OECD Green Growth Studies

Compact City Policies

A COMPARATIVE ASSESSMENT

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Foreword

This publication is the final report of the OECD's three-year project "Compact City Policies: A Comparative Assessment". It presents the project's main findings and policy recommendations.

The compact city policy project was carried out over 2009-2011, following the Declaration on Green Growth in June 2009 which mandated the OECD to develop a Green Growth Strategy. Its goal was better understanding of the compact city concept, its role in today's urban contexts, and the potential outcomes of compact city policies. It aimed to provide "food for thought" for national, sub-national and municipal governments as they seek to address economic and environmental challenges through the development and implementation of spatial strategies in pursuit of green growth objectives. This report is thus positioned as one contribution to the OECD's Green Growth Studies. The project was conducted in close collaboration with the Green Cities Programme of the Public Governance and Territorial Development Directorate, and this report contributes to that programme. The focus was on OECD countries, and the recommendations are addressed primarily to policy makers in OECD countries. However, many of the findings and recommendations have implications for policy makers in non-member countries, in particular those that are experiencing rapid urbanisation. The project was funded by a voluntary contribution from the Japanese Government.

The findings and recommendations contained in this volume build on a wide range of research, discussions and exchanges of views conducted during the project. A great deal of information was derived from the country survey of member countries and the five in-depth policy case studies: Melbourne (Australia), Vancouver (Canada), Paris (France), Toyama (Japan) and Portland (United States). The project has benefited greatly from insights gained through various opportunities for dialogue, in particular the following conferences/meetings:

- OECD-KRIHS Seminar on Compact City, co-organised by the Korea Research Institute for Human Settlements (KRIHS) and the OECD, 8 October 2010, Seoul;
- OECD Seminar on Green Growth and Compact City, organised by the OECD, supported by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the City Planning Institute of Japan (CPIJ), 15 October 2010, Tokyo;
- Roundtable on Compact Cities and Climate Change, organised by the Town and Country Planning Association (TCPA), in collaboration with the OECD, 16 November 2010, London; and
- Meeting of the OECD and the DOT/EPA/HUD Partnership for Sustainable Communities: Discussion of Compact City Policies in the United States and Abroad, 1 April 2011, Washington, D.C.

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- Chapters 1 and 3: Tadashi Matsumoto and Daniel Sanchez-Serra;
- Chapters 2, 4 and 5: Tadashi Matsumoto;
- Chapter 6: Adam Ostry and Tadashi Matsumoto.

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Konstantin Rosina assisted in the indicator work using advanced geographic information system techniques. Jeanette Duboys, Rachel Linden and Jennifer Allain prepared the report for publication. Justin Kavanagh helped to create the website for this report.

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Acronyms and abbreviations

ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
AQMP	Air Quality Management Plan
BLI	Buildable Land Inventory
BRICs	Brazil, Russian Federation, India, China
CAC	Community Amenity Contribution
CAD	Central activities district
CASBEE	Comprehensive Assessment System for Built Environment Efficiency
CBD	Central business district
CDB	Cities Data Book
CHP	Combined heat and power
CMA	Census Metropolitan Area
CMHC	Canada Mortgage and Housing Corporation
CO_2	Carbon dioxide
CREA	Canadian Real Estate Association
DCL	Development Cost Levy
DG REGIO	Directorate-General for Regional Policy of the European Commission
DID	Densely inhabited district
DOT	US Department of Transportation
DTES	Downtown Eastside
EFU	Exclusive farm use
EPA	Environmental Protection Agency (United States)
ERDP	European Regional Development Fund
EV	Electric vehicle
EVP	*Espace Vert Protégé*
FAR	Floor area ratio
FEZ	Free economic zone
FSR	Floor space ratio

FTN	Frequent Transit Network
GCIP	Global City Indicators Program
GDP	Gross domestic product
GHG	Greenhouse gas
GLA	Greater London Authority
GMA	Growth Management Act
GPVI	Greater Portland-Vancouver Indicator
GUI	Global urban indicator
GVRD	Greater Vancouver Regional District
HIV	Human immunodeficiency virus
HPMS	Highway Performance Monitoring System
HUD	US Department of Housing and Urban Development
IBD	International Business District
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
ISIC	International Standard Industrial Classification
LEED	Leadership in Energy and Environmental Design
LEM	Location efficient mortgage
LGA	Local government area
LMRPB	Lower Mainland Regional Planning Board
LOADT	*Loi d'orientation pour l'aménagement et le développement du territoire*
LPAC	London Planning Advisory Committee
LRSP	Liveable Region Strategic Plan
LRT	Light rail transport
LWH	Laneway house
MI	Matching Index
MMBW	Melbourne and Metropolitan Board of Works
MODIS	Moderate Resolution Imaging Spectroradiometer
NGO	Non-governmental organisation
NLCD	National Land Cover Database
OCP	Official community plan
PADD	*Projet d'aménagement et de développement durable*
PLU	*Plan local d'urbanisme*

POSI	Portland plus Oregon Sustainability Institute
PPP	Public-private partnership
PRIMLITJ	Policy Research Institute of Ministry of Land, Infrastructure, Transport and Tourism of Japan
PWMP	Portland Watershed Management Plan
RGS	Regional growth strategy
RTFP	Regional Transportation Functional Plan
RTP	Regional Transportation Plan
SDRIF	*Schéma directeur de la Région d'Île-de-France*
SME	Small and medium-sized enterprise
SNG	Sub-national government
SRO	Single room occupancy
TfL	Transport for London
TFP	Total factor productivity
TIF	Tax increment financing
TOD	Transit-oriented development
TSP	Transport system plan
UCB	Urban containment boundary
UDP	Urban Development Program
UGB	Urban growth boundary
UGMFP	Urban Growth Management Functional Plan
UHI	Urban heat island
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UN HABITAT	United Nations Human Settlements Programme
UGA	Urban growth area
VA	Vancouver Agreement
VMT	Vehicle miles travelled
VTP	Victoria Transport Plan

Glossary

Brownfield development	Development of abandoned brownfield sites, often located near urban centres and occupying a considerable part of urban built-up areas, so as to revitalise and make better use of existing infrastructure and the potential of the sites.
Compact city	Spatial urban form characterised by "compactness". By understanding various definitions of compact city, this report defines its key characteristics as: *i)* dense and proximate development patterns; *ii)* urban areas linked by public transport systems; and *iii)* accessibility to local services and jobs.
Compact urban development	Urban development that creates compactness in specific development sites.
Eco-neighbourhood	An urban neighbourhood designed to have minimal environmental impact by achieving sustainable resource management of energy, water and waste; dense and mixed-use development; and less automobile dependency supported by public transport systems, walking and biking.
Functional urban area	Identification of cities as functional economic units, characterised by a densely inhabited "urban core" and a "hinterland" whose labour market is highly integrated with the "urban core".
Greenfield development	New development in greenfield areas, typically located at urban fringes with both urban and rural land use.
Green growth	Fostering economic growth and development through urban activities that reduce negative environmental externalities while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.
Infrastructure gap	A divergence arising from the fact that the need for investment to maintain, upgrade or replace existing (and often ageing) infrastructures will increase, but public finances will be unable to meet future infrastructure needs owing to fast-growing social expenditures.

Liveability	A value of lively urban neighbourhoods/communities which is closely related to a diverse population, much interaction among people, economic viability and good quality of life.
Mixed land use	A combination of various usages in an urban area, including residential use, commercial space, offices, etc., typically achieved by deregulating land-use zoning.
Polycentric urban form	A metropolitan spatial form with multiple urban centres which are not widely dispersed and are linked together by public transport systems. Proximity of such urban centres is an important notion for a polycentric compact city.
Sustainable urban development	Urban development that meets urban sustainability goals, including economic viability, environmental quality, social equity, etc., in order to develop current land resources without compromising the ability of future generations to meet their own needs.
Transit-oriented development (TOD)	Urban development designed to maximise access to mass-transit systems. Such neighbourhoods often consist of a centre with a public transit station, surrounded by high-density, mixed-use development with gradually lower density development spreading outward from the centre.
Urban containment policy	A policy instrument to prevent urban development from expanding to suburban rural areas. Among the most popular are urban growth boundaries and greenbelts, which aim to limit urban development beyond boundaries and within greenbelts.
Urban sprawl	Uncontrolled expansion of urban development characterised by low density, segregated land use and insufficient infrastructure provision. Urban sprawl can take the form of "leapfrog development", whereby development "leaps" over undeveloped land.

Preface

Sustainable urban development – achieving environmental preservation, social equity and economic development – remains an urgent global challenge in a world that continues to urbanise. This report discusses sustainable urban development from the perspective of urban spatial form – or how we use urban spaces. Importantly, it highlights how urban spatial policies can help foster economic growth and development while preventing environmental degradation and climate change. The report thus addresses a central concern of the OECD Green Growth Strategy, and is an important contribution to it.

The "compact city" is a concept that has increasingly been part of urban strategies in recent years. However it is often ill-defined and even controversial among policy makers and academic researchers. This report discusses the potential benefits and pitfalls of compact cities and argues that the compact city is a sound and reasonable urban development model in today's urban policy contexts.

This book is the result of a project to compile and compare compact city policies. It redefines the concept of compact cities in today's context; sheds light on environmental and economic impacts; proposes indicators to monitor and evaluate policy performance; examines compact city examples across OECD countries – in particular in the five case study cities: Melbourne (Australia), Vancouver (Canada), Paris (France), Toyama (Japan) and Portland (United States); and proposes strategies for promoting compact city policies.

I hope this report will further nourish the compact city debate and thereby make a contribution to improving policy frameworks for green growth in both developed and developing economies.

Rolf Alter
Director
Public Governance and Territorial
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Executive summary

The compact city is one of the most discussed concepts in contemporary urban policy. Although compact cities take different forms, this report considers that the key characteristics of a compact city are dense and proximate development patterns, built-up areas linked by public transport systems, and accessibility to local services and jobs.

In recent years, compact city policies have increasingly been part of urban strategies, and international organisations and academic research groups highlight the significance of this approach to urban planning. While the compact city concept still generates debate, it is expected to play a role in achieving the OECD's Green Growth objectives, now a general policy driver for OECD countries, as it can enhance both the environmental and the economic sustainability of cities.

This report offers a better understanding of the compact city concept, its role in today's urban contexts, and the potential outcomes of compact city policies. It examines compact city policies across the OECD in relation to green growth objectives and the role of indicators in tracking policy performance. It proposes compact city strategies and ideas for achieving better outcomes and highlights governance challenges for implementing practical compact city strategies.

Current urban trends underscore the need for compact cities …

Compact cities can play a significant role in urban policy. First, the continuing growth of urban populations underscores the need to conserve land resources. By 2050, 70% of the world's population – and 86% in OECD countries – will live in urban areas. Land consumption for built-up areas will increase more rapidly than the population in 30 out of 34 OECD countries. Second, global warming raises new issues for cities and requires new responses. Third, increasing energy prices can affect living patterns, for example by raising transport costs. Fourth, the recent economic crisis has affected local governments' finances, making it more difficult to invest in new infrastructure. Finally, as demographics change, policy makers need to adapt urban policies. Population levels in Germany and Japan are already decreasing. The elderly population has doubled over the past 60 years in OECD countries and tripled worldwide, a trend that will persist for at least four decades. The average household size has also decreased in OECD countries.

… that can achieve effectively a variety of sustainability goals.

Throughout its long history, the compact city concept has evolved and enlarged its scope and policy objectives. From a simple urban containment policy to protect the local natural environment or agricultural land from urban encroachment, it has gradually acquired new policy objectives: energy savings, quality of life and liveability, etc. It has come to imply a multi-dimensional policy approach with a wide range of urban sustainability goals and indeed a mainstream policy approach to achieving urban

sustainability. As the concept evolves, it may need another name which better reflects the aspects of sustainable urban space and innovation inherent in the compact city.

Policy makers need to see the compact city in an economic as well as an environmental perspective.

Yet, the compact city is still often viewed simply as a way to protect the environment by controlling growth. This report argues, instead, that it can also contribute positively to economic growth and that it is important to take a green growth perspective and explicitly incorporate economic growth as an objective of a compact city policy. This can provide rich insights for the design and implementation of successful compact city policies.

Policy makers at the sub-national and national levels of government should consider the economic potential of compact cities in today's urban contexts. This can help local policy makers judge local opportunities for introducing compact city policies. As economic growth and reducing CO_2 emissions are central to national policy agendas, it is crucial for policy makers at the national level to understand the potential of compact city policies and include them as appropriate in national urban policies.

Compact city policies can help achieve urban sustainability in many mutually reinforcing ways ...

The outcomes of compact city policies have been widely debated. By and large, they appear positive and significant. However, there is extensive debate over whether compact city policies ultimately help to reach urban sustainability objectives. The lack of a clear understanding of policy outcomes helps explain why compact city policies do not seem to have gained more general support.

Environmentally, shorter intra-urban distances and less automobile dependency can help reduce energy consumption and CO_2 emissions. Compact cities conserve farmland and natural biodiversity around urban areas that would otherwise be irretrievably lost. They create more opportunities for urban-rural linkages. Nearby farming encourages local food consumption and reduces the distance travelled by food, which also helps reduce CO_2 emissions. In economic terms, compact cities can increase the efficiency of infrastructure investment and reduce the cost of maintenance, particularly for line systems such as transport, energy and water supply, and waste disposal. They give residents easier access to a diversity of local services and jobs. Moreover, high density, combined with a diversity of urban functions, is claimed to stimulate knowledge diffusion and thus economic growth. It is also argued that the compact city generates new green needs that promote technological development and innovation and thus stimulate growth. For example, less automobile dependency will require new types of green infrastructure (light rail, cycling, etc.). There are social benefits as well. Shorter travel distances and public transport systems mean lower travel costs; this facilitates the mobility of low-income households. Local services and jobs nearby contribute to a higher quality of life.

... although potential adverse effects require careful consideration.

Nonetheless, the compact city concept has generated concerns. The adverse effects commonly cited relate to higher densities: traffic congestion, air pollution, housing affordability, quality of life, urban heat islands, high energy demand in densely built-up areas, and loss of open and recreational spaces. Compact cities may be more vulnerable to

natural disasters such as earthquakes, tsunamis, flooding and fires. Care must be taken to mitigate their vulnerability and to make cities resilient to the various risks associated with natural disasters. For example, built-up areas at high risk of flooding may not be appropriate for densification.

Compact city policies can link environmental and economic benefits for green growth …

Compact city policies can help achieve the economic and environmental benefits of green growth. The core value of a compact city is its capacity to integrate urban policy goals such as economic viability, environmental sustainability and social equity. Compact city policies **link** these policy priorities rather than address them in separate – even mutually exclusive – ways. In particular, they can address economic and environmental goals simultaneously without major trade-offs if policies are well designed and implemented.

… but tracking compact city policy outcomes requires quantitative studies and indicators.

Overall, therefore, the compact city's potential is not to be neglected. However, for policy makers to develop strong commitment and base their decisions on hard data, they need quantitative studies that make policy outcomes clear. In particular, internationally comparable indicators can help monitor compact city policy performance so that metropolitan areas can benchmark their results and improve their policy actions. Since comparative data are limited at the metropolitan level, efforts are needed to collect and develop relevant data. Compactness can be measured in various ways. Population density on urban land, measured by 24-hour average population, can show how intensively urban land is used. Urban land cover maps illustrate well the spatial characteristics of urban agglomerations. Trip distance can serve as an indicator of proximity. The efficiency of public transport systems can be measured by the share of trips using public transport and by proximity to public transport. The match between local services and homes indicates the accessibility of local services in a neighbourhood. However, qualitative considerations should not be omitted when formulating policy.

Most OECD countries now have some compact city policies at both national and metropolitan level.

The OECD Compact City Survey revealed that most national governments currently have elements of compact city policies. In Australia, France, Korea and Japan, the concept is part of their major urban policy documents. Elsewhere, policy documents recognise the relevance of the compact city approach to urban policy without adopting the term. Case studies of five OECD metropolitan regions (Melbourne, Vancouver, Paris, Toyama and Portland) offer a variety of policy strategies and instruments in a variety of local circumstances. Policy makers in these regions are challenged to design the best strategies and policy tools to address the specific, context-dependent attributes of their metropolitan region.

Different local circumstances call for different policy responses.

As expected, the survey and case studies showed that no single, comprehensive compact city model is applicable to all cities and regions, because each must take local circumstances into account. The comparative assessment revealed several links between local circumstances and policy responses. For example, in fast-growing regions with strong development pressures such as Melbourne, regulatory tools are important to prevent uncontrolled urban extension, and complementary fiscal tools can orient market-based decisions about the location and volume of development. In contrast, a region with a shrinking population such as Toyama may find measures to contain urban development politically difficult, because of fears of weakened competitiveness and accelerated hollowing out of the population. Sophisticated measures to induce people to move to urban centres may therefore be required. Likewise, while compact city policies may apply both in large and smaller regions, appropriate policy instruments may differ.

Well-chosen combinations of policy instruments can achieve several policy objectives.

The case study metropolitan areas make clear that innovative use of price mechanisms can be effective for co-ordinating different policy objectives, including economic growth. In Portland, tax reductions for owners of farm and forest lands seemed to enhance the competitiveness of these land uses at the urban fringes. Toyama fully recognised the economic benefits of compact city policies: more efficient public service delivery. Public investment in Toyama Light-Rail Transit was combined with fiscal incentives to guide private development within the urban centre and near the mass-transit stations.

To deal with the potential adverse effects of compact city policies, some case study metropolitan areas incorporate minimisation policies into the policy package. Prominent examples include Portland's green infrastructure initiatives for restoring the hydrologic cycle and tackling urban heat islands, and Vancouver's EcoDensity initiative, which combines densification with the provision of affordable housing options. So far, however, such practices are rare; these issues are viewed as general problems to be addressed and dealt with separately.

Five recommendations for compact city policy strategies.

The first recommendation is to set explicit compact city goals. A national urban policy framework that includes compact city policies is important. National and regional/local policy makers should consider metropolitan-wide planning with explicit compact city goals. This can help stakeholders (including local constituents and private investors) share the overall vision of a compact city.

The second is to encourage dense and proximate development. Because urban structure changes slowly, compact city policies are most effective for new development. As most new development takes place on urban fringes with both urban and rural land use, the chosen strategy is very important. It can rely on more effective regulatory tools, dense development at appropriate locations, and synchronising urban and rural land-use policies.

The third is to retrofit existing built-up areas. This allows existing urban space to accommodate more activities. All built-up areas are concerned, from the central business district to single-family neighbourhoods. Promoting brownfield development, harmonising industrial policies with compact city policies, regenerating existing low-density residential suburbs, promoting transit-oriented development in built-up areas, and encouraging "intensification" of existing urban assets are effective strategies.

The fourth is to enhance diversity and quality of life. Lively urban centres help to sustain the centrifugal power of a metropolitan area. Urban centres typically have offices, housing and commercial functions, and their diversity can boost the region's economic growth potential. Less diversity in residents, local services and jobs may cause inefficient use of urban land and infrastructure. Quality of life is also an essential part of the attractiveness of an urban centre; public parks and green spaces in urban centres are an essential element of a compact city. Possibilities include promoting mixed land use, attracting residents and local services to urban centres, and promoting a walking and cycling environment.

The final recommendation is to minimise adverse negative effects. Compact city strategies should be coupled with strategies to combat unwanted effects: suppressing traffic congestion; encouraging the provision of affordable housing; promoting high-quality urban design and focused investment in the public space; fostering a "sense of place" in urban centres; and encouraging greening of built-up areas.

The key role of metropolitan governance.

The case studies revealed four common elements for the achievement of compact city outcomes.

First, city and regional governments need to commit to compact city policies by designing and implementing a region-wide long-term vision. This will give residents and private investors a spatial image of the future and enable development in accordance with the vision. The central government should be committed to compact city concepts and provide direct policy, governance and financial support to city and regional governments' strategic plans to implement the vision.

Second, a clear understanding of who does what – within governments, between governments and between the public and private sectors – is central to the successful achievement of compact city goals. Compact city strategies implicate all levels of government, since no single tier controls all the policy, regulatory and fiscal tools to implement them. It is therefore vitally important for key actors to understand their roles and responsibilities from the outset, as this determines the tools each player uses and frames the policy, financial and regulatory co-operation required to implement the strategies effectively.

Third, when vertical and horizontal co-operation is effective, the community benefits and compact city outcomes are achieved more smoothly. Aside from traditional areas of governmental co-operation, innovative institutional relationships can be valuable. In Portland, metropolitan spatial planning has benefited from the academic expertise of the local university; perhaps more important from a practical viewpoint, the university and Metro joined forces to plan streetcar lines around and through the campus.

Fourth, accountability, transparency and reporting. This set of governance tools appears to be the most underdeveloped in the case study cities. Glaring by their absence are metropolitan-level performance indicators to allow stakeholders and the general public to measure progress towards the economic, social and environmental outcomes of the compact city vision. Data are crucial to transparency and to ensure that decision makers can adjust strategies in ongoing consultations with residents and key stakeholders when objectives are not being met.

Chapter 1

The compact city concept in today's urban contexts

This chapter discusses the meaning of the compact city concept and the implications of compact city policies in current urban contexts. It is divided into three main sections. The first discusses the definition of compact city. The second illustrates key urban trends that are relevant to the concept and to the need for compact cities. The third reviews the history and evolution of the compact city concept.

1.1. Introduction

The compact city is one of the most discussed concepts in contemporary urban policy. It is a spatial form characterised by "compactness". Although a number of definitions exist, this report considers the key characteristics of the compact city to be: *i)* dense and proximate development patterns; *ii)* urban areas linked by public transport systems; and *iii)* accessibility to local services and jobs (these characteristics will be discussed later in detail, as the definition is a focus of debate). Compact city policies are in turn understood as a comprehensive approach to achieve a compact city by influencing the ways urban space is utilised.

The aim of compact city policies is to address integrated urban policy goals, or urban sustainability goals (economic viability, environmental quality, social equity, etc.). Compact city policies are expected to play a role in meeting these goals because, by influencing the use of space in cities, they can substantially improve cities' environmental, social and economic performance. For example, a compact urban form with an efficient transport system can reduce intra-urban trip distances, and this in turn reduces the cost of transporting goods and services as well as the consumption of petrol (gasoline). In built-up areas, a compact city facilitates local energy-generation technologies (combining heat and power, district cooling, etc.). On urban fringes, a compact city seems better able to conserve land resources for agriculture, recreation and water and energy provision. This is the rationale for policy makers to pursue a compact city.

However, it is widely recognised that the concept generates debate. Indeed, the very popularity of the term amplifies the difficulties. Although the term is widely known, there is no general understanding of what it means; people discuss it with different definitions in mind. Second, there is extensive debate regarding whether compact city policies actually result in solid, positive impacts on urban sustainability objectives. Even where there is evidence to this effect, many argue that substantial negative influences offset the positive ones. For example, policies to encourage more intensive use of built-up areas can lead to increased traffic congestion, air pollution, a lack of vegetation in cities, loss of open green space and insufficient affordable housing. Third, there is the issue of how best to design and implement compact city policies. As these are mostly formulated for existing cities, each with its specific context, a locality needs to adapt its compact city strategies to fit its particular circumstances. In other words, no single comprehensive compact city model is applicable to all cities. Moreover, it takes a long time for compact city policies to achieve results, and these policies often raise conflicts of interest and create strong opposition from various interest groups. The implementation challenges include governance arrangements, citizens' involvement, financing and monitoring/evaluation.

Taking these issues into consideration, the objective of this report is:

1. To better understand the compact city concept and the implications of today's urban contexts for compact city policies (Chapter 1).
2. To better understand potential outcomes, particularly in terms of how compact cities can contribute to green growth; to consider the impacts of compact city policies on urban economies and environment (Chapter 2).
3. To develop indicators to monitor compact cities and track policy performance (Chapter 3).

4. To examine compact city policies currently being implemented across the OECD in relation to the pursuit of green growth objectives (Chapter 4).
5. To propose key compact city strategies and provide ideas for achieving better outcomes (Chapter 5).
6. To assess the key governance challenges faced by decision makers as they seek to implement practical compact city strategies (Chapter 6).

This report is thus intended as "food for thought" for national, sub-national and municipal governments as they seek to address economic and environmental challenges through the development and implementation of spatial strategies in pursuit of green growth objectives. It attempts to illustrate best practices (which include key elements of successful compact city policies) based on empirical evidence that can be shared across OECD member countries. It also presents indicators that are being developed as a result of this analysis, in order to compare urban forms and the results of policy practices in different metropolitan regions.

In terms of methodology, this report takes a comparative approach: it looks at policies that have been adopted and compares and analyses the outcomes. It is based on a literature review and a survey of policy practices in OECD member countries. In addition, five metropolitan regions were chosen as in-depth policy case studies: Melbourne (Australia), Vancouver (Canada), Paris (France), Toyama (Japan) and Portland (United States). The policy practices of the case study regions are discussed in Chapters 4, 5 and 6.

1.2. Defining the compact city

Defining the term "compact city" is not an easy task because there is no single model. Nonetheless, it is crucial to have a definition because the concept is controversial and the subject of debate. This section explores the definition to be used throughout the report, so as to make its focus clear. In addition, several important related concepts are discussed to make clear distinctions among concepts and avoid confusion.

Key characteristics of a compact city

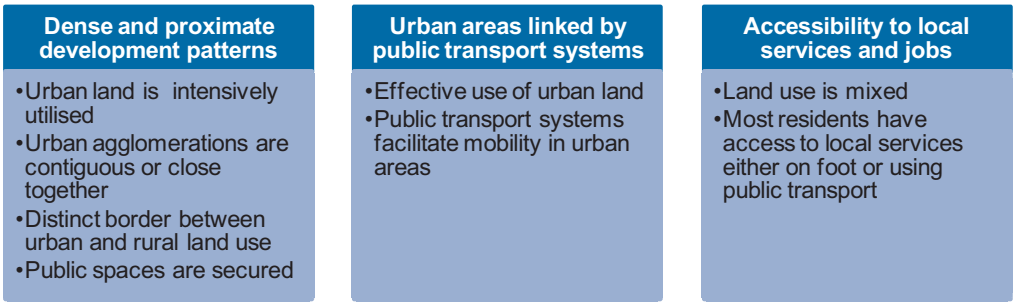
An extensive literature deals with the definition of a compact city (Box 1.1). Although cities differ and different cities take different compact city forms, this report considers that the key characteristics of a compact city are (Figure 1.1):

- **Dense and proximate development patterns.** Density involves how intensively urban land is utilised, and proximity particularly concerns the location of urban agglomerations in a metropolitan area. In a compact city, urban land is intensively utilised, urban agglomerations are contiguous or close together and the border between urban and rural land use at the urban fringe is clear. However, public spaces including squares, streets and parks are also essential elements. Density and proximity are two major physical (or morphological) elements of the compact city. Simple morphological models can help clarify these two characteristics (Box 1.2).
- **Urban areas linked by public transport systems.** These indicate how effectively urban land is utilised. Public transport systems facilitate mobility in urban areas and enable urban areas to function effectively.

- **Accessibility to local services and jobs.** This concerns how easily residents can reach local services such as grocery stores, restaurants and clinics as well as neighbourhood jobs. In a compact city, land use is mixed and most residents have access to these services either on foot or using public transport.

In addition, this report considers functional urban areas as a unit of analysis. It identifies cities as functional economic units, characterised by a densely inhabited "urban core" and a "hinterland" whose labour market is highly integrated with the "core" (OECD, 2012). Importantly, compact city policies make sense on this scale since the commuting patterns relevant to a city's urban areas in most cases extend beyond municipal administrative boundaries. For example, a new large commercial development in a suburban municipality can significantly affect traffic patterns on a metropolitan scale.

Figure 1.1. **Key characteristics of a compact city**



Box 1.1. **Various compact city definitions in the literature**

- Dantzig and Saaty (1973) is considered to have first made use of the term "compact city". They proposed a circular city with a diameter of 8 840 feet and a terraced perimeter. The city is composed of eight levels, or platforms, 30 feet apart. It can house 250 000 people and can be expanded to a population of 2 million by doubling its diameter and height. The central core contains commercial, industrial, entertainment and service centres. The top level is a large recreational park. The core is surrounded by residential areas with apartments and houses. A circular ring called the "mid-plaza" runs through the middle of the residential area and provides local facilities such as schools, clinics, neighbourhood shops and play areas. At maximum size the city has 256 elevator systems and a mass-transit system running lines along the radials and the mid-plaza. The transport system also consists of publicly owned electric cars. The characteristics of a compact city are:
  - urban form: high, dense settlements; less dependence on automobiles (as a result of high density); clear boundary from surrounding areas;
  - spatial characteristics: mixed land use; diversity (as a result of mixed land use); clear identity;
  - social functions: social fairness (as a result of high-density settlements); self-sufficiency of daily life; independent government (as a result of clear boundaries).

Box 1.1. **Various compact city definitions in the literature** (*cont.*)

- Thomas and Cousins (1996) argue that more "decentralised concentration" of development may provide a settlement pattern which is not only more environmentally sustainable and more in tune with popular aspirations, but could also meet the demands of economic forces, and hence win political favour. Thus, they identify the basic characteristics of the compact city as: compactness in scale; accessibility for all on foot, by bicycle and by public transport; and greater respect for wildlife.

- Churchman (1999) argues that compact city policies aim to intensify urban land use through a combination of higher residential density and centralisation, mixed land use and limits on development outside of a designated area.

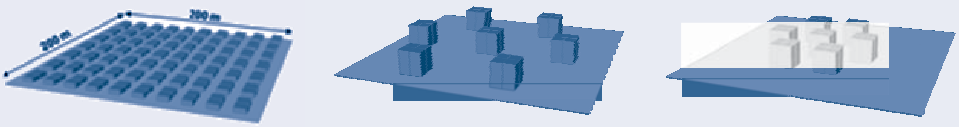
- Burton (2002) outlines three aspects of the compact city: it is high density, mixed use and intensified. The first two aspects are related to the form of the compact city, while the third focuses on the process of making the city more compact. These aspects are multi-faceted: a high-density city has high average population density, high density of built form, high-density sub-centres, high-density forms of housing and density values; a mixed-use city has a varied and plentiful supply of facilities and services, and both a horizontal and vertical mix of uses; an intensified city has an increase in population, development, density of sub-centres or nodes, new development and mix of uses.

- Neuman (2005) presents the following 14 characteristics of a compact city: *i)* high residential and employment densities; *ii)* mixture of land uses; *iii)* fine grain of land uses (proximity of varied uses and small relative size of land parcels); *iv)* strong social and economic interaction; *v)* contiguous development (some parcels or structures may be vacant or abandoned or include surface parking); *vi)* contained urban development with clearly demarcated limits; *vii)* urban infrastructure, especially sewerage and water mains; *viii)* multi-modal transport; *ix)* high degree of accessibility: local/regional; *x)* high degree of street connectivity (internal/external), including sidewalks and bicycle lanes; *xi)* high degree of impervious surface coverage; *xii)* low open-space ratio; *xiii)* unitary or closely co-ordinated control of planning of land development; *xiv)* sufficient government fiscal capacity to finance urban facilities and infrastructure.

Source: Dantzig, G.B. and T.L. Saaty (1973), *Compact City: A Plan for a Livable Urban Environment*, W.H. Freeman & Co., San Francisco, CA.; Thomas, L. and W. Cousins (1996), "A new compact city form: concepts in practice", in Jenks, M., E. Burton and K. Williams (eds.) (1996), *The Compact City: A Sustainable Urban Form?*, E & FN Spon, Oxford; Churchman, A. (1999), "Disentangling the concept of density", *Journal of Planning Literature*, 13(4): 389-411; Burton, E. (2002), "Measuring urban compactness in UK towns and cities", *Environment and Planning B: Planning and Design 2002*, 29(1): 219-250; Neuman, M. (2005), "The compact city fallacy", *Journal of Planning Education and Research*, 25(1): 11-26.

Box 1.2. **Density and proximity: two morphological characteristics of a compact city**

In the figures below, 140 dwelling units are located in a 200 x 200 meter square, in three different locations and types of buildings. While each figure has the same number of dwelling units, their density (how intensively urban land is utilised) and proximity (location of development) differ. On the left are semi-detached houses which cover a lot of land (low density). In the middle, apartment buildings cover less land (high density). On the right, the type of building is the same but their location is more proximate (the distances between the buildings are shorter). This option is more compact (that is, dense and proximate) than the other two.



Similarly, the figure below attempts to extend the same concept from a neighbourhood scale to an urban area. The circles are urban settlements consisting of residents and jobs. Figure b is twice as dense as figure a, that is, each urban centre accommodating the same number of inhabitants and jobs covers half of the land. Each circle remains in the same location, but it is smaller. The greater density reduces energy consumption in each urban centre, for example because of the ability to go to schools or stations on foot rather than by car or because of the use of local heating networks.

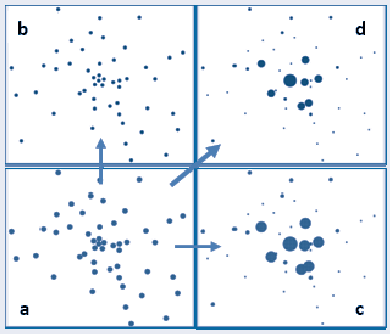


Figure c is twice as proximate as figure a, that is, residents and jobs are less dispersed and the average distance between one resident and all other people or jobs is half that of figure a. Although the density remains the same (the circles cover the same amount of land), some residents and jobs moved to form larger circles near the centre. The increase in proximity also provides energy reduction benefits, this time not from local operation but at a metropolitan scale, for example because of the average distance of shuttle buses between home and work or the length of supply chains of supermarkets from large metropolitan logistics hubs.

Finally, figure d combines the two, that is, each circle remains in the same location as in figure c but the size of each circle is decreased by doubling the density of each settlement. This is a theoretical image of a polycentric compact city.

In sum, figure b illustrates the concept of density, which means how much land is used for accommodating a given urban activity, and figure c illustrates the concept of proximity, which means how urban activities are dispersed. Density and proximity can be assessed at different levels (neighbourhoods, municipalities, metropolitan areas).

Source: Adapted from Laruelle, N. (2007), "Draft sketches illustrating density vs. compacity", IAU-ÎdF, Paris.

Compact urban development as a component of the compact city

"Compact city" and "compact urban development" are distinct concepts in terms of scale: compact city is a policy approach to urban development and urban form at a metropolitan scale, while compact urban development typically refers to a development project on the neighbourhood scale. While compact urban development can create "compactness" in a specific neighbourhood, it is not sufficient to create a compact city, among other things because the location of such development in a metropolitan region matters for compact city outcomes. That is not to say that compact urban development is not meaningful – it also involves density, mixed land use (apartments, commercial space and offices), and public transport systems, as well as ecological technologies. If the location is appropriate, compact urban development can be a meaningful policy choice. This is particularly true in that improvements in urban structure in existing cities can only occur through incremental changes. Compact urban development as a compact city policy strategy will be discussed in detail in Chapter 5.

The size of a compact city

People may associate the term "compact city" with a "small" city in terms of population or geographical space. However, this report considers that "large" metropolitan areas can also be "compact" if they have the characteristics described above, and that there would be merit in having all metropolitan areas of different sizes pursue compact city policies. For example, while it is natural that megacities (with a population of more than 10 million) consume more urban land space than smaller metropolitan areas (for example, with a population of 1 million), the need for compact city policies to address rapid urban expansion may be more serious in megacities than in smaller metropolitan areas. It is important to understand that compact city policies are not only for "small" cities.

A polycentric urban structure in a compact city

The term "compact city" tends to be associated with a monocentric urban structure and has often been discussed as the contrary of urban sprawl or decentralisation (Breheny, 1995; Gordon and Richardson, 1997; Bertaud and Malpezzi, 1998). However, it has been increasingly noted that many metropolitan areas are in fact polycentric urban structures (Box 1.3). A question that arises is whether the compact city concept can only be applied to a monocentric urban structure, or if it can also be relevant to the polycentric urban structure that is more common in today's urban contexts.

In terms of this report, the compact city on the metropolitan scale does not presume a specific urban form, whether monocentric or polycentric. A polycentric metropolitan area can be a compact city if it has the characteristics identified above. In such a case, the urban agglomerations are not necessarily located contiguously but are not widely dispersed and are linked together by public transport systems. On the contrary, it may not be considered a compact city if urban agglomerations are widely dispersed across the metropolitan area and are not well linked by public transport systems. Proximity of urban cores is an important notion for a polycentric compact city.

Another important point is that different metropolitan areas should pursue different urban structures to form a compact city (monocentric, polycentric or something else). For example, a monocentric compact city may not be realistic in megacities, as it may well cause significant negative externalities (e.g. traffic congestion, air pollution) and offset the benefits of a compact city. Instead, a polycentric compact city may be preferable. The

importance of applying appropriate compact city policies according to local circumstances will be discussed in Chapter 4.

Box 1.3. **Polycentric urban form**

Since the 1980s, the reconfiguration of metropolitan areas' physical urban form has been increasingly debated among both theorists and practitioners. The monocentric model, in which central city locations are considered the sole functional focal point for all types of social and economic activity, is no longer seen as the norm in the evolving spatial patterns of urban Europe. This is also the case in North America, Australia and increasingly in Asia. Central city locations are becoming components of a wider spatial functional entity that comprises headquarters complexes, back offices, airport cities, logistics management, different kinds of housing areas and entertainment facilities. Therefore, cities (or even clusters of proximate cities) seem to be integrating more and more with their hinterlands to form multi-centred functional city regions or metropolitan areas.

Changes in metropolitan areas are not taking place just in "inner cities" but also in their "hinterlands". There is increasing evidence that a new phase of development in terms of the "urban periphery" is emerging that is not characterised simply by growth in terms of population and the extension of the urban fabric. It also involves a wider array of economic functions and qualified jobs. The "new spaces of growth poles" take a broad variety of spatial forms and functional specialisations to create, in line with infrastructure networks, "new intermediate zones" with new centralities and peripheries. Such decentralisation processes may even lead to a hollowing out of the traditional city (Knapp and Schmitt, 2003).

It can therefore be argued that almost all metropolitan areas, even so-called monocentric ones can also – albeit to different degrees – be considered polycentric urban configurations because of the morphological and functional differentiations taking place in and between neighbouring cities and towns within metropolitan areas. The role of cities is embedded in a spatially wider polycentric organisation of socio-economic activities.

This is not without consequences for spatial planning in metropolitan areas as it entails many challenges and calls for new trade-offs and tailor-made solutions. These challenges and the resulting experience in dealing with such issues can be linked to the notion of "intra-metropolitan polycentricity" (i.e. polycentricity within metropolitan areas).

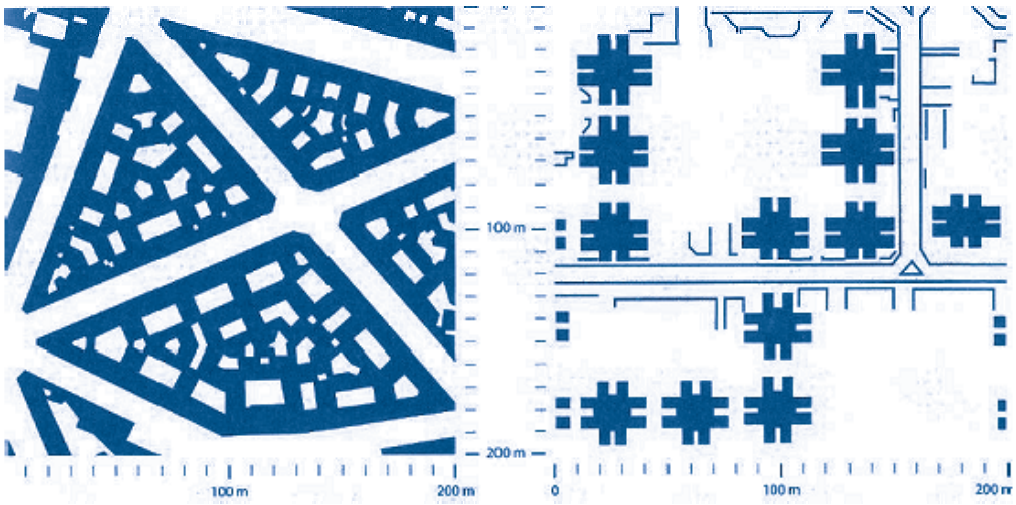
Source: METREX (2010), "Intra-metropolitan polycentricity in practice: reflections, challenges and conclusions from 12 European metropolitan areas", Nordregio, Glasgow, United Kingdom.

Building forms and open space in a compact city

Many people associate the notion of compact city with high-rise buildings in large metropolitan areas. However, there are development options other than high-rise buildings. In fact, while a compact city aims at high-density built-up areas, several studies show that high-rise building developments are not necessarily denser. A study in Toronto showed that low- to medium-rise buildings can achieve relatively high densities. The findings identified net densities of 120-230 dwelling units per hectare in areas of buildings of only up to five stories (Churchman, 1999). Another investigation of different geometrical forms of building in Paris and Hong Kong, China has indicated that high-rise building developments are not denser than low-rise developments. The study showed that a Parisian "Haussmanian" district of 6-7 stories is denser than a 20-story building neighbourhood in Hong Kong, China on the same land size (Figure 1.2). In this case density is compared by using the floor area ratio (FAR), which is a ratio of floor area to land area. The density in Paris (FAR = 5.75) is in fact higher than that in Hong Kong, China (FAR = 4.32). This shows that compactness can be achieved using

different types of buildings and that density need not mean high-rise buildings. It is important for cities aiming to create a compact city to have a certain degree of flexibility in the choice of urban form and shape of buildings. This point is of great importance for the acceptability and the feasibility of creating a compact city.

Figure 1.2. **Building forms in Paris and Hong Kong, China**



Source: Jacquet, P., R.K. Pachauri and L. Tubiana (2010), *Regards sur la terre 2010. L'annuel du développement durable: Villes : changer de trajectoire*, SciencesPo, Paris.

Another common "misconception" is that a compact city is just a dense city without open spaces (in the form of squares, urban parks, avenues, etc.) in the densely built-up areas. However, this report considers such open space as an indispensable element of a compact city, as the ultimate goal of compact city policies is to achieve urban sustainability, including environmental quality. The importance of open space in a compact city and a strategy to ensure it will be further discussed in Chapter 5.

1.3. Key urban trends and the compact city

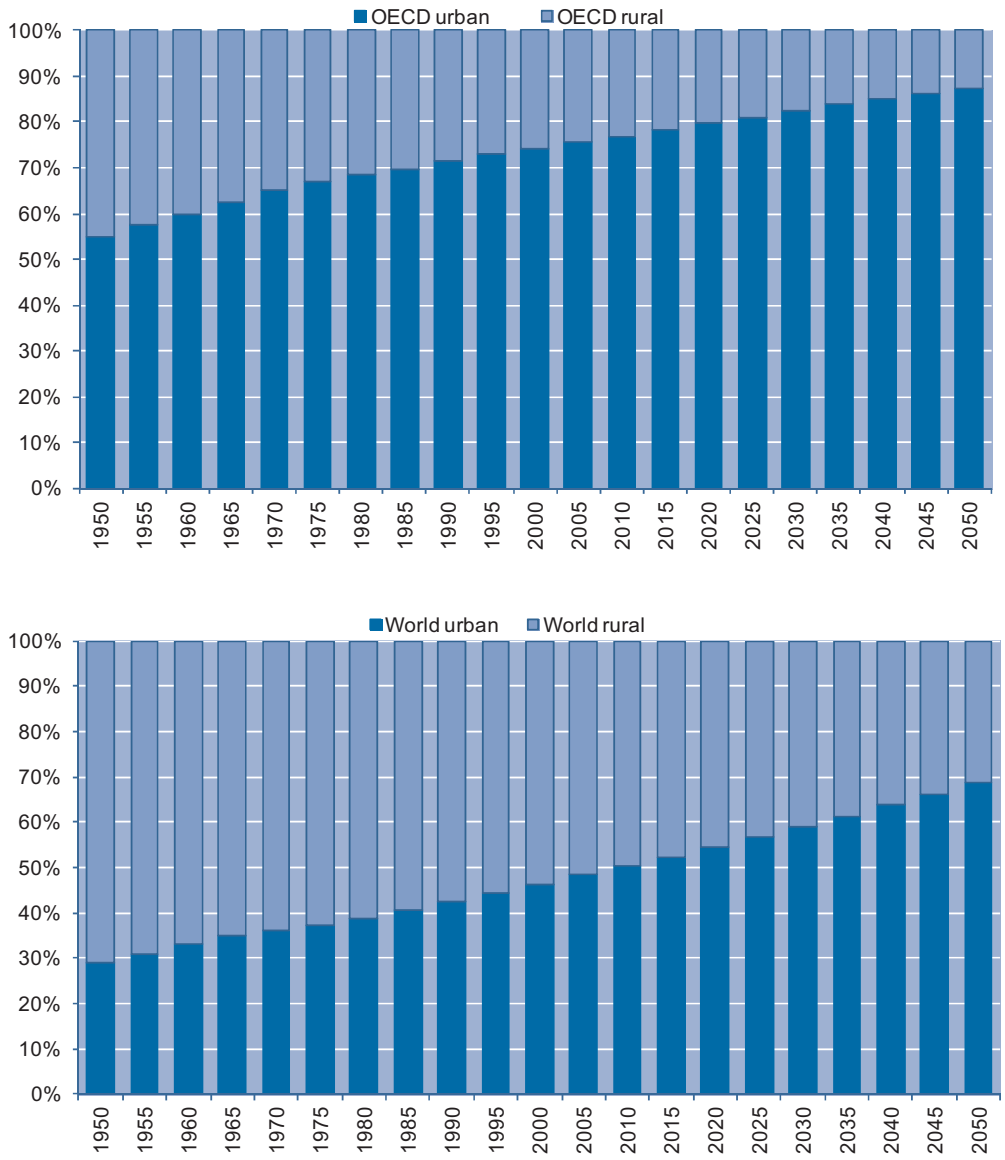
Current urban trends underscore the importance of compact city policies and suggest that they can play a significant role. This section first looks at five relevant trends and then discusses how compact city policies can play a role.

Urbanisation and the increasing need to conserve land resources

The continuing growth of urban populations underscores the increasing need to conserve land resources. By 2050, 70% of the world's population – and 86% in OECD countries – will live in urban areas (OECD, 2010) (Figure 1.3). This is a result of the continuous growth in the population living in cities over the past 60 years, which will continue in line with a reduction of the population in rural areas. This urbanisation trend will create huge urban agglomerations, most of them in developing countries. The number of megacities, cities with at least 10 million inhabitants, is projected to increase from 21 in 2009 to 29 in 2025. Today Asia has 11 megacities but will have gained another 5 by 2025. Moreover, the large cities with populations ranging from 5 million to

just under 10 million numbered 32 in 2009 and are expected to reach 46 in 2025 (United Nations, 2010).

