in association with the Kitakyushu Initiative Network (KIN), compiled information on successful experiences of urban environmental management in the cities of Asia and the Pacific, and then analysed and disseminated it among various actors, including city authorities.

### **1.2.2. Issues addressed**

The UE Project has employed continuous efforts, executed under different phases, in understanding the historical development and trends of various important aspects of urban environmental management, comparing situations across countries/cities of varied socio-economic status, and promoting the successful experiences for improved urban environmental management. It cuts across various sectors of urban development, viz. transportation, water and wastewater, and solid waste management. Based on the background information given in the previous section, the second phase of the project was focused principally on the following three themes:

1. study on the dynamics of urban environmental processes to draw-up policy suggestions for improved environmental management and urban environmental infrastructure;
2. urban policy integration of energy-related environmental issues in selected Asian mega-cities; and
3. support for the implementation of the Kitakyushu Initiative Network.

Each of these issues involves complex analyses cutting across sectors and domains. Hence, in order to achieve greater depth in analysis and meaningful conclusions, these themes were further broken down into the issues listed below while they were examined by the group of IGES-UE researchers in collaboration with outside expert teams and collaborators. Research and programme results are then presented according to this segregated set of issues:

- a. integration of urban planning, spatial, regional industrial, and urban policies to minimise the negative impact of rapid urbanisation;
- b. public-private partnership in improving the intangibility of urban environmental infrastructure;
- c. examination of energy consumption patterns and emission patterns from mega-cities in Asia, and integration of energy-related policies;
- d. development of indicators for the evaluation of urban environmental policies and review of existing indicators; and
- e. documentation and analysis of best practices of different cities in Asia and the Pacific and capacity enhancement for local environmental management under the Kitakyushu Initiative.

### **1.3. Research methodology and approach**

The set objectives of this project were achieved by means of a number of case studies and cross-cutting synthesis to formulate the broader framework. The UE Project identified a team of international researchers from various representative cities in Asia to carry out the case studies, which covered various cities. The accomplishment of the case studies was centred around a common framework developed by the in-house IGES-UE team of researchers. Collaborators came from various domains—universities, academic institutions, non-governmental organisations (NGOs), and government departments—and the selection depended, in part, on their familiarity with local conditions, including the prominent environmental problems and their characteristics.

In-house UE Project researchers were responsible for carrying out specific research tasks, as well as synthesising the research carried out by collaborators under their instructions, in order to draw up policy implications and recommendations, and to provide coordination for the activities undertaken by the case study teams. All the major findings from the specific case studies and cross-cutting synthesis were analysed and compiled into a comprehensive strategic report.

Fulfilling the objectives of this project required active dialogue between multi-stakeholders and capacity-building activities. As an attempt to achieve the strategic targets set out for the project, various capacity-building activities, information outreach, and multi-stakeholder dialogues were conducted throughout the project by organising international seminars and workshops, training programmes, and thematic seminars, whose details are presented in Table 1 at the end of this report.

This report presents in a comprehensive way the issues addressed by the UE Project and the key observations made at the end of the study.

#### **1.4. Major findings**

This section presents the major research findings and observations made, based on the activities carried out under this phase of the project (2001–2003).

##### **1.4.1. Integration of urban planning and special regional industrial and urban policies to minimise the negative impacts of rapid urbanisation**

This part of the UE Project focused on examining the environmental implications embedded in the recent spatial expansion (or sprawling) of Asian mega-cities, as well as exploring the role of planning practices in addressing urban environmental problems. Through sharing experiences and lessons of urban environmental management across Asia, the IGES-Korea Environment Institute (KEI) workshops were held in Seoul, Korea, with the aim of facilitating a cross-country analysis on the changing nature of urban environmental problems and to explore possible solutions from planning practices guiding sustainable urban development in Asia.

Expansion of city boundaries is a common phenomenon noticed in Asia for the last few decades. Several Asian mega-cities continue to expand their spatial boundaries to suburbs, peripheries, and even to peri-urban areas in order to cater to high population growth rates as well as migration. In Bangkok, one of Southeast Asia's mega-cities, along with a rapid growth of the urban population, the city's built-up area mushroomed from 67 square kilometers in the late 1950s to 426 square kilometers in the early 1990s. After the introduction of an open-door policy, the Chinese capital city, Beijing, more than tripled in size, growing from more than four million people in 1958 to nine million by the early 1980s, and then to nearly 14 million today. To accommodate the influx of population, the city continued to expand its geographical boundary, along with the construction of transport infrastructure. The government continued to build concentric beltways that radiate out from the city centre. In addition to the existing second, third, and fourth ring roads, the city plans next year to complete a fifth one, a 95-kilometer (km) asphalt ribbon. In 2005, engineers intend to complete a sixth ring road, measuring 189 km around, and there are already plans for a seventh ring road. Such is the lightning-speed pace of change in Beijing in social, economic, and political terms.

The driving forces underlying such land-consuming sprawl in metropolitan areas in Asia vary from city to city. In the Seoul Metropolitan Region (SMR), the sustained primacy of socio-economic and political activity has contributed greatly to such spatial expansion at the metropolitan scale, while in China rapid economic growth based on the market economy is regarded as the major underlying force. The spatial configuration of the extended periphery of the Bangkok Metropolitan Region (BMR), where affluent residential subdivisions for urban middle-class and foreign executives and labour-intensive manufacturing industries reside, was significantly affected by foreign direct investment (FDI) and a property boom in the early 1990s.

Regardless of the nature of the driving forces underlying such spatial expansions of Asian mega-cities, the peripheries of these metropolitan areas are being rapidly filled with newly built residential towns, industrial estates, and other facilities. Although the reckless expansion of these mega-cities has been considered unavoidable under strong developmental pressures, such as the lack of housing and other urban facilities, it induced unintended spill-over of environmental degradation across metropolitan areas.

