# Urban Green Growth in Dynamic Asia

## A conceptual framework



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# URBAN GREEN GROWTH IN DYNAMIC ASIA: A CONCEPTUAL FRAMEWORK

The development of Asian cities is characterised by rapid and continuous urbanisation on an unprecedented scale, with rapid economic growth led in most places by the manufacturing industry, and rapidly increasing motorisation. The result has been escalating greenhouse gas emissions, sprawling urban development and local environmental impacts, as well as disparities in income, education levels and job opportunities in the urban population. These trends differ sharply from those in most of the OECD area and call for a green growth model that differs from those identified in previous OECD studies and that addresses the specific circumstances of Asian cities.

This paper proposes an analytical framework for assessing policies for green growth in rapidly growing cities in the emerging world. It builds on *Cities and Green Growth: A Conceptual Framework* (Hammer et al., 2011) and is adapted to the urban policy context of dynamic Asia. Its three main elements are: i) identification of the key policy strategies for urban green growth in fast-growing Asian cities, highlighting similarities to and differences from OECD cities; ii) opportunities for green growth; and iii) enabling strategies for implementing urban green growth.

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# 1. INTRODUCTION

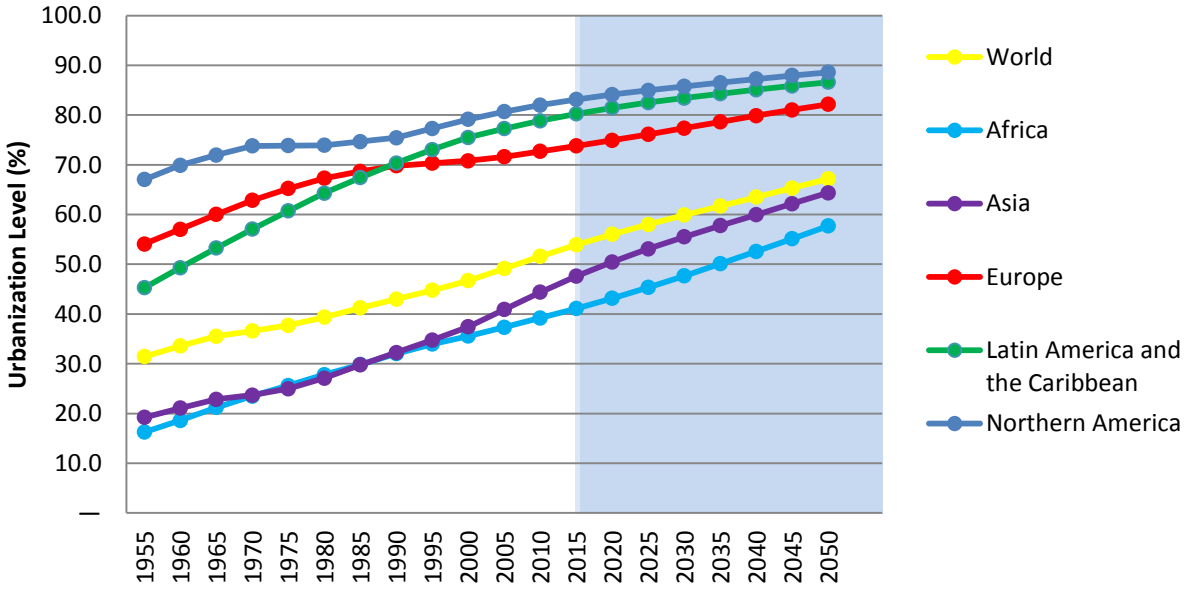
## 1.1. The need for a distinct urban green growth model in Asia

In cities experiencing rapid urban growth, fostering green growth should have high priority. While urban population growth is expected to continue in OECD countries, as population concentration increases and rural populations fall, most of the growth of the world's urban population is projected to occur in non-OECD economies. In Asia, the level of urbanisation is forecasted to increase from 45% in 2011 to 64.4% in 2050, when about 1.4 billion more people will be living in cities. In comparison, levels of urbanisation in North America will rise by less than 10 points to around 89% in 2050, but will still remain more than 24 points above Asia (Figure 1). The choices made by Asian governments as they seek to manage this rapid urbanisation will have large and lasting consequences for the environment and human well-being.

Dynamic Asian cities drive the economies of Asian countries. Although GDP per capita in Asia still varies significantly, the growth rate in most Asian countries over the past two decades has been on average much higher than the average world and OECD rates. This is due to the emergent character of Asia as a whole, not only of China and India (Table 1). In this paper, dynamic Asia therefore refers to a range of countries or cities mainly located in Southeast, East and South Asia[1] that are experiencing rapid urban and economic growth. Particular emphasis is placed on cities in the ten ASEAN countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam), China and India.

These urbanisation and economic trends present both challenges and opportunities. Local environmental problems such as management of water resources, waste disposal and air pollution must be tackled on an unprecedented scale. Yet there will be opportunities too in the choices made about urban form and infrastructure; they will have implications for both economic performance and environmental impact. Effective environmental policies can be good for urban growth, as they can enhance cities' efficiency and attractiveness. Moreover, in some parts of fast-growing cities, the creation of entirely new conurbations will open up opportunities to build green infrastructure from scratch, such as cleaner, more energy-efficient housing and transport and water systems. In many instances, it will be easier and cheaper to green new cities than established cities, where it would be prohibitively costly and might well meet political resistance. For example, at today's prices and with today's technology for natural gas-powered vehicles, it might be cost-effective to design and build new cities that use neither coal nor oil-based fuels; it would also have substantial environmental, health and productivity benefits (Romer, 2012). However, this would depend on a number of conditions (such as the prevalence of fuel subsidies). For existing cities, it would be an extremely expensive and politically difficult undertaking.

**Figure 1. Level of urbanisation by region**




*Source*: UN DESA (2012a), *World Urbanisation Prospects, the 2011 Revision*, New York.

**Table 1. GDP per capita in selected countries and regions of the world (1993-2012)**

| Country | GDP per capita in 2012 (current USD) | Annual GDP per capita growth rate (%) | | | | |
|---|---|---|---|---|---|---|
| | | 1993-97 | 1998-2002 | 2003-07 | 2008-12 | **1993-2012** |
| Singapore | 52 052 | 5.6 | 1.3 | 5.7 | 1.5 | **3.5** |
| Brunei | 41 127 | -0.8 | 0.1 | -0.3 | -0.9 | **-0.4** |
| Malaysia | 10 432 | 6.5 | 0.4 | 4 | 2.5 | **3.4** |
| China | 6 091 | 10.3 | 7.4 | 11 | 8.7 | **9.3** |
| Thailand | 5 480 | 5.3 | 0.1 | 4.9 | 2.7 | **3.2** |
| Indonesia | 3 557 | 5.4 | -1.3 | 4 | 4.5 | **3.2** |
| Philippines | 2 587 | 2.1 | 0.5 | 3.7 | 2.9 | **2.3** |
| Viet Nam | 1 755 | 7 | 4.5 | 6 | 4.7 | **5.6** |
| India | 1 503 | 4.2 | 3.8 | 7.2 | 5.4 | **5.2** |
| Lao PDR | 1 417 | 4.3 | 4 | 5.4 | 5.9 | **4.9** |
| Cambodia | 944 | 3.4 | 5.8 | 8.9 | 3.8 | **5.6** |
| Myanmar | - | 5.0 | 9.6 | - | - | **-** |
| Japan | 46 731 | 1.1 | -0.1 | 1.8 | -0.1 | **0.7** |
| Korea | 22 590 | 6.0 | 3.7 | 3.9 | 2.3 | **4.0** |
| OECD members | 37 262 | 1.9 | 1.8 | 2 | -0.1 | **1.4** |
| World | 10 318 | 1.5 | 1.4 | 2.5 | 0.6 | **1.5** |
| Latin America and the Caribbean (developing only) | 9 192 | 1.8 | 0 | 3.3 | 1.9 | **1.7** |
| Sub-Saharan Africa (developing only) | 1 629 | 0.2 | 0.3 | 3.2 | 1.4 | **1.3** |

*Note*: data on Myanmar is available only to 2004.

*Source*: World Bank, World Development Indicators Database, http://data.worldbank.org/indicator/NY.GDP.PCAP.CD and http://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG (last accessed 14 May 2014).

Cities have the potential to address such opportunities and challenges. The fact that they are closer to citizens' needs, have better knowledge of local conditions, and can test and refine innovative ideas locally creates conditions for successful policies (OECD, 2010a). However, national governments also play a key role in enabling cities to realise this potential. For example, local governments' capacity to raise their own revenues tends to be subject to national laws and regulations. In addition, in a development context, the assistance provided by international donors tends to go to national governments under national development planning frameworks, which do not fully recognise the roles of cities. It is therefore essential to understand how national and sub-national governments interact with regard to green growth and development strategies and to explore how cities can best achieve urban green growth.

The findings presented in OECD (2013a) and in the companion case studies point to many promising links between urban green growth and outcomes such as job creation, attractiveness, innovation and entrepreneurship, and increased land values (Box 1). However, most cities outside the OECD area differ in important – and very relevant – respects from most OECD cities. Emerging Asian economies, in particular, present some key trends:

- Cities in dynamic Asia are growing much faster than OECD cities, as a result of rapid and continuous urbanisation (migration from rural to urban areas), with often insufficient planning and development of urban infrastructure.
- They tend to be poorer and less well endowed with human capital, with large disparities in income, education levels and job opportunities in the urban population.
- The big cities of dynamic Asia are often more industrial than most large OECD urban areas, where the services sector plays a more dominant role. While the industry sector's share of total GDP output in Japan decreased from 33.7% to 26.1% between 1995 and 2011, it became or remained larger in emerging Asian countries such as China (from 47.2% to 46.6%), Viet Nam (from 28.8% to 37.9%), the Philippines (from 32.1% to 31.3%), Malaysia (40.5% to 40.7%), Indonesia (from 41.8% to 47.1%) and Thailand (37.6% to 38.2%) (ADB, Statistical Database). This continuing industrialisation is leading to rapidly increasing energy consumption and greenhouse gas (GHG) emissions, as well as local environmental problems.
- Cities are demographically dynamic, with consequences for housing and service provision. Southeast[2] Asia and South Asia's urban populations are expected to grow by 2% and 2.3% a year between 2010 and 2030, and by 1.2% and 1.8% a year between 2030 and 2050, respectively. In comparison, the figures for Western Europe and North America are respectively 0.4% and 1% between 2010 and 2030, and 0.2% and 0.7% between 2030 and 2050 (UN DESA, 2012a). In terms of age structure, the median age in Asian countries is much lower than the median age in OECD members, but is forecast to increase significantly in a few decades, from 25.8 years in 2010 to 39.8 years in 2050 (UN DESA, 2012b). This will reflect an expected decrease in the proportion of the overall population under 15 years (30% in 2000 and 19% in 2050 ) and a rise in the proportion of those aged 65 or more (6% in 2000 and 18% in 2050 ) (UN-HABITAT, 2010). Asian countries differ significantly in their age structure. In 2010, the median age was 37.3 years in Singapore and 44.9 years in Japan, while in Viet Nam it was 28.5 years and in the Philippines 22.3 years (UN DESA, 2012b).
- Many Asian cities are more exposed to climate change and other environmental risks than many European OECD cities and need more urgently to adapt to climate change. It is generally expected that climate change impacts will be more pronounced in the tropics, where many dynamic Asian cities are located. Asian cities will be increasingly vulnerable to floods (in terms of exposure of populations and assets) as a result of sea-level risk driven by climate change, projected socio-economic change, and natural and human-induced subsidence (Hallegatte et al., 2013; Hanson et al., 2011).

This calls for an urban green growth model different from the ones examined in *Green Growth in Cities* (OECD, 2013a), one which takes into account the specific circumstances of Asian cities. Such a model offers an opportunity to assess the extent to which OECD best practices are relevant to emerging Asian cities and at the same time to identify policies and approaches in Asia that can inform urban policy making in OECD countries and cities, especially in the field of urban adaptation to climate change.

**Box 1. Green Growth in Cities**

The OECD defines urban green growth as fostering economic growth and development through urban activities that reduce environmental impact, for example by improving air quality and reducing $CO_2$ emissions; efficient consumption of natural resources including water, energy and undeveloped land; and the protection of ecosystem services. Many urban policy makers in the OECD area have come to see green growth as an opportunity to create jobs and attract firms and investment, while improving local environmental quality and addressing global environmental challenges, particularly climate change.

OECD (2013a) outlines some of the high priority urban policies for green growth, as well as the national policies needed to complement and support these local policies. The report is illustrated with examples from six urban green growth case studies: four at the city level (Paris, Chicago, Stockholm and Kitakyushu) and two national studies (China and Korea). For example, the city-level case studies provide urban leaders with new insights on how environmental policies can contribute to different types of growth:

- **Job creation**: the right urban sustainability policies can include retrofitting the existing building stock for improved energy efficiency. For example, the Chicago Tri-State metro-region has built a regional specialty in green building design and retrofitting. In 2010 it gave 45 000 people green jobs, 36% of which were in the green building sector.
- **Attracting firms and workers**: efficient transport systems, in particular good public transport networks, help cities lure investors. The private sector in the Paris/Ile-de-France region has long recognised this, and firms that benefit from proximity to the transport system contribute to its financing.
- **Innovation and entrepreneurship**: cities can foster the growth of the green technology sector by creating green regional clusters that build on existing industries, services, research and innovation. Kitakyushu has built an impressive recycling cluster, the Eco-Town, which recycles hundreds of tons of industrial waste every day, while producing energy for residential and commercial neighbourhoods.
- **Increasing the value of urban land**: redevelopment, infill, and eco-districts can enhance land values while increasing density and reducing residents' environmental impact. Following the success of its Hammarby Sjöstad eco-district, Stockholm is now working with the private sector to develop the Stockholm Royal Seaport eco-district. Buildings there will use less energy than others in Stockholm and the new district will have an advanced smart grid and district heating.

The report presents the role of national governments. They can enhance cities' capacity to promote green growth by:

- providing financial and technical support, clear targets, and monitoring mechanisms;
- setting price signals and standards (for example, through carbon taxes or other pricing mechanisms);
- reviewing national policies' impact on local incentives, to identify and remove perverse incentives;
- encouraging infrastructure investment in line with sustainable development and green goals.

The report observes that local governments lack financial resources for investing in urban green infrastructure, so that efforts to diversify revenue bases become an important strategy for cities. Mobilising private finance is also important to fill the funding gap for many urban green infrastructure projects.

*Source*: OECD (2013a), *Green Growth in Cities,* OECD Publishing, Paris.

## 1.2. Purpose of the paper

The OECD project, Urban Green Growth in Dynamic Asia, explores ways to achieve green growth in Asian cities. Specifically, it examines ways to promote greening and competitiveness in a fast-growing economy, to improve environmental performance in cities and urban quality of life, and to increase the institutional capacity to achieve green growth. The project has three complementary elements:

- This concept paper, which proposes an analytical framework for assessing policies for green growth in fast-growing Asian cities.

- Case studies of four to six Asian cities to assess the impact of urban green growth and sustainability policies on economic performance and environmental quality. These studies will build on the analytical framework developed in the concept paper. Each city will be benchmarked against some 300 other OECD and non-OECD metropolitan areas using a set of economic and environmental indicators. It will also provide policy benchmarks in green growth efforts as well as recommendations for local and national stakeholders.

- Knowledge-sharing activities for mutual learning among cities and national governments in Asia, OECD cities and international organisations. The project can then serve as a "platform" for Asian cities and OECD cities across the world to build partnerships.

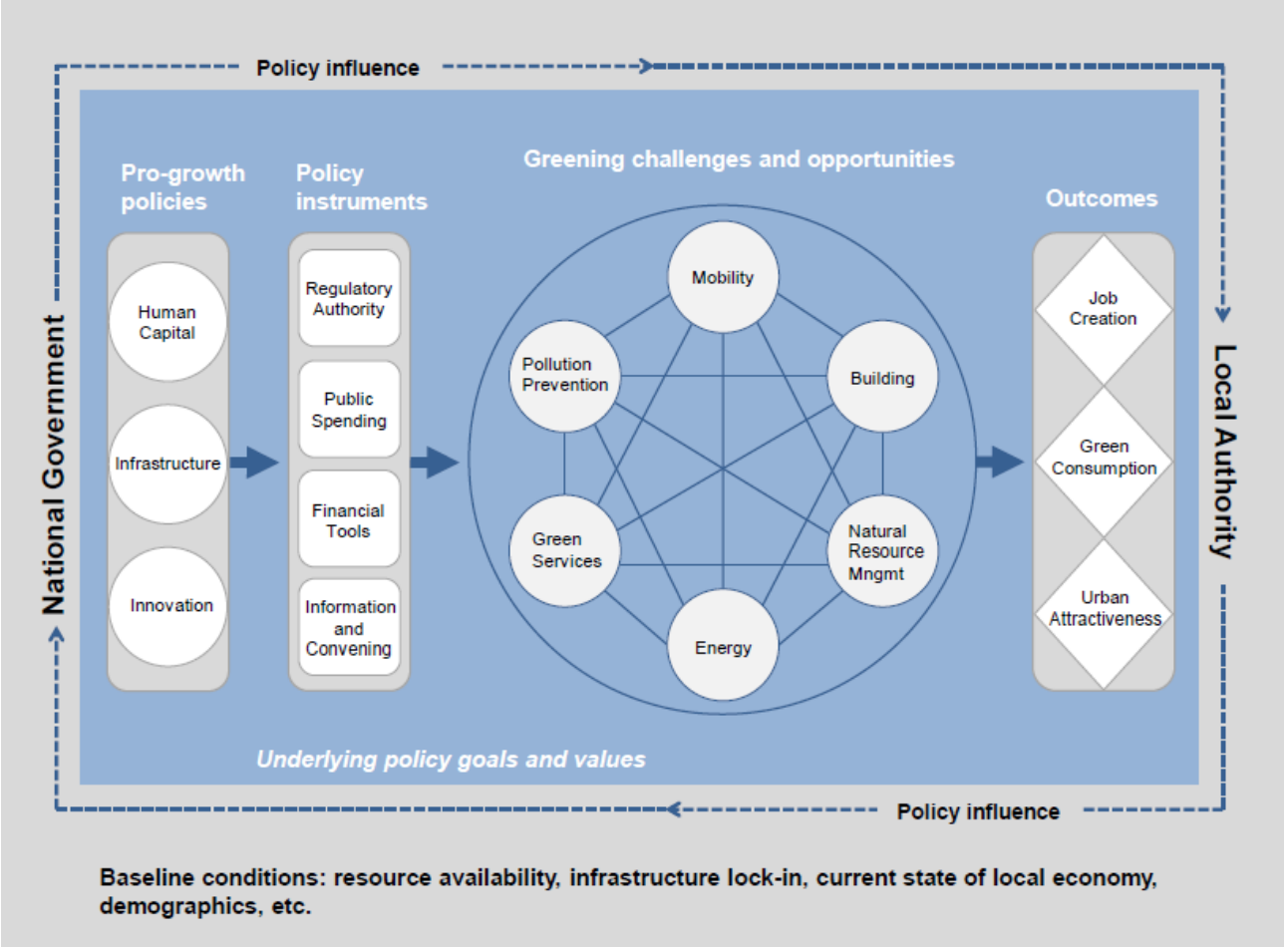
This paper proposes the analytical framework that will be used to assess policies for urban green growth in fast-growing cities of dynamic Asia, in particular for the city case studies. An analytical framework for urban green growth policies was developed for OECD cities in *Cities and Green Growth: A Conceptual Framework* (Hammer et al., 2011). It addressed needs and challenges in these cities (Figure 2). To develop a policy model for urban green growth in the cities of dynamic Asia, this paper identifies factors and sectors that require special attention. The three main elements are:

- policy strategies for green growth in fast-growing Asian cities, drawing from the urban policy contexts in Asia, with consideration of similarities to and differences from OECD cities in terms of local conditions (Section 2);

- opportunities for green growth in Asian cities (Section 3);

- enabling strategies for implementing urban green growth (Section 4).

**Figure 2. The conceptual framework for urban green growth**




*Source*: Hammer, S., L. Kamal-Chaoui, A. Robert and M. Plouin (2011a), "Cities and Green Growth: A Conceptual Framework", *OECD Regional Development Working Papers*, OECD Publishing, Paris.

# 2. THE URBAN POLICY CONTEXT AND KEY POLICY STRATEGIES FOR URBAN GREEN GROWTH

The urban policy context of cities of dynamic Asia may differ in certain ways from that of OECD cities, particularly in terms of social, economic and environmental baseline conditions. It is therefore important to look closely at these trends and to understand how they differ from OECD area trends. Policies for urban green growth in Asian cities should be tailored to fit these different circumstances.

This section will draw on comparisons between cities located in OECD member countries and cities in dynamic Asia to identify policy strategies for urban green growth that address the urban policy context of dynamic Asia. These policy strategies should be at the heart of the medium- and long-term plans and visions adopted by cities in dynamic Asia in order to implement urban green growth policies and projects (discussed in the following section). It may also offer OECD cities an opportunity to learn from the circumstances of Asian cities, notably with regard to rapid urbanisation, dynamic economic growth, and adaptation to climate change in highly vulnerable environments.

The discussion will be enriched by the experience of Singapore and Hong Kong (China), developed Asian cities that are not part of the OECD area. Their level of development and their similarities in terms of geographical location, local conditions and policy issues can usefully inform policy making in other fast-growing Asian cities. The discussion may also be informative for international donors that currently support local level efforts to promote green growth in developing and emerging countries.

## 2.1. Urbanisation and economic growth trends in Asian cities

### *Unprecedented speed of urbanisation*

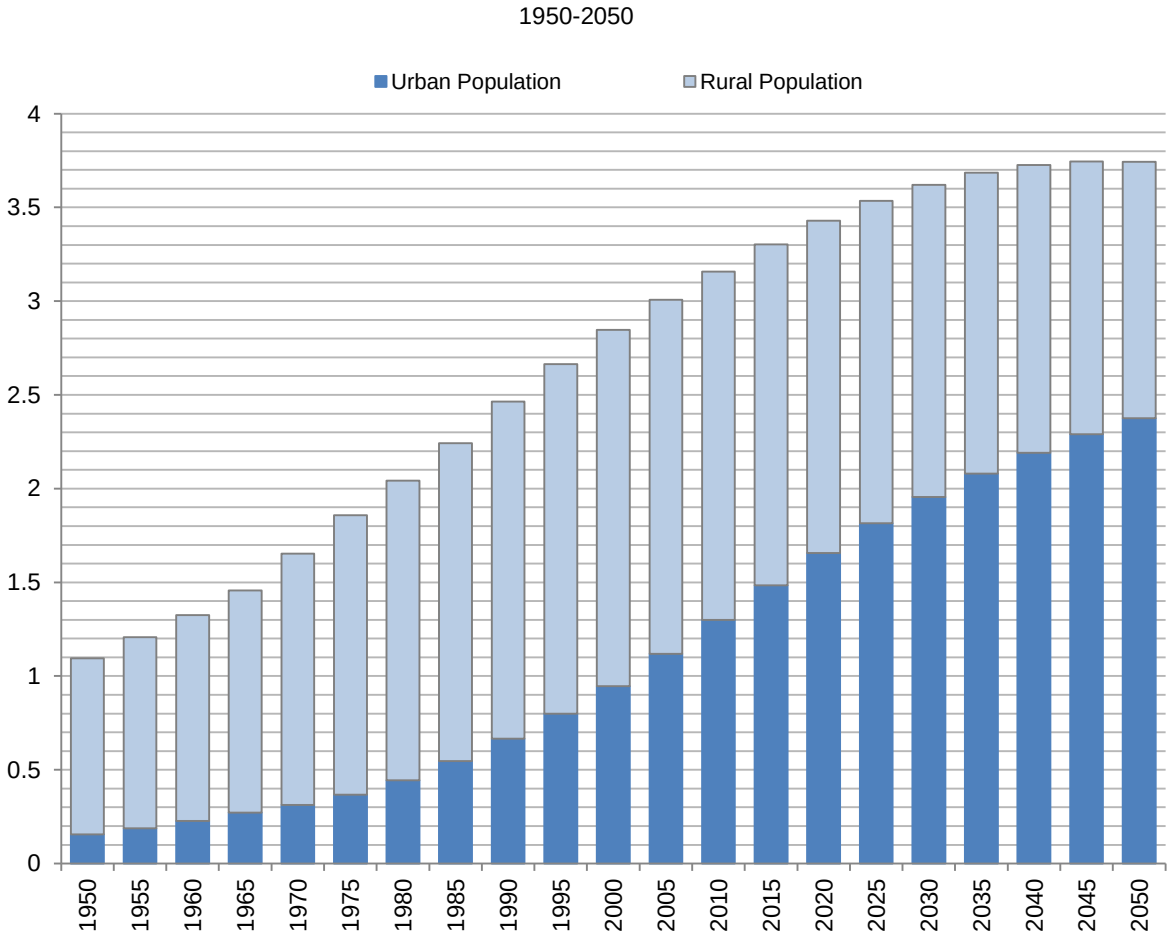
Over the century following the Industrial Revolution the leading cities of England typically grew to 15 to 20 times their initial size. Shenzhen, China, grew to more than 29 times its size in 1983 in just over a quarter of a century. Shenzhen is an extreme example but not an isolated one: Asian urbanisation overall is taking place faster and on a larger scale than anything seen elsewhere in the world. The urban population of the ASEAN ten countries, India and China is projected to expand rapidly over the next 35 years, adding more than 25 million urban dwellers annually (Figure 3).

This rapid urbanisation is observed in cities of all sizes. Mega-cities (over 10 million inhabitants) are growing. UN Population projects that Asia will have 22 of these mega-cities out of 37 worldwide and that they will have more than 200 million inhabitants in 2020, against 160 million in 2010. The population of Metropolitan Manila (National Capital Region) increased from 9.4 million to 11.7 million between 1995 and 2010, and is expected to increase to 16.3 million between 2010 and 2025. Likewise, the population of Delhi, India, rose from 12.4 million to 21.9 million between 1995 and 2010 and is expected to reach 32.9 million by 2025 (UN DESA, 2012a). Small and medium-sized cities are growing even faster. For example, the population of Johor Bahru, Malaysia, increased by 6.3% a year between 1995 and 2010, from 516 000 to 1 million inhabitants and is expected to increase by 3.8% a year to 2025, from 1 million to 1.6 million inhabitants (UN DESA, 2012a). Until 2020 cities with fewer than 500 000 inhabitants are expected to have around two thirds of the ten ASEAN countries' urban population, a share similar to that of Western Europe (around 70%) but different from that of North America (around 30%) (Figure 4). In Indonesia and the Philippines, 75% and 60% of the population, respectively, will live in cities with fewer

than 500 000 people in 2020 (UN DESA, 2012a). In Asia, urbanisation is a phenomenon in cities of all sizes; it is not concentrated in just a few.

More striking is the fact is that urbanisation in Asia still has a long way to go: most countries were still at low levels of urbanisation in 2012: 32% in India, 52% in China and 51% in Indonesia. In Japan and Korea, levels of urbanisation were 92% and 83%, respectively (World Bank, World Development Indicators Database). With more than 700 million workers across Asia, agriculture is the economic sector with the largest share (42.8%) of the total employed labour force in the region and is the top employer in most Asian countries (ADB, 2013a). In the vast majority of OECD countries, agriculture does not represent even 5% of the total employed labour force (OECD, 2010b).

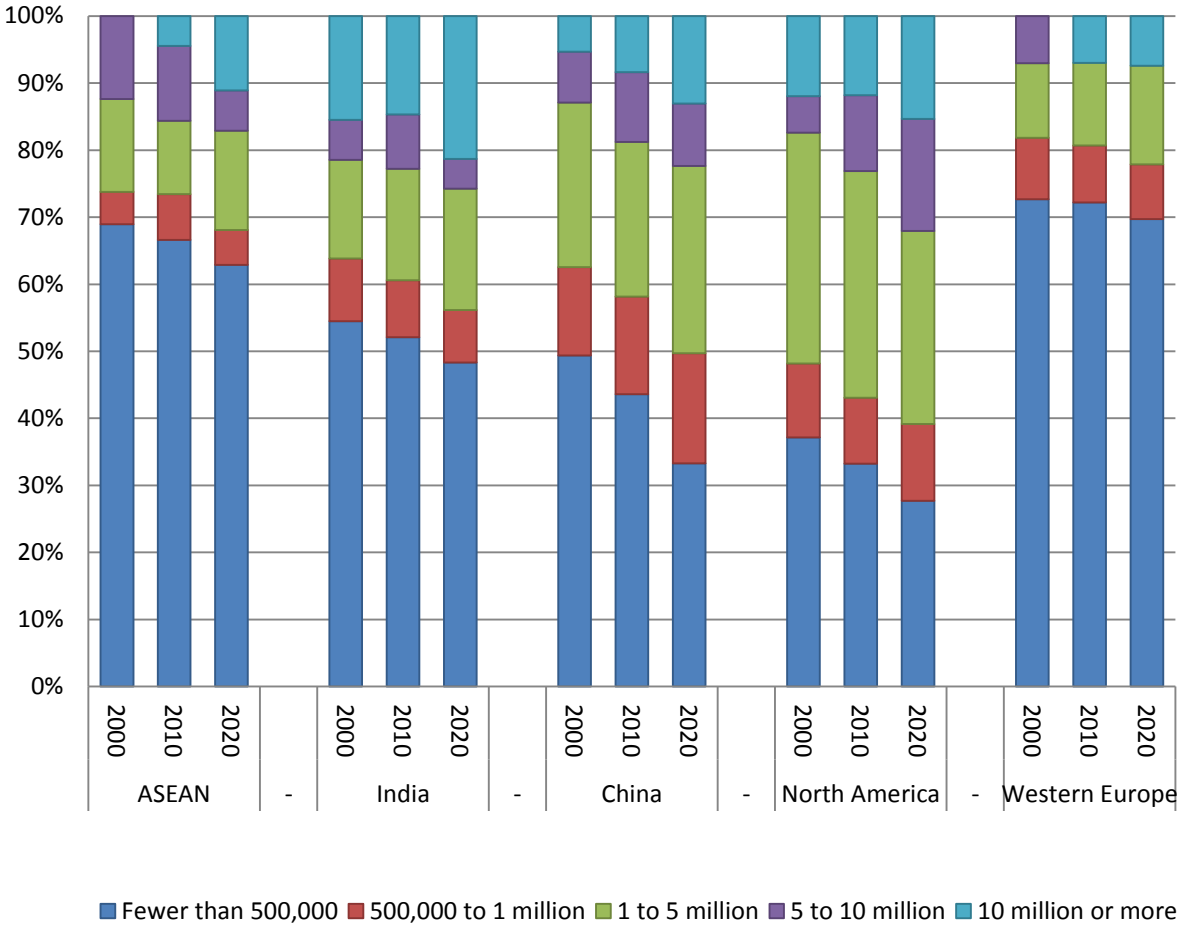
**Figure 3. Urban versus rural population growth in the ASEAN region, China and India (aggregated) (billions)**




*Source*: OECD calculations based on data provided in UN DESA (2012a), World Urbanisation Prospects, the 2011 Revision, New York.

