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Foreword

Urban issues have emerged as key features on national policy agendas. The importance of cities and their corresponding metropolitan areas to the national economy makes them key players in the international marketplace. This in turn leads governments to renew their support to cities. At a time of increasing globalisation and international competition for investment, urban regions have become the target of a wide range of public interventions. Throughout OECD member countries these policies encompass plans to solve traditional urban problems – urban sprawl, abandoned districts, and poverty – and newer issues such as competitiveness strategy, city marketing, environmental sustainability, and innovation.

The series on National Urban Policy Reviews *(NUPR) responds to a demand from member countries voiced at meetings of the Territorial Development Policy Committee and aims to analyse the role of urban areas in regional development and national performance. National reviews are a leading feature of the OECD's mandate and examine macroeconomic, educational, industrial, tax, environmental and regional development policies, in addition to other areas of interest to the Organisation. The* OECD National Urban Policies Reviews *seek to provide a comparative synthesis of urban policies in OECD countries, focusing on the role of central governments.*

A National Urban Policy Review *provides a comprehensive assessment of a country's urban policies as seen through multiple lenses, including economic, social and environmental. First, the reviews focus on the policies designed and introduced by the central government that directly address urban development and regional development policies with an urban development focus. Second, the reviews analyse how national spatial planning for urban regions along with specific sectoral policies may indirectly impact urban development. Indeed, often public policies are designed in such a way that they target sectoral objectives with little or no regard for their profound impact on urban areas. Third, the reviews address issues of governance, including inter-governmental fiscal relationships and the various institutional, fiscal and policy tools aimed at fostering co-ordination on urban development among different layers of government and among different administrations at the central level. For instance, ineffectiveness in public service delivery and other policy areas have in part been related to fragmented urban government structures. From country to country the* OECD National Urban Policy Reviews *follow a consistent methodology that will feature cross-national comparisons and recommendations on the integration of sectoral policies into urban development policy and planning.*

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Table of Contents

Acronyms and Abbreviations 11

Assessment and Recommendations 13

Chapter 1. **Trends and Challenges in Korea's Urban Structure** 23
Introduction 24
1.1. Macroeconomic trends 25
1.2. Urbanisation trends 33
1.3. Economic performance and main challenges of Korean cities 51
1.4. Cities as the centre of environmental concerns 69
Notes 87
Bibliography 88
Annex 1.A1. Zipf's Law and *q*-value of Korean Cities 92

Chapter 2. **National Policies for Urban Development in Korea** 97
2.1. An ongoing reform of Korean national urban policy 98
2.2. Strengthening the co-ordination and coherence of Korean urban policy: four policy priorities 105
Notes 126
Bibliography 129
Annex 2.A1. Methods to Monitor the Effectiveness of Planning 132

Chapter 3. **The Korean Green Growth Strategy and its Implementation in Urban Areas** 133
3.1. The Korean green growth strategy and the role of local governments 135
3.2. Challenges to advance an Urban Green Growth Agenda 161
Notes 177
Bibliography 178

Tables

1.1. Korea: fiscal stimulus indicators (2008) 30
1.2. Population density comparison 34
1.3. Different definitions of urban areas in a selection of OECD countries 39
1.4. Classification of functional urban areas in Korea 46
1.5. The *q*-values of Pareto distribution in Korean cities (1970-2009) 47
1.6. Population and GDP of Korean cities 54

1.7. Employment and demographic trends in large cities in Korea 56
1.8. Employment changes in medium-sized cities in Korea 57
1.9. Employment changes in large cities in Korea 58
1.10. Korea: annual employment growth in large cities 59
1.11. Korea: employment changes in medium-sized cities 59
1.12. R&D expenditures in seven metropolitan cities relative to the nation (2009) . . 62
1.13. Patent applications in seven metropolitan cities relative to the nation (2009) . . . 62
1.14. Korea: share of elderly population in cities 65
1.15. Korea: Number of households falling short of minimum housing standards, sorted by age of head of household (2000 and 2005) 66
1.16. Korea: municipal expenditures of growing and declining cities 67
1.17. Korea: top five cities in terms of share of foreign population (2010) 68
1.18. Total final energy consumption in Korea, by sector (1980-2009) 70
1.19. Energy consumption in metropolitan cities and provinces (*do*) (2009) 71
1.20. Air pollutant emissions in Korea 73
1.21. Trends in total air pollutant emissions by region 73
1.22. Comparison of selected air pollutants in international cities 74
1.23. Korean cities with the highest observed concentration of air pollutants (2008) 74
1.24. International comparison of average engine size of automobiles, Korea and the European Union 79
1.25. Comparison of energy consumption by size of vehicle engine 79
1.26. Rising sea levels observed at key Korean ports 85
1.A1.1. The *q*-value and primacy indicators of major countries 95
2.1. National urban policy goals and strategies suggested by the MLTM 103
2.2. Enterprise cities in Korea 105
2.3. Innovative cities in Korea 105
2.4. Ministries and levels of government engaged in regional and urban policy in Korea 107
2.5. Thematic categories of trans-border co-operation in OECD countries 121
2.6. Deviation rate between proposed and approved population of the urban master plan in 31 cities 123
3.1. Strategic objectives of Korea's Five-Year Plan for Low-Carbon, Green Growth (2009-13) 136
3.2. Budget allocation of Korea's Five-Year Plan for Low-Carbon Green Growth . . 137
3.3. Local green growth plans in Korea 140
3.4. Local actions for green growth 142
3.5. Industries identified as new growth engines for the Korean economy 147
3.6. Governance gaps for delivering green growth in Korean cities 170

Figures

1.1. GDP per capita in selected OECD countries 26
1.2. Korea: value added by activity (1996-2009) 27
1.3. OECD selected countries: value added in services (1990) 28
1.4. OECD selected countries: value-added in services (2008) 29
1.5. Selected OECD countries: relevant indicators during the recent economic downturn 31
1.6. Korea: exchange rate, real exports and real GDP (2008-09) 32

1.7. Contribution of Multi-Factor Productivity (MFP) and capital deepening to labour productivity . . . 32
1.8. Components of productivity growth in Korea (1992-2008) . . . 33
1.9. Trends in urbanisation (1950-2010) . . . 35
1.10. Urbanisation pattern curve . . . 36
1.11. Annual urban population growth rate, 1950-2010 . . . 37
1.12. Korea's local government system . . . 43
1.13. Territorial map of Korea . . . 44
1.14. Urban functional areas of Korea in 2010 . . . 45
1.15. Urbanisation in OECD countries using the UN typology . . . 46
1.16. Urbanisation in OECD countries using the OECD regional typology . . . 47
1.17. Population rank changes of Korean cities . . . 48
1.18. Population distribution changes of Korean cities . . . 49
1.19. Changes of population share of 100 Korean cities . . . 50
1.20. GDP and urbanisation share in Korea . . . 51
1.21. GDP growth rate and urban population growth rate in Korea . . . 52
1.22. OECD selected metro-regions: share of metro-regions in national GDP (2007) 53
1.23. Regional contribution to employment growth . . . 55
1.24. Share of population aged 25-64 with tertiary level of education in OECD countries (2007) . . . 61
1.25. Tertiary education attainment share and population growth rate of Korean cities . . . 62
1.26. Selected OECD metro-regions: share of total national patents (2009) . . . 63
1.27. Urban growth rate and total fertility rate in Korea . . . 64
1.28. Share of elderly people and population growth . . . 66
1.29. Selected countries: projections of old-age dependency ratio, 2000-50 . . . 67
1.30. Trends in energy intensity among selected OECD countries (1971-2007) . . . 70
1.31. Total energy consumption (2008) and CO_2 emissions (2006), by region . . . 71
1.32. Per capita CO_2 emissions in select Asian cities . . . 72
1.33. Trends in air pollution concentration in selected Korean metropolitan cities and *si* . . . 75
1.34. Concentration of daily nitrogen dioxide (NO_2) in select cities . . . 76
1.35. Concentration of daily sulphur dioxide (SO_2) in select cities . . . 76
1.36. Concentration of daily suspended particulate matter in select cities . . . 77
1.37. Regional economic performance and vehicle ownership in Korean cities . . . 79
1.38. Urban sprawl of the Seoul Metropolitan Area . . . 80
1.39. Waste generation trends in Korea . . . 81
1.40. Daily municipal and industrial waste generation levels in Korean metropolitan cities and provinces (2009) . . . 82
1.41. Per capita waste generation in select cities . . . 83
1.42. Sewage system supply rate in Korea, by region . . . 83
1.43. Per capita water consumption in select cities . . . 85
1.44. Rising average temperatures in Korean cities . . . 86
1.A1.1. Zipf's law and actual population of some countries . . . 93
2.1. Regional development strategy in the second revision of the *Fourth Comprehensive National Land Plan* . . . 101

2.2. Four policy direction suggestions for Korean national urban policy 106
3.1. Self-reliance ratio of finances in Korean metropolitan/*do* regions (2010) 174
3.2. Funding sources for local green growth plans (2009-13) 175

Acronyms and Abbreviations

ADU	Accessory dwelling units
CBD	Central Business District
CCC	Committee on Climate Change
CDC	Caisse des dépôts et consignations Deposit and Loans Fund (France)
CIADT	*Le comité interministériel d'aménagement et de développement du territoire* Interministerial Committee for National Planning and Development (France)
CIP	Climate Integration Programme (United Kingdom)
CNLP	Fourth Comprehensive National Land Plan
CoE	Centre of expertise
CPT	Comprehensive Property Tax
CPUC	California Public Utilities Commission
DATAR	*Délégation Interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale* Interministerial Delegation for Territorial Development and Regional Attractiveness (France)
DLS	Daily Living Spheres
ECC	Economic Co-operation Council
ERDP	Economic Regional Development Plan
ETBI	Environmental Technology Business Incubator
FEZ	Free Economic Zone
FIRST	Financing Initiative for Renewable and Solar Technology
GERD	Gross domestic expenditures on research and development
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIR	Greenhouse Gas Inventory and Research Centre
GIS	Geographic Information System
GRP	Gross regional product
GTF	Gas Tax Fund
IBD	International Business District
ICT	Information and communication technologies
IR	Intermediate Regions
KAIST	Korea Advanced Institute of Science and Technology
KEITI	Korea Environmental Industry and Technology Institute
KLIMP	Climate Investment Programme (Sweden)
KOICA	Korean International Co-operation Agency
KSO	Korea Statistics Office
KTX	Korea Train Express
KUT	Korean University of Technology

LEZ	Low Emission Zone
LIDC	Localised Industry Development Centre
MER	Mega-economic regional zones
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Japan)
MLTM	Minister of Land, Transport and Maritime Affairs
MOE	Ministry of Environment
NLPUA	National Land Planning and Utilisation Acts
NURI	New University for Regional Innovation
ODA	Official Development Assistance
PCGG	Presidential Committee on Green Growth
PCRD	Presidential Committee for Regional Development
PPP	Purchasing power parity
PPPs	Public-private partnerships
PR	Predominantly Rural
PU	Predominantly Urban
R&D	Research and development
ROI	Return on investment
S&T	Science and technology
SHW	Solar Hot Water
SMBA	Small and Medium Business Administration
TOD	Transit-oriented development
VAT	Value added tax (sales tax)
VKT	Vehicle kilometres travelled
ZFU	Urban Free Zone

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Assessment and Recommendations

Among the fastest growing economies in the world

Korea has proven itself to be one of the world's fastest-growing countries, despite few natural resources and constant demographic pressures within a relatively small territory. Highly compressed economic growth since the 1960s propelled Korea to bring its per capita GDP to the level of developed countries. This strong economic performance has been supported by economic development strategies that have successfully evolved over time to adapt to changing priorities and global conditions. Total GDP was approximately USD 1 344 billion in 2008 (converted to Korean University of Technology PPP), while estimated national income per capita was about USD 27 000 in PPP in 2009, slightly below the OECD average. Korea has also consistently shown resilience to recent economic shocks, including the 1997 Asian financial crisis and the 2009 global economic crisis. It has been one of the first OECD countries to show signs of recovery from the most recent crisis, thanks to the implementation of a large fiscal stimulus package composed of additional public expenditures (3.2% of GDP) and tax cuts. However, a high level of household debt, exceeding 150% of household income, the heavy dependence of domestic consumption on imports, relatively low levels of labour productivity, and an ageing workforce have been identified as potential threats to Korea's continued economic success.

Economic development has been correlated with rapid urbanisation…

Korea's economic development since the 1960s has gone hand in hand with fast and unprecedented urbanisation. As industrialisation has advanced, more labour forces and capital have been absorbed into urban areas. Indeed, since the modernisation of the Korean economy, the shares of urbanisation and industrialisation have been strikingly and consistently correlated. While the real GDP of Korea increased almost 16 times between 1970 and 2009, its share of urbanisation also doubled during the same period, from 40.7% to 81.9%. As one of the most dense and urbanised countries in the world, its population density has consistently ranked highest among OECD countries since the 1970s. Further, Korea's population is increasingly concentrated in urban areas. While the percentage of the global population residing in urban areas increased from 33% to 51% between 1960 and 2010, Korea's share of urban residents jumped from nearly 28% to 83%, during this period. The country's urbanisation trajectory since the 1960s shows urbanisation patterns similar to those of developing countries, but more recent trends indicate that its current rate of urbanisation is comparable to trends in developed countries.

… and fuelled by large cities, especially Seoul

Urbanisation has taken place in a strongly polarised pattern. Most of the population increase and economic growth has occurred in a preponderance of large cities and their surrounding areas. In 2009, seven metropolitan cities, including Seoul, Busan, Daegeon, Incheon, Daegu, Gwangju and Ulsan, generated roughly 46% of national GDP and accounted for an equal share of the national population. The Capital Area, comprised of Seoul, Incheon and Gyeonggi-do, exerts an overwhelming influence in the Korean economy, representing 48.7% of Korea's GDP, 49% of its population, 46.8% of its firms and 49.6% of all jobs in 2009. In turn, the provinces of Gangwon, Chuncheongbuk, Jeollabuk and Jeju, which do not include any metropolitan cities and are comprised of large rural areas, continue to show a limited contribution to national GDP and employment. The emergence of some mid-sized cities is also of note. The population growth rate of mid-sized cities has surpassed that of large cities since 1990, and employment growth has steadily increased, particularly in cities with a strong manufacturing base. Unlike large and mid-sized cities, however, most small cities have experienced population loss, further reinforcing unbalanced growth patterns.

Unbalanced education attainment and demographic change may constrain Korea's future competitiveness…

Korea's overall progress in tertiary education attainment has been unprecedented among OECD countries, but advancement has not been uniform. While large cities have registered the greatest advances, cities with annual population growth rates lower than the national average tend also to register below-average rates of attainment in tertiary education. As a result, a shortage of human capital in smaller and/or lagging cities may threaten these areas' long-term competitiveness. Further, demographic changes are under way that will place increasing pressure on the labour force in general, and urban areas in particular. Over the past three decades, the share of Korea's elderly population has increased sharply, and the ratio is expected to exceed 14% by 2013. Korea is expected to become a "super-aged society" by 2026, according to Korea's National Statistical Office. Along with the accelerated ageing rate, low fertility rates will also contribute to the shrinking of the labour force. Between 2000 and 2005, the fertility rate in Korea had fallen to an average of 1.2 births for women of child-bearing age, less than half of the global average (2.7 births). Currently, given that the percentage of foreign skilled labour and the participation of female workers are well below the OECD average, the labour force will probably need to be supplemented with domestic or international workers.

The country faces increasing environmental pressures…

Korea's economic model and rapid growth over the past four decades, underpinned by a highly urbanised spatial form, have led to increased resource consumption and put growing pressure on the environment. Higher living standards, rapid urbanisation and an expanding industrial sector have made Korea one of the most energy-intensive economies and, in 2008, the tenth-largest energy consumer among OECD countries. Energy

consumption in the industrial sector, in particular, increased by 506% between 1980 and 2009 and continued to account for the largest share (nearly 58%) of total energy consumption. Producing less than 20% of its total primary energy supply, Korea depends heavily on foreign imports of oil and gas to meet national energy demand. As such, it is more vulnerable to fluctuations in international oil prices. The country's high levels of energy consumption have also been closely linked with rising levels of greenhouse gas emissions. Korea's greenhouse gas emissions almost doubled between 1990 and 2005, the highest growth rate in the OECD area. Concerns also exist that increasing air pollutants may degrade the environmental value in Korea, and especially in urban areas. Despite the implementation of strict regulations on air pollution since the late 1990s, air quality in Korean cities remains poor compared to other OECD countries. The Capital Area has the largest share, accounting for nearly one-third of all air pollutants in 1999 and again in 2007, reflecting its high concentration of population, infrastructure and transportation.

… resulting from the transportation and building sectors in particular

These growing environmental concerns underscore the need for Korean policy makers to target interventions in the transportation and building sectors. Together, these sectors comprise roughly 40% of the country's total energy consumption, after the industrial sector. Energy consumption in the transport section increased tenfold between 1980 and 2009, to 19.7% of the country's total consumption, sector, due in part to a 3 285% jump in vehicle registration applications during this period. As a result, CO_2 emissions have risen sharply (157% over the same period). There is also scope to reduce energy consumption in the building sector by improving the energy efficiency of buildings. Urban sprawl is a key concern among policy makers, and could be addressed through integrated land use and transportation planning. Despite progress in waste and water management, cities from heavily industrialised regions still generate high levels of waste, though waste recycling has improved, albeit unevenly, in cities. Disparities in access to clean water can be observed between large cities and rural areas. Finally, climate change impacts, including rising sea levels and temperatures, increasing precipitation and rising surface temperatures, also pose a significant threat to Korea's urban population, infrastructure and economic well-being. Korea, surrounded on three sides by the sea, has a large number of cities that rely on the sea for the fishing industry and the development of coastal areas for tourism, housing and port operations.

Urban policy has evolved over time to promote urban competitiveness

These socio-economic and environmental challenges threaten the competitiveness of many of Korea's cities and national urban policy will be required to adapt to changing conditions and priorities, as it has done with relative success in the past. While the industrial modernisation strategy of the 1960s-80s centred on polarised growth poles was effective in encouraging economic and industrial development, it nevertheless resulted in an over-concentration of population and industry in a few large cities, notably Seoul. This in turn led to shortages in housing and infrastructure, as well as urban sprawl. In the 1980s and 1990s, national urban policy objectives shifted to decentralise the Capital Area and

support more balanced territorial development. A second wave of reform occurred in the 2000s, with the adoption of the Fourth Comprehensive National Land Plan, signalling a shift in urban policy toward more qualitative urban development and a goal of maximising urban competitiveness. The Plan divides the country into seven mega-regional economic zones, which are linked with and complemented by supra-economic regions and 161 daily living spheres. Nevertheless, Korea's new three-tiered territorial framework could be limited unless the government assists in building co-operative programmes that are significant in terms of budget and economic impact.

Yet efforts are needed to improve policy co-ordination and coherence among ministries…

Policy co-ordination across central governments and between central and local governments could be enhanced in Korea. Despite the wealth of initiatives to foster the competitiveness of urban areas, Korean urban policy typically exhibits a certain lack of co-ordination at both the ministerial and local levels and would benefit from the development of a more comprehensive, multi-sectoral approach to urban development. As in many OECD countries, an integrated approach to urban development in Korea has been stymied due in large part to the fragmentation of administrative mandates across a range of central ministries. The Presidential Committee for Regional Development (PCRD) emerged in 2008 as the main national body for resolving inter-ministerial issues, yet lacks the statutory powers to enact policies and determine priorities among matters administered by a range of independent ministries. To foster the development of a co-ordinated national strategy, Korea could consider establishing an interministerial regional development agency at the national level to implement the regional policy of the government, similar to the *Délégation Interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale* (DATAR) in France. Its task would be to co-ordinate and implement the regional policy of the government. It could also help to promote the internationalisation and competitiveness of Seoul and other large cities.

… and local governments

Co-operation among local governments has historically been weak in Korea, as local governments have tended to see each other as competitors, rather than partners, in urban development. The proliferation of separate plans to guide spatial planning, economic development and sectoral development at the sub-national level have further hindered an integrated approach to urban development. To improve inter-municipal policy co-ordination, local resources could be pooled to deliver urban services including transport, training and urban regeneration, based on an urban functional area (rather than administrative boundaries). The development of a "micropolitan" scale, similar to the metropolitan statistical area in the United States, could be a useful tool for reinforcing inter-municipal partnerships among Korea's 161 daily living spheres. As in many OECD countries, developing city networks and delivery agreements by mandating or incentivising contractualisation at the metropolitan or micropolitan levels could also be applied to Korea. Various approaches to inter-municipal contractualisation (particularly the introduction of multi-sectoral contractual procedures at the metropolitan level) have been successful in France, Switzerland and Canada.

Urban policy will need to adapt to changing demographic conditions…

Urban policy could also be reformed to adapt to demographic trends, notably an ageing and more ethnoculturally diverse population. Public expenditures will be under pressure to expand in order to provide appropriate health services for the elderly, posing an increasing financial burden on urban areas, especially in declining cities, which generally have a higher share of elderly residents and suffer from limited financial revenues. Changes will also be needed at the level of housing, the built environment and transportation policy to adapt to a growing senior population. The Korean government could increase the supply of independent senior housing, as has been attempted in Japan. Zoning regulations could be modified to permit small, vacant spaces for construction projects for the elderly, as in Denmark and Sweden, or to allow accessory dwelling units, as in Portland. Transportation policy could be adapted to take into account the fact that the elderly typically travel shorter distances. Strategies could be pursued to facilitate alternative service provision to the elderly, calling on voluntary organisations to provide services to seniors and equipping the elderly with information and communication technologies to bring services closer to home. To better incorporate the growing immigrant population into the urban economy, the government could adopt measures that encourage immigrant entrepreneurship, promote cultural diversity and incorporate ethnocultural elements into urban design, as has been pursued in Sydney, Australia, and elsewhere.

… and tailored to the needs of different cities

National urban policy in Korea could be refined to become more flexible and tailored to the specific aspects of different cities. Urban policies could be developed in consideration of the differences in city size, geographical characteristics and economic performance. Seoul, as the driver of the country's global competitiveness, should be the subject of a specific urban strategy. To enhance the competitiveness of the Capital Area, policy intervention at both the state and metropolitan level would need to address the negative externalities of agglomeration, including high density and heavy congestion costs, and intense competition in both low- and high-tech industries from other countries with lower labour costs. The competitiveness of large cities outside the Capital Area with high growth potential could be enhanced by improving innovation capacity and integrating the innovation policies of central cities with their hinterlands. France's experience with the competitiveness poles and Finland's development of eight large city-regions outside Helsinki could provide useful benchmarks. To regenerate the economic functions in lagging cities, particularly those of many small- and medium-sized cities, policies could look beyond past regeneration projects that focused solely on housing construction and instead develop lively urban spaces that restore economic value, improve public and community services and assist local residents in business creation, as experiences in the UK have demonstrated. Facilitating cross-border co-operation at the urban level could also help to enhance the competitiveness of cities.

To improve planning outcomes, Korea could make greater use of urban modelling…

As in many OECD countries, urban planning does not always generate the expected outcomes, particularly in areas where development pressure is high. For instance, target populations are often over-estimated in order to secure additional budget resources from the central government, leading to overdevelopment and overinvestment in certain areas. Further, it is often difficult to assess whether the long-term strategic plans in Korea have their intended impact, due in part to a weak link between planning, implementation and monitoring – a challenge faced by many OECD countries. In order to close the gap between the expected and actual outcomes of urban plans and policies, Korea could consider increasing the use of modelling as a means of testing potential policy outcomes prior to policy implementation. An urban modelling exercise applied to the Capital region, for instance could be used as a tool to help policy makers make more informed decisions about spatial infrastructure. These types of exercises require that more geospatial data be made available to local governments. While the Korean government is currently establishing national spatial data infrastructure, further improvements could be made to update the data and generate historical data (*e.g.* the National Historical GIS in the US and the Great Britain Historical GIS in the UK).

… and ex post *evaluation*

To improve the continued relevancy of municipal urban plans and ensure that plans meet expected outcomes, the Korean government could provide technical assistance to local authorities to measure plan implementation and compliance. Methods might include conformance-based approaches, such as the application of a "planning monitor" to measure the extent to which the goals and the objectives of the plan are met. Developing indicators to measure "effectiveness" and "relevance" of municipal urban plans could be useful to assist the national government in understanding current urban spatial structure and assessing the policy impacts on urban competitiveness. The guidelines for planning evaluation established by the United Nations Human Settlement Programme, as well as the experience of Portland, Oregon (United States) may prove instructive.

The first country to produce a comprehensive national green growth strategy…

Korean urban policy has also permeated cross-cutting policy issues, such as green growth. In the midst of a global financial crisis that revealed the limits of the traditional Korean growth model and as a response to growing economic and environmental pressures, Korea launched the *Green New Deal* (2008), a stimulus package of USD 38.5 billion, followed by the *National Strategy for Green Growth up to 2050* (2009). These flagship initiatives signalled a new growth paradigm to guide long-term economic development. The strategy, which aims to mitigate climate change, create new engines for economic growth and improve quality of life, marks a shift from Korea's historically quantity-based consumption model, dependent on a highly energy-intensive industrial sector, to a quality-based model centred on green technological advancement and low-carbon production from renewable energy sources. The Strategy is accompanied by a Five-Year Plan, which identifies specific policies,

quantifiable objectives and concrete projects designed to meet the objectives of the national strategy, and includes explicit allocations from the national budget to meet each objective. Over half of the plan's budget (KRW 61 trillion) is allocated to two major national infrastructure projects: the ongoing expansion of Korea's high-speed rail network and the Four Major Rivers Restoration project.

… with an explicit urban dimension

The effectiveness of Korea's green growth agenda will largely hinge on the contribution of urban areas toward more sustainable, greener growth. The nationally led, top-down institutional approach to green growth in Korea, co-ordinated by the Presidential Committee on Green Growth (PCGG), is compelled to incorporate an urban dimension, given the key economic role and environmental footprint of cities. Legal and institutional frameworks have been established to implement the National Strategy for Green Growth at the local level. Preliminary evidence suggests that the National Strategy has been effective in spurring green growth actions at the local level. For instance, the national government's commitment to cut greenhouse gas emissions by 30% relative to the projected level in 2020 has spurred a number of metropolitan city and provincial (*do*) governments to set their own emissions reduction goals and to establish local greenhouse gas inventories. Several demonstration projects have been launched to invest in renewable and clean energies or develop green technologies. Some local governments have also taken an active role in raising public awareness on green growth, for instance encouraging a network of volunteers to spread a low-carbon lifestyle, which now exists in over 200 cities and lower levels of government.

Stronger outcomes could be achieved by greening transportation…

Given that the implementation of Korea's National Strategy for Green Growth is still in its early stages, a robust assessment of its economic and environmental impacts would be premature. Nevertheless, several preliminary recommendations could be made in order to enhance green growth outcomes at the local level. The transportation sector could be further "greened" via the expansion of market-based instruments, such as fees, tariffs, taxes or tradable permit schemes. Local governments could consider implementing parking policies in highly congested zones that differentiate pricing based on resident and non-resident status, location, time of day and/or types of vehicle. Combining disincentives for private vehicle use with incentives for alternative modes (*e.g.* public transit, walking and cycling) could be effective. Seoul's limited congestion charge could be expanded to other areas of Seoul, and to other cities, provided that complementary measures (such as improvements to public transport) are pursued to increase political acceptability. Further, market-based instruments could be combined with a non-market-based approach. Flexible zoning regulations that limit vehicle access (or the access of certain types of vehicles, such as heavy trucks) in congested zones could be implemented. Governments could commit to invest revenues from other fines into public transportation improvements and urban amenities. Finally, transit-oriented development (TOD) projects, which emphasise higher density and mixed-use development, could be more actively pursued and combined with public investment in public transport.

… and the building sector

To green the building sector, market-based measures such as grants, subsidies, tax cuts and credits could be developed to encourage investment in energy-efficient appliances and projects. In particular, the government could provide landlords and homeowners with incentives for implementing energy efficiency upgrades or offer direct subsidies to homeowners to install energy-efficient equipment, who are more likely than tenants to invest in energy-saving equipment. Non-market-based instruments could further increase Korea's greening capacity. In addition to current regulations that have recently been adopted, including reinforced building codes and the mandatory estimation of energy consumption, the government could establish incentives (or disincentives) for regulating the energy consumption behaviour of existing residences and look to increase consumer awareness of the benefits of green building through eco-friendly building certificates or energy efficiency grading instruments. Finally, special attention could be paid to integrating transportation and land use planning to achieve greener growth. A compact, transit-oriented development strategy could effectively underpin complementary market-based measures, such as comprehensive road charging in cities and parking tariffs, and non-market-based interventions, such as energy efficiency labelling and more sustainable building codes.

Cross-sector policy coherence should be prioritised…

To enhance the implementation of the National Strategy for Green Growth, especially in urban areas, there is a need for clear market signals and greater policy coherence across all sectors and levels of government. Korea faces co-ordination challenges as a result of the involvement of different government ministries and agencies and the co-existence of separate plans for municipal economic development, spatial development and sectoral development. The establishment of clearer pricing signals could help guide investment in green growth at the sub-national scale (*e.g.* putting a price on pollution or on the over-exploitation of a scarce resource through taxes or tradable permit systems), minimising costs and providing incentives for further efficiency gains. At the same time, a comprehensive, multi-sectoral national urban development plan could be pursued to generate more effective green growth outcomes. Employing partnership development tools such as a Memorandum of Understanding (which was successful in reconciling the divergent interests of central and local authorities involved in the Model City project in Gangneung) can help clarify roles and responsibilities. Policy coherence at the urban/regional level could also be pursued by integrating transportation and land use planning. Compact development strategies that mix land uses and improve mass transit services are relevant policy initiatives in this regard.

… and co-operation among local governments incentivised

Korea could foster greater horizontal co-ordination among local governments in order to maximise financial and human resources, facilitate knowledge spillovers and help tackle congestion, air pollution, health problems and greenhouse gas emissions. Horizontal co-operation for pursuing green growth actions is especially important, since local leaders

tend to have varying levels of fiscal and technical capacity to respond to climate change. Several policy mechanisms, including contractualisation tools, could be developed to achieve greater co-operation among local governments. These types of collaborative arrangements should, however, be adapted to different regional contexts to avoid a "one-size-fits-all" approach, an inherent risk of nationally led programmes.

Effective implementation will require more diversified funding sources at the sub-national level…

Green growth implementation in most urban areas is hindered by a dependency on central government funds, reflecting a more general problem of low self-reliance ratios in Korean cities (the average fiscal autonomy of Korean local governments was 52.2% in 2010). With the vast majority of the total green growth budget financed by the central government, the sustainability of local programmes is at risk, particularly in urban areas. Existing transfers from the central government could be redesigned to correct incentives in favour of green growth actions. New "green" revenue sources could be introduced at the urban level (congestion charges and road taxes). New financial instruments, especially public-private partnerships, could be actively pursued at the local level. The central state could assist by providing sample business models, developing guidelines and reinforcing the technical capacity at the local level. Local governments could also provide incentives related to their competences, for example sharing costs or offering infrastructure, in co-operation with the central government. There may also be scope to redesign the current property tax scheme which tends to incentivise urban sprawl; property tax could instead be reformed to encourage denser development within urban cores and around transportation linkages.

… and local capacity building efforts to assess progress over time

Finally, as in many OECD countries, inconsistent (or non-existent) methodologies for establishing local emissions inventories hamper the ability of Korean cities to assess progress toward green growth over time and across locations. Building capacity at the local level and developing measuring and monitoring tools could help address these challenges. The national government could assist local governments in enhancing their technical and fiscal capacity to develop inventories, by establishing a common methodology and by monitoring progress on the environmental and employment impacts of green growth policies. In particular, the development of harmonised city-scale greenhouse gas emissions inventories could help to monitor, support and compare mitigation performance across urban jurisdictions. The responsibilities of the Greenhouse Gas Inventory and Research Centre (GIR), established by the central government in June 2010, could be expanded to include the co-ordination of regional and local emissions data, in addition to the sectoral data it already collects from other relevant ministries.

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Chapter 1

Trends and Challenges in Korea's Urban Structure

This chapter examines urbanisation trends and addresses the issues and main challenges facing urban areas in Korea. It considers different definitions of urban areas in Korea and applies a methodology to identify groups of urban areas based on their functionality, rather than on administrative boundaries. An analysis of economic performance trends in urban areas reveals the leading economic role of large cities and medium-sized cities. The chapter concludes with an assessment of the challenges facing Korean urban policy makers in the years ahead, including an ageing population and shrinking labour force, unprecedented resource consumption, environmental pressures and climate change.

Introduction

Korea has become one of the fastest-growing countries in the world. Highly compressed economic growth since the 1960s propelled Korea to bring its per capita GDP to the level of developed countries. Korea has also made a strong recovery both from the 1997 Asian financial crisis and the 2008 global recession, led by the largest fiscal stimulus among OECD countries. Urban areas have been a key driver of Korea's economic success. Indeed, rapid economic development has gone hand in hand with fast and unprecedented urbanisation. Since the modernisation of the Korean economy, the shares of urbanisation and industrialisation have been strikingly and consistently correlated. As industrialisation has expanded and further advanced, more labour forces and capital have been absorbed into urban areas. Meanwhile, urban areas have provided the right scale of markets and large-scale infrastructure to create jobs and innovation capacities, adding economic growth potential.

Urbanisation has nevertheless occurred in a strongly polarised pattern. Most of the population increase and economic growth has taken place in a concentration of large cities and their surrounding areas. Korea is one of the OECD countries with the largest territorial disparities. In addition to the challenges embedded in its urban structure, Korea's explosive urbanisation process has raised another fundamental policy issue, possibly more salient for domestic politics: the dominance of Seoul in Korea's spatial system, despite recent trends demonstrating a slowing of growth in the Capital Region, compared to the rest of the country. Despite the government's persistent efforts to mitigate regional disparities between the Seoul Metropolitan Area and other regions, considerable imbalances remain and continue to concern policy makers. On the one hand, urban areas have increasingly gained importance in their nations as engines of economic success and centres of information exchange. They offer significant cost advantages, thanks to agglomeration effects, for governments in terms of public service delivery and for the private sector in terms of product manufacturing. They spur innovations in science and technology by facilitating the diffusion of knowledge among diverse urban dwellers. On the other hand, the large concentration of population in a limited number of urban areas has incurred negative externalities, including high congestion costs, an overheated property market and insufficient affordable housing, as well as urban sprawl and environmental degradation.

This chapter discusses trends in urbanisation and the role of Korean cities in advancing a national competitiveness agenda. It begins with a discussion of the definition of urban areas, which cautions against rapid conclusions on urbanisation patterns. Whilst Korea has experienced a fast urbanisation process since the 1960s that mainly benefits large cities, more recent trends show a population increase in medium-sized cities. However, a deeper analysis reveals that the principal large Korean cities have been reinforced through leapfrogging development in their suburbs, often around satellite cities. Only the application of urban functional criteria can give policy makers a true picture of the situation The role of cities in national economies is discussed in a second section,

again providing evidence of the concentration of economic activities in the main urban centres – although recent trends tend to reveal output and employment growth potential in medium-sized cities. This is probably linked to the opportunity costs of high congestion, which tend to drive firms and skills toward more favourable locations surrounding large cities. Seoul, however, is dominant in concentrating high skills and innovation. In both large and medium-sized cities, labour productivity remains a core challenge and has been identified as a main capacity constraint of the Korean economic model. Sustaining growth and raising living standards over the medium term depend also on increasing labour force participation to offset population ageing, a phenomenon that is particularly acute in urban areas. The energy-intensive economic structure of the Korean model may also hold back the country's sustainable economic growth. In addition to serious environmental degradation and increasing air pollution, Korea's urban areas, higher living standards, urbanisation trends and an expanding industrial sector have helped to produce one of the most energy-intensive economies in the OECD. These issues will be discussed in the last section.

1.1. Macroeconomic trends

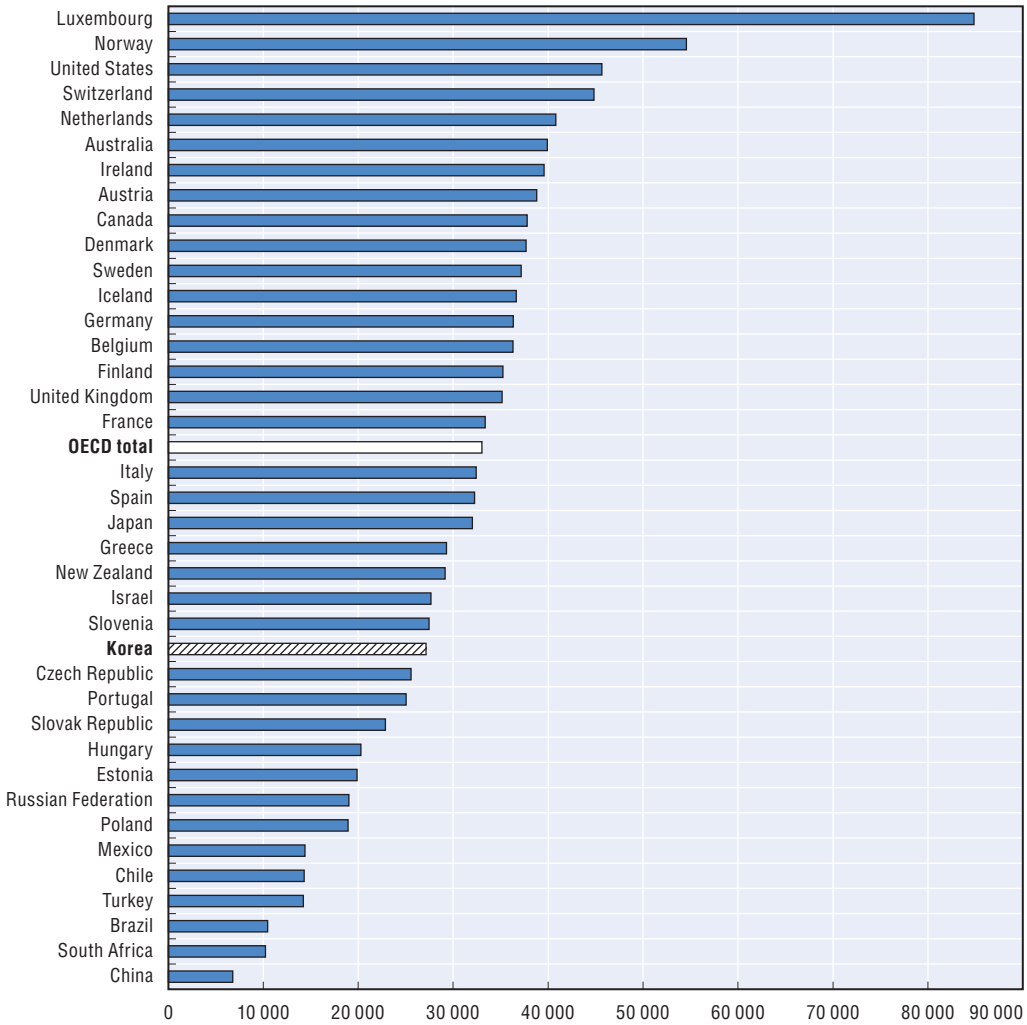
One of the fastest-growing economies

Since 1960s, Korea has been one of the world's fastest-growing economies. With almost no natural resources and under constant pressure of overpopulation in a relatively small territory, Korea's total GDP in 2008 was USD 1 344.4 billion (converted to purchasing power parity, PPP). Its estimated national income per capita was about USD 27 000 in PPP in 2009, slightly below the OECD average (Figure 1.1). Korea's outstanding economic performance has been supported by economic development strategies that varied over time. In 1960, Korea focused on increasing exports, while modernising infrastructure and nurturing firms. In the 1970s, Korea's manufacturing sector bloomed, chiefly supported by public policies focusing on the heavy and chemical industries thriving in Ulsan, Pohang and Yeosu-Si. The 1980s brought a change in economic policy, favouring more value-added industries such as semiconductors, IT and R&D activities. Meanwhile, high-tech industrial complexes were expanded (OECD, 2001). Korea ended up heavily relying on manufacturing, but policy is now turning to services as an alternative. Sectoral value-added shares have changed in recent decades. The share of agriculture in total value added has declined since 1990, while that of services including trade, transport and business has steadily increased. Despite this increase in the share of services in total value added over 1990-2008, Korea still ranks low compared to a selection of OECD countries for this indicator (Figures 1.2, 1.3 and 1.4).

As in the case of other small countries with few natural resources, international trade has played a fundamental role in the economic success of Korea. Trade in goods and services as a percentage of GDP stood at 53.5% in 2008, almost double the average for the OECD. In particular, Korea aggressively pursued an export-oriented strategy, becoming the world's seventh-largest exporter in 2010. Among exporting goods, automobiles and semiconductors were two critical pillars. In 2010, Korea exported USD 50.6 billion in semiconductors and USD 35.4 billion in automobiles, while both contributed 18.4% of the total amount of exports (MKE, 2011). Korea's semiconductors and automotive industry were also important global players, accounting for 13.3% and 5.7% of the worldwide market respectively in 2010.

Figure 1.1. **GDP per capita in selected OECD countries**

US dollars, current prices and PPPs (2009)



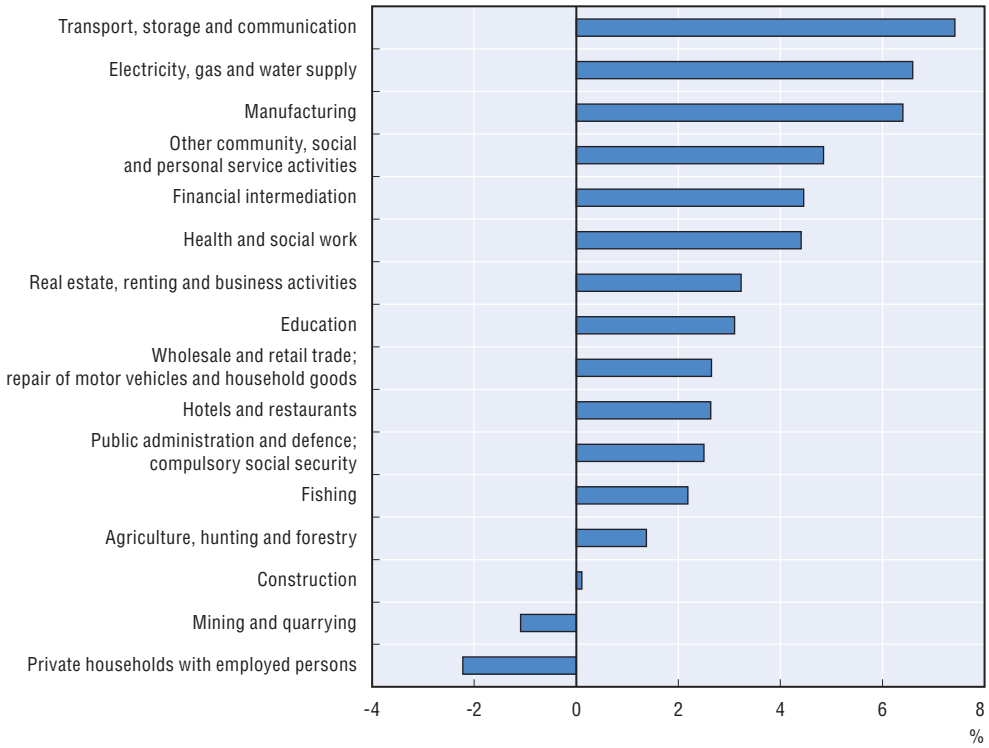
Source: (2011a), *OECD Factbook 2011-2012: Economic, Environmental and Social Statistics*, OECD Publishing, Paris.

Impacts of the global crisis

Korea's resilience to international shocks was however been put to test by the 1997 Asian crisis and by the recent global financial crisis. The 1997 Asian financial crisis led to a fall in output of almost 7% and a threefold increase in unemployment rates by 1998. As a response to the 1997 shock, the Korean government aggressively implemented a wide range of reforms, resulting in economic improvements with a surge of 10.7% in GDP in 1999, the fastest rate of growth since 1987 (OECD, 2002). The 2008 global financial crisis had unprecedented consequences for the Korean economy. Output decreased at an average annual rate of 17% in the fourth quarter of 2008, which represents more than twice the average decline in the OECD (OECD, 2010a). Manufacturing in particular was affected: more than one-quarter (25.6%) of output was lost as of January 2009. The damage was also profound for the real economy: more than 200 000 jobs were lost in the second semester of 2008 alone. Meanwhile, 2009 provided some domestic recovery, with Korea among the first OECD countries to show signs of the end of the financial crisis.

Figure 1.2. **Korea: value added by activity (1996-2009)**

Annual average growth (%)



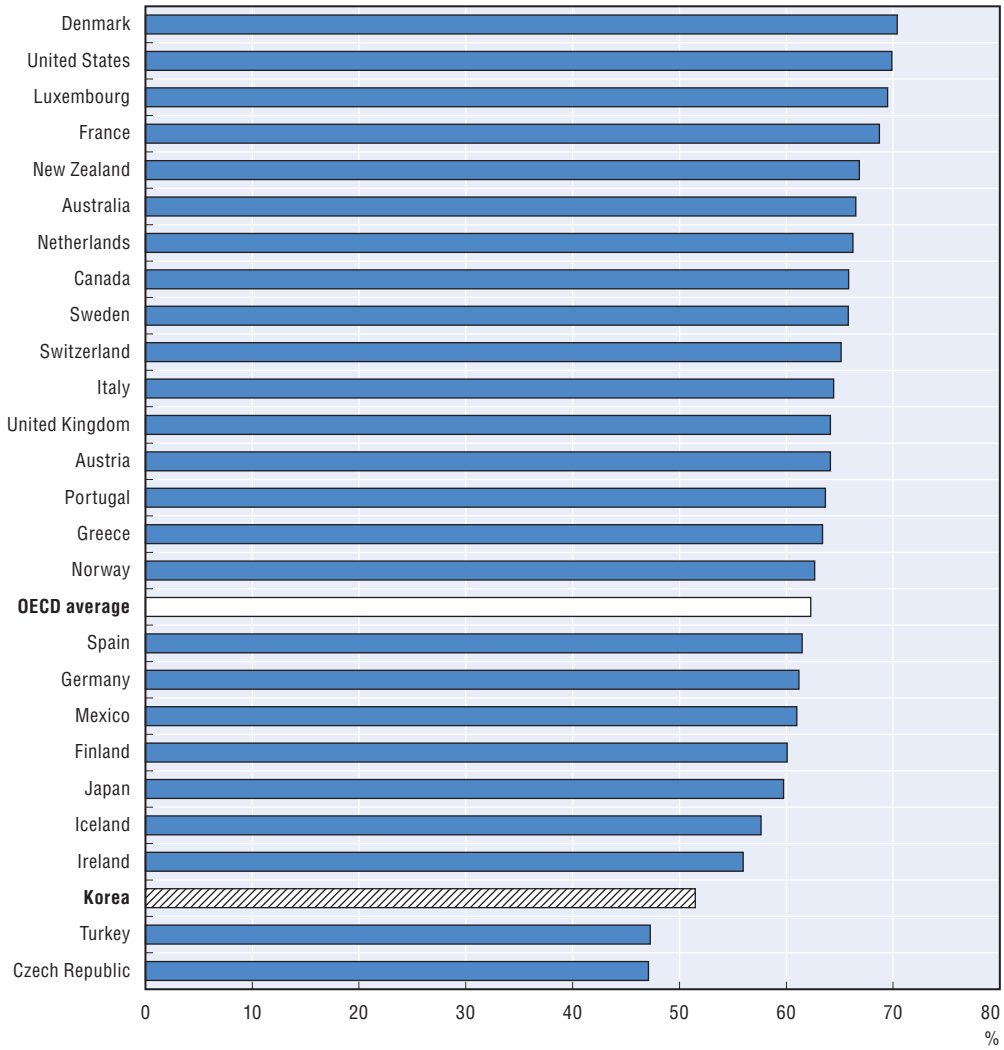
Source: OECD (2010a), "Detailed National Accounts: Value added and its components by activity", *OECD National Accounts Statistics Database*, doi: *10.1787/data-00006-en*, accessed Nov. 2011.

In order to overcome the economic crisis and boost the economy, Korea implemented the largest fiscal stimulus package among OECD countries, amounting to 6.1% of GDP (Table 1.1). This stimulus package was divided between additional expenditures (3.2% of GDP) and tax cuts. Public investment constituted the largest spending measure and has been driven in part by the Green New Deal Policy, established in January 2009. The Green New Deal was subsequently integrated into the National Strategy for Green Growth and headlined by two major public infrastructure projects: the Four Major Rivers Restoration Project and railroad construction and maintenance (see Chapter 3). The second major spending measure was allocated to transfers to businesses (1% of GDP), particularly small and medium enterprises (SMEs). The remaining expenditures were divided among transfers to households and sub-national governments and other miscellaneous measures. These timely and comprehensive policy responses helped Korea to overcome the economic crisis. Entering into 2009, the domestic economy started to recover, and Korea was among the first OECD countries to show signs of the end of the financial crisis (Figure 1.5 and Figure 1.6). GDP growth rate in 2010 was recorded at 6.1%, almost reaching the level for 2007 of 7.2% (BOK, 2011). The unemployment rate was 3.2% in 2009 and 3.6% in 2010, roughly equivalent to pre-crisis levels.

Korea's recovery is projected to remain on track, with year-average real GDP growth reaching 5.75% in 2010 and easing slightly to 4.75% in 2011 (OECD, 2010b). With this rapid recovery, Korea needs to cope with some challenges to achieve long-term development policies. Given that exports account for almost one-half of GDP in Korea, the world's

Figure 1.3. **OECD selected countries: value added in services (1990)**

As percentage of total value added



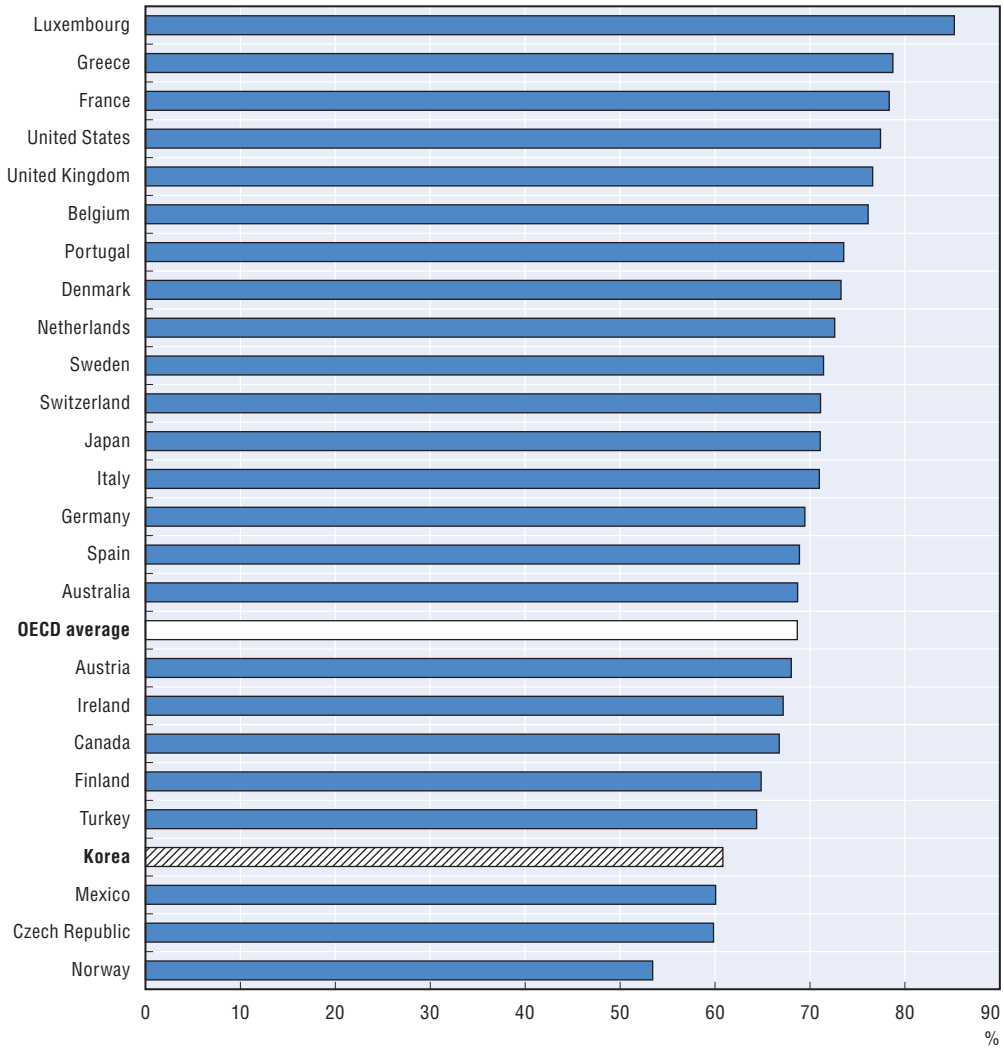
Source: OECD (2009a), *Country Profile Statistics*, *http://stats.oecd.org/Index.aspx?DataSetCode=CSP2009*, accessed 10 Oct. 2010.

eighth-largest exporter, the major risks relate mainly to the global economic environment. The outlook is particularly sensitive to demand from China, which accounts for one-third of Korean exports. In addition, a realignment of exchange rates could have a significant impact on Korean trade.

On the domestic side, the major concern is the high level of household debt, which exceeds 150% of household income. As mortgage loans, primarily with floating interest rates, account for 94% of household debt, rising interest rates could have a larger-than-expected impact on private consumption. Another uncertainty is the pace of restructuring of SMEs, which received significant support in 2008/09 to cope with the crisis and recession (OECD, 2010c). Reducing the budget deficit occurred from funding the recovery package is an issue of concern to the central and local governments. Gross government debt reached a record 34% of GDP in 2009, although the four percentage point increase was relatively small compared to the average of eight points in the OECD area. In addition, the debt of

Figure 1.4. **OECD selected countries: value-added in services (2008)**

As percentage of total value-added



Source: OECD (2009a), *Country Profile Statistics*, *http://stats.oecd.org/Index.aspx?DataSetCode=CSP2009*, accessed 10 Oct. 2010.

Korea's 24 public corporations – which is not included in government debt – more than doubled, from KRW 84 trillion in 2004 to KRW 177 trillion in 2008, boosting its share of GDP from 10.2% to 17.2% (OECD, 2010b). In particular, local public finance was severely hit by the crisis, with expenditures rapidly increasing and revenues falling. As a result, the total balance of local government budgets plunged from a surplus of KRW 20.2 trillion in 2008 to a deficit of KRW 7.1 trillion in 2009 (OECD, 2011b).

Capacity constraints to the economic model

Although the worst consequences of the crisis have been avoided, the recent deflation of the economic system has revealed the weaknesses of the Korean growth model, due mainly to domestic consumption heavily depending upon imports. A main structural issue of the Korean economic model is its low labour productivity level as compared to other OECD countries. In 2008, GDP per hour worked stood at USD 25.3, which is 60.5% of the

Table 1.1. **Korea: fiscal stimulus indicators (2008)**

Spending measures	Per cent of 2008 GDP	Tax cuts	Per cent of 2008 GDP
Total[1]	3.2	Total	2.8
Public investment	1.2	For individuals	1.4
Transport	0.4	Targeted to low-income groups	0.6
Energy	0.2	Increased personal tax allowance	0.1
Other[2]	0.6	Oil tax rebate	0.5
		Reductions in housing-related taxes	0.4
		Personal income tax cut	0.3
Transfers to households	0.7	For businesses	1.1
Pensions	0.3	Tax relief associated with new spending:	0.4
Unemployment benefits	0.2	R&D	0.1
Lengthening benefit duration	0.1	Investment	0.3
Loosening eligibility criteria	0.2	Corporate tax cut	0.7
Other income-related transfers	0.1		
Transfers to businesses	1.0	On consumption	0.2
Small and medium-sized enterprises	0.4	Cuts in general consumption taxes	0.1
For public financial institutions	0.3	Cuts in car-related taxes	0.1
To job-creating companies	0.2		
Construction and transport sectors	0.1		
Other	0.1	Other	0.2
Transfers to sub-national governments	0.3		

1. The government increased spending in FY 2008 through a supplementary budget of KRW 4.6 trillion passed in September 2008. For FY 2009, spending was boosted by KRW 11.4 trillion in December 2008 and by a supplementary budget of KRW 17.2 trillion passed in April 2009.
2. Includes 0.1% of GDP each for agriculture, education, public services, environment protection, defence and housing and health.

Source: OECD (2010b), *OECD Economic Surveys: Korea*, OECD Publishing, Paris.

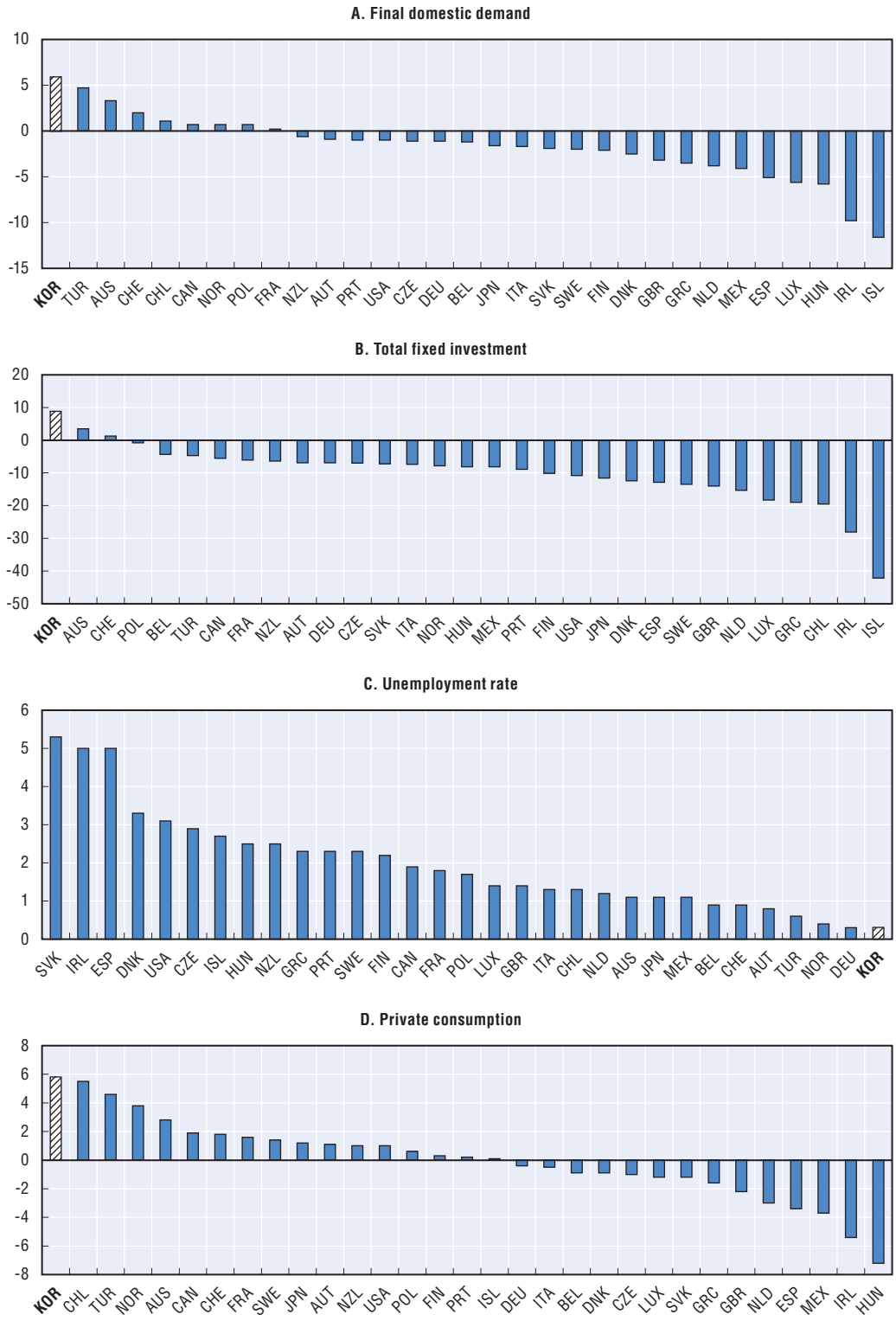
OECD level and 45.8% of that of the US (OECD, 2010c). Lagging productivity is particularly high in the services sector. In particular, the contribution of market services to aggregate productivity growth in Korea from 2000 to 2008 was one of the smallest in the OECD area and was partially offset by a fall in other services. As a result, the level of productivity in services in Korea is low, at 58% of the US manufacturing sector and 44% of the US service sector (OECD, 2010b).

Lagging labour productivity in Korea can be addressed by boosting the services sector, but most importantly by introducing reforms that increase multi-factor productivity. Korea did much in terms of capital deepening (the capital-labour ratio) in earlier stages of development, yet the contribution of further capital has recently yielded less return in terms of labour productivity (Figure 1.7). Although capital deepening can keep contributing to growth, gains are likely to accrue much more by increasing multi-factor productivity. Labour productivity has been growing slowly, and since 2003, Korea has even experienced some negative growth rates (Figure 1.8), overall productivity growth and economic growth (GDP per capita growth) was the second largest in the OECD before the 2008 crisis. Nevertheless, sluggish and even negative productivity growth could be compensated for by looking at the factors that are constraining labour productivity.