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As a consequence, these Asian “extended metropolises” impose a greater environmental burden on their periphery as well as their city core by exposing their inhabitants to traffic congestion, extended commuting distances, uncontrolled expansion of urban fringes, and great loss of greenery and natural habitats. In addition, the polluting industries relocated from the inner core are widely blamed for being the stationary source of air and water pollution. Furthermore, uncontrolled land development and intense pressure from square settlements on open spaces in the periphery are increasingly becoming apparent. Facing the sprawling growth of urban and suburban areas throughout Asian mega-cities, the primary measures of urban environmental management are sector-specific approaches such as air pollution control, water treatment, and waste management. These conventional measures, using sector-specific approaches, appeared somewhat effective in the short-term in mitigating urban environmental problems, but they revealed their own limitations in the long-term. In reality, several conventional sector-specific approaches merely comply with the minimal level of urban environmental demand due to poor financial capacity. In addition, the majority of municipal governments responding to these urban environmental problems are primarily dependent on conventional measures (command-and-control framework, reactive measures, and demand-following policy) due to several constraints that the Asian cities are encountering so far.

Because of the interdependent interaction of urban environmental load between core and periphery, it is increasingly becoming apparent that the remedy of these environmental problems should be explored at the metropolitan scale, not by singling out administrative or municipal boundaries.

The failure of the city government in controlling the water quality of the river running through the core of Seoul, in spite of its continued efforts, explains the need to take the “metropolitan” approach to environmental management of cities. Until recently, it was widely assumed that the core city or a few urban centers were in better environmental condition at the expense of environmental degradation in their peripheries. But this example proves this to be the opposite.

Owing to the dominance of socio-economic and political powers, it was often witnessed that polluting industries in the city core were forced to move beyond the boundary of Seoul. While the core of the SMR enjoyed to a greater extent an improvement in air quality, especially the level of stationary pollutants, including sulfur dioxide (SO<sub>2</sub>), it turned out to be a short-sighted prospect, because these relocated industries were consequently blamed for contaminating not only the fringes but also the core of the metropolitan region. According to a recent survey by the Ministry of Environment in Korea, seventeen towns neighboring the city of Seoul recorded much higher concentrations of SO<sub>2</sub> and ozone compared to the SMR core, and these airborne pollutants had adverse effects on air quality in the core.

The lessons drawn so far from these changing landscapes of urban environment embedded in Asian metropolitan areas include recognition of the legitimate and urgent need to take the “metropolitan” approach to the environmental management of cities, and also that the municipalities need to find more sound approaches that not only prevent environmental distresses but also create environmentally sound urban structure. In other words, from the perspective of sustainable urban environmental management, the key matter should be not only accommodating the rapidly growing demand of urban environmental services but also creating or inducing environmentally-sound urban spatial structure that restrains potential environmental loads (for instance, air pollution due to traffic congestion) in the long-term.

The potential cost-effectiveness and relevance of a wide array of planning practices (including growth management, urban inclusive guidance, environmental zoning, and transportation demand management, etc.) should capture the intensive attention of policy-makers, planners, and practitioners. In fact, in the last few decades, the role of planning practices has expanded from more narrow considerations of land use and zoning to a broader set of concerns with an emphasis on “growth management.” Such a shift assists planners in examining the causes and impacts of urban growth more systematically, ultimately adopting more comprehensive approaches and strategies for managing or controlling spatial growth.

#### **1.4.2. Public-private partnership in improving the intangibility of urban environmental infrastructure (UEI)**

Development of urban environmental infrastructure (UEI) plays an important role in improving the performance of certain environmental services like water supply, sanitation, and solid waste management. Though public-private partnership (PPP) could be effectively used in certain sectors, like transportation, its adaptation to basic environmental service sectors like wastewater and sanitation systems has been very poor. This section attempts to examine the possible application of PPP in strengthening UEI in Asian cities and various mechanisms guiding PPP in developing UEI. Case studies, personal visits to sites, documentation of successful practices, and personal interviews were used to compile the existing information on the application of PPP to basic environmental services in the cities of Asia. This includes case studies and successful experiences covering seven cities and consultations with organisations including the Asian Development Bank (ADB), Organisation for Economic Cooperation and Development (OECD), and the Japan Bank for International Cooperation (JBIC). Along with the China Council for International Cooperation on Environment and Development (CCICED), IGES has tried to identify key problems being faced in the field of environmental investment and financing in China, in order to create innovative approaches to solve these problems, address environmental protection priorities, and make policy recommendations to the government of China.

In some large and medium cities in Asia, PPP has already been implemented, mostly for water supply projects in the form of build-operate-transfer (BOT) schemes or concession contracts. In those cities, serious considerations of expanding PPP to environmental infrastructure projects, including sewer and waste treatment, have also started. Funding such projects will not only improve the environment but will also contribute considerably to economic growth. PPP could be considered an effective policy solution and would help Asian countries to achieve the targets of the World Summit on Sustainable Development (WSSD) and the Millennium Development Goals (MDGs) of the United Nations (UN). It was widely agreed that development of UEI cannot be achieved based solely on public financing and that PPP is expected to play a crucial role and make significant contributions.

With optimal role-sharing between public and private sectors, PPP can be applied to many developing countries and cities. It is easier to introduce it into such countries and cities that are poor in financing capabilities and tools, which have improved initiatives for private sector participation, are in stable political and financial condition, and are in the stages of UEI development. For cities with weak economic power, policies for better resource reallocation and incentives to private funding from the central government are required. In poor areas, small-scale, community-based PPP projects would prove effective.

Lack of experience in the preparation of relevant regulations and implementation schemes is the major bottleneck for PPP projects in Asian cities. This leads to various risks such as management risk concerning project profitability and stability and possible conflict between project profits and the public interest of environmental protection.

To implement more PPP projects, it is necessary to enhance operational capacities such as institutional framework, funding, and risk preventive measures. Careful design and implementation of PPP projects could only guarantee to meet these objectives over the long term. The following are the key components critical for successful implementation of PPP-based UEI:

- Appropriate role sharing between actors, i.e., the private sector and the government.
- The treatment of wastewater and solid waste infrastructure as a “quasi-public good” and their privatisation should be to provide the quasi-public goods through the private sector but not the commercial sector.
- There is an essential need for an independent regulatory body to ensure proper regulation enforcement before attempting privatisation in order to protect the interests of consumers as well as the private sector. This body needs to frame appropriate regulations to address critical issues, including subsidies,

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debt and equity ratio, local and foreign investment ratio, financial inflow and outflow of investment, and the holistic management concept, as well as the rules of entering and leaving the market.