**Figure 4. Shares of cities by size and selected regions and countries**

2000-20




*Source*: OECD calculations based on data provided in UN DESA (2011a), World Urbanisation Prospects, the 2010 Revision, New York City; and UN DESA (2012b), World Urbanisation Prospects, the 2011 Revision, New York.

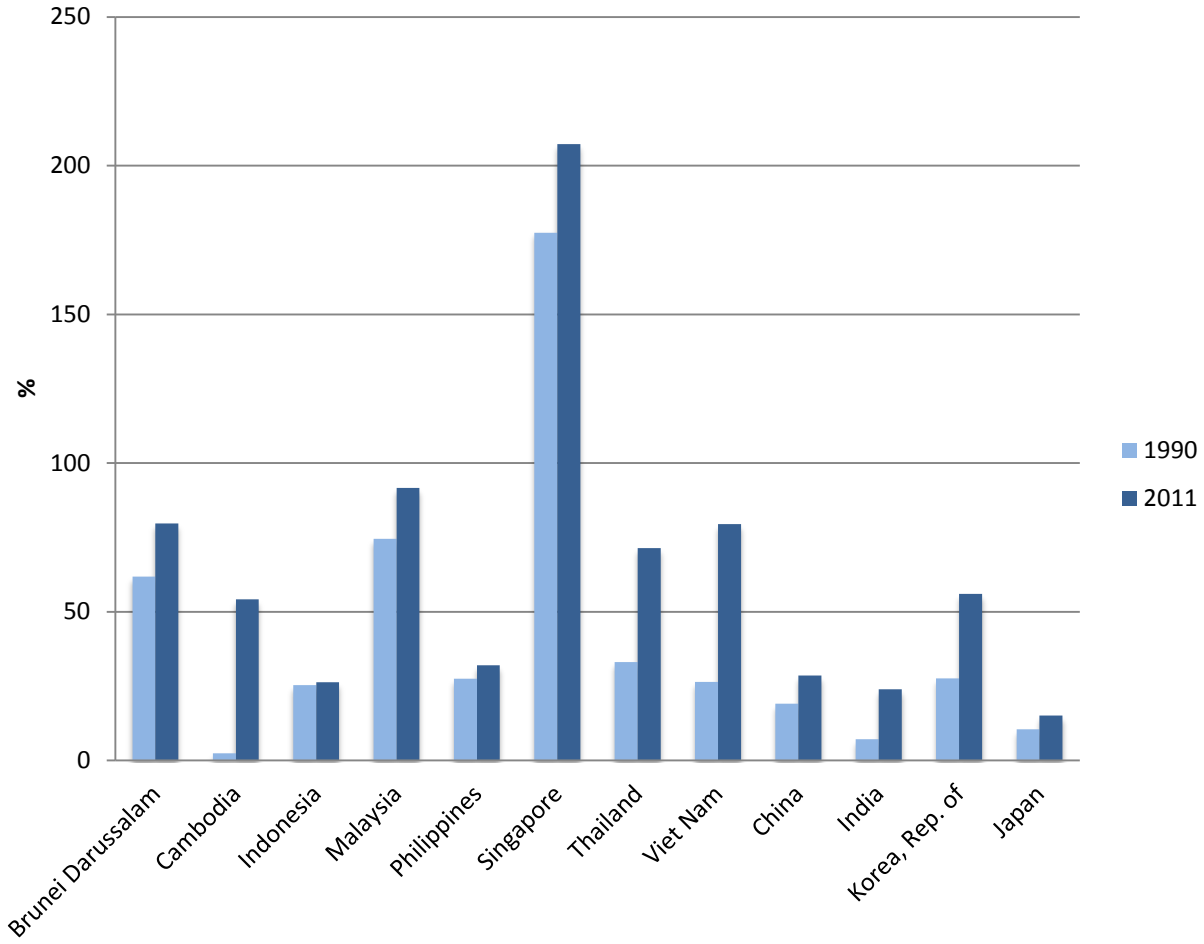
### *Economic growth and urbanisation*

Asia's rapid urbanisation has taken place in a context of overall strong economic growth, in spite of the global financial crisis and the Asian crisis of the 1990s. In most Asian countries, gross domestic product (GDP) per capita has risen much faster than the world average over the last 20 years (Table 1). Urban areas account for a large share of countries' GDP. For instance, the GDP of the Pearl River Delta economic zone grew at an annual rate of 15.6% between 1979 and 2008, against a rate of 9.77% for China as a whole, and accounted for 9.6% of China's GDP in 2008, against 2.8% in 1979 (He et al., 2011). It had 4.2% of China's total population in 2012 (Hong Kong Trade Development Council website). In the OECD area, 90 large OECD metropolitan areas account for 50% of OECD economic activity (OECD Regional Database). In many cases growth in dynamic Asia is driven by manufacturing industry and foreign direct investment (FDI). Most countries have become increasingly export-oriented, a trend that has been particularly strong in the ASEAN region, and suggests the role that international trade could play to promote green growth in this region of the world (Figure 5). In the medium term, however, growth in many

of these countries will increasingly be driven by domestic demand as a result of the rise of the middle class. The global financial crisis demonstrated the risk of continuing to rely largely on export-oriented growth strategies (OECD, 2013b).

**Figure 5. Contribution of exports to GDP of selected Asian countries**

1990 and 2011




*Note:* Data on Lao PDR and Myanmar are not available.

*Source*: ADB (2013b), Key Indicators for Asia and the Pacific, "Special Chapter: Asia's Economic Transformation; Where to, How, and How Fast?" 44th Edition, Mandaluyong City, Philippines.

The two drivers of Asian development – urbanisation and economic growth – are interrelated. This is due in part to a shift in the sectorial composition of fast-growing Asian economies towards more typically urban sectors: manufacturing and modern services are far more productive than agriculture, particularly traditional peasant agriculture. In addition, there is a large body of evidence on the economic benefits of agglomeration; even when controlling for factors such as the skill composition of the workforce or the sectorial structure of production, people tend to be more productive in cities and the productivity benefits of agglomeration tend to increase with city size (Cheshire, 2012; Puga, 2010; Alcacer and Chung, 2009; Rosenthal and Strange, 2003).

### *Vulnerable conditions for long-term economic growth*

In OECD countries over the long run, economic growth in urban areas is chiefly driven by factors such as human capital, physical capital (e.g. infrastructure) and innovation (Box 2). While economic growth in Asia has generally been led by economic restructuring (mainly industrialisation, and, in the most advanced cities, expansion of the services sector) and agglomeration economies, many Asian cities face challenges for sustaining long-term economic growth.

Many Asian cities are characterised by rising income disparities and high levels of poverty in the urban population (UN HABITAT, 2010). This is apparent from the existence and growth of slums and informal settlements in and around major cities, which sometimes reach considerable sizes. Despite a reduction in extreme poverty over the past two decades, about 30% of Asia's urban population lived in slums in 2010 and the total number of slum dwellers is on the rise, which reflects the fact that the number of the poor is decreasing in rural areas only (UN HABITAT, 2010, 2012a). In 2010, Asia had 505.5 million slum dwellers, over half of the world's slum population. There is some diversity in the evolution of the slum population over time in ASEAN countries (Figure 6). Slum dwellers tend to have low incomes, and they are poorly integrated socially and highly vulnerable to natural hazards and local environmental degradation. Their typically low levels of education limit their job opportunities. This is also an obstacle for economic growth, especially inclusive economic growth, and reinforces the "urban divide" between rich and poor. Economic growth in dynamic Asia has also fuelled other kinds of inequality, notably in terms of the urban-rural average income gap, which has increased since 1978 and is now more than 3 to 1 in China (Milanovic, 2011).

Inadequate urban infrastructure – water, power supply, transport and waste management – is another potential obstacle to growth in Asian cities. In particular, poor transport infrastructure impedes labour mobility, makes for inefficient logistics, and undermines connections between production centres and markets. It also influences the location of firms and the purchase of consumer durables (World Bank, 2012). Inadequate power supply, water and waste management infrastructures also threaten long-term economic growth and urban attractiveness. While it is essential to improve existing infrastructures in urban areas, rapid urbanisation also requires massive investment in new infrastructures. Urban infrastructure can have lock-in effects on urban form and affect cities' long-term economic and environmental performance (e.g. levels of local air pollution and GHG emissions). Yet urban infrastructure presents great potential for co-benefits, given the services that need to be built and the positive environmental externalities that the "right" infrastructures can generate (World Bank, 2012). Meeting the infrastructure challenge is a high priority in Asian cities.

A good example of infrastructure lock-in relates to automobile dependency and urban sprawl. While the conventional image of Asian cities is one of very high density, motorisation and urban sprawl – the uncontrolled expansion of urban development characterised by low density, segregated land use and insufficient infrastructure – are increasingly features of Asian urban development (Jenks et al., 2008). This issue needs to be tackled. The urban form of many Asian cities locks them into automobile-dependency, creating huge traffic flows and increased congestion, air pollution and $CO_2$ emissions. Asia is projected to account for a substantial share of the growth of the world's passenger vehicle fleet between 2010 and 2050, while the OECD area's share will decrease dramatically (ADB, 2012). While Asia had only 9% of the global vehicle fleet in 1980, it is expected to have 46% in 2030 (EMBARQ, 2013). Although the number of vehicles per 1 000 population in India and China will remain much lower than in OECD countries, the absolute number of vehicles in both countries will exceed those of OECD regions as a whole (Figure 7). The rapid increase in motorcycle traffic is also a challenge in Asian cities. Motorcycles provide more mobility at lower cost, but they, too, favour the dispersion of activities. The shift from motorcycles to cars, which is well advanced in many places, only makes things worse: a car takes four times more space than a motorcycle.

The unprecedented speed of urbanisation in fast-growing Asian cities and insufficient public financial resources create severe housing problems. More than 20 000 new housing units are needed every day to meet basic needs for shelter. Much of the urban population suffers from the lack of the safe, durable and decent housing that is necessary for participation in urban life. Slum dwellers have no choice but to settle in vulnerable sites where they suffer from poor access to basic urban infrastructures and services (UN HABITAT, 2010). These housing issues undermine Asian cities' ability to undertake green growth policies such as poverty reduction, efficient use of natural resources, and protection of the local and global environment.

As many Asian economies are still relatively immature, they do not have the resources needed to foster innovation. This limits their ability to seek out and exploit green growth opportunities (OECD, 2013c). Low levels of investment in education and in R&D mean that it is difficult to attract and retain talent and to develop local capacities sufficiently. However, the innovation potential of Asian economies is growing and must be further developed, especially in cities where the potential is greatest. The world's 40 largest mega-regions account for 85% of the world's technological and scientific innovation (UN HABITAT, 2010), and urban green growth can offer huge opportunities in dynamic Asia. Technology transfer can help drive innovation, but tariff and non-tariff trade barriers can make this difficult and costly. Asian cities can get inspiration from green growth clusters in Kitakyushu (Kitakyushu Eco-Town), Paris (Advancity and Moveo) and Chicago (Milwaukee Water Council), areas where many higher education and research institutions are working with large companies, small and medium enterprises (SMEs) and local governments. They conduct R&D activities and produce substantial numbers of patents, notably in recycling, mobility, habitat or water (OECD, 2013a).

Growth in many emerging Asian economies is still largely driven by manufacturing, and the apparel sector has been the most important industry in Cambodia, Lao PDR, Malaysia and Viet Nam over the past decades (OECD, 2013b). Although fast-growing Asian cities are progressively shifting towards the provision of services, they still lack diversity; in the OECD area, the internal economic diversity and specialisation of metro-regions raise their efficiency and competitiveness. The economic growth of Stockholm, Sweden, for instance, is supported by a wide variety of industry clusters in information and communication technology (ICT), life sciences, financial services, automation, cleantech and logistics (OECD, 2013d).

Asian countries and cities differ substantially with respect to such challenges, partly owing to differences in income levels: middle-income countries such as Malaysia face challenges that differ from those of low-income countries such as Cambodia. Similarly, the problems of a country's capital city may differ from those of a second-tier or third-tier city. For example, when addressing issues such as traffic congestion and air pollution, Metro Manila may see the scale of the problem and the complex governance structure as the main challenges, whereas provincial cities such as Davao or Cebu may consider financing the major obstacle. This clearly indicates that context matters and that green growth issues will vary depending on the local development context, the level of development, and institutional capacity and form, among others.

**Box 2. Factors driving economic growth in urban areas**

It is widely recognised that economic growth in urban areas is driven chiefly by human capital, physical capital (e.g. infrastructure) and innovation, as well as by spatial phenomena such as economies of agglomeration and proximity to markets (OECD, 2009a; OECD, 2012a):

- **Human capital** has the greatest influence on regional growth in all types of regions. It can be measured in terms of the presence of highly skilled workers and the absence of low-skilled workers. Significantly, much of the evidence suggests that large concentrations of people with no, or very limited, skills are an important drag on the economy. In many places, greater attention to the lower-to-middle end of the skills spectrum may pay greater dividends than additional investments in tertiary education.

- **Investment in infrastructure** can lead to higher growth provided that there are also improvements in education and innovation. However, the economic impact of infrastructure investment is greatest at lower levels of provision and appears to reach a point of diminishing returns. Beyond a certain point, the impact of additional infrastructure investment on growth can be limited.

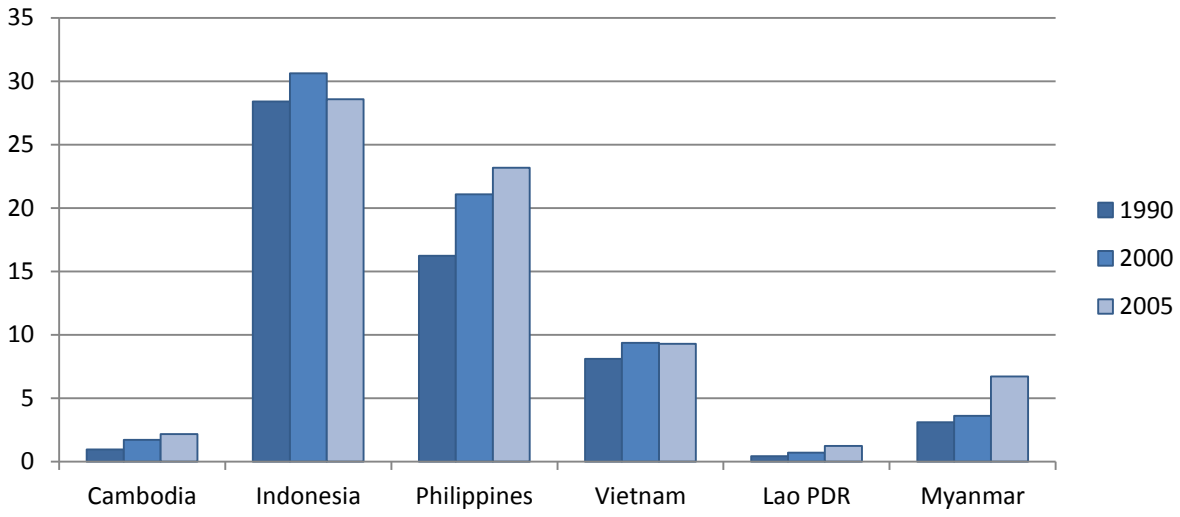
- **Innovation and knowledge creation** tend to matter most in the more advanced urban regions. They are therefore particularly important for metropolitan regions. In these regions, evidence of investment in knowledge creation (patents and patent citations, R&D spending, etc.) and the presence of relatively high shares of employment in knowledge-intensive and high-technology sectors are important.

These are all factors that can be shaped by policy – unlike geographical location or natural endowments. The three drivers of growth – skills development, infrastructure policies and innovation – are also central to strategies for "greening" urban economies.

*Source*: OECD (2013a), *Green Growth and Cities*, OECD Publishing, Paris.

**Figure 6. Urban slum population in selected ASEAN countries (millions)**

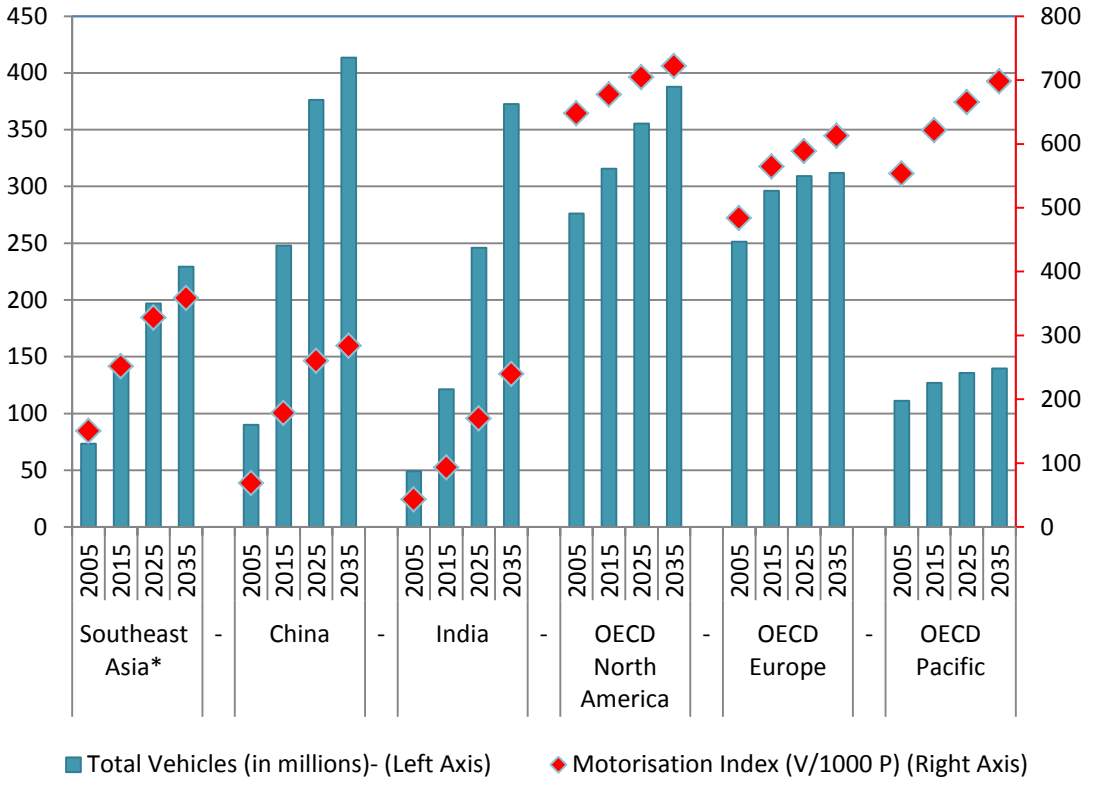
1990-2005




*Note:* Data for Thailand, Malaysia and Brunei were not available for these years.

*Source:* UN HABITAT (2010), *The State of Asian Cities 2010/11*, Fukuoka, Japan.

**Figure 7. Total vehicles and motorisation index in selected regions of the world, 2005-35**




*Note:* Southeast Asia here refers to Indonesia, Viet Nam, Philippines and Thailand.

Source: UN ESCAP, KOICA (2012), Low Carbon Green Growth Roadmap for Asia and the Pacific. "Urban Transport: policy recommendations for the development of eco-efficient infrastructures", Bangkok, Thailand.

## 2.2. Environmental trends in Asian cities

Asia's dynamic growth has negatively affected the environment. Urban dwellers in Asia, as elsewhere, increasingly face environmental problems ranging from severe and frequent natural disasters to premature death from exposure to particulate matter as a result of local air pollution.

### *Local environmental degradation*

Local air pollution is a common form of environmental degradation in Asian cities and results in health issues that must be addressed to pursue green growth. It is notably caused by heavy traffic, industrialisation, the use of coal as a fuel source in some cities, and illegal forest fires to clear land. These air pollutants are: particulate matter ($PM_{2.5}$ and $PM_{10}$), ozone ($O_3$), sulphur dioxide ($SO_2$), nitrogen oxides ($NO_x$), carbon monoxide (CO) and lead (Pb). Many Asian countries still do not have emissions standards or have lower emission standards than the World Health Organization (WHO) and the US Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS), and data are not available for some pollutants, notably ozone and $PM_{2.5}$ (Clean Air Asia, 2010). Even though levels of $SO_2$ and $NO_2$ have decreased significantly over the past two decades, levels of $PM_{10}$, a highly noxious pollutant, remain above the WHO annual Air Quality Guideline (AQG) (20 µg/m$^3$) in many Asian cities (Figure 8). In 2008,

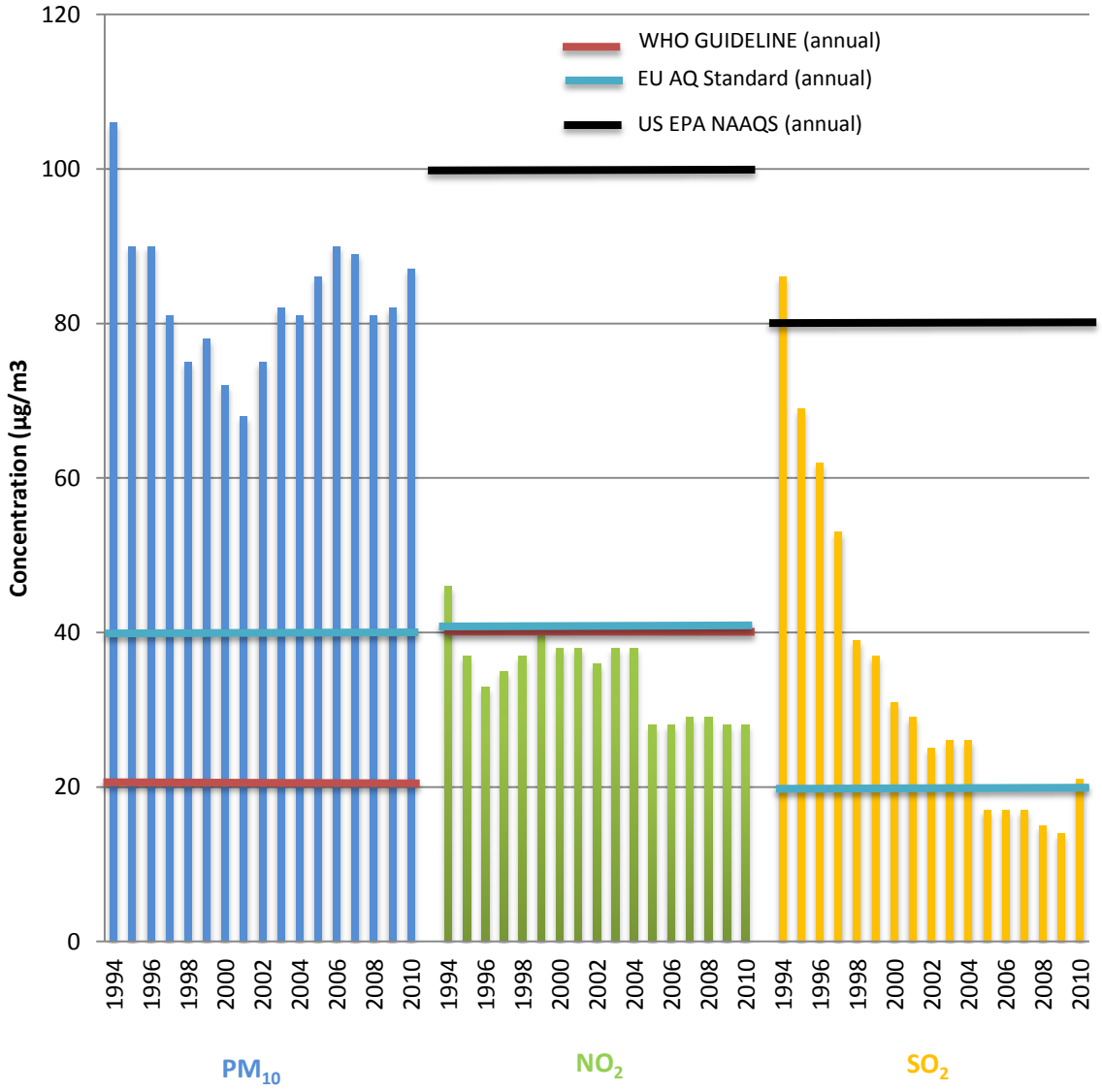
the annual average $PM_{10}$ concentration in 230 cities in Asia (89.5 µg/m$^3$) was 4.5 times the WHO annual AQG (Clean Air Asia, 2010). In comparison, levels of $PM_{10}$ concentration in Chiyoda-ku (Tokyo, Japan) and Hong Kong (China) were 22 and 45 µg/m$^3$, respectively, in 2010 (Figure 9).

Urban air pollution affects well-being. Reduction of particulate matter, particularly $PM_{2.5}$, should have especially high priority because of its severe consequences for public health (Figure 10). It contains microscopic solid or liquid droplets that are small enough to go deep into the lungs and blood and cause serious respiratory and cardiovascular problems (United States Environmental Protection Agency, 2009). Likewise, exposure to ozone can lead to a variety of respiratory troubles – chest pain, coughing, throat irritation and congestion – and can aggravate others – asthma and bronchitis – and alter lung function and tissue. Similar observations have been made for sulphur dioxide and nitrogen oxides (United States Environmental Protection Agency, 2009; Kampa and Castanas, 2008). Carbon monoxide affects the cardiovascular system (e.g. reduction of the capacity of blood to transfer oxygen to other vital organs); lead can affect the nervous system (e.g. cancer, memory disturbances, anger, fatigue). Developing foeti, children, the elderly and people already suffering from similar health issues are particularly vulnerable (Kampa and Castanas, 2008).

Fast-growing Asian cities also suffer from other kinds of local environmental degradation. The levels of pollution in rivers, groundwater, coastlines and lakes have progressively risen, creating serious public health issues. Rivers in Asia contain up to three times the world average of bacteria deriving from human waste (Evans et al., 2012) owing to poor solid waste management and wastewater treatment. Many Asian cities lack large-scale wastewater treatment facilities. Basic urban services, such as water and sanitation, solid waste collection and disposal, and transport, remain a challenge for most Asian countries, especially in slums and informal settlements (UN HABITAT, 2012b). For example, 60% of solid waste is openly dumped in Bangkok. Sewerage coverage is also often low in Asian cities. In South Asia, despite an increasing number of connections, construction can hardly keep pace with rapid urbanisation (UN HABITAT, 2010). In Jakarta, Indonesia, only 2.8% of the total urban population is served by sewerage (World Bank, 2011), whereas cities such as Tokyo and Singapore reached full sewerage coverage several decades ago (Otaki et al., 2007).

People living in urban slums are prone to many diseases caused by defective water supply, substandard sanitation, poor waste storage and collection, insalubrity and unhealthy locations (e.g. dumpsites, industrial sites). These conditions have negative consequences in terms of infant mortality. They also affect incomes as health care for the urban poor represents a disproportionate share of spending patterns (UN HABITAT, 2010).

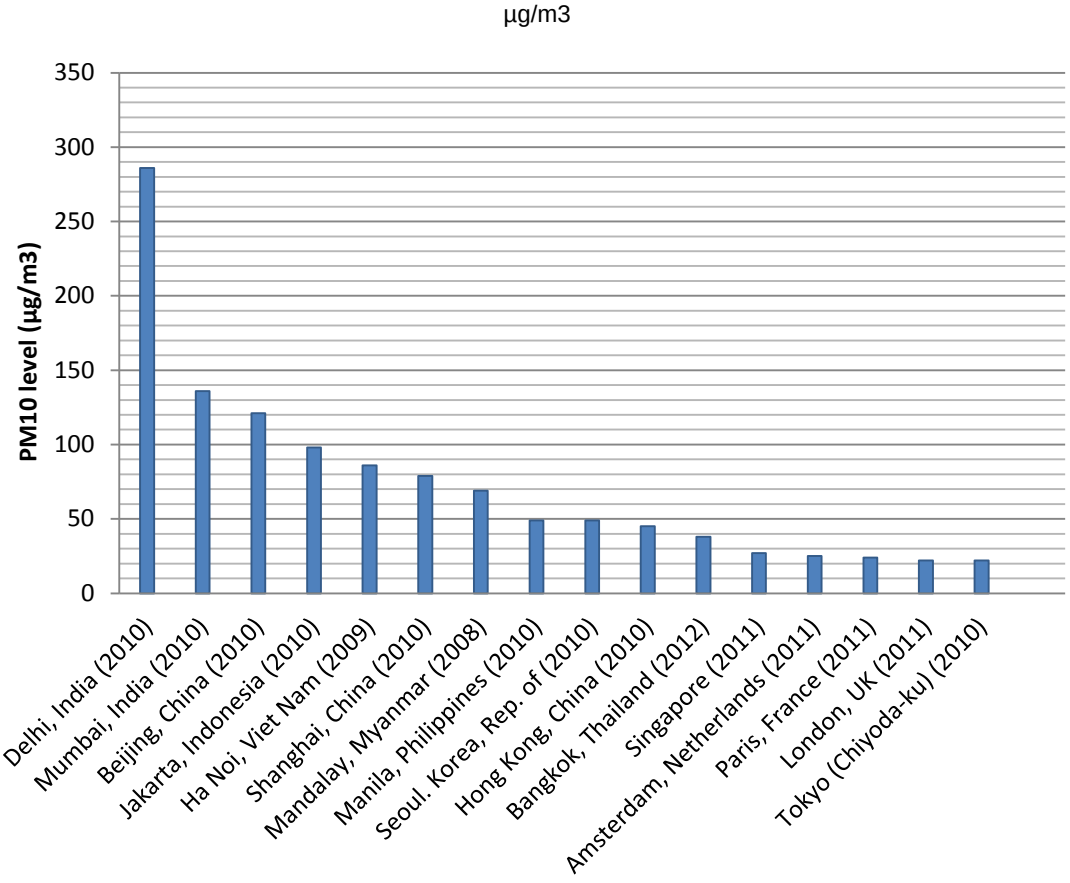
**Figure 8. Annual average ambient air quality in selected Asian cities, 1994-2010**




*Note:* Annual average concentrations for $PM_{10}$, $NO_2$ and $SO_2$ were collected from 243 cities in Asia. Sources of the data include statistical yearbooks, city websites and Clean Air Asia's requests to national and local contacts. The graph is an indication only of long-term trends as cities use different techniques (e.g. in terms of monitoring technology and number of monitoring stations). This complicates a region-wide analysis.

