

# **The Environmental Implication of Metropolitan Expansion in Asian Cities : The Role of Planning Practices toward Sustainable Urban Development in Asia**

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## **Abstract**

This paper focuses on examining environmental implications embedded in recent spatial expansion of the Asian megacities as well as exploring the potentials of planning practices in addressing urban environmental problems. Regardless what underlying forces of recent metropolitan expansion are, nearly all the Asian megacities suffer serious environmental problems as these cities rapidly grow in terms of population and geographical boundaries. Furthermore, the global environmental implication of urban expansion at Asian megacities implies that there must be intense endeavor to develop more innovative policy solution in order to tackle down the worsening urban environmental problems in Asian cities at a metropolitan scale.

Given the situation that there has been little attention on environmental consequence of the Asian metropolitan expansion in spatial term, this paper presents the overview on the changing nature of urban environmental problems embedded in the spatial expansion of recent metropolitan area in Asia, along with exploring possible solutions from planning practices guiding sustainable urban development in Asia.

**Keywords** : Asian megacities, Sustainable urban development, Urban expansion, Urban environmental problem

## I . Introduction

This paper focuses on examining environmental implications embedded in recent spatial expansion of the Asian megacities as well as exploring the potentials of planning practices in addressing urban environmental problems. Regardless of what underlying forces of recent metropolitan expansion are, nearly almost Asian megacities suffer serious environmental problems as these cities rapidly grow in terms of population and geographical boundary. Furthermore, the global environmental implication of urban expansion at Asian megacities implies that there must be intense endeavor to develop more innovative policy solutions in order to tackle down the worsening urban environmental problems in Asian cities at metropolitan scale.

Until recently, a number of comparative studies examined a wide range of environmental problems in Asian cities: urban air pollution, and the pollution of rivers and streams by industrial and domestic wastes, and misguided environmental governance(IGES, 2001). Current environmental problems in Asia impose an enormous burden on urbanized region because a city tends to be both victim and agent of environmental damages.

However, the evidence available so far on urban environment in the selected East and Southeast Asian cities presents a rather mixed picture. In other words, the nature of environmental problems in these cities varies from country to country. The experiences drawn from Japan and Korea suggest that they are now encountering lifestyle-related environmental issues derived from high consumption lifestyles, whereas many Chinese cities experience serious challenges due to rapid industrialization and lack of effective environmental management. Another example of Southeast Asian cities exhibits that the existing urban environmental issues still remain poverty-related issues such as low access to safe water and lack of sanitation facilities.

In contrary, there has been little attention on environmental consequence of the Asian metropolitan expansion in spatial term. This paper presents the overview on the changing nature of urban environmental problems embedded in the recent spatial expansion of metropolitan areas in Asia, along with exploring possible solutions from planning practices guiding sustainable urban development in Asia.