- Regressive policies may have adverse impacts on poor households whose family size is larger. Hence, progressive tariffs are widely recommended. The two most important and sometimes competing objectives for tariff policy should be the provision of the public good at an affordable price as well as the incentive to conserve.
- There is a need for a combined tariff structure for collecting tariffs in one bill.
- The type of contract is an important element in PPP. Depending on the targets and the relevant socio-economic characteristics, the most suitable type of PPP should be implemented. Full-utility concession may be an advanced level and may suit only some of the cities for services like water and transport, but for other cities it is better to start with management contracts. For solid waste, management contracting may be a good starting point.
- The public sector should hire the best team to negotiate with the private sector to allocate the risks among various partners.
- As different cities may have a different socio-economic status within the country, policy-makers should take care of these imbalances while setting the type of PPP or tariffs.
- Donor agencies have to provide various types of support, including assisting governments in contract management and negotiations, as some governments may not have the expertise to match their private sector counterparts with their international backing.
- Big cities require huge investments, and the local private sector may not be able to contribute substantially; thus, FDI is vital for this purpose as it is already contributing towards other public services like telecommunications, power, and transport.
- International cooperation can play a vital role for creating an enabling environment for private sector participation (PSP) and FDI, but cooperation within various departments of international agencies and with the other international agencies is important for optimising the impact of the efforts.

Commercialisation does not in itself ensure success unless there is a successful combination of competent and qualified concessionaire, capital, local knowledge, appropriate technology and expertise, and regulatory framework, including tariff regulations. As PPP is played out between various actors, there is a wide scope for risk, and political and legal risks could be dealt with at the national level through legislation or commitments. Social, economic, and environmental risks could be better dealt with at the local level. The financial, technical, and managerial risks could be mitigated with a good combination of joint-venture companies, so the risks can be allocated to those companies, which can mitigate them best. It is also necessary to encourage strong domestic banks and companies to take a leading role in the PPP-based initiatives.

In the joint venture between IGES and the Policy Research Center of State Environmental Protection Administration (SEPA) in making policy suggestions to the government of China for enhancing the application of PPP for UEI, it was found that the issues of insufficient investment and low efficiency are prominent, and the following recommendations were made to develop more effective and efficient financial mechanisms through the CCICED for UEI improvement:

- Improve relevant policies to make full use of multiple channels of commercial banking (bonds, trust investment funds, and loans) to raise funds from the market.
- While making full use of various commercial financing channels to raise funds from the market, the government of China should seriously consider introducing municipal bonds to serve as a new and important channel for financing UEI.
- The government should play a lead role in the construction of UEI, but market-based approaches should be applied to the operation and maintenance of municipal wastewater treatment facilities, as well as to the collection and transportation of municipal solid waste.
- Unify existing policies and establish new policies to promote market-based approaches to urban wastewater treatment and municipal solid waste management.

### 1.4.3. Examination of energy consumption patterns and emission patterns from mega-cities in Asia

This sub-theme has been developed into a project that was launched in April 2001 by the IGES Urban Environmental Management Project with additional financial support from the Asia Pacific Network for Global Change Research (APN), the Global Change System for Analysis, Research and Training (START), and others. It focuses on the dynamics of industrial transformation that is taking place in Asian cities and its environmental implications with regard to energy consumption and emissions of greenhouse gases (GHG). The study aims to measure the GHG budget of selected mega-cities in Asia, understand the nature and dynamics of driving factors, present future scenarios for GHG emissions of the cities, and provide the perspectives on what cities should do to clean their air. An inventory of various associated short-lived gases like carbon monoxide (CO), nitrogen oxide (NO<sub>x</sub>), sulfur oxide (SO<sub>x</sub>), and particulate matter was attempted in addition to the GHG budget. Key sectors considered were residential and commercial sectors, the urban transportation sector, municipal solid waste management sector, and indirect energy consumption by industry. Both direct emissions and embodied emissions were considered. Major metropolitan cities of Asia—Tokyo, Seoul, Beijing, Shanghai, Manila, Bangkok, Delhi, and Calcutta—along with their surrounding urban areas, were considered, depending upon the availability of data.

IGES developed the necessary methodologies and implemented them in different case study cities with the help of respective collaborators. Methodologies were also developed to account for embodied emissions. One of the major tasks was the quality assurance/quality control (QA/QC) of data and their inter-comparison and inter-calibration.

Cities under consideration share the common characteristic of having “high economic growth rates.” The GHG emission rates were compared to economic growth rates (gross regional product), as they have a good correlation. The emission of carbon dioxide (CO<sub>2</sub>) by sector and fuel type suggests that CO<sub>2</sub> emissions in Tokyo have increased by more than twice in the last three decades, with a 2.5 percent annual average growth rate (1970–98), during which the annual average economic growth rate was 6.87 percent. Beijing and Shanghai’s emission growth rates were 3.9 percent and 12.3 percent, respectively, for 1985–98, while the economic growth rate was about 15 percent for both cities. In the 1990s, the CO<sub>2</sub> growth rates were as low as 5 percent in spite of maintaining the same level of economic growth. In terms of emission volumes, Beijing and Shanghai are well above Tokyo and Seoul. The income effect was found to be responsible for major CO<sub>2</sub> emissions in Tokyo and Seoul during the high-growth period, during which fuel quality effects and energy intensity effects (means, energy use per unit economic activity, this shows the direction of technological changes) were responsible for restraining CO<sub>2</sub> emissions. CO<sub>2</sub> emissions have continued to rise even after that “growth period,” which could be attributed to the intensity effect. In Chinese cities, income was found to correlate to the increase in emissions, and the intensity effect lead to decreasing emissions.