Sustaining growth and raising living standards over the medium term depend also on increasing labour force participation to offset population ageing and on raising labour productivity. Labour market reforms are also needed to reduce the high share of non-regular workers, who account for more than one-third of employees. Labour market dualism reflects the rising share of temporary workers to 28% of all employment, double

Figure 1.5. **Selected OECD countries: relevant indicators during the recent economic downturn**

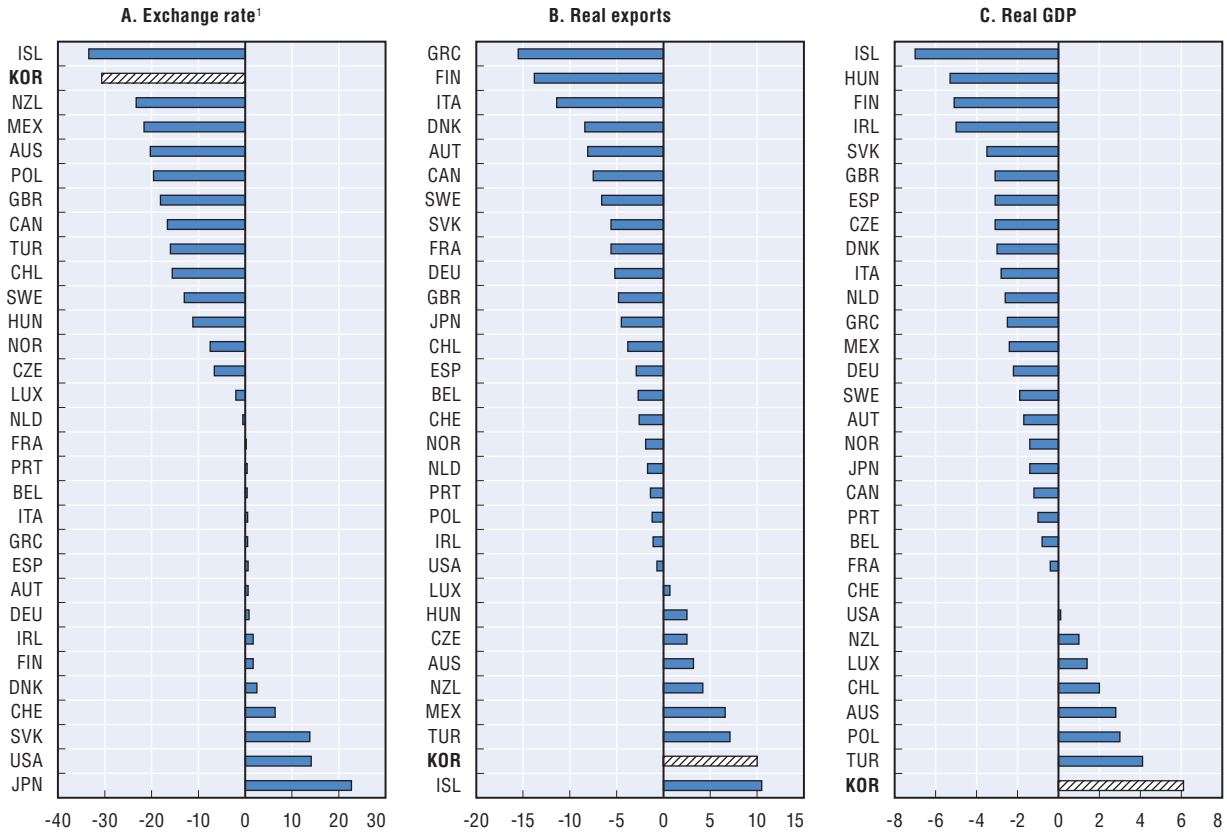
Percentage change 2008-09 (4th quarter on 4th quarter)



Source: OECD (2010c), *OECD Economic Outlook*, Vol. 2010/1, No. 87, OECD Publishing, Paris.

Figure 1.6. **Korea: exchange rate, real exports and real GDP (2008-09)**

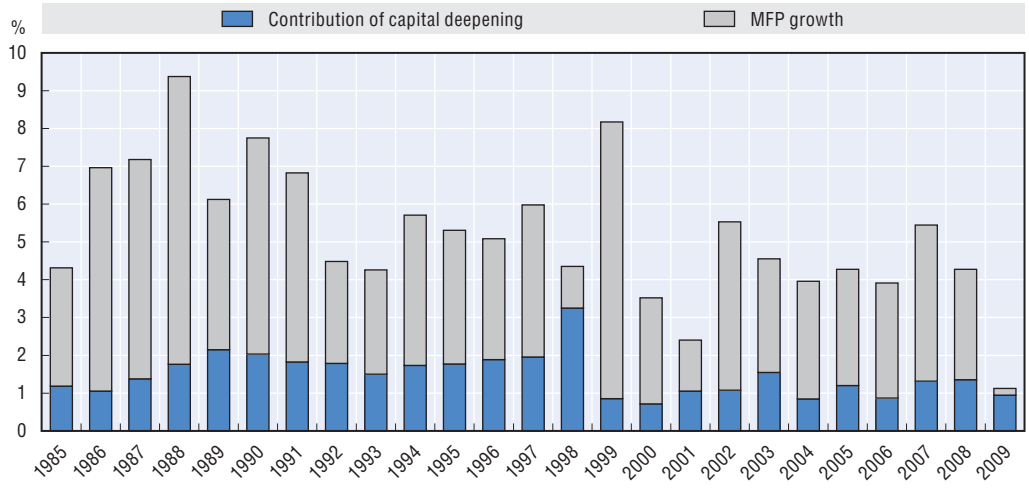
Percentage change 2008-09 (4th quarter on 4th quarter)



1. Percentage change in the nominal effective exchange rate between the first quarters of 2008 and 2009, calculated by comparison with 41 trading partners.

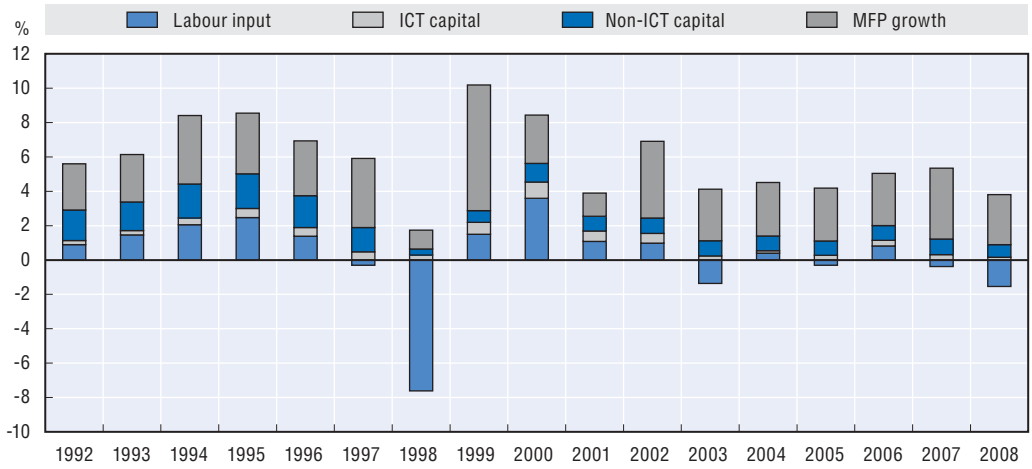
Source: OECD (2010c), *OECD Economic Outlook*, Vol. 2010/1, No. 87, OECD Publishing, Paris.

Figure 1.7. **Contribution of Multi-Factor Productivity (MFP) and capital deepening to labour productivity**



Source: Adapted from OECD (2008), *Productivity Compendium*, OECD Publishing, Paris.

Figure 1.8. **Components of productivity growth in Korea (1992-2008)**



Source: Adapted from OECD (2008), *Productivity Compendium*, OECD Publishing, Paris.

the OECD average. Firms hire non-regular workers both to increase labour flexibility, given the difficulty of dismissing regular workers, and also to reduce labour costs, as wages for non-regular workers are significantly lower. Moreover, more than half of non-regular workers are not covered by employer-based social insurance systems, further cutting their cost to firms. Addressing the problem of labour market dualism requires a comprehensive approach that includes lowering employment protection for regular workers, expanding the coverage of non-regular workers by the social insurance system and improving training, including lifelong learning opportunities, to enhance their employment prospects. Reducing dualism, which is most prevalent among women, would also make the labour market more attractive to them, encouraging female employment. In addition, it would address the problem of equity, since a large share of the population is subject to precarious employment and significantly lower wages, while receiving less social insurance coverage. Finally, reducing dualism would encourage human capital formation, given that temporary workers receive less on-the-job training than permanent workers. This could help promote the growth of labour productivity (OECD, 2010b).

The ageing of the population also has an impact on the prospects for public finance and for further growth. Low fertility and population ageing are one of the main concerns Korea faces. Fertility rates (the number of children born to women aged 15 to 49), reached only 1.19 in 2008, the lowest among OECD countries. Conversely, elderly dependency rates (population aged 65 and over as a proportion of the group aged 20 to 64), stands at less than 20%, among the lowest in the OECD. By 2050, however, it will be among the highest, at over 70% of the population (OECD, 2009a). This severe shortage of labour due to ageing may slow down economic activity.

1.2. Urbanisation trends

A fast urbanisation process

The economic development of Korea initiated since the 1960s has led to a drastic urbanisation process. As industrialisation has expanded and advanced, more labour forces and capital have been absorbed into cities. Indeed, the share of urbanisation and industrialisation in Korea since the modernisation of its economy has been strikingly and

consistently correlated. Following the UN definition of urban areas, the urbanisation share of Korea in 1970 was 40.7,% at a time when the employment share of secondary and tertiary industries was 53.0%. By 2005, urbanisation was 80.8% while the employment share of secondary and tertiary industries was 92.1% (Kwon, 2001). More markedly, in 2008, Korea's seven million-plus cities that accounted for 46.3% of the national population produced virtually the same share of national GDP (46.7%).

Korea is also recognised as one of the most dense and urbanised countries in the world (UN, 2008) (Table 1.2). The total land mass of the Korean peninsula is 221 000 km^2, while Korea takes up about 45% of the territory, or nearly 100 000 km^2, with a population of 50.2 million. Its population density has been consistently ranked the highest among OECD countries since the 1970s. In 2005, Korea's population was 478 people per square kilometre, 85 people more than the Netherlands (second rank among OECD countries) and 141 people more than Japan (third rank). Even including all countries in the world,[1] Korea's population density ranked second after Bangladesh (1 063 people in 2005). The population density of Korea as of 2005 is about 10 times higher than that of the global average for the same year (48 people per square kilometre). Korea's population has been steadily concentrating in urban areas. While the percentage of the world's population residing in urban areas increased from 33% to 50.5% in the last half of the last century (1960-2010), that of Korea almost tripled, from 27.7% to 83% for the same period. The urbanisation share of Korea in 2010 exceeds the average level of Northern Europe (79.1%), and that of Western Europe (79.5%). Major countries in Northern and Western Europe that show higher urbanisation ratio than that of Korea in 2010 are the following: Belgium (97.4%), Iceland (93.4%), Denmark (86.7%), Sweden (84.7%), and Luxembourg (85.2%) (Figure 1.9).

Table 1.2. **Population density comparison**

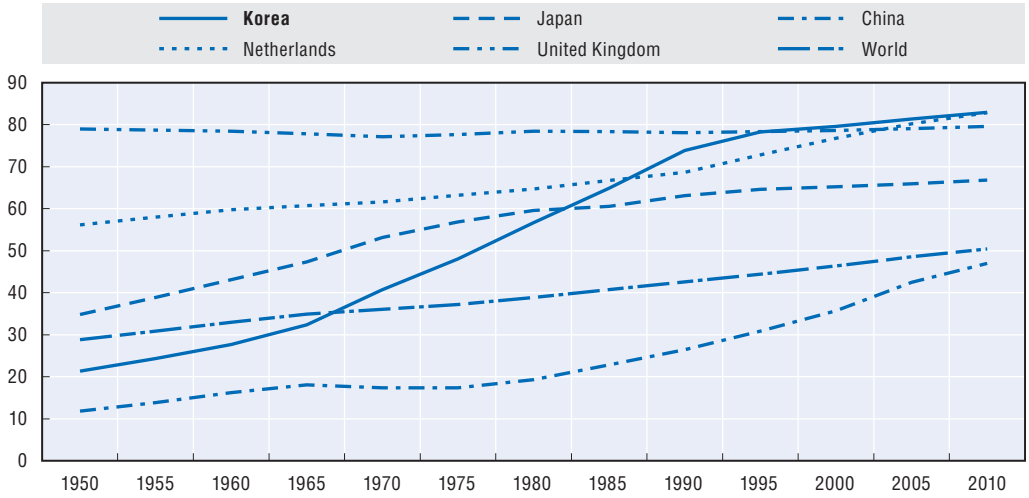
	1960	1970	1980	1990	2000	2005	2010	2030	2050
World	22	27	33	39	45	48	51	61	68
Korea	252	316	376	432	462	473	484	506	473
China	69	85	102	119	132	136	140	145	135
Japan	245	274	307	324	333	334	335	318	287
Netherlands	275	312	339	359	382	393	400	417	413

Source: United Nations Department of Economic and Social Affairs (2011), *World Population Prospects: 2010 revision*, *http://esa.un.org/unpd/wpp/index.htm*, United Nations Department of Economic and Social Affairs, New York.

The path of Korea's urbanisation since the 1960s is comparable to what developing countries have been recently experiencing, but recent trends show an urbanisation pattern more similar to that of developed countries. During the three decades from 1960 to 1990, Korea's urban population rose by 11.9% per year, far outstripping the share of developing countries overall for the same period (7.3%).[2] Like other developing countries, Korea also exhibited polarising patterns as urban dwellers moved into principal cities. In 1990, one out of four of Korean people (24.6%) resided in Seoul and almost one out of two people (47.8%) lived in six "million-plus cities".[3] Those figures were only 9.4% and 14.1%, respectively in 1960. However, during the last two decades, Korea has undergone substantial transformation in its urbanisation trend, more comparable to that of developed countries. Although the urbanisation share itself has increased to 80.8% in 2005 and is expected to reach 90.8% by 2050, the growth share of urban population has significantly tapered off. The annual growth rate was decreased to 1.8% between 1990 and 2000, quite

Figure 1.9. **Trends in urbanisation (1950-2010)**

Percentage



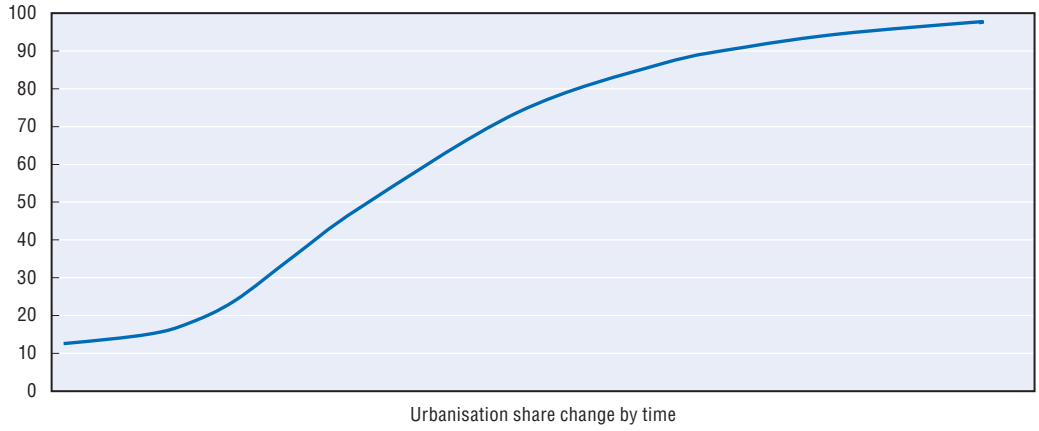
Notes: The vertical axis represents urbanisation share (%).
Figures in 2010 are estimates.
Mid-year population basis.
Definition of developed and developing countries is followed by UN-DESA (2008). Developed (or more developed) countries comprise Europe, Northern America, Australia/New Zealand and Japan. Developing (or less developed) countries comprise Africa, Asia except Japan, Latin America and the Caribbean.
Northern Europe includes Denmark, Estonia, Channel Islands, Faeroe Islands, Finland, Iceland, Ireland, Isle of Man, Latvia, Lithuania, Norway, Sweden and the UK.
Western Europe includes Austria, Belgium, France, Germany, Liechtenstein, Monaco, Netherlands and Switzerland.
Source: United Nations, Department of Economic and Social Affairs, Population Division (2010). *World Urbanization Prospects: The 2009 Revision*, CD-ROM edition, data in digital form (POP/ DB/WUP/Rev. 2009).

close to that of developed countries during the same period (0.6%). This growth rate is even projected to show a negative figure between 2025 and 2050 (–0.4% per annum), while developed countries retain a positive rate (0.3% per annum).

Korea's spatial polarisation trends have moved into a more mature stage in terms of the urbanisation cycle since the 1990s, similar to advanced OECD countries. Population concentration in Seoul has given way to a process of spatial dispersion into other nodes at its periphery, to a level where the national population is growing at a faster rate than that of the Seoul agglomeration (Seoul plus its hinterland), which could be described as "polarisation reversal" (Richardson, 1980). Between 1990 and 2005, the population of Seoul showed a negative annual growth rate (–0.5%), whereas national urban population increased by 1.5%. Even including the population of the ring of Seoul, its growth rate during that period lags behind that of the nation (Chung, 2003). The level of primacy of Korea's "million-plus cities" also started to stagnate entering the 1990s. By 2005, the number of cities with population of over a million was increased to seven, but the population share of those cities dropped to 46.5% from 47.8%[4] (including the share of the original six cities) in 1990.

As in most advanced OECD countries, Korea's urbanisation has followed an S-type curve, but unlike them, this process has occurred in a relatively short period of time. According to Davies (1969), the typical course of urbanisation for a certain country is followed by a logarithmic-growth (Figure 1.10). The first phase of this curve is associated with very high rates of urbanisation, leading to large shifts of population from rural to cities. This is followed by a longer period of consistent and steady urban growth. As

Figure 1.10. **Urbanisation pattern curve**



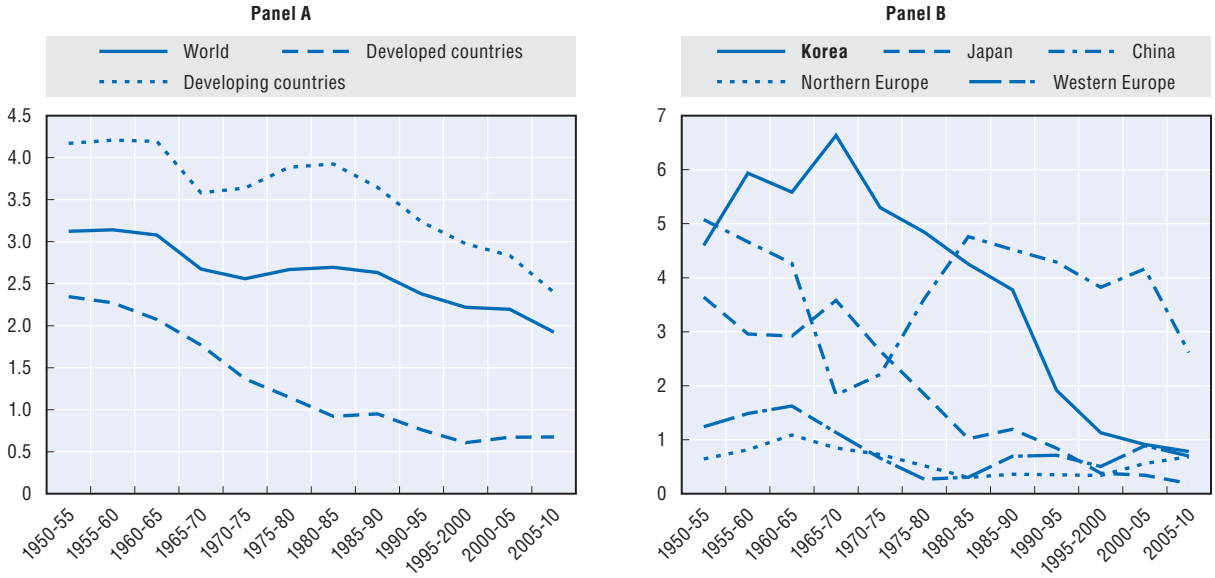
Source: K. Davies (1969), quotation from M. Pacione (2009), *Urban Geography (third edition)*, Routledge, Oxford.

urbanisation exceeds 60%, however, the curve begins to flatten, approaching a ceiling of around 80% (Pacione, 2009). Although this model is too simple to take into account different stages of the urbanisation curve of individual countries, the validity of this model for explaining the general urbanisation pattern is substantially high (Ledent, 1980). For a large number of Western countries, the urbanisation pattern conforms to this curve, and the current level of urbanisation has been attained throughout more than a century. By contrast, Korea generated such an S-shaped urbanisation curve within only five decades. After a quite negligible urbanisation share in the 1950s, Korea experienced a sharp increase in the level of urbanisation during the development era between the 1960s and the 1980s, thanks to a continuous influx of labour force into urban areas. It, however, soon reached a stagnation stage in its urban population growth rate in the late 1990s and has maintained a similar urbanisation share since then, which is mainly associated with a drastic drop in the fertility rate and the nation's overall demographic change.

The recent slowdown in the growth of urbanisation in Korea has nevertheless been much more pronounced than in other OECD countries. Korea's S-shaped urbanisation curve is principally derived from a dramatic change in the urban growth rate during a relatively short period. The share of urbanisation steeply rises when the urban population growth rate is accelerated, but the share flattens when the growth rate peaks (Figure 1.11). The urban population in Korea grew at 4.6 per year over 1950-55, and peaked over 1965-70 at a 6.6% annual growth rate, which was nearly three times faster than the global average (2.7%). However, since the early 1990s, Korea's urban population growth rate has declined significantly, to less than the global average. The difference between the urban population growth rate of Korea and the global average has further widened since the 2000s, and is expected to finally reach a level comparable to developed countries'. Notably, the annual growth rate of the urban population in Korea from 2005 to 2010 (0.62%) registers only one-tenth of the rate between 1965 and 1970 (6.8%). This sharp decline in the urban growth rate is unprecedented among OECD countries. Korea's recent urban population growth rate is similar to that of UK and the Netherlands. Between the 1960s and 1980s, the difference of the annual growth rate between Korea and those countries ranged from 6% to 3%. At the beginning of the 2000s, however, the difference became negligible and the annual urban growth rate of Korea fell to lower than that of the Netherlands.

Figure 1.11. **Annual urban population growth rate, 1950-2010**

Percentage



Notes: Vertical axis represents annual average growth rate (%) of the urban population within five years of a certain time span in the figure.
The definition of developed and developing countries is the same as that in Figure 1.9.
Mid-year population basis.
Figures for 2005-10 are estimates.

Source: OECD computations based on United Nations Department of Economic and Social Affairs (2010), *World Urbanization Prospects*: 2009 revision, United Nations Department of Economic and Social Affairs, New York.

But what is urban?

Defining what is urban has been a difficult task, and no commonly agreed-upon definition exists. Each country defines the term in its own way, whether referring to cities, towns, villages, conurbations or localities. One could distinguish three different criteria whereby urban can be defined:

- *Administrative competence* – is a place classified as a city for administrative purposes.
- *Physical indicators* – the density of buildings, of people or of other indicators, for example the proportion of any unit of area covered by hard surfaces (such as concrete or asphalt) or the intensity of night light emissions.
- *Functional definitions* relating to the behaviour of households and firms to reveal the boundaries of what is "urban" territory (see below for instance, the OECD Metropolitan Database or the ongoing work on defining urban functional areas).

Each of these methods of urban definition has strengths and weaknesses. The most obvious advantage of using administrative definitions is that it is easier, both in terms of data gathering and political support. The fact that policy and funding for data gathering is ultimately dependent on governments should not be ignored. The most obvious disadvantage of using administrative and political boundaries is that they are often arbitrary and often reflect outmoded patterns of life. The basis on which they are defined and the frequency with which they are redefined varies widely, not only between but also within countries. Most of the urban residents of the OECD live in administrative cities that are physically attached to older central cities and act as residential suburbs – suburban neighbourhoods of much larger

metropolitan regions. As will be shown later in the report, the limits of resorting to administrative unit as the basis for defining urban areas is well-illustrated in the case of Korea.

Using administrative areas can also entail difficulties, because in some cases, land use restrictions can force the functional area to leap over those obstacles. The UK and the Netherlands have strong and, particularly in the case of the UK, highly restrictive land use planning systems designed to constrain urban land and protect designated areas from urban development. The result is large "green" unbuilt areas: in the UK, greenbelts surrounding its major cities; in the case of the Netherlands a "Green Heart" separating its four major cities of the Randstad. In England, the area of greenbelts is 1.5 times the total area occupied by all urban development (Barker, 2006). The result is not only that developed areas tend to be of higher density but, more importantly that functionally, cities leap across protected green areas. It is highly likely that this is the case in Korea, which also has a greenbelt policy. As of 2009, there were 3 925 $km^2$of greenbelts in Korea, all designated around seven metropolitan areas. The greenbelt area around Seoul, Gyeonggi province and Incheon (called the Capital Region) was 453 km^2, *i.e.* nearly 37% of the total greenbelt area in Korea.

Although challenging in terms of complexity and data requirements, it is essential to assess urbanisation trends using functional definitions of urban areas. Defining cities functionally allows the identification of "urban cores" and "urban hinterlands". Urban cores are generally defined as areas of job concentration, although sometimes in terms of enhanced population density, while urban hinterlands tend to be more heavily residential, with net outward commuting to the core. In turn, this makes it possible not just to track urban growth but also to look at its spatial pattern and whether decentralisation (suburbanisation) of the population or centralisation is occurring. Another advantage of functional definitions is with respect to where economic actors choose to locate. Firms, when selecting locations, will look for access to infrastructure and labour. Potential workers largely locate with respect to job accessibility. None of these decisions will be much affected by administrative boundaries or the location of unbuilt land protected from urban development (though the value of access to that may be capitalised into house prices). Firms, for example, may claim to have better access to London's Heathrow Airport if they are located in Reading – 40 km to the west of London – than if they are located in London itself. Only a functional definition of London would capture Reading.

The OECD has defined a functional region as a territorial unit resulting from the organisation of social and economic relations and thus a functional subdivision of territories (OECD, 2002b). The most typical concept used is that of labour markets, *i.e.* the delineation of functional regions in most member countries is based on the principle of commuting conditions. However, official recognition of functional regions as a framework for territorial measures and policy implementation varies significantly from one OECD member country to another. Moreover, it should be noted that employment markets are only one possible basis for delineating functional units. It is also possible to consider the most appropriate definition based on firms' interactions, such as the movement of goods, services and information. However, data for such indicators is seldom available.

Many OECD countries have developed their own definitions of "urban" following the functional approach. Among 30 OECD member countries, the majority (26 countries) use a functional definition of urban, mostly referring to the population size within a contiguous inhabited territory, and often with a minimum population density level. Only some OECD

Table 1.3. **Different definitions of urban areas in a selection of OECD countries**

	Definitions
Australia	All urban centres with 1 000 inhabitants or more with a density of 200 or more per square kilometre
Canada	Areas with at least 1 000 inhabitants and a population density of at least 400 persons per square kilometre
Czech Republic	Municipalities of 2 000 inhabitants or more
Denmark	Localities with 200 inhabitants or more
France	Communes with 2 000 inhabitants or more living in houses separated by at most 200 metres; or communes in which the majority of the population is part of a multi-communal agglomeration
Germany	Communes with a population density of at least 150 inhabitants per square kilometre
Hungary[1]	*Budapest and all legally designated towns*
Iceland	Localities with 200 inhabitants or more
Ireland	Population clusters (aggregate towns including suburbs) with at least 1 500 inhabitants
Italy	Communes with 10 000 inhabitants or more
Japan	Densely Inhabited Districts (DID), defined as groups of contiguous basic unit blocks, each of which has a population density of 4 000 inhabitants or more per square kilometre *or* has public, industrial, educational and recreational facilities and whose total population is 5 000 persons or more within basic administrative units called *shi, ku, machi* or *mura*
Korea[1]	*Administrative areas called* dong*, an administrative division of urban areas*
Luxembourg	Communes with 2 000 inhabitants or more
Mexico	Localities with at least 2 500 inhabitants
Netherlands	All municipalities with 20 000 inhabitants or more
Norway	Localities with 2 000 inhabitants or more
Poland[1]	*Localities that have the legal status of towns (*miasta*)*
Spain	Municipalities with 10 000 inhabitants or more
Sweden	Built-up areas with at least 200 inhabitants and where dwellings are separated by at most 200 metres from each other
Switzerland	Communes with at least 10 000 inhabitants, including suburbs, and urban agglomerations with contiguous built-up area and at least 20 000 inhabitants
Turkey[1]	*Localities within the municipal limits of administrative centres of provinces and districts*
United Kingdom	Localities with at least 1 500 people in England and Wales, at least 1 000 inhabitants in Northern Ireland, and all settlements and localities in Scotland (Prior to the mid-1970s, urban was defined based on administrative boundaries)
United States	Densely settled territory that meets minimum population density requirements and with a population of at least 2 500 inhabitants

1. Countries indicated in italic are those that define urban areas according to an administrative approach.
Source: United Nations Department of Economic and Social Affairs (2008), *World Urbanization Prospects: 2007 revision*, United Nations Department of Economic and Social Affairs, New York.

countries measure urban on the basis of the simple administrative boundary, including Hungary, Poland, Turkey and Korea (Table 1.3).

National urban functional definitions are very useful in a national context, but they do not allow international comparison. In building its world urban population database, the UN adopts each country's definition of urban places, but also recognises that a distinction between urban and rural population is not yet amenable to a single definition applicable to all countries (UN-DESA, 2007). The OECD has developed different tools to answer the increasing demand for statistical information at the regional level and to allow international comparison of trends and challenges of the different types of regions. These tools have made it possible to develop *i)* the *OECD Regional Database*, *ii)* the *OECD Metropolitan Database* and *iii)* a forthcoming urban functional areas database.

i) The ***OECD Regional Database*** provides a unique set of comparable statistics and indicators on about 2 000 regions in 30 countries. It currently publishes a yearly time-series for around 40 indicators of demography, economic accounts, labour market, social and innovation themes in the 30 OECD member countries. Regions in OECD member countries have been classified according to two territorial levels (TL) to facilitate international comparability. The higher level (Territorial level 2) consists of

macro-regions, while the lower level (Territorial level 3) is composed of micro-regions. In addition, OECD small regions (Territorial level 3) are classified according to their geography into predominantly rural, intermediate or predominantly urban. The methodology is based on the following criteria: population density, degree of rurality and size of the urban centres located within a region. Predominantly urban (PU) refers to regions in which the share of population living in rural local units is below 15%; predominantly rural regions (PR) refers to regions in which the share of population living in rural local units is higher than 50%. In order to classify regions as PU or PR, it is necessary to define local units within each region to their degree of rurality. A local unit is therefore rural if its density is less than 150 inhabitants per square kilometre. The implementation of the OECD regional typology in Korea provides interesting results, since it could enable meaningful comparison between regions of the same type, but it does not reflect the reality of functional urban regions.

ii) In this context, the OECD has developed a specific ***Metropolitan Database*** based on "mixed-functional" criteria, including density, commuting rates and population size (Box 1.1). The methodology followed to select metropolitan regions consists of the selection of "predominantly urban" areas (PU) at TL3 level and a process of adding and eliminating neighbouring regions based on net commuting rates. The *Metropolitan Database* includes 90 metro-regions with populations of at least 1.5 million. This *Metropolitan Database* has allowed the OECD to make some inferences about the position of a given metro-region with respect to the others or to the average, as well as to explore key issues concerning metro-regions, such as the relationship between urban growth (in terms of population) and income (in terms of per capita GDP), ageing and dependency, the importance of capital cities, productivity and the contribution of metro-regions to their national economies.

Box 1.1. **Methodology for selecting OECD metro-regions**

- **Urban density.** Metro-regions are selected from Predominantly Urban areas (PU) as defined by the OECD Regional Typology, according to which PUs are regions less than 15% of whose population live in rural areas.
- **Self-contained labour market.** Using commuting flows for each of the regions and calculating a net commuting rate (NCR) for a combination of PU areas made it possible to determine whether a number of PU constituted a single and self-contained labour market. If the NCR was below 10%, the units comprised a common labour market. If the NCR was above 10%, more neighbouring PU regions were added until the rate fell within the metro-region level. The process implied adding one region at a time and even contemplated including intermediate regions (IN) as necessary for the rate to fall within the limits.
- **Population size.** A metro-region was considered as such if, in addition to complying with the two criteria above, its population was above 1.5 million people.

Source: OECD (2006), *Competitive Cities in the Global Economy*, OECD Publishing, Paris.

iii) Research is being conducted at the OECD to use a harmonised definition of the functional urban area and apply it to all urban regions with a population of more than 50 000[5] (OECD, 2012, forthcoming). A crucial innovation of this methodology is the

possibility of comparing **urban functional areas** of similar size across countries. This methodology provides a classification of urban functional areas in four types according to population size: *i)* small urban areas, with population below 200 000 people; *ii)* medium-sized urban areas, with a population of between 200 000 and 500 000 people; *iii)* metropolitan areas, with a population between 500 000 and 1.5 million people, and *iv)* large metropolitan areas, with a population of 1.5 million or higher.

For the purpose of the review, five units of analysis will be invoked in the next sections, obliging extreme caution in making conclusions about demographic and socio-economic trends. These units include:

i) *Urban areas*. These refer to urban areas as defined by the national authority of Korea. In particular, this term is used when referring to UN data. As this unit of analysis refers to single county or municipality-level areas, it has the advantage that national statistical institutes frequently make data available at this level. However, these urban areas are often too small or too large to account for a city. In the case of Korea, the census data collected by Korea Statistics Office (KSO) identify an "urban" population as people living in administrative units named *dong*, a subdivision of administrative urban places called cities (which have "generally more than 50 000 dwellers") or si an "autonomous district (which belongs to metropolitan cities and Seoul Special City)" or *gu* (Box 1.2 and Figure 1.12). This is reported to the database of UN World Urbanisation Prospects and will be used in this chapter for official data for Korea unless otherwise noted. However, this definition has a limit in fully integrating an urbanised area in a fast-growing rural area. For example, some lower territorial administrative units, called *eup*, located in rural areas, can experience fast growth and display urban characteristics.[6]

iii) *Predominantly urban areas* (PU). These are defined by the OECD Regional Typology at TL3 and will be also used throughout this report. They are regions where the population living in high-density areas (150 inhabitants per square kilometre)[7] represents at least half of the population in that region. Although PU areas are also based on administrative areas, they are larger than a single municipality. The OECD has been able to produce comparisons across regions and countries using PU areas, but they remain too large for medium-sized cities in some cases and too small for metropolitan areas. In the case of Korea, seven metropolitan cities (including Seoul) and Gyeonggi province (*do*) are classified as PU among the 16 metropolitan cities and provinces (Figure 1.13). There are limitations in using such units of analysis, as this is may result in assigning a rural unit to an urban area (for example several *gun* in Gyeonggi province, which is rural unit, belongs to PU), whilst growing medium-sized cities in some provinces are classified as IR (Intermediate Rural) or PR (Predominantly Rural area).

iv) *Metro-regions* (MR). These are defined by the OECD classification of metropolitan areas and included in the *OECD Metropolitan Database*. In the case of Korea, there are three metro-regions: *i)* Seoul metro-region (which includes Seoul Metropolitan City, Ulsan Metropolitan City and Gyeonggi province); *ii)* Busan metro-region (which includes Busan Metropolitan City, Ulsan Metropolitan City and Gyeonsangnam Province) and *iii)* Deagu metro-region (which includes Daegu Metropolitan City).

v) *Cities*. In Figure 1.12, Seoul and other metropolitan cities in upper-tier local government are respectively counted as a single unit, like general cities in lower-tier local

Box 1.2. **The administrative structure in Korea**

As a unitary state, Korea has a two-tier system of local government.

i) The upper (or regional) tier (Territorial level 3 in the OECD typology) includes Seoul Special City (with the status of a capital city), six metropolitan cities and nine provinces (*do*).

ii) The lower (or basic local) tier (TL 4 in OECD typology) is composed of 230* bodies, including:

- 75 cities (called *si*),
- 86 counties (*gun*, rural areas),
- and 69 autonomous districts (*gu*, urban areas that exist only in the metropolitan cities and Seoul).

The lower-tier government is further divided into 3 477 administrative sub-branches, which are not legal entities and have no autonomous power: 215 *eup* (defined as the urban division of a county or *gun*), 1 201 *myeon* (the rural division of a county or *gun*) and 2 061 *dong* (which belong to cities including Seoul City, metropolitan cities and lower-tier cities) (TL5).

Within this institutional framework, the Local Autonomous Act designates the following units as urban:

i) *Si*, a lower administrative unit in TL 4 level with a population greater than 50 000, of which at least 60% resides in the urbanised areas.

ii) *Gu*, an autonomous district in metropolitan cities and in Seoul.

Rural areas, known as counties or *gun*, are further divided into two categories:

i) *Myeon*, a basic subdivision of a *gun*;

ii) *Eup*, an urbanised area in a rural unit, with a population of more than 20 000 people, of which at least 40% live in the urbanised area of the unit.

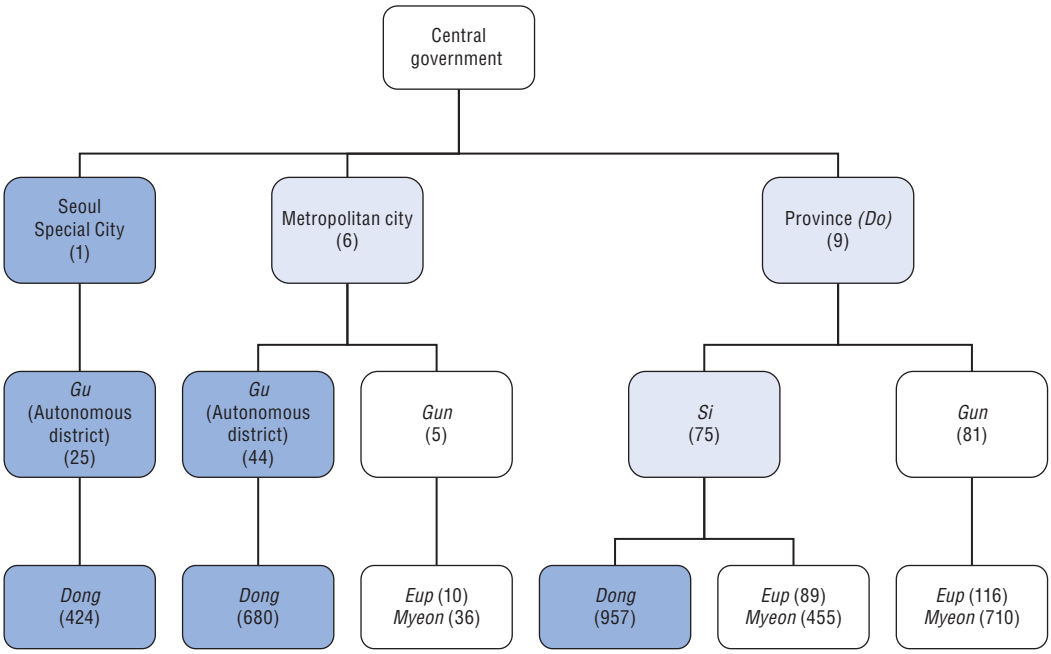
In 1994, the Korean government introduced a new administrative unit, the "urban-rural integration city", which consolidates small or medium-sized cities with surrounding rural areas in order to generate economies of scale and to minimise urban-rural disparities. Despite its merits, the new administrative unit complicates the classification of urban and rural areas in Korea: as of 2009, 52 cities were designated as "urban-rural integration cities" with substantially different size and population (MOPAS, 2009). For instance, among those cities, Yongin-si, the most populated city in the Gyunggi province, had 816 000 inhabitants, covering a surface area of 591 jkm^2, while Samchuck-si, the least populated city in the Gangwon province, had only 70 000 inhabitants (less than one-tenth of Yongin) with over twice the surface area of Yongin. Urban-rural integration cities are a type of *si*.

* The total figure includes two cities on Jeju Island that were designated "Special Autonomous Provinces" in 2006.

Source: Adapted from Ministry of Public Administration and Security (MOPAS) (2009), *Municipal Yearbook of Korea* (in Korean), Ministry of Public Administration and Security, Seoul.

Figure 1.12. **Korea's local government system**

As of 2010



Notes: Figures in parentheses represent the number of administrative units in that category.
Lower-level cities could have a district or *gu* if they have more than 500 000 residents, but this *gu* has no administrative power.
Jeju special autonomous province, for convenience, is included in the province (*do*) category, while two cities in Jeju province, which have no autonomous power, are counted as lower-level cities (*si*).
Boxes in dark blue represent urban areas, according to Korea Statistics Office's methodology, which identifies "urban" populations as people inhabiting the administrative units of *dong* and reported to the UN *World Urbanisation Prospects Database*. Boxes in light blue represent administrative units that include both urban and rural subdivisions, such as metropolitan cities, provinces (*do* and *si*).

Source: Adapted from Ministry of Public Administration and Security (2009), *Municipal Yearbook of Korea* (in Korean), Ministry of Public Administration and Security, Seoul.

government, to see their composition changes as a part of the total urban population of Korea. In this section, Korean cities that have a population of more than 1 million are categorised as large cities if not otherwise specified, while those between 200 000 and 1 million and those of less than 200 000 are grouped into medium-sized and small-sized cities respectively. Urban population in Korea is unevenly concentrated in a few major cities that are scattered in some limited regions.

vi) *Functional Urban Areas*. Applying the new OECD methodology to define urban functional areas in Korea by using census data and commuting data at TL5 makes it possible to identify 45 functional urban areas that include nearly 86% of the total population of Korea (Figure 1.14). Among these 45 urban functional areas, there are four large metropolitan areas (Seoul Incheon, Daejeon, Daegu and Busan), which represent 72% of the total urban population and 62% of the total population of Korea. The second category of urban functional areas, also designated as metropolitan areas,include Ulsan, Gwangju, Cheonan, Cheongju, Pohang, Jeonju and Changwon, and together represent 14% of the total urban population. Adding these two categories together, there are 11 urban functional areas with 500 000 and more inhabitants, representing nearly 74% of the total population of the country. This methodology provides a more accurate picture of the Korean urban systems; in order to make this methodology

Figure 1.13. **Territorial map of Korea**

TL2 for regions: TL3 for Seoul, six metropolitan cities and nine provinces

KR01	**Capital Region**	**KR04**	**Jeolla Region**	**KR06**	**Gangwon Region**
KR011	Seoul	KR041	Gwangju	KR061	Gangwon-do
KR012	Incheon	KR042	Jeollabuk-do	**KR07**	**Jeju**
KR013	Gyeonggi-do	KR043	Jeollanam-do	KR071	Jeju-do
KR02	**Gyeongnam Region**	**KR05**	**Chungcheong Region**		
KR021	Busan	KR051	Daejeon		
KR022	Ulsan	KR052	Chungcheongbuk-do		
KR023	Gyeongsangnam-do	KR053	Chungcheongnam-do		
KR03	**Gyeongbuk Region**				
KR031	Daegu				
KR032	Gyeongsangbuk-do				

Notes: Regions do not correspond to any formal administrative units in Korea. The term is used by national planners and associations.

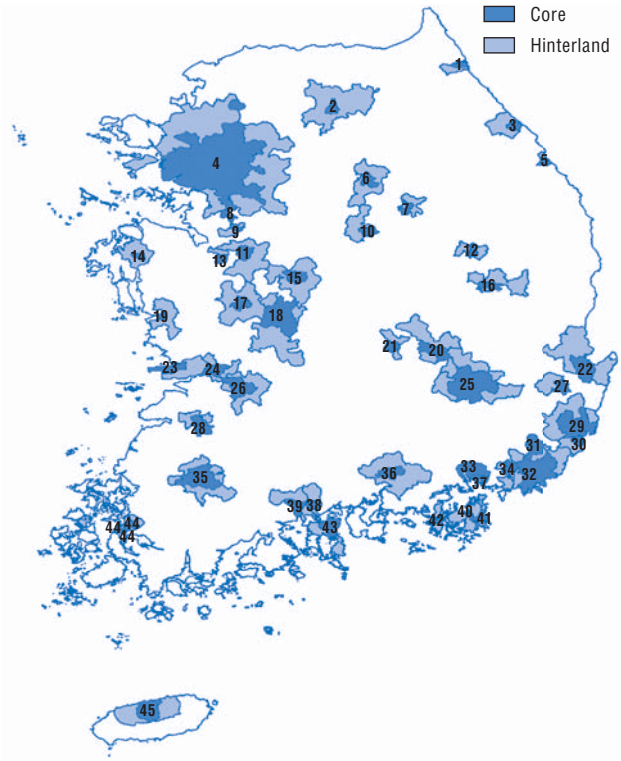
This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD Territorial Grids.

operational, additional variables should be made available by Korean government that will allow an analysis of economic trends in the different types of urban areas.

The choice of unit of analysis can provide a different picture of urbanisation in Korea. For instance, according to the UN World Urbanisation Prospects, 2009, which as mentioned before, provides data for urban areas using national definitions, the urbanisation share of Korea was at 80.8% as of 2005, *i.e.* above the average level for countries, which was 5.5%. For the period 1995-2005, OECD countries on average showed an annual growth rate of urban population of 1.1% while Korea registered 1.0% per year over the same period (Figure 1.15). Using the OECD regional typology that distinguishes Predominantly Urban areas (PU) from intermediate Regions (IR) and Predominantly Rural Regions (PR), a somewhat different picture emerges. According to *OECD Regional Database*, people living in PU areas in the OECD countries comprised on average 47.1% of the total population as of 2005, *i.e.* substantially lower than the urbanisation share measured by UN typology (75.5%), while

Figure 1.14. **Urban functional areas of Korea in 2010**



Notes: Due to the unavailability of commuting data among municipalities for the whole country, a representative sample of commuting data for 2010 is used here, provided by the Ministry of Land, Transport and Maritime Affairs (MLTM). The sample data cover around 700 000 commuters referring to the "home to offices" category.

ID on the map: 1. Sokcho; 2. Chuncheon; 3. Gangneung; 4. Seoul Incheon; 5. Donghae; 6. Wonju; 7. Jecheon; 8. Pyeongtaek Seojeong; 9. Pyeongtaek; 10. Chungju; 11. Cheonan; 12. Yeongju; 13. Asan; 14. Seosan; 15. Cheongju; 16. Andong; 17. Gongju; 18. Daejeon; 19. Boryeong; 20. Gumi; 21. Gimcheon; 22. Pohang; 23. Gunsan; 24. Iksan; 25. Daegu; 26. Jeonju; 27. Gyeongju; 28. Jeongeup, 29. Ulsan; 30. Ulsan Onsan; 31. Yangsan; 32. Busan; 33. Changwon; 34. Gimhae; 35. Gwangju; 36. Jinju; 37. Jinhae; 38. Gwangyang, 39. Suncheon; 40. Geoje Gohyun; 41. Geoje Neungpo; 42. Tongyeong; 43. Yeosu; 44. Mokpo; 45. Jeju.

This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: The OECD computations are based on the Korea Transportation Institute's (2011), "Survey on National Passenger Commuting 2010", Korea Transportation Institute, Korea and Korea Statistics Office (2011), "2010 Census", Korea Statistics Office, Korea, and OECD (2011b).

the annual population growth rate *per annum* in PU areas of OECD member states between 1995 and 2005 (0.81%) did not greatly diverge from the figure based on UN typology (1.1%). According to the OECD definition, Korea displayed a significantly higher level in urbanisation share in PU areas in 2005 (69.1%) than the OECD average, but its annual urban population growth rate between 1995 and 2005 (0.94%) was close to the OECD average (Figure 1.16). Finally, when using the new OECD methodology to define functional urban areas, the urban population reaches 85.4% of the total population in Korea, which is probably the most accurate estimate of urbanisation in Korea.

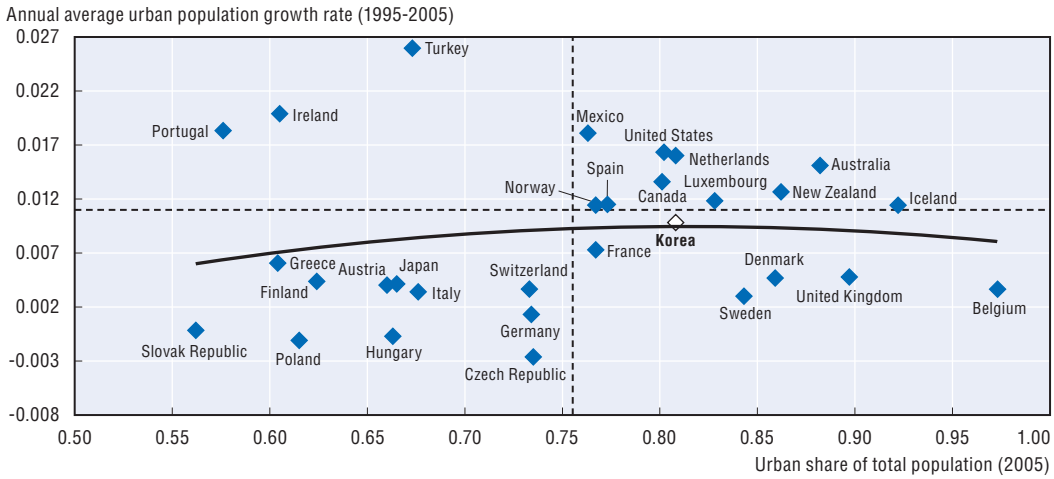
Table 1.4. **Classification of functional urban areas in Korea**

Classification	Large metropolitan areas	Metropolitan areas	Medium-sized urban areas	Small urban areas
Name	Seoul Incheon	Cheonan	Chuncheon	Sokcho
	Daejeon	Cheongju	Wonju	Gangneung
	Daegu	Pohang	Gumi	Donghae
	Busan	Jeonju	Gunsan	Jecheon
		Ulsan	Iksan	Pyeongtaek Seojeong
		Changwon	Gimhae	Pyeongtaek
		Gwangju	Jinju	Chungju
			Suncheon	Yeongju
			Yeosu	Asan
			Mokpo	Seosan
			Jeju	Andong
				Gongju
				Boryeong
				Gimcheon
				Gyeongju
				Jeongeup
				Ulsan Onsan
				Yangsan
				Jinhae
				Gwangyang
				Geoje Gohyun
				Geoje Neungpo
				Tongyeong
Population	30 035 193	5 772 096	3 366 427	2 552 229
% of the total urban population	72.0	13.8	8.1	6.1
% of total population	61.8	11.9	6.9	5.3

Notes: Large metropolitan areas are classified as having a population of 1.5 million or higher.
Metropolitan areas with a population of between 500 000 and 1.5 million people.
Medium-sized urban areas with a population of between 200 000 and 500 000 people.
Small urban areas with a population of below 200 000 people.

Figure 1.15. **Urbanisation in OECD countries using the UN typology**

Urbanisation level (2005) and urban population growth rate (1995-2005)

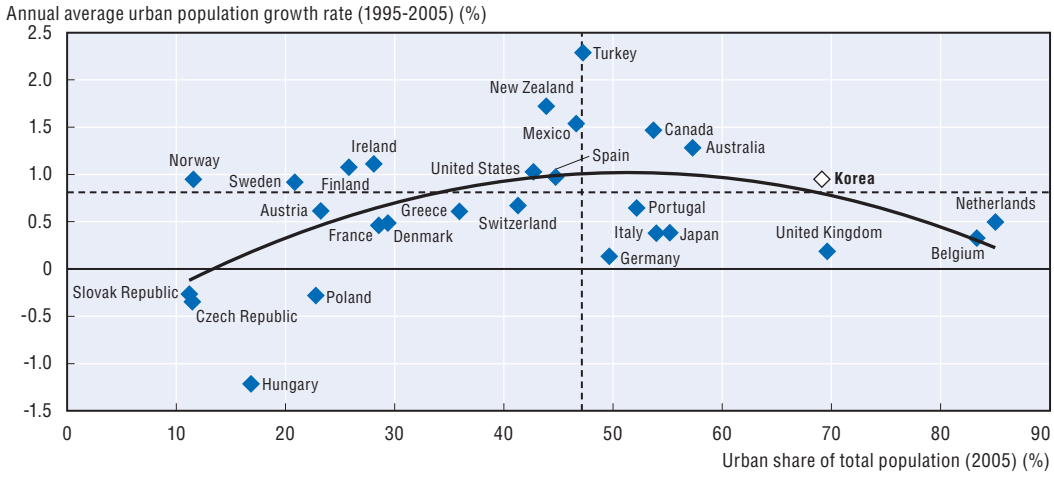


Note: Classification of urban areas is followed by each country's own definition.

Source: OECD computations based on United Nations Department of Economic and Social Affairs (2008), *World Urbanization Prospects: 2007 revision*, United Nations Department of Economic and Social Affairs, New York.

Figure 1.16. **Urbanisation in OECD countries using the OECD regional typology**

Urbanisation level (2005) and urban population growth rate (1995-2005)



Note: Iceland and Luxembourg were not included in the sample, as the *OECD Regional Database* identifies no predominantly urban regions in those countries.

Source: OECD computations based on United Nations Department of Economic and Social Affairs (2008), *World Urbanization Prospects: 2007 revision*, United Nations Department of Economic and Social Affairs, New York.

An unbalanced urbanisation pattern

Korea's urbanisation pattern features a highly unbalanced territorial structure, and Seoul has dominated as a primate city for several decades. Unlike countries like Germany and the Netherlands, Korea, like the UK, is characterised by the overwhelming size of its primate city as compared to other cities, following "Zipf's law", whereby when all the settlements of a country are ranked according to population size, the sizes of settlements will be inversely proportional to their rank (see Figure 1.A1.1 in the Annex). In the same vein, the *q*-values[8] for cities in Korea since 1970 were commonly bigger than "1" in the absolute value, implying that the primate city and other large cities accounted for a dominant share of urban population in Korea for a given year (Table 1.5). Using such coefficients in 54 countries shows Korea ranking among the countries with the greatest dominance of its primate city (see Table 1.A1.1 in the Annex).

Meanwhile, the population of mid-sized cities in Korea has grown at a faster rate than large-sized cities since the 1990s (Table 1.5). Indeed, the *q*-value in Korean cities has shown a clear downward trend since the 1990s, despite its fluctuation during the same period.

Table 1.5. **The *q*-values of Pareto distribution in Korean cities (1970-2009)**

	Number of cities	*q*-value	Intercept (log P_1)	Determinant coefficient (R^2)
1970	31	–1.2454	15.122	0.9784
1980	40	–1.2054	15.599	0.9871
1990	73	–1.2279	16.075	0.9958
1995	72	–1.0994	16.055	0.9876
2000	79	–1.0596	16.062	0.9825
2005	84	–1.0799	16.187	0.9647
2009	84	–1.0646	16.028	0.9655

Source: OECD calculation based on data from Ministry of Public Administration and Security (2009), *Municipal Yearbook of Korea* (in Korean), Ministry of Public Administration and Security, Seoul.

The q-value was substantially dropped from –1.22 in 1990 to –1.09 in 1995 and then dropped slightly farther, to –1.06 in 2009.

Population distribution change in Korean cities also strongly reinforces the trends towards an unbalanced pattern of urbanisation. Figure 1.17 summarises population rank changes for the last four decades since 1970 among the 40 largest cities of Korea, as of 2009. A group of these 40 largest cities covers most of above medium-sized cities that have more than 200 000 inhabitants. For instance, the population of the city of Asan-si in the Gyeonggi-do province in the Capital Region placed 40th in population rankings as of 2009, at 256 000. Several trends can be highlighted:

Firstly, like many OECD countries, the capital city and some large cities in Korea have continuously accounted for the overwhelming share of the population, and the population rankings among them have barely changed for the past several decades. The seven "1 million-plus and provincial-level cities" in Korea as of 2009 correspond to the seven largest cities in 1980. There were minor changes in ranking among them: Daejeon rose from sixth to fifth over 1990-95; Incheon rose from fourth to third between 1995 and 2000, while Daegu fell from third to fourth between 1995 and 2000.

Secondly, most of the other 40 largest cities experienced frequent population rank changes through the late 1990s, but have shown markedly reduced variations since

Figure 1.17. **Population rank changes of Korean cities**

1970-2009

Notes: Arrows indicate instances of a rise in ranking.
Numbers in cells indicate ranks of respective cities.
Cities in bold letters are newly created in respective terms.

Source: OECD own calculations based on data from Ministry of Public Administration and Security (MOPAS) (2009), *Municipal Yearbook of Korea* (in Korean), Seoul.

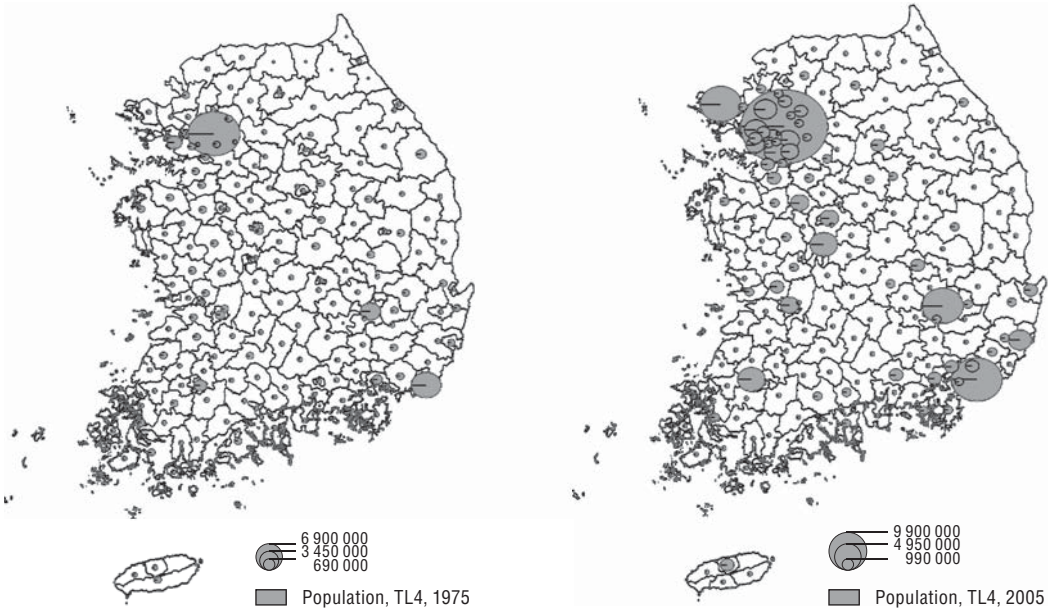
the 2000s. For a decade between1970-80, 21 out of 33 medium-sized cities that ranked between 8th and 40th as of 2009 experienced a drastic leap in the population rankings. However, between 2005 and 2009, there was no change of population rank of Korean cities from 8th and 17th and notably, all medium-sized cities remained among the 40 largest cities in 2009.

Thirdly, there has been an apparent rise in the population rankings of medium-sized cities in the Seoul Metropolitan Area (Seoul, Incheon and Gyeonggi province) and the Chungcheongnam province. In 1970, there were only nine cities (27.2%) in the Capital Region, out of 33 medium-sized cities, but this has since risen to 14 (42.4%), mainly reflecting new town development, especially in Goyang-si and Yongin-si. Medium-sized cities in the Chungcheongnam province benefited from the rise of the Chinese economy in the 1990s. For instance, Cheonan-si, home to high-tech industry, was placed at 147th in 1970, with 76 000 inhabitants, but moved up to 17th in 2009, with 540 000.

Expanding this analysis to small-sized cities (including a few *gun*, rural areas in administrative terms) reinforces the trends of the unbalanced urbanisation growth in Korea. Overall, for the four decades between 1970 and 2009, large- and medium-sized cities gained population but small-sized cities experienced population loss (Figure 1.18). This is well indicated by the trend line of 2009, which becomes flatter relative to the trend line of 1970 up to the top 61 places, but then rises more steeply (upper part of Figure 1.19). During that period, the population rise of medium-sized cities with a population ranging between 500 000 and 1 million as of 2009 (matching approximately with the 8th and 20th rankings)[9] was remarkable. The population of those cities increased by 2.5 to 4 times compared to that of the same rankings in 1970. This trend has two different paths divided

Figure 1.18. **Population distribution changes of Korean cities**

1975 (left), 2005 (right)

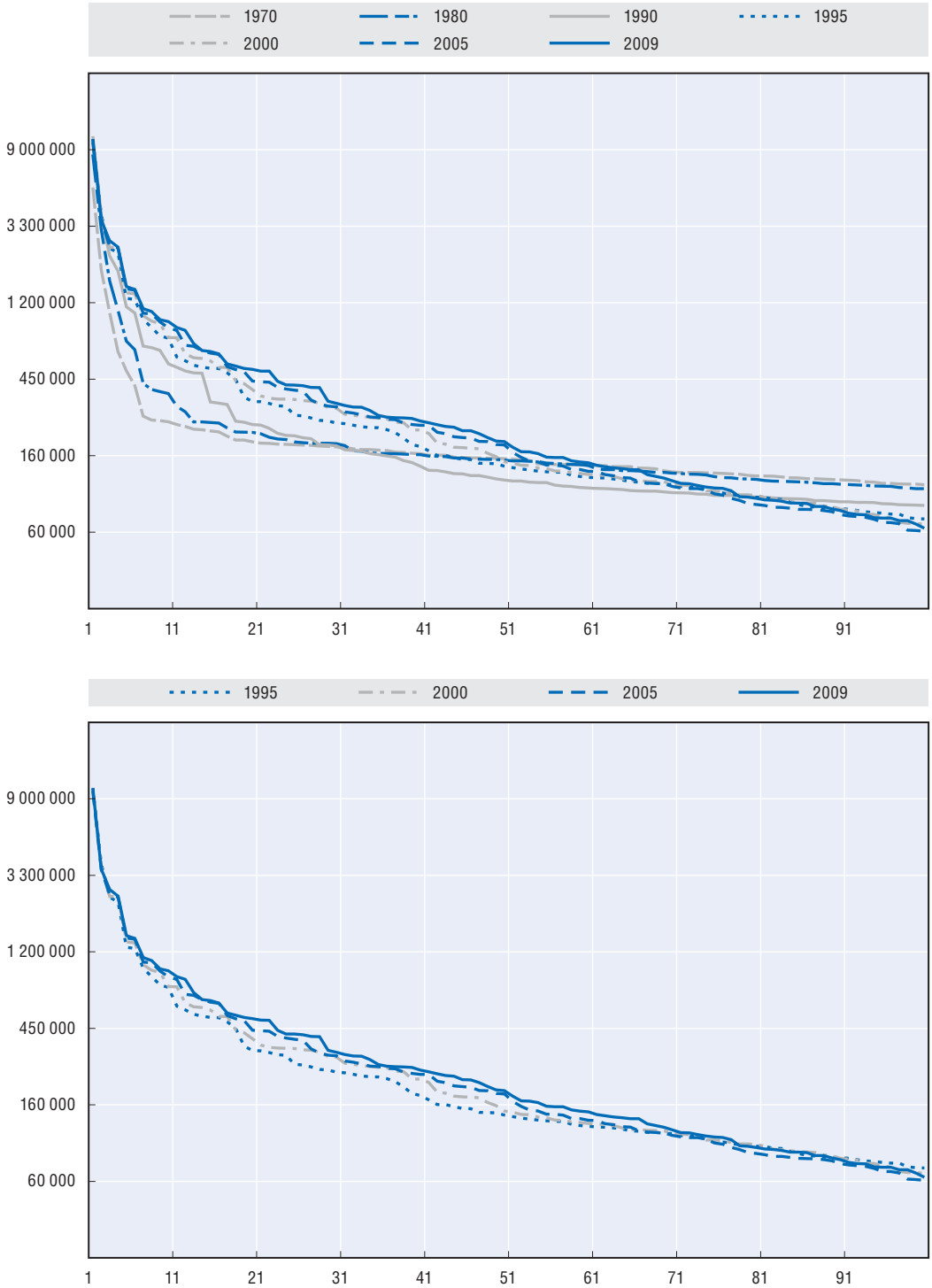


Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD calculation based on Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Figure 1.19. **Changes of population share of 100 Korean cities**

Population size changes of 100 cities in Korea



Notes: The vertical and horizontal axis respectively represent population size and population rank.
Values of population sizes in the figures are displayed in common logarithms.
Ranks of settlements (first to 100th) are in order of population size, regardless of types of administrative units (urban or rural).