## II. Metropolitan Expansion of Asian Cities in Global Context

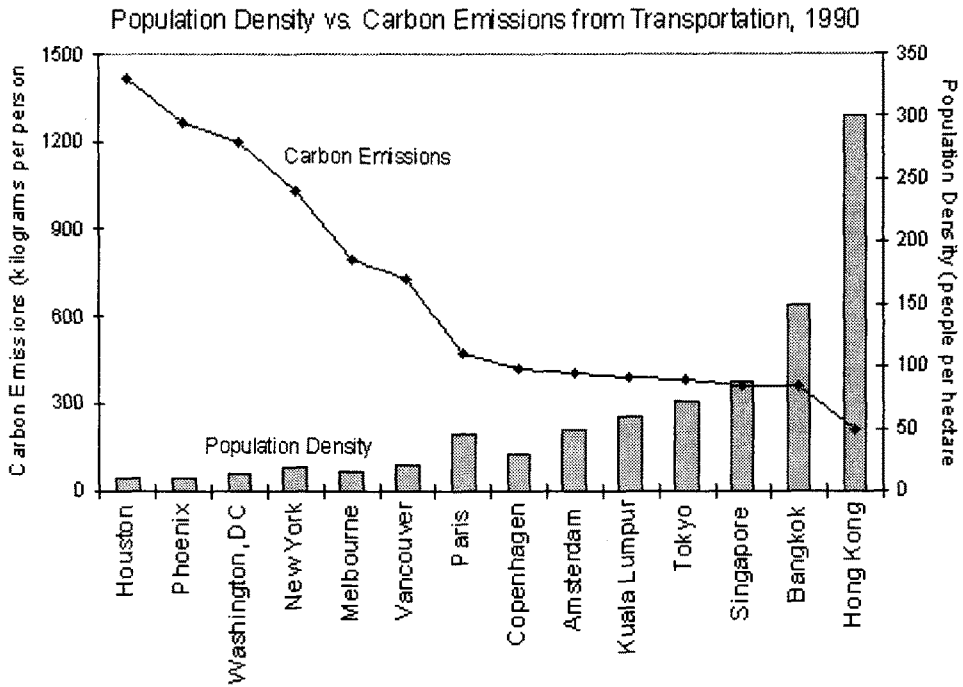
The phenomenon of spatial expansion of urbanized area at metropolitan scale is not a brand-new agenda. The so-called “urban sprawl and its adverse effects on environment” have been long debated among policymakers and academia over decades. In particular, since the emergence of automobile-oriented urban development has been extensively spread to major metropolitan areas in USA, many urban scholars and policymakers had debated over whether such spatial expansion of the metropolitan areas is desirable or not in terms of sustainable urban development as well as on the effectiveness of conventional planning practices to tackle down it (Gordon and Richardson, 1996).

The main focus of this debate places on whether such land-consumptive development into suburbs in metropolitan area would be sustainable in terms of urban environment. While a group of pro-growth advocates argues that urban sprawl seems unavoidable and can not be controlled by a series of policy intervention due to “the pitfalls of governmental failures”, the majority of urban experts and policymakers assert that new policy alternatives, particularly from planning practices, should be considered to prevent further sprawl (Gordon, Richardson, and Wong, 1986). Yet, in Asian context, the conventional debate on urban sprawl and its environmental consequences should be to some extent reexamined in unique characteristics of urban growth embedded in Asian cities.

First, unlike the US cities where the preference of life style and the affordability of automobiles are the dominant factor behind urban sprawl, several Asian cities are highly-dense along huge demographic bases. Given such density-related characteristic, several indicators related to the efficiency of resource and energy consumption are considerably higher than those of the US cities.

For example, as shown in Figure 1, the level of carbon emissions discharged from automobiles in several Asian cities is quite lower than the corresponding US cities such as Phoenix and Huston, where the size of residential population is much smaller than Asian cities. Such a contrasting example between Asian cities and the Western cities implies that conventional way to address urban environmental problem should be relevant and appropriate in accordance with local-specific conditions.

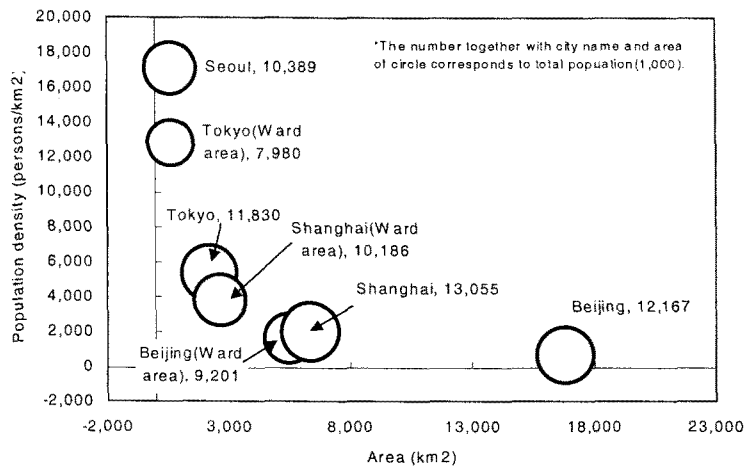
<Figure 1> Population Density vs. Carbon Emission from Transportation, 1990