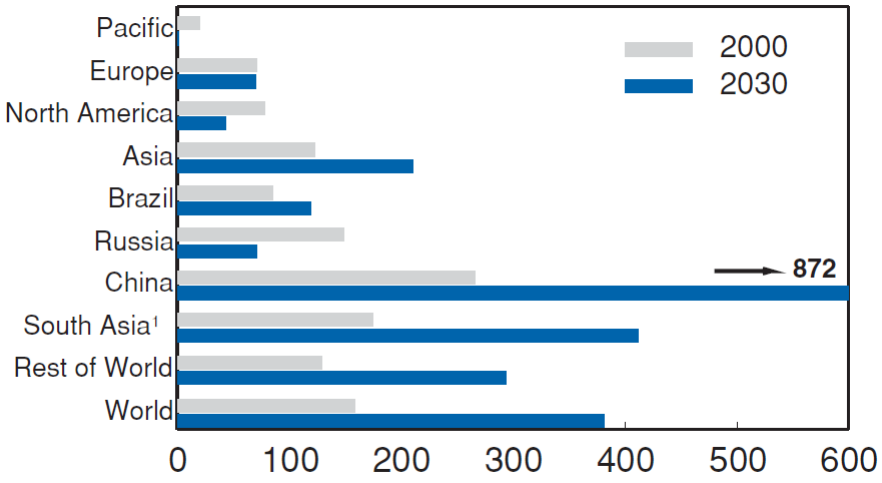
*Source*: Clean Air Asia (2010), "Air Quality in Asia, Status and Trends, 2013 Update", Pasig City, Philippines.

**Figure 9. Annual mean PM10 level in selected Asian and OECD cities, 2008-12**




*Source*: World Health Organisation (WHO) Ambient (Outdoor) Air Pollution Database by Country and City (2014), http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/

**Figure 10. Estimated premature deaths from $PM_{10}$ air pollution per million inhabitants**




*Source*: OECD (2011a), *Towards Green Growth*, OECD Publishing, Paris.

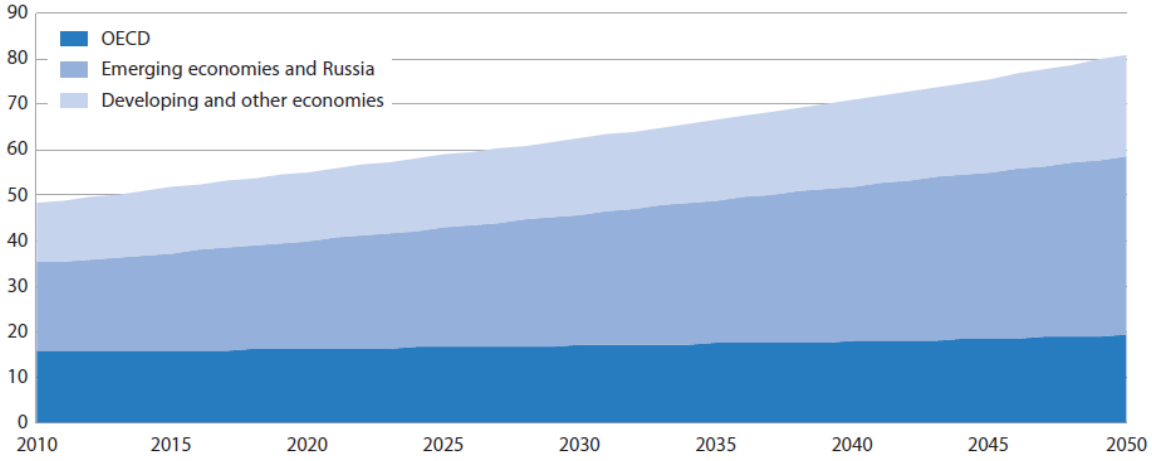
### *Greenhouse gas emissions*

In the rapidly developing countries of Asia, economic growth and urbanisation have been accompanied by a rapid increase in GHG emissions (Stern, 2008; Cole, 2007). $CO_2$ emissions from fuel combustion grew by 172.5% in non-OECD Asia (China excluded) between 1990 and 2011, while GDP grew by 201%. In comparison, $CO_2$ emissions from fuel combustion grew by 10.7% in the OECD area during this period, while GDP grew by 54.2% (IEA, 2013). Asian countries' share of global $CO_2$ emissions increased from 8.9% in 1973 to 35.1% in 2010 (IEA, 2012a). While current non-OECD per capita GHG emissions are still quite low, they are projected to increase significantly in emerging economies and Russia by 2050 (Figure 11). $CO_2$ emissions per capita in Asian mega-cities such as Shanghai, Beijing and Bangkok are higher than in many OECD cities (Figure 12). This reflects in large measure their different economic specialisations (industry vs. services) but is also a consequence of energy, infrastructure, transport and other policies. For instance, Chinese cities have a relatively high share of emissions from industry, while the transport sector is the major source in Bangkok, as in many North American cities.

Tackling GHG emissions also presents benefits for local air pollution, so these issues should be addressed together to reduce the net cost of action and to strengthen incentives to participate in climate change mitigation. Reductions in GHG emissions induce large reductions in emissions of local air pollutants, with potentially significant positive impacts on human health. For instance, in a scenario in which GHG emissions are cut by 50% relative to 2005 levels in 2050, the number of premature deaths caused by air pollution could be lowered by 20% to 40% in 2050 depending on the regions concerned relative to a business as usual scenario (Bollen et al., 2009).

**Figure 11. Trends in greenhouse gas emissions, 2010-50**

Gigatonnes of carbon dioxide equivalent (GtCO2e)



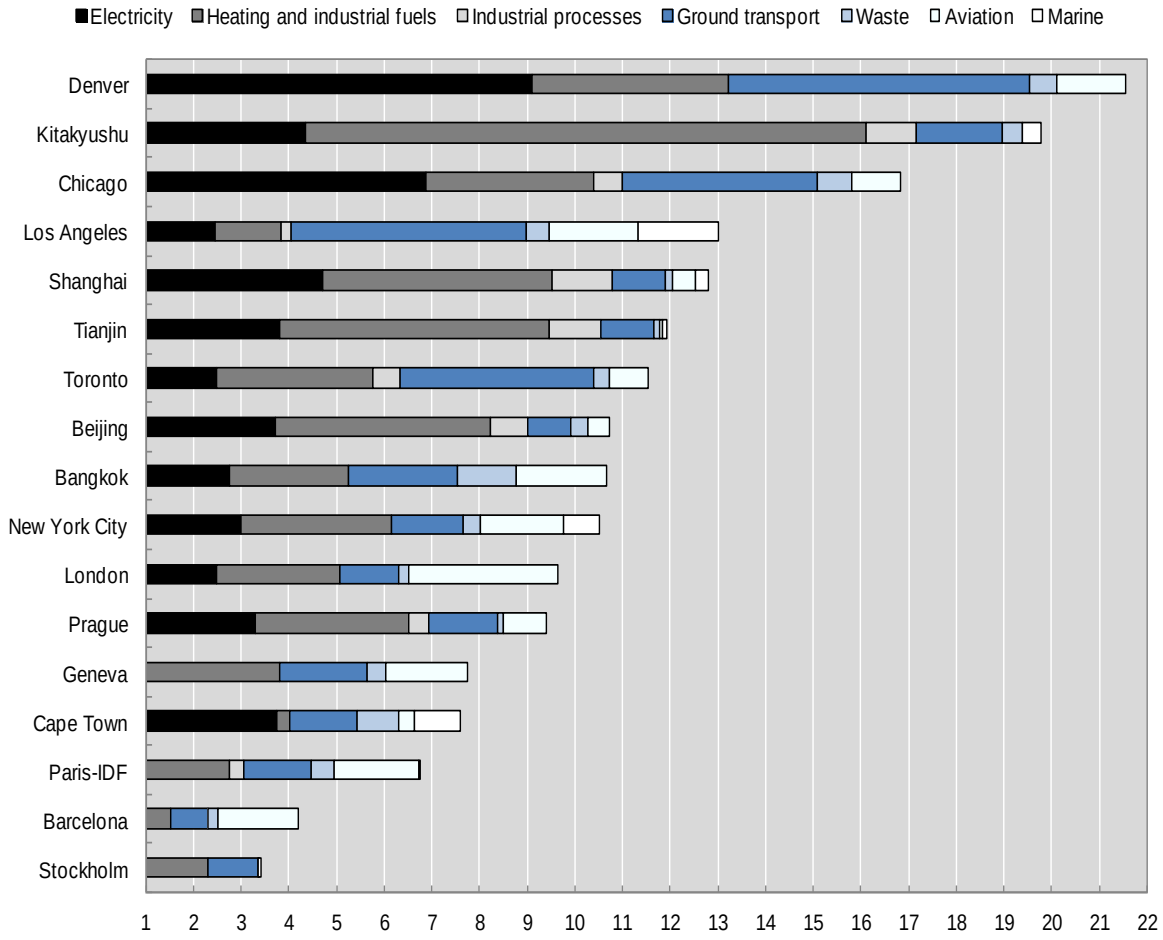

Notes:

1. Carbon dioxide equivalent is the amount of $CO_2$ emissions that would cause the same time-integrated radiative forcing, over a given time horizon, as an emitted amount of a long-lived greenhouse gas or a mixture of greenhouse gases. The equivalent $CO_2$ emission is obtained by multiplying the emission of a greenhouse gas by its global warming potential for the given time horizon. For mixed greenhouse gases it is obtained by summing the equivalent $CO_2$ emissions of each gas. Equivalent $CO_2$ emission is a standard and useful metric for comparing emissions of different greenhouse gases but does not imply the same climate change response.

2. OECD includes Mexico and Chile, even though these countries also receive official development assistance (ODA). Emerging economies include Brazil, China, India, Indonesia and South Africa. Developing and other economies include all other countries, regardless of whether they receive ODA.

*Source*: OECD Environmental Outlook Baseline; output from ENV-Linkages.

**Figure 12. $CO_2$ emissions per capita (tonnes) by sector in selected cities**




*Note:* Kitakyushu figures do not contain aviation emissions.

*Source:* Kennedy, C. (2012), calculations (personal communication) adapted by Christopher Kennedy, March 2012, using methodology from Kennedy C. et al. (2009), "Greenhouse Gas Emissions from Global Cities", *Environmental Science and Technology*, Vol. 43, No. 19, American Chemical Society, Washington, DC; City of Kitakyushu (2012), "Background Paper on the City of Kitakyushu – OECD Green Cities Programme", internal document, City of Kitakyushu, Japan.

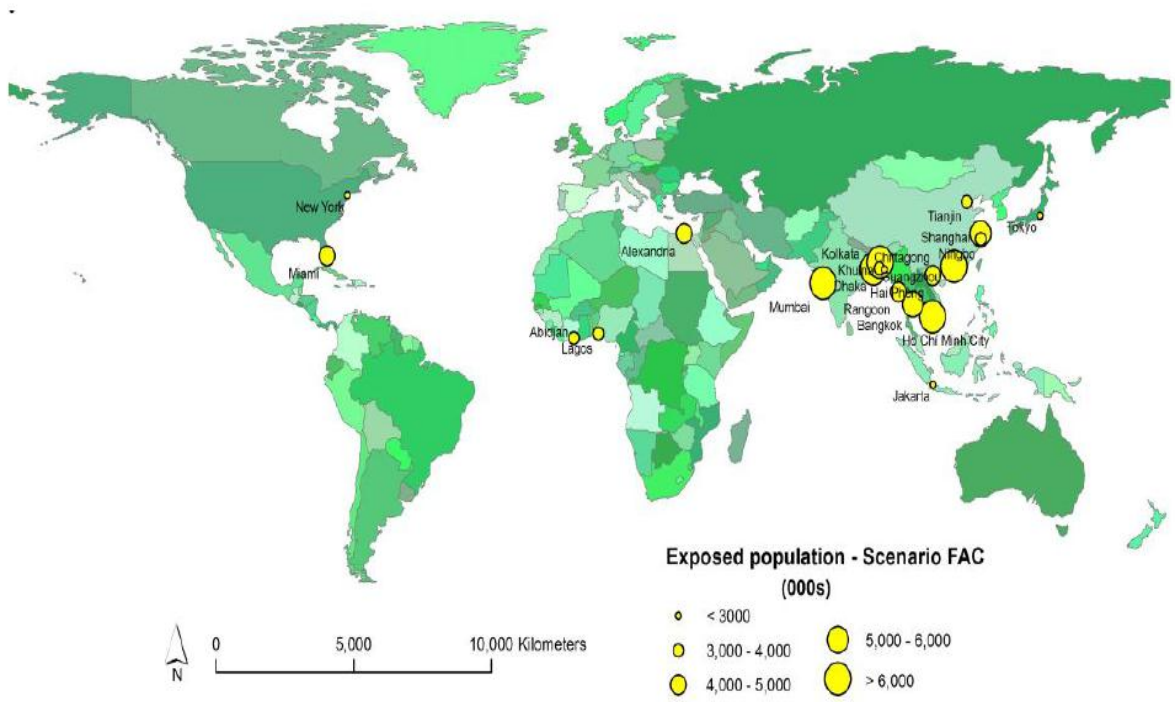
### *Local vulnerability to climate change and natural disasters*

Asian cities are particularly vulnerable to the impact of climate change. Risks of disasters in these cities are higher than in many other parts of the world, mainly owing to tropical storms, earthquakes and floods (Figure 13). In particular, the major urban agglomerations in Asia tend to be in the low-lying land of delta regions. Asia was home to roughly two-thirds of the estimated 360 million people worldwide living in cities located less than 10 metres above sea level in 2000 (McGranahan et al., 2007). Among the top ten countries in which large populations live less than 10 metres above sea level, eight were in Asia in 2000 (Table 2). These are areas exposed to the rising sea levels and frequent storm surges that might be caused by climate change. In addition, inland floods also present significant risks. For instance, the Bangkok Metropolitan Region is at high risk of inland flooding owing to land subsidence resulting from over-pumping of ground water. Ports are also vulnerable to such risks. As Asian cities host some of the world's largest ports, their vulnerability is a source of concern, as disruption of their activities can have disastrous

consequences for local and global economies. The OECD project *Future Flood Losses in Major Coastal Cities* reports that average global flood losses in 2005, estimated at about USD 6 billion a year, could increase to USD 52 billion by 2050 as a result of projected socio-economic change alone (Hallegatte et al., 2013). New Orleans, United States, Guangzhou, China, and Ho Chi Minh City, Viet Nam, are among the world's most vulnerable cities in terms of annual losses compared to their wealth. When socio-economic change, subsidence, a 20 cm rise in sea level (optimistic scenario) and adaptation to flood risk are taken into account, Ho Chi Minh City would suffer from an annual average loss of almost USD 2 billion, or 0.83% of the city's GDP, a 12% increase in losses compared with 2005. The report also emphasises the urgency of adaptation to reduce flood probabilities below current levels in order to avoid a further huge increase in average losses by 2050.

Moreover, owing to limited access to affordable land and housing, slums and informal settlements tend to be located in fragile environmental areas, such as banks of rivers or lakes, steep slopes or low-elevation coastal zones, as shown in Jakarta (Figure 14). These areas are extremely vulnerable to natural disasters such as floods, tropical storms, rises in sea level, earthquakes or tsunamis, which could increase with climate change and could deprive slum dwellers and informal settlers of their assets and drive them into a poverty trap. It is important to identify the vulnerability (and the kind of vulnerability) of Asian cities to these risks in order to assess to what extent they represent an obstacle to urban green growth. Identifying the most exposed urban groups and areas can be a first step in implementing targeted policies.

**Figure 13. Top 20 cities most exposed to floods in terms of population in the 2070s (FAC scenario)**




*Note:* The Future, All Changes (FAC) Scenario takes into account changes that are projected to affect cities' vulnerability to floods: climate risks (sea-level rise and storm enhancement factor), natural and human-induced subsidence and socioeconomic change.

*Source*: Hanson, S. et al. (2011), "A Global Ranking of Port Cities with High Exposure to Climate Extremes", *Climatic Change*, Vol. 104, Issue 1, pp. 89-111.

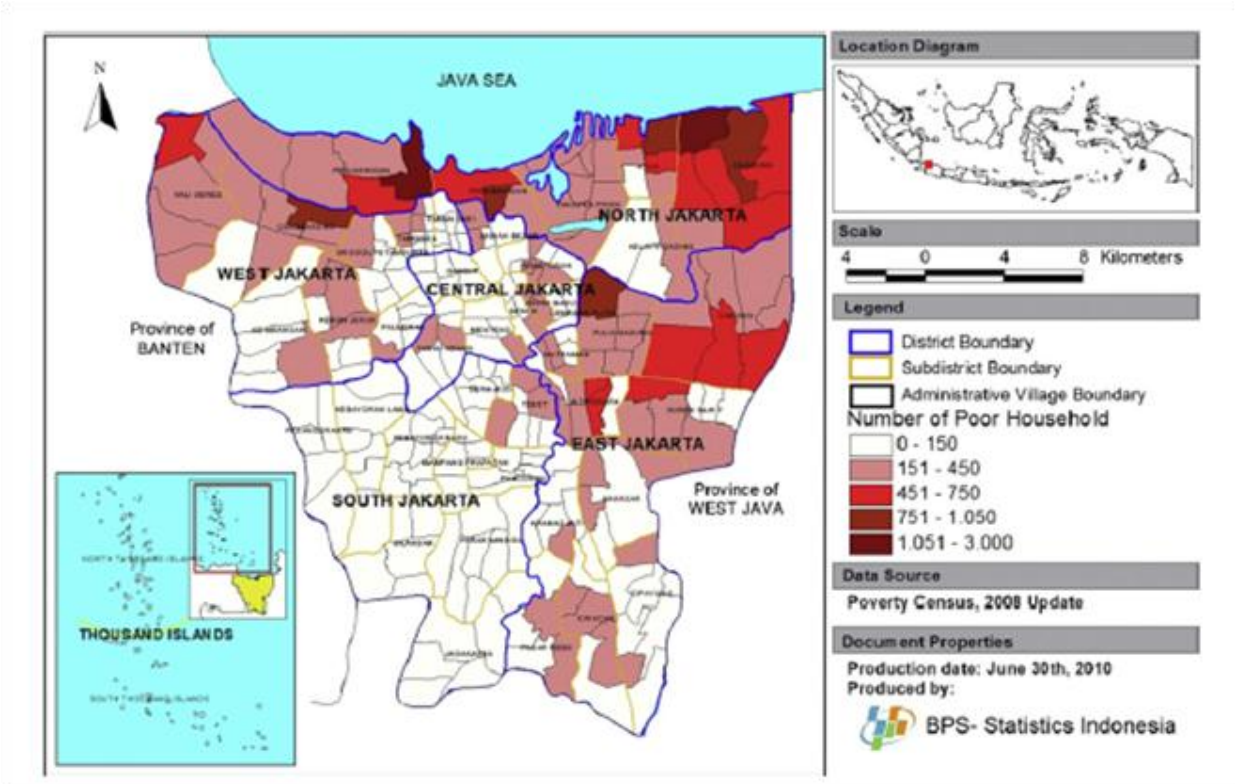
**Table 2. Ten countries with the largest population in low-elevation coastal zones in 2000**

LECZ: low-elevation coastal zones (less than 10 m above sea level)

| Country | Population in LECZ (000) | Share in total population (%) |
|---|---|---|
| China | 143 880 | 11 |
| India | 63 188 | 6 |
| Bangladesh | 62 524 | 46 |
| Viet Nam | 43 051 | 55 |
| Indonesia | 41 610 | 20 |
| Japan | 30 477 | 24 |
| Egypt | 25 655 | 38 |
| United States | 22 859 | 8 |
| Thailand | 16 478 | 26 |
| Philippines | 13 329 | 18 |

*Source*: McGranahan, G. et al (2007), "The rising tide: assessing the risks of climate change and human settlements in low-elevation coastal zones", Environment and Urbanisation, Vol. 19(1): 17–37, International Institute for Environment and Development.

**Figure 14. Location of poor households in Jakarta by sub-district, 2008**




*Source*: Firman, T. et al. (2011), "Potential climate-change related vulnerabilities in Jakarta: Challenges and current status", Habitat International, Vol.35, pp. 372-378.

## 2.3. Key policy strategies for green growth in Asian cities

The baseline economic, social and environmental conditions in fast-growing Asian cities, and their differences and similarities with those of OECD cities, must be the starting point for considering how to approach urban green growth in dynamic Asia. This section defines strategies to be developed in order to adopt the right approaches, taking these conditions into account. Such strategies can serve as guidelines for policy makers in preparing to green their city and make it economically and socially inclusive. This paper proposes five main strategies for green growth in emerging Asian cities: i) promoting urban resilience; ii) addressing poverty and social equity; iii) pursuing long-term economic development goals while achieving short-term benefits; iv) adopting proactive green infrastructure strategies to keep up with the speed of development; and v) aligning environmental actions with economic growth.

### *Promoting urban resilience*

Asian cities are particularly vulnerable to, but not well prepared to cope with, risks related to natural disasters, in particular flooding due to a rise in sea level, socio-economic change, and natural and human-induced subsidence. Such disasters can severely affect urban dwellers, the local environment and long-term economic growth. People living in slums and informal settlements, in particular, should be privileged targets of risk management policies. They often live in hazardous locations such as flood plains, steep hillsides and low-lying coastal areas without proper protection against floods, proper drainage, waste removal and roads. The consequences of a major flood or storm can be devastating in such areas and can slow urban development and the pursuit of social equity considerably. Addressing such risks must be an important component of urban green growth policy making in fast-growing Asian cities. Recognising the complexity of uncertainty associated with climate change predictions, urban climate change resilience (UCCR) is becoming a key concept to consider.

Urban resilience is a pillar of many of the urban green growth areas of opportunity presented below. For instance, while waterfront buildings can reduce the flow of water from heavy rains, efficient and resilient electricity and water infrastructures can markedly improve the capacity to recover from disasters. Upgrading of homes can prevent human loss and the destruction of assets on which many livings depend. Compact urban development and risk-sensitive land-use planning are central components of urban resilience to such disasters and affect several policy sectors. The concept of smart cities is also a potentially useful approach to urban resilience; it encompasses strategies such as investing in social and human capital and modern ICT infrastructure, enhancing the availability and quality of knowledge communication and social infrastructure, and use of and innovation in emerging technologies (e.g. wireless networks) (OECD, 2013e).

In addition, insurance policies are required to enhance the resilience of urban dwellers, especially highly vulnerable slum dwellers. The costs of natural disasters are not only economic but also social, as the urban poor lack the social safety nets that can help them recover. These disasters also have negative impacts on social infrastructures and networks (Bicknell et al., 2010). Setting up schools, health care and social welfare (including provisions for child care and old age care) are measures that local governments can adopt in view of climate change adaptation. They play a central role in protection, disaster preparedness, immediate post-disaster response and rebuilding (Satterthwaite, 2007). Public investments in basic health and education that directly benefit the poor and the disadvantaged are an essential ingredient of inclusive policies in many countries, and green growth paths need to ensure that such equity-enhancing interventions are sustained. Such safety nets could be financed by replacing fossil fuel subsidies, for instance (OECD, World Bank, United Nations, 2012). National governments play a role as they control policy instruments and resources that can help build social infrastructures and local capacities to cope with risks.

Economic resilience implies being prepared for and withstanding these shocks, but also being able to bounce back and emerge stronger than before. In a development context, economic resilience can be strengthened by the following strategies: fiscal consolidation and creation of green jobs, mobilisation of resources for sustainable development, participation in global value chains, empowerment of individuals, and support for regional co-operation and integration. Responsiveness to change, adaptability to new growth options and characteristics, and economic diversification (as long as it does not undermine the city's competitive advantage) also help make an economy resilient (OECD, 2013e). The private sector should also be encouraged to provide solutions for urban resilience and to ensure the continuity of business operations, which is closely interconnected with the resilience of cities. Innovative financing for infrastructures (e.g. public-private partnerships), business models for the operation of urban services, the provision of products and services for individual resilience (e.g. micro-insurance and affordable housing) and increasing the resilience of businesses themselves can be good strategies in this regard.

In sum, Asian cities must improve their resilience in order to cope with a wide range of potential shocks and constraints, such as those that arise from natural and man-made disasters, the impact of megatrends (e.g. climate change, demographic changes), and crises such as the one currently experienced by the world economy.

### *Addressing poverty and social equity*

Asian cities cannot be made greener at the expense of the less well off. Policy packages aiming at urban green growth need to take account of the needs and aspirations of the poorest and most vulnerable, such as the slum dwellers of Asian cities, who represent a substantial share of the urban population. While an emphasis on inclusive growth is hardly limited to developing countries, it is more relevant where poverty and low social equity are among the most urgent problems, as in most cities in emerging economies. When green growth policies are designed to take into account the interests of poor and vulnerable groups, they can greatly reduce poverty and improve social equity (Box 3). Failing to address these issues will lead to wider income disparities and may negatively affect long-term economic growth.

Poor social equity in Asian cities is reinforced by the low social status, low levels of education, low access to public entitlements, low protection, little provision of basic infrastructures, and little or no political voice or formal representation of informal settlers and slum dwellers, who lack a formal identity (Bartlett et al., 2012). Their vulnerability to local environmental degradation and natural hazards also participates in the "urban divide" between rich and poor areas. These conditions create a structural poverty that is exacerbated by the pace of urban growth and does not allow for inclusive economic growth.

High levels of poverty and inequality require targeted policies to avoid negative distributional outcomes, but the capacity to design and finance such policies is often limited (OECD, 2013c). For example, the existence of a large informal sector complicates implementation of the economic, fiscal and regulatory policy instruments needed for green growth (OECD, 2013c). It is therefore necessary to evaluate the scale of the informal sector and the obstacle it represents for policy implementation in each Asian city to avoid policy failures and to clarify policy opportunities and challenges.

**Box 3. Can green growth reduce poverty and address social equity in cities?**

When urban green growth policies are designed to take into account the interests of the poor and vulnerable groups, they can have profound impacts on poverty reduction and social equity. For instance:

- The removal of fossil fuel subsidies can improve the living conditions of the poorest if some of the money is reallocated to cheaper urban public transport or more accessible health-care services or to direct transfers. It is important to link local and national action, as fossil fuel subsidies are usually controlled at the national level and sometimes impede green growth action in cities (e.g. implementation of sustainable transport).
- Urban ecosystem services programmes (e.g. urban agriculture, solid waste recycling) can reduce poverty if they explicitly target local communities and include capacity development to boost local households' ability to negotiate payment contracts.
- Greening investment, innovation strategies, and labour and skill development policies can have even more significant impacts on poverty if they are designed to take into account pro-poor criteria, such as affordability and scalability. Here again, the role of national governments is key to developing human capital and setting the proper nationwide framework for the development of R&D activities.

Green growth can also open up new sources of income and tax revenues, employment and opportunities from innovation and the emergence of green goods, services and markets for cities. It should contribute to more resilient livelihoods, disaster-resistant urban infrastructure and wider access to energy supply and urban public transport.

To deliver short-term benefits to the urban poor, green growth policies will need to be designed to share economic and welfare benefits fairly. This includes the need for investments in human capital and skills, so that workers employed in "brown" economic sectors can quickly pick up the skills required in "green" sectors.

*Source:* Adapted from OECD (2013c), *Putting Green Growth at the Heart of Development – Summary for Policymakers*, OECD Publishing, Paris.

### *Pursuing long-term economic development goals while achieving short-term benefits*

Faced with the challenges of managing extremely rapid urbanisation, fast-growing Asian cities tend to prioritise short-term economic benefits (e.g. development of suburban housing) over long-term considerations (e.g. human capital, investment in R&D for innovation). Reconciling short-term economic growth and development goals with long-term sustainable development and green growth objectives will require a balanced policy approach (OECD, 2013c). The cost of inaction (not addressing long-term green growth goals, such as reducing vulnerability to natural disasters, green urban infrastructures, and tackling health risks from local air pollution and poor water quality) could represent a permanent loss of average world consumption per capita of over 14% (OECD, 2012b).

As there will be huge demands for urban infrastructure in the next few decades, it is crucial for urban policy makers to consider not only how to meet these demands but also how to make infrastructure investment greener. In many Asian countries, lack of experience in integrating environmental policy goals into investment policy frameworks and infrastructure planning may result in costly lock-in to high emissions and high vulnerability development pathways. A policy framework for green infrastructure investment might include: goal setting and aligning policies across and within levels of government; reforming policies to enable investment and strengthen market incentives for low-carbon, climate resilient (LCR) infrastructure; establishing specific financial policies, regulations, tools and instruments that provide transitional support for new green technologies; harnessing resources for capacity building; and promoting green business and consumer behaviour (Corfee-Morlot et al., 2012). The same framework could be applied for other infrastructure needs, such as water-related infrastructure (e.g. water supply and sanitation, rainwater drainage, storage).