Source: OECD own calculations based on data from Ministry of Public Administration and Security (2009), *Municipal Yearbook of Korea* (in Korean), Ministry of Public Administration and Security, Seoul.

by the year of 1995. Between 1970 and 1995, obvious trade-offs between large and medium-sized cities, on the one hand, and small-sized cities on the other hand, were observed: the large and medium-sized cities showed significant population gains, while the small-sized cities exhibited steady population loss. However, between 1995 and 2009, a strong convergence of trend lines and population growth has been more evenly distributed throughout most of rankings (lower part of Figure 1.19).

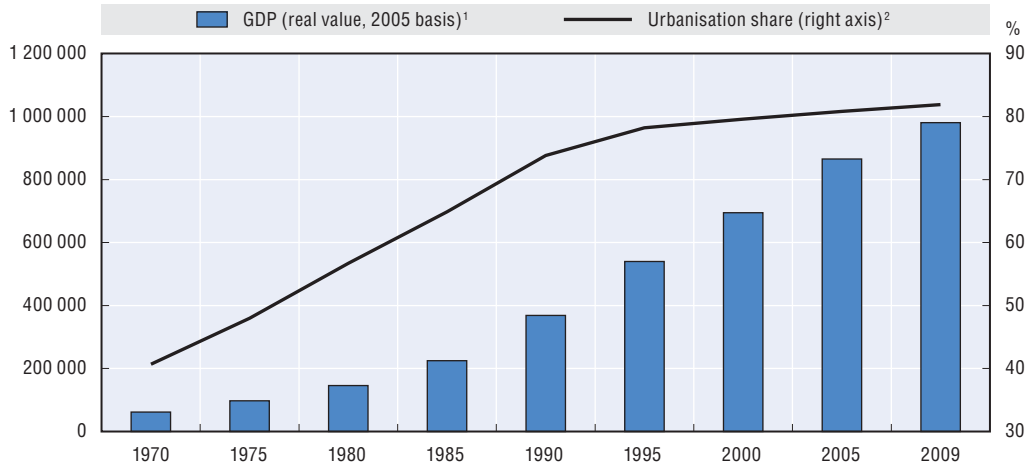
1.3. Economic performance and main challenges of Korean cities

The leading role of large cities: is it the end?

Cities in Korea play a leading role in fuelling economic prosperity. Korea is one of the countries that show a linear and positive relationship between economic growth and urbanisation. Korea's GDP growth has gone hand in hand with rapid urbanisation in the last several decades (Figure 1.20). While the real GDP of Korea increased almost 16 times between 1970 and 2009, the urbanisation share of Korea also doubled over the same period, from 40.7% to 81.9%. The coefficient of correlation between GDP size and urbanisation share of Korea during 1970 and 2010 was recorded at 0.887. This close relationship is even clearer in terms of growth rates for both GDP and urban population. Between 1970 and 1990, Korea experienced an unprecedented GDP growth rate of 9.4% per year. During this period, the urban population of Korea also expanded by 4.4% annually. However, between 1995 and 2009, the pace of Korea's GDP growth slowed to under 5% per year on average (Figure 1.21). Its annual urban population growth also slowed to 1.1% per year for 1995-2000, to 0.8% for 2000-05 and 0.6% for 2005-09.

Seven metropolitan cities have accounted for the bulk of the national output: in 2009, Seoul, Busan, Daegu, Incheon, Gwangju, Daejon and Ulsan attracted 46.1% of the national population and together produced 46.2% of national GDP. The Capital Region, also called the Seoul Metropolitan Area, composed of Seoul, Incheon and the Gyeonggi province,

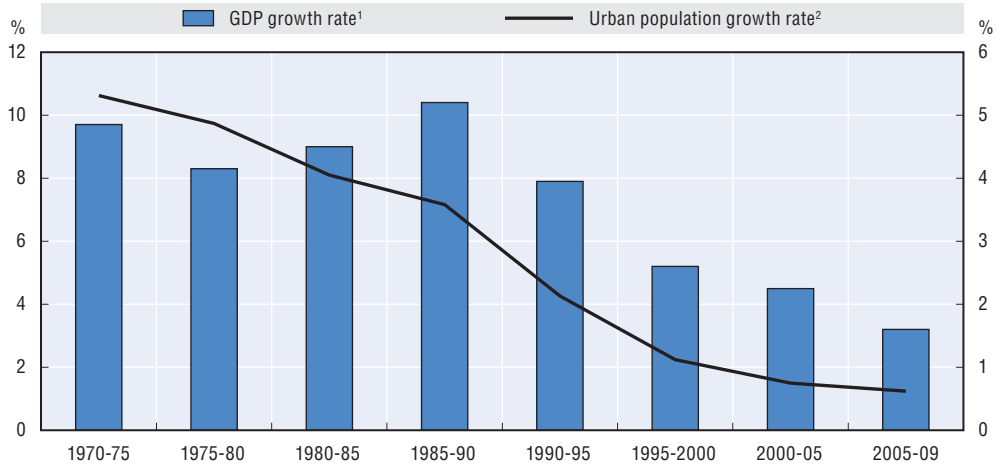
Figure 1.20. **GDP and urbanisation share in Korea**



1. Unit of left axis (GDP real value) is KRW 1 billion.
2. Urbanisation share of 2009 is for 2010.

Source: United Nations Department of Economic and Social Affairs (2010), *World Urbanization Prospects: 2009 revision*, United Nations Department of Economic and Social Affairs, New York.; Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed 1 March 2011 for GDP.

Figure 1.21. **GDP growth rate and urban population growth rate in Korea**



Note: For the urban growth rate, the most recent interval is 2005-10, rather than 2005-09.

Source: United Nations Department of Economic and Social Affairs (2010), *World Urbanization Prospects: 2009 revision*, United Nations Department of Economic and Social Affairs, New York.; Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed 1 March 2011 for GDP.

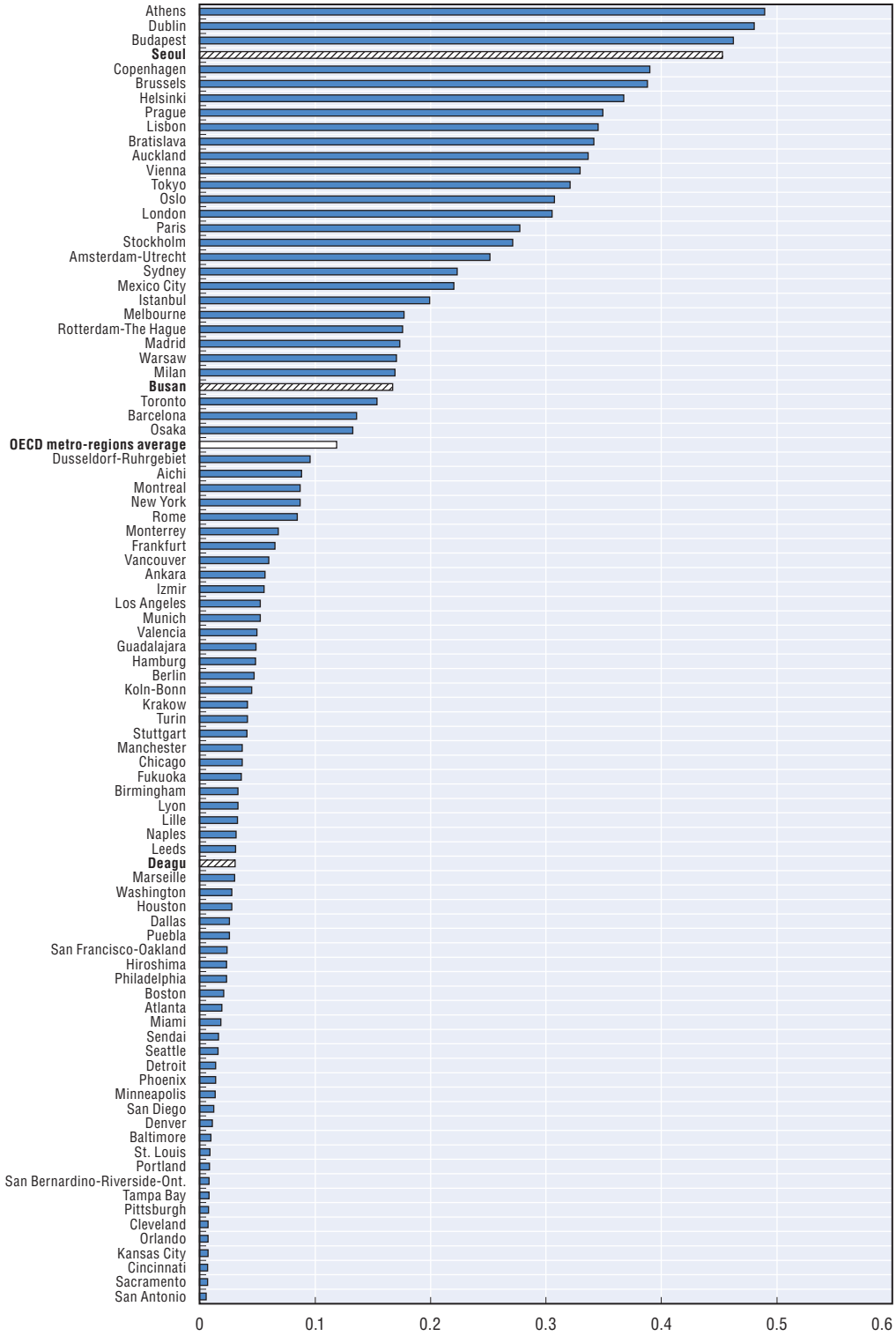
contributed almost half of national GDP (48.7%) and accounted for a similar share of the national population (49%), with Seoul City representing 24.1% of national GDP and 20.5% of national population in the same year. The dominance of Seoul and the Capital Region is exceptional (Box 1.3). With the exception of Athens' metro-region in Greece and Dublin's metro-region in Ireland, the share of the Seoul metro-region in national GDP is the highest among the 90 OECD metropolitan areas (Figure 1.22). As the second largest metropolitan

Box 1.3. **The dominance of Seoul**

Seoul concentrates the highest share of Korea's population and wealth and is three times larger than Busan, the next largest city in Korea. For many years, Seoul has been the capital of Korea and the centre of administration, politics and economic activity. The city has seen spectacular population growth in the last 50 years. Seoul had only 1 million inhabitants in 1942, and its population grew from 5 million in 1970 to 10 million in 2010. The city is divided into 25 autonomous districts (called *gu*), which are more numerous than in any other Korean city and include larger populations than the basic territorial units in most other OECD countries. In terms of population density, Seoul ranks well above Tokyo, Los Angeles, Paris' Ile de France, New York, London and Mexico City, with over 16 000 inhabitants per square kilometer. Korea is among the OECD countries with the highest geographic concentration of population after Canada, Australia, Iceland and Mexico. Seoul is Korea's major economic and employment centre. As the capital city, Seoul fulfils the key administrative, legislative, diplomatic and media functions, which, combined with the headquarters functions for larger international firms such as Samsung and LG, define an important seat of power. Seoul also performs gateway functions for the national economy, with its world-class airport (Incheon International Airport) and logistics platforms. In 2009, Seoul hosted 22% of the country's firms (723 086) and 20.6% of total employment. In the same year, Seoul and the Capital Region accounted for 46.8% of Korea's businesses (1 541 691) and 49.6% of national employment.

Source: Adapted from OECD (2005), *OECD Metropolitan Review of Seoul*, OECD Publishing, Paris.

Figure 1.22. **OECD selected metro-regions: share of metro-regions in national GDP (2007)**



Source: OECD (2010d), Metropolitan regions, *OECD Regional Statistics Database*, doi: *10.1787/data-00531-en*, accessed June 2011; OECD (2010e), *OECD Factbook 2010: Economic, Environmental and Social Statistics*, OECD Publishing. doi: *10.1787/factbook-2010-en*.

city in Korea, Busan accounted for 5.2% of the country's GDP in 2009 and for 7.1% of the country's population. Ulsan was responsible for exceptionally high economic outputs with respect to its share of the national population: in 2009, Ulsan contributed 4.7% to national GDP, while its share of population remained 2.2%. On the other hand, the provinces of

Table 1.6. **Population and GDP of Korean cities**

A share of national total, %

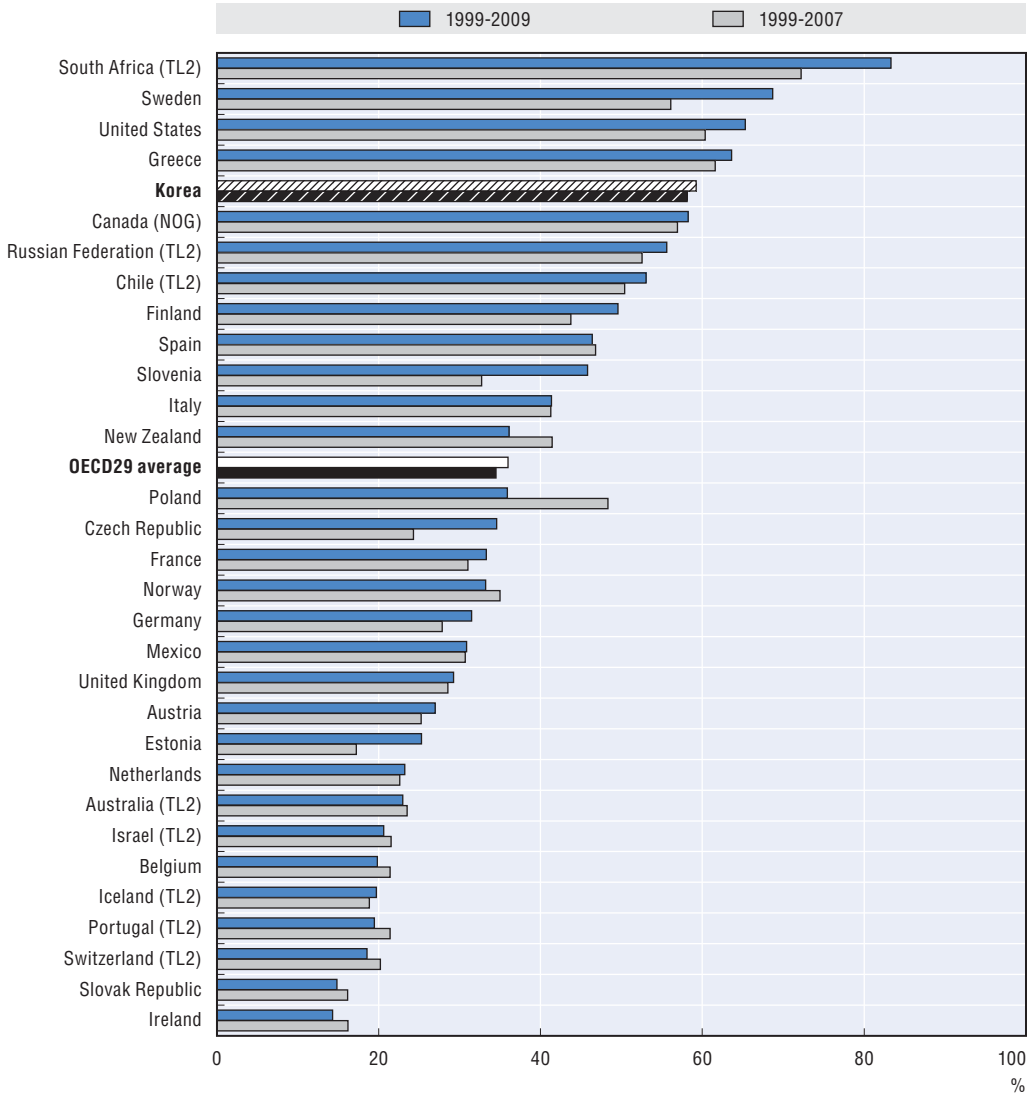
			1985	1990	2000	2005	2008
Seoul MA		GDP share	43.8	47.5	48.5	48.2	47.8
		Pop. share	39.1	42.8	46.2	48.1	48.8
	Seoul	GDP share	25.5	26.2	25.1	24.0	23.8
		Pop. share	23.8	24.4	21.4	20.8	20.6
	Incheon	GDP share	4.5	4.9	4.5	4.6	4.7
		Pop. share	3.4	4.2	5.4	5.4	5.4
	Gyeonggi	GDP share	13.8	16.4	19.0	19.5	19.4
		Pop. share	11.9	14.2	19.4	22.0	22.8
Busan MA		GDP share	18.4	17.6	17.0	17.0	17.8
		Pop. share	17.4	17.2	16.6	16.2	16.0
	Busan	GDP share	7.8	7.2	5.7	5.5	5.5
		Pop. share	8.7	8.7	7.9	7.5	7.2
	Ulsan	GDP share	0.0	0.0	4.8	4.8	5.1
		Pop. share	0.0	0.0	2.2	2.2	2.2
	Gyeongnam	GDP share	10.7	10.3	6.6	6.7	7.3
		Pop. share	8.7	8.5	6.5	6.5	6.5
Daegu MA		GDP share	11.9	11.3	10.3	10.4	9.9
		Pop. share	12.5	11.7	11.3	10.7	10.4
	Daegu	GDP share	4.3	4.4	3.6	3.3	3.2
		Pop. share	5.0	5.1	5.4	5.2	5.0
	Gyeongbuk	GDP share	7.5	6.9	6.7	7.1	6.6
		Pop. share	7.4	6.6	5.9	5.5	5.4
Gwangju MA		GDP share	7.4	7.1	6.8	7.1	7.3
		Pop. share	9.3	8.4	7.3	6.9	6.7
	Gwangju	GDP share	0.0	2.3	2.2	2.2	2.2
		Pop. share	0.0	2.6	2.9	3.0	2.9
	Jeonnam	GDP share	7.4	4.8	4.6	4.9	5.1
		Pop. share	9.3	5.8	4.3	3.9	3.9
Daejeon MA		GDP share	6.4	6.0	7.2	7.8	7.9
		Pop. share	7.4	7.1	7.0	7.1	7.1
	Daejeon	GDP share	0.0	2.4	2.3	2.3	2.3
		Pop. share	0.0	2.4	3.0	3.1	3.0
	Chungnam	GDP share	6.4	3.7	4.8	5.5	5.6
		Pop. share	7.4	4.6	4.0	4.0	4.1
Non-metropolitan	Gwangwon	GDP share	4.0	3.4	2.8	2.6	2.6
		Pop. share	4.3	3.6	3.2	3.1	3.0
	Chungbuk	GDP share	3.5	3.0	3.3	3.1	2.9
		Pop. share	3.4	3.2	3.2	3.1	3.1
	Jeonbuk	GDP share	3.8	3.2	3.2	2.9	2.9
		Pop. share	5.4	4.8	4.1	3.8	3.7
	Jeju	GDP share	0.9	0.9	0.9	0.9	0.9
		Pop. share	1.2	1.2	1.1	1.1	1.1
Nationwide		GDP share	100.0	100.0	100.0	100.0	100.0
		Pop. share	100.0	100.0	100.0	100.0	100.0

Source: OECD computation based on Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Gwangwon, Chungcheongbuk, Jeollabuk and Jeju, which have no metropolitan cities and are comprised of substantially large rural areas, have continuously accounted for a limited share of national GDP and national population, and regularly produce a smaller share of the country's GDP than their share of the total population.

Employment has also tended to concentrate in large cities, more precisely in predominantly urban regions. Korea is one of countries where the highest shares of national employment growth are spurred by 10% of regions (Figure 1.23). Recent trends reflect different patterns, depending on technical change, sectoral shifts and the historical manufacturing legacy in each city. For instance, larger urban areas (including Seoul), which experienced sustained and high employment growth rates until 2000, have seen slower job creation rates in the past decade. Although all seven metropolitan cities in Korea recorded positive annual average employment growth rates between 2000 and 2007, these growth rates are significantly lower than in previous decades (Table 1.7).

Figure 1.23. **Regional contribution to employment growth**



Source: OECD (2011c), *Regions at a Glance*, OECD Publishing, Paris.

Table 1.7. **Employment and demographic trends in large cities in Korea**

Annual growth rates (%)

		1975-80	1980-90	1990-2000	2000-05 (07)[1]
Nationwide	Employment	11.6	12.5	3.0	2.4
	Manufacturing jobs	13.4	13.8	–5.7	0.8
	Population	1.5	1.5	0.6	0.5
Seoul	Employment	2.5	5.3	8.1	1.2
	Manufacturing jobs	5.9	3.2	–1.9	–3.4
	Population	2.2	3.0	–0.7	–0.2
Busan	Employment	–2.8	2.0	6.9	1.2
	Manufacturing jobs	3.3	1.9	–4.9	–1.8
	Population	5.2	1.9	–0.4	–0.8
Daegu	Employment	–	–0.9	9.7	1.4
	Manufacturing jobs	–	1.0	0.1	–0.9
	Population	–	2.8	1.2	–0.1
Incheon	Employment	14.9	1.5	8.5	2.0
	Manufacturing jobs	17.2	1.3	0.6	–0.4
	Population	8.7	4.6	2.9	0.4
Gwangju	Employment	6.4	3.9	13.3	2.6
	Manufacturing jobs	5.0	6.4	2.9	2.4
	Population	3.7	4.6	1.7	0.9
Daejeon	Employment	8.9	–4.8	13.3	2.3
	Manufacturing jobs	–9.1	1.9	0.0	–1.3
	Population	5.2	4.9	2.7	1.1
Ulsan	Employment	12.5	3.6	8.6	2.8
	Manufacturing jobs	16.3	5.8	1.7	0.7
	Population	16.2	4.2	3.9	0.7

1. Employment data is for 2007 and population data is for 2005.

Source: OECD own calculations based on Korea Statistics Office (2011). Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Trends in employment growth show that medium-sized cities in Korea feature a steady increase in employment. Interestingly, some medium-sized cities experienced employment growth rates between 1975 and 2007 above the national average in manufacturing. As larger cities begin to pay higher wages, labour-intensive activities in manufacturing tend to relocate to smaller urban areas or abroad, leading to a sectoral shift in both larger and smaller cities, encouraged by capital deepening and technical change. For instance, Cheonan recorded 14.8% annual employment growth in manufacturing between 1990 and 2000, whereas the national figure declined to 5.7%. Cities that experienced rapid growth in manufacturing jobs in the 1970s and 1980s have, since the 1990s, been able to create new jobs in services, resulting in continued population influx. For instance, the industrialised cities of Bucheon, Cheonan and Changwon have grown faster than other medium-sized cities in terms of population since 1975 (Table 1.8). However, medium-sized cities located outside the Seoul Metropolitan Area with weak manufacturing activities often failed to generate new jobs in value-added services activities in the 1990s, leading to a prolonged decline in population. Typical administrative cities such as Jeonju, Chuncheon, Mokpo and Andong, which do not have a strong manufacturing base (in 2007, these cities reported less than 10% of total jobs in the manufacturing sector), have generally suffered from population loss or stagnation.

At the same time that employment creation is being concentrated, capital deepening may be inducing a sectoral shift in employment. Jobs in manufacturing have sharply

Table 1.8. **Employment changes in medium-sized cities in Korea**

Percentage

			1975-80	1980-90	1990-2000	2000-05 (07)[1]
Growing cities	Suwon	Employment growth rate	4.9	5.6	11.6	3.4
		Manufacturing jobs growth rate	13.3	4.1	0.8	–3.0
		Population growth rate	6.7	7.6	3.9	2.0
		Share of manufacturing jobs	69.4	60.1	21.8	14.0
		Employment rate (per 100 persons)	15.0	12.4	25.3	28.9
	Bucheon	Employment growth rate	21.4	4.0	8.8	1.7
		Manufacturing jobs growth rate	18.7	6.0	0.6	–2.7
		Population growth rate	15.2	11.7	1.3	2.0
		Share of manufacturing jobs	71.4	85.8	39.3	28.9
		Employment rate (per 100 persons)	27.2	13.4	27.2	27.8
	Cheonan	Employment growth rate	21.9	–4.0	20.2	5.6
		Manufacturing jobs growth rate	22.6	–5.0	14.8	4.9
		Population growth rate	4.5	5.8	7.1	4.5
		Share of manufacturing jobs	64.3	58.1	36.8	35.0
		Employment rate (per 100 persons)	26.0	9.8	31.1	36.6
	Changwon	Employment growth rate		10.3	8.5	2.3
		Manufacturing jobs growth rate		9.6	1.6	1.1
		Population growth rate		7.1	2.7	–0.6
		Share of manufacturing jobs	98.3	92.0	48.0	44.1
		Employment rate (per 100 persons)	16.6	22.3	38.3	46.5
Lagging cities	Jeonju	Employment growth rate	–7.1	5.9	9.4	2.0
		Manufacturing jobs growth rate	–4.2	6.5	–4.5	–4.6
		Population growth rate	3.3	3.5	1.8	0.2
		Share of manufacturing jobs	38.6	40.5	10.4	6.5
		Employment rate (per 100 persons)	9.3	11.7	24.3	27.5
	Chuncheon	Employment growth rate	28.7	–6.2	14.8	2.2
		Manufacturing jobs growth rate	32.9	–0.2	–1.6	–2.2
		Population growth rate	8.5	0.3	1.5	0.7
		Share of manufacturing jobs	17.3	32.3	6.9	5.1
		Employment rate (per 100 persons)	14.9	7.6	26.0	29.4
	Mokpo	Employment growth rate	17.0	–10.8	12.1	0.5
		Manufacturing jobs growth rate	19.7	–6.9	–4.0	–5.1
		Population growth rate	2.8	0.9	0.3	–0.5
		Share of manufacturing jobs	24.9	38.5	8.2	5.5
		Employment rate (per 100 persons)	30.0	8.7	26.5	28.1
	Andong	Employment growth rate	12.1	–3.8	17.6	1.2
		Manufacturing jobs growth rate	4.6	–2.9	6.6	2.0
		Population growth rate	–2.3	–1.8	–0.8	–1.4
		Share of manufacturing jobs	17.4	19.2	7.2	7.6
		Employment rate (per 100 persons)	5.1	4.1	22.7	26.4

1. Employment data is for 2007 and population data is for 2005.

Source: OECD calculations based on Korea Statistics Office (2011). Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

declined since the 1990s, as more domestic companies seek to relocate their relatively more labour-intensive processes overseas, particularly to China, to take advantage of lower manufacturing costs.[10] The share of manufacturing in Korean employment peaked at 57.2% in 1990 before falling to 23.7% in 2000 and 21.3% in 2007. During 1990-2000, Korea lost more than 2.4 million manufacturing jobs, equivalent to a –5.7% growth rate annually for the same period. These national patterns of employment growth were largely consistent in metropolitan cities, with some variations (Tables 1.9, 1.10 and 1.11).

Table 1.9. **Employment changes in large cities in Korea**

		1975	1980	1990	2000	2005 or 2007[1]
Nation-wide	Employment (A, thousand)	1 703	2 943	9 566	12 882	15 167
	Manufacturing jobs (B, thousand)	799	1 501	5 467	3 051	3 237
	Population (C, thousand)	34 706	37 436	43 410	46 136	47 278
	Share of manufacturing jobs (B/A, %)	46.9	51.0	57.2	23.7	21.3
	Employment per 100 person (A/C, people)	4.9	7.9	22.0	27.9	32.1
Seoul	Employment (A, thousand)	875	1 092	1 647	3 574	3 894
	Manufacturing jobs (B, thousand)	319	533	685	568	445
	Population (C, thousand)	6 889	8 350	10 603	9 853	9 726
	Share of manufacturing jobs (B/A, %)	36.5	48.8	41.6	15.9	11.4
	Employment per 100 person (A/C, unit)	12.7	13.1	15.5	36.3	39.9
Busan	Employment (A, thousand)	515	447	542	1 057	1 147
	Manufacturing jobs (B, thousand)	263	309	374	226	199
	Population (C, thousand)	2 453	3 156	3 795	3 655	3 512
	Share of manufacturing jobs (B/A, %)	51.1	69.1	68.9	21.4	17.4
	Employment per 100 person (A/C, people)	21.0	14.2	14.3	28.9	32.7
Daegu	Employment (A, thousand)	–	290	263	664	731
	Manufacturing jobs (B, thousand)	–	147	162	164	154
	Population (C, thousand)	–	1 766	2 322	2 629	2 615
	Share of manufacturing jobs (B/A, %)	–	50.8	61.6	24.8	21.1
	Employment per 100 person (A/C, people)	–	16.4	11.4	25.3	28.0
Incheon	Employment (A, thousand)	125	250	292	664	763
	Manufacturing jobs (B, thousand)	87	193	219	233	226
	Population (C, thousand)	800	1 214	1909	2 548	2 601
	Share of manufacturing jobs (B/A, %)	69.9	77.0	74.9	35.1	29.6
	Employment per 100 person (A/C, people)	15.7	20.7	15.3	26.1	29.4
Gwangju	Employment (A, thousand)	54	74	109	380	456
	Manufacturing jobs (B, thousand)	18	24	44	59	70
	Population (C, thousand)	607	727	1 139	1 352	1 417
	Share of manufacturing jobs (B/A, %)	34.6	32.5	41.2	15.6	15.4
	Employment per 100 person (A/C, people)	9	10.2	9.6	28.2	32.2
Daejeon	Employment (A, thousand)	110	169	104	365	429
	Manufacturing jobs (B, thousand)	67	42	50	50	46
	Population (C, thousand)	506	651	1 049	1 368	1 442
	Share of manufacturing jobs (B/A, %)	60.9	24.7	48.5	13.9	10.7
	Employment per 100 person (A/C, people)	21.9	26.1	10.0	26.7	29.8
Ulsan	Employment (A, thousand)	57	103	146	334	406
	Manufacturing jobs (B, thousand)	31	67	118	140	147
	Population (C, thousand)	252	535	805	1 175	1 214
	Share of manufacturing jobs (B/A, %)	55.6	65.6	81.1	41.9	36.4
	Employment per 100 person (A/C, people)	22.7	19.3	18.2	28.5	33.5

1. Employment data is for 2007 and population data is for 2005.

Source: OECD own calculations based on Korea Statistics Office (2011). Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Table 1.10. **Korea: annual employment growth in large cities**

		1975-80	1980-90	1990-2000	2000-05 or –07[1]
Nation-wide	Employment growth rate (per annum, %)	11.6	12.5	3.0	2.4
	Manufacturing jobs growth rate (per annum, %)	13.4	13.8	–5.7	0.8
	Population growth rate (per annum, %)	1.5	1.5	0.6	0.5
Seoul	Employment growth rate (per annum, %)	2.5	5.3	8.1	1.2
	Manufacturing jobs growth rate (per annum, %)	5.9	3.2	–1.9	–3.4
	Population growth rate (per annum, %)	2.2	3.0	–0.7	–0.2
Busan	Employment growth rate (per annum, %)	–2.8	2.0	6.9	1.2
	Manufacturing jobs growth rate (per annum, %)	3.3	1.9	–4.9	–1.8
	Population growth rate (per annum, %)	5.2	1.9	–0.4	–0.8
Daegu	Employment growth rate (per annum, %)	–	–0.9	9.7	1.4
	Manufacturing jobs growth rate (per annum, %)	–	1.0	0.1	–0.9
	Population growth rate (per annum, %)	–	2.8	1.2	–0.1
Incheon	Employment growth rate (per annum, %)	14.9	1.5	8.5	2.0
	Manufacturing jobs growth rate (per annum, %)	17.2	1.3	0.6	–0.4
	Population growth rate (per annum, %)	8.7	4.6	2.9	0.4
Gwangju	Employment growth rate (per annum, %)	6.4	3.9	13.3	2.6
	Manufacturing jobs growth rate (per annum, %)	5.0	6.4	2.9	2.4
	Population growth rate (per annum, %)	3.7	4.6	1.7	0.9
Daejeon	Employment growth rate (per annum, %)	8.9	–4.8	13.3	2.3
	Manufacturing jobs growth rate (per annum, %)	–9.1	1.9	0.0	–1.3
	Population growth rate (per annum, %)	5.2	4.9	2.7	1.1
Ulsan	Employment growth rate (per annum, %)	12.5	3.6	8.6	2.8
	Manufacturing jobs growth rate (per annum, %)	16.3	5.8	1.7	0.7
	Population growth rate (per annum, %)	16.2	4.2	3.9	0.7

1. Employment data is for 2007 and population data is for 2005.
Source: OECD own calculations based on Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Table 1.11. **Korea: employment changes in medium-sized cities**

			1975	1980 (75-80)	1990 (80-90)	2000 (90-00)	2005 or 2007[1] (2000-05/07)
Growing cities	Suwon	Employment growth rate (%, annually)		4.9	5.6	11.6	3.4
		Manufacturing jobs growth rate (%)		13.3	4.1	0.8	–3.0
		Population growth rate (%)		6.7	7.6	3.9	2.0
		Share of manufacturing jobs (B/A, %)	51.0	69.4	60.1	21.8	14.0
		Employment per 100 person (A/C, people)	17.1	15.0	12.4	25.3	28.9
	Bucheon	Employment growth rate (%, annually)		21.4	4.0	8.8	1.7
		Manufacturing jobs growth rate (%)		18.7	6.0	0.6	–2.7
		Population growth rate (%)		15.2	11.7	1.3	2.0
		Share of manufacturing jobs (B/A, %)	80.0	71.4	85.8	39.3	28.9
		Employment per 100 person (A/C, people)	20.9	27.2	13.4	27.2	27.8
	Cheonan	Employment growth rate (%, annually)		21.9	–4.0	20.2	5.6
		Manufacturing jobs growth rate (%)		22.6	–5.0	14.8	4.9
		Population growth rate (%)		4.5	5.8	7.1	4.5
		Share of manufacturing jobs (B/A, %)	62.4	64.3	58.1	36.8	35.0
		Employment per 100 person (A/C, people)	12.0	26.0	9.8	31.1	36.6
	Changwon	Employment growth rate (%, annually)			10.3	8.5	2.3
		Manufacturing jobs growth rate (%)			9.6	1.6	1.1
		Population growth rate (%)			7.1	2.7	–0.6
		Share of manufacturing jobs (B/A, %)		98.3	92.0	48.0	44.1
		Employment per 100 person (A/C, people)		16.6	22.3	38.3	46.5

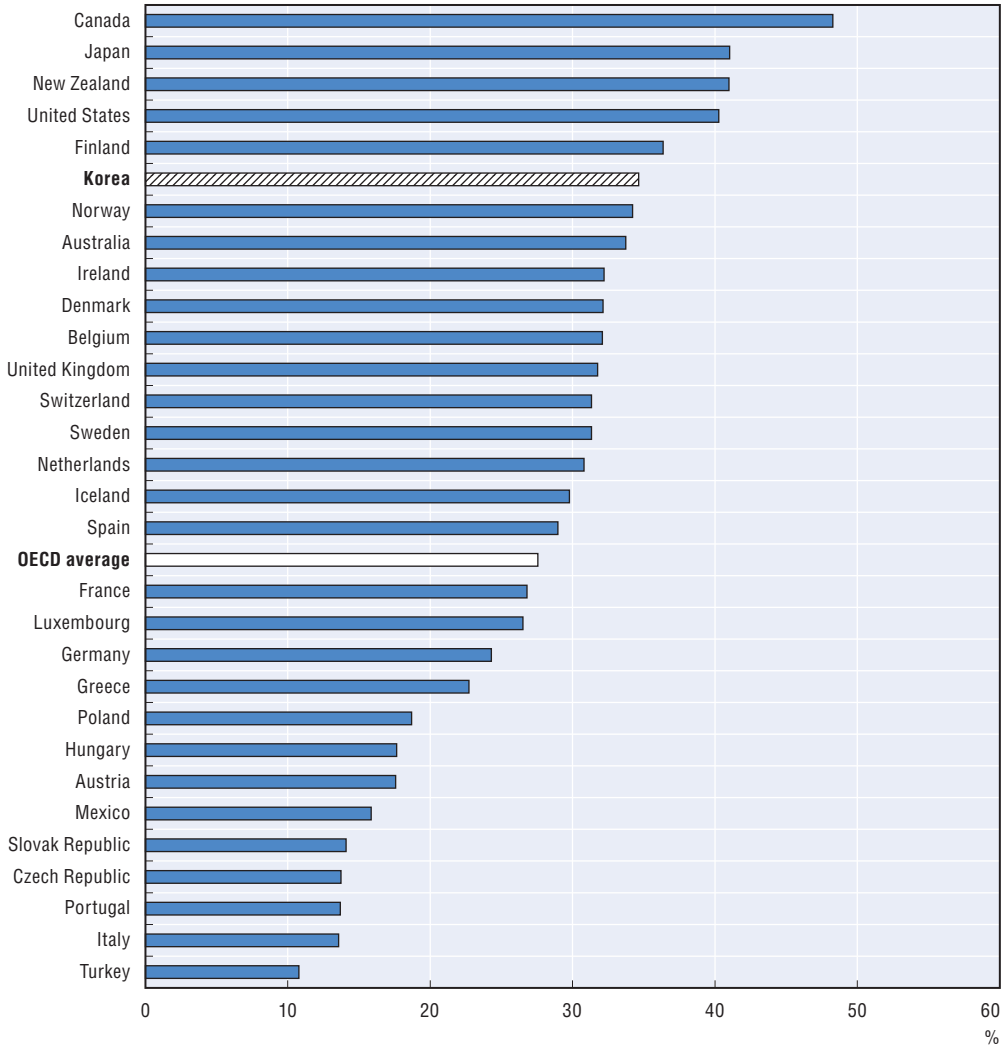
Table 1.11. **Korea: employment changes in medium-sized cities** *(cont.)*

			1975	1980 (75-80)	1990 (80-90)	2000 (90-00)	2005 or 2007[1] (2000-05/07)
Lagging cities	Jeonju	Employment growth rate (%, annually)		–7.1	5.9	9.4	2.0
		Manufacturing jobs growth rate (%)		–4.2	6.5	–4.5	–4.6
		Population growth rate (%)		3.3	3.5	1.8	0.2
		Share of manufacturing jobs (B/A, %)	33.2	38.6	40.5	10.4	6.5
		Employment per 100 person (A/C, people)	15.8	9.3	11.7	24.3	27.5
	Chuncheon	Employment growth rate (%, annually)		28.7	–6.2	14.8	2.2
		Manufacturing jobs growth rate (%)		32.9	–0.2	–1.6	–2.2
		Population growth rate (%)		8.5	0.3	1.5	0.7
		Share of manufacturing jobs (B/A, %)	14.7	17.3	32.3	6.9	5.1
		Employment per 100 person (A/C, people)	6.3	14.9	7.6	26.0	29.4
	Mokpo	Employment growth rate (%, annually)		17.0	–10.8	12.1	0.5
		Manufacturing jobs growth rate (%)		19.7	–6.9	–4.0	–5.1
		Population growth rate (%)		2.8	0.9	0.3	–0.5
		Share of manufacturing jobs (B/A, %)	22.3	24.9	38.5	8.2	5.5
		Employment per 100 person (A/C, people)	15.7	30.0	8.7	26.5	28.1
	Andong	Employment growth rate (%, annually)		12.1	–3.8	17.6	1.2
		Manufacturing jobs growth rate (%)		4.6	–2.9	6.6	2.0
		Population growth rate (%)		–2.3	–1.8	–0.8	–1.4
		Share of manufacturing jobs (B/A, %)	24.7	17.4	19.2	7.2	7.6
		Employment per 100 person (A/C, people)	2.5	5.1	4.1	22.7	26.4

1. Employment data is for 2007 and population data is for 2005.
Source: OECD calculations based on Korea Statistics Office (2011). Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Educational progress in Korea has been particularly rapid in some cities, leading to a growing gap in human capital. The country's progress in tertiary education attainment has been unprecedented in the OECD – Korea ranks seventh among OECD countries for its share of the population aged 15-64 with a tertiary education (Figure 1.24). The greatest advances have been made in large cities, especially in Seoul and in cities located in the Seoul Metropolitan Area. Tertiary education attainment is part of a virtuous cycle that fosters agglomerations. Cities become good locations for investment when they increase the size of the local labour market, which, among other factors, helps to create a talented and educated workforce. Talent is created locally and is brought in from other areas. The quantity and quality of workers attracts more workers, and the cycle continues despite negative externalities. In the case of Korea, cities with annual population growth rates lower than the national average tend to fall short of the national average in terms of tertiary education attainment levels (Figure 1.25). Between 1970 and 2005, 27 out of 68 Korean cities had a slower population growth rate than the national average, and within that group, only two cities (Gyeongsan-si in the Gyeongbuk Province and Jeju-si in Jeju Autonomous province, represented in the top-left corner of Figure 1.25) showed an above-average increase in tertiary education.

Figure 1.24. **Share of population aged 25-64 with tertiary level of education in OECD countries (2007)**

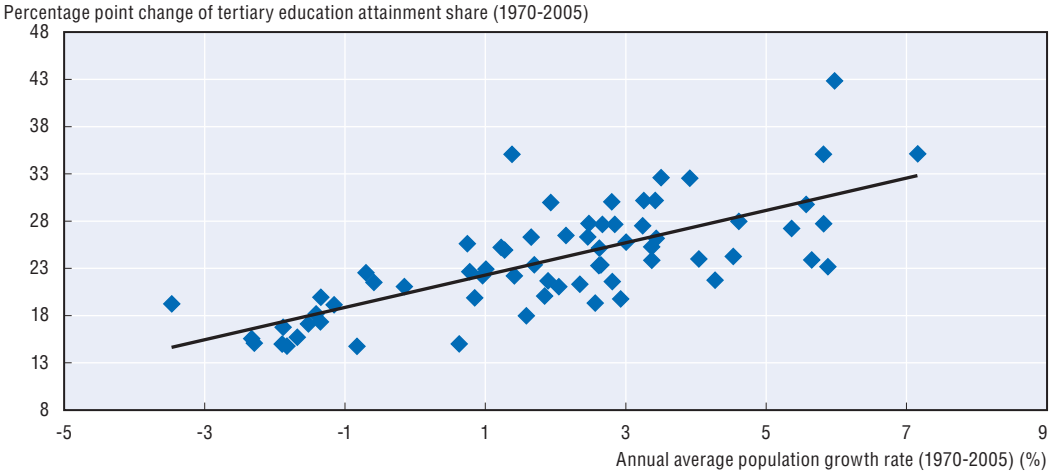


Source: OECD (2011c), *Regions at a Glance*, OECD Publishing, Paris.

In terms of innovation, the seven largest metropolitan cities also concentrate the highest share of R&D and patent applications: together, they accounted for 43.6% of total R&D expenditures in 2009, led by Seoul (19.8%) (Table 1.12) (Korea Institute of Science and Technology, Evaluation and Planning, 2010). Furthermore, 54% of the total patent applications were filed in metropolitan cities (Korean Intellectual Property Office, 2011), with Seoul contributing 33% of the total (Table 1.13). When compared internationally, Seoul ranks first among the 90 metro-regions in terms of the share of national patents (Figure 1.26).

Figure 1.25. **Tertiary education attainment share and population growth rate of Korean cities**

Percentage point increase of tertiary education attainment share, annual average growth rate of population



Notes: The horizontal line represents the nationwide annual average population growth rate between 1970 and 2005, which is 1.49%.
The vertical line indicates the nationwide percentage-point change in the share of tertiary education attainment between 1970 and 2005, which is 27.5%.
The total number of cities in this figure is 67.

Source: OECD own calculations based on data from the Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Table 1.12. **R&D expenditures in seven metropolitan cities relative to the nation (2009)**

Million KRW

	R&D expenditures	Share of national total
Seoul	7 304 245	19.8
Incheon	1 440 726	3.9
Busan	811 078	2.2
Ulsan	394 537	1.1
Daegu	530 827	1.4
Daejeon	4 356 664	11.8
Gwangju	1 274 963	3.5
Total R&D expenditures in seven metropolitan cities	16 113 040	43.6
Total R&D expenditures nationwide	36 937 423	100

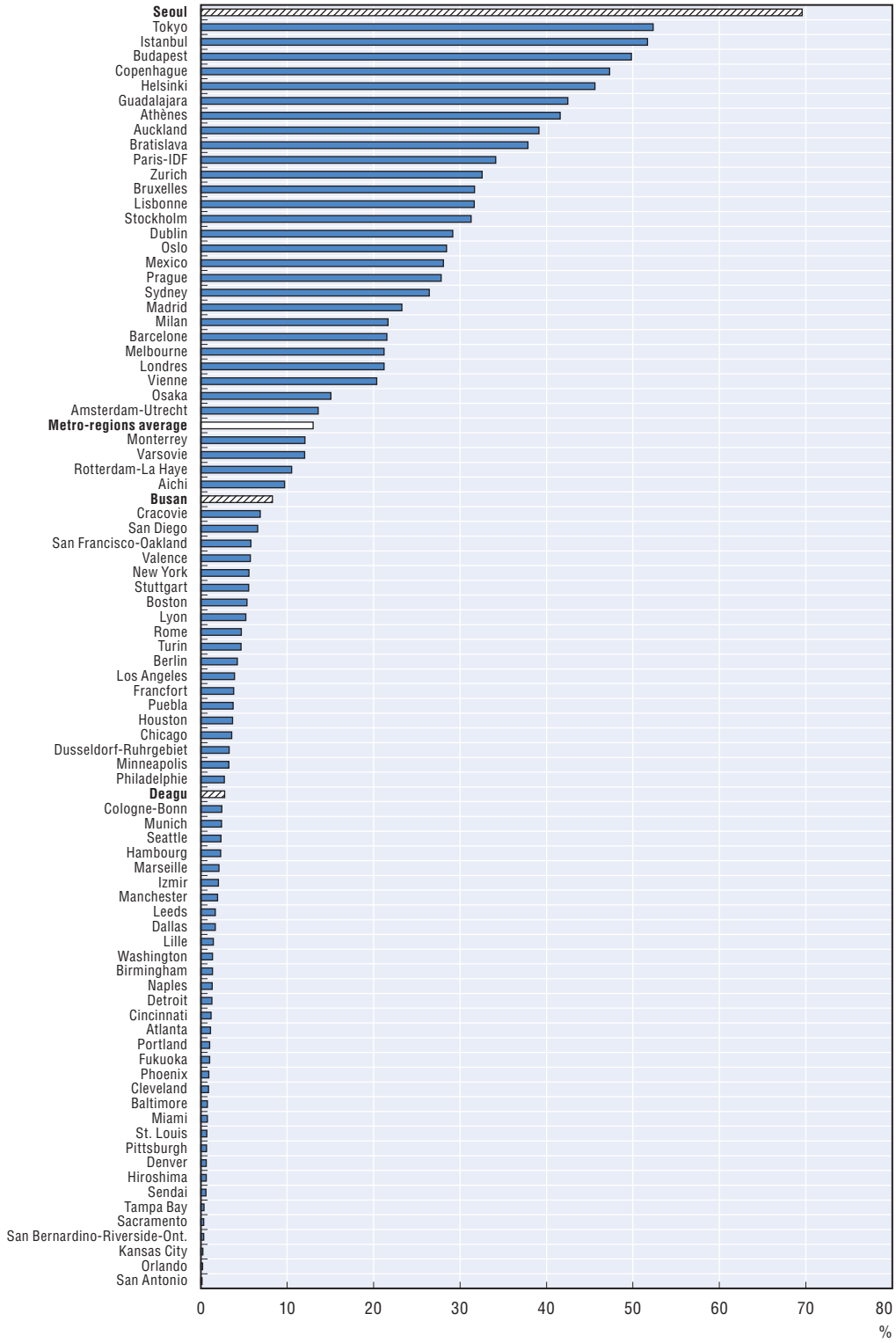
Source: Korea Institute of Science and Technology Evaluation and Planning (2010), *Survey of Research and Development in Korea*, Korea Institute of Science and Technology Evaluation and Planning, Seoul.

Table 1.13. **Patent applications in seven metropolitan cities relative to the nation (2009)**

	Patent applications	% of national total
Seoul	42 108	33
Busan	3 935	3
Daegu	3 585	3
Incheon	5 719	4
Gwangju	2 211	2
Daejeon	9 974	8
Ulsan	1 370	1
Total patent applications in seven metropolitan cities	68 902	54
Total patent applications nationwide	127 316	100

Source: Korean Intellectual Property Office (2011), *Trends in Patent Applications* (in Korean), *www.kipo.go.kr*, accessed 19 April 2011.

Figure 1.26. **Selected OECD metro-regions: share of total national patents (2009)**



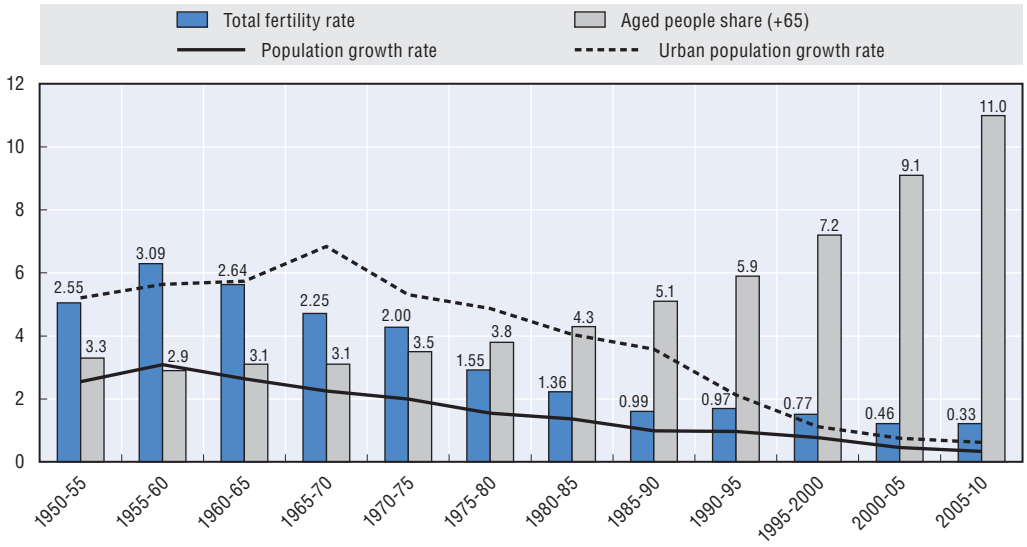
Source: OECD (2010d), "Metropolitan regions", *OECD Regional Statistics Database*, doi: *10.1787/data-00531-en*, accessed June 2011.

Ageing population and shrinking labour force in urban areas

Despite Korea's progress on several fronts, the prospects for economic growth wane as a society ages. Korea's well-educated labour force and high attainment in tertiary education have probably been key factors in Korea's economic success. However, it has recently been facing a rapid demographic transition to an ageing society, thanks in part to its low fertility rate. As a result, the labour force will soon contract, possibly leading to a slowdown in the growth of national output.

As mentioned previously, Korea's population has been ageing at an unprecedented rate. The share of its elderly population (over 65 years old) to working-age population has been sharply increasing since the 1980s, from 3.8% in 1980 to 10.5%[11] in 2009 (Figure 1.27). If Korea continues at this pace, the country could become an "aged society" by 2013, in which the share of elderly people exceeds 14%, only 13 years after its designation as an "ageing society" in 2000, when its share accounted for more than 7% (Park, 2008). It took 72 years for the US and 24 years for Japan make this transition. According to Korea's National Statistics Office, by 2026, Korea will be a "super-aged society" in which one-fifth of the total population is comprised of people over 65 years old. Korea has also experienced a drastic decrease in fertility rates. Between 1955 and 1960, Korean women of child-bearing age gave birth to 6.3 children on average, considerably more than the global average (4.8 births). However, this figure dropped significantly, to less than 2 births between 1985 and 1990, and plunged further, to 1.2 births between 2000-05, half of the global average (2.67 births) and lower than the replacement fertility rate (2.1 births). The combination of a

Figure 1.27. **Urban growth rate and total fertility rate in Korea**



Notes: Vertical axis represents %.
Total Fertility Rate (TFR) indicates the average number of children born to a woman over her lifetime.
The share of elderly people corresponds to the last year of each period.
The share of TFR, the urbanisation share and the growth rate of urban population all indicate the annual average growth rate for each period.
Data labels in the upper part of the graphic indicate the share of elderly people, and those in the lower part of the graphic the annual average population growth rate.

Source: United Nations Department of Economic and Social Affairs (2010), *World Urbanization Prospects: 2009 revision*, United Nations Department of Economic and Social Affairs, New York ; Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

lower fertility rate and an accelerated ageing rate has been intimately associated with the fall of the annual average population growth rate to lower than 1% since the second half of the 1980s. These factors also jointly influenced a sudden drop in the urban population growth rate in Korea since the 1990s, which has implications for the size of the labour market.

Korea's ageing problem is becoming even more acute in urban areas. Elderly dependency rates have increased sharply in 68 Korean cities. In 1970, the gap between the city with the lowest elderly dependency rate (3.8% in Seoul) and the highest (10.0% in Jeju-si) stood at 6.1%. By 2005, the gap widened to 20.3% between the lowest at 4.8% in Changwon-si and the highest at 25% in Gimje-si. Meanwhile, among 68 cities as of 2005, 39 had a higher share of aged people than the national average (9.1%), and of those 39 cities, only 5 cities[12] were located in the Seoul Metropolitan Area (Table 1.14).

Table 1.14. **Korea: share of elderly population in cities**

% of total population

		1970	1980	1990	2000	2005
National share on average		3.1	3.8	5.1	7.2	9.1
68 cities	Maximum	10.0	11.4	17.2	19.5	25.0
	Minimum	3.8	3.7	3.6	3.9	4.8
	Range	6.1	7.6	13.6	15.6	20.3
	Median	6.8	6.9	8.2	8.1	9.6

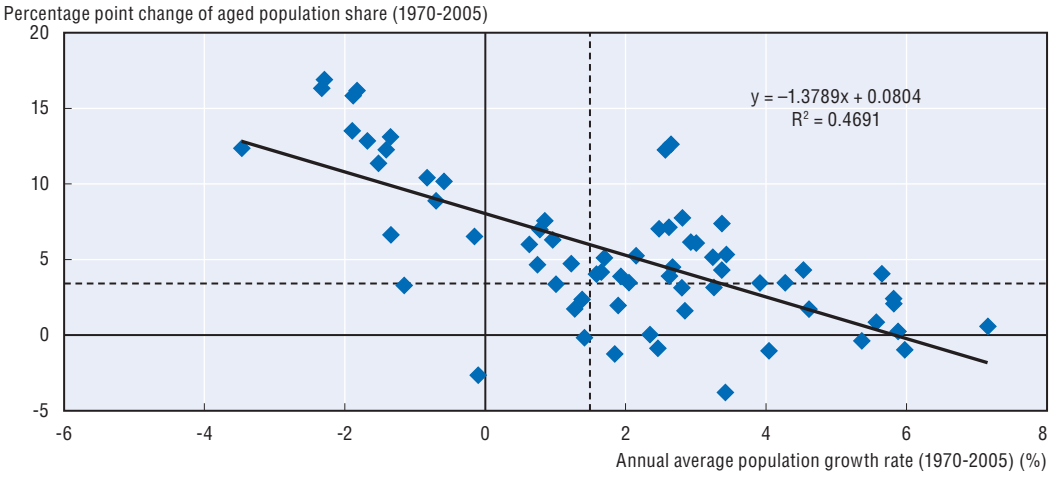
Note: The aged population is defined as people aged 65 and over.
Source: OECD computations based on Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Cities that are losing population are also experiencing the fastest ageing process. As people migrate due to lack of opportunities or better returns for labour in other cities, the elderly remain, raising the proportion of the elderly population in some cities. In general, cities that lose population faster than the national average appear to have a higher percentage-point increase in elderly dependency rates. Between 1970 and 2005, only six cities out of the 27 that had slow population growth rates also showed a slower elderly dependency growth rate relative to the national average (bottom-left corner in Figure 1.28). The remaining 21 cities exhibited a much more rapid growth rate of elderly dependency than the national average. Out of those 21 cities, only three[13] were part of the Seoul Metropolitan Area.

Korea's ageing population in urban areas raise concerns about adequate housing supply. Although Korea's progress in improving the quality of housing for Korean seniors is commendable, nearly one quarter of seniors are housed in homes that fail to meet the Korean government's minimum standards of housing. To measure housing quality, the Korea government applies criteria including floor space, environmental standards and housing facilities standards. The specific criteria were set forth in the 2003 Housing Act and embodied in Article 35 of the Constitution of the Republic of Korea. In 2000, 18.7% of urban dwellers lived in inadequate housing, but that number had decreased to 9.2% in 2005. However, the standards for seniors compare less favourably with the national rates. In 2000, 43.6% of seniors lived in substandard housing, which dropped to 24.5% in 2005 (Table 1.15). Much work has yet to be done in improving housing quality for senior Koreans.[14] This will be complicated by the increasing dependency of seniors on the

Figure 1.28. **Share of elderly people and population growth**

Percentage change in share of elderly people, and annual average population growth rate 1970-2005



Notes: The horizontal line represents the nationwide annual average population growth rate between 1970 and 2005, which is 1.49%.
The vertical line indicates the nationwide percentage point change of aged (+65) people's share between 1970 and 2005, which is 3.42%.
The total number of cities in this figure is 68.

Source: OECD computations based on Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Table 1.15. **Korea: Number of households falling short of minimum housing standards, sorted by age of head of household (2000 and 2005)**

Percentage

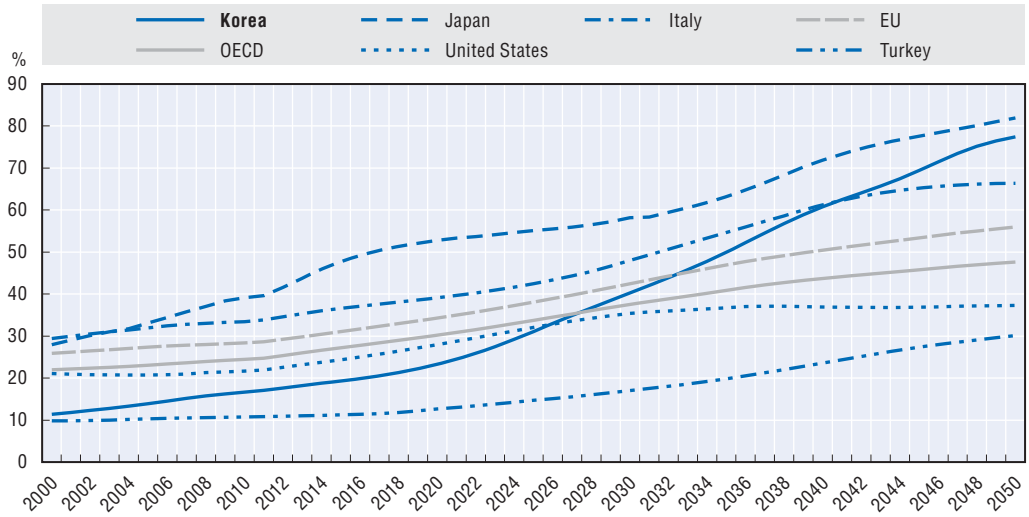
Age of head of household	2000	2005
Total	23.1	12.0
Less than 19	49.0	21.7
20-29	23.6	11.4
30-39	15.1	6.6
40-49	19.2	9.5
50-59	23.1	11.3
60-64	30.3	14.4
65+	43.6	24.5

Source: Korea Statistics Office (2007), "Households Under the Minimum Housing Standard", presented to 23rd Population Census conference, *http://unstats.un.org/unsd/censuskb20/Attachments/2007KOR_CensConf-GUID845b2545091b406db71fe56f6fd0f52e.pdf*, accessed 1 Mar 2011.

working-age population. A broad indicator of the rising economic burden that an older society may place on the working-age population is given by the elderly dependency ratio. This ratio for Korea stood at less than 20% in 2010, but it is projected to reach almost 80% by 2050 (Figure 1.29).

Population ageing will put pressure both upon policies to increase the supply of labour from domestic or international sources, and upon public expenditures, to meet the resulting health and pension systems. It is expected that between 2020 and 2050, Korea's labour force growth will switch sharply into reverse, leading to a severe shortage of labour and a slowdown in economic activity. One of the possible solutions to address this challenge is to encourage greater participation of women in the labour force in Korea. Currently, only 54% of women aged 15-64 are in the labour market, well under the OECD

Figure 1.29. **Selected countries: projections of old-age dependency ratio, 2000-50**



Note: The old-age dependency ratio refers to the ratio of the population aged 65 and over to the population aged 20 to 64.

Source: OECD Population and Labour Force Projections Database.

average (60%) and the fourth lowest in the OECD after Turkey, Mexico and Italy (OECD, 2009a). Meanwhile, public expenditures by local governments to maintain established services and accommodate the new needs of an aged population will need to expand in declining cities that generally have a higher share of elderly population than the national average. Kim (2006) confirmed that declining cities tend to have higher public expenditures and suffer from scarce financial revenues to a greater extent than growing cities, leading to a heavier fiscal burden among declining cities. As shown in Table 1.16, in 1994 and 2004, both total public expenditures and welfare expenditures in declining cities were higher and grew much faster than growing cities. By contrast, the number of municipal employees in declining cities was higher than in growing cities in both 1995 and 2004, and reduced at a slower rate than in growing cities during the same period.

Table 1.16. **Korea: municipal expenditures of growing and declining cities**

		1995	2004
Declining cities	Total public expenditures per capita (KRW)	875 668	1 654 063
	(%)	(100)	(189)
	Welfare expenditure per capita	354 646	689 297
	(%)	(100%)	(194%)
	Municipal employees per 1 000 residents	9.9	6.4
	(%)	(100)	(65)
Growing cities	Total public expenditures per capita	600 039	902 247
	(%)	(100)	(150)
	Welfare expenditure per capita	244 343	365 067
	(%)	(100)	(149)
	Municipal employees per 1 000 residents	6.0	3.7
	(%)	(100)	(61)

Note: The sample size covers a total of 62 cities.

Source: Kim (2006), "The Decline and Growth of Korean Cities: Dependencies and Policy Responses", *Journal of Korea Urban Administrative Association*, Vol. 19, No. 1, Seoul.

Given the prospect of a shrinking labour force due to the ageing population, Korea may rely more on foreign skills in the future. In 2010, the official number of foreigners in Korea reached 918 917, accounting for 1.82% of the total population. Notably, the number has increased by 1 299% between 1992 and 2010, nearly 97 times higher than that of total population (KOSIS, 2011). Presently, the share of immigrants in the total national population remains low as compared to that of OECD countries. However, a recent increase in the flows of immigrants into urban areas poses new challenges for urban policy makers. In addition, the portion of foreigners in the total population increased by 1 133% in the period from 1992-2010. This rising trend is mainly due to an increasing influx of foreign labour, which accounts for 60% of total registered foreigners, triggered by policy instruments to attract foreign labour forces, for example the *Industrial Trainee* programme (1993) and *Visiting Korea and Getting Job Programme* (2007)[15] (KRIHS, 2009). The number of married immigrants has also risen rapidly, reaching nearly 125 000 in 2009.