Source : Worthy, et al., 1999

Second, although a few Asian megacities are highly dense with very limited size of built-up area, the geographical boundary of a few Asian metropolitan areas are rapidly sprawling over recent decades. The so-called “the extended metropolises” which range to several hundred kilometers from the core, are increasingly becoming apparent in some Asian cities. For example, as shown in Figure 2, the administrative jurisdiction of Beijing metropolitan area is much larger than other East Asian metropolitan regions. Such urban spatial expansion often generates a wide variety of environmental problems if the concerned metropolitan areas are in poor urban managements such as lack of urban infrastructure and the ineffective governance. In particular, as the property-driven development by private sector has been accelerated since the early 1990s, a few Asian metropolitan areas encounter ‘mismatch between the need and supply of urban environmental infrastructures’. It often leads these metropolises, particularly the periphery areas, into being uncontrolled and unplanned. As a result, the environmental quality of these areas, where the suburbs are superb than the congested core in terms of natural habits and ecosystem, becomes swiftly deteriorated.

<Figure 2> Urban scales of four mega-cities in Asian Megacities



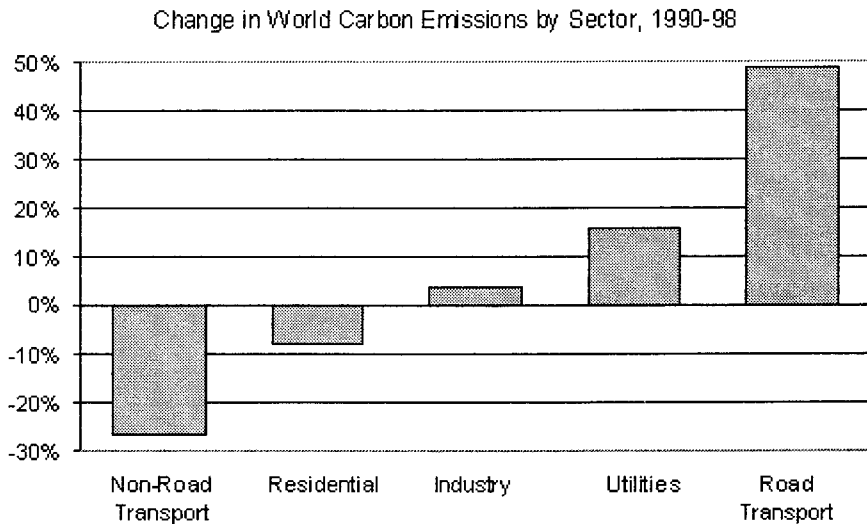
Source : Kaneko, 2001.

Third, apart from the divergent characteristic on urban spatial structure and efficiency of resource consumption between Asian cities and the Western cities, rapid increase of automobile in Asian megacities is emerging as a major contributing factor responsible for air pollution and other transport-related environmental problems. Some Asian megacities currently struggle with the emerging auto-dependent urban growth as socioeconomic development in the region occurs.

This transport-related issue imposes to a greater extent environmental distress not only at local level, but also at global level. As shown in Figure 3, road transport becomes the leading sector to discharge carbon emission blamed for the emission of Green House Gas (GHG), while other uses for industry and utilities remain a little increase during 1990-1998.

Most Asian cities are no exception on this dominant trend. According to a recent comparative study on the energy use and GHG emission in East Asian megacities, the sectoral emission profile shows that transportation sector's contribution in CO<sub>2</sub> emission continues to grow along with residential and commercial sector, while industrial sector's share of CO<sub>2</sub> emission gradually decrease (Dhakal, Kaneko, and Imura, 2002). Due to remarkable economic growth in China and a few South and Southeast Asian countries over recent decades, the appropriate policy response to transportation sector in Asian cities becomes one of top environmental concerns at the regional level as well as global level.

&lt;Figure 3&gt; Change of Carbon Emission by Sector, 1990-1998



Source : IEA, 2000

### III. Entering the Post Sprawling Era and its Environmental Implication : The Cases of Asian Megacities

As in past decades, several Asian megacities continue to expand their spatial boundary to suburbs, periphery, and even to peri-urban areas. For example, Bangkok, one of the Southeast Asian mega-cities, along with rapid growth of 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(Hayashi, et al., 2002).