Investment in human capital is another long-term challenge that may be neglected if policy makers focus on immediate pressures and short-term economic benefits. Asia is a major destination of FDI. Capital expenditure by multinational or foreign companies has made a significant contribution to Asia's rising importance in global production networks. Low labour costs and the attractions of large consumer markets made Asian urban areas a favoured destination of FDI. In 2011, the ASEAN region, India and China received altogether 23.5% of the total global FDI flows, up from only about 14% before the global crisis (OECD, 2013b). However, a long-term strategy of reliance on the supply of cheap labour has obvious drawbacks: raising productivity will be critical, particularly as the growth model shifts to one less reliant on FDI inflows. Indeed, reliance on traditional exports cannot be maintained when Asian countries reach a middle-income level because wages increase and cost competitiveness decreases. A crucial issue then is how to foster growth led by domestic markets and industry, in order for Asian cities to continue to grow and to avoid the dangers of a middle-income trap and stagnation at that level (as occurred over decades in Brazil and South Africa). Countries that cannot make a timely transition from resource-driven growth based on low-cost labour and capital to productivity-driven growth get "stuck" between low-income developing countries with better cost competitiveness and highly productive high-income countries (Kharas et al., 2011). Emerging Asian countries such as India and Malaysia are moving up the ladder after only partially completing the industrialisation stage and jumping from an agricultural economy to a low-value added service-driven economy. As a result, they risk falling into the middle-income trap (ADB, 2013a). To cope with rising wages and become competitive on the international market, such countries' growth strategies must be examined and restructured and investment in human capital to increase the skills of local labour force will play a key role.

Finally, the issue of short-term and long-term innovation should be addressed. Levels of investment in education and in R&D are still too low in dynamic Asia to attract and retain talent and to develop local capacities sufficiently, although efforts are being made. Local and national governments should allocate sufficient resources to these areas. Encouraging short-term formal and informal innovation (e.g. by local grassroots inventors) in the water, waste and energy sectors could help anticipate infrastructure failures, such as inefficient water access. This could make a significant change in the living conditions of the urban poor and in their ability to seek income-generating activities. Long-term innovation, combined with human capital investment, can not only enable the development of green technologies (e.g. renewables) but can also create green jobs and make Asian cities more competitive. In China, the wind power industry has expanded dramatically over the past years. In 2010, CNY 300 billion (USD 46 billion) was invested in 378 new wind energy projects. It is estimated that this sector created an average of 40 000 green jobs a year between 2006 and 2010, and that an average of 34 000 a year will be created until 2020 (Pan et al., 2011).

***Adopting proactive green infrastructure strategies to keep up with the speed of development***

Asian cities are growing fast – they are expected to add more than 25 million urban dwellers each year until 2050. This speed of growth is a unique feature of Asian cities, and it implies that proactive strategies are needed if Asian countries want to build greener cities: delaying action against a backdrop of such rapid urban growth risks locking in undesirable spatial development and patterns of activity for the long term. Proactive strategies are particularly important for developing physical capital, owing to the time scale of urban infrastructures (Table 3). Infrastructure must be built "right" to avoid lock-in into technologies that are no longer appropriate and settlement patterns that are vulnerable to changes in climatic conditions (World Bank, 2012) or to water-related risks. An estimated two-thirds of infrastructure demand over the next ten years will be for new construction, rather than maintenance or upgrading, so that it will be possible to build green from the start (UN HABITAT, 2010). Local strategies will need to be harmonised with national strategies, given the levels of investments needed and the centrality of infrastructure development in national development planning. To avoid perverse consequences for the urban fabric, infrastructure planning and development decisions must take into consideration how socio-economic, environmental and technological conditions will evolve over time. This will be challenging

because of the uncertainties created by climate change regarding future impacts on cities, technologies, water availability and environmental standards and prices for energy, oil or carbon (World Bank, 2012).

Flexible infrastructures (those that can easily be amended and scaled up to meet needs) should be adopted when relevant and can have both short-term and long-term benefits. Centralised, piped water networks, for instance, can have dangerous lock-in effects; it is wise to explore alternative ways of supplying water and sanitation services that do not create path dependencies (OECD, 2009b). Distributed water systems are more flexible and can adjust to shifting needs and priorities. Improvements to water management can be financed by sources such as property developers, provided they are factored in from the start. This is more difficult for retrofitting, which is why it is important to act fast and focus on flexibility. Also, flexibility in terms of the time scale of policy choices can be judicious. For cities whose urban areas are rapidly expanding, it may not be wise to invest in expensive and inflexible transport infrastructure (e.g. subways) owing to uncertainties regarding future urban development patterns or simply because construction cannot keep up with the pace of growth. It may be preferable to invest first in less expensive but more flexible short-term options (e.g. bus rapid transit). Later, as urban settlements stabilise and commuting patterns take shape, may be a better time for urban planners to consider more expensive and permanent options.

A cycling policy is another possibility. In very poor cities in Asia, cycling and walking are still the primary modes of mass transport, but there is tendency as cities get richer to ignore such "lowly" methods of transport only to discover later that development has all but designed such transport modes out of existence, by not constructing footpaths and by designing road networks suitable only for cars. Beijing was a cycling city in 1980; today it is one the world cities where commuting is considered most painful (IBM, 2011). Hanoi was a cycling city up to the mid-1990s. Now motorcycle ownership has increased sharply and city authorities are actively attempting to limit their use. For their part, European cities have recently seen the renewed growth of environmentally benign transport modes such as cycling, along with an improvement in associated urban infrastructures (Box 4). To "future-proof" the built environment and reduce the long-term rise of carbon emissions and keep their level for a given income lower, it might be sensible policy to ensure provision of adequate infrastructure for pedestrians and cyclists in growing Asian cities as they modernise. Not only is it expensive to retrofit such infrastructure, it would be likely to help retain cycling as a practical means of transport. OECD cities, and Chinese Taipei's and Singapore's experience with modernising such infrastructures and renewing non-motorised transport modes may be a source of inspiration for Asian cities, although differences in local conditions (e.g. climate, pollution, safety, etc.) and culture call for examining carefully the feasibility of such options.

Reserving land for public space in cities is another type of proactive strategy, as land will be much more expensive as urban development extends (Romer, 2012). Likewise, saving land for ecosystem functioning and management in urban areas (such as flood buffering and water filtering services around watershed areas and coastal zones) is a proactive strategy to prevent further local environmental degradation and vulnerability. The East Kolkata Wetland Management Authority has for instance been created to protect the East Kolkata Wetlands from the increasing encroachment of the built environment and addresses both short-term and long-term vulnerability (UN HABITAT, 2009). In China, more and more cities engage in land banking but this has served interests other than green growth, notably the generation of income to improve cities' fiscal balance (Huang, 2007).

Proactive policies must be informed by integrated assessments of urban green growth policies, as their interactions can lead to trade-offs, obstacles to implementation or synergies that must be taken into account to avoid costly lock-ins. Greenbelt policy, zoning policy and transport policy could create negative externalities on a least one important economic, social or environmental policy goal if implemented separately. Integrated in a policy package, their benefits are more than additive. Integrated city models (ICMs), which describe the most important drivers of city change over time, can help assess the consequences of policies on the urban fabric; they are a useful tool for showing the mechanisms and interactions at work and can help make appropriate decisions (Viguié and Hallegatte, 2012).

**Table 3. Sectors in which inertia and sensitivity to climate conditions are great**

| Sector | Example | Timescale (years) |
|---|---|---|
| Water | Dams, reservoirs | 30 – 200 |
| Land-use planning | New development in flood plain or coastal areas | >100 |
| Coastal and flood defences | Dikes, sea walls | >50 |
| Building and housing | Insulation, windows | 30-150 |
| Transport | Port infrastructure, bridge, roads, railways | 30-200 |
| Urbanism | Urban density, parks | >100 |
| Energy production | Coal-fired plants | 20-70 |

*Source:* Hallegatte, S. (2009) "Strategies to Adapt to an Uncertain Climate Change", *Global Environmental Change*, Vol. 19, Issue 2, pp. 240–247.

**Box 4. Renewal of cycling in OECD cities**

Technologically simple bicycles came into widespread use in the late 19th century in Europe, first mainly as recreational tools for the well-to-do but later as a practical means of transport for working people. As motorcycle ownership from the 1930s and then car ownership from the 1950s grew, bicycles rapidly declined as a means of transport. This process continued until the 1990s. Of course, in countries such as the Netherlands, bicycles continued to be a significant component of the transport system. Cycling in the Netherlands accounts for 34% of mechanised trips in Amsterdam and 24% in Rotterdam, the two largest cities. Nationwide it is an important means of transport.

Bicycle sharing has been a very popular non-motorised transport policy in cities worldwide over the past decade and is contributing to a renewal of cycling. It has been the most rapidly growing form of transport in London since about 2000, partly thanks to the introduction in 2010 of the bicycle-sharing system (Barclays Cycle Hire) hailed by Mayor Boris Johnson, which provides cheap, safe and convenient public bicycles for urban dwellers, using new technologies. It also shows strong signs of growth in other large cities of western Europe; in Paris, the third-generation bicycle sharing system (Vélib') was successfully introduced in 2007. In both Paris and London, the implementation of this project came with a notable improvement in cycling infrastructures. Some Asian cities are now seeking to develop such a transport mode despite sometimes very different urban conditions, as in Metro Manila, Philippines. Hangzhou, China, is now the largest bicycle-sharing programme in the world with over 60 000 bikes in use in the city, probably owing both to urban congestion and to willingness to spend more on health-related activities as realisation of the importance of physical exercise has spread.

*Sources*: Cheshire, P. (2012), *"A Draft Discussion Paper for the OECD: Green Growth in Fast-Growing Asian Cities",* Paris; UN DESA (2011b),"Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas", New York.

### *Aligning environmental actions with economic growth*

Better understanding of how rapid urbanisation and economic growth in Asian cities affect environmental risks can lead to more effective policy design. In particular, it is important to understand how the increase in real incomes influences people's behaviour and affects the local and global environments.

There are three interesting features of behaviour related to income growth. First, there is a positive relationship between growth of income, energy use and GHG emissions, although it is not straightforward or linear. Dubin and McFadden (1984) point out that energy use depends not only on income and the price of energy but also on ownership of modern energy-using appliances (including cars). In this regard, the increase in the ownership rates of appliances over the years has been partly responsible for the increase in electricity demand (IEA, 2004; IEA, 2009). More recently, Gertler et al. (2013) have argued that appliance ownership rates vary not only with income and its rise but also with the distribution of growth: when income growth occurs in poorer households, appliance ownership rates rise faster than when it occurs in middle- and higher-income households. Given that urban green growth policies need to tackle poverty and social equity issues, the urban poor should benefit from such policies. They would then contribute to an increase in the appliance ownership rates and thus to GHG emissions.

The second important feature of behaviour related to income growth is rising demand for personal living space, both internal (within houses) and external (increased lot size). As incomes have risen in China, the area of housing per person has increased significantly.[3] Between 1990 and 2010, per capita floor area in Chinese cities and towns rose from 13.7m$^2$ to 31.6m$^2$ (National Bureau of Statistics of China, 2011). In Viet Nam, the proportion of households with a large housing area (at least 60m$^2$) rose from 24.2% to 51.5% between 1999 and 2009 (General Statistics Office of Viet Nam website).

Changes in demand for personal living space in dynamic Asia could lead directly to urban sprawl and to local and global environmental degradation. This is not a desirable outcome for urban green growth. However, increasing personal living space should not *per se* be perceived as undesirable – it surely enhances the quality of life of urban residents. In this regard, containing urban development should not be overemphasised. While the compact city concept has increasingly been part of urban strategies in many OECD countries (OECD, 2012c), its relevance to the urban policy context in cities of dynamic Asia has to be carefully examined. An *a priori* commitment to urban containment in a fast-growing urban environment will likely lead planners to underestimate the land and infrastructures needed for massive urban expansion, resulting in uncontrolled sprawl on urban fringes. If urban containment policies are perceived as too restrictive to be credible, they will fuel land speculation and may lead to unplanned or poorly planned development beyond urban growth boundaries. Policies involving generous but credible urban growth boundaries, identifying where there is scope for expansion and where it should be restricted for environmental or other reasons, reduce both these risks. They offer markets greater certainty about the future and enable policy makers to plan ahead for urban growth that avoids uncontrolled sprawl. Urban expansion should therefore be accommodated rather than contained, the key being to meet rising housing and urban space demand in a sustainable way (Angel et al., 2011).

Third, policies aimed at greener urban growth must consider the income elasticity of demand for personal mobility. Among transport modes, cars, as well as two- and three-wheel vehicles in the case of fast-growing Asian cities, are the modes that dominate as incomes rise. Current estimates suggest that the number of motor vehicles in Asia will increase more than four-fold in the next 15-20 years (UN HABITAT, 2010). In Jakarta, the number of motorised vehicles has grown at roughly 9.5% a year since 2007 to reach 5.5 million in 2012, 98% of which are private vehicles. Income growth, along with urban population growth and urbanisation, are the source of this trend (UN ESCAP, KOICA, 2012). The same trends have been observed in the OECD area: in the United Kingdom, as incomes rise, total car miles have continued to increase, albeit at decelerating rates: by 39% from 1970 to 1980; by 56% during the 1980s; 12% during the 1990s and a further 7% from 2000 to 2008 (UK Department for Transport, 2012). As economic growth in Asia continues, the increasing demand for personal space and mobility is likely to encourage further pressures for motorisation and urban sprawl, which contribute to GHG emissions and to high levels of concentration of other pollutants that result in major public health issues in Asian cities.

Most fast-growing Asian cities must therefore deal with the severe urban air pollution that comes with economic growth and must also tackle increasing GHG emissions. While increasing wealth may be expected in time to prompt greater attention to problems of local pollution,[4] as demand for a better quality of life grows, local governments should not lose time to align environmental actions with economic growth. It will be important to look at the co-benefits of tackling local air pollution and GHG emissions to ensure that local governments undertake climate change adaptation and mitigation. The cost of action will be lower and the co-benefits approach will give cities incentives to participate in a global climate change mitigation agreement. Moreover, it is crucial to see GHG emissions not only as a global problem but also as a local one, since Asia's urban poor live in vulnerable areas and will be more affected by climate change.

Finally, Asian cities must identify and exploit other potential synergies between adaptation and mitigation of climate change, particularly in view of evidence that a certain amount of climate change is already "locked in" for the future, owing to past emissions. Advanced slum upgrading in Jakarta is a potentially efficient synergetic policy example. Not only would it reduce GHG emissions through relocation of slum dwellers to safer areas with energy-efficient homes and through improved access to public transport (electricity and road transport are the city's two leading emitters of GHG), it would also reduce the vulnerability of the community formerly located in flood-prone areas (Sugar et al., 2013).

# 3. OPPORTUNITIES FOR URBAN GREEN GROWTH

The strategies described above address issues related to baseline conditions in fast-growing Asian cities and give an indication of how plans and visions can approach green growth at the local level. These strategies need to be given concrete form in specific policy sectors.

This section therefore presents important policy areas for green growth opportunities in Asian cities. They are: i) energy; ii) land use and transport; iii) housing and buildings; iv) water resource management; v) solid waste management; and vi*)* green goods and services. The discussion focuses on how these areas can contribute to urban green growth in dynamic Asia, with useful examples from OECD and non-OECD cities.

## 3.1. Energy: economic growth with minimised risk of increased GHG emissions

Access to energy is a concern in Asia. About 443 million people in developing Asia have no access to electricity and there are wide disparities in access to the power grid: the electrification rate reaches more than 99% in China, 75% in India, and 34% in Cambodia (IEA Energy Access Database). A breakdown between urban and rural areas shows that Asian cities have better access to electricity (Table 4), although two major challenges remain. First, policies still need to address the lack of access in slums and informal settlements. Reasons such as irregular land tenure, ill-defined responsibilities for payment and low consumption explain the deficiencies in energy provision to the urban poor; this strongly influences their ability to participate in income-generating activities, which in turn affects their access to energy (UN HABITAT, 2010). It is therefore at the heart of the poverty cycle that affects many urban dwellers, which must be addressed to achieve continued economic growth. Second, as the rise in income spurs huge increases in energy consumption, cities need to provide a more stable energy supply and to determine the appropriate price levels (see 4.3. “Policy instruments: innovative and specific to the local context”).

**Table 4. Access to electricity in selected Asian countries**

| Country | Total population without electricity (in millions) | Electrification rate | Urban electrification rate | Rural electrification rate |
|---|---|---|---|---|
| China | 3 | 99.8 | 100 | 99.6 |
| India | 306 | 75.3 | 93.9 | 66.9 |
| **ASEAN (Total)** | **134** | **77.6** | **90.5** | **67.2** |
| Brunei Darussalam | 0 | 100 | 100 | 99 |
| Cambodia | 9 | 34 | 97 | 18 |
| Indonesia | 66 | 73 | 85 | 60 |
| Laos | 1 | 78 | 93 | 70 |
| Malaysia | 0 | 100 | 100 | 99 |
| Myanmar | 25 | 49 | 89 | 29 |
| Philippines | 28 | 70 | 89 | 52 |
| Singapore | 0 | 100 | 100 | 100 |
| Thailand | 1 | 99 | 100 | 99 |
| Viet Nam | 4 | 96 | 100 | 94 |

*Source:* IEA Energy Database (*World Energy Outlook 2013*).

Local governments are well placed to improve access to energy. The city of Ahmedabad, India, shows how fast-growing Asian cities can overcome issues related to affordability and tenure. The Municipal Corporation, the Ahmedabad Electricity Company (AEC) and USAID designed a slum-upgrading programme (*Parivartan*) and created formal certificates in order to bypass the requirement of formal land tenure for energy provision. In addition to subsidised rates and targeted information campaigns, the programme resulted in substantial improvements in living standards for the urban poor but also in benefits for the service provider, since the number of illegal connections decreased and revenues increased (UN HABITAT, 2010). The projected increase in access to energy and income will drive a surge in energy consumption and production. Raising energy efficiency is a related priority. The development of electricity capacity in Asian cities to support rapid economic development has led to a rise in the region's total energy consumption and thus its GHG emissions. Asia's share of global energy consumption will increase almost threefold between 2010 and 2030 to reach 19% (UN HABITAT, 2010). Therefore, energy-efficiency policies and programmes must be part of the energy policies of Asian cities. In this regard, buildings are a major opportunity area for reform (see 3.3 "Housing and buildings"). Another area with great potential for energy efficiency is manufacturing industries. Greening manufacturing industries, as the example of Kitakyushu, Japan, demonstrated, can make a significant contribution to energy savings and reduce the environmental impacts of this sector (see Box 5).

While renewable energies represent an interesting opportunity for limiting the carbon intensity of the energy sector, their deployment in fast-growing Asian cities may have a less immediate impact than improved access to energy and energy efficiency. Moreover, the specific characteristics of Asian cities will call for a case-by-case analysis of the renewable potential of each city and country. Electricity production from renewable energy sources in the ASEAN-6 region represented more than 15.4% of the region's total power production in 2010, the same share as renewables-share power production in OECD countries (IEA, 2010). While the production of renewable energy is mostly a rural activity, cities increasingly invest in waste-to-energy (WTE) facilities and urban buildings with solar panels. China is the world leader in solar water heater production and consumption. In 2009, it produced 77% of the world's solar hot water collectors (Liu et al., 2013). China is also one of the world's largest solar photovoltaic (PV) module manufacturers, with three of the top five solar PV manufacturers in 2011. China drove nearly half of Asia's PV module demand in 2011. It also had the sixth solar PV operating capacity in the world (4.4% of the world's total solar PV operating capacity) (REN21, 2012). The renewable energy sector will also create demand for highly skilled workers in cities, including for R&D. For all renewable energies, costs have fallen dramatically thanks to subsidies, overproduction and economies of scale in production. Nevertheless, while sizeable growth and increasing employment opportunities are expected in the coming decades (especially in the production of components and equipment for the generation of renewable energy), some renewables that are appropriate for urban areas are not yet cost-effective when compared to conventional energy sources as they require more capital and labour inputs for a given amount of output (Hammer et al., 2011).

For new urban development, new technologies, such as smart grid networks and heating/cooling from water (river, seawater), offer an opportunity to adopt proactive policies in tackling energy issues in Asian cities. However, scaling up is a major challenge owing to the lack of financial resources, of co-ordination between different authorities, of experience, etc. In addition, energy policies are often in the hands of national governments rather than cities. Therefore, local governments' room for manoeuvre may be limited. Better co-ordination between local governments and higher levels of governments would help to overcome such barriers, which are particularly salient in the energy sector (see 4.1 "Integrating sub-national actions into national green growth and development strategies").

### 3.2. Land use and transport: towards sustainable urban form

More emphasis should be placed on assessing how to achieve sustainable urban form. While many Asian countries institutionalised urban planning in the 1970s, their land use management systems did not foresee the recent rapid urbanisation. For example, in Thailand and the Philippines, a large amount of land was designated for development in accordance with land use controls. This increases the supply of land available for development and helps to lower the costs of land and housing. However, urban sprawl is facilitated by rather loose land use controls. In Indonesia, India and Viet Nam, slums and informal housing account for a considerable share of urban development. Land-use regulations and planning institutions are largely circumvented.

Sustainable urban form can contribute to urban green growth through:

- The reduction of traffic congestion as well as GHG emissions by encouraging the use of public transport. Compact-city policies facilitate investments in mass transit, as these are only possible in economic terms at relatively high urban densities with high-capacity transport corridors. They should also integrate other modes of mobility (such as bicycles and walking) to make the transport system comprehensive. In some cities, the use of existing mass transit is less than optimal owing to inadequate conditions for pedestrians around the stations (ITDP, 2007).

- The prevention of urban expansion to vulnerable areas such as river banks, steep slopes and low-lying lands where the effects of climate change are expected to be greater. Land use regulations, combined with other instruments, can discourage such undesirable spatial expansion.

- Protection against water-related risks (risks of too much water, such as flood and storm water; risks of too little water, such as droughts; risks of polluted water; risks of disruption of freshwater systems). Waterfront buildings offer great potential in this respect. Depending on how they are built, they can reduce the volume of water flows in case of heavy rains and floods.[5]

- Providing the urban poor with better access to job opportunities and other local services such as schools, grocery stores and clinics through public transport, walking and cycling, so that households can participate in social and economic activities. Sustainable urban transport can also increase social equity through affordability for the urban poor, increased road safety and social cohesion. The urban form is therefore instrumental in tackling poverty and social equity in cities. Moreover, sustainable urban form can reduce individual health risks by reducing air pollution.

Land use is particularly important in that a large amount of urban infrastructure will be built in the future in dynamic Asia. Land use decisions affect the capacity of local governments to make existing and future infrastructure green. For instance, urban sprawl, if not controlled, can significantly undermine cities' ability to finance and build green electricity, transport and water infrastructures at the scale of the metropolitan region. Policies in these areas also depend on land-use policies. Owing to the development context, fast-growing Asian cities benefit from significant potential to reduce emissions by investing in eco-efficient urban infrastructures, but the window of opportunity is closing fast (UN ESCAP, KOICA, 2012).

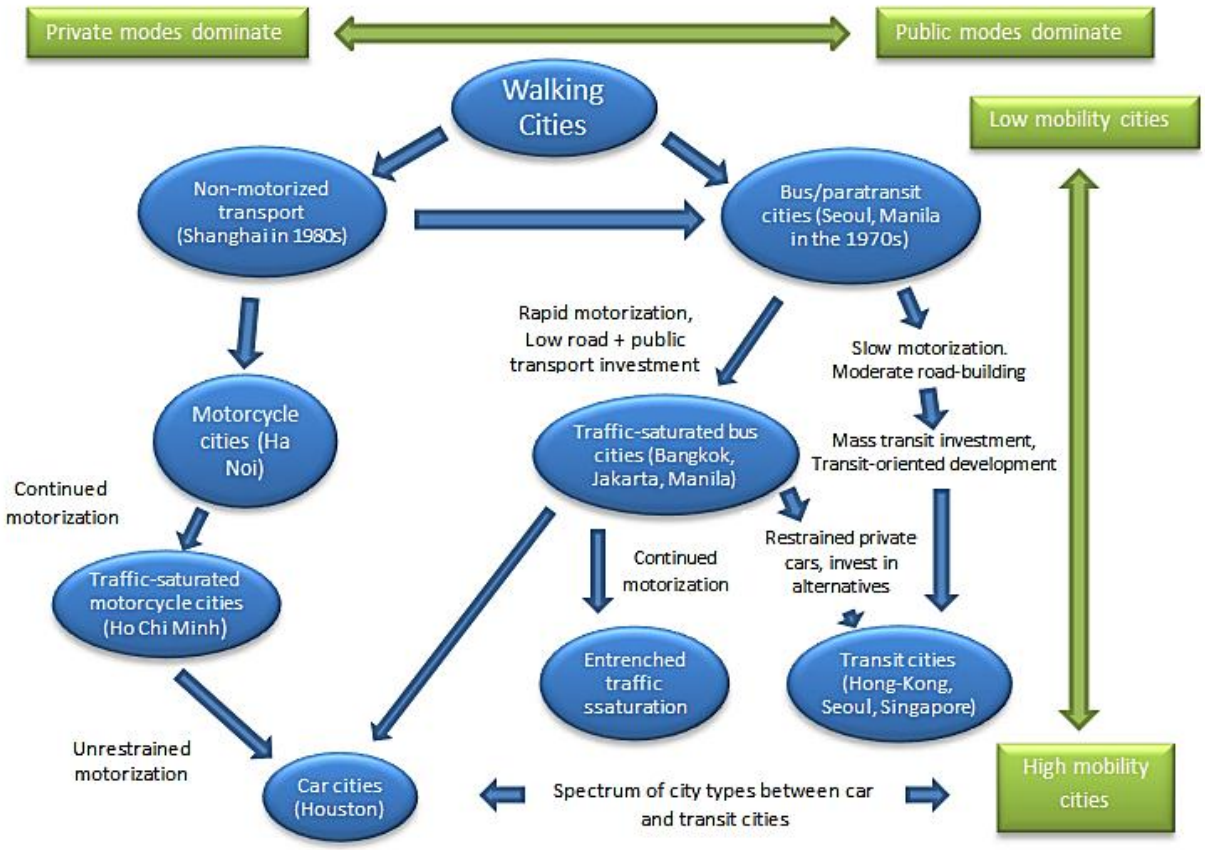
Many Asian cities are now close to the point at which they can still choose to develop as public transport-oriented or automobile-oriented cities (Figure 15). Once the automobile-oriented city form takes shape, a lock-in effect makes it difficult to shift to transit-oriented patterns, as the experience of many North American cities attests. In some cities of Southeast Asia, automobile-oriented urban patterns have been formed as governments have vacillated because of the huge investment costs required to construct urban railways. However, mass transit modes are being introduced in many cities in developing countries in Asia, most extensively in China. Bangkok, Jakarta and Delhi are also trying to expedite investment in mass transit, though many other cities still invest modestly. In 2010, the Asian Development Bank claimed that an investment of USD 2.5 trillion in urban transport in Asia was needed by 2020 to meet the challenge of sustainable development (EMBARQ, 2013). In addition to new investment plans, a redirection of investments towards more sustainable projects is essential but difficult, as many countries still spend heavily on road construction and not on mass transit in cities. Likewise, the budget of Asian cities for pedestrian facilities ranges on average between 0.2% and 5% of their total transport budgets (EMBARQ, 2013). In this regard, bilateral and multilateral initiatives are multiplying and already play a major role in developing sustainable transport in cities in dynamic Asia.

Greening the transport sector seems especially promising in terms of its many benefits: reduction of health risks through the alleviation of air pollution, reduction of traffic congestion and its associated costs, reduction of GHG emissions, and increased access to economic opportunities and services for the urban poor in a public transport-oriented city. An assessment of the impact of such changes on Asian cities would shed light on the potential of transport greening of each urban area.

As the impact of transit development on land use and *vice versa* can be dramatic, both must be well integrated in local policies. Transit can affect accessibility and thus economic and social inclusion, while land use can affect demand for travel as a result of workplace and housing densities. To understand which policies to adopt, interactions at the local level between public-sector initiatives and land market responses should be analysed (World Bank, 2013).

Finally, city governments largely manage land use so that their room for manoeuvre is often greater than for energy and they have more capacity and policy instruments to affect urban form. Land use regulations (e.g. zoning tools), congestion policies and non-motorised transport modes are examples of tools in the hands of local governments that can help achieve green growth objectives. National frameworks tend however to maintain an indirect influence on local affairs, especially when it comes to policy instruments and financing. Fossil fuel subsidies, typically in the hands of national governments, can undermine green transport projects at the local level by providing incentives to use private motorised vehicles. Likewise, the high cost of implementing new transport infrastructure projects, such as mass transit, requires the financial and technical expertise of national governments, which therefore influence urban development (see 4.1. “Integrating sub-national actions into national green growth and development strategies”).

**Figure 15. Typology and transport development paths**




*Notes:* The model shows intended or potential development paths for developing cities.

*Source*: ADB (2009), *Changing Course A New Paradigm for Sustainable Urban Transport*, Mandaluyong City, Philippines.

## 3.3. Housing and buildings: potential for quality of life, energy savings and job creation

The rapid urbanisation and income growth in Asia generates high demand for housing investment, which presents huge opportunities for urban green growth. Providing decent housing enhances the quality of life of urban residents as well as cities' attractiveness, which may drive urban green growth. Moreover, the creation of new housing development will open up opportunities to build from scratch green infrastructure, housing and transport systems, making it economically attractive to make green choices that would be prohibitively costly in established cities.

Insufficient quantity or quality of housing supply can be a major obstacle to urban green growth. For example, living in slums leads to many incapacities such as lack of representation, lack of economic freedom, lack of security, lack of transparency and lack of social opportunities, on top of lack of basic public services (UN HABITAT, 2010). In developing countries, housing conditions such as construction materials, access to safe drinking water and hygienic toilet facilities are the most critical determinants of child survival in urban areas. It also directly affects the vulnerability of urban dwellers: slum housing is often constructed of flimsy scrounged materials, such as plastic sheets, cardboard or scrap metal, or the cheapest construction materials. These structures are easily destroyed by storms, or floods since these are

frequent in the locations (river banks, etc.) where many informal settlements are located (UN HABITAT, 2010).

Securing land tenure is critically important when it comes to generating better-quality housing and living environments for the urban poor (UN HABITAT, 2010). As in the slum upgrading programme implemented in Ahmedabad, India, issues of land tenure can be a major obstacle to urban green growth in Asian cities, limiting the urban poor's access to basic needs and services and their ability to escape the cycle of poverty. The urban poor tend to be priced out of formal land markets and to be deprived of secure tenure and land titles; vacant urban land is in the hands of private landowners and governments, so that they are not free to settle there. This situation increases their distance from areas with income-earning opportunities (UN HABITAT, 2010). Tackling land tenure issues for the poor and making land markets more efficient in fast-growing Asian cities is not straightforward, however. While Singapore's public housing is unlikely to be a model for urbanising cities with limited public resources, private-sector housing and housing finance for the poor often fail to benefit them because of their lack of collateral. As a response to land market failures, innovative schemes have emerged in many Asian cities, notably self-help and savings groups among the poor aimed at improving the local housing and infrastructure conditions (UN HABITAT, 2010). National and local governments could provide more support by improving domestic capital markets and legal and regulatory frameworks and by encouraging housing microfinance (UN HABITAT, 2010).