Notable differences in foreign population distribution can be observed among cities. First of all, 65% of foreigners are concentrated in the Capital Area (28.6% in Seoul, 5.4% in Incheon and 31% in Gyeonggi-do), where the foreign workforce is afforded easy access to the unskilled jobs in the service sector (*e.g.* restaurants), construction and manufacturing industry. Some medium-sized cities report a higher ratio of foreigners to total population than that of metropolitan cities (Table 1.17). Currently, the highest-ranked cities are located in Gyeonggi-do and contain several large industrial complexes, which have attracted a relatively low-skilled foreign workforce.

Table 1.17. **Korea: top five cities in terms of share of foreign population (2010)**

		Number of foreigners	Total population	% of total population
Top five cities	Pocheon-si	10 392	158 658	6.5
	Ansan-si	38 971	714 891	5.5
	Hwaseoung-si	26 488	505 838	5.2
	Gimpo-si	12 330	238 339	5.2
	Siheung-si	17 308	403 797	4.3
Metropolitan cities	Seoul	262 902	10 312 545	2.5
	Busan	32 471	3 567 910	0.9
	Daegu	20 401	2 511 676	0.8
	Incheon	49 992	2 758 296	1.8
	Gwangju	13 360	1 454 636	0.9
	Daejeon	14 876	1 503 664	1.0
	Ulsan	16 043	1 126 298	1.4
National average		918 917	50 515 666	1.8

Source: Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

Incorporating foreign-born residents into existing urban planning or management processes is a challenge for city governments as well as the central government, particularly since many foreign workers tend to live in substandard surroundings. According to the result of a survey conducted by KRIHS (2010), nearly 16.2% of foreign workers in Ansan-si (located in Gyeonggi-do) live in non-residential buildings, including factory and shopping centres. Usually, two or three people share a single room and bathroom, even without living room in their houses. Furthermore, nearly 10% of households with over three people live in single rooms, extremely high compared to the

Korean average (0.27%). Integrating immigrant culture into the Korean society is even more difficult. Most city governments' policies for immigrant workers are focused on translation, counselling and education services, and lack a long-term strategy to improve their living conditions and integrate them into local communities (KRIHS, 2009).

1.4. Cities as the centre of environmental concerns

Korea's economic model and rapid growth since 1971, underpinned by a highly urbanised spatial form, have put growing pressure on the environment and led to increased consumption of resources. On the one hand, the increased air pollution resulting from traffic congestion, energy consumption, greenhouse gas emissions and waste generation has been partly attributed to the negative externalities of urbanisation. On the other hand, agglomeration economies and economies of scale in urban areas could provide valuable solutions to address these concerns (for instance, in recycling waste).

A rise in energy consumption, greenhouse gas emissions and pollution

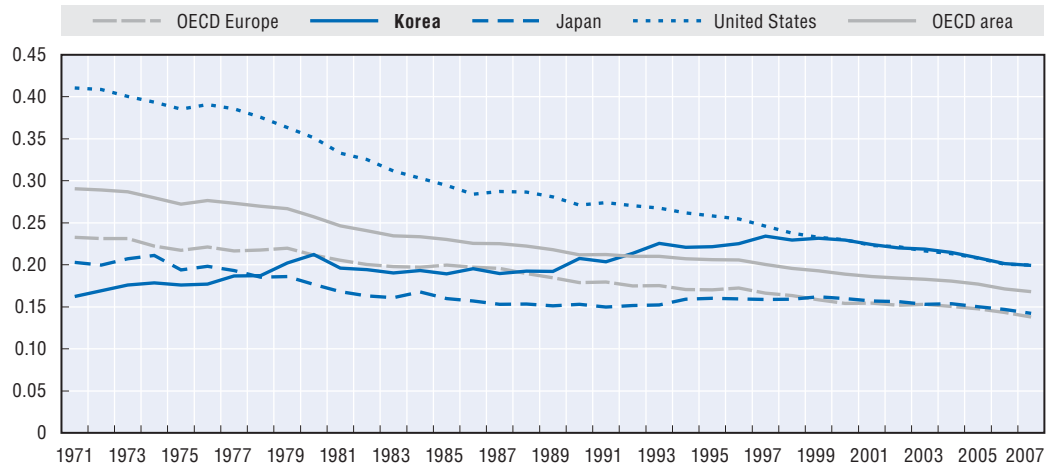
In the past several decades, higher living standards, urbanisation trends and an expanding industrial sector have helped make Korea one of the most energy-intensive economies in the OECD area (Figure 1.30). In 2008, Korea was the tenth-largest energy consumer among OECD countries (IEA, 2010a). The country's energy intensity[16] was a 25% above the OECD average in 2008 and the fourth-highest in the OECD area (Jones and Yoo, 2010). Its total energy self-sufficiency[17] in 2008 was just 19.7%, reflecting Korea's heavy reliance on foreign imports of oil and gas to meet national energy demand (97% of energy consumption and 32.5% of national imports) (IEA, 2010b). Korea's total energy consumption rose by 367% between 1980 and 2009, driven by significant increases in the transport and industrial sectors (Table 1.18). The energy consumption of the industrial sector increased by 506% between 1980 and 2009, and continued to account for the largest share of total energy consumption, increasing its share from 44.9% of the total in 1980 to 58.3% in 2009. The largest increase in energy consumption came from the transport section. It grew more than tenfold between 1980 and 2009, which can mostly be attributed to the elevated energy consumption of road transport, which comprised 79.1% of transport energy consumption in 2007. By contrast, energy consumption by the household/commercial sector decreased from a peak of 40.6% in 1980 to a low of 19.8% in 2007.

Driven by an increase in energy use, Korea's greenhouse gas emissions almost doubled between 1990 and 2005, the highest growth rate in the OECD area. Korea's greenhouse gas emissions accounted for 1.3% of the world total in 2005, making it the 15th-largest emitter in the world and ninth in the OECD area (Jones and Yoo, 2010). Over 89% of the rise in Korea's greenhouse gas emissions between 1990 and 2005 occurred between 1990 and 2000. As a result of Korea's rapid economic expansion and per capita income growth, per capita emissions rose by 71.6% between 1990 and 2005, far outstripping the OECD average of 2.1%. On the other hand, Korea experienced a decrease of 12.7% in greenhouse gas emissions per unit of energy, reflecting greater use of natural gas and nuclear power (Jones and Yoo, 2010).

The breakdown of GHG emissions and energy consumption by region shows the importance of the contribution of the industrial sector in some cities, especially medium-sized cities. With the exception of the metropolitan area of Ulsan, provinces that have medium-sized cities, including the provinces of Jeollanam-do, Gyeonggi-do, Gyeongsangbuk-do and Chungcheongnam-do, recorded the highest levels of energy

Figure 1.30. **Trends in energy intensity among selected OECD countries (1971-2007)**

Tonnes of energy per unit of GDP in thousand 2000 USD using PPP exchange rates



Source: IEA (2010), "World Indicators", *IEA World Energy Statistics and Balances Database*. doi: *10.1787/data-00514-en*, Accessed on June 2011.

Table 1.18. **Total final energy consumption in Korea, by sector (1980-2009)**

Thousand tonnes (TOE)

	1980	1990	2000	2005	2009	% change
Transport	3 721	14 173	30 945	35 559	35 930	866
(% of total)	9.60	18.90	20.70	20.60	19.70	
Industrial	17 506	36 150	83 912	94 366	106 118	506
(% of total)	44.90	48.10	56.00	54.60	58.30	
Residential/commercial	15 836	21 971	32 370	36 861	35 722	126
(% of total)	40.70	29.20	21.60	21.30	19.60	
Public sector	1 889	2 813	2 625	6 068	4 295	127
(% of total)	4.90	3.80	1.80	3.50	2.40	
Total	**38 952**	**75 107**	**149 852**	**172 854**	**182 065**	**367**

Source: Korea Energy Economics Institute (KEEI) (2011), Korean Energy Statistics Information, *www.kesis.net*, accessed 11 May 2011.

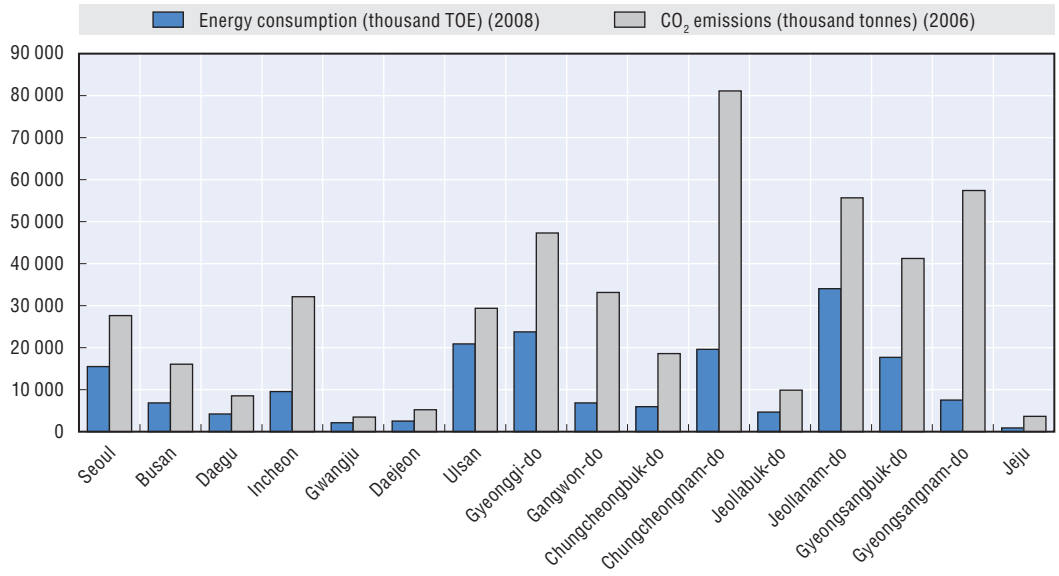
consumption. These regions (with the exception of the province of Gyeonggi-do) also record the highest levels of energy consumption on a per capita basis (Table 1.19). These medium-sized cities are the largest cities in these regions and are the sites for energy-intensive industries such as electricity generation facilities, petroleum refineries, oil and gas industries, steel mills and chemical industries. For instance, Pohang-si is the largest city in the province of Gyeongsangbuk-do (508 000 inhabitants) and has an important steel mill, while Yeosu-si is the largest city in Jeollanam-do (295 000) and has an important chemical industrial complex. These same regions also tend to concentrate a large share of national CO_2 emissions (Figure 1.31). Emissions levels in Chungcheongnam-do are exceptionally high compared to other regions, due to the relatively rural character of the region and the presence of energy-intensive industries such as the Danggin thermoelectric power plants, the automotive giant Hyundai and other steel mill companies. Ulsan's large share of energy consumption from the industrial sector (85.2%) can be attributed to its industrial past and present-day heavy industrial sector. Designated as an Industry Special

Table 1.19. **Energy consumption in metropolitan cities and provinces (*do*) (2009)**

	Per capita energy consumption (TOE)	Total energy consumption by volume (1 000 TOE)	Share of total energy consumption of the industrial sector (%)
Total	**3.76**	**182 576**	**58.3**
Seoul	1.54	15 482	8.9
Busan	1.95	6 829	23.8
Daegu	1.71	4 211	26.6
Incheon	3.63	9 542	34.9
Gwangju	1.49	2 149	17.0
Daejeon	1.69	2 527	14.4
Ulsan	19.26	20 892	85.2
Gyeonggi-do	2.11	23 763	29.9
Gangwon-do	4.69	6 860	61.9
Chungcheongbuk-do	4	5 928	56.0
Chungcheongnam-do	10.07	19 581	81.5
Jeollabuk-do	2.66	4 648	41.8
Jeollanam-do	19.09	34 053	92.1
Gyeonsangbuk-do	6.76	17 716	75.0
Gyeongsangnam-do	2.4	7 512	40.3
Jeju	1.61	877	21.7

Source: Ministry of Knowledge Economy (2009), *2009 Yearbook of Regional Energy Statistics*, Ministry of Knowledge Economy, Gyeonggi-do.

Figure 1.31. **Total energy consumption (2008) and CO_2 emissions (2006), by region**



Source: Ministry of Knowledge Economy (2009), *2009 Yearbook of Regional Energy Statistics*, Ministry of Knowledge Economy, Gyeonggi-do.

District in 1962, Ulsan is the site of a number of major heavy industry firms, such as Hyundai and the SK Chemical Company.

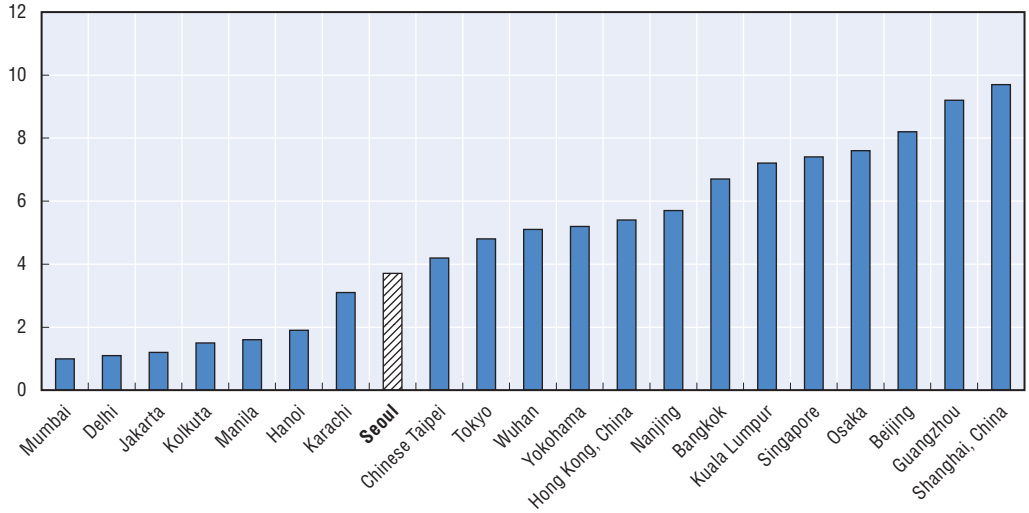
At the national level, Korea's per capita CO_2 emissions fall around the OECD average of approximately 10 tonnes of CO_2 per capita, given Korea's level of urbanisation, in line with those of Germany, Denmark and Austria. Among those countries with similar urbanisation levels, such as the US, New Zealand, Spain, Mexico and Turkey, Korea comes in at a distant second behind the US (19.00 tonnes of CO_2 per capita).

When comparing Seoul with other large cities in the world, Seoul registers relatively low levels of GHG emissions. For instance, in a World Bank inventory of representative GHG baselines for a range of cities, Seoul records 4.1 tonnes of CO_2 equivalent per capita,[18] comparable to Tokyo (4.89 tCO_2e/capita) and well below levels in Calgary (17.7 tCO_2e/capita), Stuttgart (16.0 tCO_2e/capita), Frankfurt (13.7 tCO_2e/capita), Brussels (7.5 tCO_2e/capita) and Helsinki (7 tCO_2e/capita), among others (World Bank, 2011). The Asian Green City Index report, a research project conducted by the Economist Intelligence Unit and Siemens on 22 major Asian cities, estimates the city's CO_2 emissions at 3.7 tonnes per person (based on data from Korea Energy Economics Institute, 2009), below the 22-city average in the study (Figure 1.32) (The Economist Intelligence Unit, 2011). Seoul generates fewer CO_2 emissions than Shanghai (9.7 tonnes/person), Guangzhou (9.2 tonnes/person) and Beijing (8.2 tonnes/person); about the same levels as Chinese Taipei (4.2 tonnes/person) and Karachi (3.1 tonnes/person), but well above levels in Bengalaru (0.5 tonnes/person), Mumbai (1.0 tonnes/person) and Delhi (1.1 tonnes/person). This same report found that Seoul's energy consumption per GDP performs better than Shanghai, Guangzhou and Beijing, about the same as Singapore and Kolkuta, but below levels in Tokyo and Hong Kong. Seoul's strong performance in energy consumption and CO_2 emissions can be credited to an economy dominated by the service sector, bolstered by strong municipal policies on energy and CO_2.

The rise of direct energy consumption in Korean cities has also led to an increase of air pollution. Between 1999 and 2007, total air pollutants in Korea increased by 6.4%, while emissions of nitrogen oxides (NOx), resulting from the combustion of fossil fuels, increased by 10.9% (Table 1.20) (Korea Statistics Office, 2011). Although the Korean government has implemented very strict regulations on air pollution since the late 1990s, air quality in Korean cities, especially in Seoul, still remains poor compared to other OECD countries (OECD, 2006). Absolute levels of air pollutants in Korea are far worse than those of other OECD countries. Nevertheless, in terms of the emission intensity relative to a country's

Figure 1.32. **Per capita CO_2 emissions in select Asian cities**

Tonnes/person



Source: The Economist Intelligence Unit (2011), *Asian Green City Index*, Siemens AG, Munich.

Table 1.20. **Air pollutant emissions in Korea**

Thousand tonnes

	1999	2000	2001	2002	2003	2004	2005	2006	2007	% change (1999-2007)
CO	885	900	845	822	805	816	788	829	808	91.3
NO_x	1 072	1 222	1 219	1 242	1 362	1 377	1 306	1 274	1 187	110.7
SO_x	484	490	487	474	469	446	408	446	402	83.1
TSP	84	82	88	84	85	80	88	88	144	171.4
PM_{10}	63	61	67	65	66	62	67	64	98	156.6
VOC	665	706	734	741	758	797	756	794	874	131.4
Total	3 253	3 461	3 440	3 428	3 545	3 578	3 413	3 495	3 513	108.0

Note: CO, NO_x, SO_x, TSP, PM10 and VOC in this table respectively represent carbon monoxide, nitrogen oxides, sulphur oxide, total suspended particles, particulate matter and volatile organic compounds.
Source: Korea Statistics Office (2011). Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed March 2011.

GDP size, Korea has recently made considerable progress. The sulphur oxide (SO_x) intensity of the Korean economy (0.6 kg/USD 1 000) was reduced to half of the OECD average (1.2 kg/USD 1 000) in 2003, whereas it was 27% higher than the OECD average in 1997. Korea also succeeded in holding NO_x levels in line with the OECD average (1.4 kg/USD 1 000), reaching 1.3 kg/USD 1 000 in 2003.

Seoul and the Capital Region display the highest level of total air pollutants. The capital area accounted for nearly one-third of all air pollutants in 1999 and again in 2007, reflecting its high concentration of people, infrastructure and transportation (notably private vehicles) (Table 1.21). Although Seoul's share of air pollutants relative to the national total is smaller than its share of national population, the concentration of air pollutants remains a concern. In terms of air pollutants per area (km^2), Seoul City was found to emit almost 18 times more than the national average, indirectly reflecting its higher traffic congestion costs. Compared to several other OECD cities, the levels of NO_2, SO_2 and PM_{10} are almost double those of Paris (Table 1.22). As a result, the social costs of air pollution are estimated at EUR 7.6 billion for Seoul MA and EUR 40 billion for the country as a whole (OECD, 2006).

Among Korean cities, environmental performance related to air pollution varies with the type of pollutants, with an increasing concentration of some air pollutants in medium-sized cities (Table 1.23). With the exception of the high concentrations of SO_2 in Ulsan and

Table 1.21. **Trends in total air pollutant emissions by region**

	1999				2007			
	Total air pollutants (tonnes)	Share of national total (%)	Tonnes/km^2	Tonnes/ 1 000 people	Total air pollutants	Share of national total (%)	Tonnes/km^2	Tonnes/ 1 000 people
Nationwide	3 170 512	100.0	31.8	67.0	3 372 152	100.0	33.8	68.4
Seoul MA	1 018 705	32.1	84.3	46.9	1 113 264	33.0	92.1	46.1
Seoul	374 125	11.8	618.4	36.5	359 410	10.6	594.1	34.7
Incheon	145 091	4.6	111.8	57.8	200 943	5.9	154.8	75.5
Gyeonggi	499 489	15.8	49	55.9	552 911	16.4	54.3	49.8
7 metropolitan cities	1 141 500	36.0	190.9	50.0	1 240 715	36.7	207.4	53.6

Source: National Institute of Environmental Research (2011), "National Air Pollutants Emissions System", *www.Airemiss.nier.go.kr*, accessed 16 March 2011.

Table 1.22. **Comparison of selected air pollutants in international cities**

	NO_2 (PPM)	SO_2 (PPM)	PM_{10} ($\mu g/m^3$)
Seoul (2008)	0.038	0.006	53
Tokyo (2006)	0.025	0.002	29
London (2005)	0.023	0.002	30
Paris (2007)	0.020	0.003	30
New York (2006)	0.034	0.010	26

Source: Jun (2010), M.-J. (2010), "Spatial Transformation and Regional Disparity, Housing, Transportation and Emissions", presentation at the joint workshop between Korea Planners' Association and the OECD in Seoul on 14 April 2010, Korea Planners' Association, Seoul.

Table 1.23. **Korean cities with the highest observed concentration of air pollutants (2008)**

SO_2[1]		NO_2[1]		O_3[1]		CO[1]		PM_{10}[2]	
Yeosu-si	0.012	Gwangmyeong-si	0.041	Jeju	0.038	Jecheon-si	1	Wonju-si	65
Jecheon-si	0.011	Bucheon-si	0.039	Mokpo-si	0.034	Wonju-si	0.9	Gumi-si	65
Chungju-si	0.009	**Seoul**	0.038	Jinhae-si	0.033	Gimcheon-si	0.9	Anyang-si	63
Gimcheon-si	0.009	Suwon-si	0.035	Gangneung-si	0.032	Gumi-si	0.9	Chungju-si	63
Ulsan	0.008	Seongnam-si	0.034	Yeosu-si	0.03	Chungju-si	0.8	Cheongju-si	62

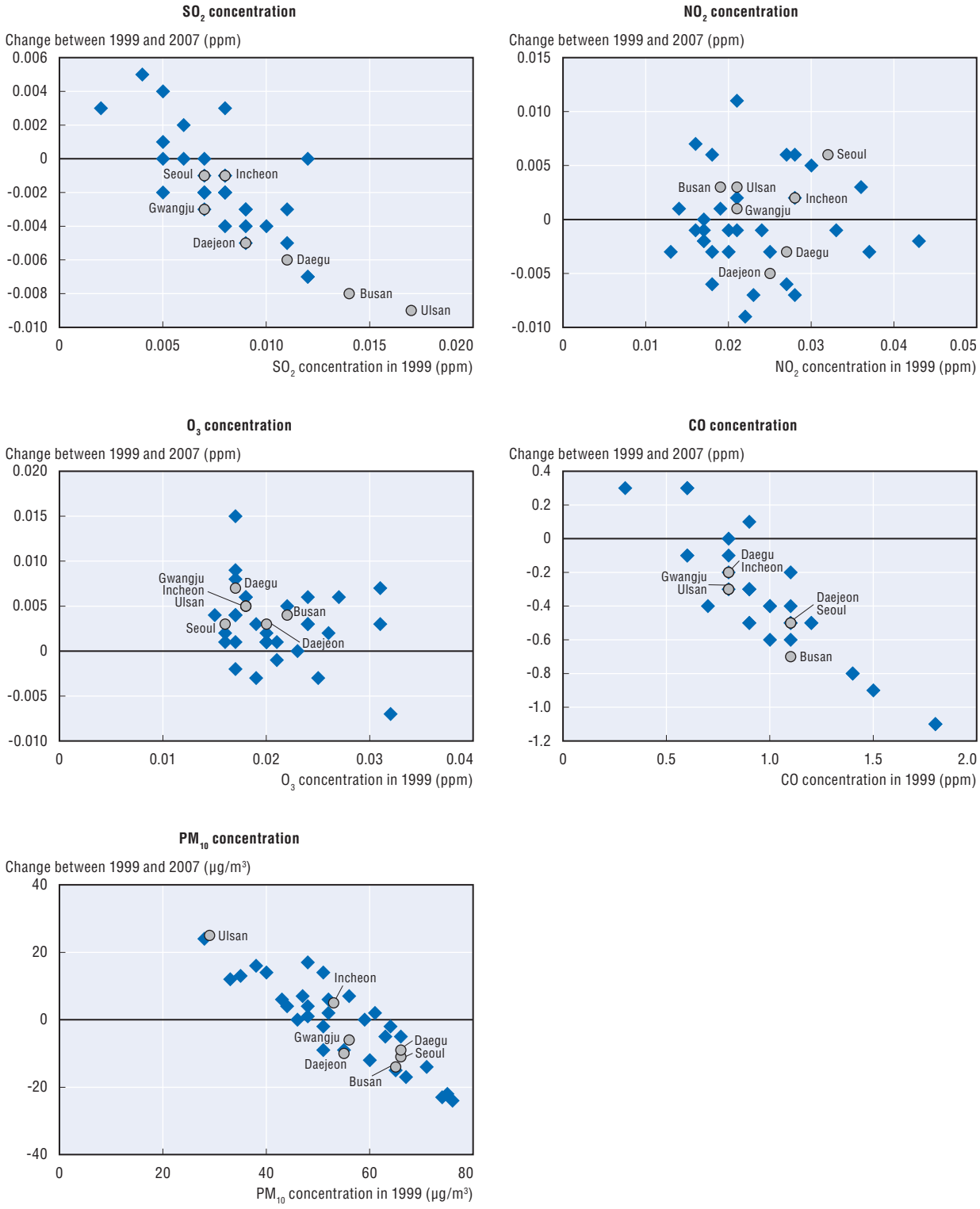
1. Measured in parts per million.
2. Measured in $\mu g/m^3$.

Source: Ministry of Environment (2009), *Environment Statistics Yearbook*, Ministry of Environment, Gyeonggi-do.

NO_2 in Seoul, the highest observed concentrations of SO_2, NO_2, O_3, CO and PM_{10} are to be found in medium-sized cities (Table 1.22 and Figure 1.33). Except in the case of PM_{10}, a number of medium-sized cities (*si*) recorded higher overall air pollutant concentrations than metropolitan cities. Gimcheon-si (located in the province of Gyeongsangnam-do) and Gangeung-si (located in the province of Gangwon-do), in particular, registered a more rapid increase in the concentration of air pollutants than other cities. Clear trends across various air pollutants are harder to discern, however. Between 1998 and 2008, most metropolitan cities and 31 medium-sized cities (*si*) registered decreasing SO_2 and CO concentrations, while the concentration of O_3, a main contributor to serious respiratory diseases, increased across nearly all metropolitan cities and medium-sized cities. Increased industrialisation in medium-sized cities explains in part the increase of pollution concentration, suggesting that the Korean government could pay more attention to medium-sized cities when addressing pollution issues.

Compared to other OECD countries, Korea's levels of nitrogen dioxide (NO_2) represent the primary concern in terms of air pollution. Among OECD countries, the total emissions of NO_2 in Korea are higher than the OECD average (OECD, 2006), while Korea's total sulphur dioxide (SO_2) and CO emissions remain well below the OECD average. Compared with a selection of Asian and Latin American cities surveyed, Seoul displays a particularly high concentration of NO_2, (71.4 micrograms per cubic metre), second only to Mumbai (Figure 1.34). This finding is echoed in the World Bank's World Development Indicators for air pollution, which reports NO_2 levels in Busan (51 $\mu g/m^3$), Seoul (60 $\mu g/m^3$) and Daegu (62 $\mu g/m^3$) (World Bank, 2011). The high levels of NO_2 are due to the city's dependence on private vehicles, which are responsible for nearly three-quarters of the city's air pollution. The use of natural gas in households has helped to limit the concentration of other air pollutants, including SO_2 (Figure 1.35) and suspended particulate matter (Figure 1.36).

Figure 1.33. **Trends in air pollution concentration in selected Korean metropolitan cities and *si***

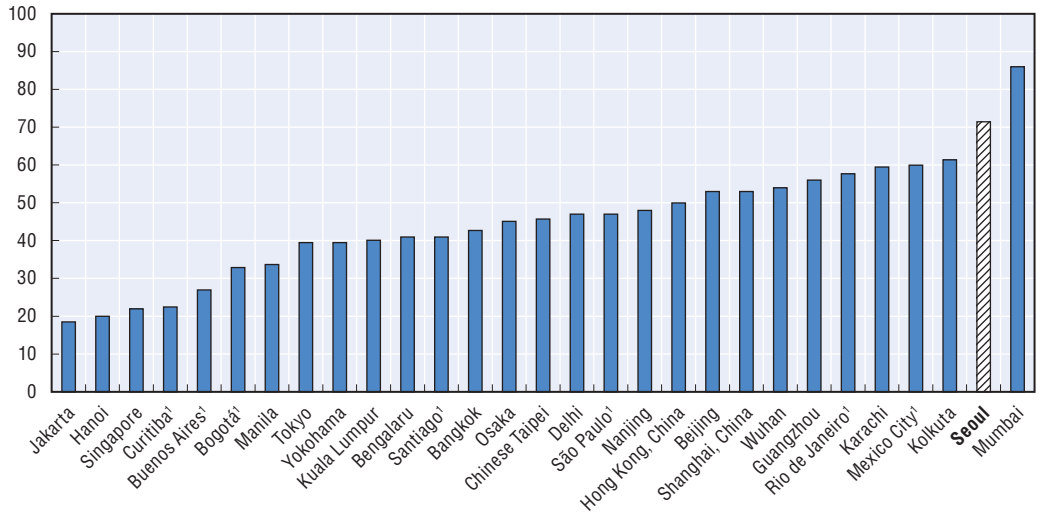


Note: Grey dots represent metropolitan cities; blue diamonds represent a selection of 31 *si*.

Source: Ministry of Environment (2009). *Environment Statistics Yearbook*, Ministry of Environment, Gyeonggi-do.

Figure 1.34. **Concentration of daily nitrogen dioxide (NO_2) in select cities**

μg/m³

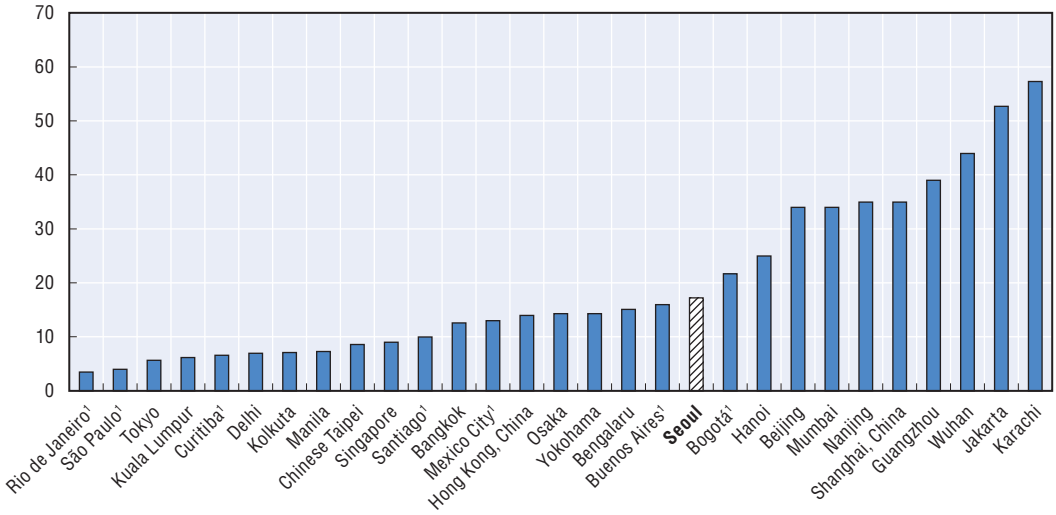


1. Data from a selection of Latin American cities are presented here.

Source: The Economist Intelligence Unit (2011), *Asian Green City Index*; The Economist Intelligence Unit (2010), *Latin American Green City Index*, Siemens AG, Munich.

Figure 1.35. **Concentration of daily sulphur dioxide (SO_2) in select cities**

μg/m³



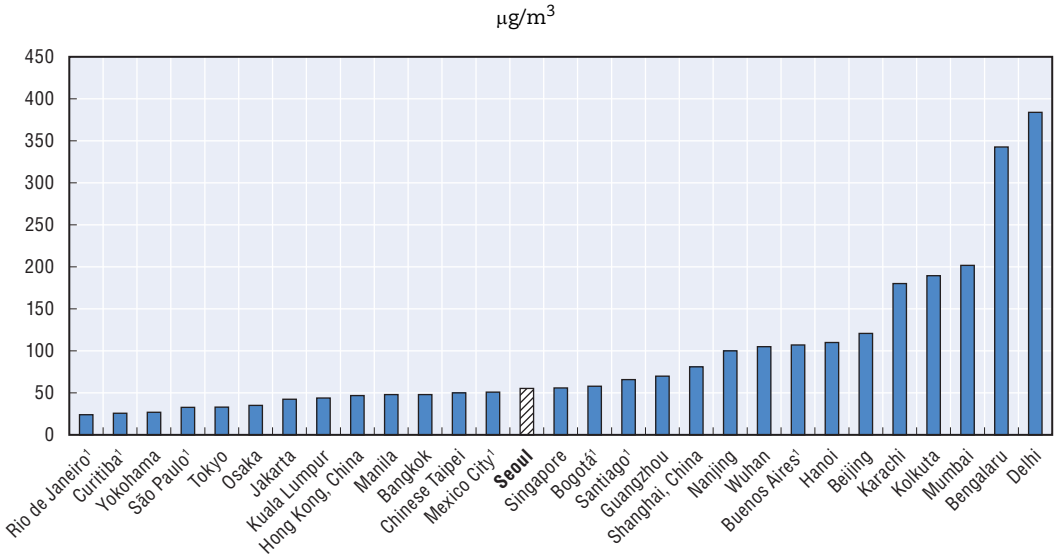
1. Data from a selection of Latin American cities are presented here.

Source: The Economist Intelligence Unit (2011), *Asian Green City Index*; The Economist Intelligence Unit (2010), *Latin American Green City Index*, Siemens AG, Munich.

Nevertheless, Seoul's average daily concentration of particulate matter (55 micrograms per cubic metre) is well above the World Health Organisation's safe guideline of 20 micrograms per cubic metre.

Air pollution in Korean cities, as in many other OECD cities, has been largely associated with massive energy consumption. However, with rigid regulations on fuel qualities for industrial consumption, current air pollution levels can be mostly attributed to the transport sector (Kim, 2003). Air quality will continue to deteriorate as long as the

Figure 1.36. **Concentration of daily suspended particulate matter in select cities**



1. Data from a selection of Latin American cities are presented here.

Source: The Economist Intelligence Unit (2011), *Asian Green City Index;* The Economist Intelligence Unit (2010), *Latin AmericanAsian Green City Index,* Siemens AG, Munich.

number of road vehicles and vehicle kilometres travelled (VKT) are on the rise. In this regard, it is recommended for both central and local governments in Korea to persistently seek to implement policies to diminish road traffic volume, such as controlling traffic demand through market mechanisms, inducing a modal shift toward public transport, with improvements to accessibility and enhancing capacities of individual vehicles to optimise energy consumption. These policy instruments will be discussed further in the third section of this paper.

Transport and building: two important sectors to be addressed

Aside from the industrial sector, which has contributed significantly to CO_2 emissions and the concentration of various pollutants in medium-sized cities, two important sectors, namely *i)* transport and *ii)* construction have increased their contribution to total CO_2 emissions in both metropolitan and medium-sized cities.

i) With the increase of car use and traffic congestion in many Korean cities, the rise of energy consumption in the *transport* sector has been the most dramatic. This sector increased its share of total energy consumption from 13.5% in 1980 to 19.7% in 2009 – an increase of 633% – due to higher rates of vehicle ownership (KEEI, 2011). Relying on fossil fuels as a primary energy source, the transportation sector accounted for 20% of energy-related CO_2 emissions in 2007 (MTLM, 2009). Historically, GDP growth and the expansion of the transport sector have been strongly correlated, while road transport has grown at an even faster rate (World Bank, 2010). Road transport is by far the dominant mode in Korea, representing 91% of passenger travel and 75% of freight transport (Eom and Schipper, 2010). From 1986 and 2008, an almost linear relationship was observed between the growth in car use and per capita growth of GDP in Korea (Eom and Schipper, 2010). With domestic GDP more than doubling between 1990 and 2010, a considerable rise in personal use of cars and light trucks was observed, consistent with motorisation trends in many rapidly developing Asian economies. CO_2 emissions from

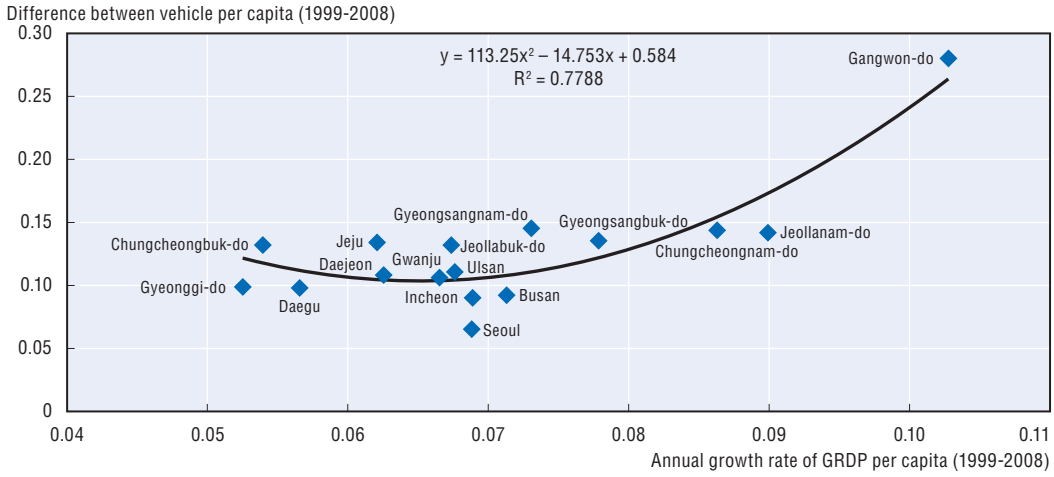
road transport increased by 156.6% between 1990 and 2007, due in part to the rapid rise in car registration.

Road transport accounts for 96% of total passenger carbon emissions and 64% of overall carbon emissions from the domestic transportation sector, of which private vehicles accounted for 68% of CO_2 emissions and buses for 28% in 2007. These patterns are consistent with those of most developed countries (IEA, 2008) and reflect the fact that private vehicle use has become an increasingly prevalent means of passenger transport (KEEI, 2007). In Korea, car ownership has risen substantially in the past 30 years, with the number of vehicle registration applications increasing by 3 285%, a trend that is likely to continue (MLTM, 2011). Although the rate slowed in recent years, vehicle registrations nevertheless increased by 49% between 2000 and 2010. Vehicle ownership appears to be closely correlated with the economic performance of cities (Figure 1.37). The Capital Region (Seoul, Incheon and Gyeonggi-do) recorded 45.1% of the national total of vehicle registrations in 2010, comparable to its share of the total national population. Some less urbanised provinces, like Gyeongsangnam-do and Chungcheongbuk-do, have started to surpass the metropolitan cities, recording the highest increasing rates of car registration in the last ten years (respectively 71.5% and 70.6%) (MLTM, 2011). While the number of vehicles per capita generally tends to be lower in denser areas, this does not seem to be the case in the Capital Region. In 2010, the number of vehicle registrations per square kilometre in Seoul was 4 928, 27 times higher than that of the national rate. This high concentration of cars in a limited area entails major pollution costs.

It is worth noting the strong preference for larger automobiles in Korea, which in turn has a considerable impact on air pollution. A main driver of air pollution in Korean cities has been road transport, which represented 32.9% of total air pollutants, higher than the share in the US, where urban sprawl has become one of the prevailing traits in most cities (OECD, 2009c). The size of cars also has an impact on air pollution levels (Table 1.24). In 1992, the average engine size of automobiles in Korea (1 620 cc) was slightly lower than that of the average in the European Union (1 602 cc). Within 15 years, however, average engine size in Korea had risen to 21.1% greater than the EU average. According to the Korea Transport Institute (2008), the percentage of cars with large engines (of 2 000 cc or more) out of all newly registered cars in Korea was 23.3% in 1998 and rose to 56.6% in 2007. In general, automobile engine size is positively related to emission levels. Larger cars consume more energy, emitting more air pollutants (Table 1.25). Larger cars (over 2 000 cc) register 150% more vehicle kilometres travelled (VKT), consume almost three times as much gasoline and generate twice as many CO_2 emissions compared to small cars (of less than 1 000 cc).

The drastic spatial expansion of Korean cities over the last half-century, particularly in the Capital Region, has been a main driver of increasing CO_2 emissions and pollution levels. The satellite image in Figure 1.38 gives a clear sense of how the Seoul metropolitan area has expanded physically. The built-up area of the Seoul Metropolitan Area increased 6.9 times, from 300 km^2 to 2 073 km^2, between 1971 and 2007. The major development axis of the Seoul Metropolitan Area was limited to within 10 km from the CBD of Seoul City in the 1970s, but extended to 40 km' radial distance in the 1990s and further expanded to 50 km in the 2000s. Urban areas in the Seoul Metropolitan Area have been developed in a non-contiguous way, leapfrogging from the solidly built-up area of the Central Business District (CBD) in Seoul City to

Figure 1.37. **Regional economic performance and vehicle ownership in Korean cities**



Source: : OECD own calculations based on data from Korea Statistics Office (2011), Korean Statistical Information Service (in Korean), *www.kosis.kr*, accessed 1 March 2011; Ministry of Land, Transport and Maritime Affairs (2011), *Statistical Yearbook of MLTM: 2011*, Ministry of Land, Transport and Maritime Affairs, Gyeonggi-do.

Table 1.24. **International comparison of average engine size of automobiles, Korea and the European Union**

Cubic centimetres

	1992	2002	2007	% change (1992-2007)
Korea	1 620	2 100	2 113	130.4
EU average	1 602	1 713	1 744	108.9
UK	1 617	1 705	1 777	109.9
France	1 599	1 757	1 680	105.1
Germany	1 776	1 844	1 863	104.9

Source: Korea Transport Institute (2008), *Calculation of Nationwide Traffic Congestion Costs and Trend Analysis for 2007*, Korea Transport Institute, Gyeonggi-do.

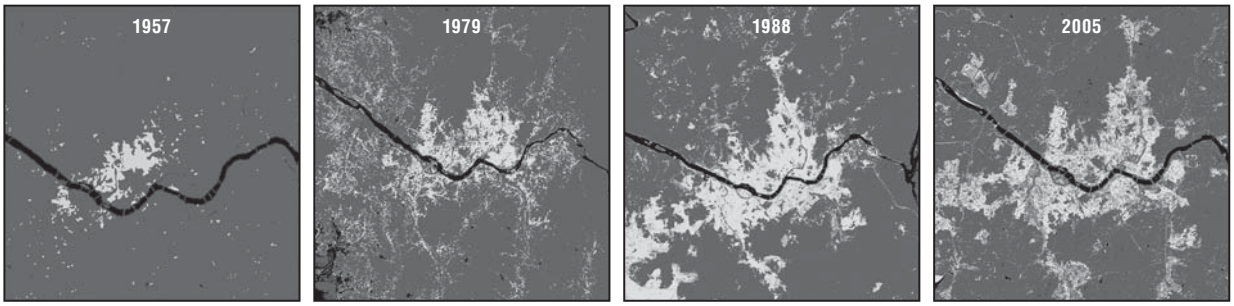
areas beyond the Restricted Development Zone and greenbelts. This has been especially true for five new towns that were built within 25 km from the CBD of Seoul City in the 1990s. These cities experienced rapid growth by absorbing spilled-over population from Seoul City. As of 2009, the Seoul Metropolitan Area, which represented only 11.7% of the national territory, had almost half of the national population and produced nearly half of national GDP. In the same year, Seoul City, which comprised

Table 1.25. **Comparison of energy consumption by size of vehicle engine**

	VKT/year	Gasoline consumption (litre/car)	CO_2 emission (g/km)	yearly CO_2 (kg/car)
Small (< 1 000 cc)	12 307	932	177	2 187
Compact (1 000-1 500 cc)	13 625	1 179	204	2 792
Mid-size (1 500-2 000 cc)	14 901	1 621	252	3 765
Large (> 2 000 cc)	18 190	2 869	324	5 902

Source: Korea Transport Institute (2008), *Calculation of Nationwide Traffic Congestion Costs and Trend Analysis for 2007*, Korea Transport Institute, Gyeonggi-do.

Figure 1.38. **Urban sprawl of the Seoul Metropolitan Area**



Notes: Areas in light grey indicate built-up area of Seoul Metropolitan Area.
This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.
Source: Seoul Development Institute (2007), *Thematic Maps of Seoul*, Seoul Development Institute, Seoul.

merely 6% of national territory, housed one-fifth of the country's population and produced more than 20% of national GDP.

Against this background, it appears that a substantial proportion of policy makers and researchers in Korea strongly adhere to the long-cherished policy goal of balanced regional development and prefer to retain a conventional policy instrument to contain the growth of the Seoul metropolitan area. Regional disparities are often viewed as a consequence of Seoul's concentration of Korea's population and economy. However, it has been widely demonstrated in policy experiments in other OECD countries, including France, Japan and the UK, that balanced regional development via containment policy is hard to attain in practice and bound to fail in most cases (OECD, 2005). There are less convincing evidences that constraints on the growth of the Capital Region actually shifted economic activities to other domestic regions. Furthermore, in an increasingly globalised economy, a containment policy in the Seoul MA could hold back its competitiveness in knowledge-based industries compared to other leading global cities, potentially resulting in a loss to the national economy. Seoul's primacy in the national urban hierarchy could be a valuable asset rather than a hindrance to Korea's economic competitiveness, in the same way that London's primacy within the UK enhances its role as a world city and adds significant value to the UK's economic success. Building city networks between Seoul and other regional centres to strengthen each other's functional specialisation and generate synergy among them could be a viable option for promoting the competitiveness of Korean cities.

ii) Besides being one of the key growth factors in urban areas, the *building sector* is also one of the major energy-intensive sectors in the Korean economy. Energy consumption from the building sector in total consumption is particularly high in Seoul, where it accounts for 60% of the total (Economist Intelligence Unit, 2011). Energy consumption levels of both the residential/commercial sector and the public sector increased between 1980 and 2009, though at slower rates (126% and 127%, respectively) than the growth of the transportation and industrial sectors. Taken together, residential and commercial buildings account for 24% of domestic energy consumption, which has been increasing by 3.8% annually since 1980 (KICT, 2009). During the period from 1980 to 2009, the share of the residential/commercial sector in total final energy consumption decreased from 40.7% in 1980 to 19.6% in 2009. The share of energy consumption from the public sector (public buildings, for example) also decreased

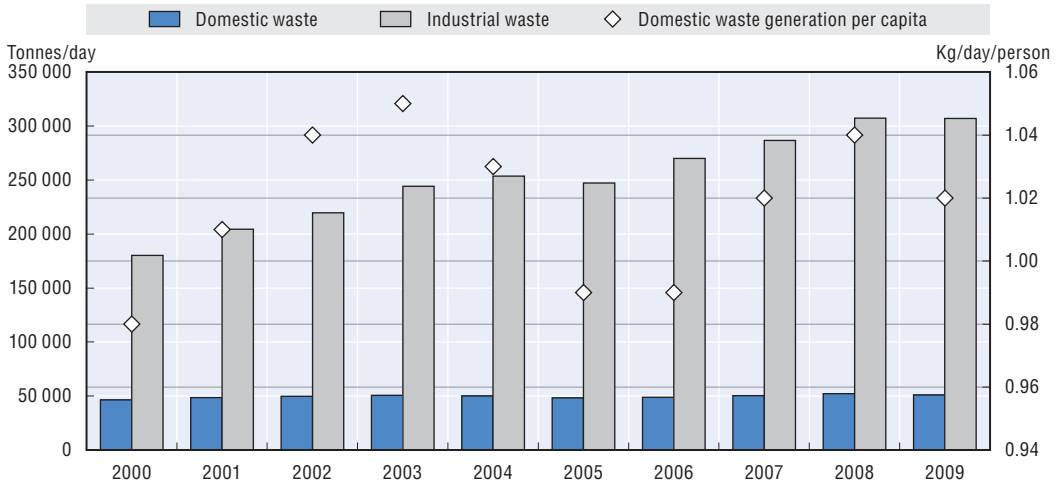
during this period, from 4.9% in 1980 to 2.4% in 2009. In terms of emissions, the building sector is responsible for the 25% of energy-related greenhouse gas emissions in Korea (MLTM, 2009).

Rapid urbanisation in Korea, along with wide fluctuations in housing prices, has led the government to implement a strong housing supply policy. According to the *Long-Term Housing Master Plan* (2003-12), required by the Housing Act, the Korean government aimed to provide 5 million housing units by 2012 (approximately 500 000 per annum) to increase the nationwide housing supply ratio to 116.7% by 2012. The government is currently on target to achieve this goal: between 2003 and 2008, on average, 485 000 housing units (mainly apartments) were built annually, with half of those housing units built in Seoul Metropolitan Area. New construction techniques have been developed to allow for a denser and more compact urban form, combined with an increased degree of flexibility in managing urban space. Nevertheless, there is still significant room for greening buildings in Korea. A 2009 Ministry of Land, Transport and Maritime Affairs report found that new construction in Korea consumed more than twice as much energy (200 kwh/m^2) as those in Germany (90 kwh/m^2) (MLTM, 2009).

Waste and water

Between 2000 and 2009, total waste generation increased by 58% in Korea. This was divided between industrial waste (86% of the total) and domestic waste (14%) in 2009 (MOE, 2010). The introduction of strict regulations on disposable goods and a volume-based disposal fee system for households in 1995 helped to limit domestic waste patterns to relatively stable levels between 2000 and 2009: domestic waste increased by just 10% during this period (Figure 1.39). Industrial waste, however, increased by nearly 70% between 2000 and 2009, due to the expansion of energy-intensive industries throughout Korea (MOE, 2010).

Figure 1.39. **Waste generation trends in Korea**



Source: Ministry of Environment (2010a), *2009 Waste Generation and Disposal in Korea*, Ministry of Environment, Gyeonggi-do.

Different trends in total waste generation can be observed across cities and regions, reflecting characteristics of local economies:

i) The Capital Region (Seoul, Incheon and Gyeonggi-do) generated 131 832 tonnes per day, 36.8 % of the national total in 2009. While the province of Gyeonggi-do registers the highest overall levels of daily waste generation, due to high levels of industrial waste, Seoul, the most populated and economically active metropolitan city, with the highest levels of GDP per capita, is responsible for the highest levels of domestic waste generation in tonnes per day, followed by Incheon, Pohang-si and Gwangyang-si (Figure 1.40). In per capita terms, total waste generation in Seoul has been lower than national average, but domestic waste per capita (*i.e.* excluding industrial and construction waste) is higher than the national average. Comparing Seoul with the 22 Asian cities shows that although the capital city records adequate waste collection and disposal for the totality of its waste, it also registers the highest levels of per capita waste generation among the cities surveyed (995.6 kg/person/year) (The Economist Intelligence Unit, 2011) (Figure 1.41).

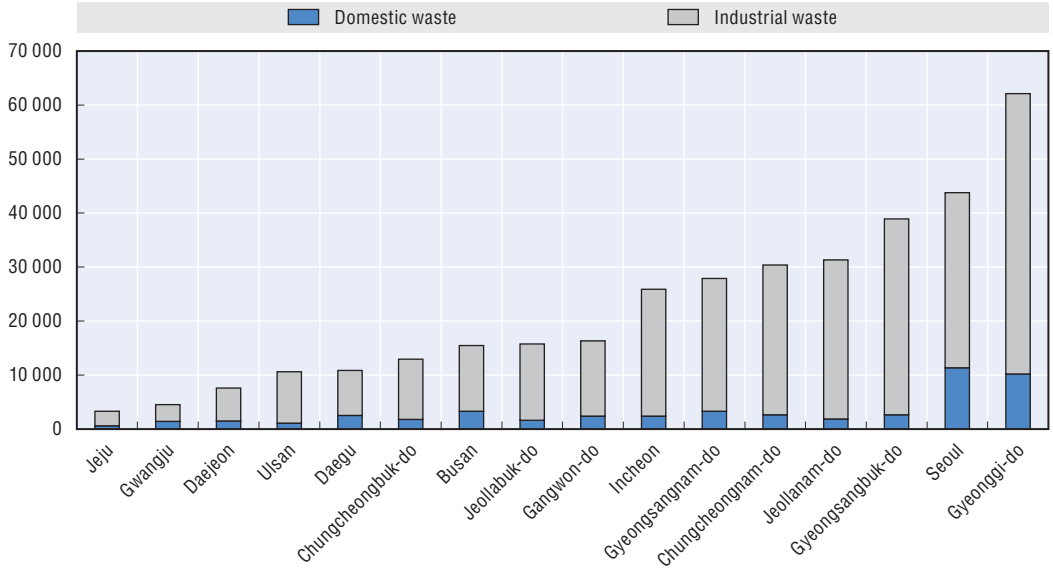
ii) High levels of waste are observed in cities from heavily industrialised regions. A high volume of waste generation in Pohang-si (in the province of Gyeongsangbuk-do) and Gwangyang-si (in the province of Jeollanam-do) can be explained by a high proportion of industrial waste, reflecting their areas of heavy industrial complexes.

iii) Redevelopment and housing construction programmes may be responsible for the large share of waste generated in some medium-sized cities, such as Goyang-si and Seongnam-si, located in Gyeonggi-do in the Capital Region.

iv) Some smaller cities are responsible for high levels of waste per capita. This was the case for 39 out of 77 small cities (*si*), which displayed higher domestic waste generations per capita than the national average (1.02 kg/day). Five out of the ten small cities with the

Figure 1.40. **Daily municipal and industrial waste generation levels in Korean metropolitan cities and provinces (2009)**

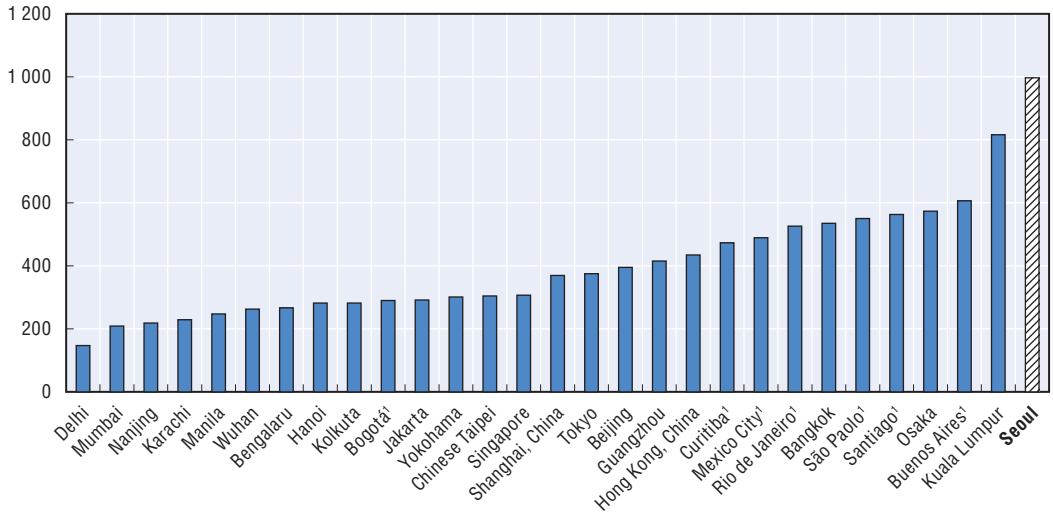
Tonnes/day



Source: Ministry of Environment (2010a), *2009 Waste Generation and Disposal in Korea,* Ministry of Environment, Gyeonggi-do.

Figure 1.41. **Per capita waste generation in select cities**

Kg/person/year



1. Data from a selection of Latin American cities are presented here.

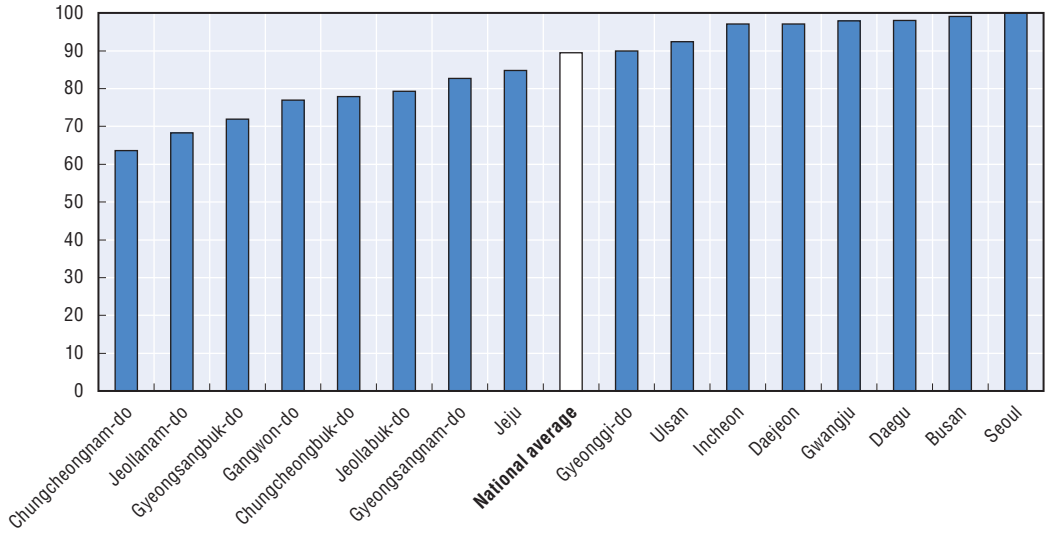
Source: The Economist Intelligence Unit (2011), *Asian Green City Index*, Siemens AG, Munich; The Economist Intelligence Unit (2010), *Latin American Green City Index*, Siemens AG, Munich

highest per capita waste generation rates are located in the province of Gangwon-do. Their high rank may be partially due to the large tourist population and related activities, which generate higher levels of domestic waste.[19]

Most of the Korean population has access to sanitation: in 2010, the national average supply rate of the sewage system was just over 89% (MOE, 2010b) (Figure 1.42). The largest metropolitan cities register the highest supply rates: Seoul (100%), Busan (99%), Daegu (98%) and Gwangju (98%). The lowest levels of wastewater treatment are found in the more rural provinces of Chungcheongnam-do (64%), Jeollanam-do (68%) and Gyeongsangbuk-do (72%).

Figure 1.42. **Sewage system supply rate in Korea, by region**

2010



Source: Ministry of Environment (2010b), *Environment Statistics Yearbook*, Ministry of Environment, Gyeonggi-do.

Sanitation levels in Asian cities are highly correlated with income levels: all residents have access to sanitation services in Seoul, as they do in Osaka and Singapore. Findings in Latin American cities indicate that a sharp division exists between the provision of sanitation services and wastewater treatment. Seoul has actively implemented sanitation policies, including regular monitoring of treatment facilities and public awareness campaigns. Seoul has a higher share of sanitation access than the average rate in Latin American cities surveyed (93%), as well as a higher rate of treated wastewater (an average of 52% for Latin American cities surveyed) (The Economist Intelligence Unit, 2010).

Waste recycling has improved, albeit unevenly, in Korean cities. Nearly 82% of total waste was recycled in 2009, followed by landfill (11%), incineration (5%) and sea disposal (2%). Recycling increased by 91% between 2000 and 2009, due to policies imposing strict separate garbage collection regulations and increased public education. The largest levels of waste recycling can be observed in relatively small-sized cities, such as Gwacheon-si (98%, located in the province of Gyeonggi-do), Gwangyang-si (97%, Jeollanam-do), Pocheon-si (94%, Gyenggi-do) and Taebaek-si (94%, Gangwon-do). Cities with the highest levels of waste going to landfills tend to be the most industrialised, such as Boryeong-si (38%, located in Chungcheongnam-do), Jeonju-si (33%, in Jeollabuk-do), Yeosu-si (34%, in Jeollanam-do), Siheung-si (28%, in Gyeonggi-do) and Incheon (29%) (MOE, 2010a). The waste recycling ratios of metropolitan cities, with the exception of Incheon, were near the national average: Seoul (86%), Busan (84%), Daegu (78%), Daejeon (78%) and Ulsan (78%). Even though these improvements in the major cities are remarkable, central and local governments should continue to make efforts to increase the share of recycled waste, given their overall large share of waste generation (33% of the national total).

Water supply also varies across Korean cities, with the highest levels of access to clean water found in metropolitan cities and the lowest levels in more rural provinces. All or nearly all residents have access to clean water in Seoul (100%), Busan (99.9%), Daegu (99.8%), Incheon (97.9%), Gwangju (98.5%), Daejeon (99.5%) and Ulsan (96.5%). Most provinces, with the exception of Jeju, record lower rates of access to clean water. In 2009, Chuncheongnam-do recorded the lowest ratio of 71.4%, followed by Jeollanam-do, at 73.5%. Only Gyeonggi-do reached over 95% (MOE, 2010a).

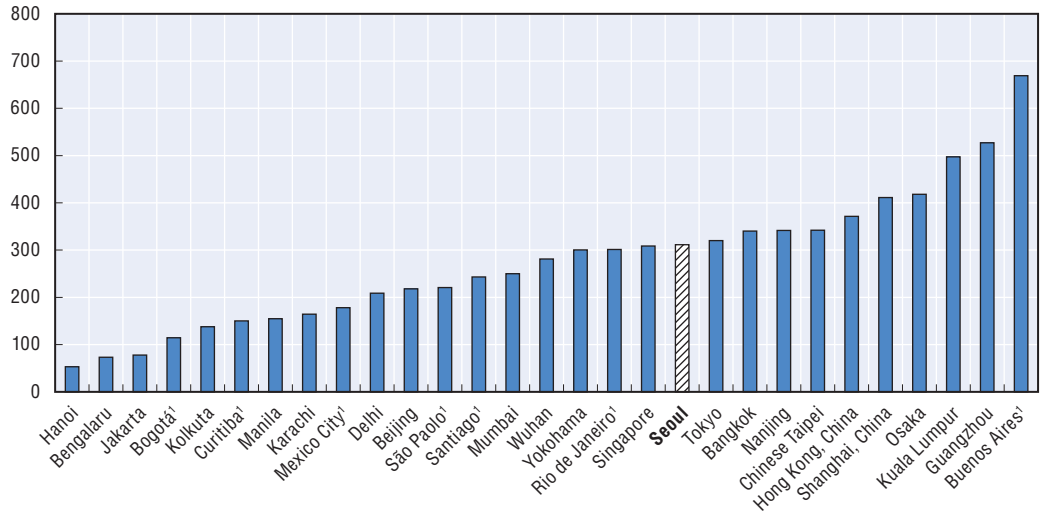
Seoul has implemented water efficiency codes and strategies to improve and monitor water quality and pollution standards, in addition to promoting public awareness about water conservation, but water shortages have been identified as an environmental vulnerability in the face of climate change (Economist Intelligence Unit, 2011). Among a selection of Asian and Latin American cities, Seoul's water consumption rate falls at just above the average for Asian cities surveyed, with 311 litres per person per day, in line with Singapore and Tokyo (Figure 1.43). Only 7% of water is lost due to leaky pipes in Seoul, in line with Osaka (6.9%) and Shanghai (10.2%). Seoul's consumption rate is slightly higher than the average rate among the European cities (288 litres/person/day) and Latin American cities surveyed (264 litres/person/day) (Economist Intelligence Unit, 2009 and 2010).