Figure 1.3. **Urban and rural population in the world and the OECD, 1950-2050**



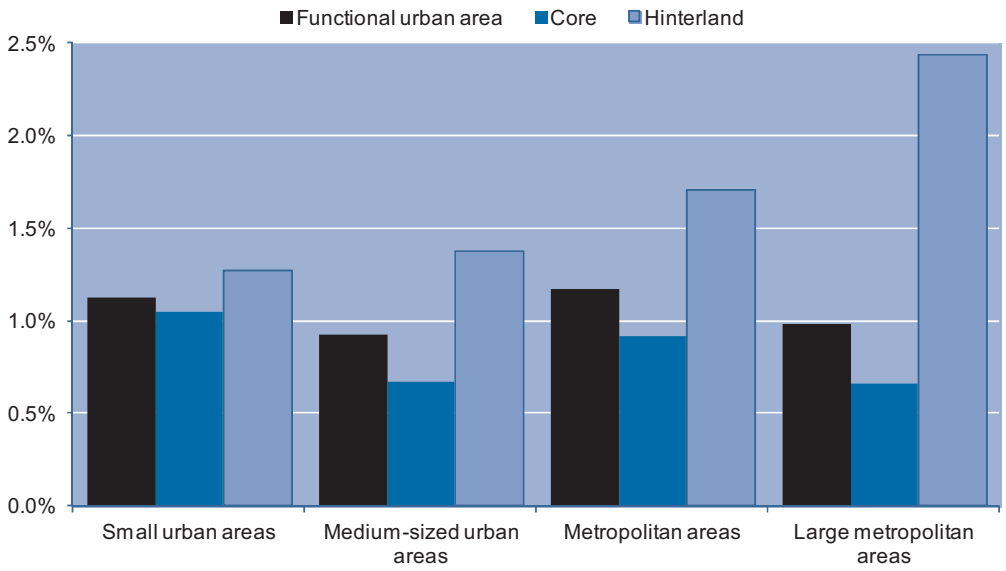
Source: Updated from OECD (2010) based on data from the *UN Population Database* (2009).

Data on the spatial distribution of the population within cities show that the urbanisation trend is accompanied by a rapid expansion of urban space at the fringe of cities. Between 2000 and 2006, population growth was faster in suburbs (shown as "hinterland" in Figure 1.4) than in urban centres (shown as "core") across all four types of functional cities in OECD countries, and the trend was strongest for large metropolitan

areas (with a population of 1.5 million or more) (Figure 1.4). This implies that there is more greenfield development than infill development in built-up areas, particularly in large metropolitan areas. Along the same lines, Angel et al. (2005) found decreases in average urban density in 90 cities both in developed and developing countries around the world between 1990 and 2000. Moreover, they found that the rate of the average decrease in the density of urban areas was faster in developed than in developing countries (Angel et al., 2011). The significance of this trend is that, on average, each person consumes more space (OECD, 2008). These trends can be explained by two facts: first, newly developed land is not used as intensively as existing urban areas; and second, urban sprawl generates brownfield sites – abandoned, vacant or under-used former industrial areas (Greenberg et al., 2001; Savitch, 2003). This leads to inefficient use of established infrastructure.

Figure 1.4. **Population growth by city type and core/hinterland**

Average yearly growth rates, 2000-2006

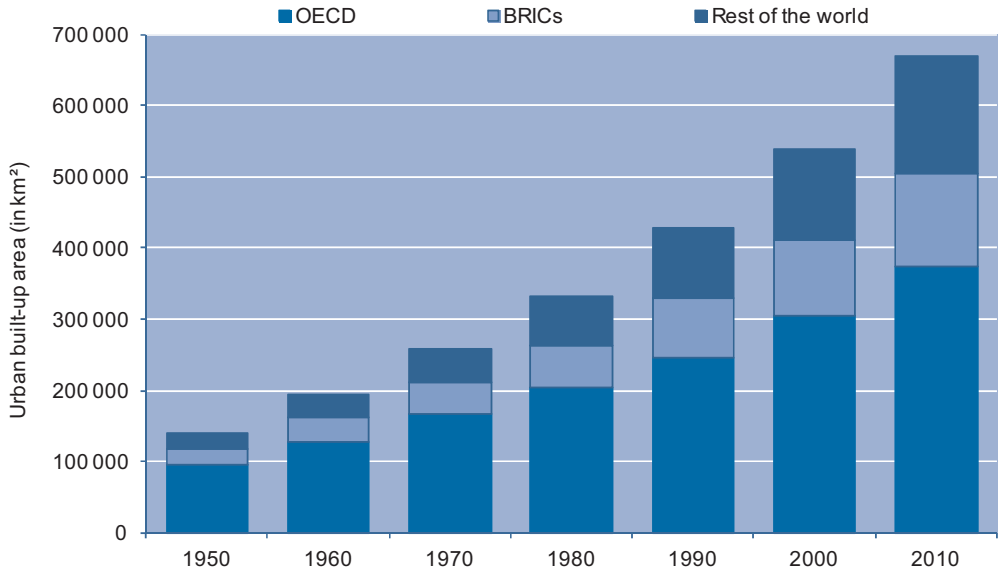


Note: The period of growth for Korea is 2000-2010 and for Portugal 1991-2011.

Source: OECD (2012), *Redefining Urban: A New Way to Measure Metropolitan Areas*, OECD Publishing, Paris.

As the result of urbanisation (from rural to urban) and faster population growth in suburbs of cities, built-up areas in OECD countries increased threefold between 1950 and 2000 (Figure 1.5). The expansion of built-up land comes at the expense of agricultural land, forests, open space or wetlands, with a concomitant loss of the economic, recreational and ecological values that those ecosystems provide. Therefore, the land covered by urban sprawl affects not only the built-up area but also a considerably wider zone. This increases the stress on ecosystems and species (OECD, 2008).

Figure 1.5. **Changes in built-up areas, 1950-2010**

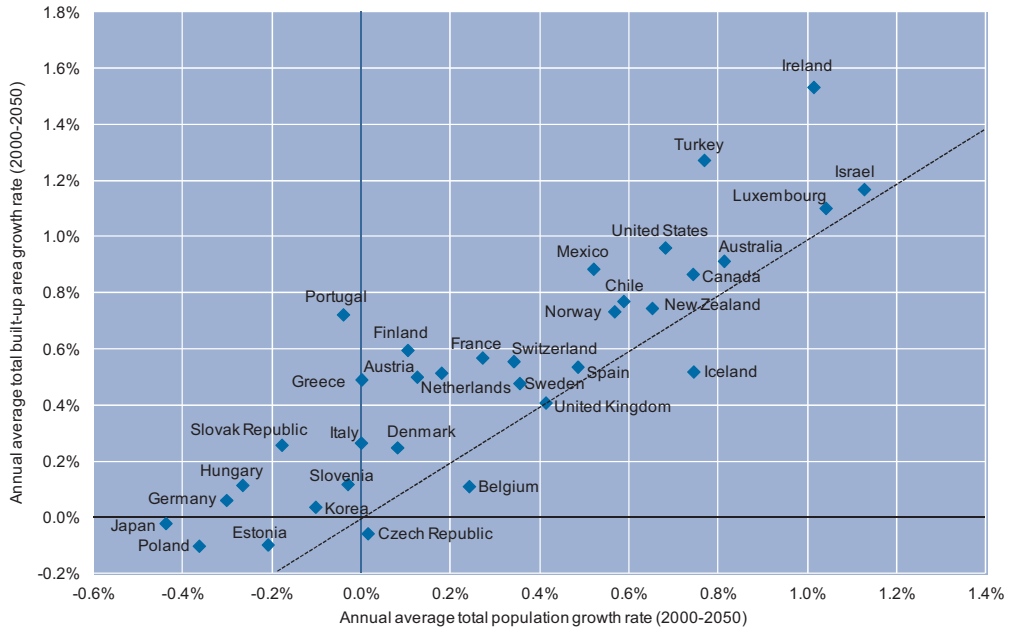


Note: Built-up areas are computed (modelled) and derived from a combination of urban population (directly derived from United Nations World Population Prospects 2008 Revision) and historical urban density estimates (approximated by a bell curve). For details, see Goldewijk et al. (2010). BRICs: Brazil, Russian Federation, India, China.

Source: Update from OECD (2010) based on data on built-up areas from Goldewijk, K., A. Beusen and P. Janssen (2010), "Long-term dynamic modeling of global population and built-up area in a spatially explicit way: HYDE 3.1", *The Holocene*, 20(4): 565-573, SAGE, Thousand Oaks.

The need to conserve land resources is highlighted by the fact that land consumption is increasing more rapidly than population growth. Built-up areas expanded by 171% worldwide between 1950 and 2010 (Figure 1.5), whereas the world population grew by only 142% according to the *UN Population Database*. In particular, OECD countries increased their built-up areas by 104% while population increased by only 66%. Moreover, this trend will continue in OECD countries over the period 2000-2050. In fact, at the current rate, the consumption of land for built-up areas will increase faster than total population in 30 out of 34 OECD countries (Figure 1.6). In Austria, Denmark, Finland, Greece, Italy and the Netherlands the urban area will increase at least twice as fast as the total population. In the United States, an area of about the size of the state of Pennsylvania could be absorbed by urban development between 2000 and 2050 (Nowak and Walton, 2005).

Figure 1.6. **Population and built-up area growth rate in OECD countries, 2000-2050**



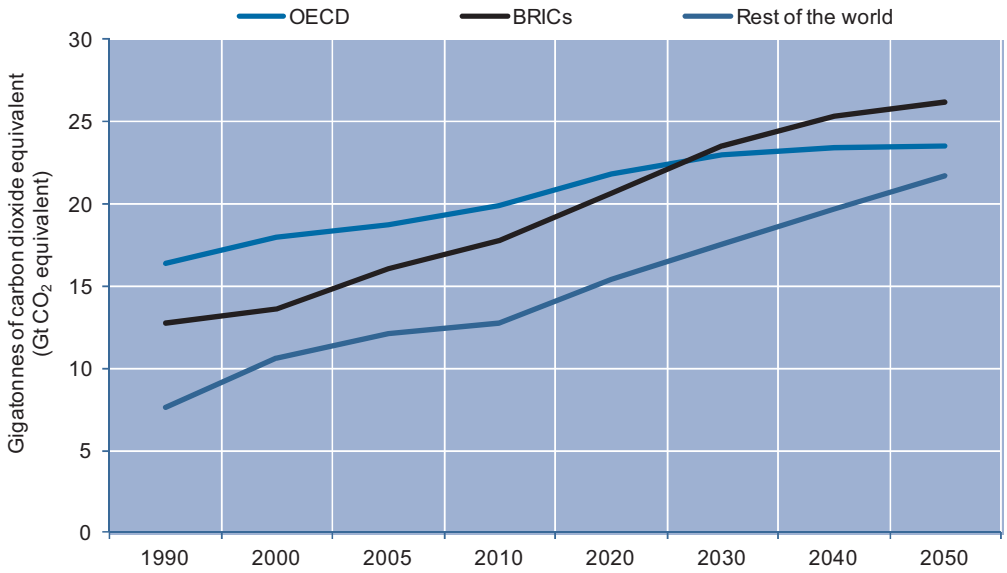
Notes: Built-up areas are computed by using GIS techniques and defined as the areas occupied by built-up pixels within the set of administrative boundaries defining the city. For details, see: *www.lincolninst.edu/subcenters/atlas-urban-expansion/area-metrics.aspx*. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: Based on population data from United Nations (2010), "World urbanization prospects: the 2009 revision population database", United Nations, NY; and urban land area data from Angel, S., J. Parent, D.L. Civco and A.M. Blei (2010), *Atlas of Urban Expansion*, Lincoln Institute of Land Policy, Cambridge, MA, *www.lincolninst.edu/subcenters/atlas-urban-expansion*, accessed 10 April 2012.

The threat of climate change to cities

Climate change increasingly threatens cities. The OECD projects that, on the present trajectory, global greenhouse gas (GHG) emissions will increase by more than 50% by mid-century, causing world temperatures to rise by 1.7 to 2.4 degrees Celsius (°C) above pre-industrial levels by 2050, and from 4°C to 6°C or more in the long term (OECD, 2009). OECD (2008) also projected an absolute global increase in GHG emissions. Total emissions in 2050 will be double 1990 levels. Their growth will be significantly higher in the BRICs (Brazil, Russia, India and China) and the rest of the world than in OECD countries (Figure 1.7). Cities are directly relevant to climate change in two ways. First, as the main consumers of energy, cities are among the major sources of CO_2 emissions. Second, urban populations and infrastructures are vulnerable to climate change. Coastal cities are particularly exposed to rising sea levels and storm surges due to climate change (OECD, 2010).

Figure 1.7. **GHG emissions by region, 1990-2050**

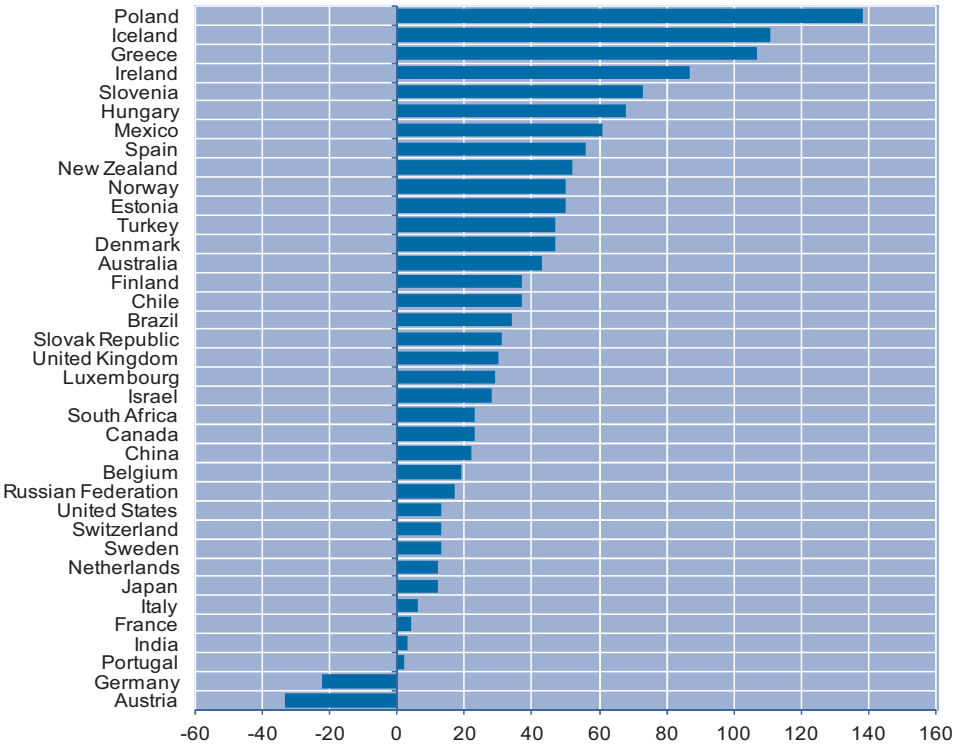


Note: Totals of hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulfur hexafluoride (SF6) appear only in world totals by gas. However, world totals of all GHG emissions do not include emissions of these fluor gases. BRICs: Brazil, Russian Federation, India, China.

Source: OECD (2008), *OECD Environmental Outlook to 2030*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264040519-en*.

Cities require effective countermeasures to reduce GHG emissions. An important option is to reduce CO_2 emissions from cars, since the transport sector has been a major source of the rise in GHG emissions (IPCC, 2007). In the United States, this sector accounts for almost 30% of total CO_2 emissions (OECD, 2010). However, OECD countries are still highly car-dependent. In almost all OECD countries, the number of vehicles per 1 000 population rose between 2003 and 2008 (Figure 1.8). Dependency on the automobile is expected to continue to rise until 2050, especially in North America and even more in some emerging economies (Figure 1.9). Another important option is the building sector, as it has the potential to substantially reduce CO_2 emissions, for example, by retrofitting existing buildings.

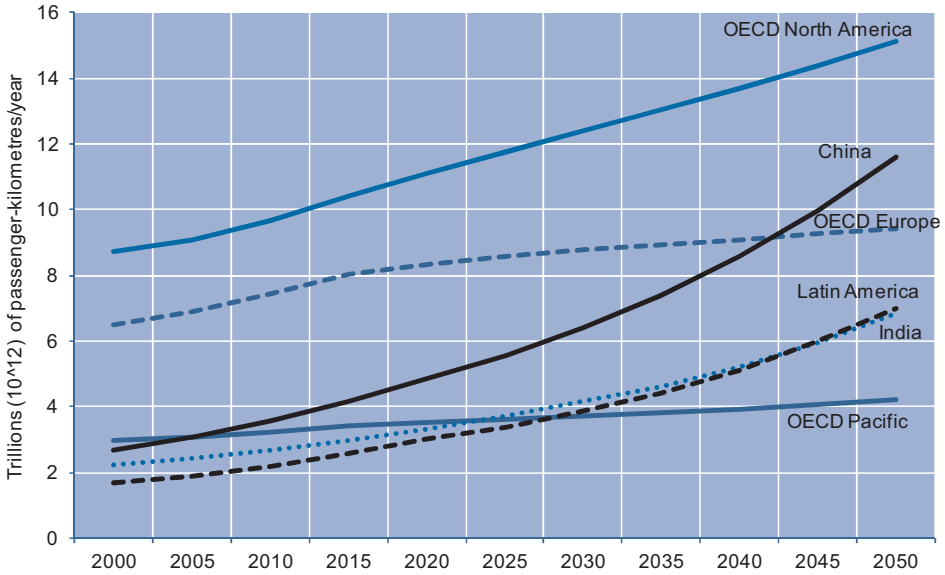
Figure 1.8. **Change in vehicles per 1 000 population, 2003-2008**



Note: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: Based on data from the International Road Federation, *World Road Statistics*.

Figure 1.9. **Passenger kilometres travelled, main regions, 2000-2050**

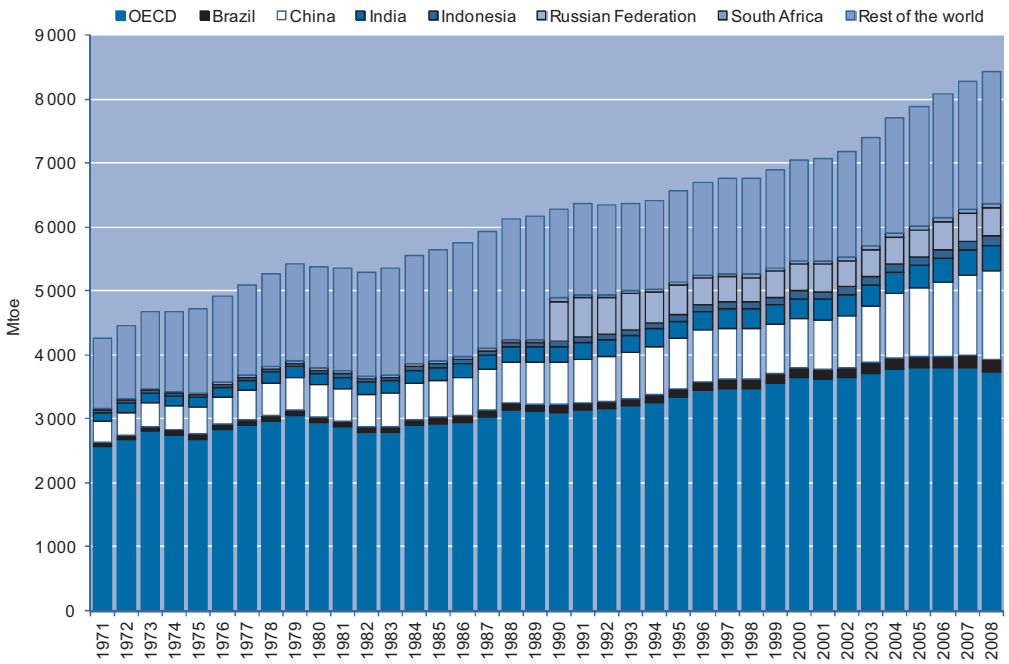


Source: Based on World Business Council for Sustainable Development's Sustainable Mobility Project calculations, *www.wbcsd.org/web/publications/mobility/smp-model-spreadsheet.xls*, accessed 23 April 2012.

The rise in energy prices

World energy demand has been increasing over the last 40 years along with, and notwithstanding, a persistent rise in energy prices. Energy consumption has risen continually in OECD countries since the mid-1980s (Figure 1.10). This long-term trend is expected to continue, mostly as a result of growth in emerging economies. Total energy prices continuously increased in OECD countries from 1998 to 2008, although the trend since the economic crisis in 2008 is not clear (Figure 1.11).

Figure 1.10. **Total energy consumption, 1971-2008**

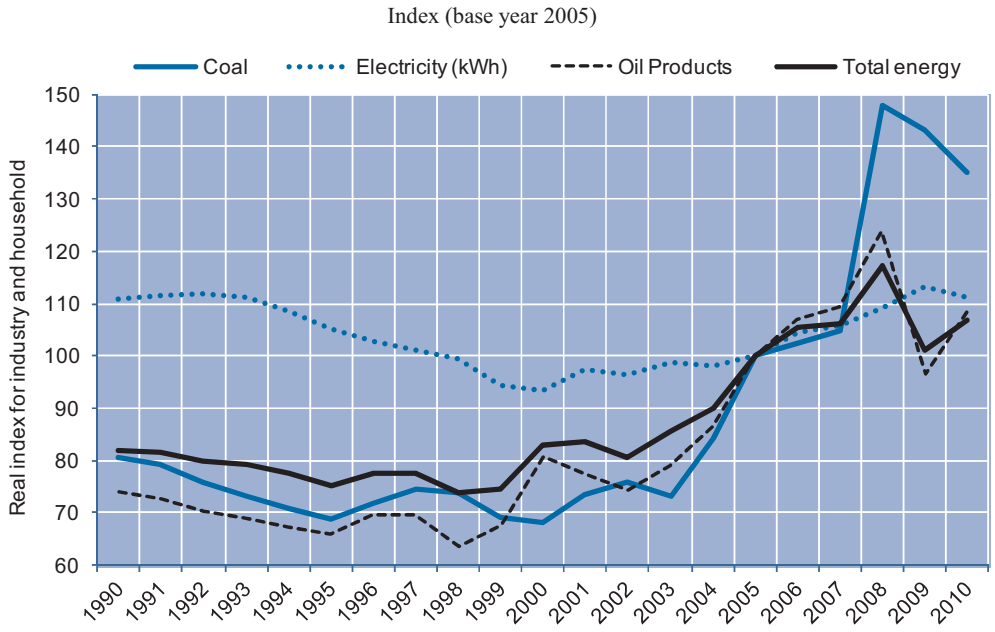


Note: Individual data for the Russian Federation before 1990 are not available (they are included in the category "rest of the world").

Source: *OECD World Energy Balances Database*.

The rise in the price of energy to cities can substantially affect their economies. Metropolitan areas with high energy dependency might lose their economic competitiveness. In terms of the use of urban space, it may also affect travel behaviour and the choice of where to live. Those who bought houses in the outer suburbs and have long commutes could suffer, especially if transport costs were considered very low at the time of purchase. The extent of households' exposure to the impact of higher fuel prices as well as mortgage interest rates has been examined closely by a research group in Australia. Their results indicate that inner areas of Australia's major cities tend to be less vulnerable to higher oil and mortgage costs than outer and fringe suburban zones (Dodson and Sipe, 2008). In the United States, a study also highlighted that the rise in gasoline prices from USD 1.1 per gallon in early 2002 to more than USD 3 in 2008 has affected suburban housing values the most: distant suburbs have seen the largest housing price declines, while values in close-in neighbourhoods have held up better (Cortright, 2008).

Figure 1.11. **OECD energy prices, 1990-2010**



Source: IEA Energy Prices and Taxes Statistics: indices of energy prices by sector.

The challenge of sustainable economic growth

Sustainable economic growth remains a priority. The recent economic crisis has had negative impacts not only on private economic activities but also on local governments' finances. In many countries, sub-national government deficits and debt levels are expected to rise considerably owing to a "scissors effect": revenues fall as a consequence of the decline in activity, while spending soars owing to the need for social welfare programmes (Blochlinger and Vammale, 2010) (Box 1.4).

Economic challenges may be presented not only by economic crises, but also by long-term fiscal conditions. For example, despite their significantly lower economic growth rates over the next few decades, OECD countries will be required to invest heavily to maintain, upgrade or replace existing (and often ageing) infrastructures and to preserve their international competitiveness. For OECD countries as a whole, investment requirements in electricity transmission and distribution are expected to more than double through to 2025/2030, almost to double in road construction, and to increase by almost 50% in the water supply and treatment sector (OECD, 2007). For their part, the share of social expenditures has already increased noticeably. The two key drivers of increases in social spending have been expenditures on health and on the retired population, both of which are expected to expand considerably in the coming decades, outpacing the growth of government budgets and that of GDP by a substantial margin. An OECD study suggests that for the OECD as a whole, spending on public health and long-term care could increase from the current level of 6.7% of GDP to between 10.1% and 12.8% by 2050, while pensions could rise on average by around 3 to 4 percentage points of GDP over the same period (OECD, 2007).

Box 1.4. **Impacts of the economic crisis on central and sub-national governments**

The 2008-2009 financial crisis weakened the financial position of both central and sub-national governments (SNGs) in OECD countries, owing to the combined effect of decreased tax revenues, a falloff in central government transfers, and increased demand for social services. This creates a "scissors effect" on sub-national budgets and tends to increase budget deficits in countries where these are allowed, while leading to spending cuts or tax increases in countries where SNGs must follow balanced-budget rules (such as the states in the United States). Given the importance of SNGs in public spending, these cuts can have great consequences for public service delivery and public investment.

After two years of fiscal stimulus which have sustained public investment and therefore supported SNGs in the crisis, central governments are now under strong pressure to consolidate their budgets and reduce their deficits in order to reassure the markets regarding the sustainability of their debt. Given this tight fiscal context, very few central governments are still taking special measures to support SNGs that are struggling to balance their budgets. In most countries, national consolidation plans affect SNGs, which are often required to participate in the consolidation efforts. This can range from a simple reduction of central government transfers to lower levels of government (France, United Kingdom), to requiring SNGs to reduce their deficits (Germany, Portugal), or even requiring SNGs to cut expenditure by given percentages (in Italy for example, SNGs were required to reduce expenditures by 5% in 2010 and 2011, and by 13% in 2012). The current fiscal context is also triggering discussions about broad structural reforms of fiscal relations across levels of government or territorial reorganisation to increase the effectiveness of local public services delivery (such as the current fiscal federalism reform in Italy).

In many countries, SNGs have little autonomy to increase their revenues through taxation so that pressures to reduce their deficits may lead them to cut public employment and public services. In many countries, the reduction of central government transfers creates a cascade effect, in which each level of government passes on the reduction in their own transfers to lower levels of government. This is notably the case in the United States, where states are cutting transfers to local governments, and in Italy, where the regions also are reducing their transfers to provinces and municipalities. Beyond an immediate reduction in public service delivery, this continued squeeze on local spending could hamper local and thus national recoveries.

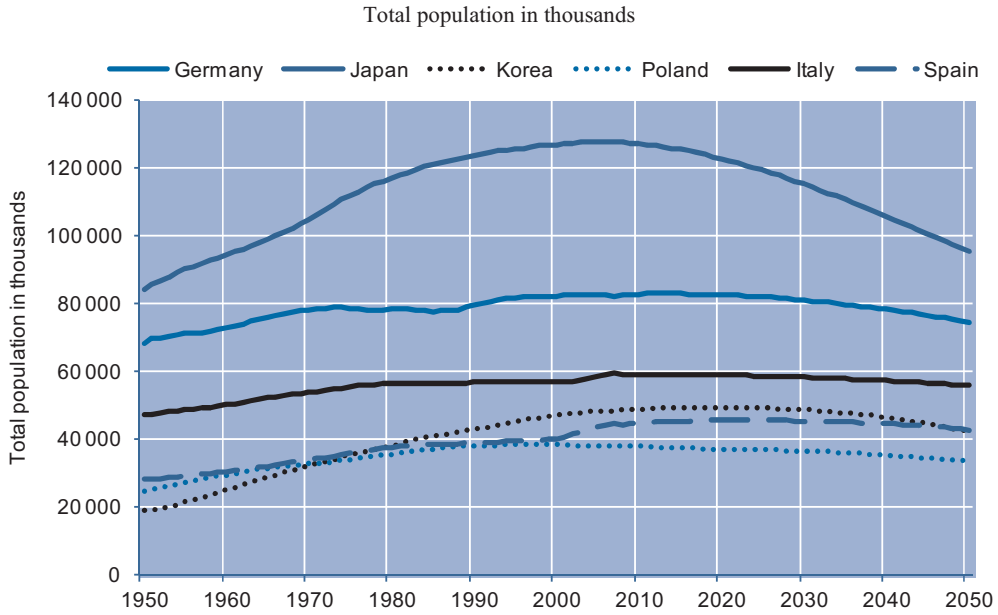
Source: OECD (2011), *OECD Regional Outlook: Building Resilient Regions for Stronger Economies*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264120983-en*.

Declining population, ageing and smaller households in cities

As demographics change, policy makers need to adapt their urban policies. First, the total population of OECD countries such as Germany and Japan is already decreasing (Figure 1.12). On the metropolitan scale, some metropolitan areas will continue to grow and some will shrink. Finding solutions for dealing with a decrease in the population in cities has already become an important issue. Second, the elderly population has doubled over the past 60 years in OECD countries and tripled in the world, a trend that will persist for at least four decades (Figure 1.13). The OECD estimates that the population over 65 years old will surpass the population under 15 years old (which is decreasing over time) in 2020, a process which could be replicated globally over the long term. Third, the average size of households has decreased in OECD countries from 2.95 in 1980 to 2.55 in 2008 (Figure 1.14). This reduction process, however, is not homogeneous across countries. In Germany, Ireland, Japan and Spain reductions are larger than in Denmark, Estonia, Sweden and Turkey. At the same time, the number of households composed of a single individual is increasing. The proportion of total households occupied by one person

has increased from 22% to 29% in the past 30 years (Figure 1.15). While the data show that large households tend to live in suburbs with more space, and that smaller as well as one-person households tend to live in dense city centres, the average size of households has decreased in all density areas, as in the case of the Paris metropolitan area (Figure 1.16).

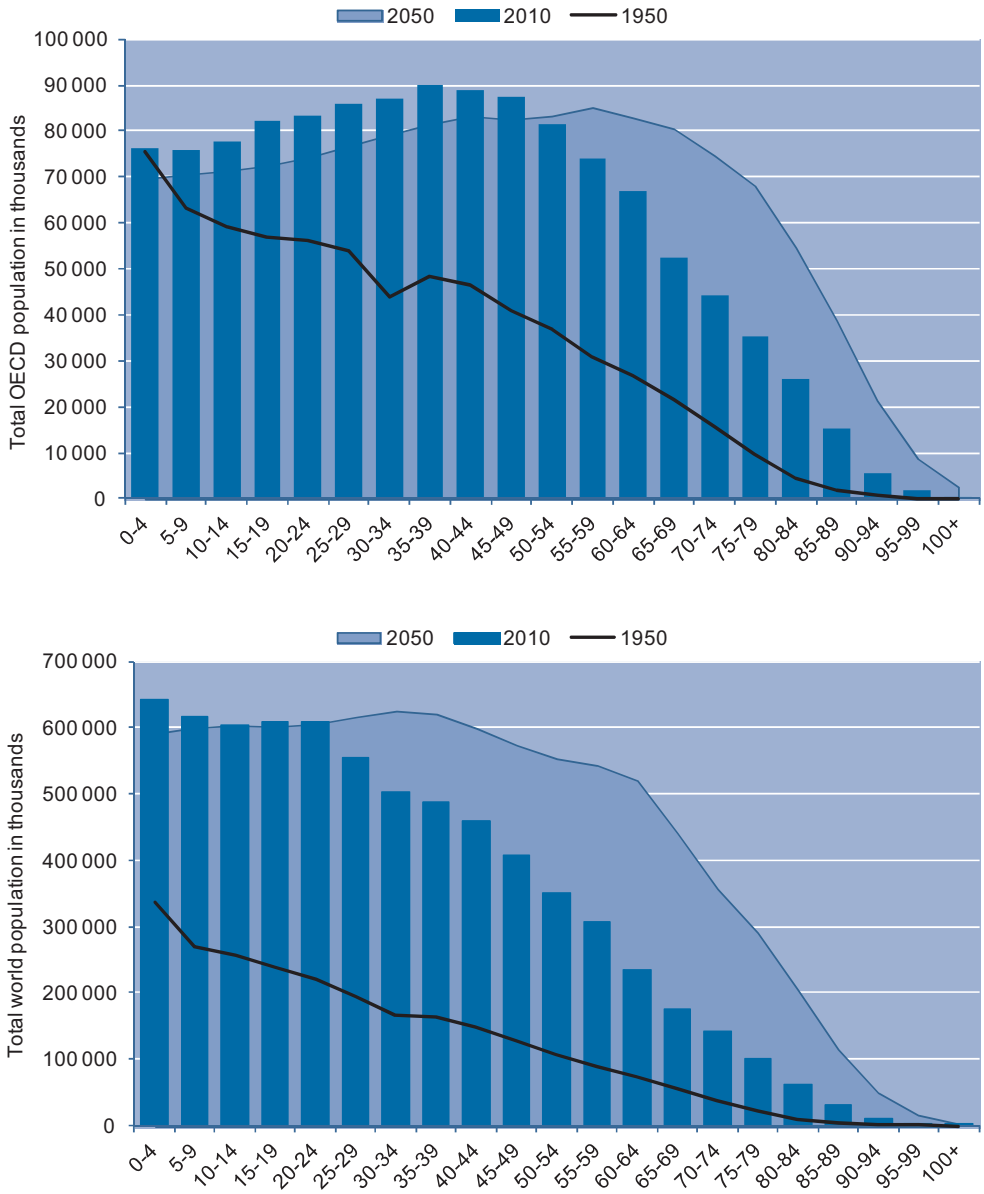
Figure 1.12. **Population trends in a selection of OECD countries, 1950-2050**



Source: OECD.Stat Country Statistical Profiles: total population.

From an economic perspective, population decrease and ageing often imply a shrinking tax base and increasing health-care expenditures. The policy issue is how to keep public service delivery at the current level with a shrinking tax base. Another implication is that the current urban structure, with high dependence on automobiles, may become increasingly less valid for an elderly population requiring access to local services without the need of a car. A "walkable" city, where local services and jobs can be accessed more easily within walking distance, will become a more attractive place to live. The change in household size coupled with ageing may change market preferences for housing types and locations. This general pattern, combined with the rise in one-person households, implies a greater need for smaller housing in all urban areas, notably in the urban core where services are more readily available. The need for housing services is changing as well.

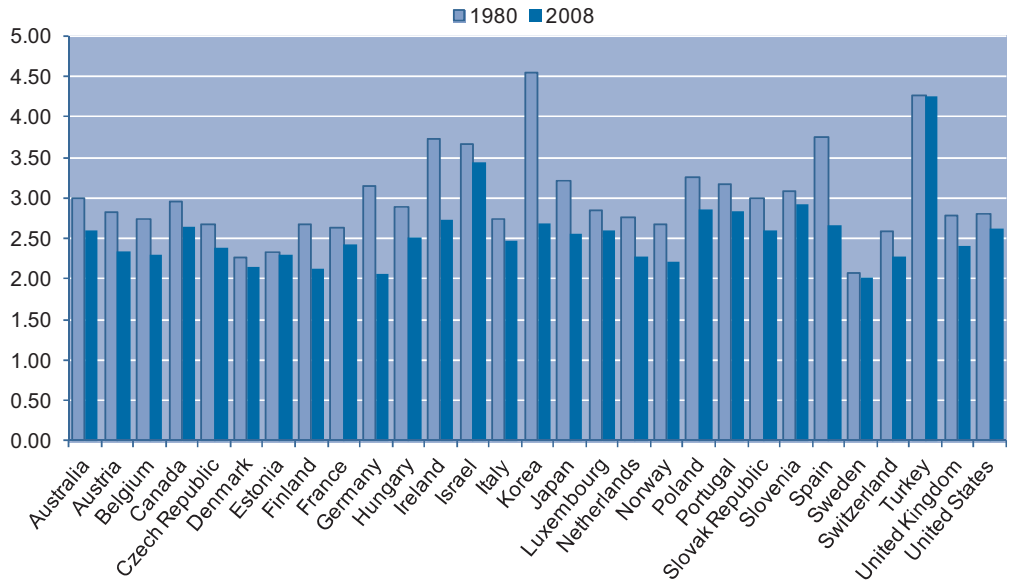
Figure 1.13. **Population structure in OECD countries and the world (1950, 2010, 2050)**



Source: Based on data from the *UN Population Database 2009*.

Figure 1.14. **Average household size in a selection of OECD countries, 1980 and 2008**

Total population divided by the total number of households



Notes: Chile, Greece, Iceland, Mexico and New Zealand were not included as average household size data at national level are not available. For Australia, data refer to 1981 and 2006; for Canada, 1980 and 2006; for Denmark and Sweden, 1990 and 2008; for Estonia, 2000 and 2008; for France, 1990 and 2005; for Hungary and Japan, 1980 and 2005; for Italy, 1995 and 2008; for Korea, 1980 and 2010; for Luxembourg and the Slovak Republic, 1980 and 2001; for Portugal, 1990 and 2001; for Slovenia, 1980 and 2001; and for Turkey, 2002 and 2008. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

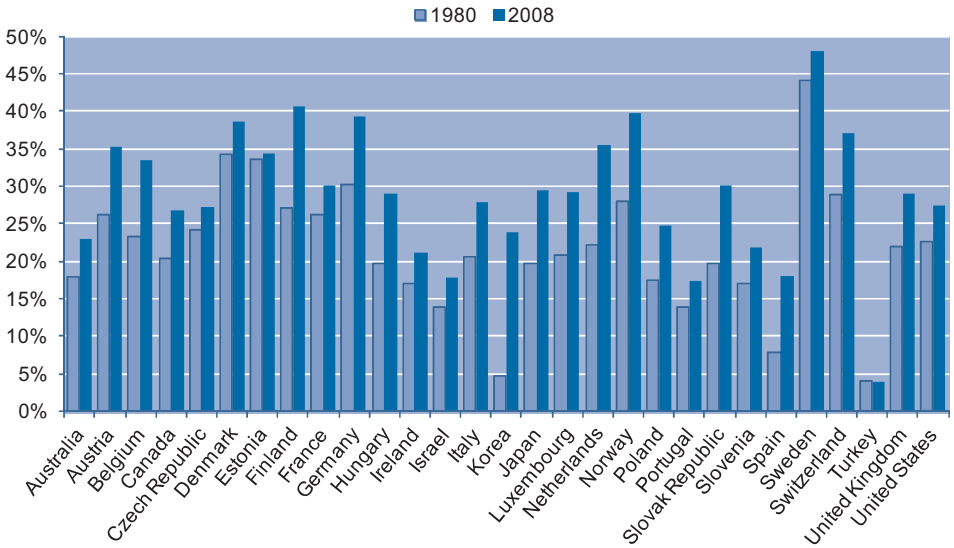
Source: Based on UNECE data (households); OECD country statistical profiles 2010 (population); Australian Bureau of Statistics Census for Australia; the Japanese National Census for Japan; and Korea Statistics Office for Korea.

The role compact city policies can play

The five key urban trends described above underscore that compact city policies can play a significant role. First, continuing urbanisation directly affects the sustainable use of space in cities, and compact city policies can be a source of policy options. Second, while there are a number of policy approaches to tackling climate change, compact city policies are expected to play an important role in reducing CO2 emissions from the transport and building sectors as the use of urban space directly affects the CO2 emissions due to these sectors. Compact city policies could also help make urban areas less energy-dependent and thus more energy price-resilient and better able to sustain their environmental, social and economic performance. As Cortright (2008) points out, while the growth of suburban housing in the United States was predicated on low transport costs, the current high fuel

Figure 1.15. **Percentage of one-person households in a selection of OECD countries, 1980 and 2008**

One-person households divided by the total number of households



Notes: Chile, Greece, Iceland, Mexico and New Zealand were not included as average household size figures at national level are not available. For Australia, data refer to 1981 and 2006; for Canada, 1980 and 2006; for Denmark and Sweden, 1990 and 2008; for Estonia, 2000 and 2008; for France, 1990 and 2005; for Hungary and Japan, 1980 and 2005; for Italy, 1995 and 2008; for Korea, 1980 and 2010; for Luxembourg and the Slovak Republic, 1980 and 2001; for Portugal, 1990 and 2001; for Slovenia, 1980 and 2001; and for Turkey, 2002 and 2008. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

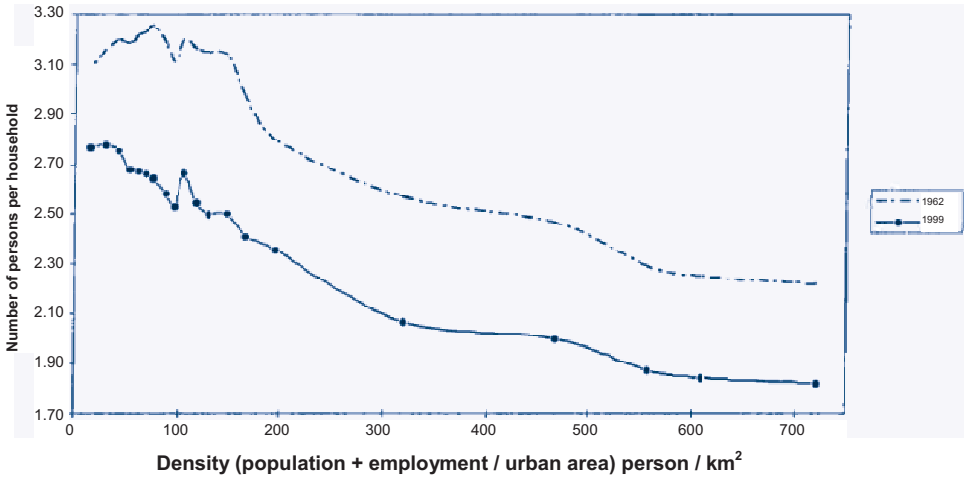
Source: Based on UNECE data; Australian Bureau of Statistics Census for Australia; the Japanese National Census for Japan; and Korea Statistics Office for Korea.

prices imply that cities that offer attractive urban living opportunities in close-in neighbourhoods are likely to be more affordable and economically successful than those that continue to have sprawling development patterns.

It might appear less clear how compact city policies are related to sustainable economic growth (the fourth trend) and demographic changes (the fifth trend). For sustainable economic growth, they can help reduce governments' financial burden by making public service delivery more efficient. Successful compact city policies can help governments save public money and invest more efficiently and/or they avoid tax increases that could be a burden on the local economy. Successful compact city policies can also remove barriers to economic growth (e.g. traffic congestion) and stimulate growth by achieving more efficient use of urban land. As for demographic changes, the current demographic trend will require urban space to be used more cost-efficiently and to be well adapted to the elderly and to smaller households. Compact city policies can play an important role in meeting these needs. This will be discussed in more detail in Chapter 2.

Figure 1.16. **Average household size by density areas**

Paris metropolitan region, 1962 and 1999



Source: Fouchier, V. (2004), "Urban sprawl, density and mobility in the case of Paris Region", French National Territorial Planning Agency, Paris.

1.4. The history and evolution of the compact city concept

The previous section discussed today's urban contexts and the relevance of the compact city concept. This section looks at the history of the compact city. It is important to understand the original concept and how it has evolved over time, as this provides valuable background for discussing compact city policies in today's urban contexts.

The origin of cities and the compact city

The origin of the compact city can be found in the medieval fortress city or even in ancient cities. Such cities were "compact" in size, but the rationale was very different from that of the modern compact city. Early urban residents constructed walls around the city for protection, and within the walls they gave careful consideration to how to allocate the available space to residential areas, public squares and roads, etc. (this was in fact the start of city planning). It could be said, in fact, that the compact city concept arose with the origin of cities. In more recent times, city walls lost their usefulness owing to the development of military technologies. With the development of railways and automobiles they also became a barrier to traffic. In Europe in the 18th and 19th centuries, the massive influxes of people to cities during the Industrial Revolution also meant that the capacity of the enclosed walled areas was exceeded, and as a result, the city walls were gradually removed. Thus, the ancient compact city came to an end.

The compact city as an urban containment tool

In modern society, the compact city appeared in order to deal with rapid urbanisation. The rationale was resistance to urban expansion in order to protect green suburbs. Greenbelt policy was developed as a planning concept following the removal of most European city walls in the 18th and 19th centuries (Kühn, 2003). The greening of spaces

occupied by former city walls constituted boundary zones between the city and the countryside. Interestingly, the compact city approach was linked to the birth of modern city planning. In the 19th century, Europe had serious public health problems in cities owing to the lack of capacity in sewage and garbage disposal and the co-existence of polluting factories and housing. At the end of the 19th century, Ebenezer Howard established the "Garden City" concept: a city surrounded by a greenbelt consisting of an agricultural and recreational zone. This, one of the first modern urban planning models, already contained today's compact city concept.

In London, greenbelts were integrated into the United Kingdom's national urban policy when first officially proposed by the Greater London Regional Planning Committee in 1935. The fundamental aim of greenbelt policy was, and still is, to prevent urban sprawl by keeping land permanently open; the most important attribute of greenbelts is their openness (UK Department of the Environment, 1995). European cities such as Vienna, Copenhagen, Barcelona, Budapest and Berlin have followed this tradition. The concept has also been adopted by non-European cities such as Hong Kong, China, Seoul, Tokyo, Toronto, Vancouver, Washington, D.C., Chicago, Boulder, Sydney and Melbourne (Kühn, 2003; Tang et al., 2007). In 1968, Japan introduced urbanisation control areas in major cities in order to restrict suburban sprawl. In Korea, in accordance with the 1971 City Planning Law, restricted development zones were designated around Seoul and 13 other cities between 1971 and 1973 (Kim, 2010). Hong Kong, China, which was already very dense, introduced a mechanism to reduce high density in dilapidated neighbourhoods while avoiding urban sprawl and maintaining overall density, by concentrating development in other neighbourhoods in the city centre.

Urban quality of life, liveability and diversity

Meanwhile, from the 1960s, quality of life, liveability and diversity gradually became relevant as policy goals of urban development. In Europe (e.g. in Frankfurt), greenbelts gained new meaning: they are not intended to contain urban development but to provide open space and recreational space for cities. In North America, urban policies focused on inner city problems in large cities, such as decreasing population and simultaneously increasing poverty. Jane Jacobs, an American sociologist, argued that the city, with its vitality, mix of uses and traditions, rather than low-density suburbs, represented the most desirable form of development (Jacobs, 1962). Although she did not use the term "compact city" and her focus was broader, her arguments clearly reflected the concept. The compact city also evolved in the United States with the concept of urban growth control in the 1970s, when local environmental concerns and energy issues drew the attention of policy makers.