Land tenure can exist in different forms: state, communal, customary and individual (UNECA, 2004). A fair and equitable land tenure system gives the poor secure access to land and its natural resources and improves their opportunities to earn a stable income. Land tenure rights can serve as collateral for credit or be exchanged for capital to start other income-generating activities, which can improve producers' incomes (Meinzen-Dick et al., 2007). A more transparent land tenure rights system can also enable more efficient collection of property revenue via district taxes and transfer fees. This in turn enables the authorities to support sound land management practices and undertake detailed planning (Warnest et al., 2012). In short, secure land tenure provides good economic, environmental and social outcomes (OECD, 2013c).

Buildings are one of the main sources of energy consumption and GHG emissions. Knowing the performance of each Asian city in this regard can be useful for detecting energy savings and job creation potential. According to the International Energy Agency, buildings represent more than 40% of total end-use energy and 24% of global GHG emissions. Energy-efficiency standards in buildings would help reduce the world's energy use by 11% by 2030 compared with a business-as-usual scenario (UN HABITAT, 2010). Buildings are therefore closely linked to issues affecting the energy sector.

In the hot climates of much of Asia, electricity use for air conditioning accounts for a substantial percentage of total energy consumption, much of which is associated with high GHG emissions. Most of the projected growth in air conditioning is expected to occur in this region of the world. Energy demand for residential air conditioning in South and Southeast Asia could increase more than 40 times in 2100 in comparison to 2000, with a 7% growth per year on average. The impacts of climate change could contribute to a further 50% increase in energy consumption (Lundgren et al., 2013). In a cold climate, such as northern China, coal-based district heating systems emit large amounts of $CO_2$. Therefore, building policies have considerable potential for environmental improvement in Asia. The city of Rizhao, China, recipient of the first World Clean Energy Award in 2007, is a successful example of energy efficiency in buildings. It is one of the country's leaders in renewable energy use, with solar water heaters made mandatory in all new housing units. A combination of technical innovations, policy instruments (incentives, regulations), environmentally friendly policies and information campaigns were used to implement the policy. The programme brought significant savings to users as well as reductions in GHG emissions; it saved more than 39 000 tons of coal annually (UN HABITAT, 2010).

Building policies can explore synergies between climate change adaptation and climate change mitigation. One initiative, taken by local communities and the local government in New York City, involved the use of white (or cool) rooftops. These rooftops participate in climate change adaptation by helping to reduce the urban heat island effect; they are also part of a mitigation strategy as they make it possible to lower greenhouse gas emissions and air pollution by decreasing power demand. Green rooftops can also be used for climate change adaptation, as they can cool the building through shading and insulation and reduce vulnerability to storm waters (they can also serve as a space to grow food). They have however no mitigation impact (Global Cool Cities Alliance website).

Many OECD cities have been attracted to energy-efficiency retrofits in existing buildings for their potential to generate jobs, contribute to energy conservation and reduce vulnerability to higher fossil fuel prices (OECD, 2013a):

- Retrofit investments can create jobs for a range of skill levels. These include low-to-medium skilled jobs that are accessible to a large range of workers, including unemployed manufacturing and construction workers (Schrock, 2009; Schrock and Sundquist, 2009).

- Given appropriate policies with respect to energy prices, the energy savings gained through retrofits can re-finance the investment. With energy service companies (ESCOs), building owners can sometimes improve buildings' energy efficiency without upfront investment or special loans. In Berlin, ESCOs are meant to absorb upfront investments and offer average annual savings in energy costs of 26%, which should allow for payback periods of 8-12 years (New York City Global Partners Inc., 2011). If a price on carbon were to be introduced, retrofits could be an important way of lessening the impact of higher energy prices on poorer households. Property Assessed Clean Energy (PACE) financing is another business model which has been experimented in the United States. This is a mechanism by which property owners finance renewable energy and energy efficiency measures via an additional tax assessment on their property. The property owner repays over a period of 15-20 years through an increase in their property tax bills. When a property changes ownership, the remaining debt is transferred with the property to the new owner. This is applicable to renewable energy technology such as solar PV and solar thermal, efficient boilers, and energy-efficient improvements (IEA-RETD, 2012).

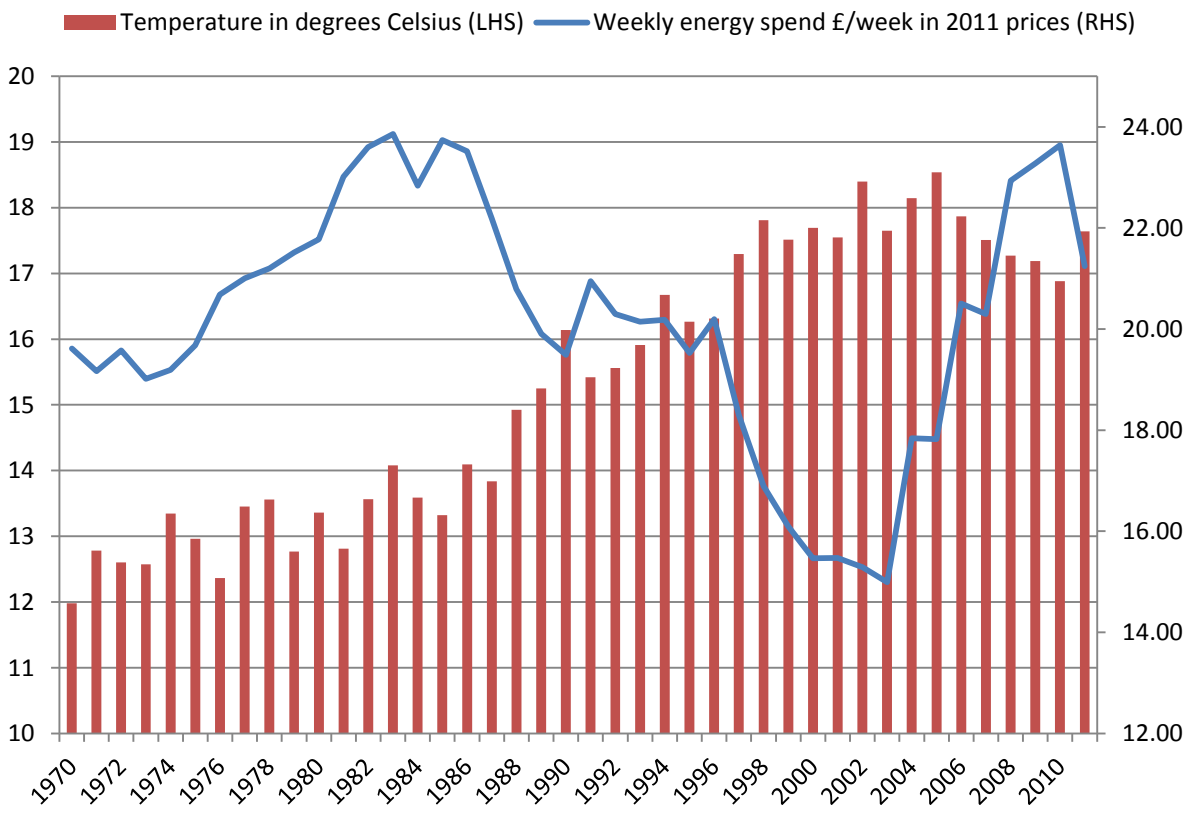
In addition to a retrofitting policy, it is also important to address new construction in Asian cities, which is taking place on a massive scale, to ensure that new building design and materials are green. More than 20 000 housing units are needed every day to meet basic requirements for shelter, and many other units are being built for purposes such as business and tourism. Where urbanisation is very rapid, this may be more urgent than retrofitting. The same reasoning can be applied to other opportunity areas, such as water resource management, for which the design of the infrastructure can influence the capacity of the networks to adapt to a changing urban environment.

Policies also need to address the demand side. While building policies' potential to save energy and reduce $CO_2$ emissions is clear, they may not reduce aggregate energy demand as much as anticipated so that the overall impact on emissions is difficult to assess. First, greater energy efficiency may lead to higher energy consumption, as when increased energy efficiency in the home leads households to keep them warmer in winter and cooler and summer, or when rising automobile fuel efficiency increases demand for larger vehicles. The UK experience is instructive: a recent government-commissioned report (Palmer and Cooper, 2013) concludes that British homes are kept 4 degrees Celsius warmer on average than they were in 1970 and have more than 30 light bulbs and an array of energy-guzzling appliances such as 40-inch TVs that would have been unimaginable then. Yet UK households spend GBP 200 less a year on average on energy than they did in 1970 (Figure 16). Second, consumers may spend the money saved on other goods and services, leading to *indirect* increases in energy consumption

and GHG emissions. The new consumption choices may be equally or even more energy- and $CO_2$-intensive (OECD, 2013a). In particular, with rapid economic growth, Asians tend to purchase more electric appliances and consume more energy as their incomes grow. While labelling schemes can then be a partial solution to encourage consumers to choose more energy-efficient appliances, overall, energy efficiency gains from buildings *per se* may not directly lead to energy savings.

**Figure 16. Household energy spending and winter indoor temperatures in the United Kingdom**

1970-2011




*Source*: Palmer J., and I. Cooper (2013), United Kingdom Housing Energy Fact File, Department of Energy and Climate Change, United Kingdom

Other kinds of outcomes of interest for policy makers can be expected, notably in terms of poverty alleviation, health improvements, consumer surplus and development goals. In fast-growing economies especially, improvements in energy efficiency are likely to improve national productivity and result in further economic development. Considering outcomes in terms of welfare gains and not only in terms of energy savings would help perceive the wider socio-economic impacts of energy efficiency improvements, which may be greater than its negative externalities (IEA, 2012b).

In Singapore, the Sustainable Development Blueprint developed by the Ministry of National Development aims to have 80% of the existing building stock achieve Green Mark Certified rating (minimum level of energy efficiency) by 2030. SGD 100 million have been allocated as a Green Mark Incentive Scheme to allow buildings to undergo energy-efficiency retrofitting, and other similar programmes and incentives have been created for energy efficiency in new buildings. In addition, the National Environment Agency of Singapore plans to create an Energy Efficiency Circle Programme to raise awareness of sustained energy efficiency improvement in companies (Government of Singapore, 2013).

### 3.4. Water resource management: a complex but fundamental policy issue

Fast-growing Asian cities suffer, in various degrees depending on the city and country, from water supply and sanitation issues. South Asia and Southeast Asia are the most affected, with only 47% and 52% respectively of the urban population having access to the water supply and 22% and 38%, respectively, benefiting from treated wastewater (ADB and Asia Pacific Water Forum, 2013). Many Asian cities face common issues: water supplies to cover actual and estimated growing domestic and non-domestic demand; water scarcity; water stress; and quality of drinking water. In addition, they suffer from huge losses in the water distribution networks, intermittent supply, and misuse of water sources. The over-exploitation of groundwater resources has also resulted in negative environmental externalities such as groundwater depletion, decrease in water quality and land subsidence (ADB and NUS, 2012). In Colombo, Sri Lanka, the share of non-revenue water was 37.6% in 1999 and still high at 35.7% in 2008, owing to a lack of improvement in the city's dilapidated distribution networks and the still uncontrolled supply of water to public stand posts. Other important challenges include unmet demand due to urbanisation, relatively inefficient centralised management of the water supply and the intrusion of saline water into the river (ADB and NUS, 2012).

Water management is a central policy issue in terms of social equity, as access to water supply and sanitation are necessary to alleviate poverty. As stated in the Millennium Development Goals, it helps poor households augment their income through productive domestic activities such as growing vegetables and raising poultry. As water is necessary for any economic activity, cities compete with other water users (farmers, energy suppliers, industries, the environment). The OECD Environmental Outlook to 2050 projects that this competition will become fiercer (see OECD, 2012b). Water security and protection against risks of too little, too much or too polluted water have significant distributional dimensions (ADB and Asia Pacific Water Forum, 2013)[6] in the cities and in the wider community.

Wastewater treatment is also poorly managed in many Asian cities, as they lack the capacity or resources to build large-scale wastewater treatment facilities. In Asia and the Pacific, about 80% of all wastewater is released in untreated form and pollutes rivers, groundwater and coastlines, the main bodies of water used for drinking, bathing, fishing and swimming (Corcoran et al., 2010). Housing density and narrow roads, together with land ownership and land compensation issues, are major obstacles to the introduction of such facilities (UN HABITAT, 2010). It is however urgent to tackle this issue to avoid further contamination of water supplies.

There are several reasons for the inability of Asian cities to provide a clean and reliable water supply: physical scarcity of water, lack of investment funds, unwillingness and inability of local governments to charge the urban poor for water consumption, and low capacity of service providers in the public sector (ADB and NUS, 2012). Despite these widespread problems, policy levers have sometimes been used successfully and can offer useful lessons. Issues affecting water resource management, as mentioned, are related to issues in other areas of opportunity. It is therefore essential for water policies to complement other green policies, such as home upgrading, sustainable land use, infrastructure development and financing.

### 3.5. Solid waste management: involving the urban poor in city greening

Asian cities face severe problems of solid waste management owing to financial and technical obstacles. Sanitary and industrial waste disposal is often inadequate and, despite legislation and rules, polluters are seldom punished. Open dumping is the most common method of waste disposal in most Asian cities. In Bangkok, 60% of solid waste is openly dumped, resulting in environmental degradation, health risks and GHG emissions. The urban poor, even though they generate less waste than the urban poor in higher-income countries, are particularly affected, owing to their proximity to waste dumping sites. Dhaka, Bangladesh, uses the Waste Concern Model developed by non-governmental organisations (NGOs) to

manage waste. It promotes recycling, treats all urban waste as a resource, involves the urban poor, improves collection services and reduces transport costs (UN HABITAT, 2010).

While collection and disposal of solid waste is often undertaken by specialist departments at the demand of local governments, local communities have helped filled the gap in waste collection on a voluntary basis in Bangalore, Delhi and Hanoi (UN HABITAT, 2010). Extensive efforts have also been made in the field of community-based recycling of solid waste in cities in low- and middle-income countries (Scheinberg et al., 2011; Matter et al., 2012). In 2009 9 500 people in Pune, India, and 10 100 in Quezon City, Philippines, contributed to informal waste recycling (UN HABITAT, 2012b). It is estimated that 15-30% of waste is already recycled in the cities of developing countries, where recycling by the informal sector prevails, and as much as 70-80% of solid waste could be recycled by the urban poor. In addition, this allows local governments to save money: in Hanoi, where 18-22% of solid waste is collected and sold by the urban poor, the city's savings range between USD 2.5 million and USD 3.1 million a year (Maclaren et al., 2007). In this regard, community-based recovery, reuse and recycling is a good example of the synergies between the solution of urban environmental risks and mitigation of climate change. Better recognition by local governments of the support community-based actions can bring will be important as cities often view the urban poor as confrontational competitors.

In parallel, sustainable materials management (SMM) will be a key principle in the greening of fast-growing Asian cities through solid waste management. SMM is defined by the OECD Working Group as "an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, taking into account economic efficiency and social equity". SMM falls in line with the "3Rs" (Reduce, Reuse, Recycle) philosophy and although it encompasses the whole life cycle of materials, it is fully relevant here, as waste management policies are a major part of the SMM process (OECD, 2012d). Tokyo Metropolitan Government's 2011 Waste Management Plan is an example of successful SMM policy applied to solid waste management.

Land use and transport are at the heart of solid waste management issues, as waste collected must be disposed of somewhere or carried to recycling facilities. Often, local authorities do not benefit from good transport conditions (e.g. poor road conditions, insufficient transport capacity) to move solid waste to the proper sites. Opportunities related to solid waste management are of course closely linked to the greening of manufacturing industries and SMM, especially in regard to the flow of industrial waste materials into natural systems.

### 3.6. Green goods and services: greening industrial processes and promoting green technology innovation

Rapid urban economic growth in Asia is often led by manufacturing (which emits greenhouse gases and may have high risks of air pollution), while many OECD cities have largely de-industrialised. This calls for a green growth model that reflects the realities of rapid urbanisation and industrialisation. Lessons learned from cities such as Kitakyushu, Japan, can be helpful. Kitakyushu overcame severe pollution while retaining an economy based chiefly on manufacturing (Box 5). Achieving energy efficiency in the industrial sector will be a necessary step in the greening process.[7] The key will be for local governments to shape behaviour and practices in the private sector, which mainly runs manufacturing facilities. Regulations (e.g. appliance standards and labelling) and incentives (e.g. financial incentives to invest in energy-efficient technology) are two policy tools that could help city governments reach energy-efficiency targets.

At a higher level, energy efficiency can be achieved through the promotion of FDI that encourages the diffusion and acquisition in Asian cities of environmentally friendly industrial technologies. National restrictions on "environmentally relevant" FDI may however limit the capacity to attract such investment. Similarly, green technology R&D and innovation can be promoted through international co-operation and

building capacity for endogenous green innovation and adoption, as well as through protection of intellectual property rights and conditions that facilitate technology transfer (OECD, 2013c). Trade in green goods and services can also be facilitated by fostering international markets, removing tariff and non-tariff trade barriers, and building capacity to allow more producers and consumers to participate in and benefit from growing international markets (OECD, 2013c).

Sustainable materials management will also be important for the greening of manufacturing industries in Asia. Although manufacturing industries are not the only actors that would be involved in the SMM process, they are absolutely central, notably in terms of natural resources policies (i.e. addressing the flow cycles that link natural and industrial systems). Such industries make heavy use of coal, which is responsible for GHG emissions and local pollutants such as particulate matter, and therefore generate health issues. While SMM is a precious policy tool for local governments in Asia to green manufacturing industries, policy coherence at various levels of government (and at the international level) and between various actors is crucial for its success. Conversely, the heat generated by manufacturing industries can be used as a source of energy, notably in cities with cold weather and in cities where industries are located near urban settlements. The centrality of manufacturing industry in a country's economy, however, varies, as some emerging Asian countries are partly skipping the industrialisation stage and moving directly towards a service economy. In these countries, greening manufacturing industries would have less impact. Likewise, although industry is a strong component of the economy of many Asian cities, other activities, such as tourism, may be dominant at the local level. Analysing the structure and diversification of the economy of fast-growing Asian cities is an important step in assessing the potential of policies in this area for urban green growth.

**Box 5. Green manufacturing in Kitakyushu, Japan**

In Kitakyushu, emissions from the iron, steel and other manufacturing sectors are largely responsible for high $CO_2$ emissions per capita, but the energy efficiency of its iron and steel manufacturing also makes this sector an asset for the city's green growth agenda. Kitakyushu's iron and steel industry offers a range of products with advanced energy performance, such as flat rolls, magnetic steel sheets, thin sheets or surface-treated steel sheets. These products represent about 75% of all products shipped (City of Kitakyushu, 2012). Growing exports of these products ensure the city's economic growth. They can also contribute to reducing $CO_2$ emissions globally, to the extent that such products maintain their leading positions in energy efficiency and the production processes reduce $CO_2$ intensity.

Besides iron and steel, successful energy-efficient and resource-saving products from a number of traditional local industries contribute strongly to Kitakyushu's growth. The local ceramic, chemical and electric manufacturing industries successfully sell resource-saving products to national and international markets. While most of these industries are resource-intensive, they can contribute to emission reductions through resource-efficient product manufacturing and reduction of their production process emissions. The city labels all types of technology, products and services that lead to the reduction of environmental impacts as "Eco-Premium" to help raise product awareness and stimulate product growth. To date, 124 companies have been labelled as "Eco-Premium".

*Source:* OECD (2013f), *Green Growth in Kitakyushu, Japan*, OECD Publishing, Paris.

## 3.7. Assembling opportunities for urban green growth in Asian cities

The six areas of opportunity presented in this section have a strong potential to contribute to advancing urban green growth. In fact, each area can contribute in a number of ways to many desirable outcomes of urban green growth: green jobs and innovation; inclusiveness; climate change adaptation and mitigation; and healthier local environment and urban attractiveness (Table 5).

As briefly mentioned at several stages, achieving urban green growth does not require policies just for one of these areas but instead requires efforts that involve all or most of these closely interconnected green growth areas of opportunity at the same time. For instance, climate change adaptation requires not only efficient and stable water and electricity networks, but also risk-sensitive land use and building design. Urban green growth must therefore be addressed in a holistic way to avoid policy failures. This implies the need for institutional settings to enable cross-sectorial action to generate synergies (see section 4).

Seeking policy synergies and complementarities can strengthen these areas of opportunity. Compared to higher levels of government, cities offer more easily identifiable policy synergies and complementarities (OECD, 2013a). Coherent policy packages can help mitigate the trade-offs among environmental, growth and equity priorities: a properly designed policy package would address the costs of reducing environmental impact in a co-ordinated way and have less impact on the most vulnerable people (OECD, 2013a).

**Table 5. Potential contribution of areas of opportunity to green growth in fast-growing Asian cities**

| | Energy | Land use and transport | Housing and buildings | Water resource management | Solid waste management | Green goods and services |
|---|---|---|---|---|---|---|
| Green jobs and innovation | Investment in energy efficiency, innovative techniques | The development of public transport can create jobs | Retrofitting the existing building stock for improved energy efficiency | Investment in water efficiency, innovative techniques (e.g. smart metering) | Sustainable waste management (SWM) can create green jobs for the urban poor | Promoting recycling of industrial waste and eco-efficient industrial processes |
| Inclusiveness | Improved access to electricity can improve living conditions of the urban poor | Public transport can improve the mobility of the urban poor and increase their ability to seek income-generating activities | Proper housing can improve living conditions of the urban poor | Improved access to clean water can improve living conditions of the urban poor | SWM can be substantially enhanced by involving the urban poor | Sustainable Materials Management (SMM) can get the urban poor involved |
| Climate change adaptation and mitigation | Investment in energy efficiency, innovative techniques and in renewable energy can reduce GHG emissions | Less automobile dependency can reduce GHG emissions; risk-sensitive land use and preservation of natural ecosystems can reduce vulnerability to risks | Green buildings can reduce GHG emissions as well as the urban heat island; building codes can address vulnerability to risks | Managing excess water can reduce risks of inland floods | SWM can reduce GHG resulting from waste and avoid solid waste pollution which can potentially be spread by natural disasters | Green manufacturing can reduce GHG emissions |
| Healthier local environment and urban attractiveness | Cleaner energy production can reduce pollution from the production process | Compact cities can reduce pollution from automobiles and preserve farmland and natural biodiversity | Proper housing can increase the quality of in-house environment | Proper wastewater treatment and water distribution can reduce degradation of lakes and rivers | SWM can reduce landfill and related pollution created by solid waste | Green manufacturing can reduce the amount of local air pollutants released |

# 4. ENABLING STRATEGIES FOR IMPLEMENTING URBAN GREEN GROWTH

The two previous sections proposed strategies and areas of opportunity for achieving urban green growth in dynamic Asia. This section considers means of implementing them. Because cities systematically encounter obstacles when implementing urban green growth policies, certain elements require particular attention:

- the role of national governments in integrating cities' green growth actions into national development/green growth plans and strategies;
- financing obstacles that weaken sub-national governments' capacity to make the necessary investments for urban green growth;
- policy instruments that allow sub-national governments to stimulate green growth and to exploit their potential to foster behavioural change and innovation and to implement action plans;
- local co-ordination of cross-sectorial and cross-territorial integration of green growth policies and of community engagement in green growth action;
- the role of international institutions, including multilateral development banks, bilateral donor organisations, NGOs, etc., which provide financial resources and technical assistance for urban green growth;
- building capacity at all levels of government.

It is clear that governance[8] has a central role in achieving urban green growth. It is crucial to recognise that many stakeholders – governments at different levels, international institutions, local NGOs, private sectors and citizens – all need to play a role in undertaking green growth at the city level. In particular, the role of national governments in setting policy frameworks and policy instruments in pursuit of urban green growth should not be understated.

While this section discusses a wide range of governance topics, it will pay particular attention to how to "enable" Asian cities so that they can implement urban green growth. Green growth action at the sub-national level has not yet been fully explored and implementation is at early stages, but a lack of capacity in sub-national governments is often an obstacle to progress (GGBP, 2014, forthcoming).

## 4.1. Integrating sub-national actions into national green growth and development strategies

In most Asian countries, national governments have development plans and strategies (Table 6). Some have also developed national green growth strategies, including low-income countries such as Cambodia and Viet Nam. However, many countries in dynamic Asia have not developed green growth policy frameworks at the national level, although they have a prominent role in setting the green growth agenda at the sub-national level. In some cases, traditional development objectives pertaining to the development of value-added chains, connectivity and infrastructural improvement remain a priority (Vitale, 2013). Moreover, existing national green growth policy frameworks do not give clear roles to sub-national governments. Without proper recognition of the role that sub-national governments can play (e.g. as an interface with local communities), and proper allocation of resources and responsibilities, national governments may miss important opportunities to drive green growth at the city level.

In order to assess urban green growth policies in fast-growing Asian cities, it is indispensable to look at how city-level plans and strategies are integrated in national green growth and development plans and strategies. There are many examples of national and sub-national integration of green growth plans and strategies, both from OECD and non-OECD countries (GGBP, 2014, forthcoming). In 2005, the central government of Japan introduced the Kyoto Protocol Target Achievement Plan (revised in 2008) which has stimulated regional and municipal initiatives in energy, transport and regional planning (Government of Japan, 2008). Under this framework, the Low Carbon City Development City Guidance was specifically created by the Ministry of Land, Infrastructure, Transport and Tourism to guide urban green initiatives in Japan (Government of Japan, 2010).

Another important issue is the need for national urban policies. A number of OECD countries have developed comprehensive national urban policy frameworks to address multiple urban policy goals, including urban green growth (OECD, 2013a). However, even in OECD countries, relatively few national urban policies specifically address the role of cities in fostering green growth. It would be worth examining whether Asian countries have national urban policy frameworks and whether these frameworks include a green growth agenda.

**Table 6. National development plans and strategies in ASEAN countries**

| Country | Medium-term national development plan | Period | Theme/vision |
|---|---|---|---|
| Brunei Darussalam | 10th National Development Plan (available, to be obtained) | 2012-17 | Knowledge and innovation to enhance productivity and economic growth |
| Cambodia | National Strategic Development Plan Update; Rectangular Strategy Phase II | 2009-13 | Growth, employment, equity and efficiency |
| Indonesia | National Medium-Term Development Plan (RPKMN) | 2010-14 | Realisation of an Indonesia that is prosperous, democratic and just |
| Lao PDR | 7th Socio-Economic Development Plan | 2011-15 | Socio-economic development, industrialisation and modernisation towards the year 2020 |
| Malaysia | 10th Malaysia Plan | 2011-15 | Charting development towards a high-income nation |
| Myanmar | Framework for Economic and Social Reforms; Comprehensive Development Plan is under development | 2012-15 | Development of industry, balanced development, improvements in education, health and living standards, and improved statistical capacities |
| Philippines | Philippine Development Plan | 2011-16 | Pursuit of inclusive growth |
| Singapore | (available from reference in SEA Economic Outlook, to be obtained) | 2010-20 | Highly skilled people, innovative economy, distinctive global city |
| Thailand | Thailand 11th National Economic and Social Development Plan | 2012-16 | A happy society with equity, fairness and resilience under the philosophy of a sufficiency economy |
| Viet Nam | Socio-economic Development Strategy for the 2011-20 period | 2011-20 | A modern, industrialised country by 2020 |

*Source*: OECD (2014a): Economic Outlook for Southeast Asia, China and India, Beyond the Middle-Income trap, OECD Publishing, Paris, http://dx.doi.org/10.1787/saeo-2014-en ; OECD (forthcoming a): *Toward Green Growth in ASEAN Countries*.

## 4.2. Financing urban green growth: reducing financing needs and diversifying cities' revenue base

Cities are key investors in infrastructure with green potential, such as buildings, transport, water and waste. As their main revenue sources – property taxes, revenues from urban services and other charges – are based on these sectors, cities have great potential to "green" their financial instruments (Merk et al., 2012). Asian countries have different tax and budget systems, so that challenges and opportunities for financing urban green growth vary. However a common feature is that local governments lack the financial resources for investing in urban green infrastructure. In addition, they tend to operate under revenue and expenditure systems that are enshrined in national legislation and checked and ratified by higher levels of government. Moreover, decentralisation of expenditures is more pronounced than decentralisation of revenues, so that local governments are dependent on transfers from higher levels of government to fund service delivery. In Thailand, the taxing discretion of local governments is limited to minor fees and charges, and spending is heavily influenced by the central government. In the Philippines, local governments can make changes in tax rates only every three years (UCLG, 2010a).

Two distinct strategies are relevant. First, a sustainable approach to management of natural resources and urban infrastructures can reduce financing needs. In the case of water, there are opportunities to minimise investment needs by managing demand or exploring alternative infrastructure design. In Brisbane, Australia, the introduction of smart water meters reduced water consumption but also deferred programmed capital investments totalling USD 3.2 billion for the entire Southeast Queensland territory. Demand management can result in cost savings or generate profits to be reinvested for new assets (ADB, 2012). Second, diversification of the revenue base is an important strategy. For example, environmental fiscal measures (taxes and fees) can raise fiscal revenues while furthering environmental goals, as in the case of Singapore's congestion charging system. They can also free up economic resources or generate revenues that can help finance access to water, sanitation and electricity services for the poor (OECD, 2013c).

It is crucial to note that financing urban green growth is not a function of city governments but involves a variety of public and private stakeholders. For example, in the transport sector, sources of finance for urban green growth projects exist and can be developed by several actors at different levels (Table 7).