Observed changes in climate and their potential impacts on Korean cities

Climate change poses a significant threat to Korea's urban population, infrastructure and economic well-being. Cities concentrate people, infrastructure and economic activity, and as a result are particularly threatened by climate change. Cities in coastal or riverine locations, in resource-dependent regions and in locations at risk from extreme weather

Figure 1.43. **Per capita water consumption in select cities**

Litres/person/year



1. Data from a selection of Latin American cities are presented here.

Source: The Economist Intelligence Unit (2011): Asian Green City Index, Siemens AG, Munich: The Economist Intelligence Unit (2010), *Latin American Green City Index*, Siemens AG, Munich.

events, especially those undergoing rapid urbanisation or whose economies are particularly climate-sensitive, are especially vulnerable (IPCC, 2001 and 2007). In Korea, a country surrounded on three sides by the sea, a large share of cities rely on the sea for the fishing industry, the development of coastal areas for tourism and housing and port operations. Three key trends that threaten urban areas in Korea: *i)* rising sea levels and sea temperatures; *ii)* increasing precipitation; and *iii)* rising surface temperature.

i) *Rising sea levels and sea temperatures*. Sea levels in Korea have risen on average by 4.02 millimetres per year between 1993 and 2008, 30% higher than the global average of 3.16 mm per year (Cho *et al*., 2009). The most significant increases have been observed in the South Sea (4.66 mm), the East Sea (3.86 mm) and the West Sea (4.18 mm). Rising sea levels have also been observed at key ports (Table 1.26), with the highest increases in sea levels recorded at the ports of Seogwipo (0.6 mm) and Jeju (0.5 mm) between 1960 and 2006. Sea temperatures have also increased. Between 1968 and 2002, the temperature of the South Sea increased by 0.93° Celsius, the West Sea by 0.81° and the East Sea by 0.79° (MOE and NIER, 2010). These trends increase the potential for coastal erosion and severe flooding, thereby putting populations and infrastructure at risk and obliging coastal residents to migrate inland. The fishing industry and the local livelihoods associated with the industry are also threatened. Rising temperatures put a

Table 1.26. **Rising sea levels observed at key Korean ports**

Increase in millimetres between 1960 and 2006

	Sokcho	Mookho	Ulleungdo	Busan	Yeosu	Jeju	Seoguipo	Mokpo	Gunsan
Increase in sea level	0.2	0.06	0.2	0.2	0.2	0.5	0.6	0.08	0.1

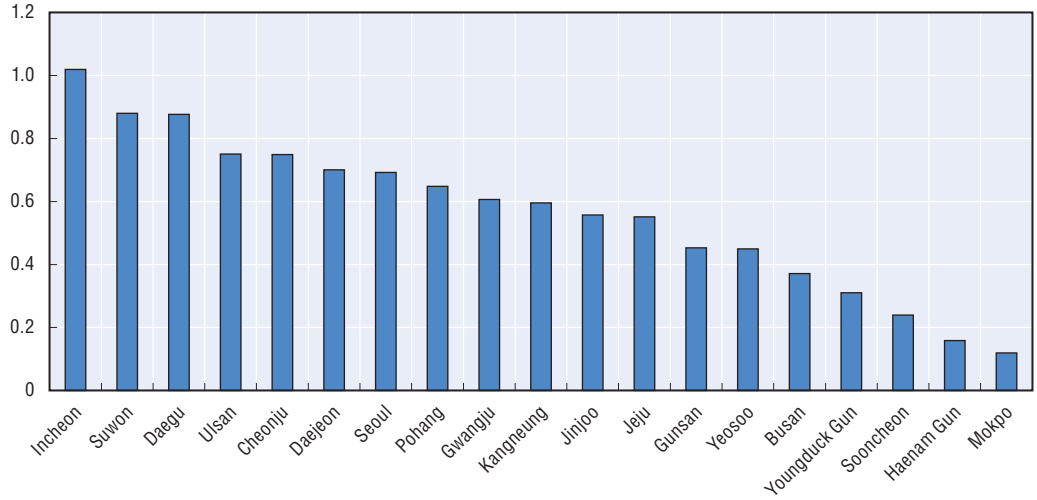
Source: Korea Environment Institute (2009), *Water Environment Management Strategy (I): Response to Climate Change*, Korea Environment Institute, Seoul.

number of marine species at risk. For example, the catch of walleye pollock has decreased dramatically, while the catch of squid, generally caught in warmer seas, has been on the rise. Sea levels and temperatures are expected to continue to rise in Korea (MOE and NIER, 2010), further exacerbating the risk to inhabitants, infrastructure and industry.

ii) *Increasing precipitation*. Consistent with global trends, between 1996 and 2005, average precipitation increased in Korea by 10% (KMA, 2008). During this period, the number of days with over 80 millimetres of precipitation increased from 20 to 28 days (KMA, 2008). The maximum precipitation per hour, one of the main causes of floods, increased from 94.6 mm per hour in the 1990s to 97.4 mm per hour in the following decade (KEI, 2009). Increased precipitation can hamper local and national development, because authorities are obliged to spend scarce technical, human and financial resources on recovery efforts. Between 1999 and 2008, the provinces of Gangwon-do, Gyeongsangnam-do and Gyeongsangbuk-do recorded the highest levels of flood damage, which affected over 113 000 residents and totaled KRW 7.1 trillion in damages (MOE, 2009; National Emergency Management Agency, 2009).

iii) *Rising surface temperatures and heatwaves*. From 1971 to 2000, average annual temperatures increased by 1.44° Celsius (MOE, 2010). Average surface temperatures in major cities, such as Incheon, Suwon, Daegu and Ulsan, increased more rapidly than those in less populated rural areas (Yongduck-gun and Haenam-gun) (Figure 1.44). Korean authorities have attributed this rise in temperatures in part to increasing urbanisation (MOE and NIER, 2010). Rising temperatures have resulted in changes to ecosystems. The Hongneung Arboretum in Seoul, for example, recorded shifts in the flowering period for over half of local plant species (Kim *et al*., 2009). The IPCC has also determined that it is likely that climate change has led to more frequent and more intense heatwaves, which threaten public health (heat exhaustion, heatstroke or even death), and may disproportionately affect different age groups and regions. Senior citizens, for example, were among the most affected populations during the 1994 heatwave in Seoul (Choi *et al*., 2005).

Figure 1.44. **Rising average temperatures in Korean cities**



Note: Difference in the average temperature from 1971-99 and from 2000-09.

Source: Own calculations based on data from Korea Meteorological Administration.

Sea levels, sea and surface temperatures, and both the frequency and intensity of extreme weather events (flooding, heatwaves, cold fronts) are expected to continue to rise in Korea, as well as globally (MOE and NIER, 2010; IPCC, 2007). The Korean government has estimated that, assuming a 4° increase in temperature, combined economic losses from agricultural, coastal development and human health costs due to climate change will result in a 5.6% drop in GDP by 2100 relative to 2008 levels (MOE, 2008). Recent OECD work on assessing the vulnerability of port cities to climate extremes estimated that a combined 294 000 inhabitants and assets totaling USD 33.3 billion are threatened by rising sea levels and extreme weather events in three Korean port cities, Busan, Incheon and Ulsan (OECD, 2007a). These findings underscore the need for urban policies that address climate change mitigation and local adaptation. Adaptation policies, including urban infrastructure reinforcement, the efficient management of food resources and strategic land use planning that focuses new development away from floodplains, can help manage the economic, health and human risks associated with climate change.

Notes

1. This does not include monarchies "city states", "self-governing dependent territories" and Chinese Taipei.
2. During the same period, the annual growth rate of the world urban population was 4.3% (UN, 2009).
3. They included Seoul (10.544 million), Busan (3.778 million), Daegu (2.215 million), Incheon (1.785 million), Gwangju (1.122 million) and Daejon (1.036 million) (UN-DESA, 2010).
4. Ulsan was added to the list of million-plus cities of Korea in 2005 (1.047 million).
5. The methodology consists of three main steps. The first step identifies contiguous or highly interconnected densely inhabited urban cores. High-density clusters are defined as an aggregation of contiguous high-density grid cells of one square kilometre each. High-density cells are those with a population density of at least 1 500 inhabitants per square kilometre in Europe, Japan, Mexico and Korea. A lower threshold of 1 000 people per square kilometre is applied to Australia, the US and Canada. Small clusters (with less than 50 000 people in Europe, the US and Canada, and 100 000 people in Japan, Mexico and Korea) are dropped, as they are likely to capture small agglomerations of built-up areas that cannot be characterised as a city. The second step identifies interconnected urban cores that are part of the same functional areas. Two urban cores are considered integrated, and thus part of the same polycentric metropolitan area, if more than 15% of the resident population of any of the cores commutes to work in the other core. Once the densely inhabited municipalities are aggregated to form urban cores, polycentric metro areas with tied cores are identified. The third step defines the commuting shed or hinterland of the functional city. The urban hinterlands are identified if hinterland municipalities send to the core a percentage of their workers above a given threshold, which is fixed for municipalities at 15% of the resident employed (OECD, 2012, forthcoming).
6. For this reason, the Korean government often includes the population of a *eup* or the total urban population reflected in the local urban plan, when calculating urban population in total. In this case, the urbanisation rate could be calculated at nearly 93%.
7. Five hundred inhabitants for Japan and Korea, to account for the fact that the national population density exceeds 300 inhabitants per square kilometre.
8. Q values are the coefficient resulting from running a regression for rank – of cities in this case – and population size. If the *q* value results to be 1 or greater in the absolute value, the urban system can be said to be dominated by a primate city.
9. As of 2009, Suwon and Changwon ranked 8th and 20th respectively.
10. For more on the hollowing-out of the manufacturing sector in both Japan and Korea, see OECD (2010c).
11. This figure is measured by "Resident registration statistics" of the Ministry of Public Administration and Security.

12. They are Dongducheon-si, Paju-si, Icheon-si, Ansung-si and Pocheon-si.
13. They are Paju-si, Ansung-si and Pocheon-si.
14. Along with a rising ageing population, the number of single-person households over 65 years old has increased by 124.3% between 1995 and 2005 (Korea Statistics Office, 2011).
15. Under this initiative, Koreans who live in China and the former Soviet Union but lack Korean nationality can apply for a Special Visa with a five-year expiration date. Once they get the visa, they can stay in Korea for a maximum of three years and do not need permission to travel to and from Korea if their visa is valid. Benefitting from these policies, Chinese-Koreans comprise nearly 40% of the number of foreigners.
16. Energy intensity is calculated as total primary energy supply (TPES) divided by GDP. Energy intensity is affected by many non-energy factors such as climate, geography, travel distance, home size and manufacturing structure.
17. Energy self-sufficiency is calculated as the production of energy divided by the TPES.
18. Data is for 1998 levels and is based on Dhakal, S. (2004). Note that the figure for Seoul should be interpreted with caution, however, as the data for Korea was among those that were not peer reviewed by the World Bank.
19. Gangwon-do's large annual tourist population, which reached 46.3 million in 2008 – nearly double the population of Korea – generates large volumes of domestic waste (KOSIS based on Gangwon-do's statistics). In 2009, summer vacationers to the beaches of the Eastern Coast of Gangwon-do were estimated to generate 1.5 kilogrammes of waste per capita between July and August, nearly 50% higher than the daily national average (Seoul Newspaper, 15 September 2009). In order to reduce waste generation by tourists, Gangwon-do has introduced a number of policy initiatives, including education campaigns and reinforced monitoring efforts (Gangwon-do, 2010).

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ANNEX 1.A1

Zipf's Law and Q-value of Korean Cities

According to the "rank-size rule" or "Zipf's law", if all the settlements of a country are ranked according to population size, the sizes of settlements will be inversely proportional to their rank. This could be expressed as equation (1). Hence, if all cities are placed in order from the largest to the smallest, each one will have a population half the size of the preceding city or, if the population of any city is multiplied by its rank in the urban hierarchy of a certain country, it will be equal to the population of the largest city in the country. However, as some of recent papers, including Kwok (2002), attested, Zipf's law does not hold uniformly across countries and the actual population of cities in many countries substantially diverges from the population predicted by Zipf's law. In Figure 1.A1.1, the actual population of cities in Germany (upper-right side of the figure) proves to fit very well with the predictions of Zipf's rule. Actual population of Korean cities tends to fairly match with expectations according to Zipf's law. However, for both the UK and Netherlands, actual population departs from Zipf's law expectations to a significant level. In the case of the UK, the population of the second-largest city of Birmingham in 2008 (1.010 million) limited to almost one-quarter of the rank-size rule's projection (3.8 million). This could be attributed to the overwhelmingly large population size of the primate city of London (7.619 million 2008) in UK's urban hierarchy. For Netherlands, the validity of rank-size rule is restricted due to its unique conurbation of the Randstad or literally "ring city", which comprises the four largest Dutch cities (Amsterdam, Rotterdam, The Hague and Utrecht) and consists of a green area in the centre called the Green Heart (OECD, 2007b). As national policy has successfully avoided the creation of one dominant city, the Randstad has a polycentric urban structure and accordingly has no substantial differences in population size among four member cities. The population of the second-largest city of Rotterdam in 2007 (584 000) was almost 80% of the primate city of Amsterdam (742 000 in 2007) (Figure 1.A1.1).

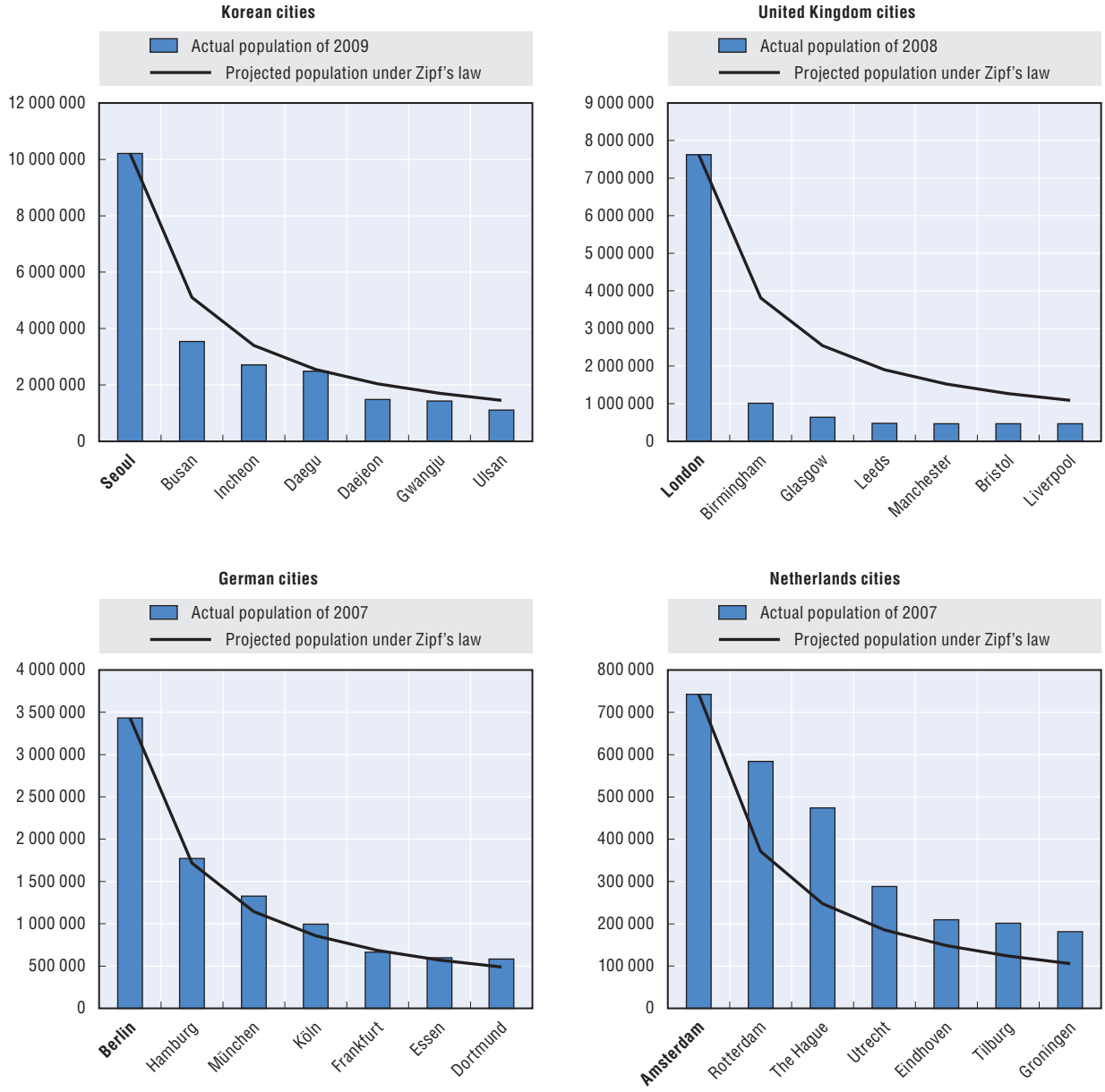
$$P_R = P_1/R \qquad (1)$$

Where, R is the rank of a city, P_R is the population of city in rank R, P_1 the population of the primate city.

Accordingly, in general, the rank-size rule is regarded as a special case of the Pareto distribution in the following equation (2) in which *q*-value is equivalent to 1.[1] This equation could be more easily interpreted from the logarithmic form in equation (3). In this form, *log* P_1 is intercept value and *q*-value is the co-efficient of the slope of the linear equation. This equation indicates that if the two axes of the city size distribution (*i.e.* population size and rank) are scaled logarithmically, the distribution will have a negative sloping straight

Figure 1.A1.1. **Zipf's law and actual population of some countries**

Korea in 2009, Germany in 2007, UK in 2008, Netherlands in 2007



Notes: The *x*-axis is placed in order of population rank of cities in a country.
All cities correspond to "city proper" or administratively recognised cities rather than conurbations.

Source: Data for Korea from Ministry of Public Administration and Security (MOPAS) (2009), Municipal Yearbook of Korea (in Korean), Ministry of Public Administration and Security, Seoul; data for UK and Germany from Thomas Brinkhoff: City Population, *www.citypopulation.de*; and data for Netherlands from United Nations Department of Economic and Social Affairs (UN-DESA).(2007), Principles and Recommendations for Population and Housing Censuses, United Nations Department of Economic and Social Affairs, New York.

line. And if the *q*-value is greater than 1, the population size of a city in rank R falls off faster in a proportionate manner with its rank of R, following primate distribution of population. This implies that in a given country, the primate city or large cities may grow faster than others as time passes (Malecki, 1975). If the *q*-value is lower than 1, on the other hand, it could mean that in a dynamic mode of population change, medium- or small-sized

cities may grow faster than the primate or large cities. If the *q*-value is equal to 1, the population of cities in a country decreases proportionately to their rank, according to rank-size distribution. This could mean that all differently sized cities of a country grow at an equivalent ratio within a lapse of time.

$$P_R = P_1/R^q \quad (2)$$

$$\log P_R = \log P_1 - q \log R \quad (3)$$

Where, R, P_r and P_1 are same with equation (1) and *q* denotes constant value.

Based on equation (3), the *q*-values of Korean cities in different years were estimated and listed in Table 1.A1.1. All linear equations derived in this table provide a significantly high determinant coefficient (R^2), indicating that the model well explains reality. The *q*-value for cities in Korea at any year since 1970 were commonly bigger than "1", implying that the primate city and other large cities accounted for a dominant share of urban population in Korea in a given certain year. In the meanwhile, the *q*-values of Korean cities have shown a clear downward trend since the 1990s, despite fluctuations during same period The *q*-value fell substantially from –1.22 in 1990 to –1.09 in 1995 and then dropped slightly further to –1.06 in 2009. This general tendency reveals that the population of mid-sized cities in Korea has grown at a faster rate than those of large-sized cities since the 1990s.

For international comparison, this paper conducts an empirical test on the interaction between rank and population size of global cities in selected countries using a data set from the United Nations' *Demographic Yearbook 2007*.[2] This yearbook covers only capital cities and cities with 100 000 or more inhabitants. Almost all countries included in this test are limited to those that have more than ten cities, except for a few Western European countries. Only when a data set for "city proper" or administratively defined city is not available, population in urban agglomeration areas is considered. Table 1.A1.1 summarises major outcomes of this test.

The average *q*-value for 54 sample countries computed by the simple OLS method indicates 0.89, which is considerably lower than what would be predicted by Zipf's law. This result matches other previous tests, notably Kwok (2002; the *q*-value for cities proper of 0.90) and Brakman *et al.* (2009; the *q*-value for city proper of 0.88). In general, larger *q*-value indicates less evenly sized cities, and conversely smaller *q*-value implies lesser dominance of the primate or large cities (Kwok, 2002). Korea showed the eighth-largest *q*-value (–1.096 in 2000), followed by Australia (–1.527 in 2007; the highest value), Canada (–1.231 in 2007; agglomeration basis; second largest) and Pakistan (–1.152 in 1998; third largest). The Netherlands (–0.604 in 2007), Turkey (–0.664 in 2007) and China (–0.658 in 2000) are grouped into countries with lower *q*-value. This test finds that the *q*-value of 18 out of 54 countries (33.3%) falls in the interval between –0.90 and –1.10,[3] when the *q*-value of –1.0 represents that the size distribution of cities follows Zipf's rule or perfect rank-size distribution. In the meanwhile, the *q*-value tested for 54 countries displays somewhat distinctive patterns among different continents. Countries in Western Europe show relatively small *q*-value (–0.812 on average), while countries in the Americas have moderately large *q*-value (–1.055 for North America and –0.946 for South America on average).

Table 1.A1.1. **The *q*-value and primacy indicators of major countries**

54 countries, latest data available, 1991-2007

Continent	Country	Year	Number of cities	*q*-value	Primacy (P_1/P_2)	Inverse (P_2/P_1)	Primacy ($P_1/P_2+P_3+P_4$)	City type
Africa	Algeria	1998	32	–0.688	2.23	0.45	1.03	City proper
	Cameroon	1998	13	–1.09	1.07	*0.93*	0.75	City proper
	Ethiopia	2002	11	–1.073	*11.16*	*0.09*	*4.49*	City proper
	Morocco	2007	24	–0.58	2.47	0.41	0.86	City proper
	Nigeria	1991	60	–0.936	2.4	0.42	1.04	City proper
	Senegal	2007	10	–0.996	1.23	0.81	0.79	City proper
	South Africa	1996	23	–0.66	1.09	0.92	*0.41*	City proper
	Sudan	1993	12	–0.983	*1.34*	0.75	0.65	City proper
			Mean	–0.876	2.87		1.25	
America North	Canada	2007	27	–1.231	1.49	0.67	0.77	Agglomeration
	Mexico	2006	37	–0.967	4.75	0.21	1.98	City proper
	United States	2007	262	–0.740	2.16	0.46	0.93	City proper
			Mean	–0.979	2.80		1.23	
America South	Argentina	1991	34	–0.901	2.56	0.39	0.93	City proper
	Brazil	2005	257	–0.806	1.8	0.56	0.98	City proper
	Chile	2007	26	–0.816	7.67	0.13	3.86	City proper
	Columbia	2007	58	–0.973	3.11	0.32	1.26	City proper
	Ecuador	2007	16	–1.041	1.41	0.71	1.02	City proper
	Peru	2007	21	–1.129	9.63	0.1	3.6	City proper
	Venezuela	1998	26	–0.959	1.16	0.86	0.52	City proper
			Mean	–0.946	3.91		1.74	
Asia	Bangladesh	2001	24	–1.093	2.64	0.38	1.68	Agglomeration
	China	2000	656	–0.658	1.25	0.8	0.48	City proper
	India	2001	422	–0.849	1.21	0.82	0.64	City proper
	Indonesia	2005	48	–1.103	3.38	0.3	1.27	City proper
	Iran	2006	79	–0.916	2.92	0.34	1.31	City proper
	Israel	2007	14	–0.663	1.91	0.52	0.85	City proper
	Japan	2005	252	–0.754	2.37	0.42	1.01	City proper
	Korea	**2000**	**56**	**–1.096**	**2.7**	**0.37**	**1.15**	**City proper**
	North Korea	1993	12	–0.981	3.75	0.27	1.35	City proper
	Kazakhstan	2007	20	–0.772	2.24	0.45	0.82	City proper
	Malaysia	2007	25	–0.653	3.05	0.33	1.17	City proper
	Pakistan	1998	51	–1.152	1.82	0.55	1.09	City proper
	Philippines	2000	68	–0.75	1.37	0.73	0.56	City proper
	Saudi Arabia	2004	26	–1.137	1.46	0.69	0.82	City proper
	Thailand	2007	54	–0.781	9.71	0.1	3.57	Agglomeration
	Turkey	2007	54	–0.664	1.95	0.51	0.73	City proper
	Uzbekistan	2001	17	–0.851	5.46	0.18	1.96	City proper
	Vietnam	1992	19	–1.076	2.81	0.36	1.35	City proper
			Mean	–0.886	2.89		1.21	
Europe Western	Belgium	2006	7	–0.71	1.98	0.51	0.74	City proper
	Finland	2007	6	–0.722	2.4	0.42	0.89	City proper
	France	1999	36	–0.7	2.67	0.37	1.3	City proper
	Germany	1999	83	–0.768	1.99	0.5	0.88	City proper
	Italy	2007	43	–0.853	2.01	0.5	0.82	City proper
	Netherlands	2007	25	–0.604	1.27	0.79	0.55	City proper
	Norway	2007	4	–1.109	2.25	0.44	1.05	City proper
	Spain	2006	61	–0.709	1.95	0.51	1	City proper
	Sweden	2007	11	–0.849	1.6	0.62	0.82	City proper
	Switzerland	2007	12	–1.063	1.95	0.51	0.75	City proper
	United Kingdom	2001	89	–0.841	3.62	0.28	1.37	Agglomeration
			Mean	–0.812	2.15		0.92	

Table 1.A1.1. **The *q*-value and primacy indicators of major countries** *(cont.)*

54 countries, latest data available, 1991-2007

Continent	Country	Year	Number of cities	*q*-value	Primacy (P_1/P_2)	Inverse (P_2/P_1)	Primacy ($P_1/P_2+P_3+P_4$)	City type
Europe Eastern	Hungary	2007	9	–1.066	8.3	0.12	3.13	City proper
	Poland	2007	39	–0.758	2.25	0.44	0.79	City proper
	Romania	2007	24	–0.701	6.13	0.16	2.07	City proper
	Russia	2007	167	–0.819	2.29	0.44	1.44	City proper
	Ukraine	2007	44	–0.848	1.86	0.54	0.78	City proper
			Mean	–0.838	4.17		1.64	
Oceania	Australia	2007	18	*–1.527*	1.14	0.88	0.6	City proper
	New Zealand	2006	10	–0.686	1.18	0.84	0.46	City proper
			Mean	–1.107	1.16		0.53	
Total			Mean	–0.886	2.92		1.24	
(Number of countries: 54)			SD	0.192	2.33		0.89	
			Max.	–1.527	11.16	0.93	4.49	
			Min.	–0.580	1.07	0.09	0.41	

Notes: Cities included in this analysis are capital cities and cities that have more than 100 000 inhabitants.
Countries included in this analysis are those that have more than 10 or more cities, except Belgium, Finland, Hungary and Norway.
P1, P2, P3 and P4 respectively denote the largest, second-, third- and fourth-largest cities in a country.
"City proper" indicates officially defined administrative boundaries of a city.
Agglomeration data is used only when "city proper" data is not available.
Italics in the table represent maximum or minimum figures in a given column.
Average value of inversed two-city primacy ratio is not computed, as this figure is not consistent with the inversed value of average of two-city primacy in any case.
Source: OECD own calculations based on data from United Nations Department of Economic and Social Affairs (UN-DESA) (2009), *Demographic Yearbook 2007,* United Nations Department of Economic and Social Affairs, New York; United Nations Department of Economic and Social Affairs (UN-DESA) (2008), *Demographic Yearbook 2006,* United Nations Department of Economic and Social Affairs, New York.

Notes

1. According to Kwok (2002), using the ordinary least squares (OLS) method and new data from Thomas Brinkhoff: City Population, *www.citypopulation.de*, Zipf's law was rejected for the majority of countries (53 out of 73 countries). When using the Hill estimator instead of the OLS method, Zipf's rule is also rejected for 29 countries in the same data set.
2. Only for Korea, the *Demographic Yearbook 2006* was used, due to data insufficiency of the *Demographic Yearbook 2007*.
3. Kwok (2002) finds that out of 73 countries tested, 39 are significantly lower than –1.0, while 14 are significantly greater than –1.0.

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Chapter 2

National Policies for Urban Development in Korea

This chapter analyses Korean urban policy and provides recommendations to address urban policy challenges. The chapter begins with a brief examination of the trajectory of urban policy in Korea, which shifted from a polarised growth pole strategy in the 1960s into promoting strategies emphasising qualitative urban management and urban competitiveness. Four policy priorities are recommendations for strengthening the co-ordination and coherence of Korean urban policy: i) *address the current policy fragmentation across ministries and among local governments through a comprehensive, multi-sectoral approach to urban development and increased co-operation among sub-national administrations;* ii) *adapt urban policy to future demographic trends, such as ageing and an increasing immigrant population;* iii) *advance a more tailored urban policy to address the different needs of Korean cities; and* iv) *close the gaps between expected and actual outcomes in urban planning, through more widespread use of urban modelling and greater* ex post *evaluation and monitoring.*

Korea is currently faced with a range of urban challenges that hinder the competitiveness of many of its cities. Rapidly growing medium-sized cities are facing increasing urbanisation pressure, especially those adjacent to larger cities such as Busan and Seoul, and suburbanisation, urban sprawl and unmanaged urban growth are increasing threats. Changing demographic trends also pose a challenge to policy makers: Korea will look quite different in 2020, with the elderly accounting for over 15% of the population and immigrants comprising 5% of the population. In addition, due to its energy-intensive economy, rising GHG emissions and deteriorating environmental quality are also increasingly evident in urban areas.[1] The articulation of a national urban policy will be fundamental in addressing these challenges. The trajectory of urban policy in Korea has transitioned from strategies promoting polarised growth poles to decentralisation and balanced quantitative growth, and finally, toward qualitative urban management that seeks to maximise urban competitiveness.

Nevertheless, four policy priorities could help to strengthen the co-ordination and coherence of Korean urban policy. First, a comprehensive, multi-sectoral approach to urban development could help to correct the high level of policy fragmentation among central ministries, whilst co-operation among local governments could be encouraged in light of the current piecemeal approach to local development, with separate plans for economic, spatial and sectoral development. Second, measures could be implemented to adapt the urban environment to an ageing and increasingly ethnoculturally diverse urban population, including modifications to urban design and zoning and land use regulations. Third, Korea could look to better tailor its urban policies to the different needs of cities, including the specific challenges faced by Seoul, other large cities outside the Capital Region and lagging cities or districts. Finally, the gap between the anticipated and actual outcomes of urban plans and policies could be addressed by a more widespread use of urban modelling to predict potential outcomes, as well as enhanced strategies for *ex post* evaluation and monitoring.

2.1. An ongoing reform of Korean national urban policy

Since the 1960s, Korean national urban policy has evolved in response to changing social and economic circumstances. While urban development from the 1960s to 1980s was concentrated in a handful of large, metropolitan cities, structured around a growth pole strategy, balanced territorial development became a policy priority during the 1990s, with measures to limit the excessive centralisation of the Capital Region in favour of the development of other areas. Most recently, the Korean government has emphasised qualitative urban management initiatives in an effort to maximise urban competitiveness.

From a polarised growth-pole strategy and decentralised, balanced quantative growth…

Industrial modernisation (1960s-80s): Growth-pole strategy

The growth-pole[2] strategy was at the centre of Korean urban policy between the 1960s and 1980s. It was considered an effective policy, because there were limited resources to develop the whole country evenly at one time. Under this strategy, metropolitan cities, Seoul in particular, and heavily industrial cities, including Ulsan, Gumi, Pohang, Banwol and Changwon, were developed as Korea's major economic and employment centres. At the same time, large-scale infrastructure projects, such as the Gyeongbu highway to connect Seoul and Busan, were constructed to support national economic development.

The growth-pole strategy also gave more weight to new development in and around some large cities, known as new town development, in addition to urban renovation in rural areas. Along with establishing industrial cities, Hwagok and Yeouido in Seoul and the Gwangju area in Seongnam-si (located in Gyeonggi-do), were planned for providing houses, while Gwacheon-si in Gyeonggi-do was built for administrative functions in the 1980s. Nevertheless, the growth-pole strategy, despite its effectiveness, entailed an over-concentration of population and industry in a few large cities, notably Seoul, which in turn lead to urban problems like a shortage of housing[3] and infrastructure, along with the encouragement of urban sprawl, as discussed in Chapter 1 (see Figure 1.37).

Decentralisation and balanced quantitative growth strategy (1980s-90s)

From the 1980s onward, with a growing demand for balanced national development policy, Korean policy makers pursued a decentralisation policy to restrain the population and concentration of industry in the Seoul Capital Area. The government relocated public administration services, public corporation offices and university branches outside Seoul, offered financial incentives to firms to relocate, and enacted regulations to curb the expansion of industrial establishments within Seoul (OECD, 2005a). In particular, the *Capital Region Readjustment Planning Act* (1994) divided the Capital Region into three categories,[4] in which the construction of new factories, buildings and universities was strictly limited and over-concentration taxes could be levied (OECD, 2005a). Along with relocation of the main urban functions outside Seoul, the Korean government took on a sweeping reform for decentralisation. The revision of the Local Autonomy Act in 1988 provided the legal foundations for the re-establishment of local assemblies in 1991 and direct elections of local chief executives in 1995, along with empowering central government's mission to local government. This decentralisation process has been pushed further by the succeeding governments.[5]

Decentralisation efforts have nevertheless been criticised, on the one hand for curbing the growth of Seoul and undermining Korea's competitiveness on the international stage, and, on the other, for being ineffective in fostering dynamism and creative capabilities outside the Capital Region. For example, despite policies to achieve more balanced territorial development, as seen in Chapter 1, the Capital Area has still dominated the national economy. Furthermore, according to a 2008 survey conducted by the Korea Chamber of Commerce and Industry, nearly 67% of surveyed companies indicated that they would delay or abandon investment in the Capital Region if the existing regulations in the Capital Region continued. Firms also expressed concerns about the significant shortage of available land in the Capital Region, which compels investors to look for available land

overseas. For example, annual overseas investment was USD 1 908 million in 1995, but increased to USD 7 628 million in 2007.

Further, decentralisation in Korea has not been completely achieved. A significant portion of local governments' work is still executed by the central government. According to a survey of the Korean Institute for Public Administration (KIPA), only 27% of total government operations were directly performed by local governments in 2001, whilst only 55% (6 306 units) of local government operations were purely local in 2005 (OECD, 2009c). Further, as will be discussed in Chapter 3, despite continuous efforts at fiscal decentralisation, many local governments still depend largely on earmarked and discretionary funds from the central government. For example, the average fiscal autonomy of local governments registered 52.2% in 2010 (Korea Statistics Office, 2011). At the same time, the central government has developed numerous special agencies to carry out its key functions at the local level. Many ministries have established affiliated administrations or regional branches to implement their core regional policies, while delegating many insignificant functions to local governments. For instance, the Small and Medium Business Administration (SMBA), an affiliated central government authority under the supervision of the Ministry of Knowledge and Economy, directly provides funds for SME and start-ups. There have been continuous requests from local governments to reduce the roles of special agencies and to transfer their key functions to sub-national governments in order for decentralisation to fully materialise. As a response, in 2006, the Jeju Province Special Autonomous Act was established to integrate branches of the central government into the Jeju province government. And in July 2008, the Korean government announced a mid-term plan to divest considerable powers from special agencies to local governments.

Specific challenges in the Capital Area remain, including soaring real estate prices due to an acute housing shortage, and increased concerns over urban quality. This has compelled the government to respond with the construction of five additional new cities around Seoul: Bundang, Ilsan, Pyeongchon, Sanbon and Jungdong, all of which were built between 1989 and 1996, with a minimum of 165 000 residents. The construction of these new cities generated controversy among national policy makers. Although the provision of large quantities of new housing has helped to stabilise housing prices, the five new cities have led to an acceleration of the population concentration in the Capital Area and to real estate speculation.

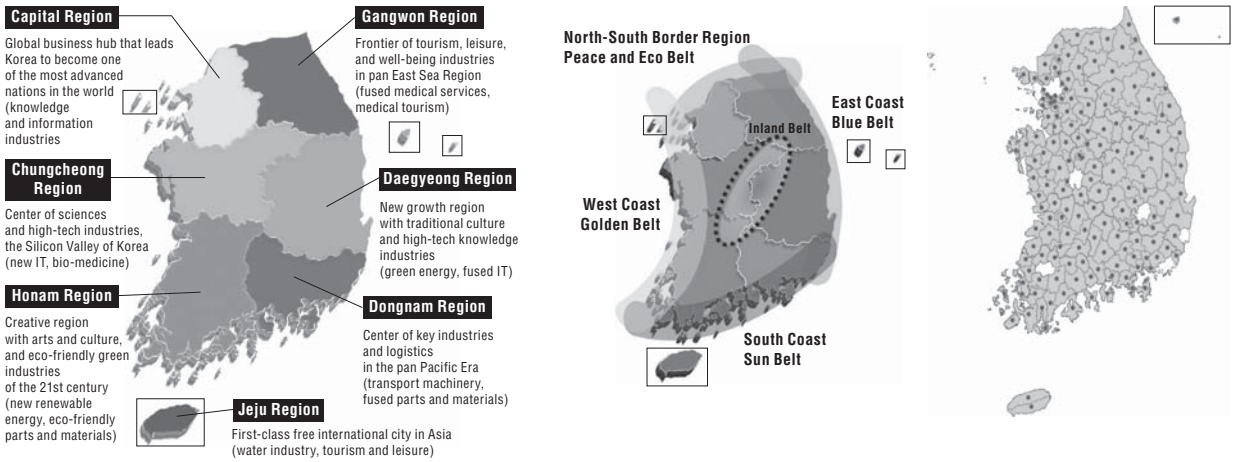
... toward qualitative urban management and maximising competitiveness (2000-)

Most recently, national policy makers have shifted their focus to stimulating competitiveness among regions and urban areas, with a new interscalar paradigm to structure territorial development. The second revision of the *Fourth Comprehensive National Land Plan* proposes a new, three-layer structure for urban and regional development that centres on maximising regional development potential, dividing the country into seven (5+2) mega-regional economic zones, which are linked with and complemented by supra-economic regions (belts) and 161 basic residential zones[6] (Kim and Koo, 2009) (Figure 2.1) :

- *Supra-economic regions (belts)(SER)* are intended to secure international competitiveness through economies of scale in industry, research and development (R&D) and infrastructure. The concept is based on the idea that a city in the narrow sense is a less viable unit of spatial organisation than city/regions or regional networks of cities, an analysis confirmed by the OECD (2006a). A supra-economic region (SER) is characterised

Figure 2.1. **Regional development strategy in the second revision of the *Fourth Comprehensive National Land Plan***

Seven mega-economic regions (left), four supra-economic belts (middle), 161 daily living spheres (right)



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: Presidential Committee on Regional Development, "Regional Development Policy", Presidential Committee on Regional Development, Seoul, *http://eng.region.go.kr*.

by commonalities in economic, social, cultural and political aspects and functions as a single economic entity. A SER satisfies conditions based on population and agglomeration, among other characteristics[7] (Box 2.1).

- *Seven mega-economic regional zones (MER)* are designed to improve regional competitiveness through interconnection and co-operation among metropolitan cities and provinces. The seven metropolitan cities and nine provinces are grouped into five-plus-two economic regions.[8] Each region is composed of one to three large cities and 5 million to 8 million people, with the exception of the Capital Region (23 million), Gangwon and Jeju (1% to 3% of total population). These cities and their hinterlands account for more than 50% of the gross regional product (GRP) on average. Each MER has an *Economic Regional Development Plan* (ERDP) and an Economic Regional Development Committee that supervises the design and implementation of the ERDP. ERDPs have a strong impact on cities in a region because they concern industry, science and technology (S&T), cultural, infrastructural and institutional issues that affect urban areas to a large extent. As a consequence, MER initiatives touch upon the development of cities and could be considered a new element of Korean economic urban policy.
- *Daily Living Spheres (DLS)* are schemes for local areas that correspond to the space of residents' everyday life. The objective of each DLS is to improve living standards through the provision of stable jobs and basic services to cities and counties. A total of 161 cities and counties (*gun*), excluding wards in Seoul and other metropolises, are eligible for the scheme, accounting for 54% of the population in 2010 (Korea Statistics Office, 2011). The plan, which may also be reflected in local urban management plans, calls for local governments to foster growth potential and for the central government to provide support to guarantee minimum living conditions. In particular, each DLS seeks to provide development directions for small and medium-sized provincial cities that have been overlooked in the nation's metropolitan-focused development policies. Although not mandatory, over 90% of the Daily Living Spheres make their own development plans, which include strategies to mobilise local industries using local endowments, to leverage

Box 2.1. **Supra-Economic Regions Outlined in Korea's second revision of the Fourth Comprehensive National Land Plan (CNLP), 2011-20**

- *East Coast Supra-Economic Regions (Energy and Tourism Industry Belt):* The Comprehensive National Land Plan, or CNLP (2011-20) aims to develop a hub of new and renewable energy space (new materials and bio-technology, nuclear energy cluster), tourism and leisure
- *West Coast Supra-Economic Regions (New Industry Belt):* The CNLP (2011-20) plans to foster state-of-the-art information technology (IT), automobiles and logistics, and develop a centre for international business
- *South Coast Supra-Economic Regions (Sun Belt):* The CNLP (2011-20) aims to support a hub for infrastructure, logistics and coastal tourism.
- *North-South Border Belt (Peace–Eco Belt):* The CNLP (2011-20) will foster a central zone for intra-Korean trade, preserve environmental resources in the De-militarised Zone (DMZ), and develop green tourism.

Source: Ministry of Land, Transport, and Maritime affairs (2011a), "Second Revision of the Fourth National Comprehensive Plan" (in Korean), Ministry of Land, Transport, and Maritime affairs, Gyeonggi-do.

cultural and historical assets and to establish a collaborative system by networking local communities and organisations. These plans should aim at improving public services and cultural facilities and programs for residents, at strengthening educational competitiveness and at improving housing, job opportunities and water services. The Presidential Committee on Regional Development outlines ten major tasks for local areas.[9]

This three-tiered approach to decentralised economic development is supported by *Korea's Urban Vision for 2020*, the vision document drafted by MLTM in 2008, which sets out to resolve current urban problems and propose ways to solicit administrative and financial support. The vision also acknowledges a raft of changing circumstances that necessitate a change in urban policy, *i.e.* population decrease, an ageing society, climate change, democratisation and decentralisation. To establish a target and strategies for future urban policies, a survey was conducted among experts and municipal government officials.[10] As a result, four urban policy goals were created, *i)* nurturing the growth engine, *ii)* improving urban living conditions, *iii)* establishing urban identity and *iv)* restoring the natural environment and ten strategies (Table 2.1).

At the same time, urban policy makers are shifting toward more localised, flexible spatial planning designed to foster competitiveness at the local level. Some spatial planning responsibilities have been transferred to sub-national governments. For example, the 2003 and 2009 *National Land Planning and Utilisation Acts* (NLPUA) have successively reformed urban policy decision-making procedures, transferring urban planning authority to local governments to promote land use that benefits local interests. As a result, urban master plans and urban management plans that demonstrate the vision and direction of urban development and manage urban areas to protect them from uncontrolled development are established under the responsibilities of city mayor and county (*gun*) governor. In order to provide the local cities with guidelines, the central government (notably MLTM) developed the Comprehensive National Land Plan to outline the national long-term land development strategy. MLTM is also responsible for approving metropolitan area plans and ensuring that any change is in line with national legislation. Further, the

Table 2.1. **National urban policy goals and strategies suggested by the MLTM**

Policy goal	Strategy
Nurturing the growth engine	1. Renew the city for vitality.
	2. Lay the foundation to raise the competence of future industries.
Improving urban living conditions	3. Improve living standards and make cities pleasant and convenient.
	4. Make the city friendly to the socially vulnerable.
	5. Develop a convenient and safe public transport system.
Establishing urban identity	6. Create a cultural city where all can participate.
	7. Develop unique and beautiful scenery.
Restoring the natural environment	8. Enable a low-carbon lifestyle.
	9. Raise water quality and preserve forests.
	10. Make a city free of crime and disasters.

Source: Ministry of Land, Transport and Maritime Affairs (MLTM) (2008), Korea's Urban Vision for 2020, Ministry of Land, Transport and Maritime Affairs, Gyeonggi-do.

land use zoning system, designed at the national level, has also been simplified and made more flexible, with the emphasis shifting from imposing restrictions to promoting development. Zoning reform, undertaken in 2008 by MLTM, thus revised the zoning categories to encourage mixed-use and transit-oriented development.

Urban policy makers have also sought to stimulate urban competitiveness by promoting qualitative urban management through urban regeneration policies, inner-city improvements and liveable cities initiatives, and maximising urban growth, notably by greenbelt policy reform. The highly urbanised nature of most cities has led the government to focus on redevelopment, densification, mixed-use and transport-oriented development. However, as MLTM has noted, urban redevelopment projects, which have been largely undertaken by the private sector, could be improved with increased public involvement (MLTM, 2009a). Many past urban regeneration projects have been criticised for placing too much focus on housing construction for profit, with little concern for investment in the surrounding urban area. For example, on average, urban environmental improvements were implemented in just 3% of the total redevelopment area, while housing redevelopment and rebuilding reached 97% (MLTM, 2009a). A desire to maximise urban growth has led to a series of recent reforms of the national greenbelt policy.[11] Since 1999, the government has been gradually lifting the Development Restriction Area. The Whole Development Restriction Areas designated around small and medium cities have been cleared, while restrictive zones around large cities have been partially removed to make way for national development projects, such as large-scale public housing complexes. As a result, the size of the restricted area has decreased from 5 397 km^2 to 3 895 km^2 as of 2009, with the majority of the Development Restriction Area concentrated in the Seoul Capital Area. Nevertheless, following the deregulation, Korean urban policy makers seem to have been torn between the two policy goals: to restrict urban sprawl and to manage urban growth. In order to address this policy dilemma, the Korean national government may need to develop a more systematic and comprehensive urban management approach, for instance, through the urban modelling method.

Finally, economic and industrial policy has taken on a more explicit urban dimension. One key strategy to promote the competitiveness of local cities has been to reinforce regional innovation networks through programmes like the New University for Regional Innovation (NURI) (2004-08),[12] the development of Regional Innovation Councils in each of the metropolitan cities and provinces composed of 845 industry, university and local

government representatives,[13] and the creation of 50 Regional Innovation Centres (RICs) and 57 Localised Industry Development Centres (LIDCs), as of 2010, with a mission to upgrade university research facilities and promote local industry[14] (MKE, 2010). Of note is the Daedeok Special R&D zone, which was established in the 1970s to improve scientific capabilities outside of the Seoul Metropolitan Area and has grown from a science education centre to an innovation hub (Box 2.2).

Box 2.2. **Daedeok Innopolis: From science-education centre to innovation hub**

Daedeok Special R&D Zone was built within the Daedeok Science Town, created in Daejeon in the 1970s. Daedeok Science Town expanded with the relocation to Daedeok of the Korea Advanced Institute of Science and Technology (KAIST), one of Korea's leading S&T universities, and several leading government research institutes. By 2009, 81 research institutes from the public and private sectors and 1 006 companies employing 45 526 staff. Daedeok includes nearly 10% of all Korean PhDs and produced 32 000 patents in 2009. A recent important development is the shift towards a more innovation-led strategy, with the 2005 rebranding of the R&D Zone as the Daedeok Innopolis. Innovation is being promoted by tax incentives and targeted R&D programmes. A key issue was whether these government interventions could catalyse the development of a Korean Silicon Valley. Detractors point to the emergence of "natural" clusters and argue that these cannot be manufactured by public policy. In response, defenders point to the contribution that policy can make to encourage the conditions for technology transfer and the formation of high-technology spin-offs. It is still too early to judge the success of the Daedeok Innopolis, but continuing growth in the number of venture companies housed in the complex is probably cause for some optimism.

Source: Adapted from OECD (2009a), *OECD Reviews of Innovation Policy: Korea 2009*, OECD Publishing, Paris.

Another strategy has been to develop new cities, or districts within cities, known as enterprise cities and innovative cities, to provide urban areas with new growth foundations and maximise innovation capacity. Expanding on previous efforts to develop industrial complexes and with the support of the Federation of Korean Industries, enterprise cities are designed to accommodate a range of functions, including production, R&D centres, distribution facilities and housing. Access to building permits is facilitated, as well as investment tax payments. The government grants various funding privileges to enable the participation of private corporations (Table 2.2). Innovative cities aim to attract public corporations and public research institutes and promote networking and collaboration among regional industries, universities, research institutes and local governments. In these cities, a central innovation district is organised as a space for knowledge exchange and reciprocal education. Notably, the innovative city policy attempts to identify the brand of cities and to enhance the image of each city in conformity with its characteristics: *e.g.* a specialty city with a regional theme, an eco-green city, an education/culture city that enables creative educational exchange, etc. As of 2011, ten innovative cities have been created throughout Korea (Table 2.3).

Nevertheless, Korea lacks a coherent innovation policy. A number of ministries have initiated parallel and sometimes competing programmes to target innovation, and more specifically, innovation in urban areas. Evidence suggests that firms can find the process of locating suppliers time consuming (OECD, 2009a). What is more, spatial inequalities

Table 2.2. **Enterprise cities in Korea**

City	Period for planning and development	Planned population	Planned size (hectares)	Purpose and main features
Wonju	2007-12	25 000	531	– Knowledge-based city
				– Advanced medical complex, health and bio-industry, media
Chungju	2007-11	20 200	701	– Knowledge-based city
				– Life science and engineering centre, English town, golf academy
Muan	2007-11	120 000	3 300	– Trade-based city
				– Airport logistics, health and well-being industries
Taean	2006-20	15 000	1 464	– Tourism and leisure-oriented
				– Theme park, eco-park, golf courses
Muju	2007-17	10 000	767	– Tourism and leisure-oriented
				– Golf courses, condominiums, water parks, wineries
Haenam, Yeongam	2008-12	35 000	3 107	– Tourism and leisure-oriented
				– Theme park, marina, hotels, golf courses, casino

Source: Ministry of Land, Transport and Maritime Affairs (2011b), "Enterprise Cities", *http://enterprisecity.moct.go.kr/eng/index.jsp*, accessed 5 May 2011.

Table 2.3. **Innovative cities in Korea**

Region(s)	City/urban districts	Population	Main concept
Gangwon-do	Wonju-si	30 000	Vitality City realising harmony of health, life and tourism
Chungcheongbuk-do	Jincheon-gun and Umsung-gun	42 000	Inno-valley of education and culture
Jeollabuk-do	Jeonju-si	29 000	Bio-industry hub connecting traditional culture with state-of-the-art technology
Gwangju, Jeollanam-do	Naju-si	50 000	Capital of high-tech futuristic industrial cluster
Gyeongsangbuk-do	Gimcheon-si	26 000	Hub for state-of-the-art science technology and transportation
Gyeongsangnam-do	Jinju-si	38 000	Hub for leading mechatronics industry
Jeju	Seogwipo-si	5 000	Leading international exchange and educational training
Busan	Yeongdo-gu, Nam-gu	7 200	Hub for maritime affairs and fisheries, film and finance connecting land and sea
Daegu	Dong-gu	23 000	Hub of educational and academic industries; centre of Southeast Asia's industrial cluster
Ulsan	Jung-gu	20 000	Environmentally friendly high-tech energy hub

Source: Ministry of Land, Transport and Maritime Affairs (2011c), "Innovative Cities", *http://innocity.mltm.go.kr/eng/city/city01.jsp*, accessed 5 May 2011.

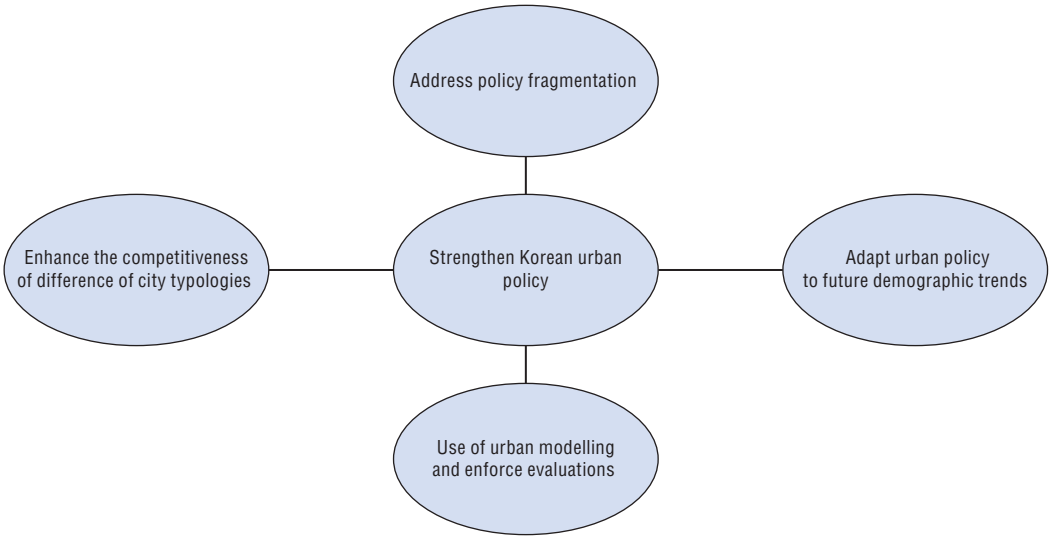
persist, with large metropolitan regions better equipped than the rest of the country. The hierarchical nature of the higher educational system, with a strong concentration of top universities in the Capital Region, has hindered regional economic development opportunities in peripheral regions. Regions outside the Capital Area tend to suffer heavily from a "brain drain", exacerbating the mismatch between demand and supply of highly qualified people.

2.2. Strengthening the co-ordination and coherence of Korean urban policy: four policy priorities

Several opportunities could be seized to *i)* address the fragmentation of urban policy mandates across multiple ministries and at the sub-national level, *ii)* adapt urban policy to future demographic trends, *iii)* enhance the competitiveness of different city typologies in Korea, including lagging cities, and *iv)* close the gap between anticipated and actual

outcomes of urban plans and policies through a more widespread use of urban modelling, prior to plan implementation and an improved culture of *ex post* evaluation and monitoring (Figure 2.2).

Figure 2.2. **Four policy direction suggestions for Korean national urban policy**



Source: OECD elaboration.

Addressing policy fragmentation

Toward a comprehensive, multi-sectoral approach to urban development

On the whole, co-operation among the central and local governments could be enhanced in Korea. Despite the wealth of initiatives to foster greater competitiveness in urban areas, Korean urban policy is characterised by strong fragmentation at both the ministerial and local levels and would benefit from the development of a more comprehensive, multi-sectoral approach to urban development. Whilst MLTM takes the national lead on urban issues and has framed its interventions in *Korea's Urban Vision for 2020*, the plan is more of an internal ministerial work plan than a national strategy; as such, in developing ministerial agendas, there is no legal or policy requirement for other ministries to take into consideration the objectives outlined in the vision. Further, as in many OECD countries, an integrated approach to urban development has typically been stymied, due in large part to the fact that urban policy mandates are fragmented across many ministries. The Presidential Committee for Regional Development (PCRD) emerged in 2008 as the main national body for resolving inter-ministerial issues[15] and has played a key role in setting the strategic direction and prioritising investment in nationally significant regional development projects (OECD, 2010b). The PCRD is not, however, an executive agency but an advisory committee that lacks the tools or authority to enforce policies and also the statutory powers to make policy and determine priorities among matters administered by a range of independent ministries. This atomisation of administrative mandates across a wide range of central ministries with jurisdiction over urban issues is not always compatible with an effective, coherent, multi-sectoral approach to urban development.

Korea's new three-tiered territorial framework could be limited unless the government assists in building co-operative programmes that are significant in terms of budget and economic impact. In this context, it is necessary to induce new collaborative behaviour among different ministries, sub-national authorities and the emergence of bottom-up initiatives that take advantage of the complementarities between cities and regions.[16] To foster the development of a co-ordinated national strategy, Korea could consider establishing an interministerial regional development agency at the national level, similar to the *Délégation Interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale* (DATAR) in France. Its task would be to implement the regional policy of the government, while the PCRD would be in charge of strategic matters. A specific directorate of the agency would be responsible for urban policy. It would make an effort to promote the internationalisation of Seoul and the other large cities, and it would also receive guidance from the PCRD to put in place a policy for the globalisation of metropolises.

Enhancing policy co-ordination among local governments

Co-ordinated spatial planning at the sub-national level is also a challenge in Korea, given the proliferation of plans to guide spatial planning, economic development and sectoral development, in addition to a history of weak co-operative relationships among local governments. Spatial plans are developed at each administrative echelon: the *National Comprehensive Development Plan*, spearheaded by the Minister of Land, Transport and Maritime Affairs (MLTM), followed by provincial plans, metropolitan area plans and, at the local level, urban master plans and urban management plans (Table 2.4). It should be noted that these spatial plans are developed separately from economic development and sectoral plans, leading to further fragmentation of objectives and implementation strategies. In addition, at the regional level, provinces and metropolitan city governments have tended to see each other as competitors rather than as potential partners in development, concerned with how to use their newly devolved responsibilities and position themselves to attract businesses and national financial support (OECD, 2004).

To increase policy coherence across the city-region area, Korea could develop city networks and develop delivery agreements at the metropolitan or micropolitan levels. Along with its supra-regional and regional scale, a micropolitan scale could be helpful for

Table 2.4. **Ministries and levels of government engaged in regional and urban policy in Korea**

Type of plan	Purpose of plan	Lead(s) for implementation	Lead(s) for approval of plans
Comprehensive National Land Plan	– Direction for long-term national development – Strategies for improving industry and balanced development	Minister of Land, Transport and Maritime Affairs (MLTM)	President
Province comprehensive plan	– Direction for long-term development at regional level	Provincial governor	Minister of MLTM
Metropolitan area plan	– Common interest in spatial development and inter-regional infrastructures with adjacent local authorities	City mayor, provincial governor (minister of MLTM)	Minister of MLTM
Urban master plan	– Direction of spatial development of each local authority for the long term	City mayor, county governor Metropolitan city mayor	Provincial governor Metropolitan city mayor
Urban management plan	– Practical measures of urban policy	City mayor, county governor	Provincial governor

Source: Framework Act on National Land.

organising intermunicipal partnerships among Korea's 161 Daily Living Spheres. Currently, Korean urban policy seems to lack such an interscalar level between the seven economic regions and the 161 Daily Living Spheres. The concept of a micropolitan area closely parallels that of the metropolitan statistical area, as in the US, for example, but a micropolitan statistical area features a smaller nucleus.[17]

In general, the various experiments in OECD countries, including voluntary inter-municipal co-operation governance agreements, demonstrate the dominant role of the central state in initiating such processes, often through the use of fiscal or legal instruments (OECD, 2010a). There are a number of cases where partnerships and contracts have been concluded with recently created metropolitan authorities, though largely as *ad hoc* sectoral partnerships. Some countries have begun to introduce or contemplate the introduction of contractual procedures at metropolitan level based on a more multi-sectoral approach. France created agglomeration contracts that involve the central state, the region and the inter-municipal body of either the Agglomeration Communities or the Urban Communities focusing on human capital improvement and economic development initiatives (Box 2.3). The introduction of metropolitan contracts in 2007 was a major step towards recognising functional economic areas by fostering collaboration among municipalities around a commonly defined project for economic development, without creating a formal metropolitan body. The Swiss Confederation has also introduced an agglomeration policy that would better integrate the problems faced by large cities within each sector by encouraging project implementation through policy incentives. Canada's experience to enhance inter-municipal co-operation for infrastructure funding is also notable. In 2005, the government instituted a Gas Tax Fund (GTF) to share half the revenue from the federal excise on gasoline with 3 600 municipalities across the country, in order to fund sustainable municipal infrastructure, including transit and waste. To access the funds, municipalities must apply jointly. The programme has resulted in the construction of regional water filtration plants, community co-generation systems and community transit systems (OECD, 2011a).

Adapting urban policy to changing demographics

Urban policy in Korea will also have to adapt to two changing demographic trends, as discussed in Chapter 1: ageing and immigration. The built environment could be adapted to better accommodate seniors, through changes in urban design and transportation policy, while other strategies could also be pursued, such as encouraging greater involvement of voluntary organisations and providing information and communication technologies to the elderly population to bring services closer to home. Further, the government could also adopt measures that encourage immigrant entrepreneurship and cultural promotion to accommodate the growing immigrant population in Korea.

Adapting the urban environment to an ageing population

Changes to urban policy include transforming public urban spaces, including buildings, parks, squares and sidewalks, and public transportation to adapt to an ageing society. Currently, Korea's *Basic Plan to Address Low Fertility and Ageing* seeks to provide jobs, expand health insurance coverage, adapt public transit and, notably, adapt housing to the needs of the elderly through the Act to Support Elderly Housing (Box 2.4).

Supplying independent housing specifically equipped for senior citizens is one strategy, as demonstrated by Japan's Silver Housing Project. The project provides

Box 2.3. **Contractual tools at the metropolitan functional level in France**

The agglomeration contract in France is a bottom-up method based on "one territory – one project – one contract". The strategy is proving increasingly successful and contributing to co-operative governance, bringing together the central government, the region and the Agglomeration Community or the Urban Community. The county council (the *conseil général* of the *département*) can be associated with the signature of the contract, in particular for questions related to social policies. This procedure involves four main stages.

1. The agglomeration project, the basic document, contains a diagnosis of the functioning of the agglomeration. It identifies the issues, provides development policy options and an indication of the support areas for these choices as well as the policies and measures to implement these choices, with a phased timetable and identification of priorities. The project must focus on regional development (economic, social and human development) rather than infrastructure development and improvement. The project must be based on dialogue with the municipalities and the main actors in the area by mobilising non-public actors for implementation.
2. The development board represents a variety of economic, social, cultural and association groups that must be consulted during the preparation of the project and on final delivery of the project prior to signature of the contract. This board can also be associated with the drafting of the contract.
3. The agglomeration contract is the financial and programme document governing the implementation of the project, which identifies the partners, projects, multi-year financing and contractors.
4. The regional coherence plan (SCOT) is a spatial projection document of the agglomeration project, which translates the project decisions into urban planning law.