Beijing, one of the fastest growing Asian megacities, also becomes bigger and bigger. After the open-door policy, the Chinese capital city had to a greater extent changed not only in population, but also in physical shape. In the past four decades, Beijing has more than tripled in size. More than four million people lived here in 1958; 9 millions by the early 1980s, and nearly 11.5 millions in 2000. To accommodate the influx of population, the city continues to expand its geographical boundary along with the construction of transport infrastructure.

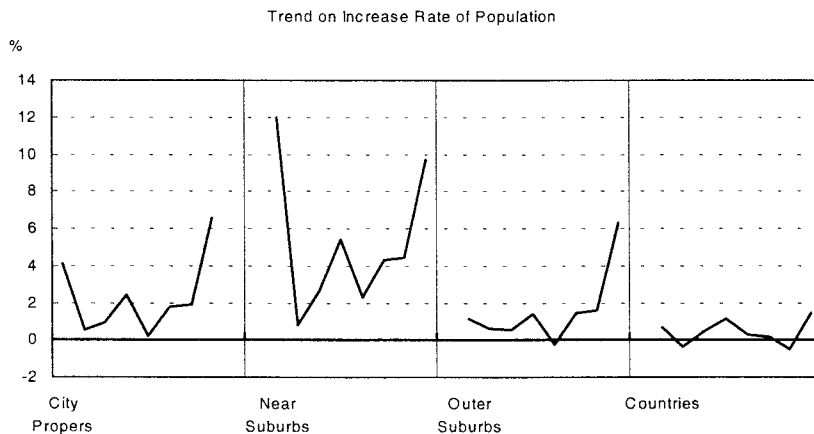
For example, the government continues to build concentric beltways that radiate from the city center. In addition to the existing Second, Third, and Fourth ring Roads, the city

plans next year to complete Fifth ring road, a 59-mile asphalt ribbon. In 2005, engineers intend to complete Sixth Ring Road, 117.5 miles around. There are already plans for a Seventh Ring Road. Such a “lightning-pace change” of Beijing in social, economic, and political terms is expected to continue apace at least until Olympic Games in 2008.

The driving forces underlying such land-consumptive sprawl in the Asian metropolitan areas vary from city to city. In the Seoul Metropolitan Region(SMR),<sup>1)</sup> the sustained primacy of socioeconomic and political activity contributes greatly to such spatial expansion at metropolitan scale, while rapid economic growth based on market economy in China is regarded as the major underlying force. The spatial configuration of the extended periphery of BMR(Bangkok Metropolitan Region) is significantly affected by FDI and the early 1990s’ property boom, where affluent residential subdivisions for urban middle-class and foreign executives and labor-intensive manufacturing industries reside.

Regardless of the nature of driving forces underlying such spatial expansions of Asian megacities, 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 cities has been considered unavoidable under strong developmental pressures such as the lack of housing and other urban facilities, but it induced unintended spill-over of environmental degradation across metropolitan areas of these Asian megacities.

<Figure 4> The Population Growth of Beijing Metropolitan Area between Core and Periphery



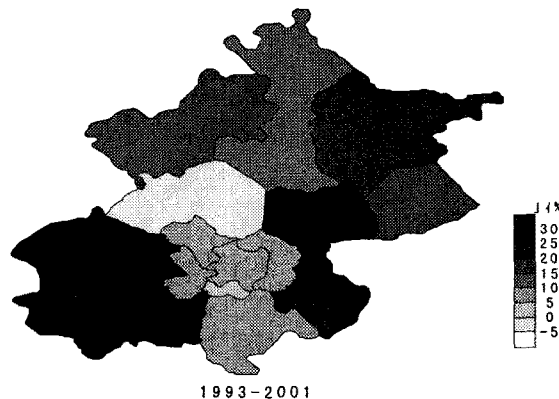
Data source : Beijing Statistical Yearbook, 1998-2001

1) It is widely accepted that the Seoul Metropolitan Region(SMR) includes Seoul, Incheon and the Kyunggi province.

As a consequence, these “Asian extended metropolises” impose a greater environmental stresses on the periphery as well as core city by exposing the traffic congestion with extended commuting distances, uncontrolled expansion of urban fringes, and great loss of greenery and natural habitats. In addition, the relocated polluting industries from the inner core are widely blamed for 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.