The compact city, urban sustainability and the green growth perspective

Since the late 1980s and the introduction of the notion of sustainability, the compact city concept has gained widespread popularity in many western countries (Fulford, 1996). It was widely discussed in the 1990s in many OECD countries, particularly in Europe, as a way to meet urban sustainability goals. The European Community's "Green paper on the urban environment" (Commission of the European Communities, 1990) emphasised environmental and quality of life objectives in urban policy and strongly promoted dense development and mixed use. It heralded a rediscovery of the value of urban living, which it believed "reflects the failure of the periphery: the absence of public life, the paucity of culture, the visual monotony, the time wasted in commuting". The compact city, on the other hand, by virtue of its density, offers a lifestyle that is both varied and culturally

enriched (Fulford, 1996). The British Government made urban compactness a central element of its sustainable development policy in its basic policy document, the PPG 13 (UK Department of the Environment, 1994). The Dutch Government has also made urban compactness a central element of its sustainable development policy. In Norway, a densification policy was initiated by the central government. In North America, the notion of "smart" growth has become popular. It consists of a combination of transport alternatives, updated infrastructure, wider choices of housing options, better environmental protection, and greater reinvestment in city centres.

More recently, the compact city is expected to play a role in achieving the OECD's green growth objectives, now a general policy driver for OECD countries (Box 1.5). As OECD countries are committed to the Green Growth Strategy, which emphasises the concomitant pursuit of economic growth and environmental preservation through policy complementarities, all policy areas are being examined to see how they can contribute to achieving this policy objective. Cities and regions constitute one of the main spatial units in which green growth can be pursued. They currently face a number of challenges in this respect, including urban sprawl, greenhouse gas emissions and structural challenges for maintaining urban economic growth over the long term as national economies emerge from the recent economic crisis. The compact city concept appears well suited to addressing these challenges, which is why international organisations and academic research groups recently highlighted the significance of compact city policies for policy makers (e.g. OECD, 2010; UN HABITAT, 2009; UNEP, 2011; World Bank, 2010; WHO, 2011; Dempsey, 2010). Chapter 2 will examine the relationship between the compact city concept and green growth in detail.

Box 1.5. **The OECD's Green Growth Strategy**

In June 2009, Ministers of Economy, Finance, Trade and Foreign Affairs from 34 countries, including both OECD and non-OECD members, met at the OECD to adopt a Declaration on Green Growth. They agreed to develop frameworks for economic growth that would minimise environmental deterioration and enhance quality of life, and mandated the OECD to develop a Green Growth strategy. In May 2011, the OECD released the report *Towards Green Growth*. In the report, green growth is defined as follows:

> Green growth is about fostering economic growth and development while ensuring that natural assets continue to provide the resources and ecosystem services on which our well-being relies. To do this it must catalyse investment, competition and innovation which will underpin sustained growth and give rise to new economic opportunities.

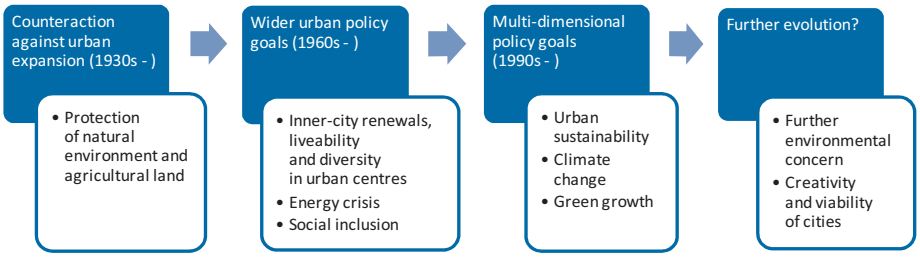
Source: OECD (2011), *Towards Green Growth*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264111318-en*.

Looking ahead: the need for further evolution of the concept

In sum, the compact city concept is not new; but throughout its long history, it has been evolving and enlarging its scope and policy objectives (Figure 1.17). In modern times, it started as a simple urban containment policy to protect the local natural environment or agricultural land from urban encroachment, but over time it acquired new

meaning and policy objectives involving energy savings, liveability and the global environment. Thus, it has come to be considered as offering a multi-dimensional policy approach covering a wider range of urban sustainability goals. In fact, it can now be considered as a mainstream policy approach to achieving urban sustainability.

Figure 1.17. **Evolution of compact city policies**



However, a number of urban policy challenges remain and new ones will arise in the future:

- Environmental challenges such as limited energy resources, loss of green spaces and the destruction of ecosystems are likely to continue, if not accelerate. This is not a concern only for developing countries; although population increase in developed countries has been slowing, demand for urban land has remained strong as people's desire for space and higher quality of life seems unlimited. Maintaining a minimal ecological footprint remains a priority.
- The nature of cities also underscores the difficulty of changing urban forms. Natural and historical contexts have determined the location of cities. Most urban land is also already used in one way or another. The existence of vested interests complicates matters. Moreover, it is important to respect cities' historical and cultural values.
- Viability and creativity in cities will become more and more important. Cities foster people's creativity and provide opportunities. These vital characteristics need to be maintained while meeting the goal of environmental sustainability. Urban space needs to evolve to accommodate functions that enhance viability and creativity (residential, commercial, educational, medical, research and development, etc.). Maintaining means to enhance viability and creativity will be essential.

The compact city concept proposed in this report will be relevant for meeting these fundamental and evolving challenges. It is clear that comprehensive, creative and innovative thinking is required to meet most or all of them. As one sociologist has pointed out, economic systems do not exist in the abstract; they are embedded within the geographic fabric of the society – the way land is used, the locations of homes and businesses, the infrastructures that tie people, places and commerce together (Florida, 2010). The complex challenges that urban policy makers are facing now require a comprehensive policy framework that includes some type of compact city.

This report considers that the compact city concept has been evolving and extending its policy objectives and tools to meet these challenges. However, as the concept evolves,

it may need another name. Already, some feel that the term "compact" should be reconsidered because it may lack the notion of economic viability, diversity, creativity and vitality needed to represent this urban policy concept. A new term might better reflect the aspects of sustainable urban space and innovation inherent in the compact city. Although answering this question is beyond the scope of this report, it is an issue to keep in mind.

1.5. Conclusion

This introductory chapter has shown that the compact city concept is attracting renewed attention as a policy approach among contemporary urban policy makers. Behind this new focus are the five urban trends, ranging from the environment and society to the economy, as described above, that drive policy makers to seek appropriate solutions. It is increasingly recognised that compact city policies can play a significant role in today's urban contexts. The definition provided, despite its complexity, underscores that compact city policies offer a comprehensive policy approach that addresses urban sustainability goals by influencing the use of urban space.

The compact city concept has evolved from a simple urban containment policy to protect the natural environment and agricultural land to a multi-purpose policy that includes sustainability. Yet, compact city policies are still often viewed as mainly protecting the environment by restraining and controlling economic growth. This report, instead, recognises that a compact city can also contribute positively to economic growth. In other words, it is important to see the compact city concept from the perspective of green growth and explicitly incorporate economic growth as a compact city policy objective. This can provide rich insights for the design and implementation of successful compact city policies, a subject to be addressed in some detail in the following chapters.

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Chapter 2

How can compact city policies contribute to urban sustainability and green growth?

This chapter deals with the outcomes of compact city policies. It explores how a compact city can contribute to urban sustainability goals. A particular focus is the link between environmental and economic outcomes: how the compact city can help to support and foster economic growth while addressing environmental concerns. This is a central concern of the OECD's Green Growth Strategy. This chapter also addresses concerns about the outcomes of compact city policies and presents ways for policy makers to handle this complex issue.

2.1. Introduction

The aim of compact city policies is to achieve urban sustainability (in terms of environmental quality, social equity, economic viability, etc.). While it appears clear that compact city policies can be expected to play a role in meeting this goal in today's urban contexts (Chapter 1), an important question for policy makers is: how, and to what extent, can compact city policies be expected contribute to urban sustainability?

There has not yet been a comprehensive attempt to understand how compact city policies can help to achieve urban sustainability. While there is some evidence concerning energy consumption and the reduction of carbon emissions, there is extensive debate over whether compact city policies have solid, positive effects on environmental quality. For example, many argue that the impact of these policies on the reduction of carbon emissions is too small or that adverse effects offset or exceed the benefits. Furthermore, no attempt has yet been made to examine compact city policies from the perspective of green growth; that is, how they can support and foster economic growth while also addressing environmental concerns. Compact city policies have often been considered only as a planning tool to protect the environment and their potential benefits in terms of economic viability have often been overlooked. The lack of a clear understanding of policy outcomes, combined with other policy challenges including costs, development barriers and community opposition, helps explain why compact city policies do not seem to have gained traction or general support.

This chapter therefore draws on a literature review and OECD analysis to explore how the compact city can contribute to urban sustainability goals. It pays particular attention to the relationship between compact city outcomes and green growth. It also addresses related concerns about the outcomes of compact city policies and discusses how policy makers can handle this complex issue.

2.2. The compact city's potential contribution to urban sustainability

Compact city policies can contribute to achieving urban sustainability in many, mutually reinforcing ways. In addition to the three key characteristics of the compact city discussed in Chapter 1 (dense and proximate development patterns; urban areas linked by public transport systems; and accessibility to local services and jobs), the following six sub-characteristics, which relate directly to the potential contribution to urban sustainability, are identified: *i)* shorter intra-urban travel distances; *ii)* less automobile dependency; *iii)* more district-wide energy utilisation and local energy generation; *iv)* optimal use of land resources and more opportunity for urban-rural linkages; *v)* more efficient public services delivery; and *vi)* better access to a diversity of local services and jobs. The potential contributions to environmental, social and economic sustainability are presented and discussed (Table 2.1).

Table 2.1. **The contribution of the compact city to urban sustainability**

Sub-characteristics of the compact city	Contribution to urban sustainability		
	Environmental benefits	Social benefits	Economic benefits
1. Shorter intra-urban travel distances	– Fewer CO_2 emissions – Less pollution from automobiles	– Greater accessibility due to lower cost	– Higher productivity due to shorter travel time for workers
2. Less automobile dependency	– Fewer CO_2 emissions – Less pollution from automobiles	– Lower transport costs – Higher mobility for people without access to a car – Improved human health due to more cycling and walking	– Development of green jobs/ technologies
3. More district-wide energy utilisation and local energy generation	– Less energy consumption per capita, fewer CO_2 emissions	–	– Development of green jobs/technologies – More energy independence
4. Optimum use of land resources and more opportunity for urban-rural linkage	– Conservation of farmlands and natural biodiversity – Fewer CO_2 emissions due to shorter food travel mileage	– Higher quality of life due to more recreational activities	– Rural economic development (urban agriculture, renewable energy, etc.)
5. More efficient public service delivery	–	– Public service level for social welfare maintained by improved efficiency	– Lower infrastructure investments and cost of maintenance
6. Better access to a diversity of local services and jobs	–	– Higher quality of life due to access to local services (shops, hospitals, etc.)	– Skilled labour force attracted by high quality of life – Greater productivity due to more diversity, vitality, innovation and creativity

Environmental benefits

A compact city emits fewer CO_2 emissions from transport and less pollution from automobiles

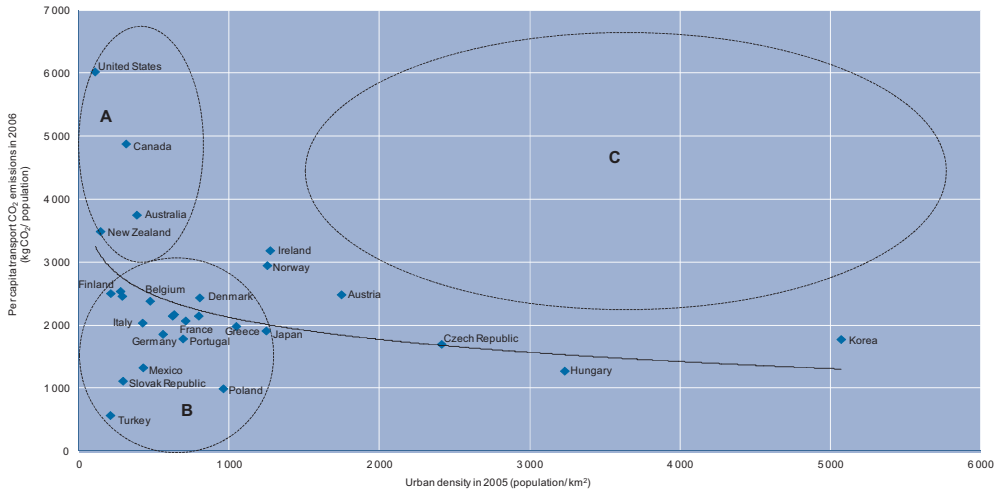
Successful compact city policies can shorten intra-urban travel distances by preventing leapfrog development and by reducing the distance between jobs and homes. They also can reduce automobile dependency through more economically viable public transport systems and by encouraging the use of walking, cycling and public transport. These can help reduce energy consumption and carbon emissions from automobiles and improve urban air quality.

Although public transport systems and accessibility to local services and jobs play a role, urban density appears the most influential factor in reducing automobile dependency. Figure 2.1 shows that the greatest environmental pressures (highest emissions per capita) occur in low-density urban areas (indicated as A in the figure). While a number of low-density urban areas have low environmental pressures (B), no densely populated urban areas have high emissions per capita (C). The probability of high emissions per capita is much greater in low-density urban areas. As urban areas become denser and rely more on public transport, walking and cycling, carbon emissions tend to decrease. The urban form of cities is not the only determinant of lower per capita emissions, but it is a critical factor among others, such as energy prices, the productive structure of urban areas or the public transport networks (OECD, 2011a). Figure 2.2 shows that when population density in built-up areas is high, motor vehicle ownership tends to be lower. Kennedy et al. (2009) compare ten world cities and show an inverse relationship between energy use for transport and urban population density; the same relationship holds for greenhouse gas

(GHG) emissions and urban population density. Taniguchi et al. (2008) use data for 38 cities in Japan to examine the relationship between CO_2 emissions and population density and draw attention to the importance of integrated land-use planning and transport planning in reducing CO_2 emissions.

Figure 2.1. **CO_2 emissions per capita in transport and urban density, 2005-2006**

Predominantly urban areas



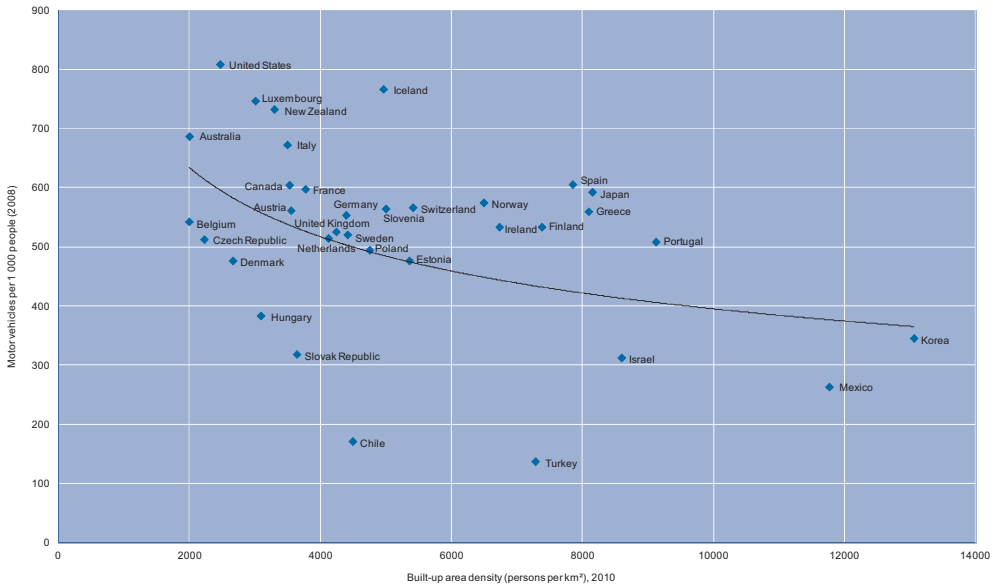
Notes: A = low-density urban areas with high emissions; B = low-density urban areas with low emissions; C = densely populated urban areas with high emissions. Urban density is calculated based on the OECD definition of "predominantly urban" areas. Iceland and Luxembourg were not included in the sample as the *OECD Regional Statistics* (database) identifies no predominantly urban (PU) regions in those countries. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: Based on data from *OECD Regional Statistics* (database); International Energy Agency (2008), "CO_2 emissions from Fuel combustion 2008", OECD Publishing, Paris, *http://dx.doi.org/10.1787/co2_fuel-2008-en-fr*, accessed 28 October 2011; and International Energy Agency (2009), "Energy balances of OECD countries 2009", OECD Publishing, Paris, *http://dx.doi.org/10.1787/energy_bal_oecd-2009-en-fr*, accessed 28 October 2011.

The relationship between density and energy consumption applies not only at the metropolitan/city scale but also at the neighbourhood level. For example, Fouchier (1997) discovered that energy consumption for personal mobility and CO_2 emissions per capita are three times higher in low-density neighbourhoods than in the high-density neighbourhoods of the Paris metropolitan area. Similarly, Taniguchi and Ikeda (2005) examined the relationship between urban layout and automobile dependency at the neighbourhood level and found that population density is the most significant variable in explaining petrol consumption although other factors, such as land-use regulations, transport conditions and infrastructure, also affect fuel consumption.

Figure 2.2. **Population density[1] in built-up areas[2] and motor vehicles per 1 000 population**

Population density (2010), motor vehicles (2008)



Notes: 1. Total population density in built-up areas is computed using total population data from United Nations' "World urbanization prospects: the 2009 revision" and built-up area from the Lincoln Institute of Land Policy's *Atlas of Urban Expansion.* 2. Built-up area from the Atlas of Urban Expansion Database is computed by using GIS techniques. It is defined as the area occupied by built-up pixels within the set of administrative boundaries defining the city. For more details about the definition, see *www.lincolninst.edu/subcenters/atlas-urban-expansion/area-metrics.aspx*.

Source: Based on motor vehicle data from the International Road Federation *World Road Statistics*; population data from United Nations (2010), "World urbanization prospects: the 2009 revision", United Nations, New York; and urban land area from Angel, S., J. Parent, D.L. Civco and A.M. Blei (2010), *Atlas of Urban Expansion*, Lincoln Institute of Land Policy, Cambridge, MA, *www.lincolninst.edu/subcenters/atlas-urban-expansion*, accessed 10 April 2012.

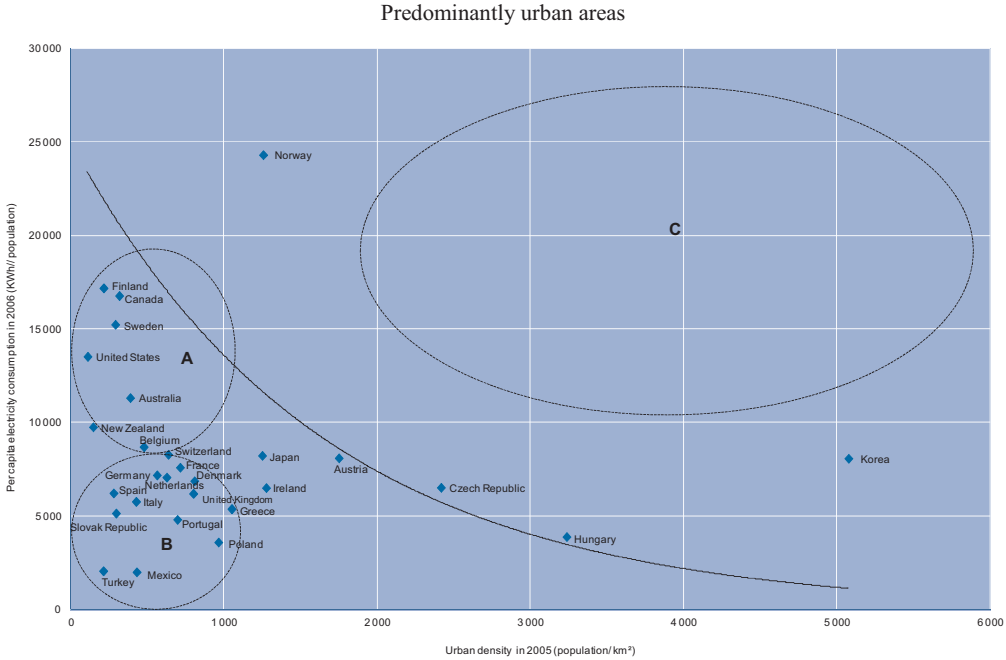
The results concerning the extent to which compact city policies can help to reduce carbon emissions differ. Because the backgrounds and research assumptions are different, it is difficult to draw a definitive conclusion. For example, the US National Research Council (2009) defined developing more compactly as doubling the current density of new residential development and assessed whether changing the design of development patterns could reduce motor vehicle travel and CO_2 emissions. The study shows that compact development would lead to less than a 1% to up to an 11% reduction in fuel use and CO_2 emissions by 2050 compared to base-case conditions. Ewing et al. (2008) estimate the expected savings of CO_2 with compact development. Assuming that compact development would lead to a 30% reduction in vehicle miles travelled (VMT), they conclude that compact development would reduce transport-related CO_2 emissions by 7% to 10% in 2050, but that this could only be achieved with changes in land use. Echenique et al. (2010) find that increased compactness would reduce the average distance travelled by car in the case study areas by less than 5% and would reduce energy use by buildings, but argue that the combined reduction in energy use by buildings and transport would be less than 2% because of congestion. Road-use charges would be the better option, as they would reduce the VMT by 5%-10% and overall combined energy

use for transport and buildings by 2%-5%, more than what could be achieved by spatial planning emphasising compactness (Echenique et al., 2010).

A compact city consumes less energy and enables local energy generation

Beyond the lower consumption of energy for transport, a compact city tends to consume less energy than other forms of urban development. A cross-country analysis of urban density and electricity consumption illustrates that as density in urban areas increases, per capita electricity demand tends to decrease (Figure 2.3). The relationship is the same as in Figure 2.2 in that higher energy consumption occurs in low-density urban areas (A) and no densely populated urban areas have high energy consumption per capita (C) except that urban areas in cold climates tend to consume more energy. Japan's urban areas are around five times denser than Canada's, and the consumption of electricity per capita in Japan is around 40% that of Canada. Denmark's urban areas are denser than Finland's by a factor of four, and Danes only consume around 40% of the electricity consumed by Finns.

Figure 2.3. **Electricity consumption per capita and urban density, 2005-2006**



Notes: A = low-density urban areas with high electricity consumption; B = low-density urban areas with low electricity consumption; C = densely populated urban areas with high electricity consumption. Urban density is calculated based on the OECD definition of "predominantly urban" areas. Iceland and Luxembourg were not included in the sample as *OECD Regional Statistics* (database) identifies no predominantly urban (PU) regions in those countries.

Source: Based on data from *OECD Regional Statistics* (database); International Energy Agency (2008), "CO_2 emissions from fuel combustion 2008", OECD Publishing, Paris, *http://dx.doi.org/10.1787/co2_fuel-2008-en-fr*, accessed 28 October 2011; and International Energy Agency (2009), "Energy balances of OECD countries 2009", OECD Publishing, Paris, *http://dx.doi.org/10.1787/energy_bal_oecd-2009-en-fr*, accessed 28 October 2011.

Lower energy consumption may be partly due to the method of generating and consuming energy in a compact city. A compact city can use district heating and cooling systems that serve more customers in a given area than in a single-family residential zone (OECD, 2010b). District-wide renewable energy utilisation and smart grids can also be operated more efficiently in densely built-up areas. Such potential compact city advantages may facilitate local energy generation technologies such as combined heat and power (CHP). Local energy generation contributes not only to more efficient electricity production but also to more stable electricity provision in urban areas by reducing the risk of electricity shortages during peak demand periods. Innovative energy management systems at the district scale and smart grids play an important role. In addition, compact urban forms with multi-family apartments (rather than detached houses) enable more efficient use of energy in buildings, although careful consideration of net energy use is necessary.[1] Finally, compact urban forms can reduce electricity consumption for public services (street lights, traffic lights, parks, public buildings, etc.). On this issue, however, more evidence is needed.

A compact city conserves farmland and natural biodiversity

A compact city can make optimal use of resources in terms of land development and retrofitting of already urbanised land. It can minimise fragmented land-use patterns that under-utilise land and avoid urban sprawl and leapfrog development. By prioritising brownfield redevelopment over greenfield development at urban fringes, compact city policies can make urban land in built-up areas more attractive to private developers by maintaining the value of that land and encouraging retrofitting. As a result, compact cities can conserve the farmland and natural biodiversity surrounding urban areas that would otherwise be irretrievably lost. Farming closer to cities also encourages local food consumption and reduces the distance travelled by food, which also helps to reduce carbon emissions.

Social benefits

Compact city policies can facilitate mobility of all households and quality of life

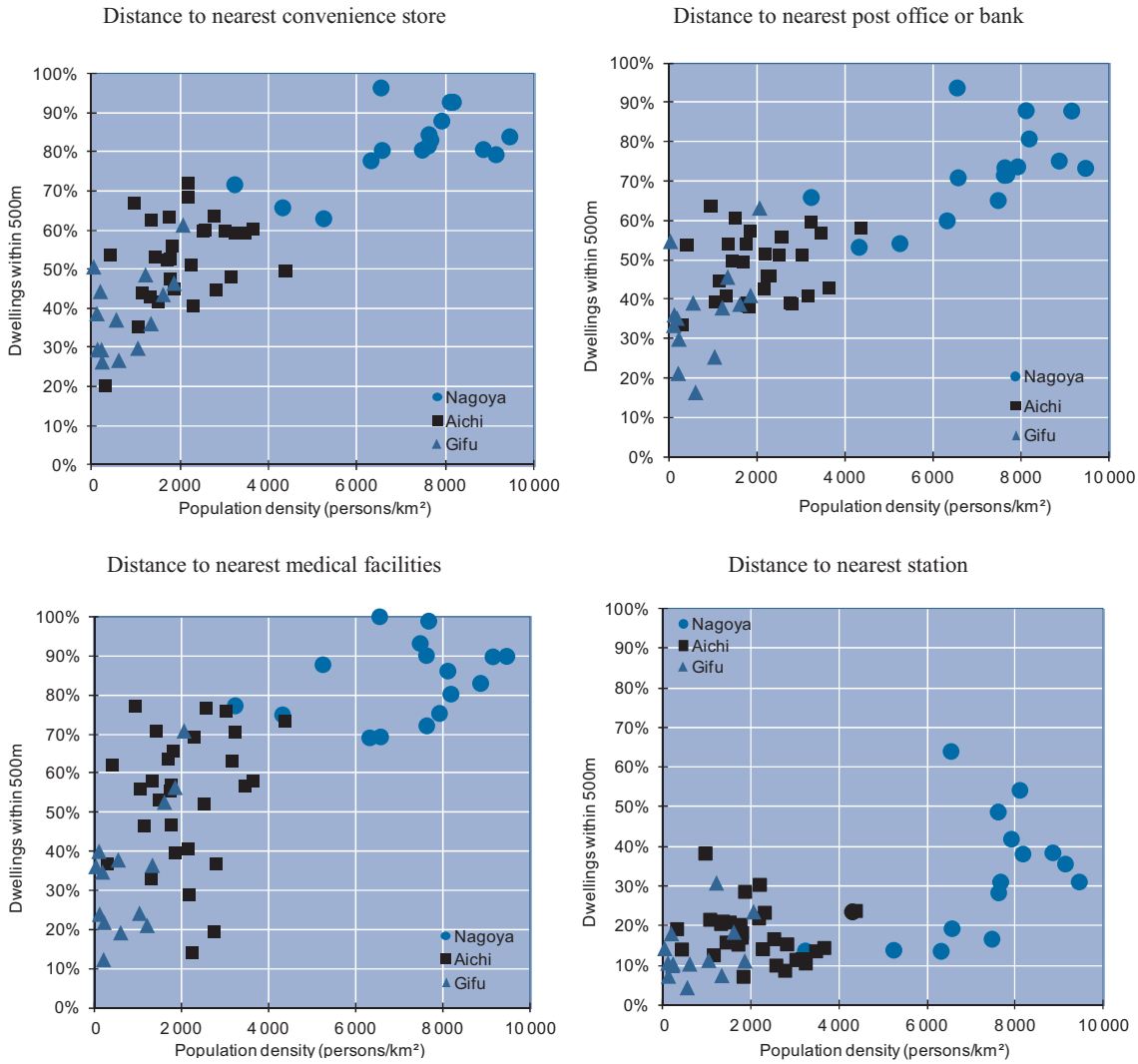
In a compact city, intra-urban travel distances tend to be shorter, and shorter travel distances mean lower travel costs. This facilitates the mobility of low- and medium-income households. Low travel costs are more and more important in urban contexts, and it is becoming widely recognised that affordable housing should be measured as a combination of housing and transport costs. For example, in high-density, transit-rich environments, the reduction of the costs associated with transport is estimated at USD 350-USD 650 per month in Chicago (OECD, 2010c). In effect, it allows urban dwellers who depend less on automobile use to purchase more expensive homes. A compact city also provides those who lack access to automobiles (elderly people, low-income households, etc.) with mobility options (public transport, walking), although it is not necessarily the case that older people do not have access to cars and that public transport is always a better option for them.

Figure 2.4 illustrates the percentage of dwellings with access to local services (convenience stores, banks, post offices, medical facilities, stations, etc.) within 500 metres, in urban neighbourhoods of different densities. It is clear that denser neighbourhoods have more local services within walking distance. This is an important benefit of a compact city, given demographic trends (an ageing population) in most

countries. In any case, having local services and jobs nearby contributes to a better quality of life.

Figure 2.4. **Density and proximity to services in Japan**

Cities of Nagoya, Aichi and Gifu



Notes: The vertical axis represents the percentage of dwellings with access to each service within 500 metres.

Source: Kaido, K. and J. Kwon (2008), "Quality of life and spatial urban forms of mega-city regions in Japan", in M. Jenks, D. Kozak and P. Takkanon (eds.), *World Cities and Urban Form: Fragmented, Polycentric, Sustainable?*, Routledge, New York.

Compact city policies are good for individuals' health

In addition, compact city policies are reported to have positive effects on individuals' health. Ewing et al. (2003) analysed the relationship between urban sprawl, health and health-related behaviour. Using data from US counties and metropolitan areas, they

conducted a cross-sectional analysis using hierarchical modelling to relate characteristics of individuals and places to levels of health variables such as obesity and diabetes. The results show that residents of sprawling counties were likely to walk less during leisure time, weigh more and have a greater prevalence of hypertension than residents of compact counties. WHO (2011) also reports that a shift to active transport (walking and cycling) and rapid transit/public transport combined with improved land use can yield much greater immediate health "co-benefits" than improving fuel and vehicle efficiencies. Potential health gains due to a shift from private motorised transport to walking, cycling and rapid transit/public transport include reduced cardiovascular and respiratory disease from air pollution, less traffic injury and less noise-related stress (WHO, 2011).

Can better access to jobs increase job opportunities?

Promoting the mix of jobs and homes in various urban areas may shorten travel distance to jobs, reduce travel costs and increase job opportunities. This is the rationale for mixed land-use policies that aim to provide more job opportunities in a socio-economically challenged area. However, the potential social benefits for local residents are not clear and need to be assessed carefully. For example, do the available jobs in a given area match the skills of the area's population? If, for example, they concern biotechnology research or work requiring advanced skills, they may not be suited to the existing local population. This can result in a situation such that local populations will still have to seek jobs outside of the area. It can even lead to gentrification (a more highly skilled population moves into the area to be closer to jobs and pushes out lower income populations). In this regard, it is important to underscore that compact city policies may be beneficial but cannot solve all urban problems.

Can a compact city promote social equity?

Some positive effects of compact city policies on social equity have been reported but the results are complex. Using social equity criteria Burton (2001) examines whether compact cities promote social equity in a large sample of towns and cities of varying degrees of compactness in the United Kingdom. The results show that in general, cities with a large proportion of high-density housing tend to support equity, but "the forms of compactness most beneficial for individual aspects of social equity vary" (Burton, 2001). Pendall and Carruthers (2003) examined two measures of income segregation for US metropolitan areas from 1980 to 2000 and found that "the relationship between density and income segregation follows a quadratic function, first rising, then falling, as densities increase".

Economic benefits

A compact city reduces the cost of urban infrastructure

While there are relatively few studies on the economic impacts of compact city policies, their potential to lower the cost of urban infrastructure have been widely discussed. The economic benefits of reducing infrastructure costs are particularly important as an option for the public sector to bridge the "infrastructure gap".[2] The segregated land use associated with low density and urban sprawl tends to require a relatively higher level of infrastructure – roads, water and sewer systems, schools and privately owned utility systems – than would be needed for more compact development (Transportation Research Board and National Research Council, 2002). In contrast, a

compact city can increase the efficiency of infrastructure investment and reduce the cost of maintenance, particularly for line systems such as transport, energy and water supply, and waste disposal. For example, while public transport represents a huge investment for the public sector, high population density around transport stations ensures steady ridership and thus the economic viability of the public transport system. Table 2.2 illustrates that population density affects the viability of various forms of public transport at the metropolitan scale. Although such benefits are commonly understood as a consequence of urban density, mixed land use can also play a role as it makes more efficient use of urban space/infrastructure.

Table 2.2. **Transit-supportive residential density thresholds**

Mode	Frequency	Minimum residential density (dwelling units per km²)
Local bus	1 bus per hour	990-1 235
Intermediate bus	1 bus every 30 minutes	1 730
Frequent bus	1 bus every 10 minutes	3 705
Light rail	5 minute headway or better during peak hour	2 235
Rapid transit	5 minute headway or better during peak hour	2 965

Source: Adapted from Institute of Transportation Engineers (1989), *A Toolbox for Alleviating Traffic Congestion*, Institute of Transportation Engineers, Washington, D.C.

The cost-reduction effect of compact city policies can be substantial. For example, the Transportation Research Board and National Research Council (2002) looks at the impact of sprawl on resource costs by examining the cost of water and sewer infrastructure in cases of uncontrolled and controlled growth. According to the calculation, it is possible to save USD 12.6 billion by containing sprawl. Similar calculations for road infrastructure show that cost savings of USD 110 billion could be achieved. For the cost of public services provision, the study shows that under a controlled-growth scenario, local public service costs would be reduced by USD 4 billion. Carruthers and Ulfarsson (2003) examine 12 measures of public expenditure for 283 US metropolitan areas and show that urban sprawl undermines the cost-effectiveness of urban services. A study in Japan showed that implementing compact city policies in a depopulating region can reduce maintenance costs for infrastructure, such as schools, roads and water facilities, by a substantial 17% to 32% if the residential area is reduced by 58% (PRIMLITJ, 2009). UNEP (2011) also argues that high urban density would lead to provision of infrastructure at lower cost per person.

A compact city increases labour productivity

Another potential economic benefit regularly discussed is that compact city policies could increase the productivity of cities. For example, UNEP (2011) points out that doubling the employment density of an urban area could raise labour productivity by 6%. Ciccone and Hall (1996) found that the density of economic activity is important in explaining the variation in productivity at the state level: average labour productivity increases by 6% when employment density doubles at the county level. Cervero (2001), by using macro-scale and micro-scale analysis for 47 US metropolitan areas, finds a positive association between employment densities and productivity levels.

This labour productivity gain has normally been explained by diversity and knowledge diffusion in a compact city. A compact city's residents have easier access to a diversity of local services and jobs. Moreover, high density, combined with the diversity of urban functions, is claimed to stimulate knowledge diffusion and thus economic growth. Knowledge diffusion is mainly considered to occur via knowledge transfers from skilled workers to lower skilled and young workers, and low-skilled workers can increase their skill levels through face-to-face interaction with skilled workers (Jovanovic and Rob, 1989). Lower intra-urban transport costs in a compact city are important because they facilitate the amount and quality of interactions between skilled and unskilled labour forces. Jacobs (1962) argued that mixed land use and sufficient density are indispensable for generating "exuberant" diversity in the streets and districts of a city. She also argued that the city, with its vitality, mix of uses and traditions, represents the most desirable form of development for people and also encourages wealth creation and innovation. In short, diversity generated by mixed land use and sufficient density can lead to economic growth.

Lower urban transport costs may also improve the functioning of the labour market. As the pool of interacting firms and households is limited by commuting costs, an increase in the number of firms and households seeking better working relations raises the expected quality of a match and the likelihood of finding such a match and has a positive productivity effect (Mortensen and Pissarides, 1999; Berliant et al., 2000, Helsley and Strange, 1990). Moreover, Jones et al. (2010) argue that competitive pressures due to geographical concentration can boost innovation.

It is also argued that the compact city shortens workers' commuting distance, thus reducing travel time and helping to raise productivity. For example, Prud'homme and Lee (1999) find that containing sprawl and improving transport speed by 10% leads to a productivity increase of 2.9%. Based on data for 23 French cities, they found that a city's efficiency is a function of its overall size, but also of its sprawl and of the speed at which trips in the city are made. However, it is important to know that shorter intra-urban travel distances do not always lead to shorter travel time. A study of the Paris region shows that those who live in high-density areas travel a third of the distance travelled by those in low-density areas but the time spent travelling is the same (Fouchier, 1997). Another study in the United States found that "workers in sprawled cities commute at a speed 9.5 miles per hour faster than workers in compact cities" (Kahn, 2007). This indicates that living closer to one's work does not necessarily improve accessibility in terms of travel time.[3]

More efficient use of land resources, more opportunities for urban-rural linkages

A compact city makes it possible to use land resources more efficiently. For example, by preventing productive agricultural land at an urban fringe from being converted to urban land, the agricultural productivity can be maintained and urban sprawl avoided. Because the distances between urban and rural areas are closer if urban sprawl is controlled, this may open up opportunities for urban-rural linkage projects such as farmers' markets and agricultural tourism, which can also foster rural economic development. However, a careful study is required to achieve optimal land use. For instance, a poorly designed densification policy may squeeze out urban agriculture (agricultural land within built-up areas), which is to some extent necessary and beneficial because it provides fresh foods and open spaces in urban areas.

New green needs in a compact city

It is also argued that a compact city generates new green needs that promote technological development and innovation and thus stimulate growth. For example, policies to reduce automobile dependency may require technological development and innovation of green transport infrastructure (light rail transit, cycling, etc.). Increased demand for district-wide energy utilisation and local energy generation may also promote technology innovation. Furthermore, more opportunities for urban-rural linkages can create demand for new businesses (e.g. farmers' markets, agricultural tourism), which may also be seen as an outcome of compact city policies. While these interesting elements should be taken into account, the scale of impact is unclear and more study is needed.

"Economies of density" in a compact city

Finally, some studies argue that urban density itself generates something called "economies of density". For example, Morikawa (2011) argues that urban density can create stable demand, especially for services, and can increase productivity in the service industry (Box 2.1). The proposed mechanism of the effect of density on the urban economy through the demand side is different from diversity and knowledge diffusion/spillovers, which focus on the supply side. Similarly, Jones et al. (2010) find that high density leads to greater concentration of demand and related spending, which could reduce "the spatial extent of viable social and private services' catchment areas (including business services)". These arguments imply that urban density helps to raise productivity in services, and that, as the weight of the services sector in the urban economy of developed countries increases, urban density also takes on greater importance.

2.3. The compact city's potential contribution to green growth

The OECD's Green Growth Strategy, released in May 2011, is becoming a policy driver for OECD countries (Box 1.5). This section looks at the concept of green growth and discusses the potential contribution of compact city policies to green growth.

The concept of green growth

The OECD's Green Growth Strategy defines green growth as "fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies" (OECD, 2011b). To do this, it must catalyse the investment and innovation that will underpin sustained growth and give rise to new economic opportunities. The OECD's Green Growth Strategy entails an operational policy agenda that can help achieve concrete, measurable progress at the interface of the economy and the environment. It has a strong focus on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth, consistent with resilient ecosystems (OECD, 2011b).

Box 2.1. **Economies of density?**

It is well known that agglomeration generates good conditions for economic growth, and urban economies use agglomeration to grow in ways ranging from simple economies of scale in production, to local specialisation, to knowledge spillovers. In fact, a city exists and grows by taking advantage of such agglomeration economies. One might also ask whether the growing importance of the service economy in the developed world does not, in view of the characteristics of the services industry, generate something like "economies of density".

The services industry is characterised by the simultaneity of production and consumption. It has virtually no "inventory". Therefore, density of demand is a very important factor in the productivity of service industries. For example, if a restaurant invests a lot of money in the kitchen and the dining room and hires top-level cooks, and if there are few customers in the area around the restaurant, it will be difficult to attract a large clientele and productivity will be low. This applies more or less to the services industry in general. Density of demand is therefore very important for the services sector's productivity.

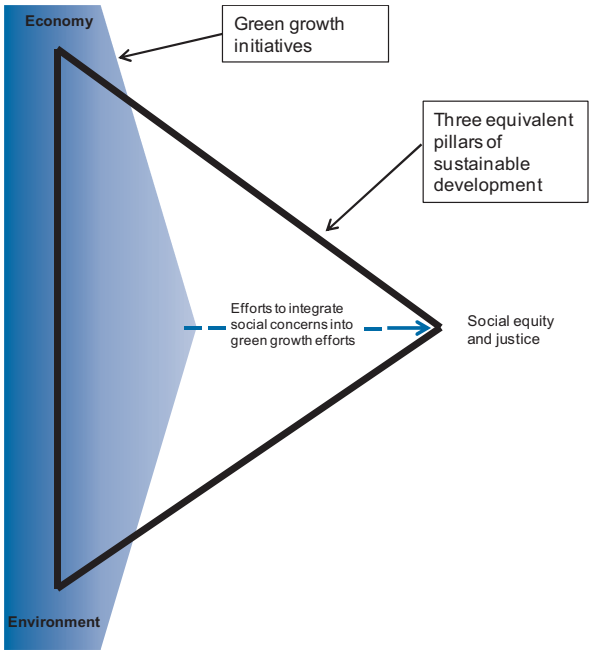
According to a recent study based on establishment-level data by a Japanese specialist, the productivity of selected service industries increases by 7%-15% as a city's population density doubles (Morikawa, 2011). This figure is quite high compared to similar figures for manufacturing reported in the same and other studies (Tabuchi, 1986; Ciccone and Hall, 1996; Lucas and Rossi-Hansberg, 2002). The study offered the following explanation:

> Another possible reason is the effect of demand. It is important to note that the coefficients of density are considerably larger for service industries than for manufacturing industries. Strong local demand results in a high-input utilization rate and efficient production planning. This may explain why economies of density are larger in service industries where simultaneous production and consumption is prominent. From the perspective of evaluating TFP [total factor productivity] as pure technological efficiency, this may be a measurement issue. However, in most service industries, where stockpiled inventory does not exist, efficient input utilization is the most important factor affecting the productivity and profitability of firms and establishments. To overlook this practically important aspect and to focus on only pure technological efficiency would imply disregarding the fundamental question to be resolved. (Morikawa, 2011)

Source: Morikawa, M. (2011), "Economies of density and productivity in service industries: an analysis of personal-service industries based on establishment-level data", *The Review of Economics & Statistics*, February, 93(1): 179-192; Tabuchi, T. (1986), "Urban agglomeration, capital augmenting technology and labour market equilibrium", *Journal of Urban Economics*, 20(2): 211-228; Ciccone, A. and R.E. Hall (1996), "Productivity and the density of economic activity", *American Economic Review*, 86(1): 54-70, NBER, Cambridge, MA; Lucas, R.E. and E. Rossi-Hansberg (2002), "On the internal structure of cities", *Econometrica*, 70(4): 1 445-1 476, Wiley-Blackwell.

It is helpful for understanding the concept to underline that sustainable development[4] provides an important context for green growth. Green growth is an essential component of sustainable development. The OECD's Green Growth Strategy focuses on two of the three pillars of sustainable development (economic and environmental sustainability) and aims to identify the complementarities between the two in a way that highlights opportunities for new sources of economic growth. However, that is not to say that green growth ignores social equity issues, as green growth initiatives can also provide benefits in terms of social equity (OECD, 2011a). Figure 2.5 depicts the three pillars of sustainable development, which operate primarily on the economy-environment axis, but simultaneously seek to deliver social equity co-benefits where possible.

Figure 2.5. **Green growth and sustainable development**



Source: Hammer, S., L. Kamal-Chaoui, A. Robert and M. Plouin (2011), "Cities and green growth: a conceptual framework", *OECD Regional Development Working Papers 2011/08*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5kg0tflmzx34-en*, accessed 2 January 2012.

Cities and green growth

Cities have a unique role to play in the pursuit of green growth. From the economic perspective, cities are critical drivers of national and aggregate growth. For example, the 2% of "hub" regions – mainly the largest OECD urban areas – account for approximately one-third of aggregate growth. Urban areas also feature higher income and productivity (Hammer et al., 2011). Despite the benefits associated with agglomeration economies, cities also need to deal with negative externalities such as congestion, air and water pollution, and the loss of ecosystems on which they depend, in order to sustain their competitiveness. It is also important in the compact city context that urban form is one of several critical factors influencing energy demand and GHG emission levels (Hammer et al., 2011). Finally, as pointed out in Chapter 1, the significant role of cities is emphasised by the fact that 70% of the world's population – and 86% in OECD countries – will live in urban areas by 2050 (OECD, 2010a).

When applied to urban areas the OECD definition of green growth can be extended in three ways. First, given the negative externalities generated by urban agglomerations and cities' urgent need to reduce their energy consumption and GHG emissions, urban areas can adopt environmental policies that draw on these new sources of economic growth. Second, the local level offers more opportunities to enact complementary environmental and economic policies, as activities related to environmental protection and economic development are more integrated at the local than at the national level. Green growth policies benefit from these policy complementarities and can be more effective at a local scale. Third, while the OECD Green Growth Strategy focuses on the inter-relatedness of economic and environmental concerns, the implementation of green growth at the local

level addresses social issues as well (Hammer et al., 2011). Taking these into account, urban green growth is defined as:

> …fostering economic growth and development through urban activities that reduce negative environmental externalities, the impact on natural resources and the pressure on ecosystem services. The greening of the traditional urban economy and expanding the green urban sector can generate growth (through increased supply and demand), job creation and increased urban attractiveness. These effects are in part the result of stronger interactions at the urban level among economic efficiency, equity and environmental objectives. (Hammer et al., 2011)

The compact city and green growth

These are the potential contributions of cities, or urban policies in general, to green growth. In addition, the compact city has its own specific ways to contribute to green growth. While urban policies address integrated urban sustainability goals (environmental quality, social equity and economic viability), existing urban policy tools often still tend to address each goal separately, sometimes viewing them as mutually exclusive and therefore implying major trade-offs. In contrast, compact city policies **link** these policy priorities since they are a comprehensive policy package. For example, findings from a general equilibrium model of OECD metropolitan regions demonstrate that urban density policies and congestion charges can reduce the overall cost to the economy of meeting GHG emissions reduction targets (OECD, 2010b). Savings in public expenditure in the environmental sector can be used for more efficient investment which can lead to sounder economic growth. Moreover, improved environmental quality affects the efficiency of local economic activity and the ability to attract firms and skilled workers.