The metropolitan contracts in France focus on actions that encourage and expand the development of the metropolitan areas: economic development, access to infrastructure, research, higher education, cultural development, etc. Particular attention is paid to poles of competitiveness, especially on actions that allow the development of synergies between the private sector, research and universities. The metropolitan contract is supposed to unfold in three phases: *i)* a government call for proposals for engineering stronger metropolitan co-operation; *ii)* a metropolitan plan, prepared by governments; and *iii)* the introduction of a metropolitan contract, based on specified activities.

Source: OECD (2006a), *Competitive Cities in the Global Economy*, OECD Publishing, Paris.

independent public rental housing for people aged 60 or over and is designed for the needs of the elderly, with services from life support advisors who help with everyday situations, check in on the well-being and health of residents, and who can be contacted in cases of emergency. The project started in 1987 in co-operation with the Ministry of Health, Labour and Welfare, and by March 2007 included 21 994 housing units on 821 housing estates (OECD 2011a, Building Centre of Japan, 2008).

Alternatively, Korea could consider modifying zoning regulations to benefit the elderly. First, policy makers could consider making exemptions to common planning rules that could help serve the needs of the ageing, such as the use of small, vacant spaces for construction projects for the elderly. For instance, Denmark favours the injection of small groups of dwellings into spaces between blocks of apartments. Elderly people from the neighbourhood move into these dwellings, thus preserving their social and family networks while using existing amenities and surrounding services. In Sweden, an exemption allows the use of the normally mandatory communal open space for the construction of small community centres rented by the municipality and used to provide hot lunches, medical care and social and cultural activities to elderly residents (OECD, 2003). These solutions can sometimes be preferable to planned, purpose-built apartments.

Box 2.4. **Korea's plans for addressing low fertility and ageing**

In 2010, Korea's Ministry of Health and Welfare, in co-operation with several relevant ministries, established the *Basic Plan to Address Low Fertility and Ageing*. This action plan covers a wide range of policies over the period 2011-15, specifically targeting the ageing "baby boom" population. The plan also proposes parallel strategies for improving the quality of life of the elderly, such as providing jobs, improving incomes and health and supporting housing. Its objectives include:

- Provide 0.2 million jobs to the elderly by 2011.
  - Support business start-ups for the elderly, by developing an affordable model and reinforcing education.
- Expand health insurance coverage for the elderly.
- Enact the Act to Support Elderly Housing, including the establishment of safety standards.
- Provide rental housing for the elderly.
  - Provide 5% of total public rental housing in the Bogeumjari housing area to seniors.
- Develop a driving education programme for the elderly.
- Distribute a "silver mark" label for vehicles driven by the elderly.
- Expand low-floor/non-step bus service.

Source: Ministry of Health and Welfare (2010), "Basic Plan to Address Low Fertility and Ageing", Ministry of Health and Welfare, Seoul.

The zoning of accessory dwelling units (ADUs) could be used to increase the supply of smaller units, which are more appropriate to elderly housing needs. The use of second dwelling dual-occupancy provisions, known as accessory dwelling units, "granny flats", "mother-in-law units" or "garage-over" units, can provide affordable rental housing, especially for students and the retired. Cities like Portland in the US have developed models for ADUs based on different designs and neighbourhoods.[18] In Korea, the central government could consider providing pre-approved, architect-designed prototypes for ADUs so that homeowners can avoid design costs and begin construction. Such a programme could also offer online tutorials on permitting and building an ADU unit, such as the Accessory Dwelling Unit Development Program in Santa Cruz, California.[19]

Allowing density bonuses for developers who provide elderly housing in central districts, near transit and other urban services, is another possible strategy. In the US, a "bonus zoning" ordinance was enacted in Newcastle, New York, which allows for 50% more dwellings to be built on expensive, centrally located parcels of land, provided that the apartments are occupied exclusively by elderly residents. Such an incentive permits developers to launch construction projects at higher density in areas that might not otherwise be financially viable. Such policies can also contribute to reducing urban sprawl and, if carefully designed, to improving the urban environment (*e.g.* through reduced transport demand).

More progressive zoning techniques beyond density thresholds could also help engender a denser form more appropriate for seniors. For example, the city of Kalamazoo, Michigan, in the US adopted a dynamic height control for areas surrounding its downtown core, in which the maximum height on an individual parcel corresponds to the height of the tallest building on an adjacent parcel plus one floor. In India, Delhi makes maximum heights in some areas of the city a function of surrounding street widths. If streets are widened, maximum heights are allowed to increase automatically (Elliott, 2008).

The government could also provide fiscal incentives to support the private housing market for the elderly with the introduction of a VAT or of income tax cuts for homeowners renting serviced apartments to elderly people, following the model of the Student Housing Programme in France. In the context of limited state funds for satisfying the housing needs of the growing number of students in cities, the government opted to stimulate the private supply by offering substantial tax breaks for homeowners who rented apartments to students (OECD, 2003).

Transportation policy could be further improved to accommodate Korea's ageing population by taking into account the tendency of the elderly to travel shorter distances, by providing more sidewalks and other urban amenities (OECD, 2011a). A national urban policy framework should also take into account urban areas' budgetary needs for proper provision of public transportation and urban spaces adapted for the elderly, as Japan's national government has done (Box 2.5).

Box 2.5. **Japan's policies for enhancing accessibility to public areas for the elderly**

In order to allow citizens to freely travel from one place to another in urban areas, Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is systematically incorporating more barrier-free features into railway facilities, hospitals, welfare facilities and other buildings, as well as into the routes connecting them and in buses and taxis. Key policy measures include:

- **The Act on Making Buildings Accessible and Usable for the Elderly and Physically Disabled (Heart Building Law).** Enacted in September 1994 and revised in April 2003, this act introduced various measures to make public buildings more accessible, including building standards to reduce barriers to movement in buildings used by large numbers of people or that serve an older or mobility-impaired population. Incentives were provided for those who intend to construct specific buildings that meet the requirements for a barrier-free environment, including: floor-area-ratio bonus, exclusive right to indicate the certification, additional 10% depreciation of income tax/corporate tax for five years, low-interest loans and government subsidies for the construction cost, as well as a simplified process for building permits.
- **The transportation "Barrier-Free" Act.** Enacted in 2000, this act promotes the accessibility of the elderly and the disabled in public transportation facilities, including stations, trains and buses, as well as in public areas including streets and squares. It introduced the standard that transportation companies must conform to in constructing new public transportation facilities, including installation of elevators, escalators and guided blocks and installation of low-floor/non-step buses.
- **New "Barrier-Free" Act of 2006.** Enacted in December 2006, this act (Act on Promotion of Smooth Transportation, etc. of Elderly Persons, Disabled Persons, etc.) integrated the two acts and promotes accessibility in public areas in a more comprehensive fashion. The standards for accessibility were enlarged to include certain streets, parks and parking facilities, with more attention to pedestrian space linking different public facilities and buildings. The act also encourages the participation of elderly and disabled people in the planning phase. The ministry is encouraging municipalities to prepare local strategies and providing financial support for their projects.

Through these comprehensive efforts, the accessibility of public areas has substantially improved. For instance, 77.2% of all the passenger facilities with traffic of more than 5 000 passengers per day (2 876 facilities in total) are now equipped with barrier-free features (as of March 2010).

Source: Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (2008), "White Paper on Land, Infrastructure, Transport and Tourism in Japan (Outline)", Warsaw; Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (2010), "Current Situation of Barrier-Free Improvement Based on the New Barrier-Free Act", press release on 1 October 2011 (*in Japanese*); Ministry of Regional Development (2006), "National Development Strategy 2007-2015", Ministry of Regional Development, Warsaw.

Promoting citizens' participation in the decision-making processes relating to elderly housing could improve efficiency and ensure that housing designs meet the needs of the elderly. Denmark has experimented with active participation in senior development projects with the Gronbo Senior Co-operation, a co-housing initiative that emphasis the role that older people can play in designing their future homes and environment. Future residents work with contractors and architects to select the site and develop plans for the general composition and layout of the housing schemes. The houses are designed with the assistance of professionals to adapt to ageing residents, and are located near shops and other facilities with good transport links. Other countries, such as the Netherlands, Finland and Switzerland, have favoured the active involvement of elderly groups in the planning and organisation of public services through questionnaires, which help to improve the organisation and management of service delivery at the local level (OECD, 2003).

The government could also consider incorporating voluntary organisations in the provision of some public services to the elderly. The participation of voluntary organisations in policy for older citizens is currently rather limited in Korea, as most social welfare services are provided by central and local governments or social welfare corporations that receive financial transfers from government. Nevertheless, voluntary organisations including charities, community groups and social enterprises, could be effective in reaching communities that the government has had difficulties in approaching (OECD, 2008). A number of OECD countries have implemented policies and programmes to strengthen and encourage the participation of voluntary organisations in public service provision at multiple levels of government (Box 2.6).

Box 2.6. **Facilitating participation of voluntary organisations in public service provision to the elderly**

- Finland's *Seniorpolis Initiative* in the municipality of Ristijärvi provides an example of how private and non-profit organisations may be involved in the provision of public services for the elderly. *Seniorpolis*, in co-operation with universities, research institutes and technical high schools, promotes know-how, technology, product development and business concepts within different services for the elderly, providing a large variety of services and products. This initiative covers four main areas: housing solutions for older citizens; lifelong learning through interactive and distant learning systems; care services emphasising self-help; and relaxation services.
- Italy's regional and local governments runs the *Estate Serena* programme, which focuses on maintaining elderly people's independence and provides them with multi-functional services, integrating services already available in the area and ensuring continuity of services. In the province of Salerno, the *Area Development Plan* aims to integrate social and welfare services, institutional services, the local community, and public, private and non-profit organisations.
- The UK has created the Office for the Third Sector, which aims to increase the involvement of the voluntary sector in public service delivery. For the British government, the participation of the third sector is a crucial part of the strategy to build more cohesive, empowered and active communities. The government's action plan for third-sector involvement includes four areas of engagement: commissioning, procurement, capacity improvement, and accountability.

Source: OECD (2008), "Ageing and Changes in Public Service Delivery and Conclusion", paper presented at the Public Employment and Management Working Party, OECD, Paris, 4-5 December 2008.

Finally, information and communication technologies (ICT) can also help integrate elderly groups in Korea and bring key services closer to a growing number of the disabled and elderly. If housing planning includes a place for ICT, services can be become more accessible to the elderly. Requests for public services and payments can be carried out using ICT, reducing the need for the elderly to leave their home. It can also help to bring together the community, delivering cultural and social services (OECD, 2003). E-health strategies can be used to increase health services delivered at home; these include not only increasing Internet access, but also launching Internet services for health users, as in Portugal and Greece; fostering e-commerce in medicine, as in Germany; enacting regulation that requires general practitioners (GPs) to offer services online, as in Denmark, and developing national strategies for e-health, as in Sweden. ICT should not, however, be considered a replacement for social care and interaction (OECD, 2003). It is important that policy recognise that the introduction of ICT can exacerbate the digital divide between those who have access to the Internet and those who do not.

Accommodating an ethnoculturally diverse community

Korean urban policy could also seek to better integrate an increasing ethnoculturally diverse population resulting from immigration. Despite the influx of immigrants to Korea and their role in helping to balance Korea's depopulation and low fertility rates, immigrants are relatively absent from Korea's national urban policy considerations. In large cities such as Seoul and Incheon in particular, where some of the country's 900 000[20] migrant workers continue to live (Korea Statistics Office, 2011), the demand for migrant workers has become structurally embedded in the economy. Measures can include the numbers of residents in households to be sensitive to different cultural practices and adjusting public participation processes to accommodate different languages and cultures (Frisken and Wallace, 2002). City governments could better prioritise this, as has been the case for such initiatives as the U-City and the Green City initiatives. Seoul could envision itself as a diverse and inclusive city, a true characteristic of a globally competitive city.

Korean ministries could assist municipalities in providing urban design improvements that accommodate the needs of the migrant labour population. Several cities in the OECD with large immigrant populations explicitly encourage immigrant entrepreneurship and cultural promotion. The City of Sydney introduced design guidelines that incorporate ethno-cultural elements, such as porticos, lanterns and trash bins with traditional Chinese symbols in Chinatown, in addition to the planting of Chinese trees and the funding of a Chinese garden. Sydney's Little Italy neighbourhood also received a makeover that included Italian signage and wider footpaths, to reproduce the feel of the *al fresco* (outdoor) Italian eating experience. Little Turkey and Vietnamese neighbourhoods have also received government support for cultural festivals.[21]

At the same time, labour policies can be modified to include an urban dimension to avoid the spatial segregation of immigrant groups and foster improved social cohesion. Some OECD countries have targeted large cities in the integration of ethnic minorities, such as the Dutch government's *Grotestedenbeleid* policy from 2004-08 (Van der Berg *et al.*, 2004). The Swedish government has also focused on integrating the immigrant labour force into the regional economy (OECD, 2010b) (Box 2.7).

Box 2.7. **The regional dimension of the integration of immigrants into the labour market in Sweden**

To avoid a large concentration of immigrants in the three metropolitan regions (Stockholm, Göteborg and Skåne), Swedish authorities implemented a placement policy in 1985 that assigned newly arrived refugees and asylum seekers to specific municipalities throughout the country. As the number of newcomers increased and housing became a limiting factor, immigrants tended to be placed in municipalities with available housing, and less attention was paid to the characteristics of the local labour market. The migrants were free to move if they found housing elsewhere, but were required to participate in an 18-month introduction programme in the municipality in which they were originally placed and received social assistance. The dispersal policy was later abandoned in the face of large increases in the number of asylum seekers. From 1994, municipalities have been encouraged to grant individuals participating in an introduction programme an "introduction allowance" rather than social assistance. The objective is to emphasise the exceptional nature of the allowance granted during the early stage of the migrants' stay in Sweden. The amount of the introduction allowance varies widely across municipalities (between EUR 350 and EUR 800 per person per month). Some municipalities grant the same amount as regular social assistance, whereas others use the level of the minimum wage. Currently, about 60 municipalities use the introduction allowance and two-thirds of refugees reside in such municipalities. Most metropolitan municipalities have chosen to introduce an allowance that is higher than normal social assistance and is means-tested. The municipality also decides whether the allowance can be combined with income from work without being reduced.

In 1998, the Swedish Integration Board was established and took over responsibility for the integration of newly arrived immigrants. The Integration Board was responsible for disbursing the introduction allowance to municipalities and issuing general guidelines on integration, while implementation and responsibility for newly arrived immigrants was left in the hands of the municipalities. However, the Swedish Integration Board was abolished in 2007.

Since 2000, a number of programmes have been introduced at the national level to improve immigrants' integration into the labour market. Currently, the Public Employment Service works on strengthening personnel at job centres in regions where the number of job seekers of foreign origin is large or where local or regional labour market conditions are difficult. While no specific labour market measures are targeted at immigrants *per se*, labour board staff can address the problems of unemployed immigrants.

Source: Adapted from OECD (2007a), *Jobs for Immigrants: Labour Market Integration in Australia, Denmark, Germany and Sweden*, OECD Publishing, Paris.

Tailoring urban policies to the different needs of cities and metropolitan areas

National urban policy in Korea will have to be flexible and tailored to the specific aspects of different cities. For example, urban policies should be developed in consideration of the differences in city size, geographical characteristics and economic performance. Issues faced by Seoul and other metropolitan cities and those faced by lagging cities, particularly small- and medium-sized industrial cities, are distinct. In this context, the government's current three-tiered economic development strategy, which treats large cities with high growth potential as the economic engines of Korea and focuses efforts in other cities, particularly lagging cities, on enhancing liveability, is on the right track. In the Netherlands, for instance, an inter-ministerial steering committee for large

cities was established to provide more cross-sectoral policies for large urban areas. This committee, consisting of the most relevant ministers, was one of the obligatory steps for government proposals before proceeding to the Council of Ministers (OECD, 2011a).

Developing a specific urban strategy for Seoul

De-concentration of the Seoul metropolitan region has been a core strategy for addressing regional disparities in Korea since the late 1970s, relying largely on regulatory measures targeting the Capital Region. These policies have nevertheless encountered criticism for curbing the growth of Seoul and undermining Korea's competitiveness on the international stage (OECD, 2005a). Further, they have not been successful in diminishing the dominance of the Capital Area. Many OECD countries that had implemented policies to restrict the development of large metropolitan areas are now also increasingly taking into account the role of their champion cities (OECD, 2010c). According to the experiences of several OECD countries, policies designed to create more balanced regional development, often at the expense of the largest cities, including the relocation of firms to lagging areas or restrictions on housing supply in large metropolitan regions, often failed to produce the expected outcome. In London, for instance, the result of highly restrictive urban containment policies has been for urban development to jump across greenbelts, thereby increasing average commuting distance. In France, decentralisation efforts have resulted in the decline of the competitive position of the Paris metro-region relative to major competitors in the European Union in terms of innovation capacity (OECD, 2006a). In response, the French Ministry for the Capital Region was mandated in 2008 to devise a strategy to enhance the region's international competitiveness, resulting in the *Grand Paris* project. In the same manner, the Randstad-Holland region has been endowed with a national ministry, while the national government focuses mainly on sustaining other regions (OECD, 2010c). Enhancing the competitiveness of champion cities should not, however, be interpreted as neglecting other cities. It is important to engage in a clear and systematic analysis of the cities' economy and assets before any potential action is taken.

As the economic engine of Korea, Seoul plays a critical role in the country's global competitiveness. As the OECD has noted previously (OECD, 2005a), however, Seoul's competitiveness might well be undermined by significant challenges including *i)* negative externalities of agglomeration (*e.g.* extremely high density and heavy congestion costs), and *ii)* intense competition both in low-tech and high-tech industries from other countries with lower labour costs. Policy intervention at both the state and metropolitan level can help Seoul to increase its international competitiveness. First, urban transport policy could be enhanced to benefit from more efficient and low-cost public transport.[22] The national government, in particular, will have to contribute financially by investing more in the subway system to connect the core of the Seoul to the ring. Second, improving urban and environmental quality will be critical for Seoul, since these qualities have become key competitive assets. Large cities in a global economy must compete to attract and retain high value-added economic activity in a world in which capital is hyper-mobile and skilled labour and knowledge-intensive businesses are increasingly mobile. The central government, in co-operation with Seoul, could review the quality of building design and urban places to help enhance the city's signature as a world city. This should include looking at the city's residential offer to mobile skilled labour over the longer term by providing the type and quality of housing sought by those working in the knowledge and creative sectors in order to ensure that new housing developments support economic

competitiveness. Providing attractive public spaces including parks, green open spaces and landscaping within the city should be part of this strategy, as well as tackling some of the disparities in community service provision between different localities within the city.

Fostering competitiveness of large cities outside the Capital Region by improving innovation capacity

The competitiveness of large cities outside the Capital Region could be enhanced by improving their capacity to innovate. Over the decades, innovation policy programmes in Korea have had an insufficient focus on central cities, which are nevertheless the main innovation hubs and the main contributors to regional competitiveness. For example, most of the large cities outside the Capital Region (*e.g.* Busan, Daegu, Gwangju and Ulsan) do not spend more than 2% of gross domestic expenditures on research and development (GERD) each, while regional disparities in R&D remain large, with only 25% of national R&D executed in the non-capital regions. While focusing on large cities, Korean national urban policy makers need to avoid the pitfalls of a one-size-fits-all approach toward innovation policy. For example, recent policy interventions failed to effectively target the mismatch between the strong industrial base in Ulsan, Busan and Daegu and their poor capacities in R&D. Busan and Daegu, in particular, are locked into old industrial structures and strategies. There is a need to learn new strategies and to depart from path dependency in these regions. The reframing of the policy could benefit from an analysis of the OECD countries' experience. The Competitiveness Poles project in France and the development of the eight largest city-regions outside Helsinki in Finland provide interesting models (Boxes 2.8 and 2.9).

In addition to focusing on large cities, Korea could consider the integration of innovation policies between central cities and their hinterland (the functional region or city-region), as well as exchanges among cities. Innovation policy in Korea currently tends to be superimposed on the provincial administrative boundaries. For example, innovative cities and enterprise cities in Korea are being developed within existing administrative boundaries. Value chain analysis could better underpin the decisions of "innovation cities" and "enterprise cities" and produce a heightened understanding of the interconnections in Korea's spatial economy. When a large number of networks of individuals and firms belonging to different supply chains are spatially concentrated, positive externalities or "urbanisation economies" can emerge (Jacobs, 1969). It is likely that economic activities within innovation cities are highly interconnected with different sectors. This can be measured through backward linkages, which illustrate inter-industry linkages between a sector, such as manufacturing, and those sectors from which it demands inputs. It has often been found that manufacturing output will generate varying degrees of demand from different sectors' inputs, for use in their production processes. In the case of Gauteng, South Africa, for example, value chain analysis suggests that a 1% increase in manufacturing's final demand for inputs stimulates the tertiary sector's intermediate output by 16%. Likewise, a 1% increase in manufacturing's final demand for inputs is correlated with a 36% increase in the intermediate output of the manufacturing sector itself and a 13% increase in intermediate output from the mining sector (OECD, 2011b).

Finally, a holistic, localised approach could be helpful for Korean urban policy makers to improve innovation capacity in urban areas. As the OECD has pointed out (OECD, 2009a), many problems pertaining to innovation capacity stem from the fact that regional programmes tend to be centrally administered by national agencies rather than by the

Box 2.8. **The characteristics of the "poles of competitiveness" programme in France**

Poles are made up of all economic agents: businesses, research and testing centres, basic and continuing training organisations that contribute, through their activities, to making sure that there is a satisfactory range of products and services available on the market, and to implementing joint projects. The goal within a variable geographical area is to achieve a critical economic, scientific and technical mass, in order to maintain and develop the dynamism and the attractiveness of the areas in question.

In order to identify these poles, a tender for projects was put out that closed in February 2005. In July 2005, 67 poles were designated, of which six were worldwide poles, nine poles with high international visibility, and 52 were regional or national poles. The number of poles subsequently designated was 71. For 2006/08, the state earmarked EUR 1.5 billion to be used in launching and supporting poles of competitiveness. The 15 labelled international or destined for international clusters received approximately 80% of central government funding.

Partners associated with designated poles have the benefit of three types of non-exclusive incentive measures: public subsidies, tax exemptions and reductions in social charges, financing systems and specific guarantees. Businesses situated within an R&D zone of the pole recognised by order of the *Conseil d'Etat* can benefit from exemption from charges and reductions in employers' contributions (50% for SMEs, 25% for others) when they take part in the pole's projects. To complement the credits intended to co-finance projects in the poles, loans for amenities, collective action and engineering are provided for (up to a total of EUR 36 million). The interministerial committee for national planning and development (CIADT) has also decided to support the expansion of broadband in the poles. It has allocated EUR 1 million for appropriation by SMEs in the digital technology field. The government has, in addition, devoted EUR 2 million to developing a system for monitoring and providing economic intelligence for the poles of competitiveness.

Given the success of the programme, the central government decided to extend its time frame. As for the initial programme, EUR 1.5 billion was planned to be allocated to this second phase (2009- 2011), of which EUR 850 billion was supposed to be provided by the research agency ANR, the SME Agency OSEO and the *Caisse des dépôts et consignations* (CDC). In addition to providing continuous support to R&D projects, funds were expected to be used for:

- strengthening leadership and strategic management of the poles (by means of performance contracts);
- promoting innovation platforms (EUR 105 million will be allocated to this task); and
- developing growth and innovation ecosystems in each pole to enhance synergies and attract private investment (EUR 495 million is devoted to R&D projects).

In addition, a set of initiatives at the international level aims to *i)* integrate national poles policies in a Europe-wide effort to build world-class clusters; *ii)* encourage poles' members to embark on partnerships with global players; and *iii)* make France more attractive to international investors.

Approximately 6 000 companies (85% of which were SMEs) participated in the poles in 2007, and 2 097 projects received agency support (from ANR and OSEO) in 2006, 2007 and 2008. So far, 14 000 researchers have taken part in supported R&D projects. The total cumulated amount of these projects now totals EUR 3.95 billion, with 54% of the funds attributed to SMEs.

Source: OECD (2006b), *OECD Territorial Reviews: France,* OECD Publishing, Paris.; OECD (2009b), *OECD Reviews of Regional Innovation: Piedmont, Italy 2009,* OECD Publishing, Paris; and the French Ministry for the Economy, Industry and Employment (2009), France's Ministry for the Economy, Industry and Employment (2009), booklet on *Poles of Competitiveness*, Ministry for the Economy, Industry and Employment, Paris.

Box 2.9. **Developing regional growth poles by promoting innovation: the case of Finland**

Finland introduced a specific urban policy to foster innovation and the growth of its eight largest city-regions (excluding Helsinki) in 1994. Initially called the centre of expertise programme (CoE), it was restructured under the designation *Regional Centre Programmes* (RCP) in 2001.

Three main rationales have driven Finnish urban policy: *i)* cities as nodal points for the creation of new jobs and the spread of economic growth; *ii)* promotion of innovation to enhance its cities' competitiveness; and *iii)* sustaining a large network of cities, including small and medium-sized, to ensure balanced territorial development. The main instruments to reach these objectives are the *Centres of Expertise* (CoE) programme launched in 1994 and the Regional Centre Programme, introduced in 2001.

The CoE programme represents one of the main tools of Finnish regional innovation policy. The objective is to increase co-operation between universities and enterprises, develop top-level expertise, attract investments and talent to the region and improve regions' ability to raise R&D funding. The programme is implemented by local development companies based on the Triple Helix model, *i.e.* a partnership between *i)* universities and related institutions (research institutes); *ii)* the local business community (companies and science parks); and *iii)* public authorities (municipalities, regional councils, national government). The responsibility for the management of the Centres of Expertise is often assumed by the local science and technology park company. The CoE programme administered by the Ministry of the Interior functions efficiently as a programme that crosses administrative boundaries. It is based on competition, and only the best local programmes are awarded centre of expertise status. These must also compete for basic state funds annually. In 2003, the ministry's basic funds for the programme amounted to EUR 8 million and EUR 9.5 million in 2004. These funds are matching grants, as local actors, mainly cities, are also required to invest in the programme an equal amount of funding (the so called 50/50 principle). In 2003, the total funding of the CoE projects was EUR 40 million, including various sources such as the EU (from the European Social Fund), private companies and national innovation organisations. The CoE, aiming to develop and consolidate international top-level knowledge within firms, in particular by fostering connections with academia and research, is widely considered a success story (Ministry of the Interior, 2003). A 2003 mid-term evaluation of the programme reported that modest public funding had successfully mobilised private resources in most cities involved. In 1998 and 2002, the national government decided to extend it to new regions, The programme, which initially targeted large urban areas, is thus progressively being extended to medium-sized city regions in conformity with the national objective to develop a polycentric urban structure.

The principal objective of the Regional Centre Programme (2000-06) is to ensure balanced territorial development, by establishing cities of different sizes as strong regional or local centres, with the aim of boosting the competitiveness of the regions concerned. The programme also specifically emphasises the development of sub-regional co-operation, by bringing together in a joint network municipalities, universities, research units and enterprises. On the basis of an agreement between municipalities, responsibility for the programme lies with the urban centres or the joint regional organisation of the municipalities, such as regional business development companies. The assumption is that urban regions are considered functional entities, on whose development the core city and surrounding municipalities must co-operate closely. The 34 cities that qualified for the RCP belong to the different categories identified in the typology of the Urban Network Study, with the exception of urban regions in Uusimaa, which were originally excluded from the programme. They represent a total of 264 municipalities, *i.e.* three-fifths of total Finnish municipalities and 63% of the total population. Ministry of the Interior funding for the programme was EUR 10 million per year in 2001-03, and the total expense EUR 20 million per year (2004-06). In terms of policy actions, the main emphasis of the programme is on competence and development, driven by technological innovation within the functional regional centre area. Quality of the environment and culture are also emphasised, as important factors in competitiveness.

Source: OECD (2005b), *OECD Territorial Reviews: Finland*, OECD Publishing, Paris.

regions, causing co-ordination challenges at the regional level and isolation from regional economic development strategies. The Korean government could consider adopting comprehensive economic development policies incorporating clusters, R&D, innovation and education. These could be targeted especially to large cities, delegating greater responsibility on metropolises and provincial cities in the area of economic policy. The success of Economic Region Development Plans (ERDP) could be enhanced if metropolitan and provincial city representatives in the ER Committee truly have a voice in the planning process. Because the ERDP is meant to consist of interprovincial programmes or projects, prepared by metropolitan, city and provincial delegates, inter-metropolis and city/province collaboration should be promoted. The possibility of establishing voluntary associations of upper levels of local government could be used not only to take advantage of economies of scale, but also as a vehicle for strategic partnerships. Special training programmes for city and provincial representatives could be developed to promote co-operation and mutual learning among regional and local staff.

Regenerating economic functions in lagging cities or districts

Korea urban policy could also benefit from developing specific policies to support small- and medium-sized lagging cities and districts. Recently, growth rates in many medium- and small-sized cities have been lower than the national average,[23] combined with depopulation due to declining manufacturing and mining industries.[24] These trends could be further accelerated due to the rapid ageing of the Korean population.

Korea is addressing this challenge through a comprehensive urban revitalisation plan, in which outdated and underdeveloped city hubs will be transformed into vibrant urban spaces. Measures include the creation of car-free streets with small urban streams or traditional cultural streets. The urban revitalisation programme will subsume the existing Liveable City programme, with KRW 104.2 billion in financial support to local governments (2010 MLTM Budget Plan).[25] However, as previously discussed, policy makers should take care to avoid some of the pitfalls of past urban regeneration initiatives, which have tended to focus solely on the construction of residential areas. An integrated strategy that includes reviving economic functions, improving the living environment and constructing new housing should be pursued. In this context, restoring economic value, improving public and community services, including transportation, and assisting local residents in business creation should all be critical elements of urban regeneration projects. Further, policy makers will need to ensure that programme funding is sufficient to make a difference. In the past, legislation to support the regeneration of inner-city and older housing areas, namely the *Act for the Management and Improvement of Urban Areas and Dwelling Conditions for Residents* and the *Special Act for the Promotion of Urban Renewal*, these initiatives have not been supported by sufficient public financial support (Lee, 2010). In order to attract economic activities to lagging cities or the inner city, France's "urban free zone" policy is one tool designed to enhance the competitiveness of local cities (Box 2.10).

Beyond regeneration initiatives, policy makers could also seek to improve labour skills in lagging cities. When policy makers in Newcastle, a relatively depressed economy in northeast England, recognised that its lagging economy could be due to a shortage of skilled workers, they devised a strategy to attract and retain more skilled and talented people, in addition to younger people (OECD, 2006a).

Box 2.10. **The "Urban free zone project" in France**

The 1996 Urban Revival Pact (1996-98), introduced Urban Free Zones (ZFUs) as part of a programme of affirmative action on behalf of specific urban areas in difficulty, to tackle their disadvantages from an economic perspective. The 44 ZFUs (0.8 million inhabitants in 1999) were designated by decree by the *Conseil État*, "taking account of the factors that will attract enterprises or foster the development of economic activity". The principle is to offer reductions in taxes and social contributions to businesses that set up in these zones and recruit at least 20% of their personnel from those living in the ZFU. Several reports give a favorable assessment of this policy, in terms of enterprise and job creation and of achievements in terms of investment. The generally favourable assessment of the first generation of ZFUs prompted the government in 2003 to give the current list of 44 free zones a five-year extension and to broaden the scheme further. As of 1 January 2004, a regime of tax and social exemptions for 41 new free zones was created under the framework law of 1 August 2003 on urban renewal. It grants five-year tax exemptions to small enterprises with fewer than 50 employees that set up business in ZFU districts, provided that one-third of the jobs created go to people living in problem neighbourhoods in the larger urban area.

Source: OECD (2007b), *OECD Territorial Reviews: Randstad Holland, Netherlands 2007*, OECD Publishing, Paris.

Encouraging cross-border co-operation at the urban level

Finally, Korea could consider encouraging cross-border co-operation at the urban level on a more formal basis. Efficient networking and seamless flows of people and goods across the existing border are a fundamental factor for enhancing cities' competitiveness (Box 2.11). In Korea, the *Comprehensive National Land Plan* supports more active trans-border co-operation through the "open territory"[26] strategy, which aims to promote economic integration among cities in neighbouring countries. However, specific policy instruments to achieve this goal at the city level do not seem to be in place, even though several cities, like Incheon, Busan and Ulsan, have benefited from trans-border co-operation in the Pan Yellow Sea Area.[27] Busan, for instance, in consideration of weakening economic growth and rising pressure from developing Asian countries, has sought to restructure its economic base from labour-intensive manufacturing such as shoe-making to knowledge-intensive services. In recent years, as a way of enhancing its international competitiveness and also based on its conventional ties, Busan has promoted active exchanges with the Fukuoka region. One of the most notable achievements in this regard is the Busan-Fukuoka Forum, which was formed in 2006 and is driven by the private sectors of two regions. Further to this effort, an Economic Co-operation Council (ECC) has been formed, led by the heads of local governments and economic organisations from both cities.

Currently, the state of trans-border co-operation in Korea is largely on an informal and *ad hoc* basis, featuring "sister city" agreements. Of Korea's 246 local governments (including 16 provinces and 230 municipalities), 75.6% (186 local governments, 16 provinces and 170 municipalities) were engaged in 547 sister city relationships with 532 cities in 51 countries as of 2008 (KLAFIR, 2007). Of these, more than 80% of the exchanges (461 cities) were established after the 1990s (OECD, 2009c). The sister-city programmes nevertheless remain in the early stages of building trans-border networking, and the lack of a coherent strategy may lead to rivalry rather than alliances, resulting in overlapping public investment and fruitless competition among cities (OECD, 2009c). For instance,

Box 2.11. **Trans-border co-operation between Copenhagen and Mälmo**

Integrated management of the ports of Copenhagen (in Denmark) and Mälmo (in Sweden) is one of the best examples of successful trans-border co-operation. The Copenhagen Mälmo Port Authority (CMP) is funded by the Copenhagen Port Authority and the City of Copenhagen, which have managed the port authority since 2001. Through a strategy of integrated management, Copenhagen and Mälmo have tried to capture international recognition through the port's expanded operations, and to secure efficient investment. In particular, the Mälmo Port specialises in freight, while the Port of Copenhagen promotes the cruise industry. The integrated port aims to become the hub port for the Nordic and Baltic Regions, taking advantage of its location as an access point between Scandinavia and Western Europe. A number of international firms, including Toyota, Sony and Roland, have already located their main distribution centres at the port.

Source: OECD (2009c), *OECD Territorial Reviews: Trans-Border Urban Co-Operation in the Pan Yellow Sea Region*, OECD Publishing, Paris.

Tianjin (China), Qingdao (China) and Busan (Korea) have simultaneously committed mega-scale capital investments to enlarge their port capacities (OECD, 2009c).

In order to facilitate cross-border co-operation, the central government will need to play a stronger role. Experiences in OECD countries suggest that successful collaborations have worked mainly where public agencies have been strongly involved and had a direct say in project definition and implementation (Table 2.5). Several policy recommendations could be considered. First, conducting a joint project to integrate sister-city agreements into the region's long-term common strategic goals would be helpful. Practical projects include the joint operation of maritime logistics information system and the creation of a regional tourism website. Second, building a stronger legal framework for co-operation at the sub-national level is important. This effort would be helpful given the different institutional systems across borders. To date, inter-city networks have relied heavily on voluntary agreements between cities, which are not legally binding. These spontaneous inter-local economic interactions can be undermined by the informal nature of transactions, which are subject to political change at both the domestic and international level. Improved legal frameworks could reinforce mutual trust and trans-border co-operation. Third, securing financial resources would be helpful for cities to build trans-

Table 2.5. **Thematic categories of trans-border co-operation in OECD countries**

	A sense of common destiny	A sense of common values	Economic interdependency (factor price)	Economic interdependency (deeper production integration)
Example	TriRhena, Öresund	Baltic Region, US-Canada	San Diego-Tijuana	US-Canada
Leader	Public sector (especially local government)	Public sector	Strong private-sector involvement	Strong private-sector involvement
Scope	Multi-faceted (place-based integrative approach)	Narrow (function-based approach)	Narrow (function-based approach)	Narrow (function-based approach)
Institution	Monocentric Multi-faceted	Polycentric Network	Polycentric Network	Polycentric Network
Geographic scale	Clear-cut	Fuzzy	Fuzzy	Fuzzy
Temporal stability	Stable	–	Unstable in the long run	Stable

Source: OECD (2009c), *OECD Territorial Reviews: Trans-Border Urban Co-Operation in the Pan Yellow Sea Region*, OECD Publishing, Paris.

border collaboration. Lack of funds is challenging the sustainability of inter-city linkages. Currently, small projects such as simple human resources exchange and training are financed by local governments. Yet, most projects for building trans-national communities surely require much larger-scale funding from both external and internal sources. One possible solution to address insufficient funds could be the use of *Official Development Assistance* (ODA) programmes, such as the *Korean International Co-operation Agency* (KOICA) programme, which actively promotes environmental collaboration with developing countries (OECD, 2009c).

Improving urban modelling and ex post evaluation to inform policy making

In Korea, as in many OECD countries, an apparent disconnect exists between the highly advanced planning concepts presented in the various framework documents and the current state of spatial planning and territorial governance on the ground. Key gaps between the expected and actual outcomes of strategic planning decisions have surfaced at Korea's local level of planning, particularly the over-estimation of target populations to secure additional budget resources from the central government. These discrepancies have been particularly acute in areas where development pressure is high. For example, in Gyeonggi-do, there was a recorded difference between the targeted population suggested by local authorities and the targeted population registered in 31 cities (Table 2.6).[28] Overall, according to a parliamentary inspection of administration in 2010, the total targeted population in 2020 urban master plans exceeded the population estimated by the National Statistics Office by over 13 million persons.[29] This has caused overdevelopment and investment in particular areas.

Further, it is often not known whether the lengthy strategic plans in Korea have their intended impact. Part of this can be explained by the traditional lack of attention to monitoring and implementation. The Korean planning system is characterised by a weak linkage on the implementation front. No explicit statements are made about the timing and sequencing of development and public facility provisions. Apart from large-scale urban developments, there is no mandatory requirement for development to take place concurrently with providing appropriate facilities. As a result, most developments tend to be permitted as long as they conform to zoning regulations (Suh and Healey, 2003). This situation is not confined to Korea. International experience suggests that the actual effects of planning are often over-estimated. In Melbourne, for instance, it was found that the city's strategic planning had unintended effects, given a "lack of understanding of the dynamics of urban change (especially by the professional public service) and a lack of attention to forecasting, monitoring, research and review associated with actual land-use policies" (McLoughlin, 1992).

Relatively few countries have a culture of evaluating in spatial planning. Traditionally, planning systems are not efficient at measuring their impact on development patterns against targets and indicators. Impact analyses are considered difficult to use because they tend to be medium- and long-term endeavours. The criteria for evaluating the effectiveness of spatial planning are mostly sectoral, at least when it comes to short-term evaluations (for example concerning regional economic development, transports and communications). These evaluations are mostly process-oriented, while their actual effectiveness can only be assessed after some years. Performance measurement is further complicated by the fact that planning systems is only one among many influences on regional development. In Korea, evaluation is delegated to the Presidential Committee on

Table 2.6. **Deviation rate between proposed and approved population of the urban master plan in 31 cities**

Si or *gun*	Targeted population (thousand persons)		Deviation rate (%)
	Proposed (A)	Approved (B)	
Paju-si	874	520	168
Hwasung-si	1 350	920	146
Yeoncheon-gun	120	85	141
Gwangju-si	450	320	140
Pocheon-si	350	260	134
Siheung-si	720	535	134
Hanam-si	280	180	133
Euiwang-si	250	190	131
Yangpyeong-gun	210	170	123
Dongducheon-si	164	133	123
Gimpo-si	720	590	122
Osan-si	320	270	118
Gapyoung-gun	150	130	115
Namyangju-si	720	630	114
Gwangmyeong-si	435	385	113
Yeoju-gun	200	180	111
Uijeongbu-si	550	500	110
Yongin-si	1 300	1 200	108
Anseong-si	300	280	107
Icheon-si	350	330	106
Gunpo-si	350	330	106
Seongnam-si	1 200	1 140	105
Bucheon-si	980	930	105
Suwon-si	1 350	1 290	104
Goyang-si	1 100	1 060	103
Guri-si	240	240	0
Anyang-si	700	700	0
Gwacheon-si	112	112	0
Yangju-si	660	660	0
Ansan-si	1 000	1 000	0
Total	**18 505**	**16 070**	**115**

Source: Kim, Y.W. and Y.K. Moon (2008), "A Critical Review on the Population Forecast in Comprehensive Plan and Alternative Approaches" (in Korean), *Journal of Land Planning*, Vol. 43, No. 4, Korea Planners Association, Seoul.

Regional Development. A regional development project evaluation team was formed in 2009 to conduct integrated evaluation of the ministries' plans and regional plans. Its work is too recent to be assessed.

In order to close the gap between the expected and actual outcomes of urban plans and policies, Korea could consider increasing the use of modelling as a means of testing potential policy outcomes prior to policy implementation, and providing greater support for *ex post* evaluation and monitoring to measure the extent to which planning policies have had their intended effects.

Applying urban modelling to simulate land use changes: the example of the Seoul Metropolitan Area

The greater use of urban modelling in Korea could increase the awareness of future consequences and support long-term strategic decision making. Essentially, urban modelling would offer two key benefits. Firstly, urban models provide logical means to

understand complex urban systems. To do so, models are typically built around appropriate theoretical framework to capture the very nature of system under study and then tested against real world data to examine their validity. Well-established models are then applied for predicting future. Secondly, urban models provide computer based virtual laboratory to examine the effects of various policy options and alternative futures. Urban models, which involve various data analysis and computation work, are essentially implemented in computer environments. Combined with varying assumptions and data inputs, urban models support the use of land development scenarios in support of planning policy making. Korean policy makers and stakeholders can learn from possible outcome states in future without doing experiments in real world.

Korea could also consider expanding its spatial data infrastructure to improve urban simulation, monitoring and forecasting. More sophisticated use of urban modelling in Korea will require a fair amount of geospatial data, which could be made publicly accessible to reduce the time and cost needed for modelling. Contemporary urban models tend not to require extensive data sets that are hard to obtain or prepare. Although different styles of urban models require different geospatial information, there are commonly used data such as land use, land cover, transportation network, and so on. If spatial databases could be developed and made accessible in Korea, a wider range of users and organisations including local governments, could better conduct strategic planning exercises.

Korean governments have recognised the importance of framework data, *i.e.* a set of widely and commonly used geospatial data. However, additional improvements could be made in updating spatial data and making historical data available. Currently the Ministry of Land, Transport and Maritime Affairs (MLTM) is in charge of Korea's National Spatial Data Infrastructure policy.[30] Currently, the main concern for framework data is to assure the accuracy and timeliness of geospatial data. Less attention is paid to recording historical changes in spatial features. However, in order to analyse the evolution of the urban system and forecast future changes, it is essential to have longitudinal data in order to build and use dynamic urban models. For this reason, the development of historical Geographic Information System (GIS) is increasing in a number of countries. Examples include the National Historical GIS in the US and Great Britain Historical GIS in the UK. If it is well documented, historical geospatial data can benefit diverse spatial policy making in Korea.

Does planning have its intended effects? Supporting ex post evaluation and monitoring

To improve the relevancy of Korea's municipal urban plans, the Korean national government could provide technical assistance in measuring plan implementation and compliance. To date, despite the enormous planning initiatives under way, there has not been a serious evaluation of the extent to which these regulations have been implemented and/or followed. In several OECD countries, legislation has been introduced to require local authorities to carry out impact analyses as well as subsequent monitoring of their strategic-level plans.[31] In some cases, the findings of these analyses are made public, thus ensuring a higher degree of transparency and accountability. This practice is still relatively limited in Korea. Korean planners have difficulty in knowing the extent to which the plans they have created have actually been implemented. To measure the implementation of plans, methods could include conformance-based approaches, such as the application of a "planning monitor" to measure the extent to which the goals and the objectives of the plan have been met (Calkins, 1979) (Annex 2.A1). Performance-based methods could also be

considered to better understand the conditions under which land use and housing plans were consulted for subsequent decisions. More sophisticated analysis using Geographic Information Systems (GIS) could also be employed to map permits and compare regulations, as in the Brody *et al.* (2006) study on compliance to environmental protection regulations in Florida.

Developing indicators to measure the effectiveness and relevance of municipal urban plans could be useful. Such indicators may be necessary for Korean urban policy makers to understand the change of current urban spatial structure, and assess the policy impacts on urban competitiveness. The United Nations *Human Settlements Programme* is encouraging stricter evaluations of urban planning and has established evaluation guidelines (Box 2.12). Portland's Metro government and Portland State University collaborated with a range of partners[32] to draft a framework for regional indicators, which cover nine categories: *i)* education, *ii)* quality housing and communities, *iii)* economic opportunity, *iv)* healthy people, *v)* safe people, *vi)* a healthy, natural environment, *vii)* arts, culture and creativity, *viii)* access and mobility, and *ix)* civic engagement and connections (OECD, 2012, forthcoming). More importantly, Korean policy makers should clarify the intent of such indicators and differences between outputs and outcomes (OECD, 2012, forthcoming). For instance, to measure performances of infrastructure investment in transit, output indicators assess the number of construction jobs created during the life of the project, or the number of kilometres of transit built, and on the other hand, outcomes indicators measure impact on GHG emissions by examining change in modal share.

Box 2.12. **Guidelines on evaluations of urban planning**

Urban planning systems should integrate monitoring and evaluation as permanent features. This should include clear indicators that are aligned with plan goals, objectives and policies. Urban plans should also explicitly explain their monitoring and evaluation philosophies, strategies and procedures. Use of too many indicators should be avoided, and focus should be on those indicators for which information is easy to collect.

Traditional evaluation tools such as cost-benefit analysis, cost-effectiveness analysis and fiscal impact assessment are still relevant, given the realities of local government's resource constraints. There has been recent interest in performance measurement, return on investment and results-based management principles, and the use of these quantitative tools in urban planning practice should be encouraged.

All *evaluations should involve extensive consultation with, and contributions from, all stakeholders*. This can be achieved through, for example, participatory urban appraisal methods. Experience has shown that this can enhance plan quality and effectiveness through insights and perspectives that might otherwise not have been captured by the formal plan-making process.

Most routine monitoring and evaluation should focus on the implementation of site, subdivision and neighbourhood plans. The outcomes and impacts of many large-scale plans are difficult to evaluate because of the myriad of influences and factors at play in communities. It makes more sense for monitoring and evaluation to focus on plans at lower spatial levels, *i.e.* site, subdivision and neighbourhood plans.

Source: United Nations Human Settlements Programme (2009), *Planning Sustainable Cities: Global Report on Human Settlements 2009*, Earthscan Publications, London.

Given the Korean government's key role in land use policies and strategic planning, it could evaluate the effects of municipal planning on meeting national land demands. Land market assessments can determine how much land and infrastructure are currently available and project how much additional land and infrastructure need to be developed to accommodate urban growth. A variety of techniques have been employed in OECD countries to conduct a land market assessment and monitor land supply. Effective land analysis has allowed policy makers to identify areas that are growing the fastest and given them accurate projections to inform infrastructure development. Through a systematic land assessment, planning can help illuminate the effects of several land policies. These policies may include:

- increases in the permitted density of existing residential land and in the intensity of existing commercial and industrial lands in a zoning ordinance;
- financial incentives for higher-density housing;
- reduction of on-site parking requirements in a zoning ordinance;
- reduction of space requirements in a zoning ordinance;
- provisions permitting additional density or intensity beyond that generally allowed in the particular zoning district(s), in exchange for amenities and features provided by the developer;
- minimum density or intensity requirements in a zoning ordinance;
- redevelopment, infill or brownfield strategies;
- authorisation of housing types or site-planning techniques in a zoning ordinance that were not previously allowed by the local comprehensive plan or zoning ordinance;
- authorisation of changes in the zoning use classification, including the employment of mixed-use zones;
- and changes in standards for public and community facilities or services, including transportation, that require the use of less land.

An analysis of the effects of municipal land policies could inform the Korean government of the effects of the new zoning categories introduced in the *National Land Planning and Utilisation Act* (2003). This merits attention, given the limited amount of land in Korea and its importance in supporting economic activity and safeguarding environmental resources.

Notes

1. Managing resource consumption and environmental pressure are part of Korea's *National Strategy for Low-Carbon, Green Growth*, and will be discussed in Chapter 3.
2. A growth pole is a dynamic and highly integrated set of industries organised around a propulsive leading sector or industry (*industrie motrice*). A growth pole is capable of rapid growth and of generating growth through spill-over and multiplier effects in the rest of the economy. According to this concept, the set of industries forming the growth pole (*pôle de croissance*) might be clustered spatially and linked to an existing urban area.
3. Housing shortages have been one of the reasons for the sharp rise in housing prices. In 2010, the apartment purchase price index in Seoul was 495, while the national average was 398 (the basis was set at 100 in 1986) (Kookmin Bank, 2011).
4. The three categories are an over-growth restriction zone, growth control zone and nature conservation zone.

5. In 2003, the Korean government shifted about 1 000 of the central government's competencies to local government. In 2004, the *Five-Year Comprehensive Plan for Decentralisation* was established, creating 47 strategic goals to prop up the local autonomy. In 2006, the Jeju Province Special Autonomous Province was built to integrate all central government branches into the Jeju provincial government. In 2008, superintendents of local educational authorities were also directly elected by residents to secure educational autonomy.

6. The number dropped from 163 to 161 in 2010, after the merger of three *si* (Masan-si, Jinhae-si and Changwon-si).

7. First, the population size and economies exceed a certain level and thus have various industrial, economic and human resources. Second, there is a significant level of urban agglomeration supported by industrial clusters and an educational and cultural foundation. Third, they operate modern infrastructure necessary for international exchange, such as a hub airport and container port. Fourth, they exhibit a certain homogeneity, sharing natural, economic, social and cultural characteristics (Lee, 2006).

8. The provinces and large cities integrated in each MER include: *a)* the Capital Region: Seoul, Incheon, Gyeonggi; *b)* the Chungcheong region: Daejon, Chungcheongnam-do, Chungcheongbuk-do; *c)* the Honam region: Gwangju, Jeollanam-do, Jeollabuk-do; *d)* the Daegyeong region: Daegu, Gyeongsangbuk-do; *e)* the Dongnam region: Busan, Ulsan, Gyeongsangnam-do. The Gangwon and Jeju regions are grouped with the current administrative units of Gangwon-do and Jeju.

9. The ten missions are: 1) improve basic living conditions, including housing, job opportunities and water services, 2) implement voluntary integration of administrative divisions and collaborate with each other on a regional scale, 3) improve public services in health and welfare, especially in underdeveloped communities and among disadvantaged families, 4) strengthen educational competitiveness in the non-Capital regions, 5) improve cultural facilities and programmes for local residents, 6) make new growth engines by using locally endowed resources, 7) conduct pro-active place marketing based on historical and cultural heritage, 8) build a collaborative system by networking existing community leaders and organisations and using the trained creative class, 9) produce high value-added goods by developing local industries, and 10) implement local green growth programmes (MLTM, 2009).

10. Key urban problems raised from municipal government officials are 1. urban sprawl and unplanned development, 2. the decline of existing city centres, 3. unbalanced public services among cities, 4. degradation of the landscape, 5. lack of basic industry and weak foundations of the local economy, 6. a shortage of developable land in cities, 7. lack of interregional co-operation, 8. poor management of cultural heritage and 9. excessive energy consumption, including a transport system oriented toward private cars.

11. The Development Restriction Area (greenbelt) was demarcated in 1971 around the main Korean cities, with the aim of preventing urban sprawl and conserving the natural environment. Development within these zones, which accounted for 5 397 km^2, 5.4% of the national territory, was highly restricted. Critics contend that the greenbelt policy has generated "leap-frogging" urban development, while aggravating underdevelopment within the greenbelt area.

12. The programme was developed to strengthen the innovative capacity of provincial universities by reinforcing networks between local universities, government and industry; it was discontinued by the Ministry of Education, Science and Technology, however, in 2009.

13. There are two integrated Regional Innovation Councils, those of Gwangju and Jeollanam-do along with those of Daegu and Gyungsangbuk-do. Councils have promoted innovation cafés and facilitated network hubs to intensify interactions and meetings between regional specialists and experts. Inno-cafe users reached 130 000 and 66 000 consultations and co-operative interactions were registered. Conventions, fairs, forums and innovation festivals have also been organised to enhance innovation awareness with professionals and the public. Most of the tacit knowledge exchanges take place within short distances, *i.e.* within the framework of the main provincial cities. These initiatives therefore indirectly target main provincial cities and metropolises. In addition, there are 81 mini-clusters created in order to create networks between universities and industries. The aim is to encourage co-operation, to exchange knowledge and contribute to new technologies. The mini-clusters consist of small-scale industrial units (4 208 firms), research (210 centres) and universities (781 units) in each complex in 2010.

14. RICs and LIDCs include centres for state-of-the-art medical devices (Wonju-si, Gangwon-do), automotive parts (Jeonju-si, Jeollabuk-do) and electronic parts (Suwon-si, located in Gyeonggi-do). They offer SMEs, mainly in urban areas, technology advice, seminars, training courses and the use of scientific equipment for testing and experiments.

15. The Presidential Committee is in charge of comprehensive co-ordination and evaluation of regional development policy including basic direction, five-year regional development plans and measures for regional development, project management and evaluation. The committee is composed of nine ministers (Ministry of Knowledge Economy; Ministry of Strategy and Finance; Ministry of Education, Science and Technology; Ministry of Public Administration and Security; Ministry for Food, Agriculture, Forestry and Fisheries; Ministry of Land, Transport and Maritime Affairs; Ministry of Environment; Ministry of Culture, Sports and Tourism; Ministry of Health; and Ministry of Welfare and Family Affairs) and 17 external experts.

16. Since 2008, the Framework Act on National Land has authorised the MLTM to request that provincial comprehensive plans, *si/gun* comprehensive plans, regional plans and sectoral plans be adjusted when they conflict or are not in conformity with the comprehensive national plan. In addition, the 2011 *Framework Act on National Land* mandates that public authorities that develop territorial development plans submit a territorial evaluation form to the minister of Land, Transport and Maritime Affairs to demonstrate how the plans will contribute to sustainable territorial development.

17. In the US, a Micropolitan Statistical Area is defined on a functional basis, primarily through community data, and associated with at least one urban cluster that has a population of at least 10 000 but less than 50 000. As of 2006, there are 582 micropolitan statistical areas in the US and Puerto Rico. The majority (83.5%) of micropolitan areas are confined to one county, 13.2% cover two counties, 3.0% encompass three counties and two micropolitan areas span four counties (Office of Management and Budget, 2010).

18. Likewise, the state of Washington in the US has aggressively supported ADUs by requiring jurisdictions with over 20 000 residents to adopt ADU ordinances (Nelson, 2003). For model state and local ordinances for accessory dwelling units, see Cobb and Dvorak (2000). For housing design information about accessory dwelling units, see *www.mass.gov/envir/smart_growth_toolkit/pages/mod-adu.html*.

19. For additional information, see *www.cityofsantacruz.com/index.aspx?page=1150*.

20. Figure as of 2010 (Korea Statistics Office).

21. See *www.toronto.ca/metropolis/metropolistoronto2005/pdf/Immigrant_Entrepreneu_DBF47.pdf* for more information.

22. The share of public transportation in Seoul is roughly 60%, which is the highest among large metropolitan cities in the OECD countries. But average speed inside the city as well as on the outskirts of the city ranked the lowest in 2007 (Korea Statistics Office, 2011).

23. For instance, between 2000 and 2009 the growth rate in Gangwon-do (5.5%), where most of the mining industries are located, was below the national average (6.5%).

24. Notably, the population of Taebaek-si (located in Gangwon-do) declined by 43%, and that of Gwangyang-si also declined by 8% from 1990 to 2010.

25. Under the past administration, the Presidential Committee on Balanced National Development co-ordinated programmes from different ministries (including Ministry of Construction and Transportation, Ministry of Government Administration and Home Affairs, and so on) to improve living conditions in cities and rural communities. These ministries then selected target communities and cities to perform individual projects to enhance liveability and urban quality. The focus of the current administration has been on outdated and underdeveloped city hubs.

26. The open territory concept seeks to create an open territorial axis across Korea's three coastal areas. According to this plan, the western coastal axis will be developed as a new economic centre, responding in particular to China's growth; the eastern coast will retain its conventional manufacturing sector as a driving force of the region's economy, while the southern coast will become a centre of international logistics.

27. The Pan Yellow Sea Region (PYSR) covers the coasts of northern China (Bohai Rim), southwestern Japan (the Kyushu area) and western and southern Korea.

28. Although the right of approval of urban master plans has been delegated to Provincial governor or Metropolitan city mayor since 2005, the first urban master plan formed after the change of the delegation system had to be approved by the minister of MLTM. That is why there is a gap between the proposed and the approved number of targeted population.

29. Whereas the National Statistics Office estimates that the Korean population will be 49 324 000 in 2020, the total targeted population in urban master plans is 62 457 000.

30. The notion of a National Spatial Data Infrastructure was first introduced by the Executive Order 12906 in the US in 1994. It contained a set of measures to promote the efficient sharing of geographic information among public and private sector users. The practice quickly gained acceptance internationally. In Korea, a set of framework data was defined in the *Spatial Data Infrastructure Act* 2009. This includes topography, coastline, administrative boundary, road and railway, cadastral, building and structure, hydrography, place names, digital ortho-imagery and Digital Elevation Model (DEM).

31. In the UK, local authorities have statutory duties for local transport, the impact assessment of local economic development or for regeneration projects. In France, public or private project leaders are mandated to implement environmental impact analysis. Requirements have been made more stringent with the recent Grenelle agreements.

32. Including Washington, Clackamas, Clark and Multnomah counties, the Portland Development Commission, Greenlight Greater Portland, the City of Portland, and Portland-Oregon Sustainability Institute (POSI).

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ANNEX 2.A1

Methods to Monitor the Effectiveness of Planning

At the end of the 1970s, Calkins (1979) presented the planning monitor, a mechanism to measure the achievement of plan objectives and to explain eventual differences between planning and urban development. There are two separate components of the planning monitor: *i)* a set of rational planning procedures; and *ii)* a supporting information system. A planning monitor would provide information that is needed for modification of a plan and for the evaluation of planning as an effective means of controlling development. When fully operational, a planning monitor would introduce accountability into the planning process through the evaluation of plan implementation actions. The planning monitor is a system where I is a vector of inventory attributes; subscript $t + n$ is the final-state inventory and subscript t is the inventory at the beginning of the planning period; superscripts g and a are used to differentiate between planned inventory vectors and actual inventory vectors, respectively; P is a vector of the rate of the change that is expected as a result of public policies; and R is a vector of the rate of forecast change, or change that is expected as a result of exogenous factors.

$$I_{t+n}^{g} = I_{t}^{a} + \sum_{n=1}^{n} (P_{t+n} + R_{t+n})$$

The Plan Implementation Evaluation (PIE) Methodology developed by Laurian *et al.* (2004) offers another evaluation framework. It conceptualises implementation as the extent to which a plan achieves its policies through adoption of the relevant management techniques in development permits. For PIE, the permitting process provides the locus of observation of the linkages between policies and their implementation. This link most strongly reflects implementation as decision makers operationalise the plan objectives (and related policies) through permits on a regular basis. Thus, permits are intended to manage land development and thereby implement the plan. A well-implemented plan is defined as one in which a high proportion of policies for achieving an objective in the plan are implemented by the development permits. The evaluation method focuses on the strength of the linkages between policies and permits, measured through the adoption of relevant management techniques. For each permit, implementation is measured as the proportion of plan polices that are implemented by the permit (as a proportion of all relevant policies). PIE has been applied to six New Zealand plans and to almost 400 land development permits and has focused on storm water and urban amenity management.

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Chapter 3

The Korean Green Growth Strategy and its Implementation in Urban Areas

This chapter focuses on the contributions of sub-national governments to Korea's National Strategy for Green Growth and identifies the main challenges for its effective implementation at the local level. The first section examines the role of urban areas in advancing the green growth agenda in Korea. The second section addresses key challenges to the implementation of green growth policies at the urban scale and proposes a series of recommendations for strengthening implementation, with a focus on policy instruments to green the urban transportation and building sectors and a set of governance challenges to advancing an urban green growth agenda.

Korea is the first OECD country to have produced an explicit and comprehensive green growth strategy. In August 2008, on the occasion of the 60th anniversary of the founding of the Republic of Korea, the President announced that the country would transition to a low-carbon, green growth model to guide long-term economic development over the next half-century. After several decades of economic growth, Korea's economic resiliency was challenged by the 2008 global financial crisis, which had unprecedented consequences. Following a period of rapidly increasing economic expansion that began in 2000, with GDP increasing annually by nearly 5%, the growth rate dropped to 2.2% in 2008 and even further in 2009 (Bank of Korea, 2009). Manufacturing was particularly hard hit: more than one-quarter (25.6%) of output was lost as of January 2009. Some domestic recovery occurred in 2009, with Korea among the first OECD countries to show signs of the end of the financial crisis (Bank of Korea, 2009). However, the damage was profound for the real economy: more than 200 000 jobs were lost in the second semester of 2008 alone.

The financial crisis revealed the limits of the traditional Korean growth model, characterised by domestic energy consumption heavily reliant on imports, and thus provided the government with the opportunity to re-evaluate its historical economic model and look toward new strategies for growth. In January 2009, the President unveiled the *Green New Deal*, a stimulus package of USD 38.5 billion, which identified a handful of large-scale infrastructure projects (namely, the Four Major Rivers Restoration and the expansion of the high-speed rail network) intended to stimulate the Korean economy through short-term job creation. In July 2009, the government announced the *National Strategy for Green Growth up to 2050*, which aims to mitigate climate change, create new engines for economic growth and improve the quality of life. A Presidential Committee on Green Growth was established to co-ordinate the national green growth efforts. This committee published the *Five-Year Green Growth Implementation Plan for 2009-2013* (hereafter referred to as the Five-Year Plan) to guide the implementation of the national strategy. The Five-Year Plan absorbed the Green New Deal and benefited from an investment of KRW 107.4 trillion (USD 83.6 billion), approximately 2% of the domestic GDP.

Conscious that no sustainability or green growth objectives can be achieved without the active involvement of the cities and regions, the National Strategy for Green Growth includes specific actions targeting urban areas as well as binding provisions for sub-national governments to reflect green growth policy actions in their own five-year plans. This paper aims to assess the contributions of sub-national governments in the National Strategy for Green Growth and to identify the main challenges for an effective implementation at the local level.