Vehicular stock is a major driver for CO<sub>2</sub> emissions. Most vehicles in Chinese cities have very poor fuel economy. In terms of its total vehicular stock, which is one-tenth of Tokyo’s, fuel consumption in cities in China is one-third of Tokyo’s. Chinese cities need to improve their fuel efficiency, especially that of their large-scale public transport vehicles. They further need to strengthen their in-use vehicle fuel performance. The former would depend on the development of sufficient urban transport systems and infrastructure.

Though the amount of energy consumption per GRP of tertiary industry is on a decreasing trend in Beijing and Shanghai, the study results showed that their commercial energy consumption would exceed Tokyo’s by 2010. Energy consumption is moving more towards the use of electricity in most of these cities and is expected to continue further. Estimated future CO<sub>2</sub> emissions from commercial and residential sectors in Chinese cities are expected to be above those of Tokyo and Seoul.

Tokyo and Seoul have dominant indirect emissions compared to their direct emissions. This trend is the reverse in Chinese cities. Tokyo has indirect CO<sub>2</sub> emissions 2.5 times higher than the direct emissions. Shanghai reduced

its indirect emissions from 1.9 times to 0.9 times that of direct emissions during 1992–97. Sectoral contributions show that secondary industries should take the major responsibility for indirect CO<sub>2</sub> emissions from all the cities.

There is a need to increase the recycling/re-use rate of municipal solid waste (MSW) and to develop effective policies and strategies to reduce food waste generation. Learning can be mutual in this sector; Tokyo can possibly learn from Seoul about landfill gas utilisation and Seoul can take lessons from Japanese incineration practices, while Chinese cities still need to develop the necessary institutions.

The GHG budgets are expressed in an inventory form using both top-down and bottom-up approaches. The format followed was that of the national inventory of GHG emissions and removals, as adopted for communication under the United Nations Framework Convention on Climate Change (UNFCCC) and based on the Intergovernmental Panel on Climate Change (IPCC) methodology. But a more appropriate format was worked out that is simpler than the national inventory, considering the limited data available at the municipal level and the feasibility of data collection. The time periods considered were 1970, 1980, 1990, 1995, and 2000, which permits an understanding of growth patterns. The research project also collected information on various policies, intervention measures, institutional arrangements, and policy instruments in Tokyo, Seoul, Beijing, and Shanghai, and it recommended potential areas for intervention, such as emissions from in-use vehicles control in Beijing and Shanghai, adopting fleet-based emissions and energy standards from private cars in Tokyo, and providing due attention to CO<sub>2</sub> emission issues, while controlling diesel vehicles in an effort to control NO<sub>x</sub> and suspended particulate matter (SPM).

This research was also endorsed as a core project of the Industrial Transformation Project of the International Human Dimensions Programme on Global Change Research, and was successful in providing important contributions to the international global change scientific community. Since no strategic research is complete without translating it into actual practice, the UE Project organised three international workshops (two in Japan and one at the East West Centre in Hawaii). These activities strengthened the network of researchers, shared research outcomes from other researchers working in similar fields, and promoted policy dialogues with city governments, national governments, and international institutions and initiatives. The UE Project developed informal but robust networks with key players in the region and beyond, such as the Asian Development Bank, Clean Air Initiative for Asian Cities, World Resources Institute, The International Council for Local Environmental Initiatives, World Bank, and various policy-oriented institutions in Asia. It also collaborated on research with a number of institutions in Japan, Korea, and China. Apart from these achievements, the UE Project also emphasised the need for an integrated approach in energy-emission interventions that involved air pollution and GHG emissions in order to create some interest in GHG mitigation among local governments and to address priority concerns at the same time.

#### **1.4.4. Development of indicators to evaluate urban environmental polices and review of existing indicators**

The Kitakyushu Initiative for a Clean Environment was adopted at the Fourth Ministerial Conference on Environment and Development in Asia and the Pacific, organised by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in September 2000. With a mandate to improve the urban environment in Asia and the Pacific, the Kitakyushu Initiative is a mechanism designed to share experiences in environmental improvement and to promote inter-city cooperation, as well as to strengthen actions taken at the local level. IGES, in its role of supporting the implementation of the Kitakyushu Initiative programme at the request of ESCAP and the Government of Japan, provided professional support to contribute substantively to carrying out the project.

As a means to achieving improvement in the current environmental status of many cities in the Asia-Pacific region, quantitative targets in several areas must be set, and policy decisions aimed at achieving the targets must be made, as well as starting and promoting activities to solicit the participation of a wide spectrum of interested

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parties. At various stages of policy decision-making and implementation for the improvement of the urban environment, the introduction of quantitative indicators is recommended, as they make it easier to define goals and measure the effectiveness and degree of success of policies, along with undertaking regular surveys and adjustments, as well as promoting the sharing of ideas and raising awareness. These also help in the transfer of successful policy experiences, as recommended by the Kitakyushu Initiative.

A set of quantitative indicators were proposed under the Kitakyushu Initiative, and a review of existing indicators and indicator systems was carried out in the beginning of the UE Project, which proved very useful in providing an understanding of major issues, approaches, and usage of indicators to identify potential areas and methodologies for overcoming barriers. A commissioned report was submitted to the Ministry of Environment of Japan, regarding these issues. Appropriate indicators were proposed based on the research conducted and the results of analyses on policy case studies in this phase of the project. The following are the categories of indicators that can be used for urban environmental management:

- a. Driving force indicators: demographics, urbanisation, lifestyle, economic situation, poverty, and local government.
- b. Pressure indicators: SO<sub>x</sub> emissions per square kilometer (km<sup>2</sup>), NO<sub>x</sub> emissions/km<sup>2</sup>, total suspended particulate matter (TSP)/SPM emissions/km<sup>2</sup>, CO emissions/km<sup>2</sup>, hydrocarbons (HC)/volatile organic compounds (VOC) emissions/km<sup>2</sup>, and CO<sub>2</sub> emissions/km<sup>2</sup>.
- c. State indicators: SO<sub>x</sub> concentration, NO<sub>x</sub> concentration, particulate matter, CO concentration, HC/VOCs concentration, and percentage of days that SO<sub>x</sub>, NO<sub>x</sub>, particulates, CO, HC/VOC concentrations met standard.
- d. Response measures and indicators: SO<sub>x</sub> emissions control, dust control, vehicle emissions control, air pollution impact minimisation, and local response to global problems.