In addition to the link between economic and environmental goals, the potential benefits of compact city policies with respect to the social pillar of urban sustainability should not be neglected. As discussed above, compact city policies are expected to play a role in facilitating the mobility of all households, in quality of life and in improving individuals' health. Compact city policies can therefore contribute to green growth by addressing the environmental, economic and social pillars of sustainable development.

2.4. Concerns about policy outcomes and possible responses

Despite the potential positive impacts of compact cities, there are a number of concerns about potential adverse effects on the environment or social cohesion, including possible conflicting interests in different locations within a compact city and the uncertainty of long-term effects. These concerns are examined below, along with possible responses. In fact, as presented in this section, many of the concerns are based on a misunderstanding of the compact city concept and could be handled by well-designed compact city policies. Nonetheless, it is important to articulate these concerns and to discuss how policy makers can handle them.

Potential adverse effects

A number of potential adverse effects are mentioned. Like the potential benefits, they are discussed as regards all three pillars of urban sustainability.

In terms of environmental quality, most of the potential adverse effects relate to densely built-up areas in a compact city. First, it is argued that air pollution problems may occur. Higher levels of pollution may occur owing to traffic congestion and reduced room

for the trees and shrubs that purify the air. Density may also reduce the capacity to cope with domestic waste and decrease opportunities for recycling (Troy, 1996). In addition, in a compact city, high density in built-up areas may increase local energy demand. For example, infill development in urban centres will put additional stress on the existing electricity network and may require additional investment in the network. However, the cost of investment in existing built-up areas can sometimes be prohibitive. Furthermore, a compact city may aggravate the urban heat island (UHI) effect, the phenomenon whereby urban areas experience warmer temperatures than rural surroundings. The UHI effect is suspected of warming urban areas by 3.5°C-4.5°C above the temperature of surrounding rural areas and this differential is expected to increase by approximately 1°C every decade (Voogt, 2002). The temperature differences can reach up to 10°C for large urban agglomerations (OECD, 2010a).[5] The UHI effect exacerbates energy demand mainly for air conditioning. A group of urban planners in Paris estimated that 30% more forests are necessary to reduce the UHI effects in Paris by 2°C (Box 2.2). In hotter climates the effects are greater, while in colder regions, they need to be compared against the potential benefits from reductions in winter heating demand. It is also noted that a compact city may be more vulnerable to natural disasters such as earthquakes, tsunamis, flooding and fires. Care must be therefore taken to reduce their vulnerability and to make compact cities resilient to the various risks associated with natural disasters. In a context of climate change, compact city policies in areas at high risk of flooding may not be appropriate. Furthermore, it is argued that compact city policies do not specifically take into account the need to adapt existing suburban areas to cope with anticipated climate changes (Williams et al., 2010).

Box 2.2. **Forestation in Paris?**

The proposal of Group Descartes, presented in the international competition "Le grand Paris de l'agglomération parisienne" proposed to increase the forests of Île-de-France by at least 30% in order to limit the temperature in case of a heat wave. The forest is a main "cooler" of air. Its effectiveness is proportional to its age, exploitation and diversity in species. The forest cover in the Paris region today is about 4 500 square kilometres or 22% of the total area. It is said to be a mature forest, unexploited, unproductive and inefficient in terms of cooling. The group's simulations show that with 30% more forest area night temperatures are reduced by 1°C-2°C during a heat spike in the center of Paris. The 30% increase, equivalent to a surface area of 1 400 square kilometres, can be obtained by converting farmland with financial assistance. In the proposal, these new forests are planted to foster the green structure linking the existing forests. This green structure goes deep into existing urban areas.

Source: Groupe Descartes, *www.legrandparis.net/equipesdetail/82*.

In terms of social sustainability, it is argued that compact city policies may increase rents and land prices owing to restrictions on urban land supply. This could raise affordability problems for housing (Cheshire and Hilber, 2006). In particular, high housing costs can affect low- and medium-income families and reduce their opportunity to live in city centres. It is argued that higher house prices result in a transfer of resources from those outside the housing market such as would-be first-time buyers to those inside the market, such as existing home owners; tend to favour older generations at the expense of younger; and enlarge the wealth gap between home owners and others (Baker, 2004). Kahn (2007) compared housing consumption in compact and sprawled cities and found that a higher metropolitan area compactness index leads to fewer minority households. The quality of life in a compact city is also questioned. Many studies argue that high

density may lead to the loss of open and recreational space (for example, Jenks et al., 1996); loss of privacy (Lindsay et al., 2010); and limited social interaction (Raman, 2010). Importantly, however, most of them conclude it is not high density *per se* that matters; it is the way a compact city is designed. Moreover, many earlier high-density development projects suffered from poor urban design and local social problems. This negative experience stays in people's minds and is one reason why they oppose compact city policies. The importance of urban design in alleviating negative views of compact cities will be discussed in Chapter 5.

Potential adverse economic effects are also reported. Among others, the economic loss caused by traffic congestion may be the most significant. However, it is not easy to calculate the monetary value of this effect. Although several OECD countries report estimates of the economic loss caused by congestion as a whole,[6] these studies do not address the specific effects of compact city policies. While densely built-up areas may aggravate traffic congestion in some cases, traffic congestion is not an inevitable result of compact city policies. There are many examples of high-density areas with no congestion and of low-density suburbs in which roads are often congested. It is also argued that the constraints on land use in compact cities limit the supply of land and lead to shortages of housing and office space, resulting in high rents and high land prices (Cheshire and Sheppard, 2002). Cities with inadequate housing will become an increasingly expensive place to do business, with high housing costs and reduced labour market mobility (Baker, 2004). Moreover, urban development in existing urban areas (e.g. brownfield sites) may be more costly due to the need to upgrade existing infrastructure (Troy, 1992), which is a burden for private investment. All of these affect business opportunities and economic activity in cities and could negatively affect their competitiveness.

Conflicting interests among geographical locations

Maximising the advantages of a compact city and minimising the disadvantages is not simple because, for the residents and users of an environment, one person's advantage may be another person's disadvantage (Churchman, 1999). It often happens that compact city policies create unbalanced geographical outcomes: one part of a metropolitan area may benefit substantially from a given policy while other parts may suffer. As a result, decision makers face difficult choices.

A typical example is found in an argument about open and green spaces in urban centres. There exist different interests regarding open and green spaces among urban centre and peripheral residents, which may create political tensions. On the one hand, society's demand for a greater role for nature in cities, which is met by creating public parks and green spaces, particularly in the centre of the agglomeration, leads to more extensive urban expansion at the periphery. On the other hand, peripheral residents desire to increase the density of the urban fabric by eliminating open spaces in the city centre, in order to preserve peripheral natural spaces. Their demand may be rationalised by the fact that, in the case of Paris, for example, it would be necessary to consume nine times more land at the periphery in order to accommodate the number of inhabitants and jobs that could have used the land transformed into parks in the city centre (Fouchier, 2011).[7] However, a policy decision is not as simple as just densifying city centres; ironically and even paradoxically, the insufficiency of open spaces in the city centre itself may be an incentive for people to leave high-density areas to live in lower density areas.

Likewise, some argue that compact city policies aimed at reducing overall air pollution and automobile dependency at the metropolitan scale may in fact result in

additional concentration of air pollution and traffic congestion in urban centres. In addition, those who suffer from local pollution the most are not those who cause the most pollution per capita, since the residents of high-density areas harm the environment less per capita: the environmental "virtue" of the residents of high-density areas is not rewarded, and in fact is punished. This may discourage them from supporting compact city policies.

Furthermore, while compact cities can enhance economic growth as a whole in a metropolitan area through better access to a diversity of services and jobs, those who live on the urban fringe may lose opportunities for economic development. In particular, at urban fringes, those who live just outside urban growth boundaries may feel that they are not treated equally with those who live just inside. Moreover, in terms of numbers, metropolitan-scale urban policies will affect people in suburbs more than those in urban centres since more people live in suburbs. Thus, if compact city policies result in economic benefits for urban centres but adversely affect the urban fringe, such policies will not be supported at the metropolitan scale.

The uncertainty of long-term policy effects

Another concern that inhibits policy makers' action is uncertainty about the long-term effects of compact city policies. This relates in particular to technological progress. For example, there is the question of whether or not automobile dependency is really an issue that compact city policies should address. Since non-polluting vehicles are now a possibility, a major factor holding back peripheral development seems to be disappearing (Box 2.3). The question then becomes whether faster expansion of urban land should be allowed or whether the compact city still remains a rational policy option.

Box 2.3. **Electric vehicles and the compact city**

Electric vehicles (EVs), hydrogen-powered vehicles and other energy-efficient vehicles are likely to increase exponentially in the coming decades. Many local governments have started to support the infrastructure for EVs (Yokohama, for example, has entered into an agreement with a major auto manufacturer to outfit the city with electric chargers for electric vehicles). This raises the question of the impact EVs will have on compact city objectives.

EVs can make dense urban areas more liveable, less noisy and less polluted, even if car usage is not reduced. Although EVs increase electricity demand, they can have several potential energy-saving effects. For example, the energy efficiency of EVs (creating electricity in power plants and using it for EVs) is greater than that of fossil fuel vehicles (which produce power from fossil fuel in each). In addition, if EVs recharge at night, electricity use can be managed more efficiently.

However, the impact on total energy consumption and CO_2 emissions will depend on how the electricity is produced. There is still concern regarding a likely significant increase in demand for electricity, and this is often a sensitive political issue. How many new nuclear plants would be needed to power the EVs if all the cars in France were to be converted to EVs? Moreover, other urban challenges remain – for example, the shortage of arable land and congestion will not be solved by EVs (to the contrary). Land use based on automobile-dependent transport systems will put bio-systems at risk and keep infrastructure and service-delivery costs high, costs that will likely increase on a per capita basis as the tax base shrinks as a result of ageing/declining populations.

Source: Fouchier, V. (2011), "Density implications regarding sustainable development", presentation to the OECD.

Possible policy responses

The potential adverse effects commonly cited relate to the density of compact cities. It is essential to understand, however, that compact city policies are not just a densification tool and that well-designed compact city policies can minimise adverse effects. This will become possible when compact city policies are regarded as an integrated set of policies that include complementary policies (this will be further discussed in Chapters 4 and 5). For example, some may argue that compact city policies mean loss of open spaces in densely built-up areas, if they see the compact city concept simply in terms of density. In contrast, this report regards open spaces in densely built-up areas as an indispensable element of a compact city and maintains that ensuring them is among the objectives of compact city policies.

Locally unbalanced outcomes make policy makers' decisions very difficult and politically fraught because they affect different constituents differently. It is not enough to analyse whether compact city policies have overall benefits or disadvantages for a metropolitan region. To make decisions requires more precise information as to who in the region will benefit and who will suffer. There may be a need for a mechanism to reconcile such conflicts among local residents. Strategies to co-ordinate conflicting interests will be discussed further in Chapters 5 and 6.

Finally, the uncertainty of long-term policy effects implies the need to understand separately both the short-term and long-term policy outcomes and to consider the best policies accordingly.

2.5. Conclusion

Compact city policies provide opportunities for urban sustainability, but also raise concerns. Although the possibility of negative outcomes must be considered carefully, the potential of the compact city must not be neglected. A compact city has the potential to generate and support economic growth. It can make public service delivery more efficient and promote agglomeration economies. And it has been, or can be, used to address all three pillars of urban sustainability: environmental, social and economic. Although to date the environmental pillar has been at the fore, compact city policies can generate green growth by building on complementarities between economic and environmental challenges. The social pillar should not be neglected, and compact cities offer policy makers a unique venue in which to pursue social sustainability.

Compact city policies thus offer great potential. In order to capitalise on this potential, policy makers need hard data on which to base their decisions, and further quantitative studies of compact city policies are needed. Since urban sustainability goals are multi-faceted, compact city policy outcomes should also be examined from multiple perspectives. A clear understanding of the concept – particularly its definition – is a prerequisite for further study.

Notes

1. For example, O'Brien et al. (2010) argue that, while zero-energy residential buildings require relatively good solar exposure, high-density residential neighbourhoods have less solar energy collection potential per capita. Their analysis indicates the possibility that the benefit of greater solar energy potential outweighs compact building forms as far as net residential energy use is concerned. However, when transport energy use is taken into account, they conclude that high-density development is still superior under current conditions.

2. The "infrastructure gap" means that while the need for investment to maintain, upgrade or replace existing (and often ageing) infrastructures will increase, public finances will be unable to meet future infrastructure needs owing to fast-growing social expenditures (OECD, 2007).

3. Fouchier (1997) further argues that urban planning that favours the extension of road and transit networks to reduce travel time has generated sprawl because suburban development occurs along with the networks. In fact, the extension of roads and transit networks to suburbs does not really save travel time for urban residents, but it does provide more space per person in suburbs without increasing their travel time. The urban space therefore expands, taking advantage of space in suburbs. This is not a bad thing in itself, but the economic, social and environmental consequences should be known and taken into account.

4. Sustainable development, which was defined in the 1987 Brundtland report and given formal recognition by governments in the 1992 Rio Declaration, reflects an aspiration to amend the undesirable social and environmental by-products of conventional modes of economic growth (Hammer et al., 2011). The OECD Green Growth Strategy leverages the substantial body of analysis and policy effort that has flowed from the 1992 Rio Earth Summit. It develops a clear and focused agenda for delivering on a number of Rio's key aspirations (OECD, 2011b).

5. As dense urban areas tend to have a higher thermal mass (building mass per unit area) than non-urban areas (Stathopoulou et al., 2009), they typically store the sun's energy as heat within their infrastructure more effectively. Heat generated by air conditioning and other man-made sources also contributes to UHI (Santamouris, 2005).

6. For example, in Toronto, Canada, traffic congestion as a result of high automobile-usage rates have meant annual costs for commuters estimated in 2006 at around CAD 3.3 billion a year and annual economic costs at CAD 2.7 billion for the Greater Toronto and Hamilton Area (OECD, 2010b).

7. In the Paris metropolitan area, the density differential between the centre and the periphery is greater than a factor of 9, and even reaches 42 in some cases.

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Chapter 3

Measuring the performance of a compact city

This chapter deals with indicators for monitoring and evaluating the performance of a compact city. First, it reviews previous attempts to measure compact city performance and discusses the relevance and availability of the indicators. Based on the review, the chapter proposes 18 indicators as core compact city indicators. It then applies the proposed indicators to OECD metropolitan areas, discusses effective ways of using them, and identifies challenges and areas for further research. Seven indicators are examined using 3-D maps and other geographic information system (GIS) tools: i) *population and urban land growth;* ii) *population density on urban land;* iii) *trip distance;* iv) *urban land cover;* v) *trips using public transport;* vi) *proximity to public transport; and* vii) *matching local services and homes.*

3.1. Introduction

Indicators are needed to monitor and evaluate the impact of compact city policies. They will make it possible to benchmark progress and establish future goals. In particular, internationally comparable indicators can help policy makers analyse their policy performance from a wider perspective and improve their policy actions.

Two types of compact city indicators are needed; they are related and sometimes overlap. The first type of indicators represents "compactness", namely, the three key characteristics defined in Chapter 1 (dense and proximate development patterns; urban areas linked by public transport systems; and accessibility to local services and jobs). The second type monitors the impact of compact city policies – how they affect urban sustainability (in terms of environmental quality, social equity, economic viability, etc.). Together, the two sets of indicators can provide policy makers with an overall picture of how compact city policies are performing.

This chapter attempts to develop compact city indicators. First, it reviews previous attempts to measure compact city performance, discusses the relevance and availability of the indicators used, and proposes a set of core compact city indicators. The following section then applies the proposed indicators to OECD metropolitan areas, discusses effective ways to use them, and identifies challenges and areas for further research. Although the indicators proposed in this chapter are preliminary and require further examination and improvement, they provide useful insight into ways in which compact city policies can be effectively monitored and evaluated.

3.2. Defining key compact city indicators

Indicators related to "compactness"

Measuring compactness is a complicated exercise. While a variety of indicators have been proposed in the existing literature, they are all based on different definitions. Moreover, even when the definition is commonly accepted, identifying the indicators that best represent it is a problem that has not been fully resolved. Therefore, the discussion focuses on understanding which indicators are relevant to the compact city concept proposed in this report.

Density

Density is one of the indicators most frequently discussed in urban policy. It can be understood in a number of ways. For example, Dempsey et al. (2010) argue that indicators of density include gross density, gross residential density, net density and net residential density. Burton (2002) argues that density indicators can include measures such as persons per hectare, persons per hectare in built-up areas, and variation in density across the city. Fouchier (2004) measures urban densities as "the sum of population and jobs per urban hectare". In urban development practice, floor area ratio (FAR), or floor space ratio, is commonly used (Box 3.1). From the compact city perspective, density of population (or employment or other urban activity) on urban land is more relevant for gauging the efficiency of urban land use. In addition to average density in a metropolitan area, the spatial distribution of density (i.e. where the denser areas are located in a metropolitan area) is also important. These points are further discussed below.

Box 3.1. **Density indicators**

Density is a way of measuring population, employment, land use or housing intensity on a specified unit of land. Several indicators are commonly used to measure density in regard to residential development:

- gross density: gross density includes all land uses within a given area and can be expressed as persons per hectare (acre) or housing units per hectare (acre);
- net density: net density refers to the number of dwellings located on residential building sites and excludes roads, parks and other non-residential land uses. Net density can also be used as an indicator of density for a given form of housing;
- floor space ratio: the floor space ratio is the ratio of the number of square metres (feet) of floor space in buildings to the square metres (feet) of the property or lot. For example, a one-storey building that covers the entire site on which it sits has a coverage or floor space ratio of 1.0, as does a two-storey building on half its lot, or a four-storey building on a quarter of its lot.

Source: Roseland, M. (2005), *Toward Sustainable Communities: Resources for Citizens and Their Governments*, revised edition, New Society Publishers.

In addition, many indicators relating to densification policies have been proposed. Burton (2002) discusses the re-use of urban land as a possible measure, based on the fact that it can increase urban density. This could be measured by comparing "the proportion of land changing to residential use that was previously developed" with "the proportion of new housing on re-used sites" (DETR, 1998). In the same vein, the rate at which new development occurs through "infill" (when more units are constructed on an already developed lot) or "redevelopment" (when a structure is removed and another is built in its place) has been discussed as a compact city indicator. Portland Metro conflates these two measures as "refill" and measures the refill rate (the percentage of new development in a year that occurs on already developed land) (see Chapter 4). Vacancy rates of housing and office building stock are useful for measuring the intensity of use of existing urban buildings. The share of multi-family housing in total housing units has also been discussed, for example in Vancouver, as an indicator of the intensity of urban land use, since multi-family housing consumes less land per unit. The share of single detached dwellings in Metro Vancouver accounted for 76% of occupied private dwellings in 1961 and for 57% in 1981. Over the past ten years, single detached housing declined from 45% in 1996 to 35% in 2006 and continues to decline as the most common type of housing in the metropolitan area. Apartments now account for 39% of all occupied private dwellings and represent the largest share of dwelling types (Metro Vancouver, 2006).

Proximity

Proximity concerns how urban activities are dispersed in a metropolitan area (as illustrated in Box 1.3). Proximity, as used in this report, does not mean proximity to a specific place (to the centre of a city, for example), but proximity of one urban activity to another in a metropolitan area as a whole, so that it applies to both monocentric and polycentric metropolitan areas.[1] Proximity is an important morphological characteristic of a compact city. Contiguity is a distinct, but related concept, and concerns whether urban agglomerations are contiguous – literally, whether they "touch" one another. A number of studies have attempted to quantify contiguity (for example, Wu and Murray, 2008;

Bechle et al., 2011). Contiguity may be useful for measuring proximity to some extent, especially as regards urban patchiness (degree of "leapfrog" development). However, it differs significantly from proximity in that it is not concerned with the spatial shapes or distances between urban agglomerations.

Theoretically, the most direct means of measuring proximity is to look at trip distances in a given area: if average travel distances are shorter, urban agglomerations are closer together. While average commuting distance (or journey-to-work trips) is often measured, it is also important to measure the average distance for other purposes (shopping, leisure, logistics, etc.), since working styles are changing and the purposes of trips are becoming more diverse. It is also useful to underscore the difference between travel time and travel distance. As discussed in Chapter 2, travel time can serve as an indicator for urban structure but not for the morphological proximity of urban agglomerations. A more instinctive way to define proximity is to look at urban land cover data. Urban land cover in a metropolitan area shows how much land is used for urban purposes. Mapping urban land cover by using geographic information system (GIS) tools is useful for visualising the location of urban land and seeing whether or not the urban agglomerations of a metropolitan area show proximate development patterns. However, such visual data are difficult to interpret objectively so that different metropolitan areas and different time periods can be compared. This issue will be further discussed below.

Public transport systems

A compact city implies higher intra-urban mobility and less automobile dependency. The provision of public transport systems thus plays a crucial role. A number of attempts have been made to measure the performance of intra-urban public transport systems. The most commonly used indicator is the percentage of commuters using public transport. For example, Ewing et al. (2008) discussed how to measure urban sprawl and proposed the percentage of commuters using public transport and the percentage of commuters walking to work as indicators. Other common indicators focus on the supply of public transport systems, such as length of public transport lines, number of stations and station density. While such indicators are useful for monitoring policy outputs, they do not necessarily capture the mobility of urban residents as they do not take account of who uses the system and how. Instead, indicators such as distance to transit and destination accessibility are more sophisticated as they measure the integration of urban land use and public transport systems.[2] Studies show that ridership of residents and workers often tapers off exponentially with distance from a railway station (Holtzclaw et al., 2002). In the case of residences, this is often the result of self-selection: some people choose to rent or purchase a residence with easy access to transit because they prefer to take public transport to work or other destinations rather than drive (Cervero, 2007). Similarly, destination accessibility pertains to how well transit-oriented development (TOD) is connected to retail shops, activity centres and other popular destinations. It thus captures how efficiently public transport connects a station area neighbourhood to activities throughout a metropolitan area. Frequency of service could also be added to and combined with these indicators.

Accessibility to local services and jobs

Accessibility to local services and jobs is concerned with the urban activities that are readily available at a local neighbourhood scale. To understand the concept, it is important to note the difference between accessibility and mobility. For example, some may argue that a housing-only neighbourhood with excellent mobility (such as an

efficient road network for reaching services or jobs in urban centres) can be considered highly accessible. However, this would not apply to those who lack some mobility options (households without a car, for example). In contrast, accessibility in a compact city means that residents easily reach local services such as grocery stores, restaurants and clinics as well as neighbourhood jobs either on foot or by a short ride on public transport. Accessibility is closely related to population or employment density but also to the mixed land-use elements of a compact city.

Mixed land use is the approach most widely used to indicate accessibility to local services and jobs. However, developing indicators on mixed land use is a challenge. Existing studies show that a clear definition of mixed land use does not exist and views on what constitutes mixed land use vary. Churchman (1999) considers mixed-use areas as those "with a simple cluster of housing, retail space, and offices within a one-quarter mile walking radius of a light rail system". Burton (2002) sees a compact city as one that is well served by facilities, with a balance of residential and non-residential uses, and also has other components: horizontal mix, or the mix of uses within streets or neighbourhoods, and vertical mix, or the mix of uses in individual buildings. Mixed land-use neighbourhoods enable "people who live there also [to] work there" (Lucas and Rossi-Hansberg, 2002). Shibata et al. (2010) argue that one key to establishing a sustainable community is to enable people to work near where they live.

Different approaches have been taken to measure accessibility to local services and jobs. Ewing et al. (2002) use the balance between jobs and residents and the balance between population-serving jobs (retail, personal services, entertainment, health, education and other professional and related services) and residents. A variation from the social equity perspective is to look at the job-resident balance for a particular population group. For example, OECD (2011a) calculates the spatial mismatch between employment and low- and medium-income households in the Gauteng metropolitan area, South Africa. Burton (2002) proposes the ratio of residential to non-residential urban land, the number of key facilities (restaurants and cafes, takeaways, food stores, banks and building societies, chemists, doctors' surgeries) per 1 000 residents and the number of newsagents for every 10 000 residents. In addition, she uses the percentage of postcode sectors containing key facilities and the variation in the number of facilities per postcode sector to find the horizontal mix of uses and the geographical spread of key facilities. She also uses the area of retail space that includes accommodation to measure vertical mix, or the different uses within individual buildings. Frenkel and Ashkenazi (2008) use the composition of six land-use categories: residential area, industrial area, public institutions, mixed land use, tourism and recreational area, and special land uses (sport centres, cemeteries, urban interchanges, buses and railway stations) to measure the mix of land uses. Another popular approach is to focus on distances between local services, jobs and homes. Kaido and Kwon (2008) use the share of dwellings with access to local services (convenience stores, banks, post offices, medical facilities, stations, etc.) within 500 metres. Ewing et al. (2002) use three indicators: *i)* percentage of residents with businesses or institutions within a certain number of blocks of their homes, *ii)* percentage of residents with satisfactory neighbourhood shopping within one mile, and *iii)* percentage of residents with a public elementary school within one mile. Shibata et al. (2010) adopt the ratio of the area within a 200-meter radius of daily-use facilities (kindergartens, hospitals, municipal administrative institutions, supermarkets and convenience stores) to the area of the densely inhabited districts (DIDs) in Japan. Other indicators include the proportion of walking and bicycle trips to all trips, the ratio

of persons working at home to total employed persons, and the ratio of persons working in the city in which they live to total employed persons (Muhammad et al., 2005).

Most of the indicators discussed above look at accessibility to local services and jobs at the neighbourhood scale. However, it is important not to ignore the metropolitan perspective. Accessibility to local services and jobs does not concern only the residents in urban centres. Compact city policies have to work towards better accessibility for every neighbourhood in a metropolitan area and the indicators need to monitor and evaluate the performance of compact city policies accordingly.

Composite indicators of compactness

There have also been attempts to develop composite indicators of compactness by combining several indicators. For example, to measure sprawl, Galster et al. (2001) draw on eight characteristics of compactness: density, continuity, concentration, clustering, centrality, nuclearity, mixed use and proximity. Ewing et al. (2002) used four factors (street connectivity, centeredness, mixed use, density) and scored the "sprawl" of 83 metropolitan areas in the United States. The results were set out in the "sprawlometer" from most sprawling to least sprawling. According to this measure, New York is the least sprawling; Riverside, California the most sprawling; and Portland is the eighth least-sprawling metropolitan area of those measured. While this approach makes inter-metropolitan comparison easier, there is a risk of bias (for example, overweighting of a particular element of compactness).

Indicators related to the impact of compact city policies

The second set of indicators measures the impact of compact city policies and how they affect urban sustainability (environmental quality, social equity, economic viability, etc.). Compared with the first set of indicators, what is measured is directly linked to the overall objectives of a compact city (for example, the reduction of CO_2 emissions per capita from transport). These indicators can also be used to monitor whether compact city policies are generating specific negative effects (for example, on the amount of public green and open space in urban centres). However, careful interpretation is needed because it is often difficult to distinguish the effects of compact city policies from those of other urban and sectoral policies.

A wide range of indicators for urban sustainability have been proposed and used in the policy-making process. For example, as regards environmental quality, OECD (2011b) proposes a tentative set of 80 urban environmental indicators under nine themes (land use, urban air, water use, urban water quality, waste management, transport and traffic, climate change and energy, environmental health, and general awareness and behaviour) as a way to track progress towards greener cities and metropolitan areas (Table 3.1). Other international organisations and institutions also have urban indicators intended for international comparison (Box 3.2). There have as well been attempts to create a composite indicator and rank the environmental performance of urban districts and cities as a whole (for example, CASBEE for urban development in Japan, LEED for neighbourhood development in the United States). Many of them are relevant to compact city policies. While these indicators for urban environmental sustainability are increasingly discussed, indicators for social and economic urban sustainability have been less developed.

Table 3.1. **The OECD proposed urban environmental indicators**

Land use, transport and traffic

Theme	Indicator
Land use	Extent of built-up area
	Urban growth
	Share of new development (residential, commercial, industrial) built in mature areas, downtown, near transit locations and on greenfield land
	Density of city/metro region (resident population/km^2), by area
	Inland or coastal areas within metro area covered by water over a large part of the year in m^2 per capita
	Area of green space accessible to the public in m^2 per capita or as a share of built-up area
	Percentage of citizens living within 300 metres from public open space larger than 5 000 m^2
	Proportion of population within a 15-minute walk of green space
	Percentage of population living within 500 metres of commercial services
	Extent of renaturalised waterways and redeveloped waterfront areas opened up to the public, as a proportion of total open public space
	Proportion of city/metro brownfield sites that has been redeveloped
	Area of land protected from urban development as a share of total city/metro area or of total green space
Transport and traffic	Passenger and freight transport intensity by mode per capita, per unit of city GDP
	Urban traffic intensity: vehicle-kilometre travelled on city/metro area roads by passenger cars and goods vehicles per unit of city GDP, per network length, and per capita
	Share of city trips by motorised private transport, by public transport, by bicycle and on foot
	Share of children going to school on foot, by bicycle, by school bus, on public transport and by private car
	Number of people commuting into/out of the city as a share of population
	City/metro road network length in kilometres per capita
	Length of public transport network in kilometres per capita, by rail, light rail, bus, bus rapid transit
	Percentage of residents living within 500 metres of transport connection
	Average travel speed on primary thoroughfares during peak hours
	Capacity and use of park-and-ride facilities in metro area in places per capita
	Total length of bicycle lanes in kilometres per capita
	Levies and charges specifically aimed at relieving urban congestion
	Household expenditure on transport services as a share of total household expenditure

Note: This table shows 25 urban environmental indicators under the themes of land use and transport and traffic, excerpted from a tentative set of 80 urban environmental indicators.

Source: OECD (2011), "Urban environmental indicators for green cities: a tentative indicator set", paper presented to the Working Party on Environmental Information, internal working document.

Box 3.2. **Selected urban indicator sets for international comparison**

The Urban Audit is a collection of quantitative information on the quality of life in European cities. The Urban Audit is a joint effort by the Directorate-General for Regional Policy (DG REGIO) of the European Commission and Eurostat to provide reliable and comparative information on selected urban areas in European Union countries. The second full-scale Urban Audit took place between 2006 and 2007, and involved 321 European cities in the 27 countries of the European Union, along with 36 additional cities in Norway, Switzerland and Turkey. Data collection currently takes place every three years, but an annual data collection is being planned for a smaller number of targeted variables. An *Urban Atlas*, accompanying the Urban Audit, was first released in 2009 for 185 cities, including all EU capitals and a large sample of large and medium-sized cities participating in the Urban Audit.

Box 3.2. **Selected urban indicator sets for international comparison** (*cont.*)

The Global City Indicators Program (GCIP) is a decentralised, city-led initiative that enables cities to measure, report and improve their performance and quality of life, facilitate capacity building, and share best practices through an easy-to-use web portal. GCIP is aimed at helping cities monitor performance and quality of life by providing a framework to facilitate consistent and comparative collection of city indicators. The GCIP also aims to enhance city government accountability to the public and has a strong focus on the performance of cities' public services, including those for water supply, wastewater and solid waste. The GCIP was initiated by the World Bank in 2008 and is now run by the Global City Indicators Facility, based at the University of Toronto, which oversees the development of indicators and helps cities to join the programme. As of early 2011, more than 125 cities worldwide were participating in the programme.

The Cities Data Book (CDB) is a very comprehensive set of urban indicators formulated in 2001 by the Asian Development Bank (ADB) and intended to improve urban management and performance measurement. The broad categories of the environment-related indicators are the same as those found in other indicator sets (water, wastewater, solid waste, noise, etc.), but the CDB's indicators go into greater detail on specific concerns addressed by this institution (e.g. the wide range of methods of sewage disposal in Asian cities) and the purpose of the indicators.

The *Global Urban Indicators* (GUI) database was established to monitor progress on the implementation of the UN-Habitat Agenda. The database covers 236 cities across the globe, including in OECD countries. As a whole, however, the indicators focus strongly on the concerns of cities in developing countries. In 1996 and 2001, the programme produced two main databases (*GUI Databases* I and II) for presentation at the Habitat II and Istanbul +5 conferences, containing data for 1993 and 1998, respectively. The next *Global Urban Indicators* database (III) will continue to address the Habitat Agenda key issues, with a specific focus on the Millennium Development Goals, particularly Target 11 on the improvement of slum dwellings. There are a total of 42 key and complementary indicators in the GUI dataset.

Source: OECD (2011), "Urban environmental indicators for green cities: a tentative indicator set", paper presented to the Working Party on Environmental Information, internal working document.

Proposed compact city indicators

It is important to select carefully the indicators that best reflect major trends related to these issues. As indicators can serve different purposes, the number of potentially useful indicators is fairly large. It is therefore necessary to use commonly agreed criteria to guide and validate their choice. For example, in the context of the OECD's Green Growth Strategy, OECD (2011c) establishes three key principles for selecting indicators to monitor progress on green growth which can also be used for compact city indicators:

- Policy relevance. The indicator set should have clear policy relevance and should in particular: *i)* provide balanced coverage of the key features of green growth with a focus on those that are of common interest to OECD member and partner countries; *ii)* be easy to interpret and transparent, i.e. users should be able to assess the significance of the values associated with the indicators and their changes over time; *iii)* provide a basis for comparisons across countries; and *iv)* lend itself to adaptation to different national contexts and to analysis at different levels of detail or aggregation.

- Analytical soundness. The indicators should be analytically sound and benefit from a consensus regarding their validity. They should lend themselves to use in economic and environmental modelling and forecasting.
- Measurability. The indicators should be based on data that are available or that can be made so.

Based on the literature review and the above criteria, this report proposes a set of 18 core compact city indicators that are considered essential for analysing compact city policies (Table 3.2). The indicators are selected so as to represent effectively the "compact city" and "compactness" as here defined. In particular, they aim to measure policy performance at the metropolitan scale, as a compact city is an aspect of urban spatial form at the metropolitan level. Several indicators measure possible impacts on urban sustainability, especially the potential adverse effects. It is important to note that they are not the only relevant indicators – many others should complement them. Moreover, the list proposed is preliminary and many of the indicators require further examination and improvement before they are ready for use. The following section applies several indicators experimentally to OECD large metropolitan areas and analyses them in terms of policy relevance, analytical soundness and measurability.

Table 3.2. **Core compact city indicators**

Category		Indicator	Description
Indicators related to compactness	Dense and proximate development patterns	1. Population and urban land growth	Annual growth rate of population and urban land within a metropolitan area
		2. Population density on urban land	Population over the surface of urban land within a metropolitan area
		3. Retrofitting existing urban land	Share of urban development that occurs on existing urban land rather than on greenfield land
		4. Intensive use of buildings	Vacancy rates of housing and offices
		5. Housing form	Share of multi-family houses in total housing units
		6. Trip distance	Average trip distance for commuting/all trips
		7. Urban land cover	Share of urban land in a metropolitan area
	Urban areas linked by public transport systems	8. Trips using public transport	Share of trips using public transport (for commuting/for all trips) in total trips
		9. Proximity to public transport	Share of population (and/or employment) within walking distance (e.g. 500 metres) of public transport stations in total population
	Accessibility to local services and jobs	10. Matching jobs and homes	Balance between jobs and homes at the neighbourhood scale
		11. Matching local services and homes	Balance between local services and homes at the neighbourhood scale
		12. Proximity to local services	Share of population within walking distance (e.g. 500 metres) of local services
		13. Trips on foot and by bicycle	Share of trips on foot and by bicycle (for commuting/for all trips) in total trips
Indicators related to the impact of compact city policies	Environmental	14. Public space and green areas	Share of population within walking distance (e.g. 500 metres) of green space accessible to the public
		15. Transport energy use	Transport energy consumption per capita
		16. Residential energy use	Residential energy consumption per capita
	Social	17. Affordability	Share of household expenditure on housing and transport in total household expenditure
	Economic	18. Public service	Expenditure on maintaining urban infrastructure (roads, water facilities, etc.) per capita

3.3. Application of the proposed indicators to OECD metropolitan areas

This section applies the proposed compact city indicators to OECD metropolitan areas, discusses effective ways to use them and identifies challenges and areas for further research. Of the 18 core indicators proposed in the previous section, this experimental exercise focuses on seven: *i)* population and urban land growth; *ii)* population density in urban land; *iii)* trip distance; *iv)* urban land cover; *v)* trips using public transport; *vi)* proximity to public transport; and *vii)* matching local services and homes. One objective of this exercise is to illustrate how these indicators can be used to monitor and evaluate compact city policies. Another is to understand measurability for each indicator and to identify challenges. In this exercise, **OECD metropolitan areas** are used as an analytical unit wherever possible. If the necessary data are not available, other administrative areas with available data are used. Some analyses were extended to 73 metropolitan areas defined as **OECD large metropolitan areas**, while others were limited to the five case study metropolitan areas: Melbourne (Australia), Vancouver (Canada), Paris (France), Toyama (Japan) and Portland (United States).

Defining an analytical unit: OECD metropolitan areas

For the compact city indicators to be comparable across countries, it is essential to define what a metropolitan area is. OECD metropolitan areas are a newly developed harmonised definition of urban areas that will enable international comparisons of urban growth and performance in terms of urban sustainability (Box 3.3). The methodology has been applied to 28 member countries so far and identifies 1 140 urban areas, 73 of which (in 19 countries) are recognised as large metropolitan areas with a population of more than 1.5 million. Table 3.3 lists the OECD large metropolitan areas with the key urban land cover and population statistics used in this section.[3]

Box 3.3. **The methodology used to define OECD metropolitan areas**

Despite its recognised effects on the economy, on quality of life and on the environment, urban development is still poorly monitored. Moreover, statistically robust comparisons of cities across countries are lacking. This knowledge gap is mostly due to the absence of an international agreement on what to measure, i.e. what is "'urban" and what is the real area of a city's labour market (its functional area). The methodology identifies urban areas as functional economic units, characterised by densely inhabited "urban cores" and "hinterlands" whose labour markets are highly integrated with the urban cores.

Step 1. Identifying core municipalities through gridded population data: high-density clusters are defined as aggregations of contiguous high-density 1 km square grid cells. High-density cells have a population density of at least 1 500 inhabitants per km^2 in Europe, Japan, Korea and Mexico. A lower threshold of 1 000 inhabitants per km^2 is used for Australia, Canada and the United States, where several metropolitan areas are less compact. Smaller clusters (with fewer than 50 000 people in Europe, Canada and the United States and 100 000 in Japan, Korea and Mexico) are dropped. If the percentage of a municipality's population living within the urban cluster is higher than 50%, the municipality is considered densely inhabited.

Box 3.3. **The methodology used to define OECD metropolitan areas** (*cont.*)

Step 2. Connecting non-contiguous cores belonging to the same functional area: not all OECD urban areas are characterised by contiguity of built-up development. Many develop in a polycentric way, with densely inhabited cores that are physically separated, but economically integrated. An important innovation of this work is the identification of urban areas with a polycentric structure. This is done by looking at the relationships among the urban cores, using information from the commuting data. Two urban cores are considered integrated, and thus part of the same polycentric metropolitan area, if more than 15% of the residence population of any of the cores commutes to work in the other core.

Step 3. The identification of the urban hinterlands: the hinterland can be defined as the "worker catchment area" of the urban labour market that is outside the densely inhabited core. The size of the hinterland, relative to the size of the core, gives a clear indication of the influence of cities on surrounding areas. All municipalities that send to the core a percentage of their workers above a given threshold are assigned to each core as hinterland municipalities. After extensive sensitivity analysis, the threshold has been fixed at 15% of the residents of the municipalities. The multiple cores within a polycentric metropolitan area are considered as a single destination.

This methodology makes it possible to compare functional urban areas of similar size across countries. A classification of urban areas into four types according to population size is proposed:

- small urban areas, with a population below 200 000 people (and above 50 000);
- medium-sized urban areas, with a population between 200 000 and 500 000;
- metropolitan areas, with a population between 500 000 and 1.5 million;
- large metropolitan areas, with a population of 1.5 million or more.

Source: OECD (2012), *Redefining Urban: A New Way to Measure Metropolitan Areas*, OECD Publishing, Paris.

Population and urban land growth

The indicator "population and urban land growth" measures the growth trend of both population and urban land at the metropolitan scale. Data at different time periods are required to calculate growth rates, although such data are not always available. If urban land grows faster than population, this implies that urban sprawl is occurring. Figure 3.1 illustrates population and urban land growth rates in 46 OECD large metropolitan areas between 2000 and 2006. It reveals two distinct trends: one group experienced faster growth of urban land than of population, as discussed in Chapter 1, while the other had faster growth of population than of urban land. This could be a consequence of recent urban policy practices favouring more compact cities or a result of market decisions, or both.

Table 3.3. **Land and population of the OECD large metropolitan areas**

19 countries, 73 large metropolitan areas

Country	OECD large metropolitan area	Total land size (km^2)	Urban land size (km^2)	Share of urban land	LandScan[1] population in total land ('000s)	LandScan[1] population in urban land ('000s)	Population density in total land based on LandScan (pop/km^2)	Population density in urban land based on LandScan (pop/km^2)
Austria	Vienna	9 030.3	947.2	10.5%	2 534.3	1 988.9	280.6	2 099.8
Belgium	Brussels	3 263.0	1 010.2	31.0%	2 295.9	1 772.1	703.6	1 754.2
Canada	Montreal	12 295.6	969.5	7.9%	4 145.4	3 117.1	337.1	3 215.2
Canada	Toronto	15 654.6	1 589.5	10.2%	6 350.6	5 232.1	405.7	3 291.7
Canada	Vancouver	5 268.2	439.8	8.3%	2 248.4	1 378.1	426.8	3 133.5
Czech Republic	Prague	3 900.8	585.2	15.0%	1 670.9	1 236.5	428.4	2 113.0
Denmark	Copenhagen	3 906.5	773.5	19.8%	1 915.6	1 517.6	490.4	1 961.9
France	Lyon	3 549.9	652.1	18.4%	1 894.0	1 387.8	533.5	2 128.2
France	Marseilles	4 216.1	477.7	11.3%	1 594.3	1 219.4	378.2	2 552.7
France	Paris	12 026.1	2 398.9	19.9%	11 622.2	9 904.4	966.4	4 128.7
Germany	Berlin	6 113.1	1 217.7	19.9%	4 282.5	3 776.6	700.5	3 101.4
Germany	Cologne	1 946.6	478.5	24.6%	1 867.2	1 344.5	959.2	2 809.7
Germany	Frankfurt	3 861.3	614.9	15.9%	2 493.1	1 654.2	645.7	2 690.3
Germany	Hamburg	5 727.6	890.9	15.6%	2 929.0	2 163.8	511.4	2 428.8
Germany	Munich	6 256.4	697.3	11.1%	2 609.4	1 886.9	417.1	2 706.0
Germany	Stuttgart	1 982.9	393.4	19.8%	1 947.4	1 222.3	982.1	3 107.1
Greece	Athens	1 650.8	431.4	26.1%	3 358.8	3 042.6	2 034.7	7 052.8
Italy	Milan	2 622.6	731.9	27.9%	3 896.4	2 870.6	1 485.7	3 922.1
Italy	Naples	1 250.0	363.2	29.1%	3 425.0	2 341.0	2 740.0	6 445.6
Italy	Rome	5 665.8	655.4	11.6%	3 763.3	2 705.1	664.2	4 127.5
Italy	Turin	1 767.1	306.5	17.3%	1 743.6	1 337.4	986.7	4 363.5
Japan	Fukuoka	1 344.8	385.1	28.6%	2 410.6	1 829.4	1 792.6	4 750.4
Japan	Nagoya	4 506.1	1 287.1	28.6%	6 262.2	4 540.1	1 389.7	3 527.4
Japan	Osaka	7 597.1	2 244.4	29.5%	17 190.6	13 800.6	2 262.8	6 148.9
Japan	Sapporo	2 564.5	407.8	15.9%	2 141.3	1 864.9	835.0	4 573.1
Japan	Sendai	2 034.8	397.2	19.5%	1 550.5	1 159.2	762.0	2 918.5
Japan	Tokyo	9 961.7	4 155.0	41.7%	33 522.4	27 012.5	3 365.1	6 501.2
Korea	Busan	789.9	295.7	37.4%	3 594.7	3 138.7	4 550.8	10 614.3

Table 3.3. **Land and population of the OECD large metropolitan areas** (*cont.*)

19 countries, 73 large metropolitan areas

Country	OECD large metropolitan area	Total land size (km^2)	Urban land size (km^2)	Share of urban land	LandScan[1] population in total land ('000s)	LandScan[1] population in urban land ('000s)	Population density in total land based on LandScan (pop/km^2)	Population density in urban land based on LandScan (pop/km^2)
Korea	Daegu	1 142.4	235.6	20.6%	2 650.2	2 384.7	2 319.9	10 121.9
Korea	Seoul-Incheon	5 196.7	1 403.8	27.0%	21 835.0	18 474.7	4 201.7	13 160.5
Mexico	Guadalajara	2 503.3	376.0	15.0%	4 195.0	3 700.2	1 675.8	9 841.0
Mexico	Mexico City	5 154.6	1 271.6	24.7%	20 215.4	17 741.6	3 921.8	13 952.2
Mexico	Monterrey	7 071.9	438.4	6.2%	3 810.1	3 326.1	538.8	7 587.0
Mexico	Puebla	872.2	138.6	15.9%	1 844.9	1 468.9	2 115.2	10 598.0
Mexico	Toluca	2 261.2	84.0	3.7%	1 787.2	781.9	790.4	9 308.2
Netherlands	Amsterdam	2 727.1	589.1	21.6%	2 194.1	1 788.0	804.5	3 035.1
Poland	Katowice	3 905.3	743.1	19.0%	2 686.0	2 042.9	687.8	2 749.1
Poland	Warsaw	8 519.4	733.5	8.6%	2 951.4	2 144.8	346.4	2 924.0
Portugal	Lisbon	3 852.9	559.9	14.5%	2 723.7	1 990.7	706.9	3 555.5
Spain	Barcelona	1 354.3	416.7	30.8%	3 032.1	2 508.0	2 238.8	6 018.8
Spain	Madrid	11 438.0	990.2	8.7%	5 545.9	4 400.1	484.9	4 443.7
Sweden	Stockholm	3 421.9	701.6	20.5%	1 619.4	1 332.7	473.3	1 899.6
United Kingdom	Birmingham	1 451.3	503.9	34.7%	1 892.5	1 679.8	1 304.0	3 333.6
United Kingdom	London	6 906.0	2 401.2	34.8%	10 859.1	9 401.9	1 572.4	3 915.5
United Kingdom	Manchester	1 430.4	487.2	34.1%	1 791.1	1 525.5	1 252.2	3 131.1
United States	Atlanta	9 468.8	3 787.2	40.0%	4 638.4	3 405.1	489.9	899.1
United States	Baltimore	2 085.2	1 109.9	53.2%	2 074.6	1 715.3	994.9	1 545.4
United States	Boston	2 657.6	1 599.8	60.2%	3 389.7	2 910.9	1 275.5	1 819.5
United States	Cincinnati	8 878.8	1 809.8	20.4%	2 018.0	1 475.5	227.3	815.3
United States	Cleveland	2 307.6	1 543.6	66.9%	1 795.1	1 633.2	777.9	1 058.0
United States	Columbus	11 236.7	1 782.6	15.9%	1 772.1	1 413.3	157.7	792.8
United States	Dallas	17 994.1	3 823.2	21.2%	4 909.0	4 171.3	272.8	1 091.1
United States	Denver	13 701.1	1 898.0	13.9%	2 546.5	2 232.1	185.9	1 176.0
United States	Detroit	3 169.8	2 558.2	80.7%	3 761.9	3 585.9	1 186.8	1 401.7
United States	Houston	16 708.2	4 529.1	27.1%	5 372.3	4 821.3	321.5	1 064.5
United States	Chicago	18 075.6	6 232.6	34.5%	9 450.6	8 688.1	522.8	1 394.0

Table 3.3. **Land and population of the OECD large metropolitan areas** (*cont.*)

19 countries, 73 large metropolitan areas

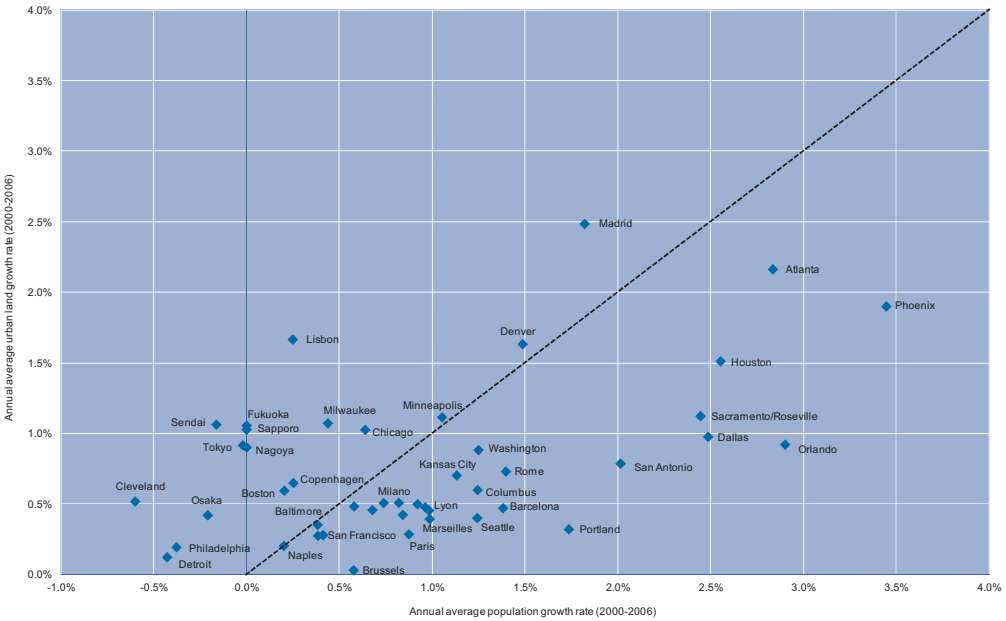
Country	OECD large metropolitan area	Total land size (km^2)	Urban land size (km^2)	Share of urban land	LandScan[1] population in total land ('000s)	LandScan[1] population in urban land ('000s)	Population density in total land based on LandScan (pop/km^2)	Population density in urban land based on LandScan (pop/km^2)
United States	Kansas City	16 583.4	2 728.3	16.5%	1 950.8	1 632.8	117.6	598.5
United States	Los Angeles	20 902.8	7 366.2	35.2%	16 770.6	15 807.1	802.3	2 145.9
United States	Miami	6 842.5	2 809.2	41.1%	5 418.7	4 890.4	791.9	1 740.9
United States	Milwaukee	5 140.3	1 402.3	27.3%	1 654.2	1 372.0	321.8	978.4
United States	Minneapolis	14 152.2	2 881.4	20.4%	3 229.3	2 558.2	228.2	887.8
United States	New York	9 805.1	5 683.8	58.0%	18 159.3	16 683.1	1 852.0	2 935.2
United States	Orlando	5 795.1	1 879.8	32.4%	2 052.4	1 577.2	354.2	839.0
United States	Philadelphia	2 071.5	1 495.3	72.2%	3 517.5	3 122.3	1 698.0	2 088.1
United States	Phoenix	37 069.1	2 959.6	8.0%	4 221.5	3 732.2	113.9	1 261.1
United States	Portland	12 911.3	1 803.1	14.0%	2 188.4	1 891.6	169.5	1 049.1
United States	Sacramento-Roseville	7 357.8	1 323.9	18.0%	2 036.4	1 829.6	276.8	1 382.0
United States	Saint Louis	14 084.4	2777.0	19.7%	2 670.1	2 206.9	189.6	794.7
United States	San Antonio	14 317.1	2 005.3	14.0%	1 966.1	1 646.9	137.3	821.3
United States	San Diego	4 909.6	1 831.3	37.3%	3 046.2	2 737.6	620.5	1 494.9
United States	San Francisco	14 759.6	3 690.5	25.0%	7 035.5	6 537.5	476.7	1 771.4
United States	Seattle	15 817.0	2 522.1	15.9%	2 948.6	2 487.4	186.4	986.2
United States	Washington	10 345.8	3 165.4	30.6%	5 381.0	4 251.0	520.1	1 343.0

Note: 1. LandScan population refers to the population data from *LandScan Global Population Database* 2009.