- *Section 3.1* will discuss the role of sub-national governments within the context of Korea's National Strategy for Green Growth.
- *Section 3.2* will assess several of the challenges of implementing green growth policies at the urban scale and propose a series of recommendations for strengthening implementation, with a focus on policy instruments to green the urban transportation

and building sectors and a set of governance challenges to advancing an urban green growth agenda.

3.1. The Korean green growth strategy and the role of local governments

Green growth: a new national growth paradigm emerging from the financial crisis

Korea's National Strategy for Green Growth to 2050, launched in 2009, specifies **three objectives:**

1. promote a synergistic relationship between economic growth and environmental protection;
2. improve quality of life and promote a green revolution in Korean lifestyles; and
3. contribute to international efforts to fight climate change and other environmental threats.

These objectives organise the country's long-term green growth vision around **three strategic pillars:**

1. mitigating climate change and promoting energy independence;
2. creating new engines for economic growth; and
3. improving the quality of life and enhancing Korea's international standing.

To implement the National Strategy for Green Growth, the Five-Year Plan identifies specific policies, quantifiable objectives and concrete projects to help achieve green growth (Table 3.1). For example, two of the strategies proposed in the Five-Year Plan for mitigating climate change are to reduce greenhouse gas emissions by developing a mandatory inventory of industrial emissions, a first step toward the creation of a domestic carbon market, and promoting the sustainable management and restoration of forests. To measure success, two quantitative objectives are cited: transform 400 000 hectares of wasteland into forest and introduce a downward trend in greenhouse gas emissions.

The Five-Year Plan also assigns budget allocations from the national budget to each strategic pillar. Over half of the five-year spending is attributed to climate change adaptation and mitigation efforts and the development of clean sources of energy, while the creation of new economic engines and projects to improve living standards and enhance Korea's international status each receive about a quarter of the overall national budget (PCGG, 2009). Approximately KRW 61 trillion – representing over half of the total budget for the Five-Year Plan – is allocated to two major infrastructure projects: the ongoing expansion of Korea's high-speed rail network, Korea Train Express (KTX), and the Four Major Rivers Restoration project, a large-scale sustainable water resources management initiative. In contrast, spending on R&D accounts for just 12% of the Five-Year Plan (Table 3.2).

The necessity of incorporating the urban dimension

The Korean green growth agenda has been driven by a central government vision and strategy. The Presidential Committee on Green Growth, formed in 2009 to co-ordinate the agenda-setting, policy formation, monitoring and evaluation of green growth programmes at all levels of government, is composed of scientific experts and representatives from ministries, academia and the private sector. The role of sub-national governments has primarily been to comply with the instructions of the central government to implement local green growth projects, with considerable, if not exclusive, financial support of the

Table 3.1. **Strategic objectives of Korea's Five-Year Plan for Low-Carbon Green Growth (2009-13)**

Strategic pillar	Strategic axis	Quantitative objective	Project
Mitigate climate change and promote energy independence	*Effective mitigation of GHG emissions*	– Transform 400 000 hectares of wasteland into forest – Introduce a downward trend of GHG emissions based on a voluntary agreement	– Mandatory inventory of industrial GHG emissions as a first step toward the creation of a domestic carbon market) – Restoration of damaged forests, reforestation and sustainable forest management programmes
	Reduction of the use of fossil fuels and enhancement of energy independence	– Increase energy efficiency from 0.317 tep/USD 1 000 in 2009 to 0.233 tep/USD 1 000 by 2020 – Increase share of renewable energy from 2.7% in 2009 to 6.08% by 2020 and 20% by 2050 – Increase share of nuclear energy from 37% in 2009 to 32% by 2020 – Increase energy self-sufficiency rate to 65% in 2030	– Construction of 12 new nuclear reactors – Construction of a 2MW wind complex – Increase share of photovoltaic (PV) solar panel installations – Construction of tidal power plants
	Strengthening the capacity to adapt to climate change	– Increase share of environmentally friendly food products from 4.5% in 2009 to 18% by 2020 – Increase volume of protected forest resources from 862 million cubic metres in 2009 to 1 087 million cubic metres by 2020	– Creation of a watchdog unit to monitor climate change impacts – Strengthening international co-operation for food safety – River retrofit and restoration of the four principal rivers of the country, including the construction of dams and infrastructure for water treatment and distribution – Extension of forest ecosystem protection zones
Create new engines for economic growth	*Development of green technologies*	– Increase share of Korean green technological firms in the global market from 2% in 2009 to 10% by 2020 – Increase number of foreign experts in green technologies working in Korea, from 25 in 2009 to 250 by 2020	– Increased investment in R&D through the support of the National Council of Sciences and Technologies – Creation of an appropriate financial system to finance innovation – Facilitation of technology transfers through collaborative agreements with leading international research institutes
	Greening of existing industries and the promotion of green industries	– Increase share of recycled waste from 15% in 2009 to 17.6% by 2020 – Increase share of green exports in core industries from 10% in 2009 to 22% by 2020 – Increase number of green PPPs from 685 in 2009 to 2 900 by 2020 – Increase number of green industrial zones from five in 2009 to 20 by 2020	– Promotion of reducing, reusing and recycling waste – Support for greening of traditional strategic industries (automobile, steel, semiconductor) to increase the share of green R&D efforts – Increased support for green SMEs
	Advancement of industrial structure to increase services	– Increase the number of foreign patients in Korean hospitals from 27 000 in 2009 to 350 000 by 2020 – Increase value of ICT exports from USD 52 million in 2009 to USD 240 million by 2020	– Investments in high value-added industries: health, education, telecommunication – Promotion of ICT during the fabrication processes of traditional industries
	Engineering a structural basis for the green economy	– Create a USD 1.6 million domestic carbon market by 2020 – Increase secured public loans for green technologies from USD 2 million in 2009 to 6.4 million by 2020 – Reduce by 50% the number of households with insufficient access to energy	– mplementation of coherent environmental tax systems to correct price signals – Labour market training programmes for workers transitioning to green jobs

Table 3.1. **Strategic objectives of Korea's Five-Year Plan for Low-Carbon Green Growth (2009-13)** *(cont.)*

Strategic pillar	Strategic axis	Quantitative objective	Project
		– Create 500 green, socially responsible companies by 2020	
Improve the quality of life and enhance Korea's international standing	*Greening land and water, and building green transport infrastructure*	– Expand nature reserves from 100 000 hectares (2009) to 150 000 by 2020 – Increase share of rail ridership from 18% (2009) to 26% by 2020 – Increase share of cycling in urban passenger transport from 1.5% (2009) to 10% by 2020	– Creation of carbon-neutral cities – Construction of 1.5 million social housing units and 2 million green housing units – Implementation of an evaluation system for green buildings – Construction of new railway lines and of 3 000 km of bike lanes
	Bringing the green revolution to daily lives	– Increase number of green households from 160 000 (2009) to 1.5 million by 2020 – Increase public consumption of green products from USD 2 million (2009) to USD 8 million by 2020 – Construct 500 ecological cities by 2020	– Public information campaigns to educate consumers about green consumption behaviour – Development of ecological tourism – Support for voluntary participation in green programmes
	Becoming a role model for the international community as a green growth leader	– Increase share of green projects in foreign economic aid from 11% (2009) to 30% by 2020	– Active participation in upcoming international negotiations on global climate change – Recognition as the Asian leader in green growth

Source: The Presidential Committee on Green Growth (PCGG) (2009), Five-Year Green Growth Action Plan, Presidential Committee on Green Growth, Seoul.

Table 3.2. **Budget allocation of Korea's Five-Year Plan for Low-Carbon Green Growth**

Trillion KRW[1]

	Total	2009	2010	2011	2012	2013
Total	**107.4**	**17.4**	**24.2**	**25.7**	**20.6**	**19.4**
Central government budget	98.9	17.4	20.5	21.9	19.6	19.4
Public enterprise investment	8.5	–	3.7	3.8	1.0	–
Total green technology R&D investment in all categories	*(13.0)*	*(1.9)*	*(2.2)*	*(2.5)*	*(2.8)*	*(3.5)*
1. Climate change adaptation and mitigation and enhancing energy independence	**57.5**	**8.5**	**15.5**	**16.0**	**9.8**	**7.7**
Effective mitigation of greenhouse gas emissions	5.4	1.0	0.9	1.0	1.1	1.3
Reduction of the use of fossil fuels and the enhancement of energy independence	15.4	2.8	3.8	2.9	3.0	2.8
Strengthening the capacity to adapt to climate change	36.7	4.7	10.9	12.0	5.6	3.6
(Four Major Rivers Restoration Project)	*(15.4)*	*(0.8)*	*(6.4)*	*(7.1)*	*(1.1)*	*(-)*
2. Create new engines for economic growth	**23.5**	**3.9**	**4.1**	**4.7**	**5.3**	**5.6**
Development of green technologies	7.6	1.5	1.4	1.5	1.5	1.6
"Greening" of existing industries and promotion of green industries	4.5	0.7	0.9	0.9	1.0	1.0
Advancement of industrial structure to increase services	9.7	1.4	1.5	2.0	2.4	2.5
Engineering a structural basis for the green economy	1.8	0.3	0.2	0.3	0.4	0.5
3. Improve quality of life and enhance Korea's international standing	**26.4**	**5.0**	**4.6**	**5.1**	**5.6**	**6.1**
Greening the land and water and building green transport infrastructure	23.9	4.6	4.2	4.6	5.0	5.5
Bringing the green revolution to daily lives	1.8	0.3	0.3	0.3	0.4	0.4
Becoming a role model for the international community as a green growth leader	0.7	0.1	0.1	0.1	0.1	0.1

1. Actual budgets for 2009-10 and projections for 2011-13.

Source: OECD (2010b), *OECD Economic Surveys: Korea*, OECD Publishing, Paris. Based on Ministry of Strategy and Finance and Presidential Committee on Green Growth (2009), *Five-Year Green Growth Action Plan*, Presidential Committee on Green Growth, Seoul.

central government. Some exceptions do exist. Seoul, notably, has been a pioneer in green growth, with several decades of pro-active land use and transportation policies preceding the launch of the *National Strategy for Green Growth*.

Korea's top-down approach to green growth is not unexpected. As discussed in Chapter 2, national policy has historically shaped local spatial and economic development in Korea. Land use and density, economic development and transportation tend to be the responsibility of a handful of ministries within the central government. Meanwhile, local governments generally exercise some control over the management of urban services, including local transportation networks, but tend to rely heavily on the financial support of the central government to operate these facilities. Non-alignment of related urban policies at the ministerial level, coupled with limited financial resources at the local level, can present considerable challenges to the green growth agenda in urban areas. Indeed, several of the current obstacles faced by local authorities in Korea (discussed in further detail below) are not new, but reflect existing institutional challenges in Korea's traditional approach to land use, environmental and economic development planning.

Nevertheless, even a nationally led, top-down institutional approach to green growth, as in the case of Korea, is compelled to incorporate an urban dimension, due to the concentration of economic activity and production, infrastructure and energy consumption in cities. The effective management and organisation of urban areas is essential to greening environments at all scales. Green growth, in particular, hinges on compact urban form with robust transportation and public service linkages, to support economic growth while reducing energy and natural resource consumption. The human and economic assets in cities located in coastal and riverine areas particularly vulnerable to climate change can be rendered less vulnerable through targeted adaptation measures. Moreover, as mentioned in Chapter 1, emissions reductions at the national level call for the special attention of urban areas. With approximately 82% of its population living in urban areas, Korea had the fourth-highest energy intensity in the OECD area in 2008 and was the ninth-largest emitter of greenhouse gases in the OECD area (Jones and Yoo, 2010). For Korea to achieve its national emissions reduction target of 30% by 2020, sub-national governments must be an integral part of the strategy toward greener growth.

In addition, policies elaborated at the national level must be implemented locally. This is especially true within a number of sectors integral to advancing greener growth that represent significant sources of local economic growth and that to a considerable extent fall under the purview of sub-national governments, such as transportation, building and infrastructure. Hence, when national policies target low-carbon transportation, green buildings and cleaner, more efficient infrastructure networks, local jurisdictions play a role in translating the national vision into effective implementation strategies at the urban level. Korea's plans to construct transit centres in metropolitan cities and 3 000 km of bike lanes, for example, will require co-ordination with local authorities to implement and manage the facilities. National policies pertaining to land use and transportation, such as updating building codes and expanding transportation networks, also inform residential and commercial land use patterns and commuting flows to urban areas.

Cities will inevitably serve as testing grounds for the implementation of national green growth policies at the urban level. For instance, the Korean government has historically sponsored demonstration projects in urban and rural areas as a way to localise national policy initiatives. With the launch of the National Strategy for Green Growth, a number of

ministries organised competitions and trial projects to partner with local governments to develop green growth model projects, which include the *Greening Cities* project, the *EcoRich City Competition*, the *Climate Change Adaptation Model City* project, the *Eco-City* project and the *Low-Carbon Green Village* project. The National Strategy for Green Growth also provides an opportunity for cities to maximise their competitiveness (a priority of national urban policy), by initiating green growth projects that capitalise on local assets to stimulate local economic growth. Local authorities are well positioned to develop policy and programmatic solutions that best meet specific geographic, climatic, economic and cultural conditions; indeed, the central government explicitly calls upon local governments to tailor programmes to local conditions in the legislation and guidelines that have been drafted in support of green growth in the Framework Act on Low-Carbon Green Growth, described in further detail below.

The legal and institutional framework guiding green growth implementation at the local level

The legal and institutional framework guiding the implementation of Korea's National Strategy for Green Growth at the local level consists of: *i)* the *Framework Act for Low-Carbon Green Growth* enacted in 2010, and *ii)* the *Five-Year Green Growth Implementation Plan*.

The Framework Act for Low-Carbon, Green Growth

The Framework Act for Low-Carbon, Green Growth (hereafter referred to as the Framework Act) establishes the legal basis for implementing the government's National Strategy for Green Growth. The Framework Act articulates the roles of each level of government, the private sector and citizens. It is the primary centralised enabling framework for green growth action at the local level, authorising the central government to develop policy tools to assist local governments in implementing national green growth projects and policies. The contribution of urban planning and infrastructure management to support green growth is made explicit in the third article of the legislation, which grants the central government the authority to "rearrange infrastructure, including national land and cities, buildings and transportation, road, ports and harbours, and waterworks and sewerage systems, to make them suitable for low-carbon green growth while preserving the value of national resources and environment" (Article 3 of the Framework Act).

Local governments, in turn, are called upon to co-operate in full with the state's green growth strategy as follows:

- The Framework Act encourages cities to take local conditions and green growth impacts into account when formulating and executing plans and projects, to intensify green growth education and advocacy among residents and to encourage green growth among businesses, residents and nongovernmental organisations through the provision of information and financial support (Article 5).
- Only metropolitan city and provincial (*do*) governments are required to establish and implement a local action plan for green growth in conformity with the national strategy; lower-level governments (at the *si*, *gun* and *gu* levels) are encouraged, but not required, to develop action plans (Article 11).
- Local governments may establish a committee on green growth, under the control of the mayor/provincial (*do*) governor, to review key green growth policies at the local level (Article 20).

- Each mayor/provincial (*do*) governor is also authorised to designate a Green Growth Officer from among public officials, to promote green growth at the local level and act as liaison with the central government to ensure vertical co-ordination of green growth strategies (Article 21).
- Action plans developed by metropolitan cities and provinces (*do*) must be submitted to the local committee on green growth (if one has been designated), the city council and, finally, the Presidential Committee on Green Growth for approval. All 16 metropolitan cities and provinces (*do*) have prepared green growth action plans, which are closely organised around the ten policy directions enumerated in the National Strategy for Green Growth; a handful of lower-level cities (*si, gu* and *gun*) have established action plans (Table 3.3).

Beyond the requirements set forth in the Framework Act, the National Strategy for Green Growth directly and indirectly impacts local urban policies and planning, even in cities for which the development of a local action plan is not mandated. Most local green growth projects are financially supported, at least in part, by the central government in the form of intergovernmental transfers and matching funds. Many of these financial resources are earmarked for specific uses; for instance, the financing of construction costs for a subway line in metropolitan cities is split between the central government (60%) and

Table 3.3. **Local green growth plans in Korea**

Metropolitan city or province (*do*)	Name of green growth plan	Lower-level tiers of government (*si, gun* and *gu*) that have established green growth plans
Seoul	Five-Year Green Growth Plan	4 out of 25 *gu* (Jung-gu, Seongdong-gu, Dongjak-gu, Seocho-gu)
Busan	Green Growth Strategy and Five-Year Implementation Plan	–
Daegu	Green Growth Implementation Plan	2 *gu* out of 7 *gu* and 1 *gun* (Nam-gu, Dalseo-gu)
Incheon	Green Growth Implementation Plan	–
Gwangju	Five-Year Green Growth Plan	1 out of 5 *gu* (Gwangsan-gu)
Daejeon	Green Growth Implementation Plan	–
Ulsan	Five-Year Green Growth Plan	–
Gyeonggi-do	Comprehensive Green Growth Implementation Plan	15 out of 27 *si* and 2 out of 4 *gun* (Suwon-si, Uijeongbu-si, Ahyang-si, Pyeongtaek-si, Dongducheon-si, Ansan-si, Namyangju-si, Osan-si, Siheung-si, Gunpo-si, Hanam-si, Yongin-si, Gimpo-si, Hwaseong-si, Yangju-si, Yeoju-gun, Yangpyeong-gun)
Gangwon-do	Five-Year Green Growth Plan	2 out of 7 *si* and 2 out of 11 *gun:* Wonju-si, Taebaek-si, Yeongwol-gun, Cheorwon-gun
Chungchengbuk-do	Green Growth Implementation Plan	1 *gun* out of 9 *gun* and 3 *si*: Cheongwon-gun
Chungchengnam-do	Green Growth Strategy and Implementation Plan	3 out of 7 *si* and 8 out of 9 *gun*: Cheonan-si, Nonsans-si, Gyeryong-si, Geumsan-gun, Buyeo-gun, Seocheon-gun, Cheongyang-gun, Hongseong-gun, Yesan-gun, Dangin-gun, Taean-gun
Jeollabuk-do	Five-Year Green Growth Plan	2 out of 6 *Si* and 8 *gun*: Kunsan-si, Namwon-si
Jeollanam-do	Five-Year Green Growth Plan	2 out of 5 *si* and 5 out of 17 *gun*: Yeosu-si, Gwangyang-si, Damyang-gun, Gokseong-gun, Hwasun-gun, Jangseong-gun, Jindo-gun
Gyeongsangbuk-do	Low-Carbon, Green Growth Implementation Plan	4 out of 10 *si* and 3 out of 13 *gun:* Pohang-si, Gimcheon-si, Ahdong-si, Gumi-si, Uiseong-gun, Goryeong-gun, Bonghwa-gun
Gyeongsangnam-do	Green Growth Implementation Plan	2 out of 10 *si* and 3 out of 10 *gun*: Tongyeong-si, Gimhae-si, Changyeong-gun, Hadong-gun, Sancheong-gun
Jeju	Low-Carbon, Green Growth Five-Year Plan	–

Source: Based on responses to the OECD questionnaire to Korean local governments.

local government (40%), except in the case of Seoul, where the central government covers only 40% of construction costs according to the *Rules for Construction and Support of Subway Lines*. Seoul's budget is financed in roughly equal shares by the local government (50%) and private sources (45%), with only 5% coming from central government sources (based on responses to an OECD questionnaire to local governments). This is in sharp contrast to most other metropolitan cities and provinces, where central government funding is expected to contribute between 25% and 82% of the budget. It is also notable that several of the provincial governments have projected very large budgets to implement their green growth plans, yet have not provided any indication of the sources of this funding (Gyeonggi-do, Jeollanam-do, Gwangju, Gyeongsangnam-do, for example). This issue will be discussed further in the next section.

The Five-Year Green Growth Implementation Plan

The Five-Year Green Growth Implementation Plan, though non-binding, is designed to build national consensus around green growth and incorporate green growth spending in the national budget by identifying policies, objectives and concrete projects that can be implemented in support of the national strategy.

As mandated by the Framework Act, most sub-national governments (*i.e.* the upper tier of local governments, including metropolitan city and provincial (*do*) governments) have drafted five-year plans to implement local policies and projects to help meet the national green growth goals (Table 3.3). Most local actions are focused on greenhouse gas emissions mitigation and include plans to increase energy efficiency through the introduction of smart grid systems, curb emissions through green building retrofits, expand public transportation networks, foster the development of emerging green technologies and the greening of existing industrial sectors and develop eco-tourism sites (Table 3.4).

Contributions of local government to green growth in Korea: Proposed actions in local five-year plans

The three strategic pillars that form Korea's National Strategy for Green Growth structure the five-year plans of the central government and most local governments: *i)* mitigating climate change and promoting energy independence, *ii)* creating new engines for economic growth and *iii)* improving the quality of life and enhancing Korea's international standing. This section examines the contributions of local governments to the three strategic pillars and associated policy directions of Korea's Five-Year Green Growth Plan. Local efforts will be described and, where possible, assessed within the context of the national policy infrastructure for green growth.

i) Mitigating climate change and promoting energy independence

Climate change mitigation strategies have been initiated by the Korean government since the 1990s, prior to its ratification of the Kyoto Protocol to the UN Framework Convention on Climate Change in 2002 as a non-Annex I country. These market and non-market mechanisms to combat climate change included voluntary and negotiated reduction targets with companies responsible for the majority of greenhouse gas emissions, increased environmental taxes, energy efficiency programmes, participation in the international carbon market and the creation of a voluntary domestic carbon market (Jones and Yoo, 2010).

Table 3.4. **Local actions for green growth**

Elements of the five-year implementation plans of metropolitan city and provincial (*do*) governments

Metropolitan city/province (*do*)	Key actions
Seoul	Introduce a smart grid network
	Improve the energy efficiency of public buildings
	Select and support "ten green technologies"
	Reinforce the climate change monitoring system
Busan	Develop a smart grid cluster at the new port
	Reinforce climate-friendly ocean management
	Green traditional industries (*i.e.* the automobile industry)
	Establish open space networks
Daegu	Select and support seven green technologies
	Green existing industries
	Increase energy efficiency in the building and transportation sectors
	Enhance sustainable forest management
Incheon	Establish green foundations
	Increase forest area within the city
	Construct a tidal plant
Gwangju	Promote the recycling of waste
	Reinforce standards for disaster prevention facilities
	Green existing industries
	Implement a pilot carbon emissions trading scheme among public administrative agencies
Daejeon	Develop the Environment-Energy town complex
	Reinforce the disaster response system
	Expand the subway system, with the construction of a new line
	Expand the supply of renewable energy
Ulsan	Develop Clean Development Mechanism (CDM) projects
	Develop an eco-industrial complex
	Support the greening of the automobile, ship, petrochemical and technology industries
	Establish an open space network
Gyeonggi -do	Develop an eco-industrial district, including green energy, eco-friendly vehicles and R&D
	Construct three GTX (Great Train eXpress) lines around the Capital Area
	Introduce a programme to plant 100 million trees
	Green the university campus
Gangwon-do	Reduce CO_2 emissions from the cement factory
	Construct photovoltaic power generation sites
	Maintain Korea's eastern coast
	Reduce the use of chemical fertiliser
Chungcheongbuk-do	Promote solar-powered houses, targeting 5 000 households by 2012
	Support restoration of the Han River and the Geumgang River
	Support the development of the solar energy industry
	Increase the use of biomass energy
Chungcheongnam-do	Reduce greenhouse gas emissions from four thermal power plants
	Develop four green technology clusters
	Support five leading industries, including green cars, solar fuel cells and LED
	Reinforce health care to prevent the spread of infectious diseases
Jeollabuk-do	Develop a low-carbon, green village demonstration project
	Build a green technology/R&D complex and an eco-industrial complex
	Establish an eco-tourism site
	Reinforce local resiliency to potential disasters associated with the river
Jeollanam-do	Develop an eco-friendly transportation network
	Reinforce the management of coastal areas to protect against rising sea levels
	Build 50 eco-friendly agricultural complexes
	Promote eco-tourism
Gyeongsangbuk-do	Restore the Nakdong River
	Green the agriculture and fishing industries
	Develop Ulleung-do as a carbon-zero island

Table 3.4. **Local actions for green growth** *(cont.)*

Elements of the five-year implementation plans of metropolitan city and provincial (*do*) governments

Metropolitan city/province (*do*)	Key actions
	Construct a hydrogen highway along the eastern coast of Korea
Gyeongsangnam-do	Select and foster ten green technologies, including smart ships, wind power and energy storage facilities
	Construct hydrogen fuel cell generation facilities
	Develop 20 low-carbon green cities
	Restore the Nakdong River
Jeju	Implement a smart grid pilot project targeting 6 000 households
	Expand the renewable energy supply
	Introduce a light rail system
	Develop a carbon-free tourism site

Source: The Presidential Committee on Green Growth, (2010), *Local Green Growth Action Plan*, *www.greengrowth.go.kr*, accessed Feb 2010.

With the launch of the National Green Growth Strategy in 2009, the government committed to cut greenhouse gas emissions by 30% relative to the projected level in 2020, based on the business-as-usual scenario (PCGG, 2009). As mandated by the Framework Act (Article 42), most metropolitan city and provincial (*do*) governments have set local targets, adopting the national target of 30% with respect to business as usual.[1] Although not legally binding, the reduction targets have helped to frame the policy agenda and implicate the involvement of sub-national authorities. Korea's National Five-Year Plan identifies three policy directions for mitigating climate change and promoting energy independence: *a)* reduce CO_2 emissions, *b)* enhance energy self-sufficiency by decreasing dependence on fossil fuels, and *c)* support climate change adaptation measures. Many local governments have structured their actions around the national framework.

a) Reducing CO_2 emissions: establishing an emissions inventory and target management system

City action to reduce CO_2 emissions has been guided by the national emissions reduction target of 30% by 2020 and the institutional framework put in place by the state, pledging to reduce domestic emissions through the introduction of emission reduction policies, emissions inventories and an international research centre on greenhouse gas emissions. In short, the national policy consists of the following elements:

- To manage sectoral emissions, the *Greenhouse Gas and Energy Target Management System* introduced mandatory greenhouse gas emissions reductions targets,[2] requiring companies emitting over 125 000 tonnes of CO_2 equivalent annually, known as "controlled entities", to negotiate reduction targets and pay fines for non-compliance. These targets will be further reinforced in 2013. In September 2010, the Ministry of the Environment announced that 470 companies in the agriculture, energy, waste, and building and transport sectors had been designated "controlled entities", together accounting for approximately 60% of overall greenhouse gas emissions in Korea.
- To facilitate the development of a centralised database and research centre for the collection and management of greenhouse gas emissions data, the government introduced the *Greenhouse Gas Inventory and Research Centre (GIR)* in June 2010. Prior to the establishment of the GIR, emissions data pertaining to greenhouse gases and air pollution had been collected and managed independently by a handful of ministries, leading to monitoring challenges. Similar to the Committee on Climate Change (CCC)

in the UK, GIR has been tasked with advising the government and private sector on setting and meeting carbon budgets.

At the sub-national level, a handful of metropolitan city and provincial (*do*) governments have begun to establish local greenhouse gas inventories in recent years. Among the metropolitan city and provincial (*do*) governments, all but three (Incheon, Gwangju, Jeollabuk-do) have created, or are in the process of creating, emissions inventories. These local inventories have largely been established on an *ad hoc* basis, however, which presents comparability challenges. As in most OECD countries, many local governments lack the technical and financial capacity to develop reliable local emissions inventories, which present two challenges that are particularly salient at the local level: *i)* unlike the national greenhouse gas inventory, it is difficult to identify emissions, operational boundaries and sectors due to unlimited movement of products, waste and vehicles across jurisdictions, and *ii)* indirect greenhouse gas emissions discharged by electricity or heat pose further complications. As will be discussed further in the next section, the GIR could potentially take the lead on harmonising sub-national emissions inventories, working closely with international partners to ensure a common framework.

Finally, metropolitan city and provincial (*do*) governments have also committed to implementing specific mitigation projects that are designed to help reduce CO_2 emissions and reflect local priorities and conditions (Table 3.4). These projects, which will be discussed in further detail later in this section, include green infrastructure construction, building retrofits and the development of eco-neighbourhoods, and the greening of traditional industries.

b) Enhancing energy self-sufficiency: investing in renewable and clean energies

With national government planning to decrease Korea's reliance on fossil fuels and enhance the country's energy independence by investing just over 14% of the Five-Year Plan budget in renewable and clean energies, local governments have also pledged support for renewable energy in general (Daejeon and Jeju), solar energy (Gangwon-do, Chungcheongbuk-do), wind (Gyeongsangnam-do), biomass and waste (Gwangju, Chungcheongbuk-do).

Several demonstration projects, such as the smart grid pilot project for Jeju Island and the renewable energy district in Pyeongtaek, are intended to test national strategies for enhancing energy self-sufficiency at the local level. The city of Paju, for instance, has partnered with local industry to supply recycled waste heat from a municipal garbage incineration plant. Since 2010, the city has invested KRW 10 billion in a waste heat recovery system at the city's incineration plant that heats the LG Display factory with 100 000 tonnes of recycled waste heat annually. It is estimated that each year the company will reduce greenhouse gas emissions by 13 000 tonnes and save KRW 1 billion in fuel expenses, meanwhile adding KRW 3 billion annually to city revenue (Paju-si, 2010).

c) Enhancing the resiliency of cities: local adaptation measures and the Four Major Rivers Restoration project

The National Climate Change Adaptation Master Plan, established in 2010 to guide adaptation measures at all levels of government, called for metropolitan city and provincial (*do*) governments to submit climate change adaptation action plans by the first half of 2011. Some metropolitan cities have already introduced adaptation policies in their local green growth action plans, which include reinforcing disaster response

systems (Gwangju and Daejeon), strengthening coastal and ocean management procedures (Busan, Gangwo-do, Jeollanam-do) and developing stronger riverine adaptation measures (Chungcheongbuk-do, Jeollabuk-do, Gyeongsangbuk-do and Gyeongsangnam-do). Seoul, in its 2007 Master Plan for Green Growth, lays out a series of policies for addressing adaptation issues. The city plans to carry out an assessment of climate change risks to human life, habitat and infrastructure; modify planning and development standards to account for climate change impacts; increase the amount of open space; and restore local streams. The city also intends to develop disaster plans addressing contagious disease, extreme temperatures, water shortages, ecosystem disruption and other risks.

One of the government's flagship projects to cope with climate change and stimulate economic growth is the Four Major Rivers Restoration, a large-scale sustainable water resources management initiative that accounts for just over 14% of total projected spending in the national Five-Year Plan (Box 3.1). The project aims to limit the impacts of natural disasters and improve natural ecosystems and cultural and historic resources, primarily through the construction of 16 moveable weirs,[3] for a more effective response against floods and droughts (Office of National River Restoration, 2011). Efforts will also be made to enhance the quality of the environment around the rivers to stimulate eco-tourism. Several provincial governments, including Gyeongsangbuk-do, Gyeongsangnam-do and Chungcheongbuk-do, have indicated plans to contribute to this restoration project. As has been the case in other OECD countries that have conducted large-scale environmental projects (such as Italy's largest infrastructure project, MOSE, located in Venice), the Four Major Rivers Restoration project has been accompanied by an important policy debate about its potential environmental and economic impacts.

As in most OECD countries, local authorities have not played a significant role in establishing the priorities or policy agenda that will be implemented to meet national green growth objectives, yet their co-operation will be crucial for implementing policies and achieving reduction targets. Experience in OECD countries can provide examples of how national governments have taken local input into account in designing national policies with respect to climate change. In Sweden, for example, the KLIMP climate investment programme was designed to stimulate local environmental initiatives and assist cities in climate change programme implementation (OECD, 2010a). KLIMP grants, attributed through a competitive process to cities that develop climate strategies, can provide central-government funding to municipalities that covers between 25% and 85% of project costs, with the city covering the balance. Between 2003 and 2008, approximately 126 local climate investment projects, representing an investment of EUR 214.9 million, resulted in an estimated 1.1 billion tonnes of CO_2 reduction per year (OECD, 2010a). However, it is important for local governments to work in concert with national authorities to implement co-ordinated policies that address climate change mitigation. As a study reviewing the UK Climate Integration Programme (CIP) reveals, national policies can result in both synergistic and antagonistic interaction between national and local action on climate change (Jordan and Unwin, 2008, cited in OECD, 2010a).

ii) Develop new engines for economic growth

Four strategic axes are identified in the National Five-Year Plan to spur future economic growth: *a)* the development of green technology as "new growth engines,"*b)* the

Box 3.1. **Four Major Rivers Restoration Project**

To cope with climate change and stimulate short-term economic growth, the Korean government has allocated KRW 15.4 trillion to the Four Major Rivers Restoration project. The four rivers implicated in the project together stretch for 929 km and span the national territory, with the Han River in the north, the Geum River in the west, the Yeongsan River in the south and the Nakdong River in the east.

According to government officials, the project is designed to address the significant environmental challenges faced by the rivers. Repeated flooding and droughts have caused human casualties, eco-system loss and habitat degradation, property damage and forced displacement of riverine residents. Extreme weather events that lead to flooding and droughts are expected to worsen in frequency and intensity as climate change advances. In the case of the Yeongsan River, toxic contamination from domestic and industrial waste disposal has resulted in water quality levels unfit even for agriculture and industrial use. These environmental challenges have had dramatic economic consequences: Over the past decade, the frequent flooding in Korea incurred KRW 67 trillion (USD 54.9 billion) in property damage and forced as many as 50 000 people from their homes (Office of National River Restoration, 2011).

The restoration project hinges on the installation of wastewater treatment and monitoring facilities and the construction of 16 movable weirs (barriers built across a river in order to control or direct the flow of water), two new multi-purpose dams and heightening the banks of 96 existing agricultural reservoirs. These measures, combined with the construction of 1 592 km of bike lanes, an enhanced green transportation network and the development of leisure and tourism facilities, are expected to spur eco-tourism along the banks of the four major rivers. According to the master plan of the Four Major River Restoration Project, the project would create 340 000 new jobs and increase economic production by KRW 40 trillion.

The Korean government has identified several policy tools to maximise local development potential through the river restoration initiative. The Master Plan mandates that local companies should compose at least 40% of all joint ventures (with the exception of turn-key projects, which require 20% participation of local companies). Currently, 187 of 338 companies (55%) are implicated in the restoration initiative. Specific lots have been consigned to the local government; as of March 2011, local governments are co-ordinating nearly a quarter of the lots associated with the project.

The government intends to invest KRW 22.2 trillion to complete the Four Major Rivers Restoration project, with spending divided among the Ministry of Land, Transport and Maritime Affairs (KRW 15.4 trillion), the Ministry of Agriculture, Fisheries and Food (KRW 3 trillion) and the Ministry of Environment (KRW 3.9 trillion). Of the MLTM's share of total investment, the Korean Water Resources Corporation assumes KRW 8 trillion, to be reimbursed through development profits for the riverside areas. To co-ordinate the details of the project among the relevant ministries, the Office of National River Restoration was established. The project is expected to be completed by 2012.

Source: Office of National River Restoration (2011), "The Four Big River Restoration Project", *www.4rivers.go.kr/news/eng*, accessed 18 March 2011.

greening of traditional industries through more efficient use of resources, improved waste management and targeted support to emerging green SMEs, *c)* investments in high value-added industries, such as health care, education and telecommunication,[4] and *d)* the establishment of policy infrastructure to support green growth. Many cities are contributing to addressing these strategic axes.

a) Develop green technologies while, *c)* investing in high value-added industries: new growth engines for the future

Korea's eco-innovation strategy is underpinned by the existing national policy framework, notably the *Ten-Year Basic Plan for the Development and Dissemination of New*

and Renewable Technologies (released in 2003) and the *Long-Term Vision for Science and Technological Development to 2025* (launched in 1999), which provide the strategic objectives for the country's future technological and industrial development (OECD, 2008). The *Ten-Year Basic Plan* identifies three high-priority areas for investment: fuel cells, photovoltaic and wind power. With the launch of the National Strategy for Green Growth in 2009, the government added a number of technologies and industries as new engines for green growth (Table 3.5). Many local governments have pledged to generate job growth through support for green technological development in their five-year plans (*i.e.* Seoul, Daegu, Ulsan, Chungcheongnam-do, Jeollabuk-do and Gyeongsangnam-do). Seoul, in particular, plans to maximise its existing technological advantage and highly educated workforce to develop a new R&D cluster in the Magok district, as a test bed for green technologies such as LED, electric cars and hydrogen fuel cells. Daegu is focusing on seven key green technologies, including solar cells, solar heat, fuel cells, intelligent transportation system, LED, electricity IT and waste-to-energy conversion systems.

The emergence of a financial and institutional framework in support of green innovation has occurred since 2001, with the creation of tools and institutions to facilitate eco-innovation. Financial instruments to stimulate new business ventures in green technologies include *Eco-Technopia 21,* an R&D fund merging public and private resources to support the development of core environmental technologies and the *Environmental Venture Fund*. To provide technical support and facilitate knowledge exchange, the *Environmental Technology Business Incubator (ETBI)* and the *Korean Green Industry Complex* cluster were developed. Finally, the *Korea Environmental Industry and Technology Institute (KEITI)* was launched in 2009 to co-ordinate a comprehensive support system for environmental ventures, including the development of environmental technology, certification of environmental technologies and products and support to promote Korea's environmental industry, including in foreign markets, green firms and green procurement.

Table 3.5. **Industries identified as new growth engines for the Korean economy**

Green technology	State-of-the-art fusion industries	High value-added industries
Renewable energy	IT fusion industry	Health care
Low-carbon energies	IT fusion system	Education services
Water management	Robot applications	Green finance
LED applications	New material and nano-fusion	Contents and software
Green transportation	Biomedicines	Meetings, incentives, conferences and exhibits (MICE) and tourism
State-of-the-art green cities	High value-added food industry	

Source: Cho, W.D. (2009), "Green Growth National Strategy and Five-Year Plan", presentation to the OECD, Paris, 9 September 2009.

Innovation has also been seen as a tool to achieve more balanced territorial development. The emergence of a regionalised innovation strategy began with the passage of the 2002 *Industrial Cluster Activation Act* and the launch of the 2004-08 *Five-Year Plan for Industrial Clusters*. Eleven *Regional Innovation Cities* were designated to support the government's plans to strategically relocate 175 public agencies (including ministries, research institutions and supporting agencies) from the Capital Region to other

metropolitan cities and provinces in Seoul. The relocation project is expected to reduce the share of public agencies in the Seoul Metropolitan Area from approximately 85% to 35% (MLTM, 2011a). Regional innovation cities have been designed to capitalise on the local industrial strengths and the knowledge and skills of the relocated public workers and researchers and promote networking and collaboration among regional industries, universities, research institutes and local governments to stimulate local economies and enhance the innovation capacity of local areas. The new cities will also be endowed with cultural and educational amenities in order to attract high-quality workers.

While each innovation city is organised around a core concept, only a handful of the themes explicitly focus on eco-innovation. In Ulsan, for example, Korea seeks to develop an industrial cluster for energy by relocating a number of energy-related public agencies to the historically manufacturing city of the automobile, shipbuilding and petrochemical industries. The joint innovation city of Gwangju and Jeonnam is intended as the site of another industrial cluster for energy (particularly renewable energy), IT, culture and the arts, reinforced by the relocation of the Korea Electric Power Corporation (Table 2.3 in Chapter 2).

The development of *regional environmental technology development centres* represents a combined national and local approach to greening the existing regional innovation system. Korea's regional environmental technology development centres bring together representatives from universities, administrative agencies, research institutes, industries and non-governmental organisations to solve unique local environmental problems collectively. The responsibilities of each centre include analysis and study of local environmental pollution, development of environmental technology, environmental education and technical support to enterprises coping with environmental management problems, dissemination of new environmental technologies, and promotion and education regarding new environmental technologies to local people (OECD, 2011a).

Additional efforts to regionalise Korea's innovation strategy are reflected in several *model city projects to foster green innovation*. New Songdo City is a flagship urban development project by the Korean government to combine ecological and economic objectives (Box 3.2). In the coastal area of Gangneung in the Gangwon-do province, for example, the central government partnered with provincial and local authorities within the framework of the Model Green City programme to develop a zero-emissions city centred on green technology and green transportation and building. Jeju Island has been selected as the site of the country's smart grid demonstration project, and is one of the government's flagship initiatives. Launched in 2009, the demonstration project will test smart grid technologies and R&D outcomes, with the intent of developing a successful smart grid business model. The project aims to test a variety of advanced smart grid technologies (including smart technologies related to power networks, buildings, renewable energy and transportation) in one place to assess potential synergy effects. The USD 200 million project combines public spending of USD 50 million with private sector investment of USD 150 million from automakers, telecommunications companies and home appliance manufacturers (Jeju, 2011).

Overall, the regionalisation of green technological development and eco-innovation strategies is a fairly recent development in Korea, and could be further emphasised. Innovation clusters and model city projects can help foster green technological

advancement, which can in turn drive down the cost of the green products and processes. Largely funded by the central government over a fixed time period, however, these initiatives risk limited sustainability and replicability; in some cases, they may also lead to technological lock-in. As highlighted in OECD work on green growth, heavy investments in isolated projects can lead to a fragmented approach that stretches scarce public resources and prevents the development of a broad-based green growth strategy (OECD, 2011b). Place-based strategies that take local strengths and challenges into account are more likely to be successful over the long term (OECD, 2011b). Funding for green growth programmes at the local/regional level remains a central issue in OECD countries. In the case of Korea, the discussion also must also take into account the fact

Box 3.2. **New Songdo City**

Built on a man-made island within the Incheon Free Economic Zone (FEZ), about 60 km from Seoul and in close proximity to Beijing, Shanghai and Tokyo, New Songdo City is a low-carbon city designed to attract businesses and foreign investment to generate a new commercial hub in northeast Asia. Plans for the eco-city, launched in 2000, are to construct a city of science, knowledge and advanced technologies that will emit just one-third of the greenhouse gases that are observed in cities of a similar size. The new city will have a population of 250 000 by 2020 and will comprise residential complexes, a university and the Songdo International Business District (IBD). Project developers hope to attract multinational corporations by providing high-quality hotels, schools, technology infrastructure and convention centres. The project has an estimated cost of USD 35 billion. A partnership between the City of Incheon and two private partners, the developer Gale International and construction manager POSCO E&C, a Korean steelmaker, was made in 2001. The project attracted considerable private investment from major financial institutions. Meanwhile, a number of architecture, engineering, design and technology firms are contributing to the development of the city, particularly in terms of green technology integration.

Ecological design features, underpinned by a strong technological coherence, make New Songdo City a futuristic and an advanced technology city. Green building design is an important element of the programme, and includes elements such as green roofs, passive solar design, and a number of buildings in accordance with the LEED standard. LED public lighting will be used. Measures to reduce the urban heat island effect, improve wastewater management and collect rainwater will be implemented. Further, Korean designers plan to capitalise on their comparative advantage in broadband investment by combining ITC technologies and clean technologies to widely diffuse the city's computer-based technologies. Designers intend to create an artificial intelligence environment and to provide customers with access to new terminals and services via appropriate interfaces. It is expected that the considerable investment required for the project will enhance the country's competitiveness.

Source: Alussi, A. *et al.* (2011), "Sustainable Cities: Oxymoron or the Shape of the Future?", working paper of the Harvard Business School, Boston.

that securing additional funding for developing green growth programmes beyond central government-driven projects remains a considerable challenge, given the generally low levels of self-reliance of sub-national governments in Korea.[5] Combining

public and private financing, as in the case of *Eco-Technopia 21*, could be a strong way forward.

b) Green existing industries: a focus on traditional strategic industries with reinforced support for SMEs

In the context of the Five-Year Plan's goals to green existing industries through waste reduction and recycling, energy efficiency measures, reduced resource consumption and increased support for SMEs, a number of local governments have developed plans to make traditional industries in the region more sustainable. Many local governments are targeting specific sectors with a strong local presence: the automobile industry (Busan, Ulsan), shipping (Ulsan), petrochemical industries (Ulsan), agriculture (Jeollanam-do, Gyeongsangbuk-do), fishing (Gyeongsangbuk-do) and cement (Gangwon-do). Increased energy efficiency in buildings is a priority for Seoul, Daegu and Chungcheongbuk-do (see Table 3.4). Although it would be premature to assess these greening initiatives, experiences elsewhere can provide relevant lessons. Lafarge, one of the world's largest cement companies, for example, succeeded in reducing GHG emissions by improvements to the energy efficiency of factories, the use of alternative fuels (*e.g.* biomass) to fire its cement kilns and the use of less harmful additives.

Because SMEs generally lack the financial resources and technical capacity to develop their own greening programmes, they have been the target of special workforce training programmes and targeted innovation support. Samsung Electronics has partnered with the Korean University of Technology (KUT) to establish the Advanced Technology Education Centre in support of technical training for Samsung-related SMEs. Intended to upgrade the skills of Samsung engineers, courses are provided in renewable energy, next-generation battery technology and LED application technology (Jeong, 2011). The Small and Medium Business Administration (SMBA) has launched a programme to enhance collaboration amongst industry, universities and research institutions by providing financial support for selected SMEs to develop skills and advanced technology. Jointly with local governments, the SMBA selects SMEs, awarding extra points to green businesses and provides 75% of the financing for spending on technological development. In 2010, the SMBA awarded KRW 56 billion to 1 228 projects (SMBA, 2011).

d) Policy infrastructure to promote job growth

Since the launch of the National Strategy for Green Growth, Korea has actively pursued the development of comprehensive policy infrastructure to promote job growth, namely with targeted workforce training and skills development programmes to help prepare workers in the transition to the green economy. To green Korea's regional public training institutions, the government introduced curriculum on renewable energy and green technologies in the regional polytechnical college system. Incorporating green technology courses in the 36-school polytechnical college system has led to the creation of 13 new departments related to green growth and the green economy, and 590 students have received training (Ministry of Employment and Labour, 2011). Curriculum reflects regional demands and links to local SMEs to develop the "core green workforce" for local businesses. In addition, the government has founded two specialised graduate schools, one focusing on climate change, supported by the Ministry of Environment, and the other on renewable energy, supported by the Ministry of Knowledge and Economy (Ministry of Employment and Labour, 2011).

To support collaboration among universities, industry and research institutions, the government initiated a joint research operation with Seoul National University and the Institute of Atomic Energy Research to research green technology (Ministry of Employment and Labour, 2011). The government is also making modifications to the national vocational qualification system in favour of green jobs specification by greening existing qualifications to embrace green skills and technology and introducing new green qualifications, such as engineers specialising in LED application development, photovoltaic systems or electric cars (Ministry of Employment and Labour, 2011). These efforts are laudable but could be combined with the regional innovation cluster system to help regionalise green technology industries and build on local strengths.

iii) Improve the quality of life and enhance Korea's international standing

The third strategic pillar of Korea's National Strategy for Green Growth seeks *a)* to improve the quality of life through the development of eco-cities, green building projects and green infrastructure, *b)* to encourage more sustainable consumption habits through public information campaigns, eco-tourism sites and voluntary participation in eco-lifestyle programmes, and *c)* to enhance Korea's international standing as a leader in green growth through participation in international negotiations and contributions to global climate change research.

a) Improving air quality in urban areas through eco-cities, green buildings and infrastructure

The government's urban planning guidelines and action plan for greening cities promote compact urban development through integrated land use and transportation planning in urban areas. These policy documents are complemented by model green city demonstration projects, designed to test new strategies and technologies for green urban development. The greening of the existing building stock and the expansion of public transit networks nevertheless represent the core urban sectors in which significant reductions in resource consumption and environmental degradation can be achieved: the building and transportation sectors are the most important energy end users and together accounted for nearly 40% of all CO_2 emissions in 2009. Since 1980, these sectors have increased their contribution to total levels of CO_2 emissions in both large and medium-sized cities.

Improving air quality in urban areas is a priority in Korea, which as mentioned in the previous section, registered the third-largest increase in NO_x emissions in the OECD area between 1990 and 2007, due to Korea's rapid economic growth and urbanisation processes and its expanding industrial sector. The Capital Region has been a particular focus of government action because, as mentioned previously, it displays some of the worst levels of air pollution among OECD countries (Jones and Yoo, 2010). With the objective of reducing air pollution in the Capital Region to the OECD average by 2014, the Korean government introduced an emission cap-and-trade programme in 2008 (Jones and Yoo, 2010). The system, which covers NO_x, SO_x and Total Suspended Particles in the Capital Region, began with large-scale emitters and was extended to mid-size emitters in January 2010 to cover a total of 136 factories in the Capital Region. The emission levels of the three pollutants are allocated to each source within the overall total limit. Emitters with excess pollution are able to purchase emission permits from those with surplus emission allowances. In case industrial emitters exceed their allocated amount, they have to pay a penalty charge, and their permissible emission level is reduced for the

following year (Jones and Yoo, 2010). The trading system applies only to fixed sources of emissions (primarily from industry), however, when vehicles are a major pollution source in the Capital Region, accounting for around half of NO_x emissions. Although the automobile fuel efficiency regulations introduced in 2006 have increased fuel efficiency, the standards remain well below those in EU countries and Japan (Jones and Yoo, 2010). Nevertheless, efforts could be strengthened in medium-sized cities, where increased industrialisation has led to rising concentrations of air pollutants. Policies to discourage travel by private vehicle (improvements to public transit and non-motorised travel networks, increased energy efficiency in vehicles to optimise energy consumption, as well as market-based instruments like parking tariffs and congestion charging) will be discussed in the next section.

A set of urban policy documents lays the foundation for *more compact, greener urban development*. The planning guidelines and action plan for greening cities were developed by the Ministry of Land, Transportation and Maritime Affairs (MLTM) to help guide the implementation of the National Strategy for Green Growth at the local level. The guidelines encourage local authorities to integrate environmentally sustainable spatial planning, building and transportation policies into local plans and call on local governments to determine current emission levels, establish reduction targets and evaluate local plans based on their potential to achieve energy efficiency. In particular, the action plan promotes compact city planning through transit-oriented developments to minimise urban sprawl and lower carbon emissions, the construction of intermodal transit centres in major railway stations and the management of dense urban centres through cutting-edge technology projects (such as the Ubiquitous City or Smart City initiatives) (Box 3.3). Although non-binding, these policy documents help to articulate concrete urban planning strategies for reducing emissions at the local level, and are intended to be easily incorporated into local planning goals.

Several *pilot projects to promote green cities* have also been implemented by different national authorities, with very similar objectives: the *EcoRich City Competition* project (Presidential Committee on Green Growth), the *Climate Change Adaptation Model City Project* (Ministry of Environment), the *Green City Project* (Ministry of the Environment), *Eco City Project* (Ministry of Environment), *Low-Carbon, Green Village Project* (a joint project involving six ministries), and guidelines for low-carbon, green cities (Ministry of Land, Transportation and Maritime Affairs). These projects aim to encourage locally tailored climate change actions and can be a useful tool for testing innovative urban planning strategies and green technological development, such as smart grids. Nevertheless, conflicts have emerged amongst ministries in the management of these at times competing green growth demonstration projects (Box 3.4). Better co-ordination among ministries could help to unlock synergies between similar projects, on the one hand, and limit redundancies to better disseminate scarce public resources on the other hand.

Greening infrastructure is an essential pillar of the Korean Green Growth Strategy. As previously mentioned, the building and transportation sectors in Korea are among the most important energy end users. Given the rapid growth rate of the Korean economy, the relatively low price of fossil fuels and the uncertain and slow process of shifting to other energy sources, CO_2 emissions are likely to increase substantially in these two sectors in the near future without additional policy measures to slow this trend. Greening the building and transportation sectors will be essential to achieve green growth objectives at the urban scale – not just because these sectors are responsible for

Box 3.3. **Action plan for greening cities**

In November 2009, the Ministry of Land, Transportation and Maritime Affairs (MLTM) proposed an action plan for greening cities to help local authorities integrate environmentally sustainable spatial planning, building and transportation policies into local plans.

Green urban planning

- *Implement compact city planning principles* through transit-oriented development (TOD), the development of intermodal transit centres in major railway stations, and the efficient management of densely populated urban centres through cutting-edge technological initiatives, such as the Ubiquitous City or Smart City projects.
- *Improve resource management systems* by expanding automatic waste collection systems, developing comprehensive energy management systems to utilise energy from multiple sources and introducing a rainwater collection system.
- *Securing ecological urban green spaces* by revitalising the urban river system (streamlets, swamps and reservoirs), requiring the provision of open space near high-density developments, permitting commercial facilities to be established in public parks and restoring the deteriorated Greenbelt Zones.

Green building

- *Strengthen energy efficiency provisions in building codes* by imposing stricter insulation standards, introducing an annual energy consumption limit on new constructions and achieving "zero-energy" buildings in the residential and non-residential sector by 2025.
- *Provide 1 million green homes by 2018* by supporting the Public Housing Corporation's annual target of 100 000 green homes between 2009 and 2018 and reducing energy consumption in the residential sector by 30%.
- *Support green building R&D* by developing leading green building technology, training design and construction engineers and providing low-interest loans to improve the energy efficiency of existing buildings.

Green transportation

- *Prioritise low-carbon infrastructure investments* by increasing the share of national Social Overhead Capital (SOC) spending to railways from 29.3% to 50% by 2020 and restricting road investments from 57.2% to 40% by 2020.
- *Control traffic demand* through the expansion of congestion charges in major cities, more efficient road uses (via the Intelligent Transport System) and introducing a *Green Traffic Priority Region* to manage areas of heavy traffic.
- *Expand pedestrian and bicycle infrastructure*, through the development of pedestrian priority districts and the construction of 3 114 km of bicycle lanes by 2018.
- *Promote public transit use* by expanding bus rapid transit (BRT) lanes, expanding the metropolitan-wide railway and completing the second bullet train line, connecting Seoul to Gwangju.
- *Promote transit-oriented development and green transportation* through the construction of a Multi-Modal Transfer Center (MMTC). As a first step, the Ministry of Land, Transport and Maritime Affairs established the *Five-Year Multi-Modal Transfer Centre Development Master Plan (2011-15)* in 2010. Under the Master Plan, MLTM hopes that nearly 15 multi-modal transfer centres will be constructed by 2015. In particular, rail station areas will be developed as mixed-use and high-density areas that reduce journey time from home to work. Total expenditures for the project are anticipated at KRW 4 trillion, to be funded mainly by the private sector. Eight trial stations were designated in 2010: Dongdaegu,

Box 3.3. **Action plan for greening cities** *(cont.)*

Iksan, Ulsan, Songjeong, Bujeon, Dongrae, Daegok and Nanchuncheon. This plan's key objectives are as follows:

- concentrate transport facilities such as railway stations and bus terminals in each multi-modal transfer centre, to reduce transferring time/distance by 50% and improve convenience for travelers;
- connect the public transport services lines within the multi-modal transfer centres;
- develop multi-modal transit centers as multi-functional areas by installing various neighborhood living facilities, such as commercial services, cultural facilities and offices; and
- promote non-motorised transport (walking and cycling) around multi-modal transfer centres by reinforcing regulations including designating public transport exclusive zones or pedestrian exclusive zones.

Ubiquitous City (U-City) is a Korean urban development model that seeks to overcome the fundamental limitations of development in traditional cities by integrating cutting-edge IT technology into urban space and creating a sustainable, human-oriented city. The main purpose of the U-city model is to provide residents with real-time traffic data, e-medical support and disaster information by using advanced IT infrastructure. The U-city model is believed to offer urban service more efficiently and improve responsiveness to natural disaster. Beginning with Dongtan U-City (located in Hwaseong-si), completed in September 2008, 36 local authorities (52 district areas) have actively introduced U-City urban development projects. More recently, the U-City model has been enhanced to include a greater focus on ecological technology, in the U-eco city model.

Source: MLTM (2009) "Greening Urban and Building Initiative", MLTM, Gyeonggi-do.

Box 3.4. **Conflicts among stakeholders in the Gangneung-si green city demonstration project**

In 2009, the Korean government declared its intention to build a low-carbon, green city in Gangneung-si, located in Gangwon-do, on the eastern coast of Korea. The project aimed to enhance the city's capabilities of carbon reduction and maximise its green growth potential. The Korean government expected this project to establish the model of a Green City to disperse to other cities. However, the project was controversial from an early stage. Various stakeholders, including the Ministry of Land, Transport, and Maritime Affairs, the Ministry of the Environment, and the local government of Gangwon-do were at the heart of the controversy. The concept was a controversial topic between MLTM and MOE (Ministry of Environment), since MOE focused on environmental protection, while MLTM stressed the development process or a maximisation of return on investment (ROI). Ministries also had conflicts with municipalities; Gangwon-do attempted to expand the scope of the project while expecting financial support from the central government. The central government, meanwhile, intended to conduct the project in stages while maximising ROI. The central government also wanted local government to fund much of the project. To resolve the conflict, several instruments, such as discussion and seminars, were employed, resulting in a Memorandum of Understanding for collaboration signed by MLTM, MOE and the Gwangwon-do and Gangneung city governments. In January 2010, MLTM and MOE announced the *Basic Strategy for Building Gangneung Green City*, to be completed by 2016. Many controversies seem to be settled by this basic strategy. However, challenges such as consolidation of spatial and environmental policies and securing funds remain.

Source: Wang, K.I. (2009), "A Low-Carbon Green City Project in Korea", proceedings of the United Nations Project Office on Governance Session in the Fifth Initiative Conference: Governance Strategies for Pro-environmental Urban Policies in Developing Countries, Jeollabuk-do, 6 July.

high levels of energy intensity and greenhouse gas emissions, but also because they have the potential to stimulate local job growth and, in most cases, fall within the purview of sub-national governments.

The *building sector* is one of the most energy-intensive sectors in the Korean economy: residential and commercial buildings combined account for 19.62% of domestic energy consumption in 2009, an increase of 155% since 1980 (Korea Statistics Office, 2011). To reduce emissions in the building sector, the government plans to *i)* strengthen the regulatory environment of the building sector through updated building codes and reinforced energy-efficiency standards for public buildings and new construction, *ii)* support green building by providing technical and financial support to the private sector and, in some cases, developing large-scale green building retrofit projects, and *iii)* increase the supply of green buildings, with the construction of one million green homes in the Bogeumjari district and the retrofitting of 9 000 rental apartments. These projects are to be complemented by the construction of fourteen *Environment Energy Towns* and 800 low-carbon, green villages in eight distinct geographical zones of Korea.

At the local level, Seoul has been recognised by the Clinton Foundation as an international leader in green building retrofit projects. The first phase targeted public building retrofits, while the second phase expanded the project to the private sector. Improving the energy efficiency of historical buildings is a special challenge in Seoul. City authorities are currently working with the national government to revise regulations for new building construction standards. In 2007, the city created the Green Architecture Standards, equivalent to the LEED standard, as an institutional device to reduce greenhouse gas emissions from the building sector. New public buildings in Seoul are required to meet the green standard, while incentives are given to private sector partners in the form of acquisition and registration tax cuts.

With the *transportation sector* accounting for over 19.7% of total energy consumption in 2009 (Korea Statistics Office, 2011), Korea aims to cut transport-related emissions by enhancing energy efficiency and developing renewable energy resources. Plans to develop renewable fuel standards, for example, will help make biodiesel and biogas available for private and public vehicles and increase the share of biodiesel to 3% of fuel demand in the transportation sector by 2012, and to 7% by 2020 (UNEP, 2009).

Coupled with densification policies, improvements to the transportation network can stimulate increased public transportation ridership, cycling and walking, which can in turn lead to reductions in greenhouse gas emissions. Improvements to the public transportation system are planned to increase the share of public transportation to 55% of total transport activity by 2013 (Presidential Commission on Green Growth in Korea, 2009). The expansion of the high-speed train system is one of the flagship transportation projects of the Five-Year Plan. The Five-Year Plan also calls for the creation of over 3 000 km of bike lanes in urban areas, which is expected to increase the share of bicycle use from 1.5% in 2009 to 5% in 2013. Approximately USD 8.5 billion will be invested in the greening of the transportation network, which is expected to create 16 000 new jobs (Cho, 2009).

In their five-year plans, many metropolitan/*do* governments intend to curb greenhouse gas emissions by developing local and regional transportation network improvements. Daegu, Daejeon, Gyeonggi-do, Jeollanam-do, Gyeongsangbuk-do and Jeju all include specific transportation measures in their local action plans. Gyeongsangbuk-do, for

example, plans to build a hydrogen highway along the eastern coast of Korea. Several urban areas with major public infrastructure facilities and networks (ports, airports, subways) plan to green the infrastructure or to develop green projects around these facilities. Daejeon, for example, plans to expand the subway system with the construction of a new line; Busan plans to develop a smart grid cluster around the new port.

To complement the measures undertaken by the central government, the city of Seoul has been active in its efforts to reduce air pollution levels through a series of policies meant to stimulate low-carbon transportation: improvements to the public transportation system, investments in hybrid taxis and electric buses, subsidies for transport companies willing to switch to green vehicles and discounts to motorists who drive electric cars. For the past several decades, Seoul has been a leader in green transportation and continues to innovate (Box 3.5), in particular toward Transit Oriented Development (TOD), which is considered an effective means to foster compact city development as well as economic development of local areas.

b) Toward more sustainable consumption habits: public awareness campaigns, eco-tourism, eco-lifestyle programmes

Korea's National Strategy for Green Growth proposes to "bring the green revolution into daily life" by promoting green growth in regular school curricula and education for adults, developing a green lifestyle index for citizens with incentives (such as a carbon point system), creating carbon footprint labeling and certification systems for goods, implementing a voluntary low-carbon smart village movement and developing eco-tourism sites and practices. A recent OECD survey of ten countries found that environmental pressures resulting from household behaviour are significant, and their impacts are projected to increase in the future (OECD, 2011c). While great variation across surveyed countries was observed in the case of charging consumers for environmental services, Korea represented one of the countries in which nearly 80% of households were charged for water consumption on a per-unit basis. Recognition of energy-efficient appliances in Korea was among the highest of countries surveyed, at 96%. Nevertheless, the difference between the level of recognition of appliance energy-efficiency labels and reported installation was also high in most countries surveyed, including Korea. However, in terms of public transport access, compared to respondents in other surveyed countries, urban and suburban households in Korea were less likely to live within 15 minutes from a public transport stop or station. Korea also recorded one of the lowest levels of government support to households installing energy efficient items (13%). The findings prompted a number of cross-cutting policy lessons (Box 3.6).

Local and regional governments can go a long way to increasing local green consumption by financing arrangements that reduce the upfront cost hurdles and unit costs of distributed energy technologies. Marginal price incentives can shift the preferences of more sensitive consumers. Direct observation and imitation by other consumers can then lead to wider market penetration. The City of Berkeley's *Financing Initiative for Renewable and Solar Technology* (FIRST) programme reduces cost hurdles by providing loans to homeowners to purchase and install solar photovoltaic systems at interest rates and payback periods similar to those for home mortgages. Borrowers repay the city through an additional, transferrable tax added to their annual property taxes. The California Public Utilities Commission (CPUC) developed a state-wide Solar Hot Water

Box 3.5. **Green transport in Seoul**

In 2009, the transport sector was responsible for 19.7% of greenhouse gas emissions in Korea (Korea Energy Economics Institute, 2010), 80% of which result from road-based transport (Hwang and Park, 2010). With over 10 million residents within city limits and 22 million in the greater metropolitan area, Seoul is home to one of the largest global transport networks. Roughly 65% of the population commutes on public transport, namely bus and rail services; 2.2 million personal vehicles also travel within the city. Costs of congestion associated with personal vehicle usage at peak hours exceed USD 8 billion per year (Pucher *et al.*, 2005).