**Table 7. Actors involved in financing urban public transport systems**

| Key actors | Role in financing urban transport |
|---|---|
| National and regional governments | • Raising national resources<br>• Setting rules for allocation and distribution at national and local level |
| Local city administrations | • Raising local financial resources<br>• Co-ordinating funding and implementing policies<br>• In some cases, operating public transport systems |
| Public transport authorities | • Securing the provision and development of public transport services, including through planning, infrastructure provision and traffic management |
| Citizens | • Users of public transport systems<br>• Payers through taxes, charges, fees and fares<br>• Voters |
| Private sector | • Operating public transport<br>• Manufacturing vehicles<br>• Providing infrastructure |
| Private financiers | • Participating in the financing as equity investors or providers of loans and grants |
| Donors/ international organisations | • Providing financing in developing countries, e.g. through official development assistance (ODA)<br>• Promoting good governance<br>• Providing technological support |

*Source:* Adapted from Sakamoto, K. and S. Belka (2010b), "Financing Sustainable Urban Transport", Module 1f in *Sustainable Transport: A Sourcebook for Policy-makers in Developing Countries*, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.

### *Mobilising private finance*

Given the scale of investment needed for green urban infrastructure in Asian cities and current strains on the public finances of several local and national governments, transitioning to green growth in Asian cities will require large-scale private-sector engagement (Corfee-Morlot et al., 2012). Mobilising private finance at the appropriate pace and scale is necessary to fill the funding gap for many urban green infrastructure projects. There are three preconditions: a market for green urban investment projects, good returns on investment and limited risk (provided it does not come at the expense of an equitable sharing of risk). Particular attention should be paid to the status of these preconditions in Asian cities. It is not possible to engage the private sector if there is no market for urban green projects; and if there is a lack of appropriate projects, the size of the market might be too small. In deciding on their investment portfolio, each private investor considers the trade-off between projected return on investment and risk. To gain the interest of private investors, urban green infrastructure projects need to be marketable and promising with regard to returns and risk, with high potential yields or limited risk, or both (OECD, 2013a; Kennedy and Corfee-Morlot, 2012; Kaminker et al., 2013; Kaminker and Stewart., 2012) (Box 6). Investment barriers, however, often limit the attractiveness of green urban infrastructure projects compared to alternatives

based on fossil fuel. This is because market and government failures still prevent accounting for the full costs of carbon-intensive urban development and the benefits of green urban infrastructure projects (Corfee-Morlot et al., 2012).

Governments have a central role in mobilising private finance for green urban infrastructure in Asian cities. The OECD has developed elements of a green investment policy framework to help governments create and improve domestic enabling conditions to shift and scale up private-sector investments in green infrastructure, by establishing agendas that deliver "investment-grade policies", and by establishing a domestic policy framework for investment in green urban infrastructure (Corfee-Morlot et al., 2012). Mobilising private finance for green urban infrastructure requires policy makers to develop an integrated policy framework. Key priorities include: establishing clean and stable policy goals and aligning policies across and within levels of government; reforming policies to enable investment and strengthen market incentives (e.g. congestion charges to support public transit systems) and regulations (e.g. zoning policies and urban land-use planning); providing specific financial policies, regulations, tools and instruments that provide transitional support to help leverage private finance; harnessing resources and building capacity; and promoting green business and consumer behaviour (Corfee-Morlot et al., 2012; Ang and Marchal, 2013). In particular, several financial instruments and risk-sharing mechanisms can help attract private finance for urban green infrastructure:

- Public-private partnerships (PPPs) are procurement methods that governments can use to encourage the private sector to participate and share risk in developing green urban infrastructure. This requires careful attention as many experiences with PPPs have gone wrong in low- and middle-income countries. To be effective, PPPs must offer sufficient "value for money" compared with traditional public procurement, and appropriate institutional processes, regulatory frameworks and capacity must be in place. Also, stakeholder engagement and political support are paramount owing to the long-term nature of PPPs and the capital-intensive nature of most rail and metro projects. In the transport sector, for instance, experience to date suggests that PPPs are particularly suited for bus rapid transit systems (BRTs) and highly used and specific rail links (Ang and Marchal, 2013).[9] Shared-use vehicle and bicycle systems, such as Vélib' in Paris, are also examples of successful PPPs.

- Land value capture tools obtain revenue from the indirect and proximity benefits arising from urban transport infrastructure (e.g. increased real estate value) and can help fund urban transit systems or cover property developers' needs (in the case of distributed water or energy services). Examples include development charges, development rights, tax increment financing (TIF) and joint development. In Hong Kong, China, the construction, maintenance and operations of the Hong Kong metro were financed by the city operator, Mass Transit Railway Corporation (MTRC), by establishing joint ventures with private real estate developers and retail outlets near subway stations, in addition to selling development rights (Ang and Marchal, 2013);

- Loans, loan guarantees, bonds and climate finance can be used more to attract private finance in some sectors (in some, such as water and transport, public-sector finance may be dominant). However, emerging countries in Asia are at different levels of bank and non-bank financial services, as well as broader legal, regulatory and institutional capacity. In addition, long-term financing may be partly possible. This is typically the case in middle-income countries (Kennedy and Corfee-Morlot, 2012).

**Box 6. Challenges for mobilising private finance for green urban infrastructure**

Relatively limited market size may present difficulties for private financing of urban projects. The potential market for urban green investment projects is small and fragmented. Attracting private investment, through large loans or issuing of bonds, often requires the assistance of intermediaries or banks, which are sensitive to economies of scale. Small investment projects can often mean prohibitively large transaction costs. It is also a challenge for city governments to build the capacity to attract private finance and negotiate contracts.

In the wake of the economic and financial crisis, some traditional sources of green infrastructure finance and investment – governments, commercial banks and utilities – are under significant constraints. Alternative sources will be needed not only to compensate for these, but also to ramp up green infrastructure investments. Institutional investors are one potential source. They include insurance companies, investment funds, pension funds, public pension reserve funds (social security systems), foundations, endowments and other forms of institutional investors. In OECD countries, these investors held over USD 83 trillion in assets in 2012. In emerging and developing countries, sovereign wealth funds are key sources of capital, with USD 6 trillion in assets in 2012. However, less than 1% of OECD pension fund assets are allocated directly to infrastructure projects, and the "green" component is even more limited. In Asia, the Asia Water Fund is a recent innovation that allows emerging market pension funds to invest in the asset class relating to green infrastructure (Kaminker et al., 2013).

The relatively high cost of clean technologies can make them appear less attractive as an investment to private investors, although some clean technologies are inexpensive (e.g., green roofs). Returns on green urban investment are often lower than on other investment options. In many sectors, clean technologies are still being developed, and the negative externalities of dirty industries are not always taken into account; as a result, the private sector may favour dirty technologies and sectors. In the energy sector, for example, only a few countries have introduced carbon taxes to internalise the negative externalities of fossil fuels, and many still have fuel subsidies that stimulate fossil fuel consumption. Therefore, the costs of generating energy from coal or natural gas are still considerably lower (up to five times lower depending on the technology) than from renewable energy sources, even if the price of clean energy seems to be dropping quickly (WEF, 2010). The benefits of clean technologies tend to spill over to actors beyond the investors, so that there is under-investment in clean technologies from a societal point of view. Policy must take this spillover into account.

The risk associated with newer technologies can also reduce financing options for urban green projects. Risk profiles vary according to the technology and its stage of development; the technology development stage determines which type of financing is most appropriate. For example, venture capital financing is generally suited for unproven and untested technologies, while project finance is used for mature technologies, such as wind and solar power. Government-supported policies need to be tailored to the stages of a technology's development. Financing methods also depend on the project phase. Urban green projects with high capital intensity and high technological risk will be the most difficult to finance.

The fact that policies at different levels of governments in Asia are not always aligned with each other in terms of a green growth agenda also impedes private sector investment. Higher levels of government can help eliminate perverse incentives that encourage carbon-intensive road transport. Fossil fuels subsidies, which are often in the hands of national governments in Asia, could be abandoned. Also, regional and national governments often make significant contributions to urban infrastructure investments, especially given the massive amounts needed to complete mass transit projects for example.

Some areas for infrastructure greening, such as urban transport, have a strong "public good" dimension, which can also hinder private investment. Indeed, public transport systems represent a classic example of market failure: a public good associated with the infrastructure (economic development, health benefits) is greater than the private good for the individual user of the infrastructure and therefore justifies public policy intervention. As a result, public stakeholders have historically carried the ownership, financing and investment risk for transport infrastructure. Given the scale of investment required in sustainable transport infrastructure, and the growing pressure on public finance, mobilising private investment has become indispensable.

Finally, low returns on investments and network externalities can hinder private-sector investment in green urban infrastructures. Metro investments require high upfront capital costs and long development timelines and payback periods relative to road projects. They require large-scale carriers operating on extensive networks, and often need to be managed on a network basis, unlike toll highways. Sustainable transport infrastructure is also constrained by externalities resulting from existing technologies and rolling stock. This raises implementation costs, requires systemic transitions and parallel investments and limits new technologies' near-term cost competitiveness, e.g. for electric vehicle charging infrastructure.

*Source:* OECD (2013a), *Green Growth and Cities*, OECD Publishing, Paris; Ang, G. and V. Marchal (2013), "Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure", *OECD Environment Working Papers*, No. 56, OECD Publishing; Kaminker, C. et al. (2013), "Institutional Investors and Green Infrastructure Investments: Selected Case Studies", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 35, OECD Publishing.

### *Budgeting at the right levels*

In parallel, green growth objectives must be aligned and integrated with budgets to allow for action at the metropolitan level. A forward-looking budgetary process, such as a medium-term expenditure framework (MTEF), can help strengthen fiscal discipline and bring greater predictability to the allocation of public resources across competing sectors (OECD, 2013c). This budgetary stability and predictability is critical, given the long-term nature of environmental policies and infrastructure investment. Another budget planning tool, public environmental expenditure review (PEER), can be used to assess the degree to which green growth objectives have been mainstreamed into plans and policies. A PEER can be designed to include questions on expenditure for the sustainable management of natural assets to assess whether government resource allocations match environmental policy priorities. It can provide valuable data for designing policy reforms, government budgets and investment projects (OECD, 2013c). Typically organised by the government, it can be used to answer questions on inputs, outputs, outcomes and sensitivities of environmental expenditure. When they have been used, they have helped finance ministries and other economic decision makers to understand the impact of their decisions on the environment. Often they have highlighted the mismatch between environmental policy and plans and levels of spending. In some cases, they have led to the reallocation of resources. PEERs have not been routinely conducted, but their use is growing. African countries such as Tanzania, Mozambique, Madagascar and Malawi have used this tool (OECD, 2013c). Although these tools have mainly been used by national governments, they can be a source of inspiration for Asia's metropolitan and local governments.

## 4.3. Policy instruments: innovative and specific to the local context

Local authorities need policy instruments that are more innovative and more specific to local contexts. Five instruments can be adapted to fit any of the areas of opportunity for green growth in fast-growing Asian cities: financial tools; regulatory authority; public procurement; information and convening; and measuring and monitoring. These provide local authorities with considerable flexibility in choosing the method(s) best suited to addressing the challenges facing their city. The use of several policy levers also allows a local authority to adopt an iterative approach, layering policies to make the most of their complementarities for maximum impact (OECD, 2013a).

### *Financial tools*

First, it is important to assess the financial tools at the disposal of Asian city authorities as their ability to provide financial incentives (subsidies, tax breaks, etc.) and/or disincentives (taxes, fees, charges, etc.) has a substantial impact on what they can achieve for their urban green growth agenda.

For example, pricing tools should be paid special attention for each sector. Management of water resources is a good example of a green growth policy area for which pricing can make significant difference. Water pricing can be seen both as an incentive mechanism to increase resource and allocation efficiency and as a strategy to raise revenues. However, water pricing can be a delicate issue insofar as it is often at the heart of trade-offs between the financial sustainability of service providers on the one hand and environmental protection and economic efficiency, on the other (see OECD, 2010c, for a discussion of the potentially conflicting goals of water prices). It also raises affordability and distributional issues. Examples of water pricing instruments are: water pollution levies, water use levies, water service levies (e.g. flood control, wastewater treatment) and fines and damage compensation penalties (EU Water Initiative, 2012). Pricing policies must also be considered in a multi-level governance context, since a lack of co-ordination at national scale or, in some cases, across adjacent municipalities in a complex metropolitan area may simply lead to the displacement of people or activity, penalising those adopting greener policies and fuelling growth elsewhere.

Another relevant price-based instrument is energy pricing, combined with policies to encourage building insulation and more efficient heating. For example, Chinese cities with free district heating at point of use emit some 45% more GHG per household from domestic sources than similar cities where domestic heating is priced. Another important issue affecting the capacity of cities to make efficient use of pricing tools, and therefore to pursue green growth objectives, is the actors in charge of design and implementation. In the water sector for instance, river basins, provinces or national governments may be in charge of water pricing rather than cities.

Price-based instruments can be particularly useful for energy-efficiency policies in buildings. Any price-based policy aimed at reducing carbon consumption will raise the cost of consuming fossil fuels. The rise in cost will depress demand for such fuels, but unless fossil fuel use becomes much more efficient (or clean energy sources replace it), the rise in energy costs will depress growth in most places (the increase in the cost of such a ubiquitous intermediate can hardly do otherwise) and the rise in energy and heat costs for households will hit the poorest segments of the population hardest. Where price-based instruments are employed, the market is likely to take care of many of the energy efficiency challenges in response to changing prices, but public intervention is likely to be needed to assist low income groups and to enhance the energy efficiency of social housing, public buildings and public infrastructure.

Different levels of governments must engage in coherent action for such pricing tools to achieve effective results. Fossil fuel subsidies are a policy tool frequently used by national governments, which sometimes undermine cities' efforts to promote sustainable transport modes (e.g. Jakarta). In addition, their supposed benefits for the urban poor are contested. As these subsidies are very high in many Asian countries, they encourage market distortions, energy consumption and private motorised transport modes. According to the IEA's estimates, the 2012 average subsidisation rate (as a proportion of the full cost of supply) was 3.9% in Chinese Taipei (0.3% of GDP), 3.4% in China (0.3% of GDP), 12.2% in Viet Nam (2.5% of GDP), 17.6% in India (2.3% of GDP), 16.5% in Thailand (2.6% of GDP) and 28.3% in Indonesia (3% of GDP) (IEA Fossil Fuel Subsidy Database). Reducing or eliminating these subsidies is urgent and can have a positive impact on green growth in Asian cities, provided it is integrated with complementary social protection measures, such as cash transfers and measures to protect the poor from increases in energy, water and agricultural input prices (OECD, 2012d). Local governments must share their knowledge of local conditions and needs with higher levels of government and develop the capacity to design their own incentives and actions for green growth, for instance for motor vehicle and fuel taxes, and investment in clean energy R&D.

***Regulatory tools***

In a context of rapid growth and structural change, regulatory tools need to be carefully designed and flexibility should be built into regulatory systems. Regulation can be a very effective way to restrict the development of environmentally sensitive areas. However, physical growth boundaries of cities that are too restrictive may have unintended and detrimental consequences for GHG emissions. Limiting urban land supply with urban growth boundaries and greenbelts (as in Britain) is just as likely, as car ownership grows, to lead to leapfrogging development and longer average commutes to work (Cheshire, 2012). From an urban economic perspective, a more effective policy in both welfare and emission terms is likely to be one that facilitates higher densities (e.g. by generous height restrictions and planning development in conjunction with the provision of mass transit) rather than imposes them by regulation.

The regulatory impact analysis (RIA) is a good regulatory practice that helps to identify the issue that regulation is meant to address. It helps to define the government's policy objective and to confirm that regulation is the best way to achieve that goal. Also, it helps to minimise the adverse impacts of regulation (e.g. compliance costs) on businesses. Another critical aspect is the importance of stakeholder engagement in regulatory processes to ensure that regulations are in the public interest: the best decisions can only be

achieved with the input and participation of citizens, businesses, NGOs, public sector organisations, etc. Finally, local governments should make use of *ex post* evaluation of regulations to ensure their continued relevance, effectiveness, efficiency and utility (OECD, 2011b).

Regulatory tools can be particularly useful in the building sector, notably to green new construction and materials through the creation of standards. The appropriate level of standards must be selected to prevent the prevalence of low-energy efficiency (if the standards are too low) and unbearable burdens for constructors (if standards are too high).

The national government can play a crucial role in enabling sub-national governments to introduce an effective regulatory framework at the city level. For example, Tokyo Metropolitan Government's policy to ban diesel vehicles in the agglomeration and to reduce the amount of particulate matter in the urban air in the early 2000s required an action at the national level to change pollutants emissions standards and to negotiate with the country's main car manufacturing companies to upgrade filter technologies (Rutherford, 2006). Currently, the trend in Asian countries is towards decentralisation (Rao, 2007; Segbers, 2007). It is therefore a good time to discuss how to facilitate sub-national actions by reducing excessive regulation and control at the national level and by providing incentives. Cities in North America, Australia and New Zealand have shown great capacity to remove national-level constraints in innovative ways (OECD, 2010a).

It would seem more productive to try to make car use more efficient in carbon terms by both regulation and pricing (including congestion pricing), than by attempting to restrict personal ownership or use directly. Well-designed congestion charging could increase use of public transport and reduce use of private vehicles, as well as reduce distances travelled in congested conditions (with implications for emissions of GHG and air pollutants). The urban form and choices made by local authorities in terms of policy objectives may also drive the congestion strategy (e.g. cordon pricing, value pricing) (OECD and ITF, 2010). The revenue obtained from congestion charging can be re-invested in other green growth areas and help compensate for the lack of financial resources in some Asian cities. Finally, it is important to get congestion policy accepted. Congestion pricing is politically difficult, as experience around the world has shown. It has been introduced in just a few cities in some form (Singapore, London, Stockholm, etc.), and in 2014 Jakarta will set up an electronic road-pricing scheme that charges toll fees on cars at certain hours. Such a scheme would be relevant in Asian cities in which the urban layout creates heavy traffic congestion, but the modalities for implementation remain to be explored and compared with existing experience.

### *Public procurement*

Green public procurement is another policy instrument to achieve environmental benefits. It can be defined as "purchasing products and services which are less environmentally damaging" (OECD, 2002). Public authorities are major consumers[10] and their purchasing power can shape consumption and production to support green growth objectives, generate new green domestic markets and provide examples of good practices for business and consumers (OECD, 2013c). This is especially true in some urban sectors (e.g. public transport, energy and construction), where public purchasers represent a large share of the market and can create strong incentives to develop green technologies and products. While green public procurement practices are more often associated with developed countries, they are as relevant to developing country policy makers interested in using purchasing to advance policy goals, including improving natural resource efficiency (OECD, 2013c). They also encourage the creation of green companies requiring qualified green jobs (APEC, 2013). In 2011, China became the global leader with an investment of USD 34.6 billion in clean energies.

Sustainable public procurement is slightly different form green public procurement as it adds social considerations, but nonetheless has a "green" perspective. Green public procurement – designated as

"environmentally preferable purchasing" (EPP) in the United States and as "green government purchasing" (GGP), "green public procurement" (GPP) or simply "green purchasing" in other economies – includes the creation and/or promotion of environmental standards and eco-labels for the acquisition of green goods and services. Green public procurement can also consist in choosing as contractors for public contracts companies that meet green criteria and limit the environmental impact of their activities or in excluding those that do not (APEC, 2013). The Hong-Kong Green Label Scheme defined by the Hong-Kong Green Council – a non-profit association with other initiatives such as the Hong Kong Green Purchasing Charter, a cyber-platform on green technologies and products, as well as green awards, events and training – is an example of good practice in green public procurement (APEC, 2013).

Regulatory tools are very important for green public procurement. A clear legal and policy green procurement framework with understandable definitions, targets and priorities helps public purchasers assess what is required to incorporate green public procurement in their procedures to achieve this goal. For example, Japan adopted in 2000 the *Law on Promoting Green Purchasing* to promote the procurement of eco-friendly goods and services by the state and other public entities. The law is complemented by the Basic Policy on Green Purchasing, which contains directions for green purchasing and for identifying product categories for which green purchasing is required (such as recycled paper or low emission vehicles).

While most Asian economies examined in this paper are developing green public procurement practices, they have encountered several obstacles to the use of this policy instrument, such as poor capacity building, unclear legislation, slow development of a monitoring system, and the difficulty of integrating such practices into the daily activities of procurers and officers (APEC, 2013). Such obstacles reveal, once again, the need to adopt a multi-level approach to maximise the efficiency of this instrument, as capacity building, environmental standards and financial resources must be co-ordinated between national and local governments. These issues must also be addressed at the international level, as a lack of coherence among Asian economies in terms of environmental criteria and eco-labels that define a green product and service, the scarcity of green products on the markets, and non-tariff barriers to international trade, affect sustainable public procurement regionally (see 4.5 "Accelerating urban green growth by international co-operation"). Malaysia, the Philippines and Viet Nam have developed a general policy to acquire green goods and services but have not defined the environmental criteria, while China (including Hong Kong), Indonesia and Thailand have done so (APEC, 2013).

To assist countries in implementing green public procurement policies, the OECD Public Governance Committee is developing a compendium of good practices for green public procurement. In the context of this initiative, the OECD and UNEP have set up a joint working group, which aims to increase international collaboration in green public procurement and is included in the work plan of the International Initiative on Sustainable Public Procurement that UNEP launched in June 2012 at the Rio+20 Summit.

### *Information and convening*

Information tools would be important for cities and countries that do not already make use of them. Labelling energy-efficient products helps consumers select such products and therefore encourages industry to produce greener products (Box 5). Labelling buildings is another example. Smart meters can tell households and local governments how much electricity and water is used (and their cost) and can help them save energy. It is particularly relevant for Asia where the smart meter market is taking off. In the Philippines, smart metering is now one of the major services performed by the National Grid Corporation of the Philippines (NGCP), operator of the country's power transmission network, and also by the Manila Electric Company (MERALCO), the Philippines' largest distributor of electrical power. Smart metering is a central element of the long-term smart grid roadmap, which will focus not only on prepaid smart

metering to record customers' energy consumption, but also on the modernisation of the country's electric infrastructures. However, as there is no "one size fits all" smart grid solution, owing to differences in local conditions, such a measure needs to be implemented on a case-by-case basis. Another example is the Green Building Index created in 2009 by the Malaysian national government, which is used to assess the "green" character of buildings.

### *Measuring and monitoring*

Cities and countries generally lack effective tools for setting up urban green growth targets and measuring and monitoring progress towards them, and which are key to evaluate urban green growth policies. Problems include lack of definition of green growth indicators, lack of initial baseline, and lack of tools and resources for data collection, treatment and distribution. Data on levels of $PM_{2.5}$ particles in Asian cities is for instance not often available, as they are more difficult to measure than $PM_{10}$ particles. Moreover, many Asian countries do not have standards for $PM_{2.5}$ levels. As a result, monitoring is not mandatory.

The OECD proposes a green growth measurement framework in *Towards Green Growth: Monitoring Progress* (OECD, 2011c), which has been used by the Green Growth Knowledge Platform to synthesise green growth measurement approaches adopted by several international organisations (GGKP, 2013). Recently, the OECD updated this green growth measurement framework and also presented a selection of updated indicators that illustrate the progress that OECD countries have made since the 1990s (OECD, forthcoming b). At the city level, the OECD also presents a tentative list of 80 urban environmental indicators (OECD, 2013a). Combined with indicators of growth and socio-economic characteristics, this set of indicators can be considered a starting point for assessing the impact of cities' efforts to foster economic growth and development through urban activities to reduce environmental impact. In developing a measuring and monitoring framework for Asian cities, a first step would be to define a metropolitan area as a unit of analysis so that comparisons with other metropolitan areas become meaningful. Data on urban population density and commuting flows make this possible. Additional data would, however, be required to reflect the rapid growth of Asian cities. Candidates for such data include: foreign direct investment, income disparity, car/motorbike ownership, urban population living in slums and informal settlements, and urban population living in areas vulnerable to floods. It is a goal of this study to propose effective indicators through case studies.

### *Selecting the right instruments*

The comparative impact of each policy instrument in the regional, national and urban contexts of dynamic Asia should be examined, since their relevance may vary depending on the area and the target (private sector, individuals, etc.). For instance, from a firm's perspective, public procurement and regulatory tools may have different outcomes (Aschhoff et al., 2008).

Policy instruments must always be integrated to control for as many obstacles to implementation as possible at the same time. For instance, achieving energy efficiency in buildings requires a balanced mix of hard and soft measures targeting energy consumers and building owners (Metz, 2010):

- Building codes: in many Asian countries these are still non-existent, voluntary or simply proposed. In Japan and almost all countries of Western Europe, they are mandatory. They are of two types: prescriptive (they set specific provisions) and performance (they give architects and builders more flexibility).

- Demand-side management (DSM) policies: these use regulation to require utilities to invest in energy savings before expanding power plant capacity. They have been successfully implemented in the United States and possibilities for replicating this strategy in Asian cities must be explored.

- Appliances standards and labelling: this can speed up the improvement of energy efficiency and standards must be frequently raised. The Hong Kong government, for instance, enacted the Building Energy Efficiency Ordinance in 2012, which stipulates that building services such as air conditioning, lighting, electrical, and lift and escalator installations must comply with performance standards (Hong Kong Government website). Standards and labelling also help people concerned about energy conservation to choose appropriate appliances.

- Financial incentives: these can help overcome high initial investment needs. They are a good complement to building codes, which are not always respected because of financial obstacles. They include upfront subsidies, tax deductions, taxes on carbon-based energy to make energy and $CO_2$ savings more financially attractive.

Local conditions need to be carefully taken into account when selecting policy instruments. For example, countries have different types of informal settlements, depending on how much they deviate from a formal development process. Informal settlements are typically slum/squatter areas in which people occupy the land and construct self-help-type housing without property rights. However, in countries where customary land rights are recognised, as in Indonesia, China and Viet Nam, a villager's right to develop village housing is recognised; built-up areas expand in rural areas under customary land rights and development takes place without planning. Case studies can be used to explore how variations in local conditions may affect which policy instruments are best suited for urban green growth.

### 4.4. Enhancing local co-operation and community engagement

#### *Horizontal co-operation among sub-national governments*

A key feature of Asian urbanisation is the scale of urban agglomerations. Metropolitan areas often extend beyond the administrative boundaries of specific cities or even provinces and co-ordination of local governments in metropolitan regions is increasingly difficult. In China, it is reported that municipalities' greater autonomy and fiscal responsibility has been among the main reasons for urban sprawl: land sales are an important source of income for local Chinese governments, and they therefore tend to promote extensive land development in their jurisdiction (Zhao, 2010). The case of Jakarta is similar (Firman, 2008). From the institutional point of view, Asian city governments generally have one of the following forms of governance (UN HABITAT, 2010):

- Autonomous urban authorities: in this case, local authorities in a metropolitan area have their own planning, legislative and executive branches, and are functionally and territorially separate. This fragmentation is problematic insofar as it creates local competition – and therefore a lack of co-ordination among different authorities – and political conflicts. Metro Manila has autonomous urban authorities.

- Mixed systems of regional governance: in this form of metropolitan governance, authority and power are devolved to a group of formal structures, such as central government departments, regional authorities, metropolitan bodies, special-purpose authorities, cities, towns, etc. Various entities usually share responsibility for specific urban services, as in New Delhi, Jakarta and Kuala Lumpur.

- Combined metropolitan authorities: here, a single governance body is responsible for the services provided in the whole metropolitan area. Local authorities are subordinated to the metropolitan government. While those who hail this form of metropolitan governance argue that it can provide urban services and tackle environmental issues more efficiently, others often consider that it is too bureaucratic.

A governance mechanism is needed to plan, co-ordinate and supervise sustainable green growth programmes across provincial and local jurisdictional boundaries in an effective way. Integrated metropolitan-wide policies are essential, in particular, for co-ordinated urban development, land use and transport, preservation of green and open spaces and environmentally sensitive areas, and appropriate energy supply. However, uncertainties about the expected costs and benefits of urban green growth actions in each jurisdiction make co-operation difficult. For example, for climate change mitigation actions, it is not easy in a metropolitan area to comprehend and trace how policies can affect concentrations of greenhouse gases, temperature increases, and climatic changes such as increased severity and frequency of storms, cycles of droughts and floods, and patterns of precipitation in each local community (Vitale, 2013). This makes it difficult to generate the necessary political will, especially across political jurisdictions, to address climate change mitigation because communities must pay upfront to generate benefits for the whole metropolitan area (in fact for the whole world). This shows the urgent need for better understanding of the costs and benefits of urban green growth actions in specific contexts in fast-growing Asian cities, so that collective long-term development strategies can be more easily defined. They are essential to generate ownership and foster political will and action.

In addition, multi-stakeholder governance in metropolitan areas is a particularly salient issue in the water sector, which requires close examination. During the first OECD Water Governance Initiative (WGI) meeting held in Paris in March 2013, it was noted that, despite some improvements in recent years, Asian cities face institutional fragmentation in the water sector, limited stakeholder engagement in development processes, and weak regulatory frameworks. In some cases, although there has been a massive increase in private-sector involvement, the market struggles to deliver the levels of investment required to meet water infrastructure needs, as in China (OECD, 2009c). Phnom Penh stands out as an example of good water governance. It replaced poor management by a public water utility with a 24-hour drinking water service and subsidies to the poor through connection fees and tariffs; non-revenue water dropped to 6.15%, and bill collection rose to over 99%. Some of the governance measures that made this possible were: the autonomy given to the water authority (which remained state-owned); development of a utility-customer relationship; and capacity building programmes for the water authority staff (Chan, 2009). Singapore also has an effective water governance model, with the implementation of "the four national taps" based on sustainable water supply. A holistic approach, flexible planning, innovative management and the search for technological advances have been a hallmark of Singapore's efforts (Tortajada et al., 2013).

Within sub-national governments, sectorial complementarities between green growth programmes, green growth policies and existing policy instruments need to be explored in all their complexity. However, limited public administration capacity (e.g. low human and financial resources, weak institutions, dependence on higher levels of government) and weak regulatory frameworks do not facilitate cross-sectorial integration. So far, such integration tends to be dominated by economic development and energy issues, and by the various interests of stakeholders and political actors. Climate change also poses the problem of who faces the cost of mitigation, now and in the future, and thus raises distributional and ethical problems (Gardiner, 2004; Roberts and Parks, 2007; Vanderheiden, 2008). To further complicate matters, urban green growth is framed differently by different stakeholders; this influences the type of policies designed at various levels and shapes the contours of local climate change action (Howes and Wyrwoll, 2012).