Source: Based on *LandScan Global Population Database* 2009 (for all countries), CORINE Land Cover 2006 (for Europe), *National Land Cover Database* 2006 (for the United States), Japanese National Land Information 2006 (for Japan), and MODIS Global Land Cover 2002 (for Canada, Korea and Mexico).

Figure 3.1. **Population and urban land growth, 2000-2006**

46 selected OECD large metropolitan areas



Source: Based on data from CORINE Land Cover (2000, 2006) and population census data.

Population density on urban land

Population density on urban land is used in this exercise on the assumption that relating population counts to the amount of urban land instead of total land surface in a metropolitan area should demonstrate density more rigorously. The methodology used was to overlay the population and land cover data at the grid cell level (using a size of 15 arc-seconds, or a rectangle of roughly 300 by 450 metres in mid-latitudes) to identify the population on urban land. An advanced GIS technique was used to synchronise the spatial resolution and co-ordinate systems of all of the input data sets. The data used are listed in Table 3.4. Four land cover data sources were used.[4] The population data (*LandScan Global Population Database* 2009) provide 24-hour average population (ambient population), which is better suited to seeing the intensity of land use than night-time population or employment.[5]

Table 3.4. **Data sources used for calculating population density on urban land**

Type	Name	Countries	Spatial resolution
Population	*LandScan Global Population Database* 2009 by Oak Ridge National Laboratory	All countries	30 arc-seconds (ca. 1 km)
Urban land cover	CORINE Land Cover 2006	Europe	100 metres
	NLCD (*National Land Cover Database*) 2006	United States	ca. 30 metres
	Japanese National Land Information 2006	Japan	ca. 100 metres
	MODIS Global Land Cover 2002	Canada, Korea and Mexico	ca. 500 metres

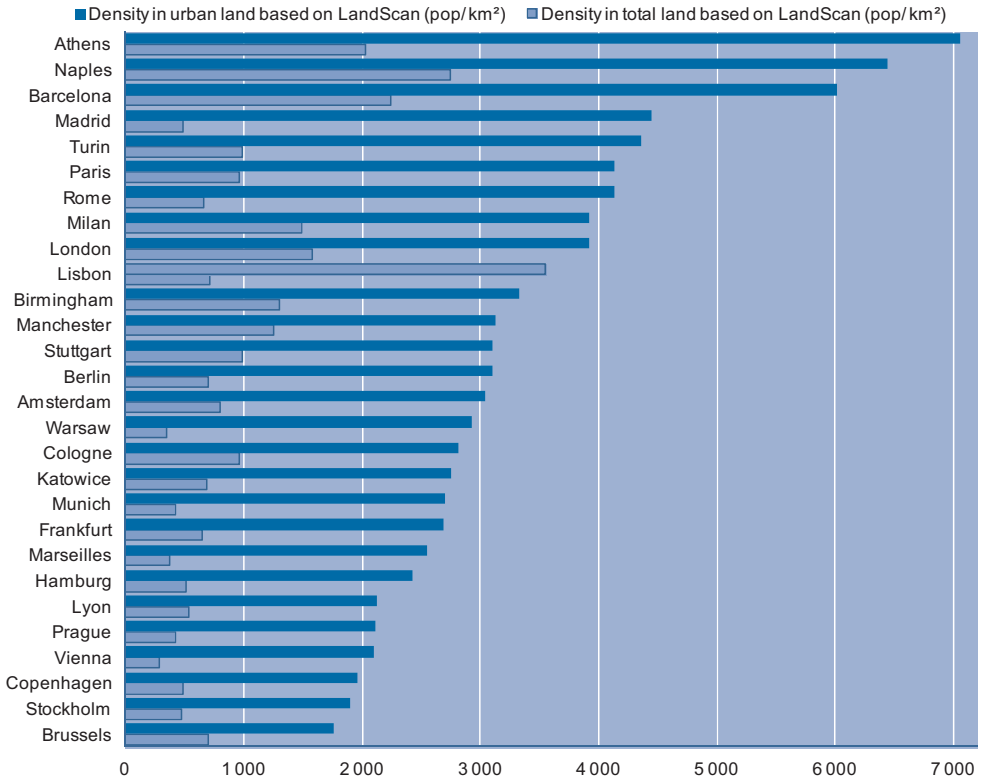
Figure 3.2 compares the results of the calculation in four separate figures by source of land cover data (Europe; Japan; the United States; and Canada, Korea and Mexico). It is important to be cautious about comparisons of metropolitan areas based on different land cover data sources. This is because the four land cover rasters used were created using different methods, different source data, different scales, different classification schemes and class definitions, so that the calculated urban land may not be fully comparable.[6] Comparing the two population densities (on total land and on urban land) gives several interesting results. In Europe, for example, population densities on total land in Madrid and Stockholm are quite similar (484.9 and 473.3 pop/km^2, respectively), but population densities on urban land differ greatly (4 443.7 and 1 899.6 pop/km^2, respectively). Urban land is utilised more densely in Madrid than in Stockholm. While Milan looks more than twice as dense as Rome on the traditional calculation (1 485.7 and 664.2 pop/km^2, respectively), the new methodology indicates that they are equally dense and even that Rome is slightly denser (3 922.1 and 4 127.5 pop/km^2, respectively). Likewise, in Japan, urban land is utilised more densely in Sapporo than in Nagoya, although population density on total land indicates otherwise. In the United States, a comparison of Atlanta and San Francisco also illustrates the difference (densities on total land are 489.9 and 476.7 pop/km^2, respectively, and densities on urban land are 899.1 and 1 771.4 pop/km^2, respectively). Although Los Angeles is the sixth densest of the 28 OECD large metropolitan areas in the United States, it is the second densest after New York in terms of the population density on urban land. The population densities on urban land in Mexico City and Seoul-Inchon (13 952.2 and 13 160.5 pop/km^2, respectively) are among the highest of the 73 OECD metropolitan areas. However, the data must be compared to other OECD metropolitan areas in Europe, Japan and United States with care, owing to the differences in the source of the land cover data.

Figure 3.3 presents different ways to visualise how density is distributed spatially for three large OECD metropolitan areas (Vancouver, Paris and Portland):

- Urban land density map: in this map, population density on urban land is illustrated by a grid (roughly 1 kilometre by 1 kilometre) at three density levels: high density (more than 5 000 pop/km^2), medium density (from 2 500 to 4 999 pop/km^2) and low density (less than 2 500 pop/km^2).
- 3-D density map: population density is illustrated by a grid (roughly 1 kilometre by 1 kilometre) for the whole surface of a metropolitan area (note that the map does not exclude density information on non-urban land). This map can be useful for visualising the overall density structure of a metropolitan area.
- Density gradient graph: in this bar graph, urban land is grouped in a radius of 5 kilometres, 10 kilometres, etc., from the density peak and classified into three levels. Non-urban land is not included. Note that this figure presumes a single urban centre – careful observation is needed for metropolitan areas with a polycentric urban structure.

Figure 3.2. **Population density on urban land and on total land**

A. 28 OECD large metropolitan areas in Europe



B. 6 OECD large metropolitan areas in Japan

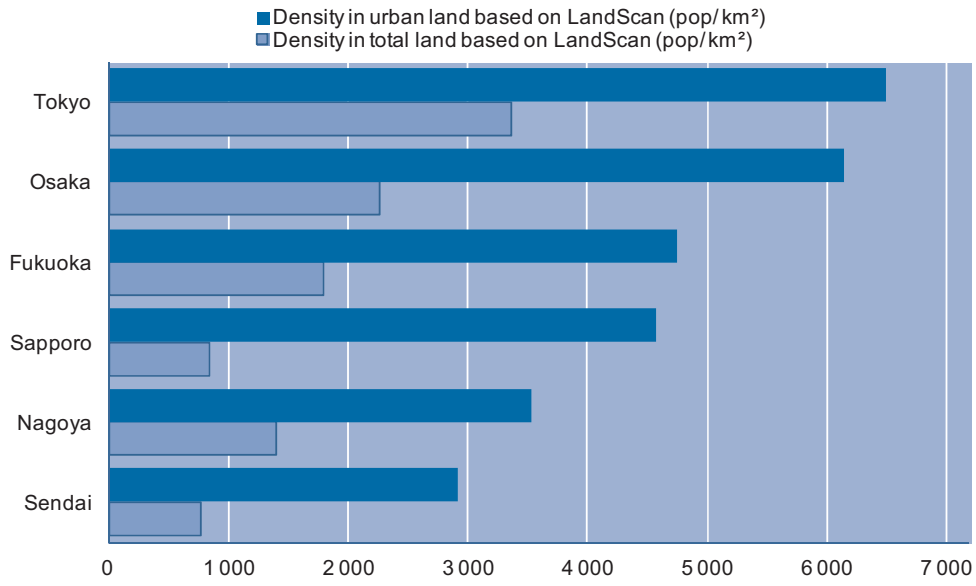
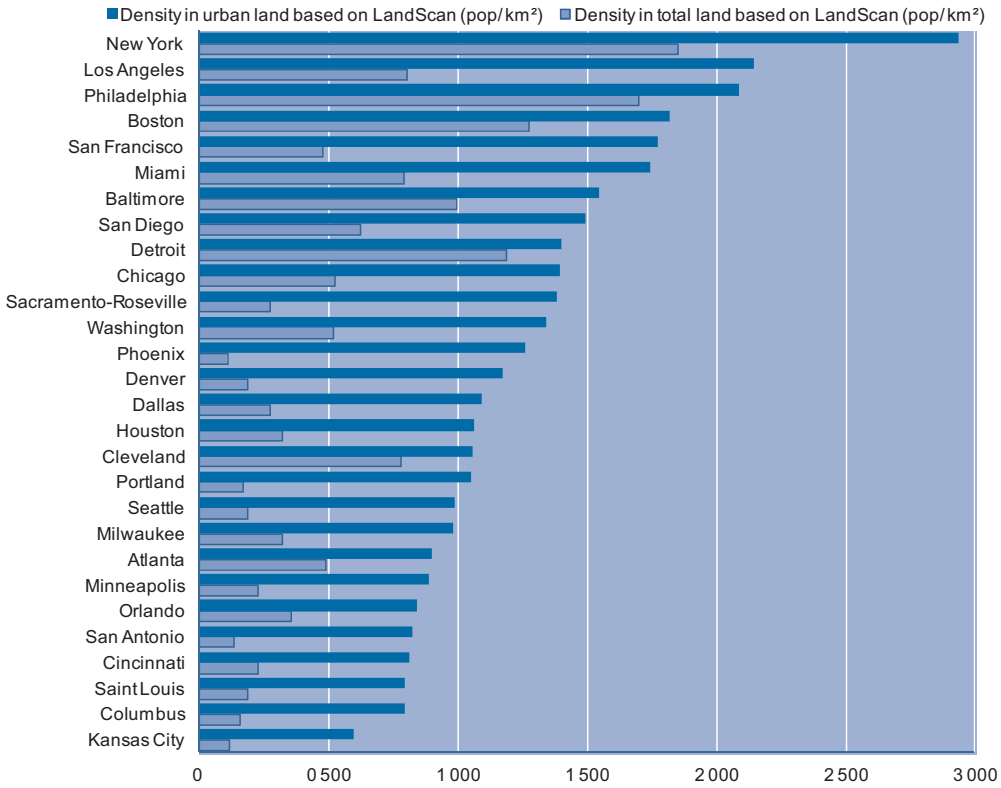
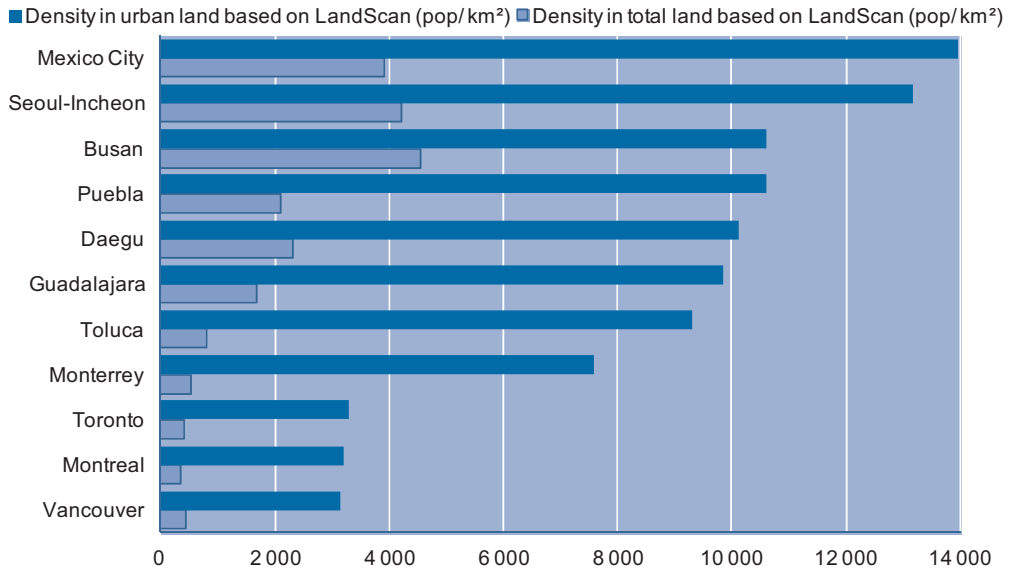


Figure 3.2. **Population density on urban land and on total land** (*cont.*)

C. 28 OECD large metropolitan areas in the United States



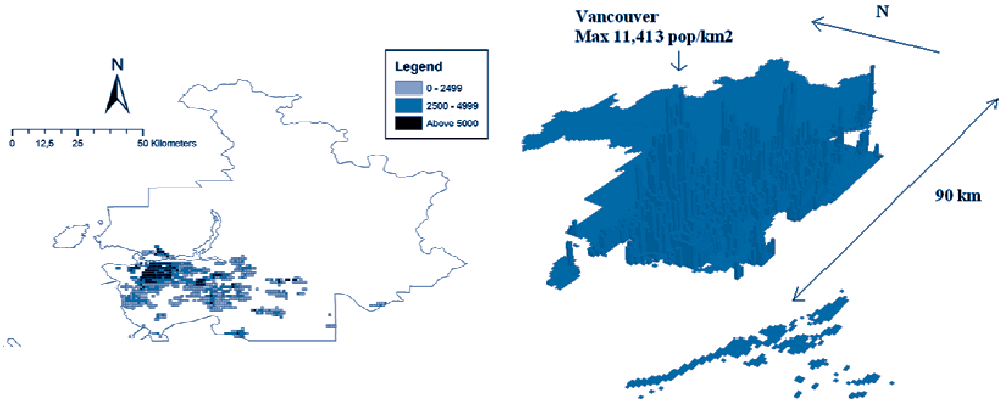
D. 11 OECD large metropolitan areas in Canada, Korea and Mexico

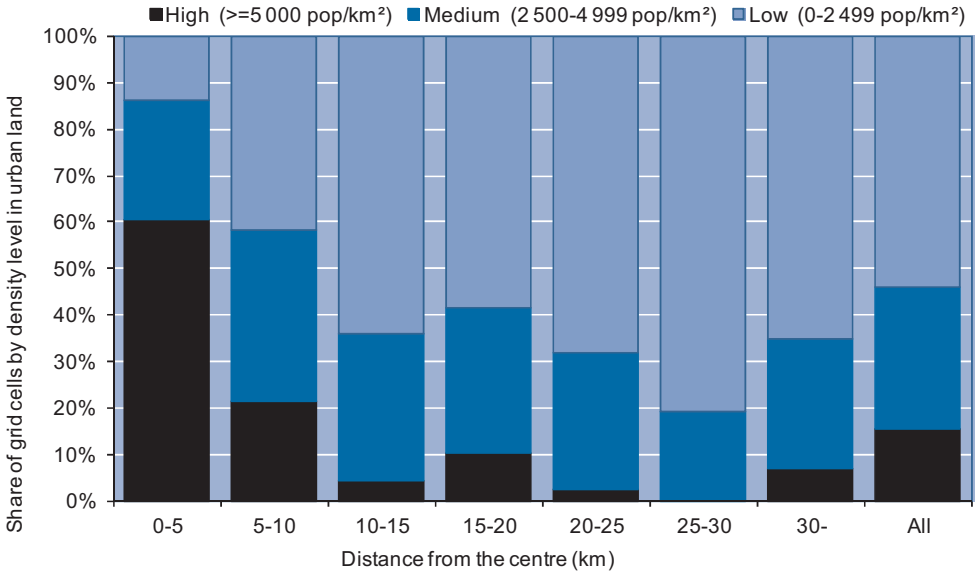


Source: Based on *LandScan Global Population Database* 2009 (for all countries), CORINE Land Cover 2006 (for Europe), *National Land Cover Database* 2006 (for the United States), Japanese National Land Information 2006 (for Japan), and MODIS Global Land Cover 2002 (for Canada, Korea and Mexico).

Figure 3.3. **Urban land density maps and density gradient graph**

A. Vancouver metropolitan area



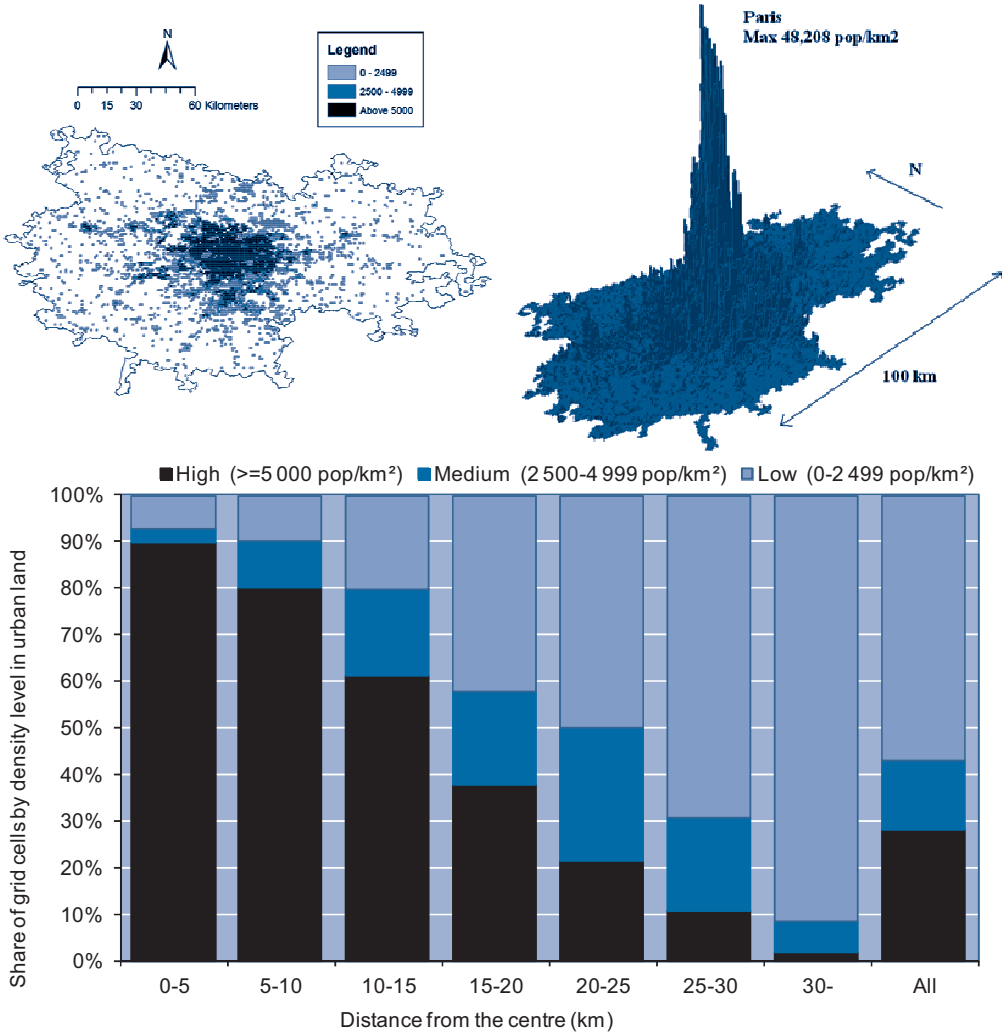


Note: The centre is considered to be the densest grid cell in the metropolitan area.

Each image of the population density on urban land tells certain stories. The 3-D density map of Vancouver clearly shows that Vancouver has a polycentric structure, with several peaks of moderate density in the metropolitan area (the cities of Vancouver, Burnaby, Coquitlam and Surrey). In contrast, the 3-D density map of Paris underscores its high density peak (48 208 pop/km^2) and monocentric characteristics. In Portland, the centre shows a very high peak (35 524 pop/km^2) but density falls sharply after a few kilometres. In Paris, high density areas dominate the five-kilometre ring and even the ten-kilometre ring. Vancouver is unique in that it has higher percentages of medium density not only on urban land near the centre but also on urban land at some distance. This is because apartments account for the largest share of dwelling types in the metropolitan area.[7] This type of gridded information could be combined with other socio-economic characteristics for further analysis.

Figure 3.3. **Urban land density maps and density gradient graph** (*cont.*)

B. Paris metropolitan area

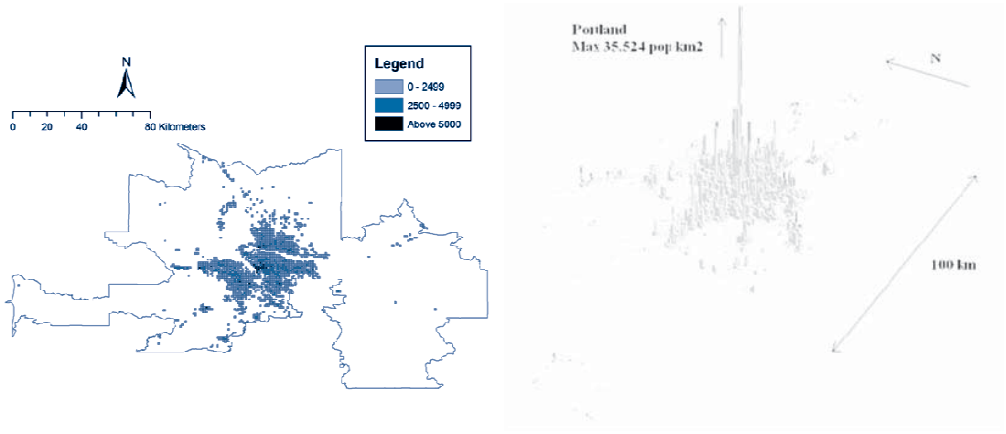


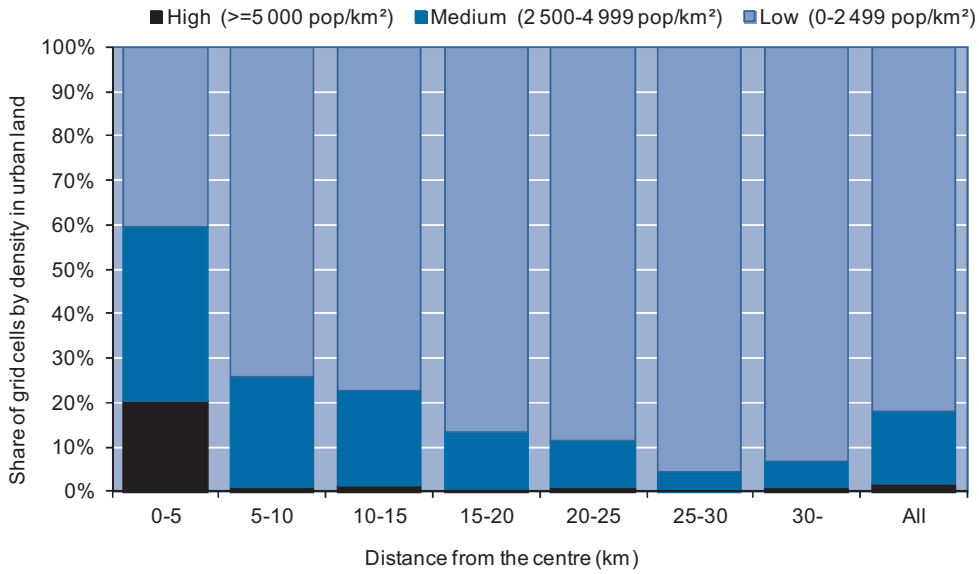
Note: The centre is considered to be the densest grid cell in the metropolitan area.

In sum, population density on urban land can offer a new way to look at density in a compact city analysis. Compared with the traditional indicator (population density on total land), this indicator is less affected by the metropolitan borders because the identification of urban land is based on land cover data. It can also provide a more accurate indication of the intensity of use of urban land by excluding non-urban land from the calculation. Therefore, this indicator can provide better results, for example, for analysing the relationship between a metropolitan area's population density and its environmental and economic performance as discussed in Chapter 2.

Figure 3.3. **Urban land density maps and density gradient graph** (*cont.*)

C. Portland metropolitan area





Note: The centre is considered to be the densest grid cell in the metropolitan area.

Source: Based on *LandScan Global Population Database* 2009 (for all the three metropolitan areas), MODIS Global Land Cover 2002 (for Canada), CORINE Land Cover 2006 (for Paris), and *National Land Cover Database* 2006 (for Portland).

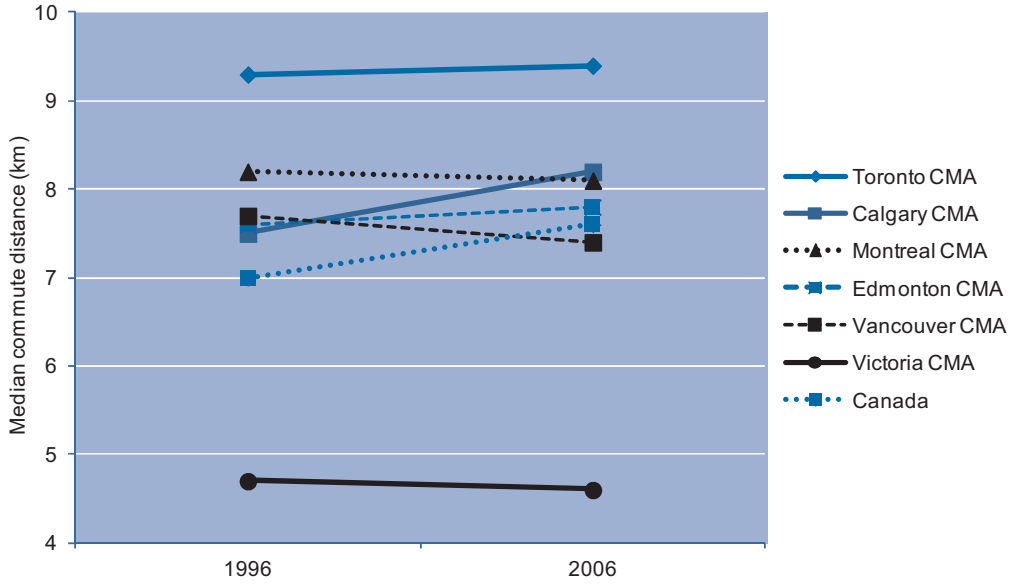
Trip distance

Trip distance can serve as an indicator of proximity. In this exercise, the average (or median) journey-to-work distance was collected for the five case study metropolitan areas (Melbourne, Vancouver, Paris, Toyama and Portland). The unit of analysis varies because the necessary data were not always available at the level of OECD metropolitan areas. Although their population sizes differ, the results offer interesting insights. Of the five metropolitan areas, Toyama indicated the shortest distance (7.2 kilometres in 1999

for the Toyama-Takaoka metropolitan area, newer data not available), followed by Vancouver (7.4 kilometres in 2006 for the Census Metropolitan Area [CMA]), Paris (11.2 kilometres in 2008 for Île-de-France), Melbourne (13.2 kilometres in 2006 for the CMA), and Portland (13.84 kilometres in 2010 for Portland Metro). Vancouver and Portland have similar population sizes (around 2 million at the metropolitan level) but the trip distance in Vancouver is much shorter. Paris has the largest population (around 11 million) but a shorter trip distance than Melbourne (about 4 million) and Vancouver.

Trends over time give further insights. Figure 3.4 shows the median commuting distances in selected Canadian metropolitan areas. Between 1996 and 2006, the median commuting distance in the Vancouver CMA decreased from 7.7 kilometres to 7.4 kilometres, while the national average increased from 7.0 kilometres to 7.6 kilometres. Moreover, the detailed data show that commuting distances of less than 5 kilometres made up 35.4% of all commuting travel in Vancouver in 2006, up from 33.8% in 1996. It is important to note that both Vancouver's population and the number of commuting trips grew over the same period. This shows that in Metro Vancouver it was possible to reduce journey-to-work distances for the working population even as population and employment grew. In comparison, Melbourne's average journey-to-work distance remained the same or increased slightly (13.0 kilometres in 1996 and in 2001, 13.2 kilometres in 2006). The increase is greater in Paris (7.0 kilometres in 1982, 9.4 kilometres in 1994, 11.2 kilometres in 2008), and rose at a faster rate than growth of population and urban land.[8]

Figure 3.4. **Median commute distance for selected metropolitan areas in Canada, 1996-2006**



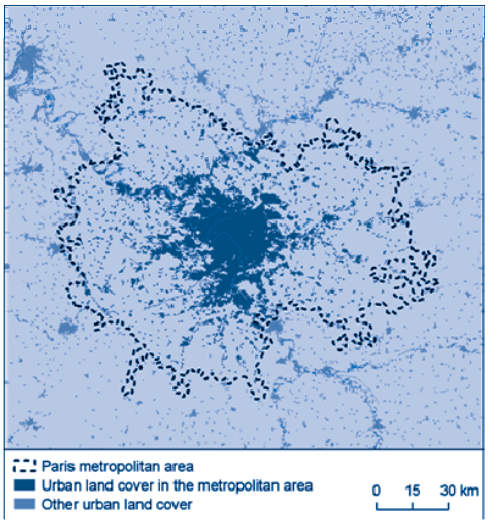
Note: CMA = Census Metropolitan Area.

Source: Census Statistics Canada.

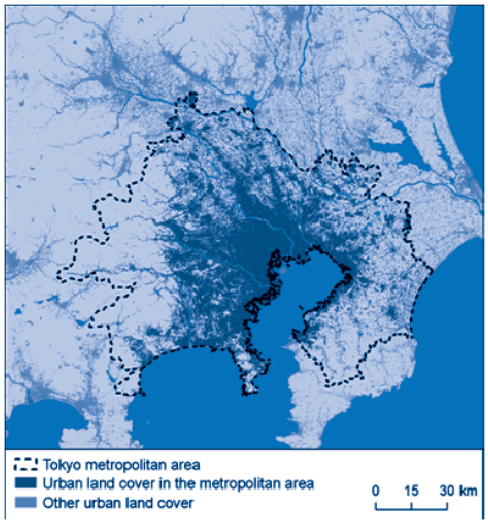
Figure 3.5. **Urban land cover in selected OECD large metropolitan areas**

A. Metropolitan areas with a population of over 10 million

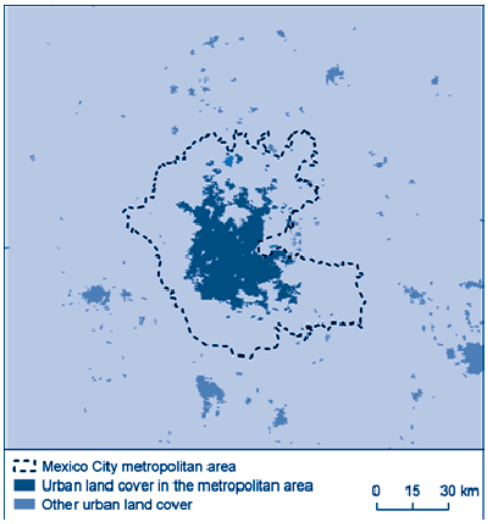
Paris
(12.0 million, 12 191 km^2 total, 2 609 km^2 urban)



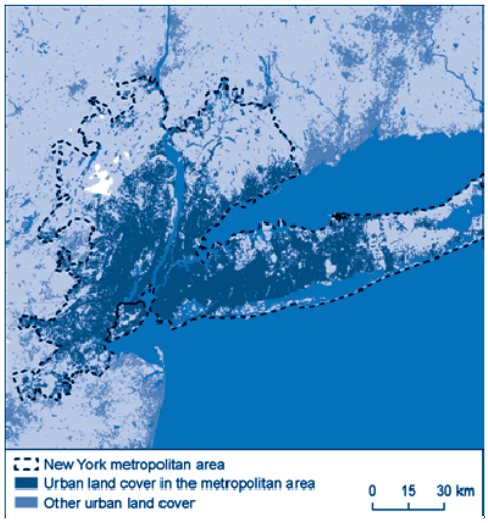
Tokyo
(33.5 million, 10 384 km^2 total, 4 155 km^2 urban)



Mexico City
(20.2 million, 5 167 km^2 total, 1 272 km^2 urban)



New York
(18.2 million, 6 838 km^2 total, 5 683 km^2 urban)



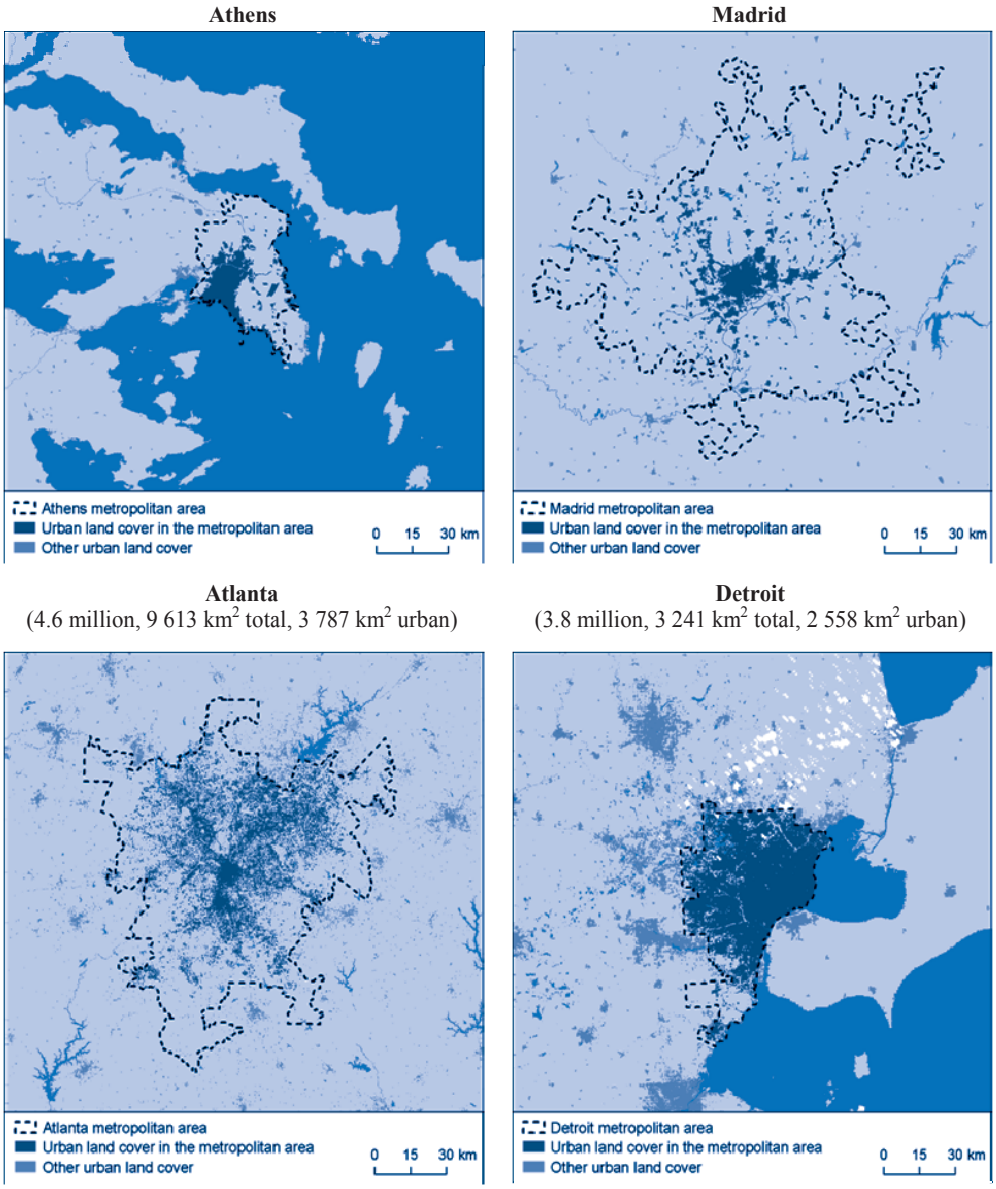
Note: These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps. The dark grey refers to urban land (land cover considered urban use) within the metropolitan area displayed; the medium grey refers to urban land outside of the metropolitan area; the light grey represents other types of land cover (e.g. arable land, forest, grassland); blue represents rivers, lakes and seas; occasional white spots represent areas for which land cover data are not available.

Urban land cover

Figure 3.5 illustrates the spatial distribution of urban land in 12 OECD metropolitan areas at the same geographic scale. They take a wide variety of urban forms. They are categorised into three groups by total population (over 10 million, from 3 to 6 million, and from 2 to 3 million) to make the comparison more meaningful. In the first group

Figure 3.5. **Urban land cover in selected OECD large metropolitan areas** (*cont.*)

B. Metropolitan areas with a population of between 3 and 6 million



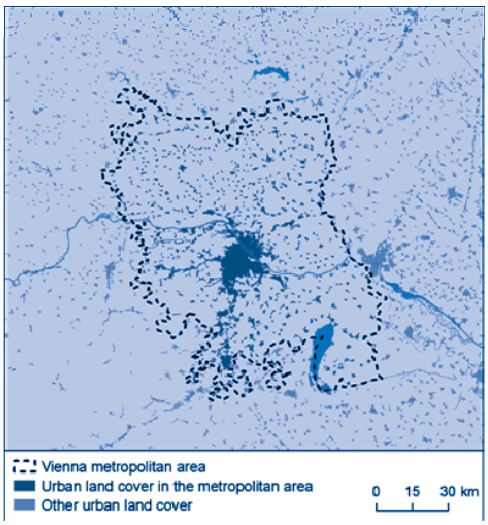
Note: These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps. The dark grey refers to urban land (land cover considered urban use) within the metropolitan area displayed; the medium grey refers to urban land outside of the metropolitan area; the light grey represents other types of land cover (e.g. arable land, forest, grassland); blue represents rivers, lakes and seas; occasional white spots represent areas for which land cover data are not available.

(Paris, Tokyo, Mexico City and New York), Mexico City's urban land is less dispersed than that of the other metropolitan areas. The second group (Athens, Detroit, Atlanta and Madrid) shows more diversity of urban land. Athens has a relatively large population in a very small geographical space, and illustrates well the two morphological characteristics of a compact city (dense and proximate). In contrast, Detroit consumes nearly six times as

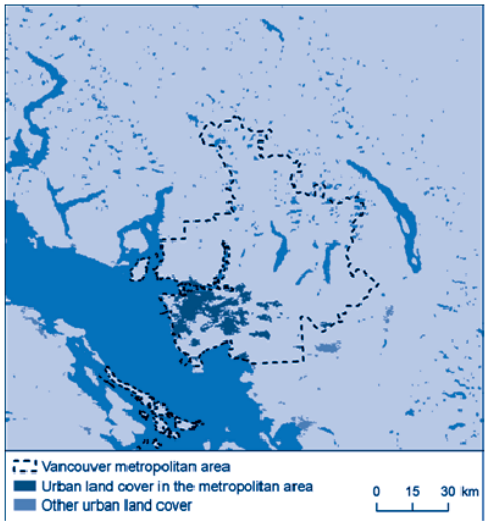
Figure 3.5. **Urban land cover in selected OECD large metropolitan areas** (*cont.*)

C. Metropolitan areas with a population of between 2 and 3 million

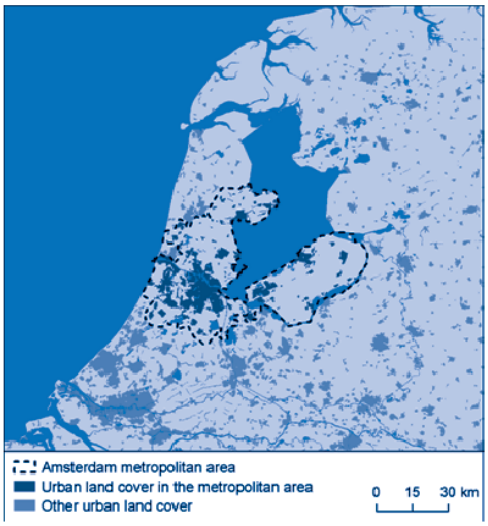
Vienna
(2.7 million, 8 545 km^2 total, 1 110 km^2 urban)



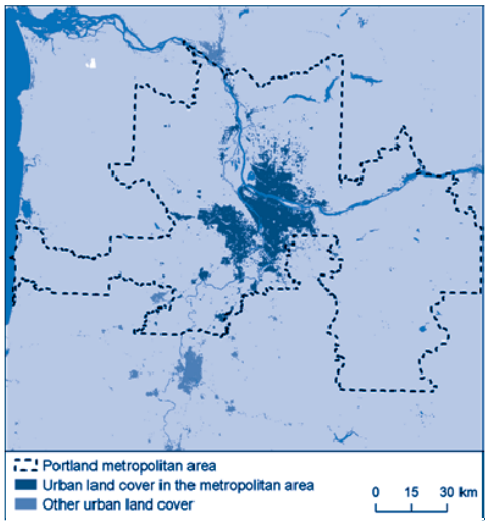
Vancouver
(2.2 million, 5 583 km^2 total, 440 km^2 urban)



Amsterdam
(2.4 million, 2 198 km^2 total, 577 km^2 urban)



Portland
(2.2 million, 13 150 km^2 total, 1 803 km^2 urban)



Note: These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps. The dark grey refers to urban land (land cover considered urban use) within the metropolitan area displayed; the medium grey refers to urban land outside of the metropolitan area; the light grey represents other types of land cover (e.g. arable land, forest, grassland); blue represents rivers, lakes and seas; occasional white spots represent areas for which land cover data are not available.