A recent environmental report on China provides a contrasting picture of urban population growth between the core and periphery of the Beijing metropolitan area over last four years(Urban Statistical yearbook of China, 1998-2001). As plotted in the following figure, the population growth is the most remarkable in the region near suburbs, while other outward areas experience slow population growth(See Figure 4 and Figure 5).

<Figure 5> Population change of the Beijing Metropolitan Region, 1998-2001



Data source : Beijing Statistical Yearbook, 1998-2001

In fact, with a total area of 16,800 square kilometers, the urban area of Beijing metropolitan area is planned to reach 1,040 square kilometers, whereas the downtown area within the Fourth Ring Road of the city is about 300 square kilometers. Currently, the city government is carrying out so-called “urban strategic shift”, in which the focus of urban construction will be shifted not only from the downtown area to remote suburban areas and outer suburban areas in order to accommodate the rapidly growing housing demand in the metropolitan area. As a result, it is expected that the outer areas of Beijing metropolitan area will be filled with built-up areas, including 14 satellite towns, 30 central



towns, and about 100 ordinary organic towns(Song, Zhao, and Wang, 2003: 4).

Facing the sprawling growth of urban and suburban areas throughout Asian megacities, the primary measures of urban environmental management are sector-specific approaches such as air pollution control, water treatment, and waste management. These conventional measures, equipped with sector-specific approach, appeared somewhat effective in short-term in mitigating urban environmental problems, but revealed their own limitations in the long-term.

In reality, several conventional sector-specific approaches are merely accommodating 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 the conventional measures(control and command framework, reactive measures, and demand- following policy) due to several constraints that the Asian cities are encountering so far.

Furthermore, due to little attention on causal relation between these sector-specific approaches and spatial consequences, these measures turn out to be less effective in addressing several environmental problems. In this sense, it is increasingly becoming apparent that the remedy of these environmental problems should be explored at metropolitan scale, not single administrative or municipal boundary. Because of interdependent interaction of urban environmental load between core and periphery, it is hardly expected to be an effective solution in addressing these urban environmental problems without further consideration on the changing physical layout of metropolitan areas.

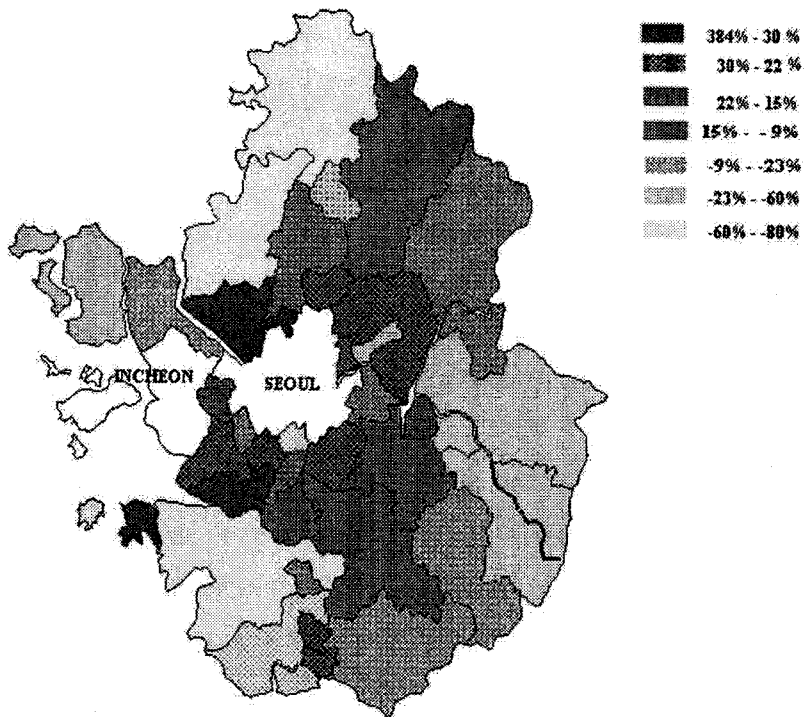
Some recent empirical evidences illustrate that it is almost impossible to achieve the sustained improvement of environmental status in metropolitan regions by the endeavor of a single city. For instance, the water quality of Han River, running through the core of Seoul, is estimated as being worse than the previous one in terms of BOD(Biochemical Oxygen Demand) and other related water indicators, although the city government had continuously invested tremendous resources to upgrade water quality. The discharging wastewaters from upstream of the periphery of SMR, in which polluting industries and newly-built bed town are densely concentrated, are largely blamed for the main cause of the worsening water quality.