### *Engaging communities in urban green growth actions*

Community-based approaches may be a way to foster urban green growth actions, especially in the developing world, and is a major trend in Asia. Such approaches tend to complement the lack of capacity in local government by sharing responsibility between the local community and the public sector. Moreover, community-based approaches are likely to create local jobs, thereby contributing to inclusive growth. In Dhaka City, community-based organisations ensure primary waste collection prior to a second collection process managed by the Dhaka City Corporation (Asian Productivity Organisation, 2007). There are also successful examples of community-based recycling, in Surabaya, Indonesia (UCLG, 2010b), as well as in Belo Horizonte, Brazil (ICLEI and IRENA, 2012). Community-based approaches are also being used to improve slums and informal settlements, as mentioned earlier (Galuska, 2013).

Local governments and community-based organisations have a key role to play in designing and implementing the solutions to the many issues faced by the urban poor. Local governments, by their capacity to allow more space and influence for urban slum dwellers, can work in partnership with the local population to reduce inequalities in cities and work towards green growth objectives in such urban areas. They can design frameworks to regulate local participation at both the policy-making and implementation stages. The city of Surabaya, Indonesia, started in 2004 a waste management programme based on community education and actions. Local residents are mentored and guided by about 420 environmental facilitators recruited among community leaders, young generations and cadres of the Family Welfare Programme (PKK). These community recruits serve as an interface between local people and the city government. They train environmental cadres whose role is to motivate communities to adopt environmentally friendly waste management behaviour. With the support of NGOs, these local facilitators and cadres seek innovative ideas to adapt action to the type of community (APEKSI, 2012).

Local knowledge and consultation are needed to understand the specific risks of different urban groups and the contribution they can make to reducing their vulnerability (Bicknell et al., 2010). Collective practices, often in the form of urban social movements, play an important role in upgrading urban slums across Asia. Federations and organisations belonging to Slum/Shack Dwellers International, driven by locally based savings schemes led by women, have been able to negotiate improvements with local governments, such as secure tenure and provision of water and sanitation. They have helped to map and survey all informal settlements in Phnom Penh, Cambodia, to obtain information on plot boundaries and existing infrastructure in order to upgrade such areas, regularise households, provide them with land tenure, and allow for investment plans (Bicknell et al., 2010). National governments have also undertaken initiatives to upgrade urban slums: Thailand's Baan Mankong programme, for instance, has helped improve housing conditions, infrastructures and services through close collaboration with local communities (Bartlett et al., 2012).

Participatory budgeting is another type of community-based action that is gaining in popularity in Asia. Neighbourhood, district and city-wide groups and associations elect delegates who then influence spending strategies. Participatory budgeting has been found to raise the quality of public services and improve the transparency and accountability of local officials. In Pune, India, participatory budgeting has allowed for the allocation of resources for the construction of sorting sheds (sorting and selling solid waste is a significant source of revenues for low-income communities) (UN HABITAT, 2010).

It is interesting to examine actions taken by national and local policies to encourage community-based actions. Factors in their success include support from NGOs, government networking, and partnership organisations that are independent of government agencies (Kidokoro, 2012).

### 4.5. Accelerating urban green investment through international co-operation

International co-operation can promote the urban green growth agenda, even though dynamic Asia's dependence on international co-operation is set to decrease progressively in the coming years as domestic demand increases. It can contribute by strengthening external development finance and investment towards urban green issues. This can be done by promoting knowledge sharing among relevant actors, including international financial institutions and other partners in development co-operation. It can also help to strengthen domestic policies and enabling environments thus attracting private investment to support the greening of urban development and infrastructure in dynamic Asian economies.

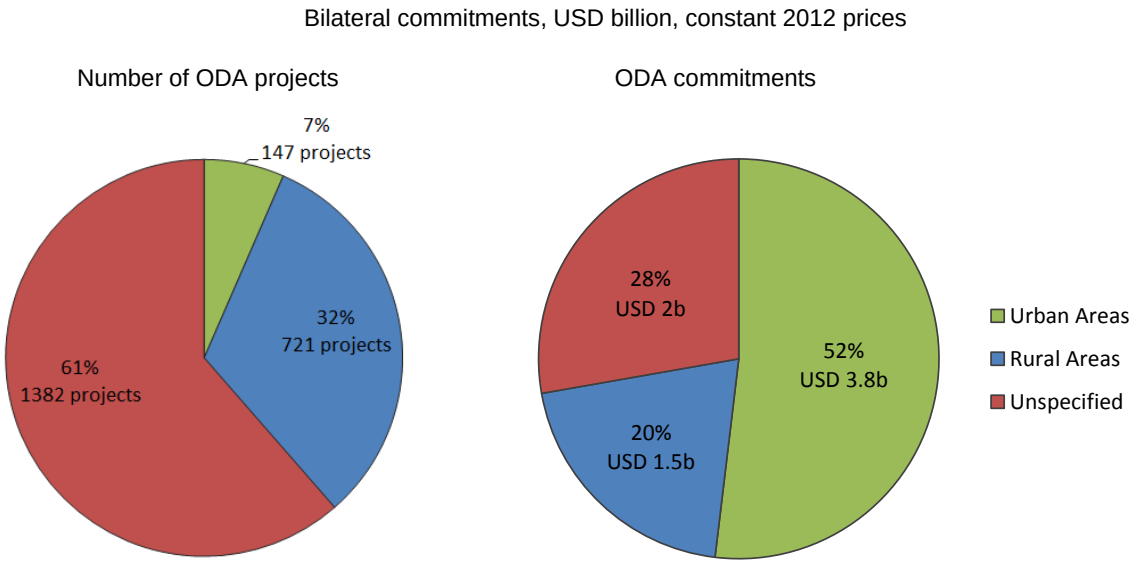
Multilateral banks and bilateral aid agencies have played, and will continue to play, an important role in fostering urban green growth in most Asian countries. Policy coherence among international, national and sub-national actors is essential. Official development finance includes both official development assistance and non-concessional other official flows (OOF). These can be delivered through bilateral and multilateral development co-operation and a range of instruments. ODA promotes the economic development and welfare of developing countries and is predominately provided through grants and concessional loans. Climate and environment-related multilateral aid funds include the Global Environmental Facility (GEF) and the Climate Investment Funds (CIFs). Other financing flows, such as the Clean-Development Mechanism (CDM), are excluded from the current definition of official development finance. Current discussions on a post-2015 framework for monitoring and measuring development finance include whether and how public and private finance (particularly what is directly mobilised through public intervention) might be reflected in a broader measure of total official support for development. ODA and OOF can help to strengthen local financial markets and boost investment; this can increase factor productivity in the targeted sector and makes private-sector investment more viable. In Thailand a blending of ODA and non-concessional OOF has leveraged private-sector investment in renewable energy and energy efficiency to avoid lock-in to carbon-intensive development pathways (OECD, 2013c).

The OECD DAC Creditor Reporting System (CRS) measures and monitors official development finance from countries that are members of the OECD Development Assistance Committee (DAC). It also identifies a wide range of targeted policy objectives. Bilateral ODA is a relatively important channel for green development finance (OECD, 2013c). Among the ODA projects marked as contributing to environmental objectives (including Rio Conventions) that were committed bilaterally by DAC members to countries in dynamic Asia in 2012, it is estimated that only 147 (7% of the total number of environment-related projects addressed to these countries in 2012) were specifically for cities. However, they accounted for about 52% (USD 3.8 billion) of total environment-related finance commitments to these countries (Figure 17).[11] Of the funds allocated to urban areas, a major share was for urban transport projects (Figure 18). Although more accurate data are needed to identify the "urban" character of ODA,[12] these estimates clearly show cities' huge infrastructure financing needs and the link between these and green growth and thus the need to build more infrastructure and to build it right (OECD, 2013c; World Bank, 2012). Along with the private sector, international aid can help advance urban green growth actions in dynamic Asia.

Bilateral and multilateral initiatives are already increasingly involved in the financing of urban green growth projects in Asia. The Asian Development Bank's 2010-20 Sustainable Transport Initiative plans to increase the share of the Bank's investments in urban transport in Asian cities from 2% to 30% of its total transport lending by 2020, which could encourage more sustainable infrastructure development patterns in cities (EMBARQ, 2013). Another example is the Thai-German partnership, which engages in trilateral co-operation in the region and launched the 2013-15 Cities-Environment-Transport Project. In this project, Thailand and GIZ (the German International Co-operation Agency) work with Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines and Viet Nam to reduce emissions from transport and other sectors and to achieve co-benefits such as improved air quality and more competitive urban centres. They achieve this by promoting clean air measures, increasing the energy efficiency of land transport, and reducing exhaust

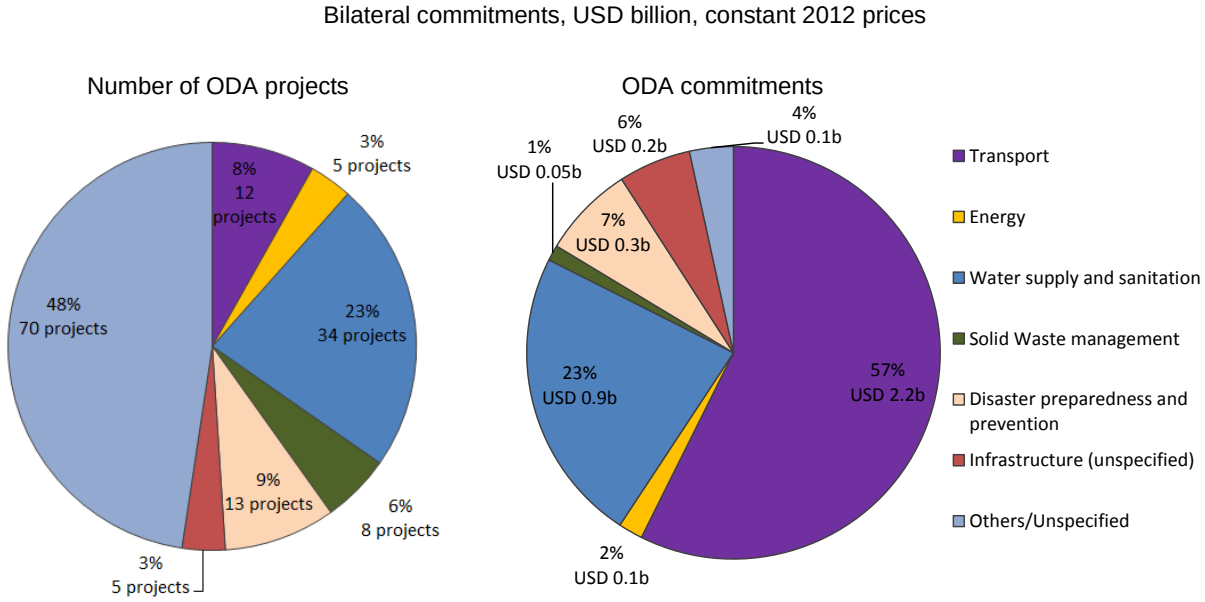
emissions and local waste related to port activities. Such activities should be scaled up and replicated. An option is to explore possibilities of direct involvement with local governments and to increase joint actions between national and local governments.

**Figure 17. Number of bilateral ODA activities and bilateral ODA finance to urban and rural areas in selected countries of dynamic Asia in 2012, targeting environmental objectives (including Rio Conventions)**




*Source*: OECD DAC Creditor Reporting System, Dataset "Aid activities targeting Global Environmental Objectives", http://stats.oecd.org/ (last accessed 21 March 2014).

**Figure 18. Number of bilateral ODA activities and bilateral ODA finance to urban areas in selected countries of dynamic Asia in 2012, targeting environmental objectives (including Rio Conventions)**




*Source*: OECD DAC Creditor Reporting System, Dataset "Aid activities targeting Global Environmental Objectives", http://stats.oecd.org/ (last accessed 21 March 2014).

## 4.6. Building capacity at all levels of government

### *Increasing capacity in national and subnational governments*

Capacity building (at the community, local and national government levels) is necessary for effective implementation of urban green growth in Asian cities. Lack of capacity may result in substantial delays in generating urban green growth. Until now, interest in sustainable public procurement often exceeds uptake in developing countries. This is partly due to limited government capacity to operate sustainable public procurement programmes effectively, equitably and transparently (OECD, 2013c). In 2004 the Philippines government announced a green public procurement policy, but the initiative was not launched until 2012 owing to a lack of technical knowledge and supply, particularly from SMEs that were unable to keep up with demand for environmentally preferable products and services (Manila Bulletin, 2012). In contrast, more than three-quarters of OECD countries have practical guides (such as manuals) and approximately half have training materials or offer advice to procurement officials for building capacity in relation to green public procurement (OECD, 2011d). The Public Procurement Service of Korea launched a green purchasing education course in 2010 and has provided related education to public purchasers by inviting lecturers and organising field trips.

Capacity is defined as "the ability of people, organisations and society as a whole to manage their affairs successfully" (OECD, 2012e). Within the development community, capacity development is generally considered a three-level process that goes beyond technical co-operation and awareness raising at the individual level (OECD, 2012e):

- *Individual capacity* focuses on the individual's competencies and skills, but more importantly on the good use of these competencies to set and achieve objectives. Building individual capacity focuses on "soft" competencies, such as building relationships, trust and legitimacy, as well as "hard" competencies, such as technical, logistical and managerial skills. Another important aspect is capability, which allows individuals to develop their competencies and skills to fit future purposes as the context evolves.
- *Organisational capacity* refers to organisational structures, functions and systems that enable the capacities of individuals to come together to fulfil the mandate of the organisation and to achieve its objectives. Organisational capacity is crucial for ensuring continuity and the preservation of institutional memory, given the high level of staff turnover in many agencies and ministries. For similar reasons, it can also contribute to the improvement of horizontal and vertical governance, which, as mentioned, is essential to create synergies, to encourage knowledge sharing and to avoid conflicting policies.
- *The enabling environment* refers to the policy, legal, regulatory, economic and social support systems in which individuals and organisations operate. The enabling environment is determined by international regimes, national policies, the rule of law, accountability, transparency and information flows.

Capacity development at the organisational and individual levels can be achieved by using a variety of management techniques, analytical and regulatory tools, incentives and organisational structures. For example, it may involve helping people or organisations gain access to knowledge, brokering multi-stakeholder agreements, participating in policy dialogue and creating space for "learning by doing". Knowledge sharing in particular can be central to achieving capacity building in cities, if it is encouraged among city actors (including multilateral donor agencies and international organisations), and across cities. In this regard, collecting information systematically and making information on green growth strategies and instruments publicly available is critical for building capacity in local governments and local communities. Capacity development efforts are most effective when multiple strategies are employed

together, for example by targeting the three levels of the enabling environment, the organisation and the individual (OECD, 2012e) (Table 8). The OECD developed a five-step framework for initiating capacity development initiatives. It is worth exploring how this framework can be applied to capacity development at the city level, bearing in mind that the variety of contexts calls for some flexibility in its application.

**Table 8. Capacity development at three levels**

| | Enabling environment | Organisational level | Individual level |
|---|---|---|---|
| Overall capacity objective | • Develop regulatory frameworks for environmental governance, rule of law and property rights<br>• Improve inter-institutional co-ordination | • Develop organisational performance and environmental management capabilities | • Improve understanding of environment-development linkages<br>• Develop technical skills (e.g. economic and environmental assessment)<br>• Support long-term commitment |
| Examples of specific interventions | • Support legislative, policy and regulatory reforms<br>• Develop guidelines on environmental management<br>• Monitor and review environmental management systems | • Develop internal guidelines on environmental management<br>• Conduct institutional monitoring and evaluation | • Create awareness and provide basic skills development<br>• Provide training on environmental management tools and valuation techniques |
| Cross-cutting intervention | • Raise awareness of the benefits of good practice<br>• Create platforms for debate and policy dialogue among key stakeholders (i.e. professional networks or conferences to review and discuss states of practice)<br>• Improve co-ordination procedures, e.g. on the inclusion of environmental sustainability in government policies<br>• Support pilot projects that test proposed capacity building initiatives<br>• Award schemes that identify and appreciate best practice | | |

*Source:* OECD (2012e), *Greening Development, Enhancing Capacity for Environmental Management and Governance*, OECD Publishing, Paris.

### *Promoting knowledge sharing among international organisations on urban green growth*

Knowledge sharing is relevant not only for capacity building in Asian cities but also for other players, including international organisations. It can help come up with new approaches to urban green growth in emerging Asian countries and cities and eventually improve the performance of urban green growth actions, by sharing knowledge among all the actors involved (Box 7).

**Box 7. Knowledge sharing initiatives on development and green growth**

In the context of green growth and development, the OECD, together with other implementing agencies and networks, aims to share results and facilitate a joint learning process. At least three knowledge-sharing platforms are actively involved:

**1. Green Growth Knowledge Platform (GGKP)**

The Green Growth Knowledge Platform is an initiative launched in 2012 by the Global Green Growth Institute (GGGI), the OECD, the United Nations Environment Programme (UNEP) and the World Bank. Its aim is to identify major knowledge gaps in green growth theory and practice, and to help countries design and implement policies to move towards a green economy. These core partners form the GGKP's governing council. They have a number of knowledge partners, notably institutions and organisations active in areas related to green growth and green economy at the local, national, regional and international levels. GGKP seeks to catalyse knowledge-generating initiatives and programmes with a wide range of research agencies (Including those of the GGKP members and partners), to help build links between research teams, and to encourage funders to commit to new work.

**2. Global Partnership for Effective Development Co-operation**

The Global Partnership for Effective Development Co-operation is a new, inclusive forum. It brings together countries and organisations from around the world that are committed to ensuring that development co-operation is effective and supports the achievement of results. The OECD's direct contribution for the Global Partnership is concentrated in two specific areas:

- Together with the UNDP, the OECD provides secretariat support for the steering committee and the ministerial-level meetings of the Global Partnership.
- Based on its previous experience in the three rounds of monitoring the Paris Declaration, the OECD Secretariat co-ordinates the data analysis of the global monitoring of the Busan commitments.

**3. The OECD's Knowledge Sharing Alliance (KSA)**

The OECD intends to learn more about the policies and practical implications of greening cities in Asia and has offered to build a learning platform together with participants on an equal footing. The Knowledge Sharing Alliance defined by the Strategy of Development adopted in May 2012 can serve as a basis for knowledge sharing in emerging Asia. Its objectives are threefold:

- to open OECD's knowledge, interdisciplinary policy expertise and peer learning networks to partner countries that seek this access;
- to co-produce knowledge through peer learning;
- to establish feedback loops in order to upgrade the Organisation's knowledge, policy instruments, frameworks and skills.

This will result in better-informed analysis and policy options that are more relevant for countries at different stages of development, that are adapted to their contexts and needs, and that will respond better to the complex challenges of today's rapidly changing global context. The OECD has identified four thematic areas in which the OECD has core competencies, adds value to other international efforts, and responds to the demands and needs of developing countries: innovative and sustainable sources of growth; mobilisation of resources for development; governance for development; and measuring progress on development. Knowledge sharing is intended to improve understanding of interconnections, synergies, trade-offs and policy spillovers across these areas.

The Alliance's strategic role would be to promote and transform knowledge sharing into action, make it more visible, and monitor progress and lessons learned by the actors involved. It could serve as interface to promote a more effective and comprehensive collaboration by all platforms, both vertically and horizontally, and support demand from developing countries or clusters of countries. It would have both a strategic and an operational level. Knowledge sharing can take place through knowledge exchanges, sharing of knowledge by clusters of countries and cities, and exchanges of experience and development. Various modalities could be used: [global] forum discussions, a web-based platform; country and thematic studies; workshops and seminars; help desk for punctual requests and referrals; virtual and real networks; and partnerships with organisations, think tanks, etc., in developed and developing countries.

# 5. CONCLUSION: PROPOSED ANALYTICAL FRAMEWORK AND CASE STUDY STRUCTURE

## 5.1. Analytical framework for urban green growth in dynamic Asia

This concept paper emphasises the need for a new framework which takes into account: i) the specific baseline conditions in fast-growing Asian cities, which differ in a number of points from those in OECD cities; ii) the key strategies for urban green growth that stem from these pre-conditions; iii) the areas to which such strategies should be directed; and iv) the enabling strategies fast-growing Asian cities should explore to overcome implementation obstacles. Integrating these elements in the policy context of dynamic Asia will help achieve urban green growth (Figure 19).

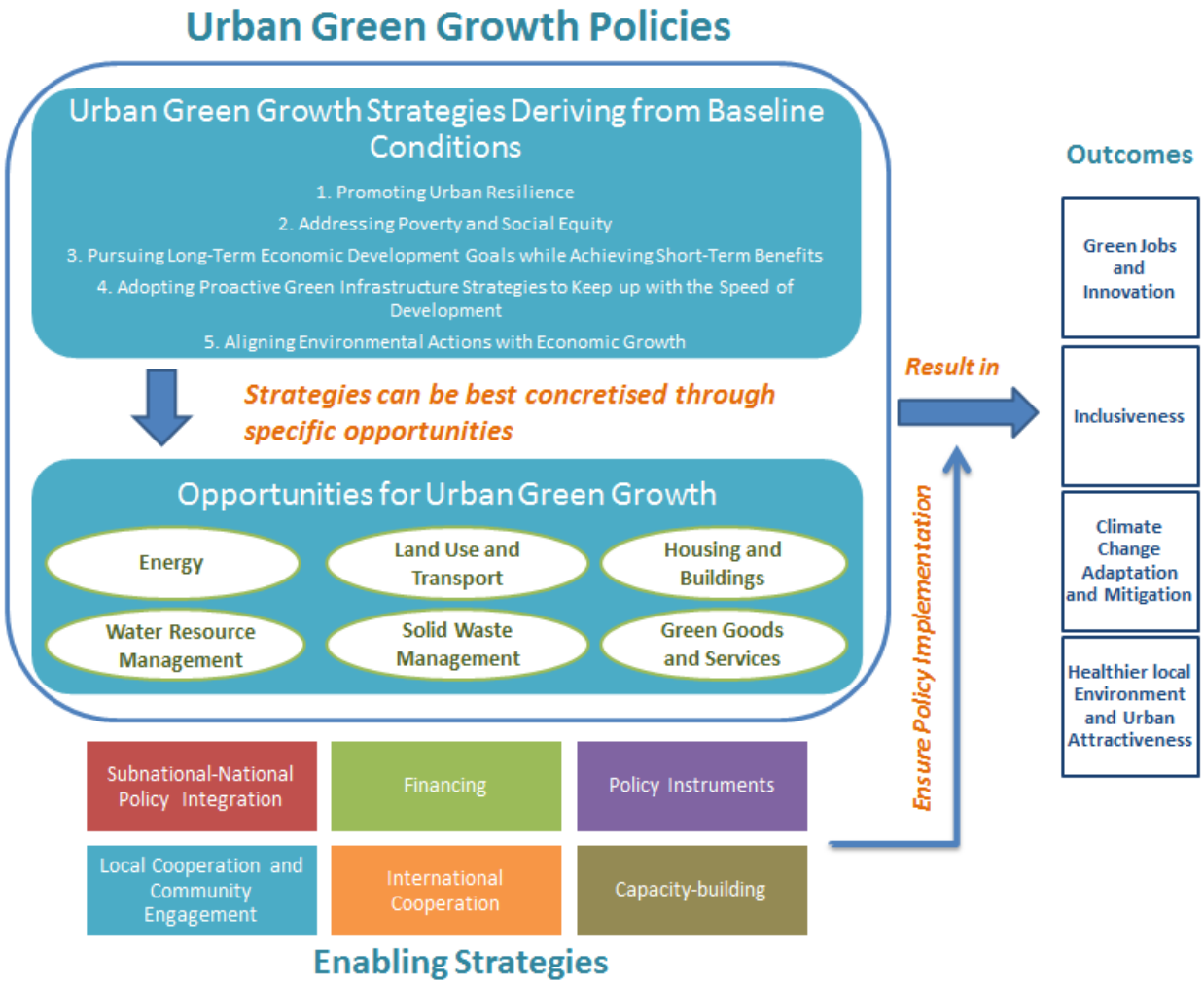
The framework will help connect the urban and policy context of fast-growing Asian cities, strategies and policies for urban green growth, important implementation levers in these cities, and the desired outcomes of strategies and policies in view of the needs of these cities. As the framework shows, the five main strategies developed in the second section of this paper should be considered for urban green growth: promoting urban resilience, addressing poverty and social equity, pursuing long-term economic development goals while achieving short-term benefits, adopting proactive green infrastructure strategies to keep up with the speed of development, and aligning environmental actions with economic growth.

These strategies derive from the baseline conditions observed in fast-growing Asian cities and can be used to define medium- and long-term visions and plans at the local level. These plans and visions can be used to shape actions in specific areas or policy sectors with great challenges but above all great opportunities for green growth. The areas of opportunity are: energy, land use and transport, housing and buildings, water resource management, solid waste management, and green goods and services. Achieving urban green growth requires efforts that involve several or all of these closely interconnected areas of opportunity at the same time. It is also important to emphasise that policy synergies and complementarities, are more easily identifiable at the local level.

To ensure that policies resulting from the translation of these general strategies into specific action are efficient, local governments must in parallel tackle some weaknesses through enabling strategies. It would be particularly relevant to address the following enabling strategies in the context of fast-growing Asian cities: the integration of sub-national action into national green growth and development strategies; innovative and specific policy instruments; financing urban green growth by reducing financing needs and diversifying cities' revenue base; enhancing local co-operation and community engagement; accelerating urban green investment through international co-operation; and finally building capacity at all levels of government. The goal is the full realisation of urban green growth policies, which, if specifically tailored to the local context of Asian cities, can result in outcomes that respond to the cities' needs in terms of efficient consumption of natural resources, reduced local pollution, climate change adaptation and mitigation, economic and social inclusiveness and green innovation.

The analytical framework will serve as a basis for four to six case studies selected among fast-growing Asian cities, in the second step of the project Urban Green Growth in Dynamic Asia (see 5.2 "Case-study structure" below). Case studies will explore the applicability of this framework to the urban policy context of each city and consider room for improvement.

**Figure 19. The proposed conceptual framework for urban green growth in dynamic Asia**




## 5.2. Case-study structure

### *Scope and objective of the case studies*

The OECD project, Urban Green Growth in Dynamic Asia, includes case studies of four to six Asian cities. These case studies will be used to study the impact of urban green growth and sustainability policies on economic performance and environmental quality. They will be chosen on the basis of several criteria: population size, speed of growth, economic structure, personal income levels, centrality of the city in the country's and the region's economy, among others. Each case study will benchmark the city concerned against some 300 OECD and non-OECD metropolitan areas.

The project period of each case study is about 12 months, and the first case study will start in 2014. The results of each case study will be publicly presented in the form of an OECD publication. In this way the lessons learned will be disseminated to local, regional and national governments in Asia and other parts of the world, as well as to international organisations and donors wishing to exploit the green growth potential of fast-growing Asian cities, and to make green growth policy making more effective.

***Report structure***

This section sets out the main elements to be covered in the case studies. They define the structure of the questionnaire that is the basis for each case study. The study will employ a "focused comparison" strategy of case-study research. In essence, this entails asking the same questions for the different city case studies in order to discern similarities that could suggest possible generalisations and lessons learned.[13] The structure of each case study will follow the structure of the concept paper to ensure coherence. Each case study report is expected to have 80-100 pages. It will also be consistent with the case study questionnaire to facilitate legibility. The length of individual sections may vary from case to case, depending on what emerges as important in any given city. However, all the major issues will be addressed for each, to ensure comprehensiveness and ease of comparability.

*i) Economic and environmental trends*

The first element of the case study is concerned with socio-economic, environmental and infrastructure conditions in the functional urban area (FUA). This will help build the general profile of the city, define the specific urban policy context and the needs of the metropolitan area, and connect it, in the following sections, to the urban green growth strategies and policies undertaken by different levels of government. This part will cover:

1. *The socio-economic profile of the metropolitan area.* It will help understand how the pace of urbanisation is correlated with the evolution of economic activity, poverty, social equity and living conditions. It will include an assessment of: *i)* demographic change over time; *ii)* wealth and attractiveness; *iii)* economic performance and diversity; *iv)* the green sector; and *v)* social performance.
2. *The environmental profile of the city, with data on the degradation of the local and global environment and the natural risks faced by the metropolitan area.* This section will include an assessment of: *i)* air quality; *ii)* natural resources; and *iii)* natural man-made disaster risks.
3. *The spatial/infrastructure profile of the city.* Relatively low levels of development of fast-growing Asian cities, compared with OECD cities, and the speed of development of the urban fabric have created specific conditions in terms of physical capital. These need to be examined to understand the scope of the problems and the action needed for urban green growth. An assessment will be made of: *i)* the spatial development pattern; *ii)* energy performance; *iii)* intra-urban transport; *iv)* water management; and *v)* solid waste.

*ii) Key plans and strategies for urban green growth*

The second element of the case study analysis refers to the key strategies (i.e. plans and visions) for addressing the various issues for the metropolitan area revealed in the first step, and will help identify their strengths and weaknesses at the metropolitan level, including obstacles to implementation. The following elements will be covered:

1. *Key metropolitan-wide green growth strategies, plans, or visions to address local conditions.* This section will shed light on the green growth strategies, plans or visions for the metropolitan level and in other cities in the same country.
2. *Key nation-wide development, green growth, and urban strategies, plans or visions.* This section will shed light on the policy framework at the national level, in the context of the national development strategy and in particular from the perspective of urban green growth.

*iii) Assessment of policies for areas of opportunity*

The third element of the case study analysis refers to current policy practices in the six areas specified in the concept paper (i.e. energy, land use and transport, housing and buildings, water resource management, solid waste management, and green goods and services) by different levels of government in the FUA. The impacts of these policies will be assessed:

1. *Current policies in each area of opportunity.* This will give more precise information on the action taken by various authorities and on the policy instruments and tools used to reach goals in each of these areas. It will help to identify gaps between existing opportunities and policy responses. The discussion will include policies relevant to areas other than those specified in the concept paper when necessary.
2. *Policy outcomes.* The impacts of each policy will be analysed in order to assess its effectiveness and identify options for improvement.
3. *Policy synergies and complementarities*. It will be important to assess to what extent the case study cities have integrated several areas of opportunity into policy packages, as such packages can strengthen the impact of urban green growth policies.

*iv) Special chapter to discuss a topic unique to the case study city*

The fourth element of the case study analysis refers to a topic that calls for particular attention for advancing urban green growth in the FUA, such as green R&D and innovation, climate adaptation, inclusive growth, etc. The details will be determined by negotiation with the local team.