Source: Based on CORINE land cover data (2008), *US National Land Cover Database* (2006), Japanese National Land Information data (2006), and MODIS Global Land Cover (2002).

much urban land as Athens in order to accommodate a similar population. Atlanta and Madrid both show dispersed urban development patterns but Madrid consumes less than a third of the urban land that Atlanta does, so that urban development is much denser in

Madrid than in Atlanta. In the third group (Vienna, Vancouver, Amsterdam and Portland), Vancouver and Amsterdam illustrate proximate development patterns with distinct urban and rural land use. While Vienna's urban land is the most dispersed, Portland consumes the largest amount of urban land of the four metropolitan areas.

While the land cover maps illustrate well the spatial characteristics of urban agglomerations, quantifying them is not an easy task. This report temporarily proposes using the share of urban land in total land in a metropolitan area to indicate the proximity characteristics of a compact city, although this requires very careful interpretation, with the help of the land cover maps. Figure 3.6 shows the results of the calculation for the 73 OECD large metropolitan areas. When a metropolitan area shows a high share of urban land (for example, Detroit's share of urban land is 80.7%), the urban land tends to be proximate (contiguous or close knit, with less "leapfrog" development), as indicated in the map of Detroit in Figure 3.5. While this is certainly a characteristic of a compact city, such a metropolitan area does not necessarily have other compact city characteristics. Urban density in Detroit (1 401.7 pop/km^2) is much lower than in Madrid (4 443.7 pop/km^2), for instance. The indicator needs to be even more carefully interpreted when a metropolitan area has a low share of urban land. For example, although both Vienna and Vancouver show low shares of urban land (10.5% and 8.3%, respectively), this does not mean that these metropolitan areas have dispersed urban land; the land cover maps clearly indicate that Vancouver's urban land is more proximate than Vienna's. Another drawback of this indicator is that it may be influenced by the shape of the administrative units used to define metropolitan areas. For example, as Figure 3.5 shows, the Portland metropolitan area includes a lot of non-urban area outside of the urban area, mainly owing to the shape of census tract units. To summarise, while the share of urban land in a metropolitan area can indicate proximity to some extent, more precise indicators should be sought, or at least this indicator must be analysed using the land cover maps of the metropolitan area.

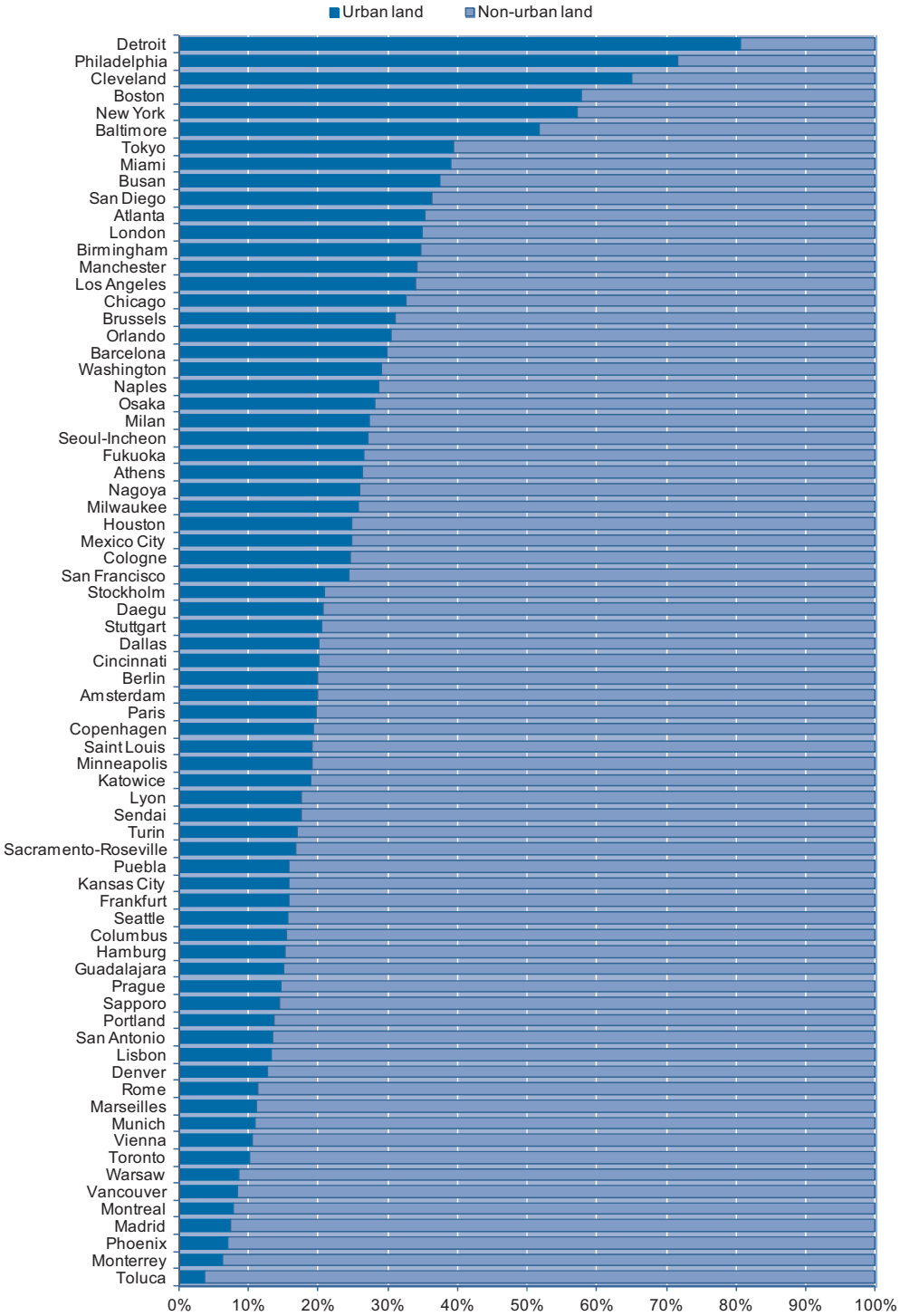
Trips using public transport

In this exercise, the share of trips using public transport for commuting in total trips was collected for 19 metropolitan areas, including the five case study areas. Relevant data are often not available at the OECD metropolitan area level. Commuting trips are used owing to better data availability, although trips for all purposes could also be used. Figure 3.7 illustrates the results. The Paris metropolitan area has the highest share, followed by Madrid and Stockholm. The figures should be interpreted with care, as larger metropolitan areas have scale advantages for installing large public transport systems.

In addition to analysis at the metropolitan level, differences within a metropolitan area can also provide important information. Figure 3.8 illustrates the modal share in three geographical locations in the Paris metropolitan area: Paris, inner belt and outer belt. While in Paris the majority of trips between home and work are by public transport (64.0%) or on foot (14.3%) –against 13.3% by car – car use becomes more frequent as one moves away from Paris. Cars account for 38.0% of travel by residents in the inner belt and for 59.8% by those in the outer belt.

Figure 3.6. **Share of urban land**

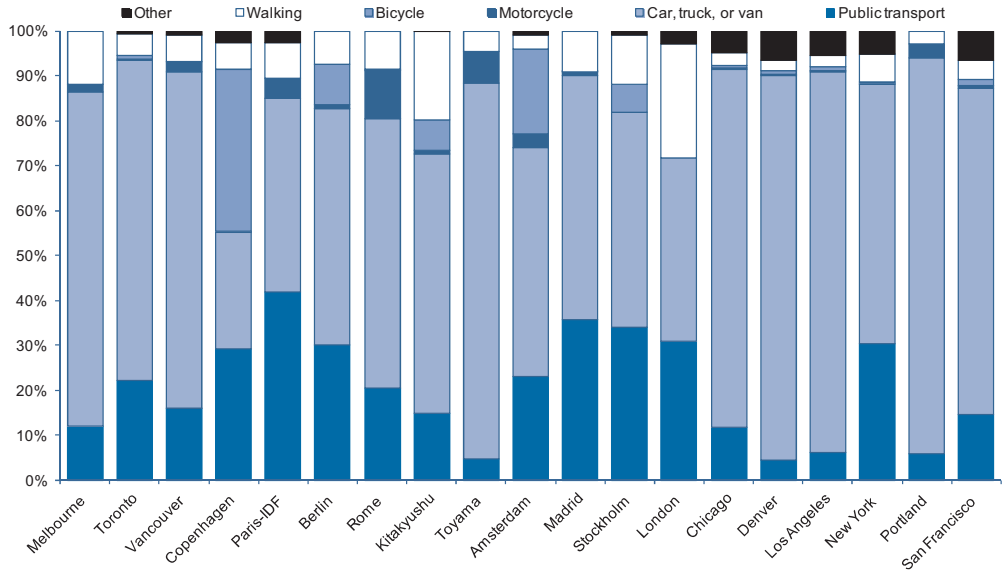
73 OECD large metropolitan areas



Source: Based on OECD (2012), *Redefining Urban: A New Way to Measure Metropolitan Areas*, OECD Publishing, Paris.

Figure 3.7. **Modal share of commuting trips**

Sample of 19 metropolitan areas in OECD countries

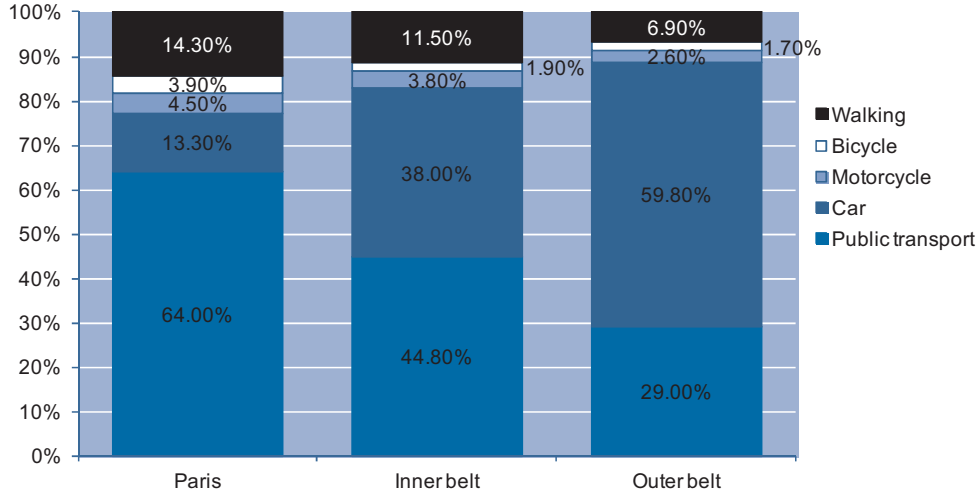


Note: Analytical units are as follows: Melbourne Statistical Division for Melbourne; Census Metropolitan Area for Toronto and Vancouver; Eurostat metropolitan definition (larger urban zone) for Copenhagen, Berlin, Rome, Amsterdam, Madrid and Stockholm; Region Ile-de-France for Paris-IDF; City of Kitakyushu for Kitakyushu; Toyama-Takaoka Wider Urban Zone for Toyama; OECD Metropolitan Region for Chicago, Denver, Los Angeles, New York and San Francisco; Metropolitan Statistical Area for Portland; and London Boroughs for London. For London, the "other" category includes two-wheeled vehicles and bicycles.

Source: Victoria State Government, 2007, for Melbourne; Statistics Canada, 2006, for Toronto and Vancouver; Eurostat, 2003-2006, for Copenhagen, Berlin, Rome, Amsterdam, Madrid and Stockholm; Insee, Enquête Nationale Transport, 2008, for Paris-IDF; Person Trip Survey, 2005, for Kitakyushu; the Third Toyama-Takaoka Person Trip Survey, 2001, for Toyama; American Community Survey, 2005-2009, for Chicago, Denver, Los Angeles, New York and San Francisco; American Community Survey, 2009, for Portland; and Department for Transport, 2008-2009, for London.

Figure 3.8. **Modal share in the Paris metropolitan area, 2008**

Mode of home-to-work travel by form of transport and place of residence of workers



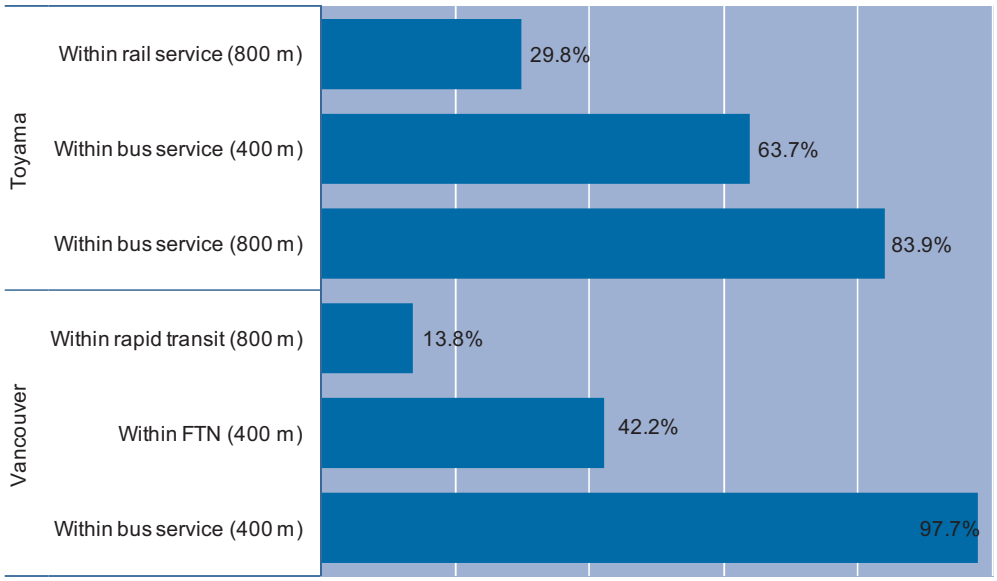
Source: Insee – SOeS, ENTD 2008.

Proximity to public transport

Proximity to public transport is a primary indicator for measuring the effective link between urban development and the public transport network in a metropolitan area. Figure 3.9 illustrates the share of population living within 400 and 800 metres of public transport stations in Toyama and Vancouver. In the Vancouver metropolitan area, 97.7% of the population lives within 400 metres of bus stations and more than 40% lives within 400 metres of the Frequent Transit Network (defined as bus service every 15 minutes or less, 7 days a week). In Toyama, while the share of population living within 400 metres of bus stations (63.7%) is smaller than in Vancouver, the share of population living within 800 metres of rail services (29.8%) is larger than in Vancouver (13.8%).

Figure 3.9. **Population living close to transport stations/network**

Toyama and Vancouver metropolitan areas



Source: Translink (for Vancouver); Japan Census and MLIT (for Toyama).

Matching local services and homes

This indicator compares the volume of local services available in a neighbourhood and its population. A mismatch can occur both in suburbs (for example, in strictly zoned residential areas with few local services) and in urban centres (for example, central business districts with low population). A high level of mismatch implies the need for longer travel, lower quality of life, and low productivity in the service sector.[9]

In this exercise, the match between local services and homes was calculated for three case study metropolitan areas: Melbourne (major statistical region), Vancouver (Metro Vancouver) and Paris (Île-de-France), by using the Matching Index (MI). The MI varies from 0 to 1 and smaller figures mean a better match. Box 3.4 describes the methodology. The results indicate that Paris (MI of 0.12) has a better match than Vancouver (0.13) and Melbourne (0.16). Figure 3.10 further illustrates the match by sub-district for Melbourne and Vancouver. In Melbourne, inner Melbourne has a

disproportionally large share of local services (22.2% of local service sector employees are concentrated in this district, which has only 7.8% of the population), while Western Melbourne has 9.4% of local service sector employees and 11.6% of the population. In Vancouver, likewise, the City of Vancouver, Richmond, the GVRD Electoral Area and Burnaby have a larger share of the local service sector employees relative to their share of the population, while Surrey and North Vancouver have a smaller share. The implication is that this indicator could help policy makers to identify neighbourhoods with extreme mismatches and to design policies to reduce them. For example, a policy to attract more housing development could be appropriate for urban centres with a smaller share of population. In contrast, promoting mixed land use could be appropriate for residential neighbourhoods with few local services.

Box 3.4. **Methodology used to calculate the match between local services and homes**

The Matching Index (MI) was developed to indicate the match between local service sector employees and population in a metropolitan area. The concept is based on Ewing et al. (2002), which measured the balance between population-serving jobs and residents. The MI is calculated as follows:

$$MI = \tfrac{1}{2} \Sigma \{ |(Ei / E) - (Pi / P)| \}$$

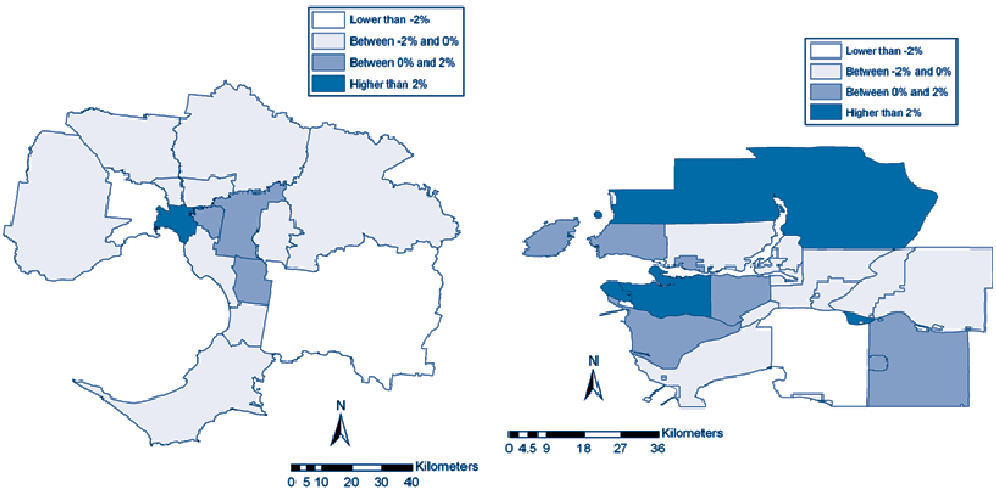
Ei is the number of employees in the local service sectors in sub-district *i* (*i* represents and indexes sub-districts in a given metropolitan area); *Pi* is the population in sub-district *i*; *E* represents the total number of employees in the local service sectors in the metropolitan area; and *P* represents the total population in the metropolitan area. First, the match in each sub-district is calculated (that is, $E_i / E - P_i / P$ in the formula above). Then, MI is calculated by aggregating the absolute value of each sub-district. If MI is equal to 0, it means a complete match, and if it is equal to 1, it means a complete mismatch.

The International Standard Industrial Classification (ISIC) was used to define the local service sectors used in the analysis. The following sectors were selected: 46 (wholesale trade, except motor vehicles and motorcycles), 47 (retail trade, except motor vehicles and motorcycles), 56 (food and beverage service activities), 85 (education), 96 (other personal service activities). Then the relevant industrial classification codes of each country were selected to specify the number of employees in the defined local service sectors. It must be noted that the local service sectors included may differ, since industrial classifications vary across countries and do not correspond exactly to the ISIC categories. The employee data also must be interpreted with care because not all employees in the local service sectors serve local residents (for example, the employees of headquarters of a wholesale company are not excluded).

Source: Ewing, R., R. Pendall and D. Chen (2002), "Measuring sprawl and its impact", Volume I, Smart Growth America, *www.smartgrowthamerica.org/sprawlindex/MeasuringSprawl.PDF*.

Figure 3.10. **Matching local services and homes in the Melbourne and Vancouver metropolitan areas**

(E_i / E – P_i / P) by municipality/district



Source: Based on Australian Bureau of Statistics (2006), Census, Australian Bureau of Statistics, Belconnen, Australia; and Statistics Canada (2006), Census, Statistics Canada, Ottawa, Ontario.

Challenges identified and future work

The indicators discussed in this section are preliminary and require further examination and improvement. Furthermore, it is necessary to extend this work to the indicators that have not been discussed here. In addition, the exercises highlight the absence of essential internationally comparable data such as data on location of urban development, data on housing and building stocks (forms of housing, rents, vacancy rates, etc.) and data on public transport (geographic information on stations, service frequency, etc.). Efforts are needed to develop relevant databases, in particular at the metropolitan level.

The exercises also underscore the need for skills to better interpret each indicator. For example, international comparisons of metropolitan areas may not be useful, and may sometimes be even misleading, unless the indicators are carefully interpreted according to the local context. Comparisons of metropolitan areas with similar characteristics and comparison of the same metropolitan area over time should be used together in order to monitor and evaluate the performance of compact city policies from more diverse angles.

3.4. Conclusion

This chapter argues that internationally comparable indicators can help monitor compact city policy performance and allow metropolitan areas to benchmark their results and improve their policy actions. More precisely, it illustrates various ways of measuring and monitoring compactness. For example, the volume and spatial distribution of urban land in a metropolitan area indicate the proximity of urban development. Trips using public transport and proximity to public transport can indicate how urban areas are linked by public transport systems. Matching local services and homes indicates the accessibility of local services in a neighbourhood. In particular, an innovative indicator in comparison

with traditional population density measures is population density on urban land, which can provide more accurate information on how intensively urban land is used. Although closer examination is needed, population density on urban land has the potential to be used for quantitative analysis. For example, analysis of the relationship between density and environmental performance (CO_2 emissions per capita in transport, electricity consumption per capita, etc., see Figures 2.2 and 2.3) could use population density on urban land instead of traditional population density for better results.

The exercise also identified many challenges. First, it found that a good understanding of both the concept and the definition of the term "compact city" – and what the words "compact" or "compactness" mean – is a prerequisite for developing effective indicators. Second, since comparative data at the metropolitan level are limited, efforts are needed to collect and develop the relevant data. Third, while a compact city can best be measured and monitored with the use of multiple indicators, interpretation then becomes more complicated. Finally, having noted the usefulness of quantitative analysis, qualitative aspects of compact city characteristics should not be omitted when formulating policy.

Notes

1. In contrast, some indicators presume a specific point and measure the distance from it. For example, Bertaud and Malpezzi (1998) use the average distance per person to the central business district (CBD). Similarly, Fouchier (2004) conceives urban sprawl as the average distance of inhabitants and jobs from the Paris centre. While these indicators can be useful in metropolitan areas with a monocentric urban structure, proximity needs to be measured differently in polycentric metropolitan areas.
2. They are part of the "5Ds" of the built environment: density, diversity, design, distance to transit, and destination accessibility (Cervero and Murakami, 2008).
3. The process of defining OECD metropolitan areas is still under way. The information in this report (countries, number of identified metropolitan areas, etc.) is as of the end of 2011 and subject to change in the near future.
4. Fry et al. (2011) provides details on the *National Land Cover Database*. Schneider et al. (2009) and Schneider et al. (2010) provide details on the MODIS Global Land Cover.
5. The *LandScan Global Population Database* 2009 provides ambient population (average presence of people in the area over a certain time span) instead of residential population. Therefore the metropolitan population counts obtained from LandScan and from census data may differ. This does not mean, however, that the figures are inaccurate. Nevertheless, it should be kept in mind that the LandScan is approximate and its accuracy can vary for different parts of the world.
6. For example, the *MODIS land cover database* specifies non-urban land as following: water, evergreen needleleaf forest, evergreen broadleaf forest, deciduous needleleaf forest, deciduous broadleaf forest, mixed forest, closed shrublands, open shrublands, woody savannas, savannas, grasslands, permanent wetlands, croplands, cropland/natural vegetation mosaic, snow and ice, barren or sparsely vegetated.
7. Apartments represent 40% of all occupied private dwellings, or 321 970 dwelling units, while single detached houses represent 35%, or 288 320 dwelling units. The municipalities with the highest percentage of apartment dwelling units are New Westminster (66%), North Vancouver (61%) and the City of Vancouver (59%) (Metro Vancouver, 2011).
8. Fouchier (1995) reported that between 1982 and 1990, average commuting distances increased by 17.6%, much faster than urban spatial expansion (+7.6%) or the net increase in population and employment (+6.6%).
9. As Morikawa (2008) points out, the value added of a service industry is low if there are abundant services but few people consuming them.

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Chapter 4

Current compact city practices in OECD countries

This chapter looks at current compact city policy practices in OECD countries. First, it describes major policy instruments in OECD countries based on the results of the OECD survey and a literature review. Next, it takes a closer look at policy practices in the five case study metropolitan areas: Melbourne (Australia), Vancouver (Canada), Paris (France), Toyama (Japan) and Portland (United States). Finally, it presents a comparative assessment from three perspectives: first, how policy goals and strategies respond to different local circumstances; then, whether appropriate policy instruments are utilised to address multiple policy objectives, including environmental and economic sustainability; and finally, how current policy practices incorporate complementary strategies to minimise the potential adverse effects of compact cities.

4.1. Introduction

While the compact city concept is widely discussed, no attempts have been made to examine the kinds of policy measures currently being taken around the world. This chapter examines relevant policy practices currently in existence in OECD countries. Comparative policy assessment can help policy makers to better understand the current status and to identify key problems and challenges.

Three aspects of compact city policy practices, based on the three previous chapters, are examined. The first is how policy goals and strategies respond to different local circumstances. The fact that urban form, climate and economic structure vary significantly clearly indicates that "one policy does not fit all". It is essential to understand local circumstances and adjust policy goals and strategies accordingly to achieve a successful compact city. The relevant questions are: what aspects of local context affect the setting of policy goals? What strategies are best suited to particular local circumstances? A comparative assessment reveals several key "missing links" between local circumstances and policy responses. The second is whether appropriate policy instruments are utilised to address multiple policy objectives, including environmental and economic sustainability. Chapter 1 considered the fact that compact city objectives are becoming more comprehensive and multi-faceted, especially from the perspective of green growth. Then, how effectively are current policy practices addressing them? The third is how current policy practices incorporate complementary strategies to minimise the potential adverse effects of a compact city. Chapter 2 revealed that a compact city may generate some potential adverse effects as well as various potential benefits. It is therefore crucial to include strategies to counterbalance adverse effects in a policy package. The analysis focuses on how current policy practices integrate such strategies.

Two methods were used for the analysis. First, the OECD Compact City Survey, conducted with the help of OECD member countries, collected information. Second, case studies were conducted in five metropolitan areas across OECD countries to obtain more detailed information on compact city policy practices in their local context. A literature review supplemented this analysis.

4.2. The OECD Compact City Survey

In December 2010, the OECD conducted the OECD Compact City Survey in order to collect information on current compact city policy practices in OECD countries. In this survey, compact city policies were temporarily defined as policies that aim to prevent urban sprawl and promote higher density, mixed land use and public transport linkages. The survey was distributed to the national government of all the 34 member countries. It asked the following questions:

- In your country, do compact city policies[1] exist at the national level? If so, what kind of policies are they? Please provide details. If not, does the national government recognise the need for such policies at the national level? Please provide your views. If your country has a federal structure in which sub-national governments are responsible for municipal matters, please provide information on compact city policies at the sub-national government level (a summary of all sub-national governments or examples of several governments).

- In your country, have metropolitan regions introduced (or do they plan to introduce) compact city policies? What kind of policies are they? Please provide details.

Answers were received from 27 countries. Supplementary research was conducted to create a policy profile for each country (see Annex).

Major compact city policy practices by country

Table 4.1 summarises the main compact city policy practices at the national and local/regional levels. The governments of OECD countries have made very rich information available on their country's policy practice. A remarkable finding is that in most OECD countries the compact city concept is an element of their major urban policy documents. In some countries, the term compact city appears in their policy documents; in others, policy documents fully recognise the relevance of a compact city approach to urban policy although they do not use the term compact city as such. A few countries indicated that there were no compact city policies at the national level. Particularly, in the past few years, compact city policies have increasingly been part of national urban strategies. For example:

- In May 2011, the Australian Government released *Our Cities, Our Future – A National Urban Policy for a Productive, Sustainable and Liveable Future*. It outlines 14 objectives for Australia's major cities, including: improve labour and capital productivity; integrate land use and infrastructure; protect and sustain nature and built environments; support affordable living choices; and improve accessibility and reduce dependence on private vehicles.

- In the Czech Republic, the "National Principles of Urban Policy" released in 2010 promotes compact settlements with mixed functions.

- France has been trying to renew its approach to urban planning to include the concept of compact cities. This policy direction was particularly stressed at the *Grenelle de l'Environnement* launched in 2007.

- The Japanese Government has listed the compact city concept as a top priority urban policy in its *Low Carbon City Development Guidance*, published in August 2010. The "Kyoto Protocol Target Achievement Plan" also promotes the compact city as a means of creating low-carbon cities and regions.

- In Korea, the compact city is explicitly included in the urban strategy of the National Comprehensive Development Plan revised in January 2011.

Another important finding is that many national governments currently have tools to implement compact city policies, whether regulatory or fiscal, in addition to national policy documents. Moreover, at the metropolitan/local level, there are a variety of policy strategies and instruments.

Table 4.1. **Major compact city policies in OECD countries (by country)**

Country	National level	Local/regional level
Australia	National Urban Policy (May 2011)	Metropolitan Plan for Sydney 2030 (Sydney) Melbourne 2030/Melbourne @ 5 Million (Melbourne) Directions 2031 and Beyond (Perth)
Austria	Austrian Spatial Development Concept	Urban Development Plan (Vienna)
Canada	Integrated Community Energy Solutions (ICES)	Places to Grow Programme (Ontario) Regional Growth Strategy (Metro Vancouver) Ottawa 2020 (Ottawa)
Czech Republic	Principles of Urban Policy	Brownfield redevelopment (Brno)
Denmark	Planning Act (urban boundaries, zoning, areas for retail and trade) Copenhagen Fingerplan	Housing Plan 2005 (Copenhagen) Four New Cities initiative (Århus)
Estonia	Transport Development Plan 2006-2013	–
Finland	National Land Use Guidelines	Metropole Plan (Helsinki)
France	*Grenelle de l'Environnement* City planning code (density bonuses, minimum density, SCOT/PLU) Tax on sub-density (VSD)	SDRIF (Paris) SCOT (Montpellier) *Quartier de Bonne* project (Grenoble)
Germany	National Urban Development Policy Policy reports for compact city policies	Strategic Cornerstones for Sustainable Development in Municipalities, 2010 (declared by 17 Lord mayors) Metropolitan strategies for Compact City (Nuremberg, Berlin) Inner-development before outer-development (Hamburg, Region Rhein-Neckar)
Greece	National Spatial Plan (2008)	New Blueprint, Athens Regulatory Master Plan 2021 (Athens)
Hungary	National Spatial Plan Law on Protection and Formation of Built Environment National Spatial Development Concept	Spatial plan (Budapest agglomeration)
Italy	Inter-regional energy programme 2007-2013 Fund for Sustainable Mobility	Greenbelts (Rome) Sustainable development initiative (Province of Trento)
Japan	City Planning Act Revitalisation of urban centres Low Carbon City Development Guidance	Toyama Light Rail (Toyama) Master Plan (Aomori)
Korea	National Comprehensive Plan Sustainable new town planning standard Development of multi-modal transfer centres	SHIFT housing project (Seoul) Song-do new city (Incheon)
Luxembourg	Centres of Development and Attraction Greenbelts Integrated Transport and Spatial Development Concept for Luxembourg	Integrated and co-ordinated inter-municipal development (DICI)
Mexico	Integrated Sustainable Urban Development (DUIS) Guidelines on Infrastructure, Equipment and Services (Housing Act)	Metropolitan Plan (Monterrey, Guadalajara, Puebla-Tlaxcala, Valley of Mexico) General Urban Development Programme for the Federal District
Netherlands	Fifth Policy Document on Spatial Planning Part 1 Frame of Reference on Urbanisation	Green heart, Structure Vision Randstad 2040 (Randstad)
New Zealand	Building Competitive Cities	Auckland Plan (Auckland) Urban Development Strategy (Wellington)
Norway	National guideline based on the Planning and Building Act Cities of the Future programme (2008-2014)	Initiatives to develop regional land-use and transport strategies based on compact city principals (City of Oslo, Akershus County)
Poland	Act of Spatial Planning and Management	–

Table 4.1. **Major compact city policies in OECD countries (by country)** (*cont.*)

Country	National level	Local/regional level
Portugal	2007 National Spatial Development Policy Programme (NSDPP/PNPOT)	Regional Spatial Plan (Lisbon) North Regional Spatial Plan (Porto)
Spain	2008 Consolidated Land Law 2009 Spanish Strategy for Urban and Local Sustainability	General Urban Organisation Plan, Sustainable Mobility Plan (Vitoria-Gasteiz)
Sweden	2009 Government Bill "Objectives for future travel and transport"	Comprehensive plans (Stockholm, Gothenburg and Malmo)
Switzerland	Agglomeration Policy (since 2001) Urban Growth Boundary (Land Use Plans)	Agglomeration Project (Lausanne-Morges, Zurich)
Turkey	The 9th Development Plan (2007-2013) The Integrated Urban Development Strategy and Action Plan (2010-2023) (KENTGES)	–
United Kingdom	Planning Policy Statement on climate change (PPS1) and on local spatial planning (PPS12) Planning Policy Guidelines on Green Belts (PPG2) and Housing (PPG3)	London Plan of 2008 (London) London congestion charge (London)
United States	Regional Innovation Cluster Initiative Partnership for Sustainable Communities Neighbourhood Revitalisation Initiative	Transit-oriented development (Arlington) 2040 Growth Concept (Portland) Chicago GO TO 2040 (Chicago)

Note: No answers were received from Belgium, Chile, Iceland, Ireland, the Slovak Republic, or Slovenia. Israel answered that there were no relevant policies in the country.

Source: OECD Compact City Survey.

Compact city policy instruments

Table 4.2 summarises the instruments that are widely used in OECD countries. They are classified by types of policy intervention (regulatory, fiscal, direct investment, partnership, informative). Highlights include:

- The compact city is a part of many master plans and strategic plans not only at the metropolitan but also at the national level.
- Regulatory tools seem to be the instrument the most widely used for compact cities. Among the most popular are urban growth boundaries (also known by terms such as urban containment boundary) and greenbelts, which aim to limit urban development beyond boundaries and in greenbelts.[2] While development is strictly controlled in most cases, some are more a fiscal tool than a regulation. For example, an urban service boundary system adopts a tiering system in order to direct public infrastructure into new areas in a particular order (Bengston et al., 2004). The Priority Funding Areas Initiative in Maryland, United States, also reflects the concept of a tiering system of infrastructure services by focusing investment in the city centre. The greenbelt system around Paris (*Ceinture Verte*) is not a regulatory tool, but the Regional Council has used an extensive toolbox ranging from woodland acquisition and layout to monitoring of farmland ownership in order to support peri-urban farming (Laurelle and Legenne, 2008). Tang et al. (2007) argue that the greenbelt in Hong Kong, China is a "transitional zone", in which development permits are given in a rather ambivalent and flexible way.

- Density requirements and mixed-use requirements are increasingly popular regulatory tools. In France, a new article (L 123-1-5, 13°bis) added to the city planning code (*Code d'urbanisme*) created a mechanism that allows municipalities to impose minimum density requirements on new construction near sites with existing or planned transport services. A sub-density tax is imposed on development that does not meet the requirements (*Loi de finances rectificative pour 2010 du 29 décembre*). The London Planning Advisory Committee (LPAC) in the United Kingdom has issued guidelines on density requirements, and many London boroughs have explicit density requirements (170-175 habitable rooms per hectare) that are higher than the LPAC's recommended density (125). Many cities in the United States set a minimum density requirement in their zoning ordinances. Mixed-use requirements are also used.
- Fiscal tools have also been proposed as effective measures for spatial development policy (Cheshire and Sheppard, 2005) and there is a variety of fiscal programmes for compact cities. Arlington County in Virginia, United States, promotes transit-oriented development (TOD) by providing density credits. Vancouver and other communities in British Columbia, Canada, use an amenity bonus programme, in which developers provide public amenity contributions as part of their urban development project (both in cash and in the form of libraries, parks, childcare, community centres, etc.) to mitigate the impacts of higher density on the surrounding community. In many countries, subsidies and other fiscal incentives are used for the conversion and renovation of existing buildings to provide more housing in urban centres.
- Direct government intervention through investment in city projects is widely used to create attractive public spaces. These projects are also carried out in co-operation with the private sector under various schemes including public-private partnerships (PPPs). Development agreements between a private developer and the planning authority can play a similar role in a private development project.

It should be noted that these instruments do not represent all the practices put in place in OECD countries, as the survey only asked for major practices. Another limitation to the survey was the definition of a compact city; although the definition was provided in the survey, the interpretation (which instruments should be included) was left to the respondents. In addition, the survey did not provide information on which instruments are more effective; as the very first survey on compact city policies, it focused on the instruments that exist rather than their effectiveness. Nonetheless, the survey still provides an overall picture of current compact city practices in OECD countries.

Table 4.2. **Major compact city instruments in OECD countries**

Type of intervention	Name of instrument	Purpose/mechanisms/how achieve the stated goal	Examples (country name indicates nationwide use)
Regulatory / informative	National urban development guidelines	To show the direction of urban policy and encourage regional/local governments to follow	Czech Republic, Korea, Japan
	Regional master plan	To declare explicit compact city goals/instruments and guide public and private investment	Melbourne (Australia), Montreal (Canada), Paris (France)
	Urban design guidelines	To reduce perceived density and increase quality of life in high-density neighbourhoods	Melbourne (Australia), Vancouver (Canada), Portland (United States)
Regulatory	Urban growth/containment boundary	A line drawn around an urban area to separate it from surrounding rural areas to limit urban development outside boundary	Melbourne (Australia), Vancouver (Canada), Japan, Portland (United States)
	Greenbelt	A zone that divides an urban area from the surrounding rural areas, to limit urban development in the belt. Sometimes greenbelts are accompanied by public or non-profit acquisition of open space or development rights	Vienna (Austria), Ontario (Canada), Frankfurt (Germany), Budapest (Hungary), Rome (Italy), Barcelona (Spain), Korea, Switzerland, United Kingdom
	Urban service boundary	Similar to urban growth boundaries, but beyond boundaries, certain urban services such as sewer and water are not provided. Often linked with adequate public facilities ordinances that prohibit development in areas not served by specific public services and facilities	Santiago (Chile), Maryland (United States)
	Agricultural/natural land reserve	A zone in which agriculture/nature is recognised as the priority use, to ensure that agricultural/natural land is preserved and available for farm and natural uses both now and in the future. It often acts as an urban growth/containment boundary and greenbelt	Vancouver (Canada)
	Minimum density requirement	Zoning codes designate minimum density, in addition to maximum density, to ensure intensive use of land in specific areas	France, Portland (United States), Vancouver and Montreal (Canada)
	Mixed use requirement	Zoning codes designate mixed land use	Paris (France)
	A target of limited greenfield development	A target (e.g. 50%) of new development in greenfields. Sometimes combined with minimum density requirement	United Kingdom, Melbourne (Australia)
	Zoning deregulation for densification/ mixed land use	Zoning deregulation for additional housing units in existing residential areas or for mixed land use	Vancouver (Canada)
	Restricted location of facilities causing high trip frequency	Stricter regulation of the location of large facilities that cause high trip demands: hospitals, stadiums, large retail stores, etc.	Japan
	Development tax/fee/charge	To discourage urban sprawl by levying taxes/fees/charges on developers in order to fund services for new development or to capture the capital gains on land price appreciation	British Columbia (Canada), United States
	Parking tax, fee, charge; congestion tax, fee, charge	To discourage private car use and promote public transport usage	London (United Kingdom), Stockholm (Sweden), Oslo (Norway)

Table 4.2. **Major compact city instruments in OECD countries** (*cont.*)

Type of intervention	Name of instrument	Purpose/mechanisms/how achieve the stated goal	Examples (country name indicates nationwide use)
Fiscal	Amenity bonus	Developers provide public amenity contributions as part of their urban development project (both as cash and in the form of libraries, parks, childcare, community centres, etc.) in exchange for allowing greater density	Vancouver (Canada)
	Subsidies for densification	Incentive to households and developers to promote focused investment in growth priority areas (transport nodes, etc.)	Toyama (Japan)
	Incentives for renovation and preservation of buildings	Incentives for conversion of vacant houses and offices and for preserving historical heritage buildings in the form of subsidies, funds and public-private agreements	Melbourne (Australia), Vancouver (Canada)
	Taxation of insufficient density	A sub-density tax is imposed for development which does not meet the requirements	France
	Location efficient mortgage (LEM)	LEM increases the amount of money homebuyers in urban areas are able to borrow by taking into account the money they save by living in dense, walkable neighbourhoods close to public transit	Seattle, Chicago, Los Angeles, San Francisco (United States)
	Use-value tax assessment in peri-urban areas	Land is taxed at a lower agricultural or forestry value rather than the higher values associated with development uses. It provides farmer-landowners with an incentive to maintain agricultural use. Typically includes requirements that the owner be actively engaged in farming	Japan
	Split-rate property tax	Proportionally higher taxes on land than on built structures. It is an incentive to develop brownfields by making it more costly to hold on to vacant or underutilised, centrally located sites	Sydney (Australia), Hong Kong (China), cities in Pennsylvania (United States), Denmark, Finland
	Public infrastructure investment	Major investments include: public transport system, streetscape, plazas, libraries and structured parking	Portland (United States)
	Purchasing land for natural reserve	Protecting open space in and around urban areas through acquisition. One of the most expensive tools but has a lasting impact on urban form. The location should be carefully chosen so as not to lead to leapfrog development	Portland (United States)
Public investment	Development agreement for dense/mixed-use development	Public-private agreements often include higher density and mixed use in the public partner's requirements, along with floor-area bonus and financial support for developers	Portland (United States)
Partnership	Public-private partnership	Public-private agreements for infrastructure investment such as public transport systems, streetscapes and plazas.	Vancouver (Canada), Toyama (Japan), Portland (United States)

Source: OECD (2010a), *Regional Development Policies in OECD Countries 2010*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264087255-en*; OECD (2010b), *Cities and Climate Change*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264091375-en*; Bengston, D.N., J.O. Fletcher and K.C. Nelson (2004), "Public policies for managing urban growth and protecting open space: policy instruments and lessons learned in the United States", *Landscape and Urban Planning*, 69(2-3): 271-286.

4.3. The case studies

The objective of the case studies was to understand: *i)* the policy instruments introduced in each case-study region; *ii)* the urban context in which such policy actions are taken; and *iii)* the outcomes and remaining challenges. Five OECD metropolitan areas were selected for the case studies. The selection criteria included: *i)* differences in population size; *ii)* differences in geographical location; and *iii)* differences in metropolitan/local governments' active engagement in compact city policies. As a result, some metropolitan areas were chosen not because they have been successful with compact city policies but because they have just started compact city policies based on local needs. This made it harder to assess the policy impacts from these cases; however, the focus of the case studies was to understand diverse local contexts and policy responses in specific contexts. The five selected OECD metropolitan areas are:

- Melbourne (Australia);
- Vancouver (Canada);
- Paris (France);
- Toyama (Japan);
- Portland (United States).

These metropolitan areas display a wide variety in terms of policy instruments. This made it possible not just to describe different policy instruments and outcomes, but also to analyse them as a function of their local circumstances and provide an assessment and recommendations to be shared with other metropolitan areas.

Melbourne, Australia

Urban policy context

The Melbourne metropolitan area (Melbourne Statistical Division)[3] is the second largest metropolitan area in Australia. Its population, around 4 million in 2009, represents about 75% of the population of the State of Victoria and about 18% of that of Australia. It is located on the coast of Port Philip Bay and its topography is flat. It covers 1 791 km². There is no single administrative unit for metropolitan Melbourne. It consists of 31 local municipalities and metropolitan planning is mainly the responsibility of the state of Victoria.

Melbourne is the economic driving force for Victoria, with above average growth rates of GDP and low unemployment over the last ten years. It is the country's leading container port and a centre for manufacturing, research and higher education. Due to its location on the south-east coast of Australia, it is considered an ideal production and strategic business base from which firms can serve large international markets throughout the Asia-Pacific region. Melbourne offers an extensive supply of primary production factors and cheap industrial land as well as excellent infrastructure. Firms find a well-educated workforce and high-quality universities and research institutions, especially in the field of bio-medical and health research. Melbourne is also Australia's major intellectual centre. Melbourne has been recognised as among the world's most liveable cities (e.g. Economist Intelligence Unit, 2011) and its liveability contributes to its

competitiveness; it has an open, multi-cultural society, the effect of continuous and increasing in-migration from abroad as well as from other states of Australia. It is led by a stable state government with clearly defined roles and responsibilities and with a decision process based on a high degree of public consultation. Melbourne has a long tradition of excellence in urban design, quality housing, and the provision of major cultural and sporting events (OECD, 2003).

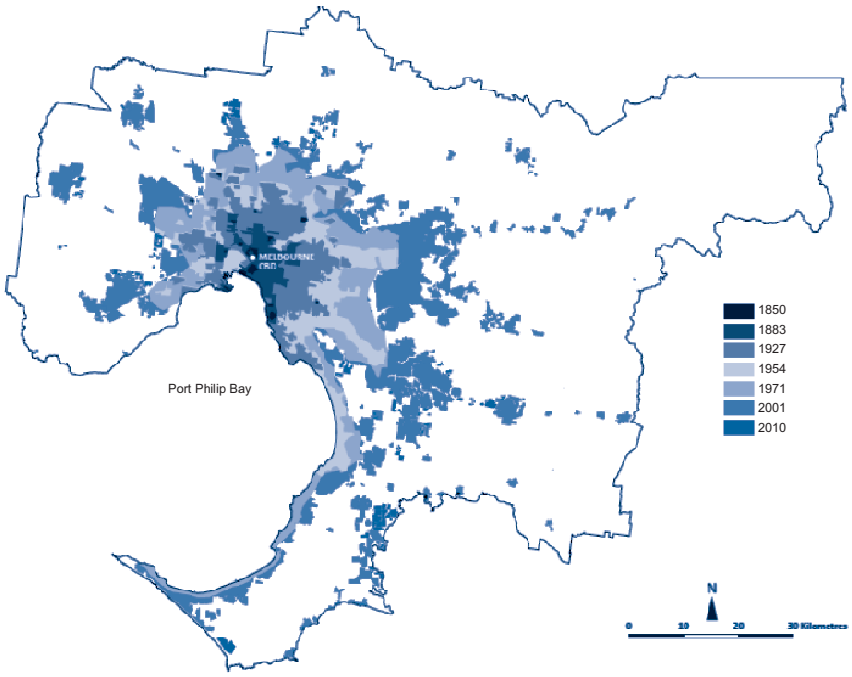
Melbourne's compact city policies originated from a challenge arising from the structural change of its industry. In the early 1980s, Melbourne, like many other cities, experienced industrial decline, with a reduction in almost all sectors of its economy. Inner Melbourne was "losing retail to district shopping centres, residents to suburbs and was increasingly becoming a dead mono-functional business centre" (German Federal Ministry of Transport, Building and Urban Affairs, 2007). The region needed to deal with its deteriorated urban centres. Moreover, in the mid-1980s, deregulation of land use resulted in an oversupply of office buildings (Tsutsumi and O'Connor, 2006).