For the past several decades, Seoul has relied on a mix of policies to respond to increasing congestion, in an effort to green its transport system. The city's approach integrates financial incentives, monitoring mechanisms and infrastructure investment programmes that are designed to improve urban attractiveness, economic productivity and environmental quality of life in the metropolitan area. The programme's primary intent is to reduce the amount of private car usage within the city limits. Improvements in public transportation accessibility and performance are simultaneously coupled with disincentives toward using personal vehicles. In addition, the city has taken steps to encourage walking and bicycle usage to further green transportation modes by providing car-free pedestrian walkways and bicycle lanes.

Specific policy initiatives include:

- *Greening of the public fleet:* Since 2004, the government has increased its involvement in bus service planning and system upgrades. The Seoul Municipal Government has converted approximately 95% of its bus fleet's fuel sources from traditional diesel engines to concentrated natural gas (CNG), a cleaner-burning source. The bus rapid transit programme (BRT), which has expanded bus routes and designated dedicated bus lanes, aims to improve average bus speed by approximately 82% while reducing accident rates by 13%. Improved bus design and accessibility should increase passenger capacity by nearly 40%. In addition to bus service renovations, Seoul is in the process of constructing an additional 159 km of subway rails (expected to be completed by 2019), which will accommodate an anticipated increase in ridership from 35% to over 50%. However, total underground rail construction accounts for roughly 80% of city public debt, with half of this amount absorbed by the national government.
- *Voluntary "no driving day":* Through the Commute Trip Reduction programme, financial incentives are offered to drivers that volunteer to find an alternative method of commuting on given days. Within the first two years of the programme, 750 000 vehicles had registered, approximately 34% of the total pool of private cars. Participants are eligible for a 5% reduction in their automobile tax, reduced congestion charges and parking fee discounts. The city deployed radio frequency identification stations, the e-Tag system, which provides communal parking in designated areas adjacent to public transport facilities in order to monitor compliance of registered participants. With one million cars participating, it is estimated that the programme could result in a nearly 10% reduction in air pollutants and greenhouse gas equivalents, while also decreasing congestion by roughly 10%. Social costs are projected to be reduced by a total of USD 754 million in annual savings.
- *Travel demand management:* Since 1996, congestion charges levying fees at peak travel hours have helped curb private automobile use in Seoul, reduce downtown traffic by approximately 13% and improve average travel speed by over 80%. The T-Money transportation card enables passengers to transfer between different modes of public transportation in the metropolitan region for free or at a discounted rate, further reducing barriers to adopting public transportation over personal vehicle.
- *Urban design to accommodate electric vehicles:* In collaboration with the Korea Advanced Institute of Science and Technology (KAIST), Seoul is investigating the implementation of electric vehicles for private and public modes of transportation. Installing electric recharging strips on 10-20% of the cities' roads could enable all road-based transportation to operate electrically continuously, without having to recharge at a station.

Source: Pucher, John *et al.* (2005), "Public Transport in Seoul: Meeting Burgeoning Travel Demands of a Megacity", *Public Transport International*, May/June 2005, Vol. 54, No. 3, pp. 54-61; Mok, Y.M. (2009), "Environment-Friendly Traffic Demand Management in Seoul", C40 Climate Change Summit, Seoul Metropolitan Government, Seoul, 18 May 2009.

Box 3.6. **OECD policy recommendations for greening household behaviour**

To reach a better understanding of the factors driving households' environment-related decisions, in order to inform policy design and implementation, a study of household behaviour was conducted by the OECD in ten countries. Five areas of particular concern to the decision makers, given their environmental significance, were examined: residential energy use, domestic water consumption, waste generation and recycling, organic food consumption and personal transport choices. The findings prompted a number of cross-cutting policy lessons.

First, providing **the right incentives** is key. The role played by incentive-based instruments to spur behavioural change is clearly confirmed. Metering and billing encourage energy and water savings. Households charged for the water they use are also more likely to install water-efficient equipment at home and consume approximately 20% less water. In addition, waste charges increase recycling volumes and affect waste prevention behaviour. Finally, fuel costs are found to have a negative effect on car use, confirming the existing literature. Survey results suggest that changing relative prices (for electricity, water and fuel) is necessary if emissions are to be reduced and natural resources to be conserved. While measures that have a direct effect on prices, such as charges or taxes, appear to be necessary, they do not prove to always be sufficient, particularly for pressing environmental concerns.

The impacts of economic incentives may be limited in the short term, but increase with time, particularly in the areas of transport, energy or water, as consumers adjust their holdings of durable equipment and invest in energy-efficient or water-efficient appliances. In a similar way, the response to the introduction of fuel-related taxes is limited in the first instance to reducing the use of motor vehicles, while, in the medium term, households can change vehicles, or even travel mode. In the longer term, the choice of location of residence may be adjusted to increase the proximity to public transportation. Attention should also be paid to distributional concerns. For instance, the survey provides new evidence that low-income households are the most adversely affected by increases in water charges.

Second, **information and awareness** play a significant role. These "softer" instruments, based on the provision of information to consumers, as well as education, can have an even more substantial complementary role to induce changes on the demand side than previously expected. The environmental awareness of consumers has a clear influence on a number of household decisions. For example, environmental awareness is a main driver for water-saving behaviours and reduces the likelihood of owning a car. Concern for the environment also influences demand for energy-efficient appliances and renewable energy, as well as the intensity of waste recycling and decisions to consume organic food. This indicates that an important task for governments may be to multiply information campaigns in order to raise the environmental awareness of the public. This may spur behavioural change, but can also help to increase the political acceptability of environmental policies, facilitating their implementation. Governments have a significant role to play to promote "greener" behaviour by increasing the general level of educational attainment, as well as through targeted public information campaigns.

Third, consumers tend to make greener and more informed decisions when **eco-labels** are clear and comprehensible. As such, measures that encourage ease of identification and understanding of eco-labels are likely to be more effective. Moreover, labels prove to be particularly effective if they relate to both the public and private benefits of the good or service. An example is the reduced energy bill resulting from energy-saving behaviour that also leads to a reduction in greenhouse gas emissions.

Fourth, ***the role of norms***, particularly in households' motivation to recycle material or not, can also be significant. Policies have an effect on people's intrinsic and social norms, and policy makers need to take into account the effect of different policy measures on norms. For instance, some measures may result in reduced voluntary provision of the good in question. This also suggests that information policy and training programmes to help make informed decisions can play a role in stimulating personal motives by stressing the social aspects of environment-friendly behaviours such as recycling and waste prevention.

Box 3.6. **OECD policy recommendations for greening household behaviour** *(cont.)*

Fifth, ***supply-side measures*** should also be implemented to green household behaviour, as they can increase the range of substitution possibilities. Governments have a significant role to play. In a number of areas (transport, recycling, energy) the provision of adequate infrastructure and services can have an impact at least as important, if not more important than relative prices. Moreover, environmental policy measures tend to have a more significant effect on individual behaviour when implemented in combination with investments in related environmental services. Access to public transport affects car ownership and car use. Installing meters also encourages people to reduce energy and water consumption, through both behavioural change and investment in more efficient appliances. However, it is important to bear in mind the administrative costs associated with the provision of infrastructures. Also, some environment-friendly decisions tend to be only weakly driven by demand and thus may rely heavily upon complementary measures targeting the supply side (particularly in the case of renewable energy).

Finally, in many cases, using ***a mix of instruments*** is likely to increase the impact of environmental policies targeting behavioural change. When implementing policy packages, it is important to keep in mind that there may be a significant time-lag for households to adjust. Taking into account this lag in the responsiveness to price incentives is particularly important when addressing certain environmental concerns (such as water scarcity). Further, the time horizon involved in decision-making processes can vary significantly across policy areas, where short-term responses may be smaller as households adjust their stock of durables and invest in more efficient equipment, limiting the overall reduction in consumption levels early on. The impact of pricing can be more significant in the long term, but well-designed information-based measures can make a difference in the short term. Attention should also be paid to potential redundancy and conflicting effects when applying a package of measures to target a similar externality.

Source: OECD (2011c), *Greening Household Behaviour: The Role of Public Policy*, OECD Publishing, Paris.

(SHW) incentive programme. The proposed incentive amount for residential SWH systems is expected to be about USD 1 500 per system on average. Effective programmes to facilitate and reduce the cost of green investments often involve multilevel governance co-ordination between national, regional and local governments (OECD, 2010a; IEA, 2009).

Some local governments have taken an active role in raising public awareness on green growth. The Green Start Movement, a nationwide movement in Korea focused on reducing non-industrial greenhouse gas emissions, mainly through voluntary citizen participation and actions, is a good example. The Green Start Network, established in 2003 to support the Green Start Movement to spread a low-carbon lifestyle and now existing in over 200 cities and *gun,* is composed of representatives of the media, industry, religious groups, and civil and governmental organisations. Local Green Networks emphasise green growth education and awareness events. Seoul in particular, operates an Eco Mileage programme, whereby citizens receive "eco-miles" for achieving reductions in GHG from electricity, water, and gas consumption. Eco-mileage can then be used to buy eco-friendly products, such as LEP lamps, energy-efficient appliances and hybrid vehicles. Changwon-si, a medium-sized city, has also developed a voluntary carbon mileage programme to encourage citizens to reduce emissions. Participating households and businesses receive tips for cutting emissions in daily operations and are then awarded vouchers for reducing their carbon consumption, based on historical

electricity and water consumption records. The city plans to expand the programme to include gas and transportation consumption (C40 Cities, 2011).

The government's low-carbon, green village project aims to establish energy self-reliant villages by installing renewable energy-generating facilities (biomass, wind and water) in rural areas to provide power to the village. The green villages are expected to generate employment and boost local economies, while reducing energy consumption from fossil fuels. By 2010, four ministries or government agencies (Ministry of the Environment, Ministry of Public Administration and Security, Ministry of Food, Agriculture, Forestry and Fisheries and Korea Forest Service) had launched separate demonstration projects, which included feasibility studies and public hearings. The pilot projects will be assessed by the government to help determine the next phase of the programme and the responsibilities of each ministry. Currently, the projects are financed by the national government, with varying amounts of financial support from local governments.

The Four Major Rivers Restoration project includes a plan to develop a number of eco-tourism sites (Box 3.1). In their five-year plans, other metropolitan/*do* governments indicate plans to develop eco-tourism sites. Suncheon-si, a small city located on the southern coast of Jeollabuk-do, has pursued wetlands restoration in the Suncheon Bay as a means of eco-tourism. While surrounding areas devoted wetlands to industrial purposes (petro-chemical plants and steel mills), Suncheon-si restored the wetlands to provide habitat for migratory birds and ecological tourist attractions. The conservation efforts have created 6 400 jobs and USD 100 million in economic benefits from tourism (United Nations Economic and Social Commission for Asia and the Pacific, 2010).

c) Enhance Korea's status as a global leader in green growth: a global institute for green growth and financing mechanisms for developing countries

In an effort to enhance Korea's status as a global leader in green growth, Korea launched the Global Green Growth Institute (GGGI) in 2010. The Institute is envisioned as a global think-tank for green growth in developed and developing countries. Supported by a global network of representatives from universities, international organisations, research institutions and interest groups, the GGGI is headquartered in Seoul, with regional offices to be opened in developed and developing countries. The Korean government hopes over time to transform the legal status of the GGI from a non-profit to an intergovernmental organisation. An initial USD 10 million annual investment is promised by the Korean government for the first three years (GGGI, 2010).

Korea will offer assistance and co-operation to neighbouring developing countries in Asia through the East Asia Climate Partnership. Korea will also increase the amount of official development assistance, and raise the share of green development assistance from 11% in 2007 to 20% in 2013 and 30% in 2020. Contributions to multi-lateral organisations, such as the UN Global Environment Facility, will be expanded.

At the sub-national level, a handful of Korean cities have taken part in international networks of cities, such as the Clinton Foundation's C40 Climate Leadership Group, of which Seoul is a participating city and Changwon is an affiliate city.

3.2. Challenges to advance an Urban Green Growth Agenda

An international leader in green growth with a clear recognition of the urban dimension

Korea's vision for green growth stemmed from an acute recognition of the limits of the country's previous growth paradigm, which was based on increasing environmental pressures and the over-exploitation of resources. The *Green New Deal* was conceived and implemented as a way for the country to foster long-term sustainable growth. Two strategies have been developed to achieve this objective, the first focusing on short-term recovery and the second oriented to facilitate growth in the long term. The short-term strategy aims to boost the labour market with massive investments in infrastructure, to facilitate the production switch toward less energy-intensive activities. This strategy was conceived as a short-term response to the financial crisis. The second, longer-term strategy is a voluntary industrial policy to enable a structural change in Korea's economic development path by enhancing its global competiveness in the green technology sector, which has been identified as the future engine of sustainable growth.

Despite the difficulty in provoking structural change – especially in such a critical period for the global economy, which renders the net outcome of ambitious green growth policy plans uncertain – there is good confidence in the potential impacts of Korea's strategy on environmental and economic performance. Korea's integrated approach to green growth, which is structured around ten strategic axes that are in turn associated with concrete projects and corresponding evaluation methods, is a potential benchmark for similar policy initiatives. Korea's National Strategy for Green Growth combines several macro-areas of policy action into an integrated and coherent policy framework: an economic master plan, a set of environmental regulations, a climate agreement and a carbon tax proposal. This capacity to assemble a wealth of sensitive issues in the current political and economic debate can prove essential to pave the way toward a broader and more global paradigm shift.

While Korea's strategy is not the only attempt to foster greener growth worldwide, it certainly represents the first, largest and most organised policy approach to green growth thus far. Integrating the multiple dimensions of green growth into a single, coherent policy framework represents a truly innovative approach. Further, the massive investment capacity mobilised in the green technology sector signifies not only an important milestone toward more sustainable development for the country, but is especially aimed at increasing the competitiveness of the domestic economy in the rapidly growing international market for green technology.

With the largest investment package dedicated to sustainability and green growth strategies among OECD countries, Korea has been instrumental in shaping the international green growth agenda and establishing itself as a green growth leader. In addition to the dedication of considerable financial resources, since the Presidential Decree in 2009 the government has laid the foundation for a comprehensive policy and institutional framework to enable the transition to low-carbon green growth. Korea's National Strategy, coupled with the Five-Year Plan, combines both a long-term vision for green growth with short-term job creation programmes. Driven by strong political will at the national level, the green growth strategy enjoys broad support among ministries and the compliance of metropolitan city and provincial (*do*) governments, as well as lower tiers of government.

At the sub-national scale, Korea's national strategy has attached a strong emphasis to the local/spatial dimension of green growth by identifying urban planning, transport, buildings and infrastructure as key determinants of policy effectiveness toward green growth. In many countries, translating the multi-dimensional and often unwieldy concept of green growth into concrete actions at the local and regional scale, where action can be most concrete and effective, is a difficult one. With few exceptions, the spatial dimension of the economy tends to be underestimated as a driver of green growth in most OECD countries. Korea is nevertheless an exception that merits considerable attention.

Given that the implementation of Korea's National Strategy for Green Growth is still in its early stages, a robust assessment of its economic and environmental impacts at the local scale would be premature. This section will assess a set of policies and governance challenges that should be addressed to further advance Korea's urban green growth agenda, as defined in the three pillars of the strategy. First, it will focus on the *economic instruments and planning policies for greening urban transportation and building* – two key sectors for achieving green economic development – which can provide valuable responses to curb carbon emissions. Second, given the breadth of issues covered by the Korea green growth agenda, collaboration across and within different tiers of government is required, as is co-operation with the business community. The second part will thus discuss *governance challenges to advancing an urban green growth agenda*. We will use the OECD Multilevel Governance Framework, adapted for an Urban Green Growth Agenda (Hammer *et al*., 2011), to discuss obstacles to effective implementation of the Korea green growth agenda at the sub-national level.

Strengthening the urban dimension by addressing transport and building

Korea's National Strategy for Green Growth acknowledges the importance of focusing on a complementary, local approach to green growth and gives regional and urban policies the important role they deserve in achieving green growth. The sustainable use of land and space, particularly in terms of transportation planning and increased energy efficiency in the building sector, are at the core of this programme.

Urban land use and its functions can be shaped by a number of spatial policy instruments, notably land use zoning, which regulates density (and thus height) of buildings and investments in infrastructure. In addition, changes in the modal split, shifting from the use of private vehicles to energy-efficient transport modes like walking, biking and public transport, can lead to a reduction in transport-related GHG emissions and in the amount of energy required for heating. This section assesses the extent to which a range of economic instruments and policy tools have been used in Korea to foster urban green economic development in the transportation and building sectors, and provides policy recommendations for strengthening their effectiveness in realising economic and environmental objectives.

i) Why the spatial dimension of transport and building matters for green growth

How cities grow and operate matters for energy and resource demand. It is not cities, or urbanisation *per se*, that contribute to greenhouse gas emissions and resource demand, but rather the way in which people move around the city, the sprawling spatial patterns they produce, the way in which people use energy at home and how buildings are heated that make cities great consumers of energy and polluters. While urbanisation is linked to increased carbon emissions, not all urban areas contribute to emissions equally.

Transportation demand, urban design and density, and spatial organisation are key factors that influence energy consumption and resulting GHG emissions.

Transport demand is shaped by both urban form and density, affecting travel distances in urban areas, mainly through commuting. Denser urban areas may experience higher levels of congestion, yet they also hold the potential for robust transportation linkages and the shift to more energy-efficient modes of travel. In accordance with previous findings for the US (Ryan and McNelly, 1995), recent empirical simulations on European cities reveal the potential for spatial planning at the urban scale to reduce average travel distance of 10% (25% when increasing density to its maximum degree), which in turn would lead to reduced carbon emission from urban transport by 11% (31% under maximum density) (Box 3.7) (Grazi *et al.*, 2008).

In the building sector, residential and commercial settlement patterns impact the size of dwellings and office buildings. For a given urbanised area, a higher population density implies less available space for individuals. This, in turn, influences the type and amount of energy required for daily activities (heating, cooling, etc.). At the same time, scarce aeration due to the physical proximity of buildings, coupled with the replacement of vegetation by impermeable surfaces that retain heat (such as asphalt) can also contribute to the urban heat island effect, in which urban areas become warmer than nearby rural areas, particularly at night. Urban land use and its functions are shaped by a number of spatial policy instruments, notably through zoning, regulating density and building height, and infrastructure investments (in roads, public transportation or amenities for cycling

Box 3.7. **An empirical analysis of the impact of urban form on transport-related carbon emissions**

To measure the impact of urban form on individuals' travel behaviour and, consequently, environmental quality, Grazi *et al.* (2008) performed an instrumental variable econometric analysis of the influence of urban density on greenhouse gas emissions related to commuting behavior.

The findings from this study indicate that a higher urban density is likely to lead to a change in travel behaviour. The magnitude and direction of this change are observed by modal shifts in individual travel choices, from motorised vehicle use to other transport modes, notably public transport, bicycling and walking. The estimates show that in locations where density is 30% higher, CO_2 emissions from transport are on average 15% lower.

The main implication of this finding is that policies that try to enforce or stimulate a higher density of activities may have a favourable effect on reducing CO_2 emissions. For instance, if targeted urban policies resulted in 10% of the workforce settling in high-density areas rather than low-density areas, the reduction in CO_2 would be about 5%. To achieve more substantial changes in density, indirect or general equilibrium type of effects may have to be taken into consideration.

Urban form, and policies that affect urban form, such as land use and transportation planning, deserve more attention in climate policy debates because they can contribute to significant reductions in greenhouse gases.

Source: Grazi *et al.* (2008), "An Empirical Analysis of Urban Form, Transport, and Global Warming", *The Energy Journal*, Vol. 29, No. 4, IAEE, Cleveland.

and walking). In addition, changes in modal split, which shift the scales from private vehicle use in favour of energy-efficient transport modes like walking, biking and public transport, can reduce transport-related GHG emissions, as well as the energy required for heating.

Modelling and analysis of the impacts of climate change policies on emissions reduction have long been dominated by aggregate approaches with a national and international perspective. The role of spatial organisation, including land use planning and urban form, has often been neglected in these macro-analyses, along with its impacts on transport. Nevertheless, a growing body of research affirms that land use and transportation are inextricably linked. Research in the US provides evidence that transportation investments and policies influence development patterns, particularly development that occurs along highway corridors or at interchanges. At the same time, development patterns shape travel patterns, insofar as the design of suburban areas makes transit and walking a challenge, or the separation between land uses in low-density developments makes driving a necessity (Handy, 2005). As a result, transportation investments can contribute to sprawl, as evidenced in the case of highway development, but can also potentially be used as strategies to help fight sprawl (with investments in public transit, for example). Efforts to reduce energy use and greenhouse emissions benefit from dense urban form. As density increases, CO_2 emissions from transport go down, as does per capita electricity demand (OECD, 2010c).

Integrated transportation and land use planning efforts can lead to significant reductions in greenhouse gas emissions. A number of policy tools exist to facilitate compact development, through mixing land-uses, improving mass transit services and providing urban amenities. These include reducing existing regulatory barriers to more compact development, including barriers to mixed-use, transit-oriented and brownfields development, accompanied by fiscal reform that internalises environmental and public services costs incurred by new development and concentrates urban amenities and services in priority growth areas. These instruments, and the extent to which they are relevant to the case of Korean cities, are examined in further detail below.

ii) Policy instruments for greening urban transportation in Korea

As mentioned in Chapter 1, energy use from the transportation sector in Korea accounted for 19.7% of total domestic energy demand in 2009 (KEEI, 2011). From an aggregate national policy standpoint, Korea's National Strategy for Green Growth proposes to cut transport-related emissions by enhancing energy efficiency and developing new and renewable energies. In particular, renewable fuel standards are to be developed in order to make biodiesel and biogas available for private and public vehicles, with the goal of biodiesel reaching 3% of fuel demand in the transportation sector by 2012, and 7% by 2020 (UNEP, 2009).

While the promotion of renewable energy sources will be crucial to meeting the stabilisation target of transport-related emissions in Korea, complementary, local transportation and land-use measures will also be necessary. First, Korea aims to increase the share of public transit to 55% of all transport activity by 2013 (PCGG, 2009). Green transportation interventions include the planned expansion of the railroad networks, with the objective of increasing train ridership from 18% in 2009 to 22% in 2013, in addition to the construction of multi-modal transportation centres in urban areas. The greening of the transportation network will be possible due to relevant investment capacity (around

USD 8.5 billion) and is expected to create 16 000 new jobs (Cho, 2009). Land-use zoning changes and densification policies are expected to reduce average commuting distances and travel time, thus encouraging individuals to switch from private vehicles to public transportation. Finally, to increase the rate of bicycle use from 1.5% in 2009 to 5% by 2013, the government plans to construct 3 114 km of new bike lanes (PCGG, 2009).

This section examines a range of market-based and nonmarket-based instruments that can be used to green the transportation sector. While market-based instruments tend to be effective in the short term (EPA, 2006; EEA, 2007), the role of complementary spatial planning and other regulatory measures may be important in the longer run. Moreover, a distinction should be made on the basis of the direct *versus* indirect impacts of the instruments on the target. On the one hand, some market-based instruments may directly reduce the average demand for transport in urban areas or promote a shift in modal split toward less energy-intensive travel modes (for commuting especially). On the other hand, acting on the spatial structure of the economy through physical planning can be seen as an indirect instrument to alter individuals' travel behaviour (Grazi and van den Bergh, 2009).

These measures can contribute to reductions in transport-related GHG emissions by inducing changes to the modal split, increasing the energy efficiency of vehicles and transport infrastructure, encouraging (or discouraging) the use of certain fuels, and reducing congestion and transport volume. In meeting this global objective, most options give rise to various co-benefits as well, in terms of reduced local pollution and improved quality of life and health.

Market-based instruments. Market-based instruments, such as fees, tariffs, taxes or tradable permit schemes, are generally cost-effective tools to achieve environmental goals, such as emission reduction targets, as captured by equalisation among polluters of marginal abatement costs. What is more, pricing instruments can stimulate the search for new investments or innovation through R&D, thereby reducing the monetary burden, *e.g.* the payment of an environmental tax (Perman *et al.*, 2003).

In the context of curbing GHG emissions from urban transport, three different price instruments will be examined:

- *Parking tariffs.* Parking tariffs can help stimulate the shift from private to public transport modes and/or discourage non-residents from using their automobiles, resulting in lower GHG emissions. Some parking tariff schemes increase the hourly cost of parking and/or limit the available parking time; others distinguish between residents and other users of public urban parking spaces (Calthorpe, 2000). In Korea, local governments have the authority to apply parking tariffs in cities. Most Korean local governments currently operate their own parking tariff policies, although the policy structure is relatively simple in most areas (*e.g.* a single tariff charged in proportion to the time parked, with an exemption for the disabled). Changing the tariff policy is often met with opposition from residents. Depending on the source of the vehicles (*e.g.* residents or non-residents), one solution could be for local governments to consider more flexible parking policies that distinguish between residents and non-residents (as is the case in Paris, where residents are given the possibility of parking for longer periods than non-residents) or vary the pricing based on the location or time of day. Lower parking tariffs could be adopted for low-emission (hybrid and electric) vehicles, which may be effective in promoting the modal shift towards less polluting modes of transport. In order to generate broader public support for parking tariff policies, this approach should be combined with other

instruments and incentives that discourage private vehicle use and encourage public transit, walking and cycling.

- *Road charges*. Taxing the use of roads is an old idea (Henderson, 1974) that has been implemented in different urban contexts: Singapore, Norwegian municipalities, and most recently London and Stockholm. Congestion pricing exists in different forms, but most commonly consists of setting a price on busy roads during peak hours or levying a charge to access a specific zone, such as city centres. Seoul is the only city to have introduced road charging in Korea, with a limited approach that was launched in 1996. The policy charges a fee to private cars (carrying less than three passengers) runningthrough the Namsan 1st and 3rd Tunnel, which are notorious for heavy traffic congestion. Although traffic data should be accumulated for a robust impacts analysis, a preliminary assessment of the policy suggests that it has been relatively successful in reducing traffic volumes in the tunnel, with only a slight increase in traffic volume on detour roads. Between 1996 and 2006, traffic volume of private vehicles decreased by 20.8% in the tunnel and increased by 1.4% on detour roads, because drivers chose to take bypass roads in order to avoid the charge (Mo, 2009). At the same time, average traffic speed through the Namsan Tunnel increased by 115%.

  This type of congestion charge could be expanded to other areas of Seoul, and to other cities. The Area License System, which charges a fee to traffic flows in and out of designated zones in Singapore, and the congestion charges in Stockholm and London are notable examples. Further reductions in traffic volume in urban areas could be achieved through the implementation of a Vehicle Quota System, to directly control the growth of the vehicle stock (as is the case in Singapore). To increase the political acceptability of these types of fiscal disincentives, complementary measures to improve public transport should also be implemented so as to limit redistributive inequities. Fees collected could be invested for improvements in public transit, as in London. Singapore promised revenue neutrality by reducing vehicle taxes, while the Dutch proposed to replace vehicle ownership-based charges with usage-based charges (ITF, 2010).

- *Land use tax*. An increasing number of municipalities have replaced taxes on the value of buildings with taxes on the value of land sites, resulting in a decoupling of land value from the value of real estate improvements (Cohen and Coughlin, 2005). With the most famous example in Pittsburgh (Pennsylvania) (Oates and Schwab, 1997), nowadays more than 700 cities worldwide use a "two-rate" taxation system, whereby the majority of property values is represented by land, whose value is often increased as a result of public investments in the surrounding area (*e.g.* attractive neighbourhoods and services). As a result, property owners benefit from an increased value for which they bore none of the cost. Empirical and theoretical studies have shown that the "two-rate" scheme can lead to a higher quality of residential buildings, greater production output, higher rates of employment, increased urban security, less speculation, lower land prices and ultimately higher population densities, which can contribute to reduced commuting distances and transport-related GHG emissions.

  In Korea, under the central government's property tax scheme, local governments impose a "two-rate" property tax on land and buildings. However, a standard of assessment declared by the central government (the appraised value of land) and local governments (defined as a ratio multiplied to the appraised value of land) has been criticised for generating values that are too low relative to the market value (*e.g.* 23% of

market value in 2003) or economic value, and focusing on the acquisition stage rather than possession (Ji and Choi, 2003). The Korean government could make refinements to the property tax system by incorporating land value and the land tax scheme, using the example of the state of Virginia, which estimates land use value by the productive potential of land.

Non-market-based instruments. Non-market-based instruments include command-and-control measures (such as standard setting and the enforcement of regulations) and integrated spatial and transportation planning. Such instruments are rarely effective alone, but can become crucial complementary policies for the market-based instruments described above.

- *Command-and-control measures* (*e.g.* land-use (zoning) regulations, fuel efficiency standards). Zoning regulations that limit vehicle access (or the access of certain types of vehicles, such as heavy trucks) in certain zones is a clear example of a command-and-control measure at the urban scale. These types of policies can be implemented to address externalities like noise and pollution intensity (including GHG emissions) associated with heavy[6] cars and trucks. Zoning may influence the demand for transport volume, notably by reducing traffic by heavy cars in urban centres, which can in turn help to reduce GHG emissions per kilometre driven. Only recently, some metropolitan governments in Korea (for example, Daegu, Busan and Incheon) have introduced "Transit Mall Districts", which are only accessible to public transit and bicycles. The policy has met with some resistance, however, due to uncertainty about the effect on congestion levels in nearby districts and on local businesses.

  In order to expand this type of zoning and generate greater public support, cities could increase the flexibility of these instruments, for example by allowing low-emission cars to access the district during certain hours, and by committing to invest revenues from fines into public transportation improvements and urban amenities. London's Low Emission Zone (LEZ) is a good example. Since 2008, public authorities have operated a LEZ that prohibits access by most polluting heavy diesel vehicles, and plans to apply tighter standards in 2012, under which more vehicles would be affected (Transport for London, 2011).

- *Spatial planning*. A number of studies have provided evidence of the positive role of physical (urban) planning in effectively curbing long-term urban GHG emissions (notably from transport), although this type of instrument has not been shown to be effective in the short term (Greene and Schafer, 2003; Rietveld, 2006). Cities' reactions to changes in the spatial structure (involving the relocation of activities, new buildings and new infrastructure) occur with a certain time lag. Mismatch between land use and transportation policies has all too often aggravated traffic congestion around metropolitan cities. For instance, the introduction of a beltway around Seoul in 1999 was succeeded by the construction of five new cities (Bundang, Ilsan, Pyeongchon, Sanbon, and Jungdong) around Seoul three years later, leading to considerable traffic congestion. Another case is the development northwest of the Yong-in area. Nearly 250 000 newly constructed homes were built in the area in 2006, but were connected to Seoul via a single road (Route 23) and, at the time, no subway service (Jung *et al.*, 2010). The resulting traffic jams were significant.

  Korea could more actively pursue compact Transit-Oriented Development (TOD), which consists of higher density and mixed-use development near transportation stations,

combined with public investment on public transport. In Curitiba, urban growth is channelled along structural axes based on public transport routes and on modal interchange nodes through a combination of densification, intensification and mixed land use measures (Burgess, 2000).

The long-term effectiveness of physical planning relies upon the efficacy in which space is reorganised and on the presence of economic activities. For example, at a time of low energy prices, planning of American cities as "car-dimensioned cities" has been effective in guaranteeing high flows of vehicle traffic and increased ownership rates (which both contribute significantly to GHG emissions).

Urban design and physical planning can help to discourage the use of energy-intensive private vehicles and promote a modal shift by designing safe bike lanes and altering the functions and uses of old buildings. Projects aimed at reducing travel distances and thus increasing residential and employment density, accompanied by adequate mobility planning and transit supply, can be effective in decreasing the demand for transport as well as stimulating modal split toward less polluting modes. A number of empirical (mainly economic) studies confirm the positive effect of denser urban form on reducing travel distance per capita (*e.g.*, Boarnet and Sarmiento, 1999; Bento *et al.*, 2005).

iii) Policy instruments for greening the building sector in Korea

Korea's building sector has become a major focus for national greenhouse gas reduction efforts, given its high levels of energy consumption. As mentioned in the first section, building-related energy use accounts for approximately 24% of overall domestic energy demand, taking into account the building's life cycle (construction, operation and demolition). Efforts to cut emissions from this energy-intensive sector are expected on the national level by promoting green technologies in the building sector, developing renewable energy and establishing an energy efficiency rating certification system. The use of solar energy, thermal heat and wind power in new apartments and homes and larger public buildings (such as universities, which alone are responsible for 14% of total energy demand) is planned in phases and should help curtail overall energy use and associated GHG emissions. After building one million settlements following the renewable energy paradigm, another million homes and buildings have been gradually substituted by more energy-efficient buildings starting 2010. The *National Strategy for Green Growth*, moreover, foresees the construction of 14 *Environment Energy Towns* and a total of 800 low-carbon green villages in eight distinct geographical zones of Korea. Finally, the standard illumination system in public buildings will be replaced by the light-emitting diode (LED) system. Investments are planned to be mobilised for a total of USD 7 billion and expected to generate 150 000 employment opportunities.

A handful of market-based and non-market-based instruments can be used to reduce GHG emissions in the building sector. These measures can contribute to a greener building sector by altering the equipment demand in terms of both structural housing features (size and insulation) and household appliances; increasing the energy efficiency of buildings and household appliances; promoting renewable energy use (solar, geothermal energy or biomass); and reducing energy demand.

Market-based and regulation (command-and-control) instruments in the building sector are generally effective in the short to medium-term, whereas urban planning tends to generate results over the long term. These instruments also differ by the economic

mechanisms through which they are employed: on the one hand, market-based policies can directly affect energy efficiency and building equipment through the investments in equipment, which in turn can slow down overall energy consumption. On the other hand, urban planning can indirectly shape individuals' energy consumption by altering the type and nature of the building stock.

Market-based instruments. A possible source of failure of energy policy may be represented by distortion in the market mechanisms that drive demand and supply of housing. This might arise in the case of investment decisions by agents who are not necessarily the ultimate beneficiary of such an investment. For instance, landlords have little, if any, fiscal incentive to improve a building's energy efficiency if the tenants are paying the energy bill, and tenants, for their part, are not often willing to make the necessary investments in a rental property. Market-based measures like grants, subsidies, tax cuts and credits are put in place to compensate for the extra cost of investing in energy-efficient appliances and projects, or to encourage actors to invest in energy-efficient products.

The Korean government could develop policies to provide landlord incentives. According to a recent OECD survey (2011c), homeowners are more likely to invest in energy-saving equipment than tenants. The Korean government could develop policies to target specific household groups with different incentives, for example to provide the homeowner incentives including direct subsidies to install energy-efficient equipment, and at the same time rights to reclaim the costs for such investments (OECD, 2011c). Tax cuts for green building investment could be another useful policy instrument.

Non-market-based instruments. Non-market-based instruments include command-and-control measures for regulating actors' behaviour, such as energy performance requirements or pre-defined energy efficiency standards, which make energy-efficient choices compulsory. Examples of command-and-control measures implemented worldwide include building codes and standards, as in the case of thermal regulations, appliance and equipment standards and mandatory energy performance certificates. Since 2007, an energy performance evaluation is required for each housing transaction in France, which has generated a need for specialised workers in the construction sector, leading to job creation. Korea has also introduced various regulatory policy instruments, including reinforced building codes, mandatory estimation of energy consumption and the submission of an energy savings plan when applying for a building permit. The government has also introduced the *Eco-Friendly Building Certificate and Energy Efficiency Grading* instruments to provide the housing market with information about energy efficiency. However, challenges remain in determining how to efficiently regulate energy consumption in residences. Multiple policy instruments, such as incentives and disincentives, in addition to policies to increase consumer awareness, should be considered essential elements of an integrated policy package. Seoul's *Eco Mileage* programme could complement regulatory measures. Under this programme, citizens who cut 10% of GHG emissions from their electricity, water and gas consumption for six months are entitled to 50 000 miles, which can then be used to buy eco-friendly products.

Pursuing integrated transportation and land use and spatial planning will be essential for Korea to achieve greener growth. A policy mix of both market-based and nonmarket-based instruments is needed to provide a coherent policy message that encourages sustainable transport modes and spatial and building form, while discouraging less

efficient travel modes and urban settlement patterns. A compact, transit-oriented development strategy can underpin complementary market-based measures, such as comprehensive road charging in cities and parking tariffs, and nonmarket-based interventions, such as energy efficiency labelling and more sustainable building codes.

Implementation of the Green Growth Strategy: bridging the gaps in multi-level governance

Diagnosis of co-ordination gaps in delivering a coherent response to current economic and environmental pressures represents one of the primary challenges in multi-level green growth governance. Several governance gaps can be observed in the context of green growth in Korean cities; gaps can exist in terms of *administrative boundaries, policy*, *information*, *capacity, funding, objectives, accountability* and the *market* (Table 3.6).

Table 3.6. **Governance gaps for delivering green growth in Korean cities**

Type of gap	Description	How does this occur in Korea?
Administrative gap	Occurs when there is a geographical mismatch between the green growth challenge or opportunity and administrative boundaries. Most of the time, administrative boundaries (municipalities, regions and states) are not fixed according to the greening challenge/ opportunity logic and frontiers, resulting in a mismatch at the sub-national level that hinders the coherence of policy making and makes the relationships between elected representative, local authorities and end-users more complex.	Existing administrative boundaries do not always correspond to the delimitations of functionally integrated economic regions. As a result, it can be difficult to address air pollution sources that are generated across administrative boundaries (*e.g.* in the transportation sector).
Policy gap	Refers to the sectoral fragmentation of policy tasks and powers across ministries and public agencies within the central government administration, as well as among different departments within sub-national government administrations. Silo approaches in policy making foster incoherence between sub-national policy needs and national-level policy initiatives and reduce the possibility for cross-sectoral policy coherence and implementation at the sub-national level. They also create uncertain market conditions that may inhibit companies from entering the marketplace in this city-region, or create conditions that make it difficult to obtain capital for infrastructure investments, business operations or expansion.	Fragmentation of urban policies in general exists at the central level in Korea, as well as for green growth-related tasks involving different government ministries and agencies. At the urban scale, there is also a need to harmonise emerging green growth policies within the already fragmented local development policy framework, a result of separate plans for municipal economic development, spatial development and sectoral development. To a limited extent, local and regional governments have incorporated green growth goals and policies into regional economic development plans and the development plans of Daily Living Spheres. For example, in 2011, green growth was included as one of the ten major tasks for local areas. However, economic development plans remain separate from spatial development and sectoral plans, resulting in fragmented local development policy.
Information gap	Occurs when there is an asymmetry of information across ministries, between levels of government and across local actors involved in specific policy areas. An asymmetry of information may also occur when national and sub-national authorities do not share their knowledge of what is happening on the ground, creating win-lose situations by use of information not in the possession of the other party.	Inconsistent, or non-existent, methodologies for establishing local emissions inventories hamper the ability of cities to assess progress toward green growth over time and across locations.
Capacity gap	Is generated by insufficient scientific and technical expertise, know-how and infrastructure to design and implement policy. The capacity gap is particularly acute in issues related to environment and green growth. When there is a difference between the capacity required for carrying out certain responsibilities, and the organisational, technical, procedural, networking and infrastructure capacity available within the local authority, impacts on the implementation of desired policies are unavoidable. The capacity gap also applies to the national level in terms of managing multi-level relations, allocating responsibilities and funds, and ensuring co-ordinated, coherent policy approaches among central-level actors.	A lack of green growth expertise at the local level (especially in small and medium-sized cities) hinders the effective implementation of green growth strategies at the urban scale.

Table 3.6. **Governance gaps for delivering green growth in Korean cities** *(cont.)*

Type of gap	Description	How does this occur in Korea?
Funding (or fiscal) gap	Refers to insufficient or unstable revenues for implementing policy across ministries and levels of government. This gap reflects a mutual dependence between levels of government, where sub-national authorities depend on higher levels of government for funding support, while central government depends on sub-national authorities to deliver the policy goals and meet both national and sub-national priorities. A funding gap can also occur if private capital is too costly because of perceived implementation risks or other factors that make private lenders or investors wary of entering the local marketplace. In the case of green growth initiatives, there may also be a disconnect related to the return on investment requirements of the project sponsor, who may seek a shorter payback period than the project is capable of delivering.	Most green growth initiatives have been heavily financed by the central government, given the generally low levels of self-reliance of local governments.
Objective gap	Occurs when diverging or contradictory objectives between levels of government or departments/ministries compromise the adoption of convergent targets over the long run. Frequently, when clear priorities are not formulated at the highest political level, conflicting interests prevent any consensus on common and aligned targets towards effective policies. Overall, the objective gap underlines the difficulties of governments to foster strategic and territorialised planning engaging all relevant stakeholders over the long run, beyond political changes and electoral calendars. The objective gap may also arise if local political or policy interests do not align with the interests or needs of private sector stakeholders, causing them to leave the local market entirely or restrict efforts to expand in the city/region.	The dual economic and environmental aims of green growth can at times lead to conflicting objectives. As mentioned previously, the design of the Gangneung-si green city demonstration project was initially hampered by conflicting objectives of the ministries involved in the project, understandably due to differences in the scope of each ministries' work: MOE wished to focus on environmental protection, while MLTM stressed the development process and maximisation of the return on investment.
Accountability gap	Refers to a lack of transparency in policy making, integrity and institutional quality issues. Ensuring transparency practices across different constituencies is crucial for effective implementation of policies. In addition, with the development of private sector participation in some sectors related to green growth, the traditional government accountability is changing. In this context, the *accountability gap* can be reflected in the market entry process, award criteria and contract provisions for unforeseen contingencies.	Although the Presidential Committee on Green Growth (PCGG) includes a range of stakeholders, including representatives of the private sector, non-governmental agencies, industries, universities and civic groups, there are currently no representatives from local governments, presenting a potential gap in the accountability of the PCGG at the local scale.
Market gap	Arises when policy goals or ambitions do not align with the ability of private sector stakeholders to deliver on these goals. The private sector is a critical partner in horizontal co-ordination efforts to advance green growth, because businesses serve many different roles in delivering this growth, such as: direct service providers contracted by government to carry out certain greening functions (*e.g.* transport provider, energy supplier, water treatment plant operator, contractor responsible for energy efficiency or climate adaptation upgrades, etc.) or innovator designed to address green growth challenges or opportunities. To the extent certain green business sectors are immature in a city-region, that will inhibit the success of certain policy solutions and clarify the need for policy action or improved co-ordination between different governmental entities.	The market for green technology is still at an early stage in Korea, and could be hampered in the long run by the current limits on small and medium-sized businesses in participating widely in the green growth industry.

Source: Adapted from Charbit, C. (2011), "Governance of Public Policies in Decentralised Contexts: The Multi-Level Approach", *OECD Regional Development Working Papers*, 2011/04, OECD Publishing, Paris.

Although these gaps could apply more or less to all countries, in the case of Korea, we will focus on four main governance gaps: *i) the policy gap, ii) the administrative gap, iii) the fiscal gap,* and *iv) the information and capacity gap.*

i) Addressing the policy gap: the need for clear market signals and policy coherence

In order for sub-national authorities to effectively implement the National Strategy for Green Growth, the central government will need to provide a more coherent policy message across all sectors and levels of government. This includes *a)* establishing clear

pricing signals on carbon and greenhouse gas emissions; *b)* resolving inter-ministerial conflicts that have led to policy fragmentation; and *c)* addressing fragmentation and inconsistencies of planning instruments at the regional and local levels.

a) The establishment of clearer pricing signals can help guide investment in green growth at the sub-national scale. Putting a price on pollution or on the over-exploitation of a scarce resource through mechanisms such as taxes or tradable permit systems should be a central element of the green growth policy mix (OECD, 2011b). These policy instruments tend to minimise the costs of achieving a given objective and provide incentives for further efficiency gains and innovation. The OECD has previously recommended the introduction of a comprehensive cap-and-trade emissions trading system in Korea, combined with a carbon tax levied on households and offices to put a global price on greenhouse gases and contribute to achieving the mid-term emission reduction targets (Jones and Yoo, 2010). To complement this strategy, Korea could also remove environmentally harmful direct subsidies for coal and the more indirect subsidy of selling electricity at prices below cost, notably in the agriculture sector.

b) As discussed in Chapter 2, a comprehensive, multi-sectoral approach to urban development in Korea at the national level should be pursued to generate more effective green growth outcomes. An integrated approach to urban development has traditionally been stymied in Korea, as in many OECD countries. In particular, urban policy mandates are fragmented across many ministries, particularly those administrations responsible for public administration, regional development, transport, environment, public finance and budget, culture and protection of national heritage, higher education and health. The atomisation of administrative mandates across a wide range of central ministries with jurisdiction over urban issues is not always compatible with an effective, coherent, multi-sectoral approach to urban development. Harmonising urban development plans with economic development, environmental planning and sectoral plans can lead to conflicts.

The implementation of green growth policies has further aggravated inter-ministerial conflicts. For instance, climate change statistics relating to the environment, land use and sea levels and meteorological trends have historically been collected by a handful of different ministries, each of which is loath to share information with others. As a result, each ministry bases its climate change scenarios on different baseline information, resulting in at times conflicting policy measures (Lee *et al.*, 2009). The establishment of the *Greenhouse Gas and Energy Target Management System* in 2010 was at the heart of a fierce struggle over which ministry would take charge of greenhouse gas emissions regulation. In the end, the Ministry of Environment was designated to co-ordinate the institution and collect data from four ministries, each of which was responsible for designating the "controlled entities" in their sectors of competency. As mentioned previously, tensions between competing ministries became evident early in the planning stages of the Gangneung Green City project (Wang, 2009). Employing partnership development tools such as a Memorandum of Understanding, one of the solutions to moving forward with the Gangneung project, can help clarify roles and responsibilities.

c) At the urban scale, there is also a need to harmonise emerging green growth policies within the already fragmented local development policy framework, a result of separate plans for municipal economic development, spatial development and sectoral plans (as discussed in Chapter 2). The Ministry of Land, Transportation and Maritime Affairs must

approve provincial comprehensive and metropolitan area plans and ensure that any changes are in line with national legislation. At the local level, however, two different planning frameworks guide urban development: the urban master plan is a long-term plan (generally 20 years) that communicates the vision and direction of local development, while the urban management plan is for ten years, and unlike the urban master plan, includes enforcement mechanisms to ensure that administrative officials manage urban areas and protect them from uncontrolled development.

To a limited extent, local and regional governments have incorporated green growth goals and policies into regional economic development plans and the development plans of Daily Living Spheres.[7] For example, in 2011, green growth was included as one of the ten major tasks for local areas. However, economic development plans have been separate from spatial development and sectoral plans, resulting in fragmented local development policy. Policy coherence at the urban/regional level also requires pursuing integrated transportation and land use planning. A number of policy tools exist to facilitate compact development, through mixing land use, improving mass transit services and providing urban amenities. These include reducing existing regulatory barriers to more compact development, including barriers to mixed-use, transit-oriented and brownfields development, accompanied by fiscal reform that internalises environmental and public services costs incurred by new development and that concentrates urban amenities and services in priority growth areas. To more effectively incorporate green growth policy tools into existing multi-layer urban planning, Korea could consider the policy instruments based on experiences in other OECD countries, for example the development of instruments like the *Chartes d'objectifs* and *Contrats de Villes* (France) or the creation of a Secretariat for Cities (Canada).

ii) Addressing the administrative gap: fostering horizontal collaboration

Enhanced horizontal co-ordination among local governments can enable local authorities to maximise financial and human resources, facilitate knowledge spill-overs and help tackle congestion, air pollution, health problems and greenhouse gas emissions (OECD, 2010a). With varying levels of fiscal and technical capacity to respond to climate change, local leaders can assist each other. Knowledge spill-overs can be enhanced by collaborative inter-urban frameworks to combat climate change. Hanover, a German metropolitan region with about 4 million inhabitants, benefits from a regional approach to mitigation and adaptation strategies with its Regional Climate Protection Agency (*Klimaschutz-Agentur Region Hannover*), which co-ordinates all climate protection activities throughout the region (OECD, 2010a).

As discussed in Chapter 2, limited co-operation among local governments occurs in Korea, as provinces and metropolitan cities tend to see each other as competitors rather than as potential partners in development. National programmes like the green growth demonstration projects can further exacerbate competition among local authorities, as municipalities compete to become one of the selected projects. The recommendations outlined in Chapter 2 to achieve greater co-operation among local governments to facilitate local service delivery[8] are highly relevant for green growth, and should be pursued with green growth objectives in mind.

As the green growth strategy includes a wide range of actions that should be implemented at different scales, such a collaborative framework requires some flexibility. These types of collaborative arrangements should also be adapted to the different regional

contexts to avoid a one-size-fits-all approach, an inherent risk of nationally led programmes. The Korean government has recently begun to develop more localised policy initiatives, such as the *600 Low-Carbon Green Villages* project, which aims to establish energy self-reliant villages by installing facilities to generate biomass fuel and wind and water power in rural areas. According to the PCGG (2009), each project will be designed and developed individually, with consideration of the characteristics of each village.

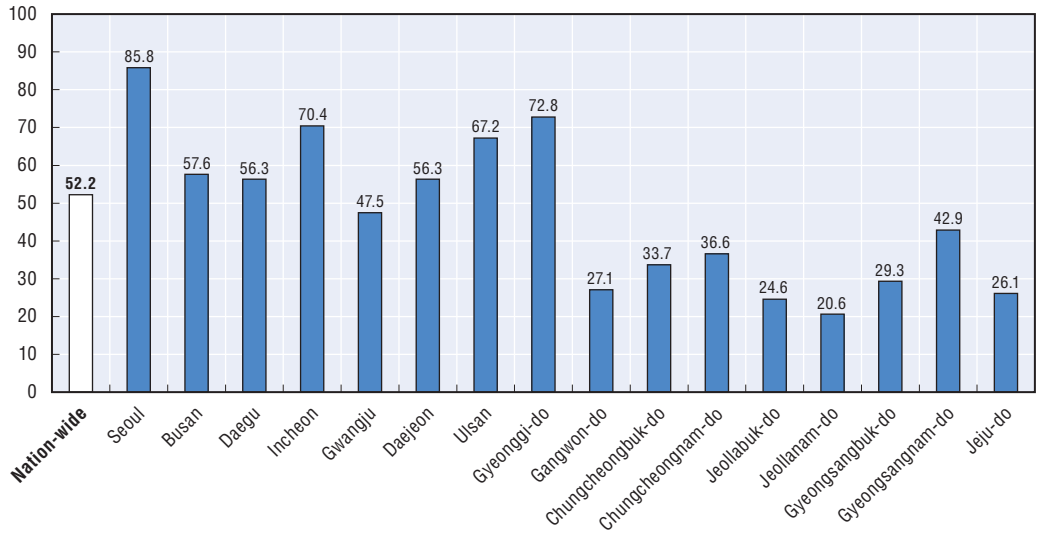
iii) Addressing the financial gap: diversify funding sources

With the vast majority of the overall green growth budget financed by the central state through grants or matching funds to local governments, the sustainability of local programmes is a considerable challenge, particularly in urban areas where local authorities rely heavily on central government support in general to fund the overall city budget. What is more, local public finance was severely hit by the recent global economic crisis (OECD, 2011d). The total balance of local government budgets plunged from a surplus of KRW 20.2 trillion in 2008 to a deficit of KRW 7.1 trillion in 2009. Meanwhile, the average fiscal autonomy of local governments decreased from 59.4% in 2000 to 53.6% in 2009 and 52.2% in 2010. In contrast to the Capital Region, which exhibits relatively good fiscal autonomy (85.8% in Seoul, 72.8% in Gyeonggi-do, 70.4% in Incheon in 2010), most provinces rely on the central government for two-thirds to three-quarters of their budgets (Figure 3.1).

Most local government green growth action plans include five-year investment plans, which range from KRW 2.6 trillion in total investment (Ulsan) to KRW 42.2 trillion (Gyeonggi-do) (Figure 3.2). The highest investment volumes as a portion of GRDP can be found in Gwangju (12.2%), Jeju (11.6%) and by Jeollanam-do (10.7%). However, most local investment plans (Seoul is an exception) rely heavily on central government support in the form of grants and matching funds. The central government is responsible for over 80% of total green growth investments in Gyeongsanbuk-do and approximately 72.4% in Chungcheongbuk-do.

Figure 3.1. **Self-reliance ratio of finances in Korean metropolitan/*do* regions (2010)**

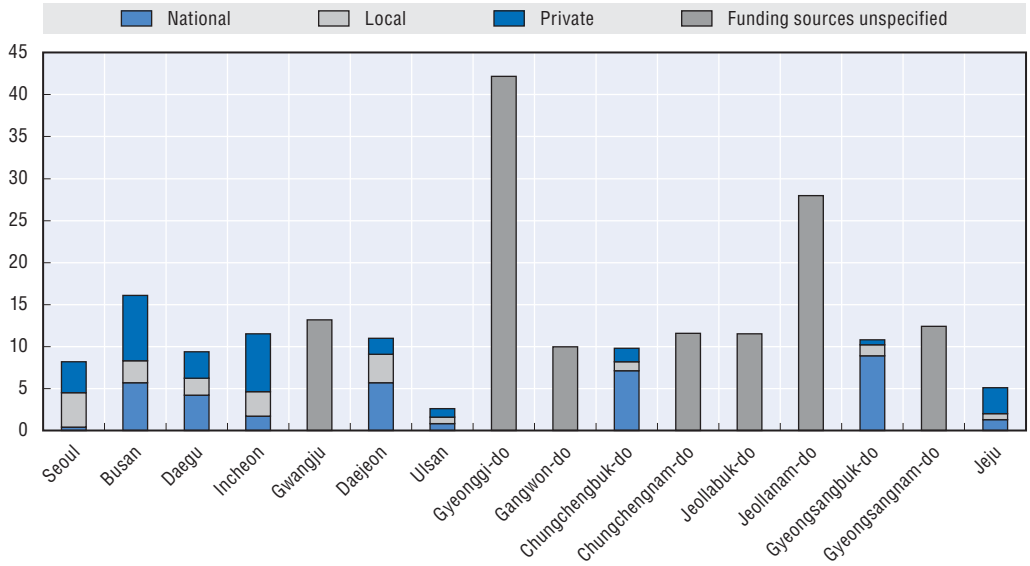
Percentage



Source: Ministry of Public Administration and Security (2011), *Municipal Yearbook of Korea* (in Korean), Ministry of Public Administration and Security, Seoul.

Figure 3.2. **Funding sources for local green growth plans (2009-13)**

Trillion KRW



Note: The investment period of Seoul is from 2010 to 2014.

Source: Responses to the OECD questionnaire to 16 metropolitan cities and provinces.

Limited local fiscal autonomy threatens the resiliency of local authorities, because it limits their capacity to respond to the changing priorities of higher levels of government or sudden budget adjustments. Further, low self-reliance ratios render local authorities especially vulnerable to an eventual political regime shift, which could transfer power to an administration with limited or no support for green growth. Seoul, the most financially independent city in Korea, has for decades been a leader in sustainability and green growth policies. While the city benefits from a highly qualified labour force, among many other factors, its financial independence has enabled the city to initiate its own policies and programmes. There has been considerable discussion in Korea over increasing local fiscal autonomy, while focusing on building the revenue base of local taxation, such as shifting a portion of the national VAT to local governments (OECD, 2005). However, this highly political debate, due to the inevitable sharing of authority that would be required among different level of governments, suggests that change may not be expected in the short term, suggesting that the central government will need to envision a more strategic approach.

Experiences in OECD countries show that national government can play a key role by greening existing urban revenue sources: as discussed previously, congestion charges and road taxes can reduce car travel by private vehicle and fund green infrastructure; and local energy fees that put a price on wasteful energy use can increase efficiency. National governments could also green urban finance by redesigning grants to sub-national governments to correct incentives for unsustainable behaviour and reward cities that create environmental benefits beyond their borders. While in some OECD countries there is room to redesign property taxes so as to stop favouring urban sprawl and start encouraging development in the urban core and around transportation linkages, the local property tax system is not thought to be conducive to sprawl in the case of Korea. In Korea, local property tax is a relatively marginal revenue source for local governments. It has

become even more marginal since 2005, when the introduction of the Comprehensive Property Tax (CPT) at the central level was accompanied by a scaling back of the local property tax. A special feature of the property tax in Korea is its progressive character (it is only paid by 2% of households, mostly in three of the wealthiest wards in Seoul).

In addition to the local finance stream, new financial instruments will be needed to act on green growth in cities. Public-private partnerships (PPPs), which have been increasingly used by cities in the last few decades, can bolster urban green growth goals under certain conditions. By sharing risks in innovative ways, PPPs can, under the right circumstances, provide better value for money, such as lower prices, than traditional infrastructure procurement. PPPs also have the potential to encourage private (and public) actors to take a more long-term view on spending by relating maintenance spending more closely to capital investment. PPPs can also stimulate energy efficiency in public buildings, given the potential for investments in energy efficiency to generate efficiency gains for the private operator. The use of PPPs can, however, be problematic. In many cases, only the annual PPP-agreement payments are visible on government balance sheets, while the private party in a PPP can carry a number of the risks and thus be obliged to record the PPP on its balance sheet. In order to circumvent national or supra-national deficit and debt rules, cities thus might not be interested in assessing a project on its merits, but only on whether it can be undertaken as a PPP, which undermines value for money and long-term fiscal sustainability. Some countries have tried to limit this problem by imposing more strict accounting rules, ensuring a mandated value-for-money process and imposing a maximum amount of transparency about the deal when it is struck.

The use of PPPs as a source of financing green growth actions could be further exploited by local authorities to diversify their funding sources. A survey of 300 companies undertaken by the Federation of Korean Industries revealed that 70% of the Korean private sector is supportive of green growth and 41.4% of surveyed firms expressed a willingness to invest in green growth projects (UNEP, 2009). Co-ordinated efforts may also be facilitated through private sector participation on the Presidential Committee on Green Growth, which includes a range of key private sector actors.

In certain infrastructural sectors, notably ICT, the government has been able to induce the private sector to make long-term investments. The central government launched large-scale programmes such as *Cyber Korea 21* (1999-2002) and *e-Korea vision* (2002-07). A fund for the promotion of the information society was established to decouple investment trends from the budgetary constraints and endowed with USD 8 billion between 1993 and 2002 (40% from public funds and the rest from private actors). In 2010, however, the government announced a super-broadband infrastructure that is expected to be completed by 2013. This plan is being developed as a PPP that mobilises USD 24 billion from public funds and USD 32 billion from the private sector. At an urban scale, PPPs are being used to as a supplement to local finances for greening urban area or new development. Pilot projects, including New Songdo City in Incheon, are being pursued in various metropolises, successfully attracting local business and international investment. However, PPPs can bear a high risk of failure if local governments rush into agreements with private partners without a full understanding of the local economy, urban characteristics and resources. In order to maximise the possibilities of success, the central government could support local governments by providing sample business models, developing guidelines and reinforcing technical capacity at the local level. Local governments could also provide incentives

related to their competences, for example sharing the costs or offering infrastructure, in co-operation with the central government.

iv) Addressing the information and capacity gap: developing measuring and monitoring tools

To help cities become more effective in the design and delivery of locally tailored policy solutions to climate change, Korea could also pursue the development of harmonised city-scale emissions inventories so that mitigation performance can be monitored, supported and compared across urban jurisdictions. As previous OECD work has shown, at the international level, cities have been active in efforts to reduce greenhouse emissions for at least a decade, and the level of ambition and scale of statements of intent to mitigate have grown with time. However, there is a need for cities to bring rigour and structure into their efforts to measure progress in achieving their mitigation goals (OECD, 2010c). Harmonised urban inventory methods and reporting is essential to enable performance assessment and comparison across urban locations within a nation, for example, to assist national decision-makers to better understand the potential for, and overall mitigation progress made, at urban scale and to compare cost-effectiveness of policies. The OECD is currently contributing to international efforts to develop a harmonised urban GHG emissions inventory (see OECD, 2011e), although the adoption of a single international protocol is still likely to be years away. As a result, cities have taken different approaches in defining what sectors to include, in establishing the geographic boundaries of the area included, as well as in aggregating data in different ways, hampering comparison across existing inventories.

Establishing a common framework for urban inventory remains a challenge in Korea. Emissions data is currently collected nationally, by sector, in each relevant ministry, which in turn submits to GIR "information and statistics about matters under its jurisdiction, such as energy, industrial process, agriculture, waste and forestry" (Framework Act, Article 45). At the local level, while the guidelines for greening cities developed by the Ministry of Land, Transportation and Maritime Affairs recommend that local jurisdictions establish inventories on which to base localised action plans, a common framework is still lacking. Since many local jurisdictions lack the technical or financial capacity to develop such inventories, assistance from the national government will be needed to establish a common methodology and monitor progress on the environmental and employment impacts of green growth policies at the metropolitan level. Here, there is potential to expand the current responsibilities of the GIR to include the co-ordination of regional and local emissions data, in addition to the sectoral data it already collects from other relevant ministries. Nevertheless, the GIR should work closely with international bodies, such as the IPCC, to ensure that Korea's methodology corresponds to the approach adopted internationally.

Notes

1. In its 2007 Green Energy Declaration, Seoul however, established an emissions reduction target of 40% by 2030, compared to 1990 levels.
2. This programme replaced the voluntary emissions reduction pilot programme established in 2010, in which 38 industrial firms committed to reduce energy consumption by 3.7% by 2012.
3. Weirs are low barriers built across a river to control or direct the flow of water.

4. The PCGG included this strategic axis in National Green Growth Strategy and Five-Year Plan. State-of-the-art convergence technology industries (using ICT technologies and also high value-added industries in which the energy intensity per unit is lower than traditional industries) will make it possible to pursue climate change mitigation and sustainable development simultaneously.
5. This issue will be further discussed in the next section.
6. "Heavy" in terms of motor capacity and weight.
7. A total of 161 cities (*si*) and counties (*gun*), excluding the wards in Seoul and other metropolises, are eligible for developing Daily Living Sphere plans. These cities and counties accounted for 54% of the population in 2007. The scheme, which also may be reflected in local urban management plans, calls for both local government efforts to foster their growth potential and central government support to guarantee minimum living conditions.
8. Recommendations include the following: *i)* an interministerial regional development agency could be created at the national level to support the regionalisation of the central government structure and policy making, *ii)* the central government could encourage voluntary modes of co-operation among adjacent municipalities, *iii)* Korean urban policy could acknowledge city networks and develop delivery agreements at the metropolitan or micropolitan levels; and *iv)* additional projects and funding could be secured to integrate sister city agreements into the region's long-term common strategic goals and to build a stronger legal framework for co-operation at the sub-national level.

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