*v) Enabling strategies for implementing urban green growth*

Finally, the case study analysis will assess enabling strategies that are particularly relevant to rapidly growing Asian cities. The following elements will be covered:

1. *The connections, mechanisms and instruments between metropolitan and national strategies, plans or visions.* This is particularly important because of the role of national development plans in setting green growth frameworks, aligning actions, and unlocking resources in Asian countries. It will help identify constraints as well as options for improving the metropolitan area's relationship with higher levels of government and its ability to implement its strategy, plan or vision effectively.
2. *Financing urban green growth.* This section will discuss sources of revenue, the expenditure and debt structure, any innovative financing schemes set up by the local government (e.g. PPPs), as well as its financial autonomy from or dependence on national and international funds. Local budget issues and characteristics in relation to urban green growth will also be explored.
3. *Policy instruments used by the local government.* An assessment of the major policy tools used by the city government for each category of policy instrument developed in the concept paper (pricing and regulatory instruments, public procurement, information and convening, and measuring and monitoring) and their implementation by local authorities. This would be useful in assessing the importance of such tools for implementing green growth policies.
4. *Local co-operation and community engagement.* This includes issues related to: *i)* the number and types of jurisdictions in the metro-region; *ii)* the metropolitan governance system; *iii)* the kind and quality of co-operation/collaboration on green growth projects between different departments/agencies in the local government and between local governments in the metro-region; and *iv)* community engagement.
5. *International co-operation.* This will cover urban green growth projects undertaken with the help of multilateral banks/international aid.
6. *Capacity building.* This section will assess capacity policies undertaken for advancing urban green growth.

# NOTES

1. The regional classification used in some places in this paper – notably to cite United Nations' data on Southeast, South and East Asia – follows the United Nations classification, unless otherwise specified. Link: https://unstats.un.org/unsd/methods/m49/m49regin.htm.

2. "Southeast Asia" in this document refers to the ten ASEAN countries plus East Timor, based on the United Nations classification, unless otherwise specified.

3. Of course like the demand for any good, the demand for housing space responds not just to incomes but also to prices. Nevertheless income is a very important factor (Cheshire, 2012).

4. Other forms of emission tend to be more localised and subject to the so-called environmental Kuznets curve, which rises initially as per capita income grows but peaks at around USD 8 000 a year (in 1985 USD) then tends to fall. Grossman and Kreuger (1995) provide perhaps the most widely cited base study; they analysed four pollutants: sulphur dioxide and suspended particulate matter in cities and dissolved oxygen and faecal coliform contamination in rivers.

5. For information on the strategy of New York City (PlaNYC) on water-related risks, see Aerts and Botzen (2011).

6. The Asian Development Bank has developed a set of indicators to measure urban water security.

7. Changing the energy mix from a fossil-fuel-intensive industrial economy to an industrial economy increasingly reliant on less carbon-intensive sources of energy will also be instrumental. In the case of fast-growing Asian cities, however, the rise in energy needs and current inefficiencies in the energy networks make energy efficiency a top priority.

8. Governance is defined as the "formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values in the face of changing problems, actors and environments" (OECD, 2005).

9 . For a detailed discussion on the benefits and challenges of PPPs for LCR infrastructures, see Kennedy and Corfee-Morlot (2012).

10. Public procurement represents 13% of GDP in OECD countries (OECD, 2013g).

11. The selected countries of dynamic Asia are: China, India, Malaysia, Lao PDR, Cambodia, Philippines, Viet Nam, Indonesia and Thailand. Bilateral ODA activities targeting environmental objectives can be identified in a dataset accessible through the OECD statistical website and from the CRS database. This dataset contains commitment data on aid in support of environment sustainability and aid targeting the objectives of the Rio Conventions (biodiversity, climate change mitigation, climate change adaptation and desertification). The main approach to identifying projects committed to urban areas was based on a word search of their purpose name (e.g. "Urban Development and Management"). For all other projects whose purpose name did not allow for deciding whether the project was urban, the "urban" character was identified by looking at each project description. Similarly, the main element used to identify projects committed to rural areas was their purpose name ("Rural Development"). A second step, if the purpose name was not conclusive, was to look at the titles and short description of projects. Agricultural, fishery and forestry projects were classified as rural. The remaining rural projects were identified judging on the basis of their long description. Unspecified projects refer to all other projects, with no detailed description, no details on the geographical scope, or inconclusive geographical scope.

12 As mentioned in the previous note, information on project descriptions often does not directly identify or permit reviewers to conclude on the "urban" or "rural" character of each individual project. In this regard, there is a need for more detailed information at the source, i.e. from OECD DAC members, but also from multilateral institutions, which are not taken into account here. A Joint Task Team of the DAC Network on Environment and Development Co-operation (ENVIRONET) and the Working Party on Development Finance Statistics (WP-STAT) on improvement of Rio markers, environment and development finance statistics was revived in November 2013, is working to increase data coverage and improve activity descriptions in the CRS database. However, the identification of urban objectives is not a priority of the Task Team. Finally, the data presented in this concept paper must be put in perspective, as it only analyses bilateral ODA committed in 2012. The significant figures in terms of share of ODA commitments to urban areas, in comparison to the share of projects committed to urban areas, can be explained by a few massive single investment projects in urban transport.

13. For more detail on the method, its potential and its limitations, see A. George and A. Bennett, *Case Studies and Theory Development in the Social Sciences*, MIT Press, Cambridge, MA, 2005.

# BIBLIOGRAPHY

ADB (Asian Development Bank), Statistical Database, *https://sdbs.adb.org/sdbs/index.jsp*. Last accessed 14 May 2014.

ADB (2008), *Key Indicators for Asia and the Pacific*, "Special Chapter: Comparing Poverty across Countries: The Role of Purchasing Power Parities, Part III: Regional Tables", Mandaluyong City, Philippines.

ADB (2009), *Changing Course: A New Paradigm for Sustainable Urban Transport*, Mandaluyong City, Philippines.

ADB (2012), *Green Cities*, Urban Development Series, Mandaluyong City, Philippines.

ADB (2013a), *Key Indicators for Asia and the Pacific*, Mandaluyong City, Philippines.

ADB (2013b), *Key Indicators for Asia and the Pacific*, "Special Chapter: Asia's Economic Transformation; Where to, How, and How Fast?", 44th Edition, Mandaluyong City, Philippines.

ADB and Asia-Pacific Water Forum (2013), *Asian Water Development Outlook 2013: Measuring Water Security in Asia and the Pacific*, Mandaluyong City, Philippines.

ADB and NUS (National University of Singapore) (2012), *Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future*, Mandaluyong City, Philippines.

Aerts, J., and W. Botzen (2011), "Flood-resilient waterfront development in New York City: Bridging flood insurance, building codes and flood zoning", *Annals of the New York Academy of Sciences*, New York.

Alcacer, J., and W. Chung (2009), "Location Strategies for agglomeration economies" *Journal of Economic Literature*, Harvard Business School.

Ang, G., and V. Marchal (2013), "Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure", *OECD Environment Working Papers*, No. 56, OECD Publishing, Paris, *http://doi.org/10.1787/5k46hjm8jpmv-en*.

Angel, S., Parent J., Civco D., and A. Blei (2011), *Making Room for a Planet of Cities*, *Lincoln Institute of Land Policy*, Cambridge.

APEKSI (2012), *Best Practices of Indonesian Cities*, 8th Edition, Jakarta, Indonesia.

Aschhoff, B., and W. Sofka (2008), *Innovation on Demand – Can Public Procurement Drive Market Success of Innovations*, Discussion Paper No. 08-052, Centre for European Economic Research, Mannheim.

APEC (Asia-Pacific Economic Cooperation) (2013), *Green Public Procurement in the Asia Pacific Region: Challenges and Opportunities for Green Growth and Trade*, APEC Committee on Trade and Investment, Singapore.

Asian Productivity Organisation (2007), "Solid Waste Management, Issues and Challenges in Asia", Tokyo.

Bartlett, S., Mitlin, D., and D. Satterthwaite (2012), "Urban Inequalities", Global Thematic Consultation.

Bicknell, J., Dodman, D., and D. Satterthwaite (2010), "Adapting Cities to Climate Change: Understanding and Addressing the Development Challenges", Earthscan, London.

Bollen, J., Guay B., Jamet S. and J. Corfee-Morlot (2009), "Co-Benefits of Climate Change Mitigation Policies: Literature Review and New Results", Economics Department Working Papers No. 693, OECD

Chan, E. S. (2009), "Bringing safe water to Phnom Penh's city, International Journal of Water Resources Development", *International Journal of Water Resources Development*, 25:4, pp. 597–609.

Cheshire, P. (2012), "A draft Discussion Paper for the OECD: Green Growth in Fast-Growing Asian Cities", Paris. City of Kitakyushu (2012), "Background Paper on the City of Kitakyushu – OECD Green Cities Programme", internal document, City of Kitakyushu, Japan.

Clean Air Asia (2010), "Air Quality in Asia, Status and Trends, 2013 Update", Pasig City, Philippines.

Cole, M.A. (2007), "Economic Growth and the Environment", Ch. 15 in Atkinson, G., Dietz, S. and Neumayer, E. (eds.) *Handbook of Sustainable Development*, Cheltenham: Edward Elgar, UK.

Corcoran, E. C., Nellemann, C., Baker, E., Bos , R., Osborn, D., and H. Savelli (2010), *Sick Water? The central role of wastewater management in sustainable development. A Rapid Response Assessment.* United 260 Green Cities Nations Environment Programme (UNEP), UN-HABITAT, GRID-Arendal, *www.grida.no*.

Corfee-Morlot, J. et al. (2012), "Towards a Green Investment Policy Framework: The Case of Low-Carbon, Climate-Resilient Infrastructure", *OECD Environment Working Papers*, No. 48, OECD Publishing. *http://dx.doi.org/10.1787/5k8zth7s6s6d-en*.

Dubin, J., and D. McFadden (1984), "An Econometric Analysis of Residential Electric Appliance Holdings and Consumption", *Econometrica*, 52, 345-362.

EMBARQ (2013), "Financing Needs for Sustainable Transport Systems for the 21st Century", Background paper presented at the 7th Regional Environmentally Sustainable Transport Forum in Asia, 23-25 April 2013, Bali, Indonesia.

EU Water Initiative (2012), *Pricing Water Resources to Finance their Sustainable Management*, Stockholm.

Evans, A. E., Hanjra, M. A., Jiang, Y., Qadir, M. and P. Drechsel (2012), "Water pollution in Asia: The urgent need for prevention and monitoring", GWF Discussion Paper 1222, Global Water Forum, Canberra, Australia.

Federation of Indian Mine Industries (2013), "India – the next landmark for Mining & Metals", Toronto, Canada.

Firman, T. (2008), "In search of a governance institution model for Jakarta Metropolitan Area (JMA) under Indonesia's new decentralisation policy: old problems, new challenges", *Public Administration and Development*, 28, 4, 280–290.

Firman, T., et al. (2011), "Potential climate-change related vulnerabilities in Jakarta: Challenges and current status", *Habitat International*, Vol.35, pp.372-378.

Galuska, J. (2013), "Community-based approaches toward upgrading of informal settlements: Alternative strategies and recommendations for policymaking", Philippines Institute for Development Studies, Metro Manila.

Gardiner, S.M. (2004), "The Global Warming Tragedy and the Dangerous Illusion of the Kyoto Protocol", *Ethics and International Affairs*, 18 (1), pp. 23–39.

General Statistics Office of Viet Nam website, *http://www.gso.gov.vn/default_en.aspx?tabid=599&ItemID=9788.*

George, A., and A. Bennett (2005), *Case Studies and Theory Development in the Social Sciences*, MIT Press, Cambridge, MA.

Gertler, P., Shelef, O., Wolfram, C., and A. Fuchs (2013), "How Pro-Poor Growth Affects the Demand for Energy," NBER Working Paper 19092, *http://www.nber.org/papers/w19092*.

Global Cool Alliance website, accessed 11/21/2013, *http://www.globalcoolcities.org/?page_id=48*.

Government of Japan (2008), *Kyoto Protocol Achievement Plan*, Ministry of Environment, *http://www.env.go.jp/en/earth/cc/kptap.pdf*

Government of Japan (2010), *Low Carbon City Development Guidance*, Ministry of Land, Infrastructure, Transport and Tourism, *https://www.mlit.go.jp/common/000996971.pdf*

Government of Singapore (2013), *Sustainable Development Blueprint*, *https://app.mewr.gov.sg/data/ImgCont/1292/sustainbleblueprint_forweb.pdf*

GGBP (Green Growth Best Practice) (2014, forthcoming), *Green Growth in Practice: Lessons from Country Experiences*.

GGKP (Green Growth Knowledge Platform) (2013), *Moving towards a Common Approach on Green Growth Indicators*, *http://www.unep.org/greeneconomy/Portals/88/documents/partnerships/GGKP%20Moving%20towards%20a%20Common%20Approach%20on%20Green%20Growth%20Indicators.pdf*.

Hallegatte, S. (2009) "Strategies to Adapt to an Uncertain Climate Change." *Global Environmental Change, Vol.* 19, Issue 2, pp. 240–7.

Hallegatte, S., Green, C., Nicholls, R., and J. Corfee-Morlot (2013), "Future Flood Losses in Major Coastal Cities", Nature Climate Change, Vol.3.

Hammer, S., Kamal-Chaoui, L., Robert, A., and M. Plouin (2011), "Cities and green growth: a conceptual framework", OECD Regional Development Working Papers 2011/08, OECD Publishing, Paris.

Hanson, S. et al. (2011), "A Global Ranking of Port Cities with High Exposure to Climate Extremes", *Climatic Change*, Vol. 104, Issue 1, pp. 89-111.

He, C. and L. Yang (2011), "Urban Development and Climate Change in China's Pearl River Delta", *Land Lines*, Lincoln Institute of Land Policy, *https://www.lincolninst.edu/pubs/dl/1922_1245_LLA_071102.pdf*

Hong Kong Government website, *http://www.gov.hk/en/residents/environment/energy/* (last accessed 5 December 2013).

Hong Kong Trade Development Council website, *http://china-trade-research.hktdc.com/business-news/article/Fast-Facts/PRD-Economic-Profile/ff/en/1/1X000000/1X06BW84.htm.*

Howes, S. and P. Wyrwoll (2012), *Climate Change Mitigation and Green Growth in Developing Asia*, ADBI Working Paper No. 369. http://dx.doi.org/10.2139/ssrn.2103472.

Huang, D. (2007), "Land Banking Mechanism and Its Effects on City Development in China", The University of Hong-Kong.

IBM (2011), "Frustration Rising: IBM 2011 Commuter Pain Survey".

ICLEI (International Council for Local Environmental Initiatives) and IRENA (International Renewable Energy Agency) (2012), "Waste to Energy for More Effective Landfill Site Management".

IEA (International Energy Agency)'s subsidy database, *http://www.iea.org/subsidy/.*

IEA (2004), *Oil Crises and Climate Challenges, 30 years of energy use in IEA countries*, Paris.

IEA (2009), *Gadgets and Gigawatts: Policies for Energy Efficient Electronics*, Paris.

IEA (2010), *Deploying Renewables in South-East Asia: Trends and Potentials*, Paris.

IEA (2012a), *Key World Energy Statistics*, Paris.

IEA (2012b), "Spreading the Net: the Multiple Benefits of Energy Efficiency Improvements", Paris.

IEA (2013), *$CO_2$ Emissions from Fuel Combustion: Highlights*, Paris.

IEA-RETD (2012), *Business Model for Renewable Energy in the Built Environment*, Paris.

IEA Energy Access Database (accessed February 2014), *http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/*

ITDP (Institute for Transportation and Development Policy) (2007), *Bus Rapid Transit - Planning Guide*, New York City.

Jenks, M., et al. (eds.) (2008), *World Cities and Urban Form: Fragmented, Polycentric, Sustainable?*, Routledge, New York City.

Kaminker, C., and F. Stewart (2012), "The Role of Institutional Investors in Financing Clean Energy", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 23, OECD Publishing. http://dx.doi.org/10.1787/5k9312v21l6f-en

Kaminker, C., et al. (2013), "Institutional Investors and Green Infrastructure Investments: Selected Case Studies", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 35, OECD Publishing. http://dx.doi.org/10.1787/5k3xr8k6jb0n-en

Kampa, M. and E. Castanas (2008), "Human health effects of air pollution", *Environmental Pollution*, Vol. 151, pp. 362-67.

Kennedy, C. (2012), calculations (personal communication) adapted by Christopher Kennedy, March 2012, using methodology from Kennedy C., et al. (2009), "Greenhouse Gas Emissions from Global Cities", *Environmental Science and Technology*, Vol. 43, No. 19, American Chemical Society, Washington, DC.

Kennedy, C. and J. Corfee-Morlot (2012), "Mobilising Investment in Low Carbon, Climate Resilient Infrastructure", *OECD Environment Working Papers*, No. 46, OECD Publishing, Paris. *http://dx.doi.org/10.1787/5k8zm3gxxmnq-en*.

Kharas et al. (2011), "What Is the Middle Income Trap, Why do Countries Fall into It, and How Can It Be Avoided?" *Global Journal of Emerging Market Economies*, Volume 3, pp. 281-289, Washington DC.

Kidokoro, T. (2012), "A draft Discussion Paper for the OECD: Green Growth in Fast-Growing Asian Cities", Paris.

Liu, L., and J. Liu (2013), "Why is China the World's Leader of Solar Water Heater Production and Consumption?", American Journal of Environmental Science, Vol. 9 Issue 2, pp. 182-187.

Lundgren, K., and T. Kjellstrom (2013), "Sustainability Challenges from Climate Change and Air Conditioning Use in Urban Areas", *Sustainability*, Vol. 5, pp. 3116-28.

Maclaren, Virginia, Nazrul Islam & Salma A. Shafi (2007) "Solid Waste Management in Asian Cities: Implications for the Urban Poor." In *The Inclusive City: Infrastructure and Public Services for the Urban Poor in Asia*, by A. Laquian, V. Tewari & L. Hanley, pp. 197-223. Washington, DC and Baltimore, MD: Woodrow Wilson Center Press & Johns Hopkins University Press, 2007

Manila Bulletin (2012), "Green Public Procurement Project Launched", Manila Bulletin, Manila, *www.mb.com.ph/articles/348253/green-public-procurement-project-launched*.

Matter, A., et al. (2012), "Improving the informal recycling sector through segregation of waste in the household: The case of Dhaka Bangladesh", *Habitat International*, *http://dx.doi.org/10.1016/j.habitatint.2012.06.001*.

McGranahan, G., et al (2007), "The rising tide: assessing the risks of climate change and human settlements in low-elevation coastal zones", *Environment and Urbanisation*, Vol. 19(1): 17–37. International Institute for Environment and Development.

Meinzen-Dick R., Kameri-Mbote, P., and H. Markelova (2007), Property Rights for Poverty Reduction: 2020 Focus Brief on the World's Poor and Hungry People, IFPRI, Washington, DC.

Merk, O., Saussier, S., Staropoli, C., Slack, E., and J-H. Kim (2012), "Financing Green Urban Infrastructure", OECD Regional Development Working Papers 2012/10, OECD Publishing; *http://dc.doi.org/10.1787/5k92p0c6j6r0-en*.

Metz, B. (2010), *Controlling Climate Change*, Cambridge University Press.

Milanovic, B. (2011), "More or Less: Income Inequality has risen over the past quarter-century instead of falling as expected", *Finance & Development*, Vol. 48, No. 3.

National Bureau of Statistics of China (NBS) (2011), *China Statistical Yearbook 2011*, China Statistics Press, Beijing.

New York City Global Partners Inc. (2011), "Best Practice: Public-Private Partnership for Building Retrofits" (the case of Berlin), New York City.

OECD (2002), "Draft Recommendation of the Council on Improving the Environmental Performance of Public Procurement", C(2002)3.

OECD (2005), *Modernising Government, The Way Forward*, OECD Publishing, Paris, http://www.oecd.org/gov/modernisinggovernmentthewayforward.htm

OECD (2009a), *How Regions Grow: Trends and Analysis*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264039469-en*.

OECD (2009b), *Alternative ways of providing water. Emerging Options and Their Policy Implications*, OECD Publishing, Paris, http://www.oecd.org/env/resources/42349741.pdf

OECD (2009c), "OECD Reviews of Regulatory Reform: China, Defining the Boundary Between the Market and the State", OECD Publishing, Paris

OECD (2010a), *Cities and Climate Change*, OECD Publishing, Paris. *http://dx.doi.org/10.1787/9789264091375-en*

OECD (2010b), *Agricultural Policies and Rural Development: A Synthesis of Recent OECD Work*, OECD Publishing, Paris.OECD (2010c), *Pricing Water Resources and Water and Sanitation Services*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264083608-en*

OECD (2011a), *Towards Green Growth*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264111318-en.*

OECD (2011b), *Regulatory Policy and Governance, Supporting Economic Growth and Serving the Public Interest*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264116573-en*

OECD (2011c), *Towards Green Growth: Monitoring Progress*, OECD Publishing, Paris. *http://dx.doi.org/10.1787/9789264111356-en*.

OECD (2011d), *Government at a Glance 2011*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/gov_glance-2011-en*

OECD (2012a), *Promoting Growth in All Regions*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264174634-en.

OECD (2012b), *Environmental Outlook to 2050*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264122246-en.

OECD (2012c), *Compact City Policy, A Comparative Assessment*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264167865-en

OECD (2012d), *Green Growth in Developing Countries: a Summary for Policymakers*, OECD Publishing, Paris.

OECD (2012e), *Greening Development, Enhancing Capacity for Environmental Management and Governance*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264167896-en

OECD (2013a), *Green Growth in Cities*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264195325-en.

OECD (2013b), *Southeast Asian Economic Outlook 2013: With Perspectives on China and India*, OECD Publishing, Paris, http://dx.doi.org/10.1787/saeo-2013-en.

OECD (2013c), *Putting Green Growth at the Heart of Development*, OECD Publishing. Paris. http://dx.doi.org/10.1787/9789264181144-4-en.

OECD (2013d), Green Growth in Stockholm, Sweden, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264195158-en

OECD (2013e), "Fifth OECD Roundtable of Mayors and Ministers: Building the Future of our Cities, Bridging National and Local Policies", http://www.oecd.org/urban/roundtable/Sessions-at-a-glance.pdf

OECD (2013f), *Green Growth in Kitakyushu, Japan*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264195134-en.

OECD (2013g), *Government at a Glance 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/gov_glance-2013-en

OECD (2014a): *Economic Outlook for Southeast Asia, China and India, Beyond the Middle-Income trap*, OECD Publishing, Paris, http://dx.doi.org/10.1787/saeo-2014-en

OECD (forthcoming a): *Toward Green Growth in ASEAN Countries*.

OECD (forthcoming b), *Green Growth Indicators 2014*.

OECD DAC Creditor Reporting System, Dataset "Aid activities targeting Global Environmental Objectives", http://stats.oecd.org/ (last accessed 21 March 2014).

OECD Regional Database, http://stats.oecd.org/Index.aspx?datasetcode=REG_DEMO_TL2.

OECD and ITF (International Transport Forum) (2010), "Implementing Congestion Charging, Summary and Conclusions", Joint Transport Research Center, Round Table, 4-5 February 2010. http://www.internationaltransportforum.org/jtrc/discussionpapers/DP201012.pdf

OECD, World Bank, United Nations (2012), "Incorporating Green Growth and Sustainable Development Policies into Structural reform Agendas", Report prepared for the G20 Summit (Los Cabos, 18-19 June 2012).

Otaki Y., Otaki, M., and O. Sakura (2007), "Water Systems and Urban Sanitation: a Historical Comparison of Tokyo and Singapore", *Journal of Water and Health*.

Palmer, J., and I. Cooper (2013), *United Kingdom Housing Energy Fact File*, Department of Energy and Climate Change, United Kingdom

Pan, J., Ma, H., and Y. Zhang (2011), *Green Economy and Green Jobs in China: Current Status and Potentials for 2020*, Worldwatch Institute, Washington D.C.

Puga, D. (2010), "The magnitude and causes of agglomeration economies", *Journal of Regional Science*, Volume 50, Issue 1, pp. 203-219.

REN21 (2012), *Renewables 2012: Global Status Report*, Paris.

Roberts, J.T., and B. Parks (2007), *A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy*, MIT Press, Cambridge, MA.

Romer, P. (2012), "Urbanization as Opportunity", presentation to the OECD symposium "What Cities for the next 3 Billion?", OECD, Paris.

Rao, N. (2007), "Cities in Transition: Growth, Change and Governance in Six Metropolitan Areas", Routledge.

Rosenthal, S., and W. Strange (2003), "Evidence on the Nature and Sources of Agglomeration Economies", *Handbook of Urban and Regional Economics*, Elsevier, Edition 1, Volume 4, Number 4.

Rutherford, JD. (2006), *Policy Change in Japan: the Tokyo Metropolitan Government's Regulations of Diesel Emissions*, Stanford University.

Sakamoto, K., and S. Belka (2010b), "Financing Sustainable Urban Transport", Module 1f in *Sustainable Transport: A Sourcebook for Policy-makers in Developing Countries*, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Satterthwaite, D. (2007) "Integrating Adaptation to Climate Change in Decision-Making at the Urban/Municipal Level in Low- and Middle-Income Countries", First draft, Prepared for the OECD Development Assistance Committee, Paris.

Scheinberg, A. et al. (2011), "Assessing Urban Recycling in Low- and Middle- Income Countries: Building on Modernised Mixtures", *Habitat International*, Vol. 35, Issue 2, pp. 188-198.

Schrock, G. (2009), "Career Ladders and Training Gaps in CCAP Workforce Impact Areas: Energy Efficiency, Landscape/Horticulture, and Recycling/Reuse" Report to the Chicago Climate Action Plan Workforce Advisory Committee, University of Illinois-Chicago, Center for Urban Economic Development.

Schrock, G. and E. Sundquist (2009), "Potential Workforce Impacts of the Chicago Climate Action Plan (CCAP): Quantitative and Qualitative Assessments." Report to the Chicago Climate Action Plan Workforce Advisory Committee. Chicago: UIC Center for Urban Economic Development.

Segbers, K. (2007), "The Making of Global City Regions: Johannesburg, Mumbai/Bombay, Sao Paulo, and Shanghai", The Johns Hopkins Univ. Press, Baltimore.

Stern, N. (2008), "The economics of climate change", *The American Economic Review*, 98, p.1-37.

Sugar, L. et al. (2013), "Synergies between climate change adaptation and mitigation in development; Case studies of Amman, Jakarta, and Dar es Salaam", *International Journal of Climate Change Strategies and Management*, Vol. 5 No. 1, pp. 95-111.

Tortajada, C., Joshi, Y., and A. Biswas (2013), "The Singapore water story: Sustainable Development in an Urban City-State", Routledge, London and New York.

UK Department for Transport (2012), *National Road Traffic Survey*: Table TRA0101. Road traffic (vehicle miles) by vehicle type in Great Britain, annual from 1949 to 2010, February, London.

UN DESA (2011a), *World Urbanization Prospects, the 2010 Revision*, New York City.

UN DESA (2011b),"Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas", New York

UN DESA (2012a), *World Urbanization Prospects, the 2011 Revision*, New York City.

UN DESA (2012b), *World Urbanisation Prospects: the 2012 Revision*, New York City.

UN ESCAP (2012), *Statistical Yearbook for Asia and the Pacific, Country Profiles,* Bangkok, Thailand.

UN ESCAP, KOICA (2012), *Low Carbon Green Growth Roadmap for Asia and the Pacific*. "Urban Transport: policy recommendations for the development of eco-efficient infrastructures", Bangkok, Thailand.

UN HABITAT (2009), *Urban Development, Biodiversity and Wetland Management*, Fukuoka, Japan.

UN HABITAT (2010), *The State of Asian Cities 2010/11*, Fukuoka, Japan.

UN HABITAT (2012a), *Sustainable Urbanization in Asia: A Sourcebook for Local Governments*, Fukuoka, Japan.

UN HABITAT (2012b), *Sustainable Urban Energy, A Sourcebook for Asia,* Fukuoka, Japan.

UNECA (United Nations Economic Commission for Africa) (2004), *Land Tenure Systems and their Impacts on Food Security and Sustainable Development in Africa*, United Nations Economic Commission for Africa, Addis Ababa.

UNEP (2012), *Sustainable Public Procurement Implementation Guidelines*, Paris, France.

UCLG (United Cities and Local Governments) (2010a), *Local Government Finance: The Challenges of the 21st Century*, Second Global Report on Decentralization and Local Democracy, Barcelona.

UCLG (2010b), "Surabaya, Indonesia: Green and Clean Initiative", Barcelona.

United States Environmental Protection Agency (2009), "Air Quality Index: a Guide to Air Quality and Your Health", *http://www.epa.gov/airnow/aqi_brochure_08-09.pdf*

Vanderheiden, S. (2008), "Introduction", in S. Vanderheiden (Ed.), *Political theory and global climate change*, MIT Press, Cambridge MA.

Viguie, V. and S. Hallegatte (2012), "Trade-offs and Synergies in Urban Climate Policies", *Nature Climate Change*, 2, pp. 334-337.

Warnest, M., Sagashya, G., and E. Nkurunziza (2012), Emerging in a Changing Climate – Sustainable Land Use Management in Rwanda, FIG (International Federation of Surveyors), www.fig.net/pub/fig2012/papers/ts07f/TS07F_warnest_sagashya_et_al_5991.pdf

World Bank, World Development Indicators, *http://data.worldbank.org/data-catalog/world-development-indicators.*

World Bank, (2011), "Lessons in Urban Sanitation Development: Indonesia Sanitation Sector Development Program 2006-2010" Water and Sanitation Program, Washington DC.

World Bank (2012), *Inclusive Green Growth, the Pathway to Sustainable Development*, Washington DC.

World Bank (2013), *Transforming Cities with Transit*, Washington DC.

WEF (World Economic Forum) (2010*), Green Investing 2010: Policy Mechanisms to Bridge the Financing Gap*, WEF, Geneva.

WHO (World Health Organisation) Ambient (Outdoor) Air Pollution Database by Country and City (2014), *http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/*

Zhao, P. (2010), "Sustainable urban expansion and transportation in a growing megacity: Consequences of urban sprawl for mobility on the urban fringe of Beijing", *Habitat International*, 34 (2010) 236–243.