Rapid population growth is also a challenge, as the region's population grew faster than expected: by 4.1% a year between 2001 and 2006. The population is expected to reach 5 million before 2030. Although the region's urban areas have grown significantly over the last two centuries (Figure 4.1), there is still strong demand for development to accommodate the increasing population. Urban spatial form and commuting patterns, especially the increased use of cars and trucks caused by the skewed distribution of jobs, can have a significant effect on Melbourne's economic and environmental performance. The number of people with jobs in Melbourne is expected to increase from 1.86 million to around 3 million by 2036; however, most office and specialised jobs will be concentrated in central and inner Melbourne, while retail, community service and industrial jobs will be located on the fringe (State of Victoria, 2008). With the growth of the metropolitan area, people living in outer areas need to travel further to go to work. It is therefore becoming crucial to link transport, jobs and land-use planning.

Revitalising central Melbourne

The City of Melbourne launched a project called "Postcode 3000" in 1985. The main objective was to improve the city's public realm incrementally, while going through "a conscious process of action planning to assist in turning around the centre's fortunes" (German Federal Ministry of Transport, Building and Urban Affairs, 2007). The project aimed to increase the population of the central city from 800 to 8 000 residential units over 15 years. Various instruments including fiscal incentives and deregulation were combined. A 3% tax for the provision of open space was lifted and building and planning fees were removed. Building and planning regulations were amended to favour residential development. In particular, dual purpose "office and retail" and "residential and retail" land-use planning categories were created to replace the original single-purpose office use category (Tsutsumi and O'Connor, 2006). The city also upgraded the adjacent public realm so as to complement and support developers' investment. Moreover, the city put together a comprehensive marketing strategy and pilot projects. For example, it converted a number of buildings in order to illustrate the potential building stock available for reuse.

Figure 4.1. **Melbourne's urban growth, 1850-2010**



Source: State of Victoria (Department of Planning and Community Development) (2008), "Melbourne 2030: a planning update – Melbourne @ 5 Million", State of Victoria, Melbourne, Australia, *www.dpcd.vic.gov.au/planning/plansandpolicies/planningformelbourne/planninghistory/melbourne@5million*, accessed 20 November 2011.

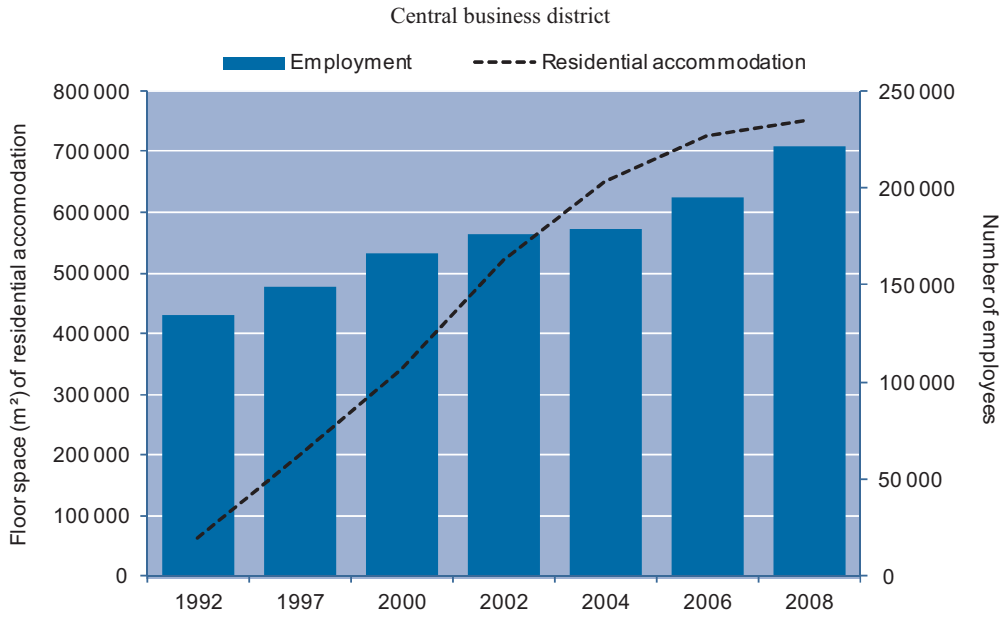
In addition, Melbourne's campaign to make streets lively and vibrant included an "active edges" policy, which set regulations for the design of new buildings to ensure a lively street and urban environment with a mix of functions and activities. The most important objective of introducing active edges along city streets was to ensure that ground-floor facades appeal to pedestrians and contribute good lighting and levels of interest and activity. The policy's framework included the following:

- shops and food service outlets must have a display window or entrance measuring at least five metres or 80% of the ground-floor facade (whichever is larger);
- the rhythm, scale, architectural detail, windows and colours of new facades must be in keeping with existing street space;
- buildings must provide details of interest to pedestrians and use high-quality, durable materials (City of Melbourne, 2004).

By 2002 the residential stock had increased from 800 to over 10 000 units in the central city. Bars, cafes and restaurants increased from 580 to 1 200 at the end of the 1990s. Vacancy rates in commercial buildings dropped from 14% in 1992 to 6% by 2004 (German Federal Ministry of Transport, Building and Urban Affairs, 2007). Employment in the central business district (CBD) of Melbourne also increased substantially (Figure 4.2). Over the same period, Melbourne expanded the number of educational institutions in the city centre, in most cases integrating these facilities into the city fabric. The number of students attending academic institutions and/or living in the city centre expanded by 62% from 1993 to reach nearly 82 000 in 2004 (Figure 4.3).

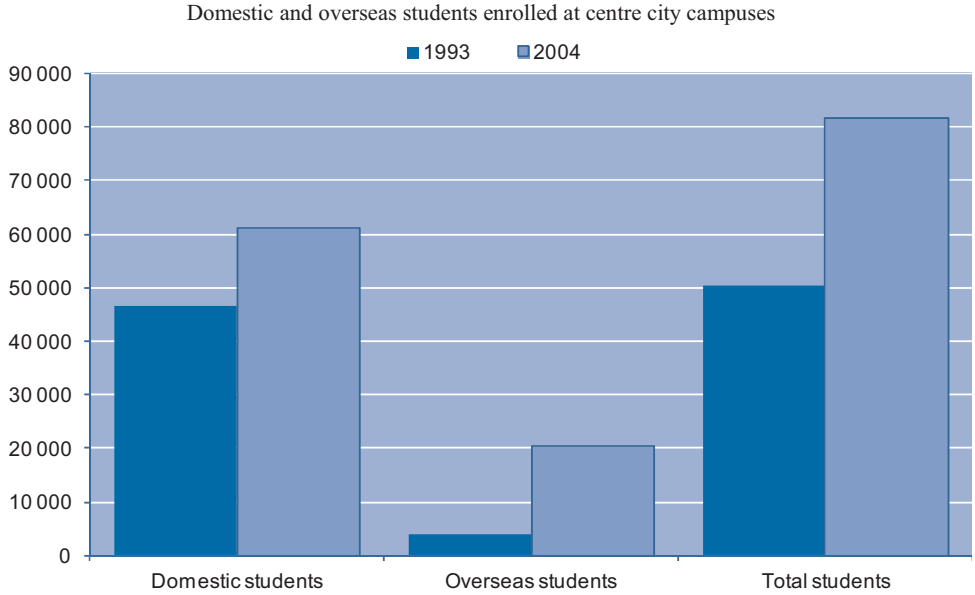
Universities and other educational institutions contribute to an active, lively urban environment by creating a climate oriented towards young people. Students make a strong contribution to the city's vitality and cultural diversity, as they provide a youthful stimulus and often an international perspective (City of Melbourne, 2004).

Figure 4.2. **Residential accommodation and number of employees in Melbourne**



Source: City of Melbourne, "Census of land use and employment", City of Melbourne, Melbourne, Australia.

Figure 4.3. **Diversity of students in Melbourne's central business district**



Source: City of Melbourne (2004), "Places for people Melbourne", City of Melbourne, Melbourne, Australia, *www.melbourne.vic.gov.au/AboutCouncil/PlansandPublications/Documents/Places_People_2004.pdf*, accessed 28 November 2011.

"Melbourne 2030" and "Melbourne @ 5 Million": the region's compact city strategies

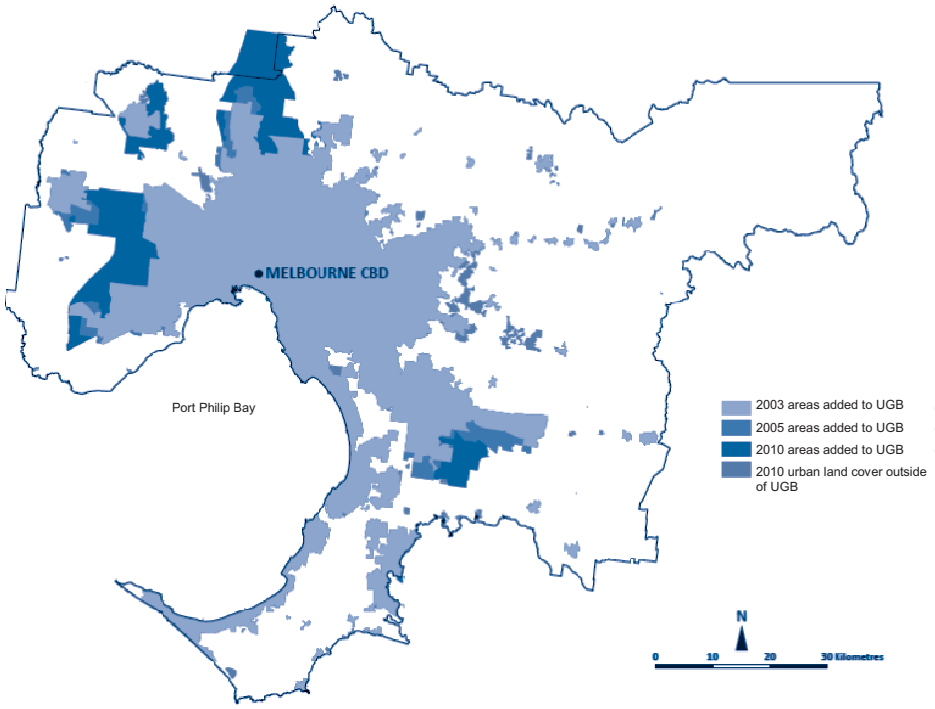
Melbourne has a long history of metropolitan planning. In 1954, the first comprehensive planning scheme for the metropolitan area was prepared by the Melbourne and Metropolitan Board of Works (MMBW). The 1971 MMBW report, *Planning Policies for the Melbourne Metropolitan Region*, introduced long-term conservation and development policies through growth corridor and green wedge principles, and contained outward growth to a limited number of areas on the edge of the city.

In 2002, the State of Victoria released "Melbourne 2030". It was a long-term plan to manage growth and development in Melbourne and the surrounding region. For the first time since the late 1920s, the plan introduced an urban growth boundary as a tool to manage the outward growth of metropolitan Melbourne. The purpose was not to stop Melbourne's outward urban expansion. Rather, it was seen as "a tool to facilitate the achievement of a more compact city" – a planning tool to better manage outward expansion by limiting it around most of the urban area and direct growth to designated "growth areas" (State of Victoria, 2002). These were the continuation of the development "corridors" policy created as part of Melbourne's planning in 1971 and since then maintained in planning policy. They were based around major regional transport corridors, and formed linear "fingers" of growth outwards from the existing city. The policy is based on the view that new communities should be developed where major transport infrastructure either exists or can be provided relatively efficiently to link these communities to the broader metropolitan jobs and services markets. The urban growth boundary policy was also intended to facilitate urban renewal by limiting indiscriminate development everywhere around the fringe of the region by stopping the use of greenfield land in areas that are hard to serve. "Melbourne 2030" explicitly stated that the urban growth boundary could and would be changed as required (State of Victoria, 2002). In 2005 the first post-implementation review of the urban growth boundary was completed and the boundary changed to place additional land within the designated growth areas.

In 2007, the government commissioned an independent audit of "Melbourne 2030" which, among other things, examined and reported on the manner in which the urban growth boundary was being used as a policy tool. The audit reported that "the objectives and strategies of Melbourne 2030 [are] sound, but some improvement is needed for implementation". In May 2008, the state government responded to the audit and issued a policy document that set out a series of commitments and actions to guide the ongoing implementation of "Melbourne 2030", including a commitment to prepare longer term plans for Melbourne's growth. In 2008, the government also released its revised population and household forecasts based on the 2006 Australian Census. It became clear that Melbourne's "population will pass the original Melbourne 2030 population projections before 2020 and is likely to reach five million before 2030" (State of Victoria, 2008). This revision of population and household projections indicated that the designated growth areas would run out of greenfield land supply much sooner than anticipated when the urban growth boundary was changed in 2005. The government undertook a review of development options for expanding land supply in 2009 (the Delivering Melbourne's Newest Sustainable Communities programme) and on that basis elected to revised the urban growth boundary in 2010. As a result, the urban growth boundary has expanded significantly since its introduction: in 2003, land within the urban growth boundary covered approximately 215 000 hectares. It was expanded in 2005, by

approximately 19 800 hectares and in 2010 by a further 43 600 hectares. The increase in eight years was 64 400 hectares or about 29% (Figure 4.4).[4] The expansion of the boundary led some to question the effectiveness of the measure. For example, Buxton and Goodman (2003) argued that many planners regard the greenbelt in Melbourne as a "holding zone for possible future urban development".

Figure 4.4. **Urban growth boundary extensions in Melbourne, 2003-2010**



Source: State of Victoria (Department of Planning and Community Development) (2008), "Melbourne 2030: a planning update – Melbourne @ 5 Million", State of Victoria, Melbourne, Australia, *www.dpcd.vic.gov.au/planning/plansandpolicies/planningformelbourne/planninghistory/melbourne@5million*, accessed 20 November 2011.

In December 2008, the state government released "Melbourne @ 5 Million", a plan which provided policy initiatives that complemented "Melbourne 2030" (State of Victoria, 2008). It was prepared in consultation with the Department of Transport to ensure that the metropolitan area was well served by an integrated and modern transport system. New initiatives introduced in "Melbourne @ 5 Million" included:

- A more compact city: designation of six new central activities districts (CADs); employment corridors to improve accessibility to jobs and services and reduce congestion on the transport network; and established areas to accommodate 53% of new dwellings.
- Better management of growth: growth areas to accommodate 284 000 (or 47%) of the 600 000 new households Melbourne was projected to have by 2030 (Shin and Inbakaran, 2010); areas of investigation for potential extensions to the growth areas; and more efficient use of greenfield land with a target of 15 dwellings per hectare.

Melbourne's six growth areas, in which greenfield residential development is to concentrate, comprise part of seven local government areas (LGAs) on Melbourne's urban fringe: Casey, Cardinia, Hume, Melton, Mitchell, Whittlesea and Wyndham. These LGAs are home to 21% of Melbourne's population, and between 2008 and 2009 their populations increased by between 3.5% and 8.1%, more than the 2.4% increase in metropolitan Melbourne as a whole. They are becoming more popular as well as more populous: in the ten years to 2006, the proportion of Melbourne's residential sales in growth LGAs increased from 16% to 26%. The Growth Areas Authority was established in 2006 as an independent statutory body with a broad, facilitative role to help create greater certainty, faster decisions and better co-ordination of all parties involved in the planning and development of Melbourne's growth areas. The Growth Areas Authority reports directly to the state's Minister for Planning. Its aim is to have Australia's best land development system for creating well-designed neighbourhoods that provide more lifestyle, housing and employment choices. The key is improving the planning process around the release of land and providing the government with in-depth and long-term advice on infrastructure needs. The Growth Areas Authority's objectives are to:

- ensure that development and infrastructure take place in a co-ordinated and timely manner;
- promote sustainable development, housing diversity and affordability and jobs in growth areas;
- ensure that employment land is provided for commercial and industrial purposes in a co-ordinated and timely manner;
- create communities in growth areas that are socially, environmentally and economically sustainable;
- improve the operation of the regulatory environment and administrative processes to reduce costs and inefficiencies for developers and local government.

New government

The political situation in Melbourne recently changed. In November 2010, power in the State of Victoria shifted from the Labor government to the Liberal-National Coalition government. A number of planning reforms are envisaged by the new government. For example, a new metropolitan planning strategy is to be established over the next two years. It will be necessary to watch how the orientation of compact city policies evolves in the future.

Vancouver, Canada

Urban policy context

The Vancouver metropolitan area (Metro Vancouver)[5] is located in south-western British Columbia, Canada, and covers an area of 2 832 km^2. The area is bounded by mountains, rivers, the Pacific Ocean and the United States border. It is Canada's largest non-amalgamated major metropolitan area and comprises 22 municipalities, 1 electoral area and 1 treaty First Nation. The population is around 2.4 million, approximately 50% of the population of British Columbia and about 13% of that of Canada. The region is administered by Metro Vancouver, a government at the metropolitan level. Metro Vancouver is mainly in charge of utilities such as regional water and waste management,

air quality management, regional parks, growth management, and affordable housing (Metro Vancouver, 2011a).[6]

The region has experienced substantial growth over the past three decades, adding more than 1 million people in a generation. Population increased by 8.5% between 1996 and 2001 and by 6.5% between 2001 and 2006. In terms of absolute population growth, Surrey led all municipalities with 47 150 additional residents, followed by Vancouver (32 370), Richmond (10 115), and Burnaby (8 845); these four municipalities accounted for 76% of growth over the 2001-2006 census period. Metro Vancouver's economy accounts for more than 55% of the provincial gross domestic product. Service industries account for 80% of employment in the region. It has emerged as Canada's primary gateway to the Asia-Pacific, and leads regional provincial and national economies "both through the movement of goods on rail and roads and due to the value of international passenger travel" (Translink, 2008).

Several factors drove Metro Vancouver to adopt compact city policies. The first is the need to accommodate growth to advance liveability and sustainability. Population in the region is expected to increase by over 35 000 a year and to reach 3.4 million by 2041 (Metro Vancouver, 2011a). Achieving growth without sprawl implies greater density. Since population density affects how people travel, a carefully elaborated development strategy would help to reduce congestion, improve the economics of transport infrastructure and public services, and maintain an attractive and diverse urban environment (Metro Vancouver, 2011b). Second, population growth increases the need to establish sustainable transport systems. Conventional development patterns have typically relied on single-use zoning models and low density, sprawling neighbourhoods that cannot be economically served by public transport. This leads to segregation and dependence on private cars. This model puts certain demographic groups at a disadvantage: the elderly who no longer drive or own a car, those who cannot afford or choose not to own a car, and young people. Careful consideration of the interaction of land use and transport is required to develop healthy, compact and well-rounded communities. The third is economic sustainability. Although under traditional economic development strategies municipalities often embrace any sort of development or new business, this is often done at the expense of long-range, integrated planning. Compact development is critical to the long-term economic sustainability of metropolitan areas. The location of work and residence affects not only productivity and overall economic performance, it is also the key to a more transport-oriented urban structure. The municipalities of Metro Vancouver have areas in which they can improve planning for economic development. For example, Vancouver has jobs, but not enough affordable and attainable housing for those in many sectors of the economy; in Surrey and North Vancouver a large proportion of residents travel to jobs outside the community. Finally, there is a need for environmental sustainability. First, with natural assets of national and international significance, it is crucial to protect these assets for future generations. Second, it is necessary to prepare for and mitigate regional natural hazards, such as earthquakes, floods and slope instability and to reduce the greenhouse gas emissions associated with these risks. Third, it is important to protect the region's more than 50 000 hectares of rich agricultural land which supports the production of fresh, regionally grown food (Metro Vancouver, 2011a).

Providing affordable housing is a challenge. Metro Vancouver has the highest housing prices in Canada. Canada Mortgage and Housing Corporation (CMHC) reports that the average rent for a two-bedroom apartment in 2010 was CAD 1 195 in Vancouver against a Canadian average of CAD 835, and that the average resale price[7] in Vancouver

in 2010 was the highest in Canada – CAD 675 853 in Vancouver compared to CAD 339 042 in Canada on average (CMHC, 2011). The cities of Vancouver and North Vancouver have had the greatest success in fostering pedestrian-friendly neighbourhoods, but also face the toughest challenges in terms of affordability. The issue of affordable housing, not simply social housing for the lowest income earners, but attainable housing for the middle class, does not appear to be waning. In fact, although some families are moving into the downtown core, there is a significant concern that a large fraction of the young adult population is leaving Vancouver for more affordable communities (Beers et al., 2007). Culturally, most residents believe that it is better to own property than to rent;[8] and many feel uncomfortable paying high mortgages or high rents for small condominium apartments.

Metropolitan planning framework

A regional approach to planning and governance has been a feature of the Vancouver region for nearly 100 years. In 1913, the cities of Vancouver, Point Grey, and Burnaby established the Burrard Peninsula Joint Sewerage and Drainage Board (Taylor and Burchfield, 2010). Planning collaborations between communities have also been occurring since the 1930s, starting with the Regional Planning Committee in 1937. In 1965, regional districts were created by the Province of British Columbia, which allowed municipalities to collaborate on a voluntary basis to provide services. Even though several attempts were made to establish inter-municipal co-operation, the creation of regional plans has not always succeeded.[9] The Provincial Local Government Act of 1996 established the legal framework for regional districts and provided important local government regulations concerning planning and land use. Under the Local Government Act and Community Charter local governments are responsible for the development and application of regional growth strategies, official community plans (OCPs), land-use zoning and other land use bylaws.

A regional growth strategy (RGS) is an agreement between a regional district and its member municipalities on social, economic and environmental goals and priority actions. The RGS's objectives are to co-ordinate action on housing, transport, infrastructure and economic development in recognition that collaboration at regional level will make individual municipal action more effective. All regional district bylaws and all OCPs of member municipalities must be consistent with an RGS. Metro Vancouver's current RGS is the Liveable Region Strategic Plan (LRSP), adopted in 1999 and currently under review. The goals of a regional growth strategy are to create compact urban areas; support a sustainable economy; protect the environment and respond to climate change impacts; develop complete communities; and support sustainable transport choices (Metro Vancouver, 2011b).

The purpose of an official community plan is to guide and direct land use and development decision making within a municipality. It clearly states the community's values and goals through a vision statement that steers growth management, servicing, transport, climate change mitigation, environmental protection, the promotion of agriculture and a variety of other issues. Once an OCP is in place, local government decisions to amend existing regulations and approval requirements must be consistent with the OCP.

Resource land protection

The Agricultural Land Commission (ALC) was created by the Province of British Columbia in 1973 to preserve agricultural land as an object of provincial concern. The ALC administers the ALC Act and is responsible for the Agricultural Land Reserve (ALR), a provincial zone in which agriculture is recognised as the priority use. The purpose of the ALR is to ensure that the province's agricultural land is preserved and available for farm uses both now and in the future. The ALC requires local governments to ensure that land use bylaws are consistent with the legislation, regulations and stipulations of the ALC Act. The ALR has protected farmland all over the province and has helped promote more compact communities. Despite strong population growth, the amount of urbanised land in Metro Vancouver has only increased by 149 hectares since 1986, primarily as a result of the constraints of the Agricultural Land Reserve to the east, the international border of the United States to the south, and the Pacific Ocean to the west.

An industrial lands inventory was prepared for Metro Vancouver in 2005 (Metro Vancouver 2005). The purpose of the inventory was to estimate how much land is allocated for industrial use, determine where industrial land is located, and estimate how much of the industrial land base is vacant. The results indicate 10 558 hectares of industrial land in Metro Vancouver. Approximately 26% of the industrial land supply, or 2 775 hectares, is classified as "vacant". Based on a range of preliminary demand estimates using historical land absorption rates, and assuming all lands will be available for development, the supply of industrial land could theoretically accommodate regional development demand for the next ten years. The inventory can be used as a baseline for monitoring and tracking changes and absorption of industrial land in the region, as well as the basis for making informed land-use choices regarding the supply and use of industrial land in Metro Vancouver.

Land use and transit linkages

The South Coast British Columbia Transportation Authority, known as TransLink, was created in 1999. One of TransLink's main sustainability goals is for the majority of jobs and housing in the region to be located along the Frequent Transit Network (FTN) which offers frequent, reliable services on designated corridors throughout the day, every day. Transport service is provided every 15 minutes or better from morning to evening, every day of the week, on corridors with densities and land uses that promote maximum ridership. As part of the latest regional growth strategy, Metro Vancouver is introducing a concept, "frequent transit development corridors", to shape land use in support of frequent transit. The FTN and Metro Vancouver's frequent transit development corridors are a vision for how to integrate land use, transit supportive infrastructure and frequent service.

In Vancouver, policies have been enacted to support active transport (walking and cycling). Numerous neighbourhood projects have been undertaken since the early 1990s; these include measures such as traffic circles, speed humps and street narrowing. In addition, the Pedestrian Plan makes policy recommendations such as creating pedestrian connector routes and greenways and improving existing pedestrian facilities. Furthermore, the Bicycle Plan, which was adopted in 1999, aims to increase cycling in Vancouver through "four fundamental Es" – engineering, education, enforcement and encouragement. Since 1999, the bicycle route network has grown more slowly than over the previous decade, expanding from 133 kilometres in 1999 to 178 kilometres in 2007;

the total network length is expected to increase to 241 kilometres. Surrey's Transportation Strategic Plan is its long-range planning document for transport policy (City of Surrey, 2008a). The city is currently developing walking and cycling plans to achieve the plan's goals. The walking and cycling plans aim to achieve improved accessibility, increased transport choices, safety for vulnerable road users and integration of transport. In North Vancouver, a comprehensive, multi-modal transport plan was developed to serve the transport system over the next 20 years and beyond. It emphasises the use of alternative travel modes and supports the creation of "complete streets". The plan was endorsed by Council on 14 April 2008, and the city is now developing an implementation strategy.

Densification, housing affordability and quality of life

The Vancouver metropolitan area has made long-term efforts to achieve a compact city. For example, the City of Vancouver's Central Area Plan back in 1991 was the plan that added additional residential density to the city centre, and it has made Vancouver the city it is today. More recently, in 2008, the Vancouver City Council adopted the EcoDensity Charter and a set of initial actions. EcoDensity is an ambitious initiative to achieve density in all of the built-up areas in Vancouver while also addressing housing affordability. The EcoDensity Charter commits the city to make environmental sustainability a primary goal in all city planning decisions in ways that also support housing affordability and liveability. Through its initial programmes, the EcoDensity initiative examines how density can: *i)* create more complete communities and reduce the carbon footprint through housing diversity within walking distance of shops and services, and accessible transport; *ii)* take advantage of existing infrastructure and reduce development pressure on agricultural lands and natural habitats; *iii)* allow for new green systems that more efficiently use energy, water and materials; and *iv)* introduce urban agriculture to reduce "food miles" (the distance it takes to get food to homes) and strengthen local food security.

The EcoDensity Charter promotes a gentle, hidden, invisible form of density. Initial actions provide the framework for future work and implementation of the EcoDensity commitments, including **secondary suites** (invisible density) and **laneway houses** (hidden density) (Table 4.3). Secondary suites are not only a densification tool but also a solution for communities facing a shortage of affordable housing. They increase the supply of rental housing, increase the affordability of home ownership (financial institutions take the income into consideration in the mortgage calculation) and provide more housing while retaining a neighbourhood character. The main concern when legitimising secondary units is the cost of bringing them into compliance with building and safety codes. A second challenge is the neighbourhood perception that the suites will change the character of the neighbourhood. In 2004, the city first adopted regulations allowing secondary suites in single family homes. In 2009, the Vancouver City Council unanimously approved zoning changes and a set of design guidelines to enable secondary suites within apartments. Laneway Houses (LWHs) have been permitted in Vancouver's single-family neighbourhoods since July 2009. Homeowners may add a LWH while retaining the existing main house or a laneway house may be built alongside a new main house. A LWH can be the third dwelling unit on a site, in addition to the main house and a secondary suite; it is intended to respond to the need for diverse kinds of rental housing in Vancouver. Although LWHs cannot be sold, they provide ideal accommodations for family members, caregivers or renters. LWH goes through an application approval process similar to single-family homes, yet includes a streamlined design review to

ensure neighbourhood compatibility. Guidelines provide direction on roof form and height, setbacks, shading, privacy and overlook, landscaping, durability, and parking spaces. While it is too early to assess the overall impacts of LWH on housing affordability in Vancouver, a monitoring report conducted once the first 100 LWH projects were completed indicates support for the continued promotion of LWH as a tool for assisting with affordability challenges. The City of Surrey and the City of North Vancouver have also introduced similar density policy initiatives.

Table 4.3. **Density policies in the city of Vancouver**

	Secondary suites	Basement suites	Laneway housing
Outline	Allowing a secondary housing unit in addition to the primary dwelling unit – applicable in commercial zones; residential areas of the downtown district; and as a policy in all new official development plans	Enabling basements to accommodate an additional separate dwelling unit by adding an option to single family zoning	Allowing 500 to 750 ft² detached dwellings in the typical garage area of a single-family lot, facing the laneway and maintaining backyard open space, in addition to secondary suites
Requirements	– Secondary suites cannot be strata titled as a separate unit or sold separately from the primary dwelling unit – Only for rental or family use – Self-contained, including one bathroom unit, a kitchen unit, and with its own separate door to a corridor or the outside – Minimum unit size of 26 m² (280 ft²) – No additional parking spaces beyond what is required for the apartment building – Design guidelines to enhance aspects such as light, privacy and safety	– Permit a basement provided that: – total floor area is not more than 0.70 FSR (0.75 for existing houses); – above grade area is not more than 0.45 FSR (0.50 for existing houses); and – the house footprint is not more than 25% of lot area – Council also recommended support for more liveable basement suites by allowing basements to be built higher out of the ground – increase outright basement height by two feet (in the RS-1 zone by one foot) to accommodate the basement height increase	– Limited to rental or family use only, with no strata-titling permitted – Single-storey and partial upper-storey – A minimum of one parking space must be provided on each lot with a LWH – LWH must maintain a neighbourly relationship with adjacent properties – A streamlined design review to ensure neighbourhood compatibility

Source: OECD Compact City Survey.

Along with these densification tools, policies to mitigate the impacts of higher density were developed. In the city of Vancouver, the city's authority to use development charges has been strengthened. The City Council introduced several city-wide development charges. The Interim City-Wide Development Cost Levy (DCL) is used to pay for facilities such as parks and childcare. In addition to DCL, an Interim City-wide Community Amenity Contribution (CAC) Policy has been introduced. CACs are community amenities provided when additional density is approved by the City Council through rezoning. Developers provide CACs in their urban development project (both in cash and in the form of libraries, parks, childcare, community centres, etc.) to mitigate the impacts of higher density on the surrounding community (City of Vancouver, 2004). Even though these do not represent a large source of revenue, CACs can help to address the potential negative adverse effects of high-density development and meet the needs of the surrounding community.

Energy and emission policies

At the provincial level, in support of the 2008 Provincial Climate Action Plan, the Province of British Columbia passed the Greenhouse Gas Reduction Targets Act which established targets for reducing GHG emissions in British Columbia: at least 33% less than 2007 emissions by 2020, and at least 80% less than 2007 emissions by 2050. To help meet these targets, the province passed Bill 27 in 2008 (Green Communities Act), which required municipalities, by 31 May 2010, to include several targets for the reduction of greenhouse gas emissions and policies and actions to achieve these targets in their plans. Local governments are expected to play an important role in climate protection, such as land use and development, transport, energy, infrastructure and facilities.

At the metropolitan level, Metro Vancouver is developing a climate change strategy that will cover its corporate operations as well as the region as a whole. In 2008, the Metro Vancouver Board adopted targets to reduce regional greenhouse gas emissions by 15% from 2007 levels by 2015 and by 33% by 2020. In addition, Metro Vancouver's Air Quality Management Plan (AQMP) was adopted in 2005 and provides a framework to maintain and improve air quality in the region.

Municipal governments in the metropolitan area have also been actively working to mitigate climate change. In 2005, Vancouver's City Council approved a report entitled "Vancouver's Community Climate Change Action Plan". The report identifies policies to meet GHG emission reduction targets, such as smart growth land-use planning, regulations for energy performance of new buildings, and programmes and infrastructure to support sustainable transport. The city is seeing successful results so far: in 2008, while the city's population had increased by 27% from 1990 to 2008 and jobs by 18% from 1991 to 2006, Vancouver had reduced GHG emissions to 1990 levels, on track to achieving their GHG reduction target – reducing community emissions by 6% below 1990 levels by 2012 (City of Vancouver, 2009a). Furthermore, the city released "Vancouver 2020: A Bright Green Future" in 2009. It sets out the broad long-term vision as well as ten specific goals to achieve by 2020 in order to turn Vancouver into the greenest city in the world (City of Vancouver, 2009b). In terms of GHG emission reduction, the plan sets a target to reduce greenhouse gas emissions 33% from 2007 levels.

The City of Surrey's Sustainability Charter points to several areas for reductions of emissions and GHG including tracking and reducing GHG emissions, building a district energy system in the city centre and reducing waste at City Hall (City of Surrey, 2008b). North Vancouver was one of the first municipalities in the country to develop a Local Action Plan for GHG reduction. It set targets for both corporate (city operations) and community reductions. The Local Action Plan focuses on cost-effective actions to reduce GHG emissions which also provide significant environmental, economic and social benefits. North Vancouver aims to better manage the impacts of urban development related to energy, greenhouse gases and air quality, while achieving broader community objectives related to affordable housing, transport management, job creation and local economic development. Its action plan sets a corporate target and a community target,[10] and it is initiating the updating of the community component of the Local Action Plan. The new Community Climate Action Plan will identify actions for maximum GHG reductions in the community.

Paris, France

Urban policy context

The Paris metropolitan area (Île-de-France)[11] covers 12 000 km^2 or 2.8% of the national territory. It is composed of 1 281 communes and 8 departments. The regional government of Île-de-France administers the region. It is the most populated area in France, with approximately 11.8 million inhabitants and 5.35 million jobs or 19% of the total national population and 29% of national GDP.

A key feature of Île-de-France is the geographical inertia of the urban area, with a pronounced difference in density between the centre and the periphery. Densities inside the city of Paris are among the highest in OECD metropolitan areas. As Chapter 3 illustrated, population density in urban areas based on LandScan peaks at 48 208 pop/km^2 and remains high within a 5-kilometre radius of the peak (22 530 pop/km^2). However, it falls rapidly and density at the 25-30 kilometre radius is below one-tenth (2 182 pop/km^2). The inertia of the gradient is substantial, and it would be futile to try to obtain the densities of Paris far beyond the *périphérique*.[12] Secondary centres exist and may be mutually reinforcing but do not have densities as high as those in Paris.

The core agglomeration contains Paris itself and several historical urban centres and a large number of clusters (towns, prefectures, train stations and hubs, service clusters, major infrastructure facilities, etc.) outside the Paris city boundary. It has nearly half of the regional population, two-thirds of its jobs, and a decisive share of the economic attractiveness, cultural influence and tourist attractions. Although Paris and, for economic matters, La Défense, remain the metropolitan decision-making core, many other functions, such as economic ones, are distributed over a wider area and a group of more or less specialised emerging clusters. There are several major metropolitan clusters, some of which are well established such as La Défense, while others are still growing, such as Plaine-Saint-Denis or Boulogne-Issy. The interdependence of Paris and its first ring is increasing. The agglomeration core has expanded to the A86 corridor, which now plays a significant role in the national economy. In contrast, to the east and south, many potentially strategic projects are finding it difficult to become established, since they are insufficiently supported by the market and by the existing urban fabric.

The core agglomeration has increasing demographic weight in comparison with the suburbs. While the population of the Paris region has continued to grow at a fairly steady pace, there has been a reversal in the spatial trend, with marked growth of population in the agglomeration core. Between 1975 and 1990, the overall population of the area within 20 kilometres of Notre-Dame had decreased; between 1990 and 2006, it increased by 435 000 (half of the additional inhabitants of the region). This reversal can be explained in part by the sharp slowdown in construction in new towns, which played a large part in urban expansion over the past decades. Office construction has now shifted back to the core agglomeration, while logistics activities continue to develop at the outer limits of the region and in the Paris basin.

Île-de-France offers one of the world's best public transport systems with 1 400 kilometres of railway lines (RATP and SNCF) (more than 900 million trips a year) and 218 kilometres of metro lines (1 118 million trips a year). Nonetheless, mobility in the region remains highly dependent on the private car. In particular, more households in the suburbs rely on a car – 41% of Parisian households own at least one car, as opposed to 68% in the inner belt and 84% in the outer belt. Furthermore, people living outside Paris (the city) are more likely to own at least two cars: while only 5% of Parisian households

have at least two, this proportion rises to 17% in the inner belt and 35% in the outer belt (Insee, 2011). This level of car ownership has had noticeable consequences: between 1976 and 2001, the total distance covered by car drivers rose by almost 90%, of which 50% was attributable to the outer belt (Insee, 2011). There are serious deficiencies in the territorial coverage of the public transport systems and in suburb-to-suburb connections.[13] The mobility of inhabitants is also very closely related to the density of their communes of residence. If they live in high-density areas, they travel an average of 12 kilometres a day (all forms of and reasons for travel), whereas if they live in low-density areas, they travel over 30 kilometres a day and are much more dependent on cars. Land development policy can play a key role in limiting car use by influencing the location and density of development and its links to the transport network.

The share of household budgets spent on transport ranges from 7% in Paris to 25% for some populations in rural areas (IAU-ÎdF, 2011), whereas the share of the budget allocated to housing is practically the same irrespective of location owing to regulatory limits on bank loans (maximum of 33% of the household budget). Mobility-related handicaps are greater for those whose jobs are more remote and less accessible by public transport; they are even greater for those with manual and salaried jobs and for those who work irregularly, have few skills or short-term contracts. Long and costly journeys to work also complicate the organisation of daily life for households with modest incomes in which both partners work.

Île-de-France still has 51% agricultural land and 24% forested land. This means that France's most populated region has practically the same shares of land use as the national average. With some of the most fertile land in Europe, agriculture in the region primarily focuses on field crops (soft wheat, barley, rapeseed, and sugar beet for sugar production). These are the primary activities of approximately 70% of farms and cover more than 90% of farmland. In addition, a well-established agro-food sector exists downstream of agricultural production: Île-de-France is the leading region in terms of value added in these industries (12% of national value added and an important regional economic sector). Although agriculture only accounts for 0.5% of assets, it actively manages nearly two-thirds of the region's open spaces or half of the regional territory. However, urban pressure threatens the open spaces: while open spaces occupy 90% of the outer rural ring, this share drops to 60% in the greenbelt zones and to only 10% in the inner agglomeration.

After a significant peak in the consumption of agricultural and natural spaces between 1990 and 1994 (2 500 hectares/year), the rate of consumption has declined since 2000 (1 200 hectares/year). However, this decline is not so much the result of a radical change in how urban space is managed but a side effect of less than expected growth and levels of construction (approximately half as many dwellings are being built as are needed by the population). Compared to other French agglomerations, urbanisation in the Île-de-France region consumes less space overall. From 1993 to 2004, land cover grew by 9.5% in Île-de-France, half the pace in the rest of the national territory (+17.9%) for similar levels of population growth (4.6% and 5.3%, respectively). However, this does not mean that there is less demand for space in the Paris metropolitan area than in the rest of the country; there is a clear trend towards increased space consumption per inhabitant and per job. The lower space consumption is due in particular to the severe shortage of new construction. According to experts, the chronic disparity between quantitative and qualitative household supply and demand requires the construction of 60 000 dwellings a year, or the equivalent of an average new town in the Île-de-France region. The regional

spatial programme required to achieve such a goal is a major issue for the "governments" of the Île-de-France metropolis.

The Paris region accounts for 15.8% of national energy consumption and 9% of national greenhouse gas emissions (excluding air transport), for the region's 19% of the population and 29% of the country's gross domestic product. The relatively low emissions figure is attributable to density and compactness, backed up by dense public transport networks. The share of emissions attributable to transport (excluding air transport) is below the national average. The large number of natural areas located at the heart of the bio-geographical crossroads in the Paris Basin gives the Île-de-France region remarkable biodiversity and an environment rich in open spaces. The challenge is to maintain these characteristics by avoiding excessive consumption of space and increased dependency on cars.

Metropolitan planning framework

The *Schéma Directeur de la Region Île-de-France* (SDRIF) is the reference strategy document for urban planning and regional development and is based on the framework Law of 4 February 1995 for Urban Planning and Regional Development (*Loi d'orientation pour l'aménagement et le développement du territoire*, LOADT). The previous document, SDRIF 1994, was a continuation of the 1965 and 1976 Master Plans for Regional Development and Urban Planning of the Paris Region (SDAURP 1965 and SDAURIF 1976, respectively). The SDAURP 1965 was a regional development strategy tailored to the strong post-war demographic and economic growth, while the SDAURIF 1976 aimed to reduce the harmful effects of poorly controlled urbanisation on standards of living.

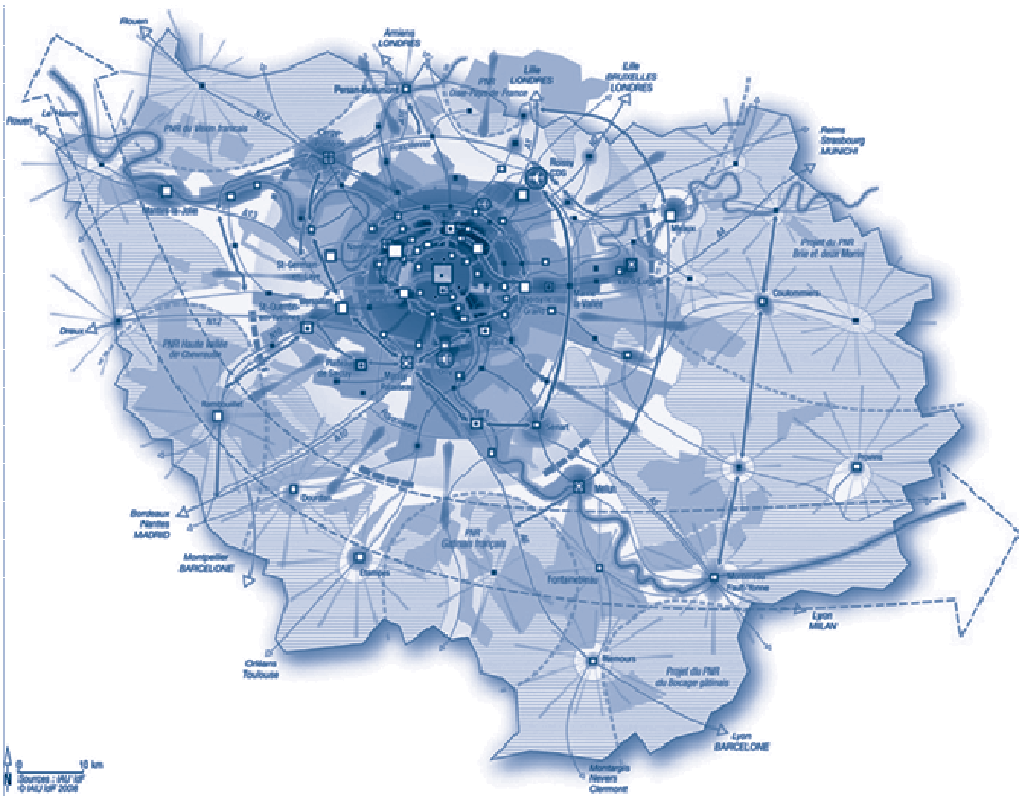
In the new energy climate, where access to energy comes at a much higher cost and CO_2 emissions must be reduced, it is necessary to reconsider the ties between regional development and mobility, commit to a renewed public transport supply in the Île-de-France region and preserve the industrial function of space allocated to productive activities. The preceding master plans had a structured vision of regional development, based on a tight mesh of high-speed networks and distinct development centres. They, and in particular the 1994 SDRIF, were also based on the assumption that the criterion of efficiency is increased speed and the possibility to travel greater distances. However, this organisation of the regional territory did not prevent an increase in car use, in particular for suburb-to-suburb travel. One of the new challenges facing metropolitan planning, in particular in response to environmental imperatives (post-Kyoto), is to give direction to the evolution of the existing urban fabric, outside major development operations.

The new regional development agenda proposed by SDRIF 2008, decided after intense discussions, aims to better articulate the different scales of development, from everyday city life to the polycentric organisation of a world metropolis. It is designed to incorporate the imperatives of denser urban development with better organisation of the transport system, protection and development of forested, natural and agricultural spaces, taking account of the urban heritage and landscape, resource conservation and exploitation, and risks. The SDRIF 2008 thus proposes a metropolitan operation based on three components and focused on "polycentric compactness" (Figure 4.5):

- A broader, better structured and served agglomeration core, in which development clusters are rebalanced and invigorated and major transformable territories are optimised. Its opening onto the river and the agglomeration's greenbelt are reinforced.

- At major poles such as new towns and historic towns in the outer ring (*Francilien*), regional economic clusters are strengthened and networked. In the greenbelt, concern for maintaining the green space system plays a role in the opening of new spaces for urbanisation.
- In the rural areas, urban development is to be very limited outside the corridors served by public transport.

Figure 4.5. **Paris' new regional spatial project: polycentrism and compactness**



Source: IAU-ÎdF (2008), "Le projet et les orientations pour l'aménagement de l'Île-de-France", IAU-ÎdF, Paris, *www.iledefrance.fr/fileadmin/contrib_folder/Doc/SDRIF_121-168.pdf*, accessed 20 November 2011.

Another unique characteristic of the SDRIF 2008 is that all of this spatial vision translates into an urban planning document, "the map of general end-use of different parts of the territory" where the location of future urbanisation is expressed by orange or red discs which are the zones where local authorities may freely develop their projects (Mancret-Taylor, 2009).

The Grand Paris Express connection is the SDRIF's high-priority infrastructure project, with more than 170 kilometres of new automatic metro. It is on a scale unparalleled since the creation of the RER in the 1970s. This railroad beltway around Paris would considerably boost accessibility via public transport. By facilitating suburb-to-suburb travel, it not only reaches areas of the agglomeration core that are directly served, but also areas outside the central agglomeration that are suitable for urban development. The Grand Paris Express thus creates the potential for intense urban

development and is the backbone of the spatial project for the agglomeration core and supports housing construction and economic development projects.