Undoubtedly, the lack of data availability is the biggest hindrance for such an indicator system in the local context. The most contentious issue is how to motivate cities to present their successful experiences and information, since the UE Project cannot have pilot projects in all member cities.

The Kitakyushu Initiative also includes the encouragement of public participation and partnership as an important element. Therefore, a set of indicators is required that enables self-assessment of progress and weaknesses in participation and partnership formation, and provides the project body with encouragement for the implementation of policies.

It was identified that, given the mandate of the Kitakyushu Initiative to not only improve the system but also produce direct environmental impacts, the social system indicators, such as system improvement and partnership building, should not be used alone. It is essential for them to be used in combination with practical environmental indicators such as air or water quality and waste generation/disposal volumes.

In a case study of Bangkok, where attempts were made to codify the environmental management capacity as low, medium, and high, it was observed that air quality management capacity has been improving due to various strategies. These include capacity building for monitoring by incorporating new technology and providing appropriate human resources. Similarly, various means, including the launch of a mass transit system, setting and enforcement of standards, private sector participation, better technology for vehicles and their inspection, and improved social capacity and public participation, have contributed towards the improved response capacity. The tangible improvements in air quality in Bangkok are evidence of the enhanced capacity in urban air quality management. Nevertheless, there is still a lot of room for improvement in terms of capacity as well as in terms of tangible improvements in air quality, mainly in reductions of particulate matter like PM<sub>10</sub> and PM<sub>2.5</sub>.

Another set of case studies was carried out to assess the capacity of cities in environmental management at different levels. The city of Jakarta (Indonesia) is close to the central government and is rich in various aspects of capacity such as human resources, finance, and technology. Being a big city, it provides a much wider scope for

NGO activities, which are a key component of awareness and capacity development. Pelangi, one of the major NGO-actors in environmental management in Jakarta, is not only an international cooperation organisation in charge of lobbying and education, but it is also a research institute that can back-up its activities with logical reasoning. In particular, their research on transportation has resulted in proposing drastic measures for implementing an innovative bus system in Jakarta. The role of the non-governmental sector in Jakarta is found to be strong in contrast to many other cities in urban environmental management.

Although Surabaya is the second largest city in Indonesia, its environmental management section was only just established in 2001, and the precursor of the environmental department was not as active as that in Jakarta. Compared to Jakarta, Surabaya is not as well informed of recent technologies or other information, being located far from central research institutes such as the Agency for the Assessment and Application of Technology/Environmental Technology Centre (BPPT/ETC). Tunas Hijau is a local NGO that is active internationally, and being dominant with young members, it is expected to be the future environmental governance leader in Surabaya. There are around 20 environmental NGOs in Surabaya, and around ten of them regularly attend meetings at city hall. In both cases, improving institutional capacity requires additional study and investigation. Regulations are very obvious in both cities, but their effectiveness may need to be looked at on the basis of a time series study. Financial mechanisms are not clearly assessed in both cases due to the fact that the environment departments in Indonesia's local governments are still very new and they have not determined the details of spending on the environment.

#### **1.4.5. Documentation and analysis of best practices from different Asia-Pacific cities and capacity enhancement for local environmental management under the Kitakyushu Initiative**

The Kitakyushu Initiative for a Clean Environment, an ESCAP initiative, has four interrelated means to achieving tangible improvements in the urban environment: (1) networking within member cities and with outside agencies, (2) compilation and analysis of successful experiences to identify the elements that can be transferred to other cities, (3) implementation of pilot activities to demonstrate the applicability of new ideas for managing the urban environment, and (4) organisation of thematic seminars and training for capacity building.

This section presents the outcome of the documentation and analysis of successful practices prepared under the Kitakyushu Initiative Network. Under the Kitakyushu Initiative, five thematic seminars were organised on various topics (details given at the end of the report) with the aim of introducing the effective implementation of practical policies and technologies, as well as increasing the capacity of policy-makers through the exchange of information and policy discussions by cities with experience in these areas, along with representatives of donor organisations and experts. Analyses are being carried out on the case studies presented at the Network meetings and thematic seminars as well as the case studies of best practices collected from the members of the Kitakyushu Initiative Network, including Bangladesh, China, Indonesia, Japan, Korea, Nepal, Pakistan, the Philippines, and Thailand, which are expected to be of practical use for cities as a reference tool. Figure 1, at the end of this report, presents a graphical view of the urban environmental management concept.

The presentation of successful experiences covers most of the major challenges for urban environmental management (details are presented in Table 2 at the end of the report). The physical environmental challenges cover water supply and wastewater treatment, air quality, solid waste, and overall urban environment. The managerial challenges cover urban planning and infrastructure development capacity, regulatory and institutional capacity, financial capacity, appropriate technology, and social capacity (which includes stakeholder participation). Many of the successful experiences, however, overlap and cover more than one challenge. Criteria for the selection of successful practices included effectiveness, innovation, efficiency, relevance, and sustainability. The cities were encouraged to document the successful practices with the help of local researchers from local academia and NGOs and researchers from IGES. The analysis of successful practices was undertaken in cooperation with policy-makers, academia, and other stakeholders.