Another example from air pollution in SMR also challenges conventional wisdom on environment between core city and the periphery. Until recently, it is widely assumed that

core city or a few urban centers have been in better environmental condition at the expense of the environmental degradation in their peripheries.

Owing to the dominance of socioeconomic and political powers, it was often witnessed that polluting industries in the core were forced to move beyond the boundary of Seoul, while the core of SMR enjoyed to greater extent the improvement of air quality, especially the level of stationary pollutant including SO<sub>2</sub>. Yet, it is turned out to be short-sighted prospect because these relocated industries were consequently blamed for contaminating not only the fringes, but also the core of metropolitan regions. According to the recent survey by the Ministry of Environment in Korea, seventeen towns neighboring the city of Seoul recorded much higher concentration of SO<sub>2</sub> and Ozone compared to the core of SMR and these airborne pollutants made adverse effects on air quality of the core(Korean Ministry of Environment, 2002).

<Figure 6> Population Change of the Seoul Metropolitan Region, 1990-1994



Data source : Kyunggi Provincial Government, 1990-1995; National Statistical Office, 1996.

Another adverse consequence of metropolitan expansion is witnessed in the Seoul Metropolitan Region, where recently encounters reckless development and its adverse

impact on environment in the peripheries.

Although Seoul has encountered a declining population growth rate relative to that of South Korea as a whole, SMR continues to experience very high rates of net migration, due mainly to overflow of population from Seoul to Incheon and Kyunggi Province. Between 1990 and 1995, the population growth rate of Seoul declined to 3.7 percent, while Incheon and the Kyunggi experienced population growth rates of 26.8 percent and 24.1 percent, respectively.

The explanation for this is found in looking at the rapid growth of satellite cities located in the periphery of Seoul. For example, Koyang, a newly built dormitory town located in the northern periphery of Seoul, experienced more than 300 percent increase in population during 1990-1994. During the late 1980s and early 1990s, a number of dormitory towns (e.g., Pundang, Ilsan, Chungdong, Pyongchon, Sanbon), which were built around the fringes of Seoul, also experienced explosive growth. These new towns are located within about 20-km from the city center just beyond the outer edge of the greenbelt. Total planned population of these five new towns exceeds 1.1 million. Over 66 percent of these new town residents have jobs located in Seoul, whereas only 16.7 percent and 15.8 percent of new town residents commute to their own town, and Kyunggi and Incheon, respectively (Chung and Lee, 1996: 60).

Figure 6 suggests the significant facts regarding dynamics of recent SMR's growth. First, it is evident that the most rapid increase of population within the boundary of SMR occurred in the peripheral cities, which are mostly located in the radius of 25 miles from Seoul. The estimates of internal migration rate in SMR reveal that Kyunggi and Incheon have sustained high internal migration rate, from 8.0 in 1970-1975 to 11.9 percent in 1985 - 1990, while Seoul's internal migration rate drastically dropped from 10.3 percent to 0.4 percent during the same period (National Statistical Office, 1996).

As a consequence of recent development in the peripheries of SMR, the spill-over of urban activities and functions is often witnessed in urban fringes or outskirts around the jurisdictions, which are environmentally-fragile greenfields. Pushing new settlements towards urban periphery, due to inappropriate land-use controls and continued influx of population, remains the biggest challenge in terms of urban environmental management. In addition, given political and administrative fragmentation at local municipalities of SMR, it is more likely to suffer reckless development and its adverse impact on environment for

a while if there must be more genuine planning practices to control it. In reality, despite a wide variety of laws have been enacted to require all Seoul metropolitan regions to create growth boundaries beyond which new urban development would not occur, such a reckless land development is still prevailing in the SMR. Hence, it is critical to craft balance between local land-use control on environmentally fragile lands and a metropolitan approach to managing growth at metropolitan level.