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The following conclusions can be made based on the compilation of good practices:

- Bangkok's case is a good example of integrating various air quality challenges, including leaded gasoline, public transport, regulations, monitoring, public awareness, and involvement of various stakeholders to plan and implement various actions.
- In countries like Thailand and Vietnam, political will and sustained economic growth have led to the phasing out of leaded gasoline, while SO<sub>x</sub> pollution increased with industrialisation and public transport using diesel. Kitakyushu (Japan) and Chongqing (China) used different approaches to address the same challenge of SO<sub>2</sub> pollution management. The experiences of Kitakyushu, which faced a similar situation in the 1960s, and the experiences of Chongqing could help the cities in the region to formulate policies on SO<sub>x</sub> control.
- Case studies of Kathmandu (Nepal), a developing city, and Singapore, a developed city, focus on improvements in their transportation systems in terms of environmental considerations.
- A United Kingdom study focused on the role of local governments in formulating action plans to address local air quality issues.
- Case studies from China focused on urban planning and infrastructure development. Prediction of future demand for urban water and wastewater services and the relevant investment decisions are also the focal areas in later studies.
- The Nonthaburi (Thailand) study is focused on the promotion of recycling through separation at source with the help of political will and public awareness.
- Surabaya (Indonesia) presented a case where community empowerment was used to improve basic environmental services like sanitation in *kampung*s (poorly-serviced settlements). The important lesson learned from this programme and the *Kampung* Improvement Program (KIP) is that the community-based mobilisation of resources and implementation activities is very effective in dealing with low-income group problems.
- The Dhaka (Bangladesh) study focused on integrating composting activity with national fertilizer production and marketing.
- In practices addressing overall urban environmental management, the focus is on the cleaning and restoration of polluted waters, relocation of polluting industries, and integrated approaches to create win-win situations for the environment and economy. Two case studies from China focus on institutional structure and information disclosure.

The case studies show that political will and public awareness are the most crucial elements in the development and implementation of policies related to urban environmental management. Hard decisions to improve the situation are unavoidable. Those decisions could involve implementing command-and-control (regulatory) measures or market-based instruments (in terms of pricing of environmental goods and services). Regulations on pollution sources may create some temporary hardships, but these are compensated for by future health-related and socio-economic benefits. Additionally, pricing helps generate resources for protecting the environment and providing environmental services. It also contributes to changing attitudes towards valuing environmental resources.

Public awareness, as one can gauge from the successful practices, helps reduce the impact of socio-economic backlash against hard political decisions. Furthermore, public awareness helps in improving the understanding of all stakeholders in sharing responsibilities and becoming part of the process. It is also evident that public awareness campaigns work well if they are initiated or actively backed by the government. Likewise, the active involvement of stakeholders builds trust among the government, the private sector, and the community, which leads to stronger partnerships for urban environmental management. It is evident from the case studies that communities can put enormous pressure on local government to prioritise environmental issues. Women play a major role in helping to manage various environmental services such as solid waste management.

The case studies on zoning and infrastructure development policies indicated that proper zoning for various urban activities and living standards is important to optimising infrastructure development, and enhancement of

public-private partnerships is becoming a well-established process to overcome lack of investment. Regulations and institutions constitute the essential elements in providing solutions to urban environmental problems. A mix of command-and-control and economic instruments is more effective than solely applying pure command-and-control regulations or purely depending on economic instruments. As new technology may require the enhancement of local capacity to operate and maintain equipment, the use of older techniques is advised, especially where the slum population is high.

Replication of successful experiences in other cities presents a real challenge for planners. Some practices may be transferred without too much modification; one such case is the phasing-out of leaded gasoline, as it has been established that it does not have any major socio-economic or technical implications. An integrated approach involving various polluters and actors is the best way to accelerate the pace of improving urban air quality. The most viable transferable element for water and wastewater services is involvement of the private sector. If the city is somewhat developed then the concession model employing the private sector's role for even retail services can work well. For less developed cities, at least operation and maintenance of services can be conducted by the private sector to improve efficiency. For solid waste management, the most transferable cases are the separation of solid waste at source for recycling, as in Nonthaburi, while the other is composting of solid waste and its integration into overall solid waste management strategies.

The first limitation of these cases is transferability. The second limitation is the lack of experience of the local partners in considering appropriate modifications. One of the ways to overcome this problem is to promote city-to-city cooperation through inter-city visits and "twinning" of cities. The second way could be to bring together the cities with similar type of challenges, along with other experts and donors, to a forum where free dialogue on the replication of successful practices could take place.

### ***1.5. Capacity building and pilot project implementation***

The implementation of activities/projects was closely monitored to gauge the effectiveness of specific approaches and to develop models to enable their transfer to other cities in the region. Pilot activities essentially involved: (1) actions aimed at tangible improvements in environmental quality and human health and other co-benefits, (2) quantitatively monitoring of progress using appropriate indicators, (3) enhanced participation of local stakeholders, and (4) encouraging a replication approach. In some cases the objective was to develop a demonstration project that could be transformed later into a large investment project. Demonstration projects/pilot activities are currently in operation in five cities in the region with partial financial sponsorship by ESCAP. In addition, five pilot activities are in operation with funding from other sources.

Pilot activities/demonstration projects are under implementation in the areas of solid waste management, urban water conservation, urban air quality management, industrial pollution control, and promotion of information/communication tools (ICT) in urban environmental management. Major pilot projects implemented under the Kitakyushu Initiative are solid waste management in Nonthaburi (Thailand), public-private partnership in wastewater management in Weihai (China), air quality management in Puerto Princesa (the Philippines), urban air quality management in Chongqing (China), solid waste management in Dhaka (Bangladesh), urban wastewater management in Korat (Thailand), industrial relocation in Ho Chi Minh City (Vietnam), pollution control in Cebu (Philippines), urban air quality management in Surabaya (Indonesia), urban air quality management in Ulaanbaatar (Mongolia), and water pollution control in Semarang (Indonesia). These cases have been analysed for their potential and adaptability using a set of quantitative indicators.

## **2. Self-evaluation**

### **2.1. Originality and evaluation of achievements**

The second phase of the UE Project essentially covers most of the debated issues with regard to the major domains of the urban environment, viz. water and wastewater, air and solid waste management. Its attempt to cover a range of cities with diverse backgrounds, both economically as well as environmentally, makes it a unique effort with a nicely balanced selection of cases, and it provides a wider scope for a comprehensive analysis of the whole situation in the region. Second, it developed and adopted a common analytical framework, in addition to collecting actual data from case studies of selected cities. Addressing cross-sector issues was attempted by adopting the common analytical framework. It identified topics among diverse urban environmental issues that were most relevant to the implementation of actual urban environmental policies. It focused on strategic issues, including the methods and policies to finance the development of improving urban environmental infrastructure so as to handle basic environmental services. It developed a common framework for indicators to assess the individual policies aimed at improving urban environmental management, compiled the best environmental practices, and attempted to demonstrate them as pilot projects under the Kitakyushu Initiative.

### **2.2. Evaluation of project management**

The second phase of the UE Project involved both data analysis and extensive networking, as it tried to integrate analysis and action plans by means of case studies and pilot projects. It provided a good opportunity for the project to develop an international network of researchers and expand the IGES research network in general. Coordination of many thematic workshops and conferences not only broadened the scope for future IGES activities but also provided IGES researchers with an excellent exposure to the burning research issues in the Asian region. This project, by its nature, has created a huge amount of information, which needs to be carefully utilised. A system of database management is an essential component for maximising the research benefits of this project and the information collected in the long term.

## **3. Conclusion**

The second phase of the Urban Environmental Management Project tried to study the process of environmental change in various cities of Asia, analyse the drivers of the change, and provide policies to provide a better environment and improve certain basic environmental services. It examined the possible mechanisms that can be applied to different types of environmental problems and the necessary conditions to develop suitable policies. The UE Project, along with the Kitakyushu Initiative, has attempted to assess individual environmental policies by using quantitative indicators and to compile the best environmental practices for their possible replication. The major findings of this project provide several policy options for sustainable urban development in Asian cities. Below are a few of the major issues.

A number of Asian cities are expanding their spatial boundaries to suburbs, peripheries, and even to peri-urban areas in response to various driving forces, such as the sustained primacy of socio-economic and political activity in the Seoul Metropolitan Region, and the rapid economic growth based on a market economy in China, as well as FDI and the early 1990s property boom in the Bangkok Metropolitan Region. Regardless of the nature of driving forces underlying such spatial expansions, they have all resulted in unintended spill-over of environmental degradation across the metropolitan areas of these Asian mega-cities.

Conventional measures, equipped with sector-specific approaches, appeared somewhat effective in the short-term in mitigating urban environmental problems, but revealed their own limitations in the long-term. Hence, city environmental management should adopt the “metropolitan” nature, with provisions for not only accommodating the rapidly growing demand for urban environmental services but also creating or inducing environmentally sound urban spatial structure that restrains potential environmental loads.

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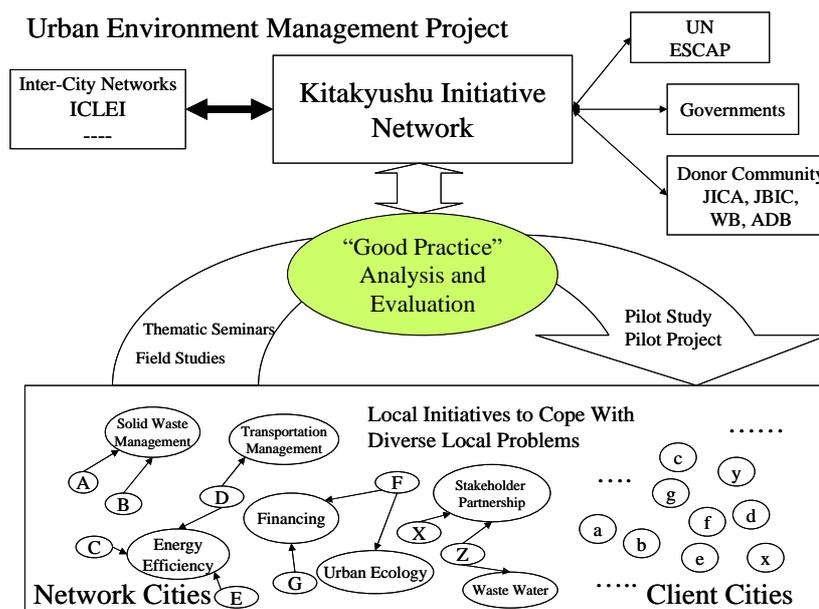
Insufficient investment and low efficiency were identified as prominent issues in providing the required urban environmental infrastructure in Asian cities. In some large and medium cities in Asia, PPP has already been implemented, mostly for water supply projects in the form of BOT or concession contracts. In those cities, serious considerations about the possibility of expanding PPP to environmental infrastructure projects, including sewer and waste treatment, are under scrutiny. PPP could be considered as the most effective policy solution and would help Asian countries to achieve the targets of the WSSD and UN MDGs. It was agreed widely that development of UEI cannot be achieved based only on public finance, and PPP is expected to play a crucial role and provide significant input, but there are vital issues to be considered before PPP can be successfully employed in UEI. These include proper role-sharing between actors, proper and independent regulatory institutions to design and control tariffs and subsidies, design of appropriate contracts, controlling guarantees, and actively deriving support from FDIs and donor agencies.

Economic growth brought about a rise in CO<sub>2</sub> emissions in the mega-cities of Asia, viz. Tokyo, Seoul, Beijing, and Shanghai; however, in the case of Tokyo, the recession in the economy did not reduce the emissions. Rapid industrialisation was found to be responsible for a rise in CO<sub>2</sub> emissions in Chinese cities, although the energy intensity effect contributed to restrain emissions. In terms of volume of emissions, those in Chinese cities are higher than those in Tokyo and Seoul. Fuel economy is very low in Chinese cities compared to Tokyo and Seoul, pointing to the necessity for development of large-scale public transport and improved efficiency of in-use vehicles.

Though the amount of energy consumption per GRP of tertiary industry is decreasing in Beijing and Shanghai, the results showed that their commercial energy consumption would exceed the amount in Tokyo by 2010. Tokyo and Seoul dominate in indirect emissions, whereas Beijing and Shanghai have more direct CO<sub>2</sub> emissions. In the case of waste management, these mega-cities have to learn from each other's experiences in conserving energy. There is a need for increasing recycling/re-use rates. The overall results endorsed the need to employ an integrated approach in cities where local air pollution benefits and global GHG reduction targets can be simultaneously addressed, pointing out the need to carry out further research along these lines.