The lessons so far drawn from these changing landscapes of urban environment embedded in Asian metropolitan areas legitimate urgent need of the redirection of urban environmental management in Asia in the following terms:

First, it is necessary to expand the geographical scope of urban environmental management to metropolitan scale in order to deal with the changing nature of environmental externalities due to spatial expansion of Asian megacities with regard to the effectiveness of environmental policy measures. In particular, the recent sociopolitical change such as the enhanced local autonomy in recent decades in Asia calls for more comprehensive applications of planning practices in integrating environmental concern into urban development process. In this sense, the emerging role of growth management in Asian metropolitan area should be a showcase that not only readjusts the changing urban function in efficient manner, but also addresses adverse environmental externality due to rapid suburbanization in Asia.

Second, it is necessary that municipalities are asked to find sounder 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 the potential environmental loads (for instance, air pollution due to traffic congestion) in long term perspective.

In this regard, the potentials of a wide array of planning practices, including growth management, urban inclusive guidance, environmental zoning, and transportation demand management, etc., would capture the intensive attention of policymakers, planners, and practitioners with regard to cost-effectiveness and relevance.

<Table 1> The Comparison of Sector-specific Approach and Planning Practices  
for Urban Environmental Management

Target term	Major environmental response	Effect & Impact	Nature of measures	Priority	Major modality
Short-term	Sector-specific	Direct	Responsive	Mitigation and abatement of environmental distresses	Regulation, Charging & incentive
Mid-long term	Spatial Planning	Indirect	Precautionary	Inducing sustainable urban form	Planning practices

In fact, planning practices have been expanded their role from exclusive considerations of land use and zoning to broader set of concerns addressed in the emphasis on “growth management” since last decades (Beatly and Manning, 1997:18). Prior to the previous decades, the prevailing assumption of planning had been that ‘the plan’ was an end of in itself rather than just one component in the management of urban process (UNHABITAT, 1996: 257).

Considering the failure of taking account of planning paradigm into urban evolutionary process in dynamic terms, it should be concerned that the shift of the role of planning helps planning measures on examining the causes and impacts of urban growth more systematically, ultimately adopting more comprehensive approaches and strategies for managing or controlling spatial growth. In addition, the relationship between conventional sector-specific approach and planning practice should be complementary in the nature of policy response, but differentiated in terms of priority and target (see Table 1).

#### IV. Concluding Remarks

This paper tries to figure out how the selected Asian cities have been expanded in terms of socioeconomic and geographical terms and to describe the environmental implication of spatial expansion in Asian cities at metropolitan scale.

As stated earlier, the spatial expansion of metropolitan areas over decades in selected Asian cities, which is largely driven by socioeconomic factors, generates a wide variety

of urban environmental problems. In particular, the role of planning practices preventing environmental degradation in both the core and the periphery of Asian metropolitan areas should be prioritized in the following terms:

First, it should be seriously concerned that the changing nature of urban environment in the periphery of Asian metropolitan areas calls for special attention of urban policy with regard to urban environmental management. In other words, the dualistic challenges of such urban fringes require a closer look at how effectively the conventional planning practices have been functioned and legitimize the direction of urban planning practices into the preservation of green space and the containment of urban sprawl through innovative of the urban planning practices.

Second, considering that inevitable environmental costs of urban sprawl are not only long commuting time and distance, but also high traveling cost between home and work, the extended travels for commuting and other activities impose environmental costs, particularly air pollution due to the increase of automobile emissions. While improvements in vehicles and fuel have helped reduce air pollution in some Asian megacities in the last decades, most vehicles continue to emit carbon dioxide, a “greenhouse gas” responsible for global warming. Hence, it is appropriate to respond to the mobile-source pollution with spatial planning in the long-term perspective, rather than to target individual source of the pollution in short-term perspective.

Lastly, it should be encouraged that there must be intense endeavors to utilize the expertise and knowledge on local case, along with the inter-linkage between sector-specific approach and innovative planning practice guiding sustainable urban environmental management in Asia.

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