Under the Kitakyushu Initiative, IGES analysed various environmental policies and practices. In attempts to find ways to improve environmental management at the city level, involvement of the private sector was found to be the most viable transferable element that could work well for developed cities. For less developed cities, at least the operation and maintenance of services can be conducted by the private sector to improve efficiency. The first limitation of adapting the best practices in other cities is transferability. The second limitation is the lack of experience of local partners in considering appropriate modifications. Through the Kitakyushu Initiative, IGES compiled successful experiences in Asia and the Pacific, carried out demonstrations, and attempted to transfer those policies and methodologies to other cities as a way to improve urban environmental management.

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**Figure 1.** Urban Environmental Management Project concept.

**Table 1.** List of activities undertaken under the UEM Project (Phase II).

1	International Workshop on Policy Integration towards Sustainable Energy Use for Asian Cities: Integrating Local Air Pollution and Greenhouse Gas Emissions Concerns (28–30 January 2004, Hayama, Japan). Organized by IGES (partly sponsored by Asahi Glass Foundation). < <a href="http://www.iges.or.jp/kitakyushu/megacity_workshop/index.htm">http://www.iges.or.jp/kitakyushu/megacity_workshop/index.htm</a> >
2	International Workshop on the Role of Planning Practices towards Sustainable Development in Asia (March 2003, Seoul). Organized by IGES and Korea Environment Institute. < <a href="http://www.iges.or.jp/en/ue/activity/iges-kei/index.html">http://www.iges.or.jp/en/ue/activity/iges-kei/index.html</a> >
3	International Workshop on Policy Integration towards Sustainable Energy Use for Cities in Asia (4–5 February 2003, Hawaii). Organized by IGES, hosted by East West Center, Hawaii, U.S.A (sponsored by APN, AEON Foundation, and Asahi Glass Foundation). < <a href="http://www.iges.or.jp/en/ue/pdf/megacity03/HTML/index.html">http://www.iges.or.jp/en/ue/pdf/megacity03/HTML/index.html</a> >
4	International Seminar on Financial Mechanisms for Environmental Protection (5–6 November 2002, Beijing). Organized by IGES, Japan Bank for International Development, and Secretariat of CCICED, co-organized by Ministry of Environment Japan, State Environmental Protection Administration China.
5	International Workshop on Policy Integration and Industrial Transformation towards Sustainable Urban Energy Use for Cities in Asia; International Symposium on Sustainable Urban Development in Asia, Japan (23–25 January 2002, Kitakyushu, Japan). Organized by IGES (sponsored by APN, AEON Foundation, and Asahi Glass Foundation). < <a href="http://www.iges.or.jp/en/ue/pdf/megacity02/index.html">http://www.iges.or.jp/en/ue/pdf/megacity02/index.html</a> >
6	First Meeting of the Kitakyushu Initiative Network (November 2001). Organized by ESCAP, Ministry of Environment Japan, and IGES.
7	1st Thematic Seminar: Kitakyushu Initiative Seminar on Solid Waste Management (September 2002). Organized by ESCAP, Ministry of Environment Japan, and IGES.
8	2nd Thematic Seminar: Kitakyushu Initiative Seminar on Public-Private Partnerships for Urban Water Supply and Wastewater Treatment (November 2002). Organized by ESCAP, Ministry of Environment Japan, and IGES.
9	3rd Thematic Seminar: Kitakyushu Initiative Seminar on Urban Air Quality Management (February 2003). Organized by ESCAP, Ministry of Environment Japan, and IGES.
10	4th Thematic Seminar: Kitakyushu Initiative Seminar on Industrial Relocation (August 2003). Organized by ESCAP, Ministry of Environment Japan, and IGES.
11	Second Meeting of the Kitakyushu Initiative Network (September/October 2003). Organized by ESCAP, Ministry of Environment Japan, and IGES.
12	5th Thematic Seminar: Kitakyushu Initiative Seminar on Public Participation (January 2004). Organized by ESCAP, Ministry of Environment Japan, and IGES.

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**Table 2.** Successful practices in urban environmental management.

<b>City/Country</b>	<b>Area covered</b>
<b>Air quality management</b>	
Bangkok (Thailand)	Integrated urban air quality management
Kathmandu (Nepal)	Role of government, private sector, and civic society in promoting battery-operated electric three-wheelers in Kathmandu, Nepal
Kitakyushu (Japan)	Coexistence of industry and community
Singapore	De-coupling of urban mobility needs from environmental degradation in Singapore
Singapore	Successful experiences in containing environmental problems from transportation
Chongqing (China)	SO <sub>2</sub> pollution control
Guiyang (China)	Strategies for air pollution control
Lanzhou (China)	Special programme on air pollution
United Kingdom	Local air quality management
<b>Urban water and wastewater management</b>	
Cartagena (Colombia)	Public-private partnerships in water and sanitation
Cordoba (Argentina)	Public-private partnerships in urban water (concession contracts)
Johor Bahru (Malaysia)	Public-private partnerships in bulk water supply
Manila (Philippines)	Public-private partnerships in water supply and wastewater treatment
Macao (China)	Public-private partnerships in water supply and wastewater treatment
Weihai (China)	Wastewater management
Rongcheng (China)	Water management models
Shenzhen (China)	Construction and operation of environmental infrastructure
<b>Solid waste management</b>	
Nonthaburi (Thailand)	Community awareness in recycling and solid waste management
Dhaka (Bangladesh)	Innovation in community-driven composting
Surabaya (Indonesia)	Integrated sustainable approach to waste management
<b>Overall urban environmental management</b>	
Jeju (Korea)	Restoration of severely polluted and damaged streams
Daegu (Korea)	Tearing-Down-Walls campaign
Dalian (China)	Removal and modification of polluting industries
Ho Chi Minh (Vietnam)	Promotion of cleaner production
Jiangyin (China)	Structural adjustment in urban environmental management
Ningbo (China)	Integrated urban environmental policies
Surabaya (Indonesia)	Comprehensive Kampung Improvement (model for community participation)
Taiyuan (China)	Cleaner production
Yantai (China)	National Model City for Environmental Protection
Zhang Jiagang (China)	Integrating environment and economy (Three First System)
Zhenjiang (China)	Environmental information disclosure system