Overall, on the regional scale, the development capacity of the SDRIF project should considerably slow the consumption of rural space, from 0.8% a year between 1990 and 2005 to 0.5% between 2005 and 2030. The new towns of Sénart and Marne-la-Vallée would account for a significant portion of the space consumed.

The state-supported project: eight clusters

The project supported by the state is based on the following eight specialised activity clusters in targeted segments:

- Roissy-Villepinte-Tremblay, around the airport platform;
- Paris-Saclay, scientific and technological cluster on the Plateau de Saclay;
- the biotechnology valley from the south of Paris to Evry and Saclay;
- Le Bourget, gateway to the sky and space;
- Lower Seine confluence, the Paris maritime gateway;
- territory for creating the Ile Saint-Denis in Aubervilliers, by way of Saint-Denis and Saint-Ouen;
- Paris La Défense, the financial city;
- Cité Descartes, for sustainable urban development in the east of Paris.

The project aims to bring together actors in industry, research and training so as to develop interactions between the key players in economic development. To this end, the state will construct an underground transport network with 130 kilometres of driverless metro ("double loop" or "large figure eight"), able to operate day and night at approximately 60 km/h. While the route unites the different project areas, it is also designed to connect to the current primary transport lines, promote suburb-to-suburb transit, and help improve access to districts.

Several models or "visions" of territorial development have been under discussion in the Paris region, either in policy or in technical terms, since work was started on revising the regional master plan (which is both a regional urban planning document that local urban planning documents must follow and a framework for regional action for the next 25 years). The discussion on the future of the region and the major options for its development is not over. Beyond the future of the master plan project, which should soon enter into force, the population and socio-economic players will be able to debate. They should help guide the major choices.[14]

Toyama, Japan

Urban policy context

The Toyama metropolitan area (Toyama prefecture)[15] is a central location on the main Japanese island. It has around 1.1 million inhabitants and an area of 4 411 km². The city of Toyama, the capital of Toyama Prefecture, has 417 322 inhabitants (as of 31 March 2010). To the east of Toyama lies the 3 000 metres Tateyama Mountain Range. To the north is Toyama Bay, a treasury of marine life 1 000 metres deep. This is an area of great natural beauty.

The population in the Toyama metropolitan area has been decreasing since 2005. By 2030, the population is estimated to reach 929 000. By 2035, it would be 880 000. The younger generation (0-14 years old) and the working age population (15-64 years old) are expected to decrease, and the ageing population (65 years or older) is expected to increase. Although the total population would decline, the ageing population would be a predicted 334 000 in 2020. In 2035, one out of three inhabitants would be 65 years or more. If the current urban development trend continues, the population in the suburbs would increase by approximately 27 000 between 2005 and 2025, although total population would decrease.

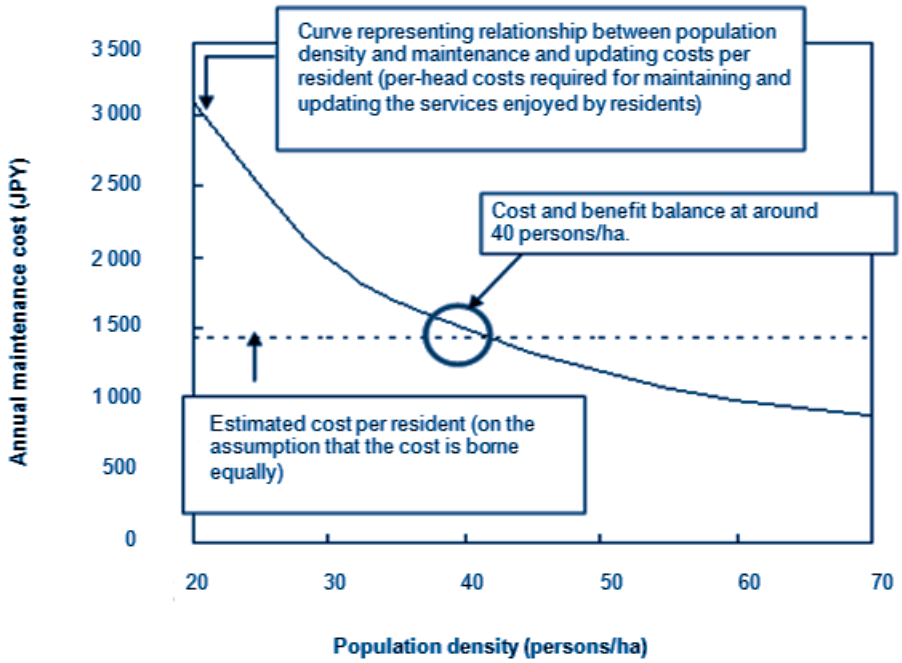
Although the population is declining, the number of cars is increasing. Between 1989 and 2009, regular cars increased by 49.7% and light cars increased by 72.2%. The share of households with more than two cars also increased from 55.3% in 1994 to 72.8% in 2009. In 1999, 72.2% of automobiles were used for all purposes and 83.8% for commuting. The amount of petrol and diesel consumed by passenger cars increased from 235 000 kilolitres in 1990 to 346 000 kilolitres in 2008 and was closely related to continuing urban sprawl. The built-up area of Toyama prefecture covered 22 016 hectares in 1976 and 33 326 hectares in 2006, an increase of 51.4%. Over the same period, agricultural land decreased by 11.4% from 97 432 hectares to 86 286 hectares. The forest area did not change significantly.

Along with these changes, the use of public transport, especially buses, declined. Users of the local bus service decreased by 70% between 1989 and 2009, as people increasingly depended on cars. Total CO_2 emissions (industrial, home, business, transport) were 12 486 000 t-CO_2 in 2008, an increase of 21% from 1990 (the national average was 7.1%). The transport sector's share of CO_2 emissions was 19% of the total, an increase of 29%. Households accounted for 16%, an increase of 61% owing to increased energy consumption, and the business sector for 13%, an increase of 74% largely owing to energy consumption by office automation equipment.

The City of Toyama decided to adopt compact city policies for several reasons. The first was concern for the mobility of citizens without access to a car. Currently 30% of the population lacks access to a car (no licence or no car at their disposal) and the percentage is higher among women and the elderly. With the ageing of the population, there will be 1.2 times more without access to a car in 2030.

The second is the expected decline in the effectiveness and efficiency of public service delivery. The region's population decline is likely to result in higher per capita maintenance costs for urban infrastructure and facilities. In addition, further urban expansion would mean higher costs for infrastructure investment and maintenance. The per capita cost of maintenance and operation for urban facilities is expected to increase as population density decreases (Figure 4.6). The city estimated the cost to be approximately JPY 18.9 trillion in 2025, an increase of 12% from 2005, if the current urban development trend continues (City of Toyama, 2010). Similarly, as transport costs (fuel cost and personnel expense) for home-visit nursing care per household rise, the density of the (ageing) population in the urban district will diminish. Given the predicted population decrease of about 20% between 2005 and 2040 in Toyama city, efforts will be needed to achieve more efficient public service delivery.

Figure 4.6. **Population density and the cost* of maintaining urban infrastructure in Toyama**



Note: The cost of maintaining urban infrastructure includes: snow clearance, street cleaning, maintenance of urban area parks, sewer culvert maintenance fees.

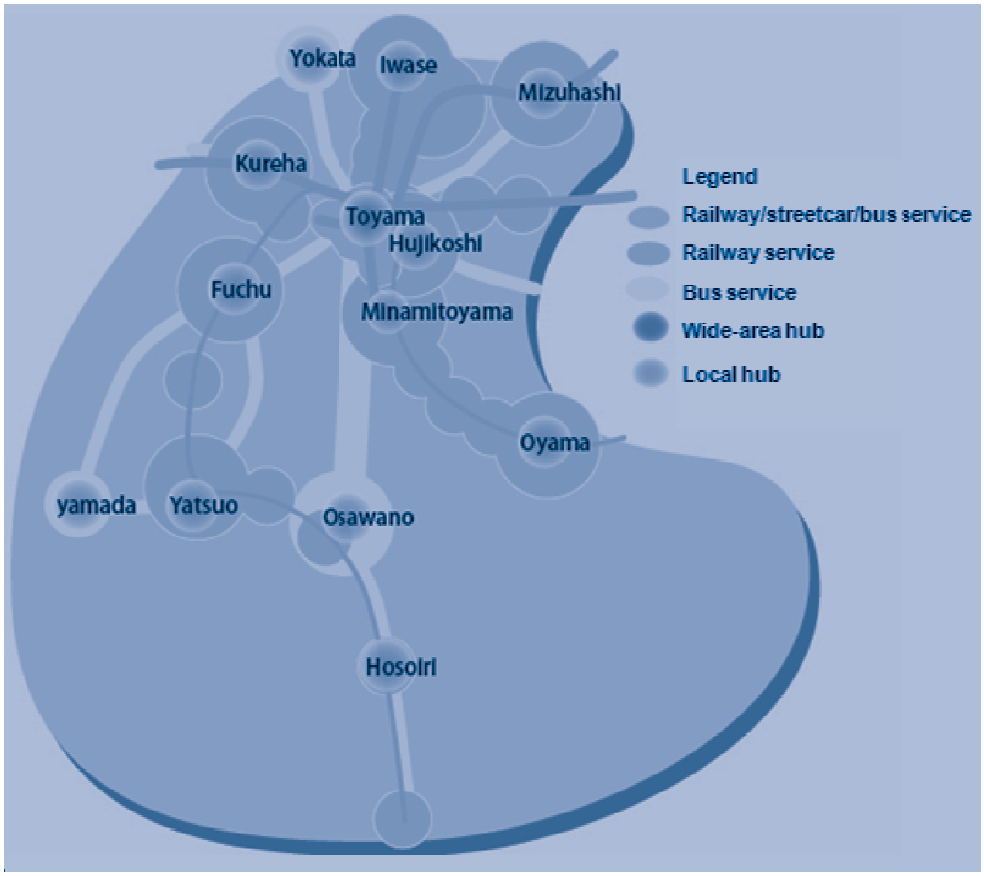
Source: City of Toyama (2010), "Toyama city's efforts toward compact urban development", presentation to the OECD delegation, Toyama, 12 October 2010.

The third challenge is the decline of urban centres. The expansion of the urban area led to a "doughnut phenomenon" and the relocation of urban facilities to suburbs. Large-scale retail stores located in suburban areas instead of urban centres and the floor space sales efficiency (the value of sales per floor space of a retail store) decreased. At the same time, the price of land fell in urban centres, resulting in less revenue from property taxes. In 2006, land prices were a quarter of what they had been in 1996, and the share of revenue from property and city planning taxes in the urbanisation promotion areas was only 19.1%. The decline in city centre land prices adversely affected the finances of the city administration and the loss of attractiveness of the urban centre directly affected the region's economic competitiveness.

Spatial development strategy in Toyama

When defining the future urban structure, the city emphasised the need to ensure the mobility of citizens without access to a car, such as the elderly. Under the current structure, local services (e.g. commercial, medical care, welfare, administrative services) are not located within walking distance and public transport service is not frequent enough. In order to enhance mobility, the city proposed a "Toyama compact city model" to improve the public transport system and concentrate urban functions in the city centre and along the railway and bus routes (Figure 4.7).

Figure 4.7. **Conceptual urban structure in Toyama**



Source: City of Toyama (2010), "Toyama city's efforts toward compact urban development", presentation to the OECD delegation, Toyama, 12 October 2010.

A main challenge is to bring population into the target area. It is not realistic to strengthen land-use control. In the city's scenario, citizens will gradually migrate and the city will promote this migration from the suburbs to areas with a convenient public transport system, created by improving public transport and making pedestrian areas around stations or tram/bus stops more attractive. In rural areas, the aim is to maintain the population level by offering services such as public transport that are necessary for daily life. The city designated 6 railway lines (including tram lines) and 13 bus routes as public transport axes, and the areas within walking distance of the station or tram/bus stop as residence promotion districts. In selecting the 13 bus routes, the city considered the bus routes offering more than 60 departures a day (2 departures an hour in the daytime). This service level was set based on a survey of citizens' satisfaction with public transport.[16] In designating the residence promotion districts, walking distance was set at 500 metres for railway stations (within a ten-minute walk) and at 300 metres for bus stops (five-minute walk), based on the same survey.

The city's density target and grant programme

Toyama city has started a long-term (about 20 years) city plan to increase the population in the residence promotion districts. The density target along bus routes is 40 persons/hectare (the current density is 34), a level that would define an urban area in the future. The density target along the railways is 50 persons/hectare (the current density is 44). In addition, by maintaining the bus service frequency and increasing that of railway service, the city would expand the residence promotion districts from 2 927 to 3 489 hectares. This would put the population in residence promotion districts at 162 180. The city's total population is predicted to be 389 510 in 2025, and the districts would have 42% of the total.

To concentrate urban functions in the city centre and areas along public transport routes, the city has introduced two subsidy systems, the City Centre Dwelling Promotion Scheme and a scheme to promote dwelling along the public transport axes:

- City Centre Dwelling Promotion Scheme. Since July 2005, the city has subsidised construction companies and citizens who purchase or rent a house in the city centre. The target population density in the city centre (from 55.7 persons/ hectare in 2004 to 65 persons/hectare in 2014) was set based on the average national population density in urban areas in 2000. The target will be achieved if approximately 3 000 houses are provided in the city centre between 2004 and 2014. As of March 2011 this had involved 774 houses. The average grant provided is JPY 199 438/house.
- Scheme to promote dwelling along the public transport axes (Table 4.4). Since October 2007, the city has subsidised construction companies and citizens who purchase a house in the designated areas with easy access to public transport. The city targets an increase in the share of the population in these areas from 28% in 2005 to 42% by 2025. As of March 2011 this had involved 491 houses. The average grant provided is JPY 691 071/house.

Table 4.4. **Toyama's grant programme to concentrate development in the target areas**

Target areas	To whom	Types of cost to be subsidised	Subsidy limit (JPY)
City centres	To construction companies:	for construction cost of apartment buildings	1 million/house
		for construction cost of high-quality houses for rent	500 000/house
		for remodelling of office/commercial buildings to apartment buildings	1 million/house
		for building cost of stores, medical and welfare facilities in apartment buildings	20 000/m²
	To citizens who purchase or rent a house:	for loan procured for purchasing a house or a unit in an apartment building	500 000/house
		for rent when transferring to a downtown area	10 000/month (max. for three years)
Public transport axes	To construction companies:	for construction cost of collective housing	700 000/house
		for construction cost of high-quality houses for rent	Two-thirds of the cost of the shared space
	To citizens who purchase or rent a house:	for building/purchasing a house/unit in an apartment building	300 000/house
		(Special addition for two-family houses)	(100 000/house)
		(Special addition for those moving in from outside areas)	(100 000/house)

Source: City of Toyama (2010), "Toyama city's efforts toward compact urban development", presentation to the OECD delegation, Toyama, 12 October 2010.

Renovation of the former Toyama-ko line to light rail transit

To revitalise the public transport axes, the city has improved the service level, such as number of departures and service schedule. Toyama's public transport plan will involve a public-private partnership.

In 2003, an urban development project to elevate the railway lines around the Toyama station was initiated. One of the lines concerned was the Toyama-ko line run at that time by the West Japan Railway Company which was suffering from regular decline in use. With the adoption of the project, the question of whether or not the Toyama-ko Line should be elevated at great expense was discussed, and three alternatives were presented: *i)* elevation of the existing line; *ii)* changing the line to an LRT; and *iii)* abolishing the existing line and switching to bus service. Following a careful comparison of the plans, the second plan was adopted as the best way to pursue compact city goals, and the city started investment in the LRT and other development strategies for the communities along the line. Responsibility for the Toyama-ko line, which ran until 28 February 2006, was transferred to the semi-public sector, Toyama Light Rail Co., Ltd. The line was immediately transformed into an LRT line, and started operation on 29 April of the same year. There was an impressive improvement in the service level. Three new stations were built so that the stations are 600 metres apart on average. Frequency of service was increased by about 3.5 times. New LRT low-floor vehicles were introduced. The first and the last trains scheduled were also changed. The fare is JPY 200 flat fare, JPY 160 when using an IC card, and JPY 100 for those over 65 years old.

To implement the project, a public-private partnership was created for more efficient project management. In the agreed scheme, the city assumed the entire expense for the railway facilities and train cars (installation and the cost of maintenance after opening); the company bears the operational costs. A subsidy from the central government was used for maintenance costs to reduce the city's burden. Donations from citizens and local companies were used to pay for benches and walls at the train stops. Local businesses also invest in the Toyama Light Rail Co., Ltd. Naming rights for the new railway station can be purchased.

The city also promotes projects to improve accessibility to the LRT. First, it introduced a feeder bus system connecting to the LRT every 30 minutes on weekdays and every 60 minutes on weekends to improve access to the stations (Figure 4.8). At the Awajima station, a shopping centre offered its parking lots to introduce a park-and-ride system. People with a monthly tram pass can use the parking lot at any time if they buy the shopping coupon (JPY 3 000). At the Hasumachi station, those with an LRT IC card get free parking (up to 20 times a month). In addition, 480 bicycle parking lots were installed and all stations of the Toyama light rail except the Toyama-kita station now have a bicycle parking area.

Since the operation started, the number of users has almost doubled (from 2 268 to 4 988 passengers/day) on weekdays and quadrupled (from 1 045 to 5 576 passengers/day) on weekends. As the area along the LRT is the city's built-up area, there is stable demand for public transport and the increase in the number of users is due to its greater convenience. According to the results of the user questionnaire conducted by the city after starting operation of Toyama Light Rail (2006), 11.5% of the rise in use is due to a shift from the automobile and 20.5% is due to new users on weekdays. The survey also noted a remarkable increase in opportunities for going out, especially for ageing people. In addition, the city surveyed construction and migration patterns along the public transport line, based on the building confirmation application register from 2003 to 2009

as well as on building owners' previous addresses. The share of construction sites along the public transport line (over the city total) increased from 31.3% (from 2003 to 2005) to 38.0% (from 2006 to 2009). Migration into the target areas also increased from 6.7% to 10.6% at the same period.

Figure 4.8. **Transfer between the Toyama LRT and a feeder bus at Iwasehama station**

Source: City of Toyama.

Revitalising urban centres

Greater economic activity in the city centre would increase tax revenues and enable the city to invest further in a compact city structure. In February 2007 the city released the City Centre Vitalisation Master Plan for Toyama City. The plan aims to encourage the private sector to invest more in urban centres and to encourage more people to visit the area through focused public investment. The plan identifies three strategies to achieve attractive and safe living:

- enhancement of mass transit to create a city centre that is not dependent on cars through excellent public transport services;
- creation of a bustling city centre worthy of the reputation of a fascinating and vibrant city;
- promotion of attractive city centre dwellings and an attractive city centre lifestyle to encourage living in the city centre.

A total of 27 projects were set up based on these strategies. Among them was the Grand Plaza, a public square improvement project based on a public-private partnership. Considering the city's cold and snowy climate, an all-weather multi-purpose plaza with a glass roof and equipment for various events was constructed. After the opening, the number of pedestrians around the Plaza increased by about 1.2 times, especially in the evening (see Box 5.7). To improve the ability to travel, Toyama's LRT was then extended to create a loop around the city. The looped tram service started operation in

December 2009. The track was installed by the city and the operation is run by the Toyama-chiho Railway Inc. The total number of users for all railways in the city has increased by 15%. The looped tram service also encourages more people to walk around in the city centre. In addition, the city introduced a public cycle rental system: 150 bicycles were installed at 15 rental stations located every 300-500 metres in the urban centre.

Remaining challenges

The compact city strategy of Toyama, relying on public transport investment and on concentrating population and urban functions in the target areas, needs to be examined with a view to the medium and long term. First is the need of a vision for the spatial development of the public transport axes. While the city centre has a clear development strategy for the city centre (City Centre Vitalisation Master Plan for Toyama City), there is no such plan for the axes. A second issue concerns the instruments for bringing people and development to the target areas. The effectiveness of the current subsidy scheme needs to be carefully monitored, as the grants are costly. More effective ways should be explored; for example, focused public investment in pilot development sites could illustrate effectively the benefits of living near the transit stations. Discouraging urban development outside the target areas by regulatory and fiscal tools could also be considered. A third question concerns the need to maintain the private bus service. In Toyama, and more generally in Japan, public transport services are often operated by private companies. It is easier to introduce a new bus line than a new railway, but it is also easier to close it. Therefore, for strategically important bus lines, it is necessary to establish a financing scheme so that both the private and the public sector play their roles in supporting the mass-transit system of a compact city. Finally, the need for horizontal co-ordination among surrounding municipalities in the metropolitan area should not be neglected.

Portland, United States

The urban policy context

The Portland metropolitan area studied includes four counties (Multnomah, Clackamas and Washington counties in Oregon and Clark County in Washington State)[17] and 26 cities, 25 in Oregon and Vancouver, Washington.[18] It lies at the confluence of the Columbia and Willamette Rivers. The Columbia River forms the boundary between the state of Washington on the north and Oregon on the south. The Cascade Range, marked by Mt. St. Helens east of Vancouver, Washington, and Mount Hood east of Portland, lies on the region's east side. The Willapa Hills of western Washington and the Coast Range of western Oregon bound the region on its west side. Between the mountain ranges, fertile valleys lie north and south of the confluence. The mountains limited urbanisation in the region before the development of Oregon's and Washington's growth management laws of the 1960s, 1970s and 1990s. The valleys and rivers focused settlement and development in the cities of Portland, Oregon, and Vancouver, Washington. Today, two major rail lines (Southern Pacific and Burlington Northern) and two cross-country interstate highways (I-5 and I-84) converge in the region, and a string of ports that export to Pacific Rim countries line the Columbia and Snake Rivers east to Idaho. The metropolitan area has a population of approximately 1.8 million. Portland (583 000 inhabitants) and Vancouver (166 000) are the two largest cities in the metropolitan area. Until the 2007 recession, both cities were growing faster than the national average.

Portland was originally established and grew as a result of industries driven by abundant natural resources: lumber and wood products and the agricultural produce of the Willamette Valley. In the second half of the 20th century, it shifted to a more diversified economy led by active wear and outdoor gear; advanced manufacturing; bioscience; "cleantech"; energy efficiency; health services (Metro, 2009). High technology, particularly semi-conductors, display systems and software, is now the leading industry (Regional Business Plan Steering Committee, 2006). Between 2010 and 2035, the industrial sector in Portland is projected to grow by 18%, and job growth is expected to be greatest in and around the centre of Portland.

In rural areas, agriculture continues to play a major role in the regional economy and employs approximately 12% of the workforce. The metropolitan area had 842 000 non-agricultural jobs in 2006. Of the three Oregon counties that surround the metropolitan area, two (Clackamas and Washington) rank among the top five out of the state's 36 counties for the value of their farm products. Over 90% of agricultural products grown in the lower Willamette Valley are exported; the valley generated USD 2 billion in farm-gate receipts in 2007.

The political structure of the metropolitan area encompasses 2 states, a regional government, 4 counties and 26 cities. Viewed from afar, the systems of governance share many principles and practices. The two states share a pronounced hierarchy of authority and provide guidance to local governments on matters of growth management and sustainability. Historically, the states have delegated much authority in these matters to cities and counties. State guidance is implemented by cities and counties through their comprehensive plans and zoning regulations, and, together with a plethora of special service districts, they provide municipal services to the region.

Despite the fundamental similarities, there are differences. Oregon provides firmer substantive and procedural direction than Washington, as reflected in the respective state planning laws. Most importantly, it requires all cities to adopt urban growth boundaries (UGBs) and all counties to protect farm and forest land outside the UGBs. Only large and fast-growing urban areas must have growth boundaries ("urban growth areas") under Washington law. An Oregon state agency, the Land Conservation & Development Commission, enforces the law and can withhold (or have withheld) transport and other state funds from cities and counties that do not comply with state planning requirements. Enforcement responsibility is more diffuse in Washington.

It is Metro, however, that most sharply distinguishes the Oregon from the Washington portion of the region. Metro is the nation's only popularly elected regional government. It has no jurisdiction in Washington and no counterpart on the Washington side. Metro's charter, adopted by voters in 1992, charges its seven-member council to protect the region's quality of life and makes growth management its principal function. The charter required Metro to adopt a 50-year Future Vision and a long-range Regional Framework Plan with which city and county comprehensive plans must comply. Metro has authority to levy taxes (it levies property taxes and excise taxes) and to enforce its planning requirements. Like cities and counties, Metro must comply with state land-use regulations. There are no formal, governmental links that span the Columbia River to connect the Oregon and Washington parts of the region. But there are many inter-governmental committees and commissions, generally focused upon trade, transport and planning. Representatives of Vancouver and Clark County have official positions on Metro's planning and transport committees to advise the Metro Council.

The principal challenge to sustainable development in the region is the low-density, automobile-dependent development pattern that emerged in the decades following World War II. This post-war pattern extended out of dense centres served by streetcar systems established early in the 20th century. Federal subsidies for single-family housing and highways, together with 1920s zoning regulations to separate residential from employment uses, yielded low-density development heavily reliant upon the private automobile. Prior to zoning revisions required by state planning laws adopted in 1973 (Comprehensive Land Use Planning Co-ordination Act, Oregon) and 1990 (Growth Management Act, Washington), residential zoning in the suburbs set large minimum sizes for new subdivisions. As late as 1978, the average minimum size for a new residential subdivision lot in the Metro urban growth boundary (outside the downtown Portland area) was 13 000 ft² (Ketcham et al., 1991). A number of suburban cities in the region prohibited apartments. Instead of requiring a connected system of streets in new subdivisions, cities allowed developers to establish cul-de-sac communities that funnelled auto trips onto state highways.

Few cities and no county in the region had a comprehensive plan to guide zoning prior to the mid-1950s. Residential development was haphazard and uncoordinated, led by private developers rather than by public investment. The public role was to accommodate whatever the private sector built. Retail commercial development was also unplanned and haphazard, resulting in dispersed commercial services along state highways. The scatter of retail services was exacerbated in the Washington portion of the region by reliance upon a state sales tax, which led to uncoordinated competition among local governments for retail uses that generated high property taxes.

Declining local revenues for infrastructure and statutory limitations on traditional local government techniques for funding infrastructure have also slowed regional efforts to rebuild suburbs. Voters in Oregon and Washington have imposed limitations on property taxes through the initiative process. Legislatures in both states have imposed limitations on the imposition of local sales, real estate taxes, systems development charges and tax-increment financing (the principal urban renewal financing tool). Greater auto and truck (lorry) fuel efficiency and diminished spending on gas (petrol) in the region have reduced state and local gas tax revenues to the point where state and local governments cannot keep pace with the maintenance and capital needs associated with population and employment growth.

Migration of ethnic populations within the region also presents challenges for land use and transport planning. In many US cities, people with lower incomes have concentrated in urban centres and the affluent have migrated to the suburbs. Portland and Vancouver experienced this post-war phenomenon, with a steady decline in density (Portland). Then, in the 1990s, the migration reversed. In part because of the region's growth management strategy, the affluent began to return to the central city, attracted by urban amenities and easy access to transit and employment. A chain of causation followed: conversion and redevelopment of low-income downtown housing to condos and high-end apartments; gentrification of the old streetcar neighbourhoods near the central city; and forced migration of lower income ethnic populations to far suburbs in search of affordable housing. The region's outlying suburbs are underserved by its radial transit system. This is one reason why the number of cost-burdened households in the region (renters who spend more than 50% of household income on housing and transport) is predicted to increase significantly over the next 20 years (Metro, 2010a).

Growth management policies in the two states

Fortunately, the specific responses of both the states and the local governments served sustainability objectives as well as farmland protection objectives. Oregon initiated a dramatic shift in its growth management policy in 1969, before the challenges described above were appreciated. Oregon policy makers were responding instead to the spread of exurban development and the consequent loss of agricultural and forest land. The governor at the time, Tom McCall, worried that Oregon would become the centre of a megalopolis ranging from Seattle to San Francisco, "committing some of the richest farmland in America to supermarkets and suburbs".

In 1969, Oregon's legislature enacted comprehensive planning requirements, with general policy guidance, which required every city and county in the state to have a comprehensive land-use plan that met state objectives relating to the preservation of agricultural lands prescribed in the bill. However, no state agency was charged with managing the programme; there was no significant source of funding to assist cities and counties with the development of comprehensive plans; and the enforcement mechanism – assumption of planning by the state if a local government refused to comply – was politically unpalatable. In 1973, the 1969 legislation was overhauled. The resulting Comprehensive Land Use Planning Co-ordination Act (Oregon Revised Statutes, Chapter 197) established the Land Conservation and Development Commission to manage the programme, gave it money to distribute to cities and counties to support their planning efforts, and authorised the agency to withhold transport and other state funds from local governments that did not comply. The act also directed the agency to adopt state-wide planning goals, which have the force of law, for city and county plans. By 1975, the new goals were in place. By 1985, all cities and counties had plans and ordinances that met the planning goals. In 1973, the legislature also adopted Senate Bill 101, which significantly strengthened the exclusive farm use (EFU) zoning statutes, which awarded tax reductions to owners of farm and forest lands.

Of the new state-wide planning goals, the two that most influenced development patterns are Goal 14, which required all cities (and Metro) to adopt urban growth boundaries (UGBs), and Goal 3, which required counties to zone agricultural land outside UGBs for farm use. The principal policy objective was protection of farmland in the Willamette Valley. In the first decade of the programme, its managers gave priority to the establishment of UGBs and zoning to protect farmland outside the UGBs. In 1992, with the adoption of new policy linking land use and transport (Oregon Department of Land Conservation & Development, 1992), efficient use of land to make urban areas liveable and sustainable emerged as priority objectives of UGBs. Goals 14 and 3 virtually stopped exurban development and focused development in existing urbanised areas. Other goals reinforced the effects of these goals. Goal 11 (public utilities and services) stemmed the extension of sewer and water services outside UGBs. Goal 9 (economy) required local governments to develop economic development strategies within UGBs. Goal 10 (housing) required cities, counties and Metro to change zoning regulations to ensure the availability of the housing types needed by current and future residents.

Washington's response came in the late 1980s. By that time, policy makers everywhere had begun to understand that low-density, auto-oriented development patterns threatened not only agricultural lands, but also the sustainability of cities and the quality of urban life. Washington's Growth Management Act (GMA) of 1990 contained many of the planning concepts of the Oregon programme, including the fundamentals: containment of urban development within urban growth areas (UGAs) and protection of

farmland and other resources outside UGAs. Unlike Oregon, the Washington legislation did not require all cities and counties to plan to the new state standards. Instead, it concentrated on areas of large population and high growth. Vancouver and Clark County were among the local governments immediately subject to the GMA. The Washington programme places higher priority on protecting natural areas than the Oregon programme and its governance is less centralised. Vancouver and Clark County have revised their comprehensive and implementing regulations to comply with the GMA. Both local programmes have been found to comply with the act. The act calls for periodic updates to local plans to ensure continued compliance as growth occurs. Both local governments have updates under way.

2040 Growth Concept

In Oregon, the 25 cities and urbanised portions of the three counties within Metro have comprehensive plans and land-use regulations under the state-wide planning programme. The cities and portions of counties within Metro must also comply with Metro's Regional Framework Plan (adopted in 1997) and its functional plans. The Framework Plan contains the region's overall growth management strategy, the 2040 Growth Concept (Figure 4.11), adopted by the Metro Council in 1995. The cities and counties concerned began to implement it shortly thereafter. The Growth Concept emphasises a compact, pedestrian-friendly and transit-supportive development pattern. Metro has moved towards this pattern by merging land-use and transport planning, the two largest public influences on development. The strategy is to concentrate high-density residential uses and mixed-use development in 40 centres, 33 light rail communities and 400 miles of transit corridors that connect the centres by public transport. High-capacity transport connects eight regional centres with the central city and each other. Regional centres are centres of commerce and public services for a population of several hundred thousand. Bus service links regional centres with the central city and with 31 "town centres" which provide local services for tens of thousands of people within a three- to five-mile radius. "Main streets", at a finer grain, are commercial service hubs within residential neighbourhoods.

The Regional Framework Plan provides policy guidance for the Growth Concept. It involves six sustainability and liveability outcomes: vibrant communities, economic competitiveness and prosperity, safe and reliable transport, minimised contributions to global warming, clean air and water, and shared benefits and burdens. Specific policies for urban form and design, urban expansion, economic and housing opportunities, the transport system, parks and green spaces, and habitat guide the choice of implementing regulations and actions. All are components of the Framework Plan.

Cities, counties and service districts implement the Growth Concept and their own comprehensive plans. The Urban Growth Management Functional Plan (UGMFP), adopted by the Metro Council in 1996 with the support of the region's local governments, converts the policies of the Regional Framework Plan into regulations for city and county zoning ordinances. The provisions of the UGMFP address growth management issues: Title 1 requires each city and county to provide through zoning a minimum residential capacity which represents its share of the region's capacity; Title 3 requires each city and county to limit development in floodplains, water area and riparian areas; Title 4 identifies regional employment areas and requires cities and counties to protect industrial areas from conflicting uses; Title 6 specifies densities and a mix of uses for the region's centres, corridors, main streets and light rail communities.

Emphasis on protection of farmland in the early years of the planning programme had an unintended consequence for the expansion of Metro's UGB. State law required that Metro take farmland into the UGB only as a last resort. Consequently, most of the land added to the Metro UGB in the 25 years following its establishment was rural residential land. The resulting exurban development pattern proved very difficult to urbanise and the steep topography was not conducive to transit. Metro and the cities and counties of the region proposed legislation to address this issue in 2007. The resulting legislation allowed the region to identify the best land to urbanise – even if it is farmland – in exchange for agreement not to include the region's most important farmland for 50 years. Metro and the three counties with land outside the UGB then established a system of urban and rural reserves. They designated 266 600 acres of rural reserves and 28 250 acres of urban reserves in 2010. The urban reserves, composed of flat land in large, undeveloped parcels, will be relatively easy to urbanise efficiently. The region expects to accommodate a 77% increase in population over the next 50 years with an 11% increase in its urban footprint (UGB) (Metro, 2010b).

The Metropolitan Greenspaces Master Plan calls for a region-wide system of connected parks, trails, green spaces, habitat areas and open spaces. Citizens have supported the system by approving two bond measures (1996 and 2006) authorising a combined total of USD 364 million in general obligation bonds for the acquisition of parks and green spaces. To date, Metro has purchased more than 11 000 acres and expects to acquire several thousand more (Cotugno, 2011).

The Regional Transportation Plan (RTP) calls for a multi-modal system that supports, and is supported by, the development pattern defined in the 2040 Growth Concept. It provides for expansion of the light rail system to connect regional centres and to stimulate private development along transit corridors. It is also an equity tool to reduce the cost of transport in parts of the region where households are "cost-burdened". Cities and counties adopt transport system plans (TSPs) to implement their comprehensive plans. The TSPs must be consistent with the RTP. The Regional Transportation Functional Plan (RTFP), adopted by the Metro Council in 2000 with the support of the region's local governments, converts the policies of the Regional Transportation Plan into regulations for city and county TSPs.

More compact urban form

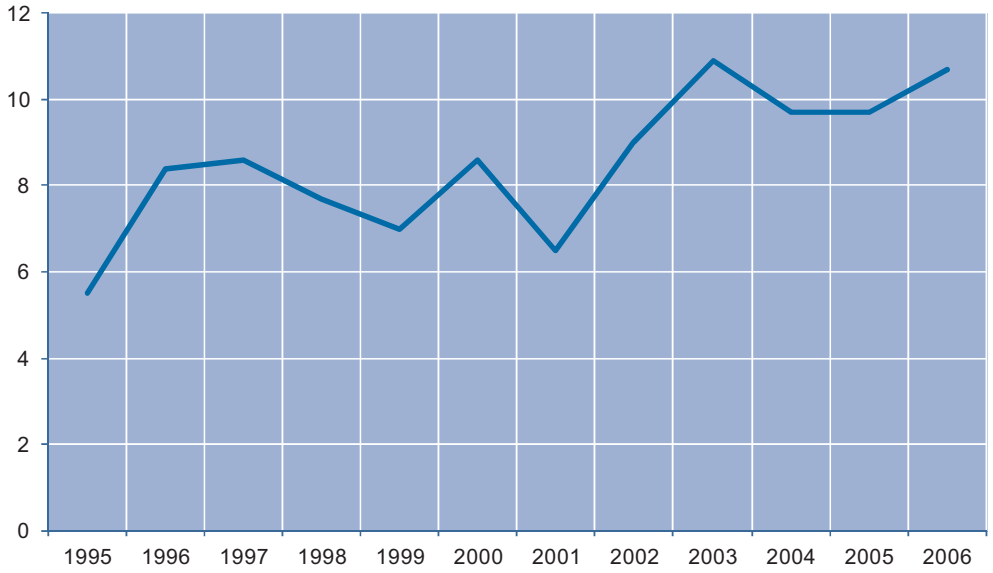
Development is now shifting from the post-war low-density, auto-dependent pattern to a higher density, compact form. Density in the region (including Clark County) has risen from 3 000 persons per square mile in 1998 to 3 333 per square mile in 2007 (Texas Transportation Institute, 2009). Density in the city of Portland was 4 000 persons per square mile by 2010 (581 000 on 145 square mile) (City of Portland, 2009). Between 1980 and 2000, the city of Portland grew as fast as its suburbs, by about 43%. In the same period, Seattle grew by 14% and its suburbs by 46%, and Denver grew by 12% and its suburbs by 47% (Lewyn, 2007). Each person moving into the Washington, D.C. metropolitan area used 480 yards of space in 2000, while each person moving into the Portland metro area used 120 yards (Masek and Lindsay, 2000).

In terms of local authorities' zoning practices, minimum sizes for new lots in local zoning ordinances have dropped significantly. Neighbourhoods can accommodate more residential units (higher density) and contribute to compact city goals. The size of lots for new dwellings averaged 4 000-4 700 ft² in 2001-2006, compared to 5 700 ft² from 1997 to 2001 (Metro, 2009). Following adoption of the 2040 Growth Concept, average density

has risen from 5.5 to 10.7 units per acre within Metro's UGB (Figure 4.9). In 1995, 6% of newly built units were attached dwellings and dwellings on small lots but by 2006, they represented just under 50% (Metro, 2010a). The region's housing mix is moving dramatically towards multi-family dwellings (Metro, 2010a). The change was driven partly by the market (households that prefer smaller homes) and partly by public intervention (the 2040 Growth Concept). In the wake of the Growth Concept, local governments revised their zoning ordinances to allow a greater mix of residential, retail, commercial and office uses.

Figure 4.9. **Average density of new development in the Portland Metro UGB, 1995-2006**

All new dwelling units (single family and multi-family units per net acre)



Source: Metro (2010), "Building a sustainable, prosperous and equitable region", Metro, Portland, OR, *www.oregonmetro.gov*, accessed 25 November 2011.

Employment areas have also become more compact. The density of non-industrial buildings has increased substantially since 2000 (Metro, 2009). The region has fewer square feet of retail floor space per capita than the US average (16 versus 22 ft²). Portland also has higher sales per square foot of retail floor space per capita than the US average (USD 12 000 versus USD 9 190 a year). Of the nation's 50 largest metropolitan areas, only two – New York and San Francisco – have a higher share than Portland of regional employment within three miles of the central business district (Cortright, 2007).

An indication of the region's growing compactness is the rate at which new development is occurring through "infill" (more units constructed on an already developed lot) and "redevelopment" (a structure is removed and another takes its place). For convenience, Metro conflates these two measures as "refill" and measures the refill rate (the percentage of new development on already developed land in a year). In 2009, Metro found that the refill rate for new industrial development was 20%. For non-industrial use, 52% of new capacity was built on developed land (Metro, 2009). The residential refill rate has climbed steadily, from 30.4% during 1997-2001 to 33% during 2001-2006 (Metro, 2009). Metro predicts the rate will rise to 38% from 2010 to 2030

(Metro, 2010a). If it does, the UGB will be able to accommodate 11 300 additional dwellings without expanding the UGB. Refill rates are highest in the central city and lowest in suburban residential neighbourhoods. The city of Portland's share of the region's new housing units has grown dramatically. During the period of migration to the suburbs (1960-1990), only 3%-5% of new units built annually were in Portland. In the 15 years since the adoption of the 2040 Growth Concept, Portland has accounted for 36% of new units built annually. Since the beginning of the current recession, Portland's share has risen to nearly 50%.

Green infrastructure: a solution to address multiple objectives

The City of Portland promotes green infrastructure, which is defined as interconnected natural systems and/or engineered systems that use plants and soil to slow, filter and infiltrate runoff close to its source in a way that strengthens and mimics natural functions/processes. The 2005 Portland Watershed Management Plan (PWMP) provides the scientific framework for watershed improvements with an emphasis on hydrology. A big part of this is understanding that restoring the hydrologic cycle has a significant role in watershed health and protects both Portland's piped infrastructure investment (capacity) and its rivers and streams at less cost. Green streets and eco-roofs are among the most typical green infrastructures:

- Green streets consist of swales, linear facilities that collect and often convey storm water. Storm water flows into the swale and soaks into the ground as the vegetation and soil filter pollutants. This keeps storm water from flowing to sewers or into rivers and streams. It also replenishes the groundwater that feeds cool, clean water to rivers and streams. The first curb extension was built in 2002 (Figure 4.10). There are already more than 900 green street facilities in Portland. It was successful partly because the initiative was started as a pilot to be removed if unsuccessful. Different designs were then developed for different situations. Green streets have also enhanced pedestrian safety by shortening crossing distance and some also say that it has the potential to slow traffic. Neighbours feel that they are a real asset to the neighbourhood because they provide water quality and habitat benefits and increase property values.
- More and more eco-roofs are built in Portland. As of 1 July 2010, Portland had a total of 250 projects for over 12 acres. Since 2008, nearly 100 incentive projects have been accepted for an additional 5.6 acres, despite the recession and economic downturn. The approach seems to be working. Incentive funds have been awarded and interest is growing.

Less auto use, more public transport, biking and walking

The mid-1970s brought a shift in transport policy. The initial segments of a regional freeway system had been built, but there were conflicting visions for the expansion of the region's transport system. Metro's predecessor had adopted a major freeway expansion plan developed by the Oregon Department of Transportation. TriMet, the public transport agency established at that time, wanted significant expansion of the transit system. The city and county leadership decided to reallocate federal funds from freeway expansion to the first light rail line east to Gresham (11 miles), which opened in 1986. Since then, Metro and its regional partners have developed a regional light rail and streetcar network and an expanding system of bus, bicycle, pedestrian and trail projects to support a more compact development pattern. Westside Light Rail (18 miles) opened in 1998, light rail

Figure 4.10. **Portland's green infrastructure: the first curb extension in 2002**

Source: ©Environmental Services, City of Portland Oregon, United States.

to the airport (5.5 miles) in 2001, light rail to the north (5.8 miles) in 2004, and the region's first commuter rail line (14.7 miles) in 2008. Light rail to the south has secured federal funding and is due to begin construction in 2013. TriMet daily ridership stood at 300 000 in 2008. The city of Portland's streetcar system, integrated with the light rail system, has four miles of lines with another eight miles under construction.

Most residential refill is multi-family housing, often as part of transit-oriented development (TOD). Portland prioritises transport projects that support refill and investment in TODs to achieve higher density and greater mix of uses than prevailing market conditions would support in terms of developers' construction costs and income from rent or sale (Metro, 2011). The Pearl, Portland's new high-density, transit-oriented neighbourhood, has 7 200 new dwelling units and 4.6 million ft² of new commercial space along the streetcar line. In other parts of the city, TODs built between 1999 and 2009 added 2 596 new units. Portland's TOD with streetcars has stimulated brownfield redevelopment in the centre of the metropolitan area. Light rail stations have concentrated more than USD 6 billion of residential and commercial development since the first line opened in 1986. The average floor area ratio (FAR) was 0.65 above the average outside station areas. Low-to-moderate value properties near the stations were redeveloped at twice the rate reported for similar properties along the light rail corridor but away from the stations (Jordan and Hovee, 2008).

Interestingly, Portland's mass-transit policies created the need for streetcars and led to the first national production of modern streetcars. Ten years ago, Portland became the first city nationally to reinvest in streetcars, eventually building the line from the Pearl through the city centre to the South Waterfront. That line relied on European-built

streetcars. However, state and federal politicians, disappointed at missed opportunities to manufacture light-rail lines in the United States, insisted that a domestic company begin making streetcars. They turned to Oregon Iron Works, Inc., and its subsidiary, United Streetcar. The company's first batch of streetcars is being built for a 3.3-mile eastside extension in Portland, and seven cars are slated for a project in Tucson, Arizona.[19]

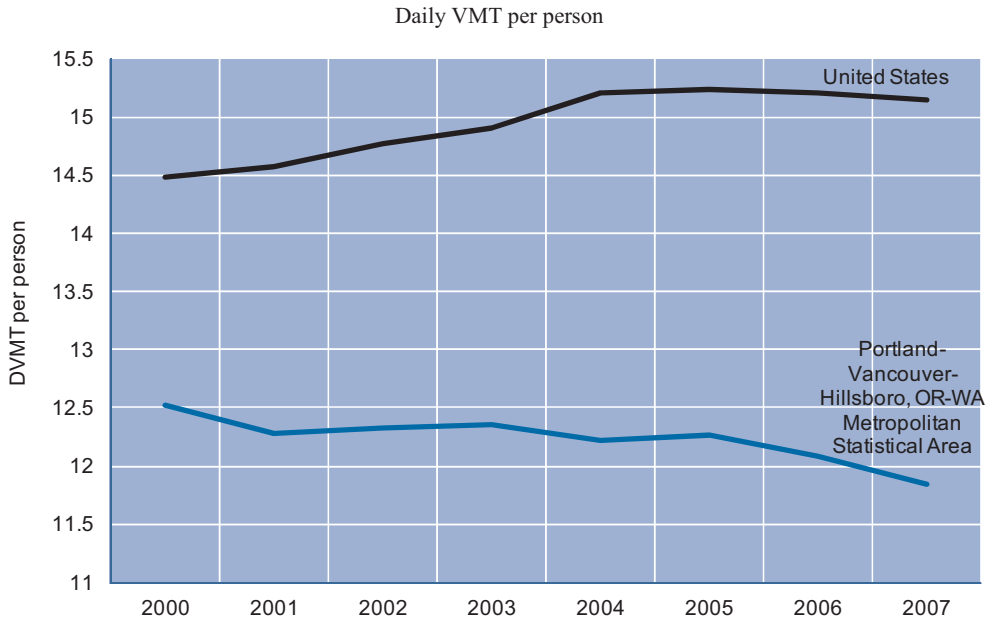
Commuting by bicycle has grown within the Metro UGB (Metro, 2009). In Portland, it grew dramatically from 1.8% to 4.2% between 2000 and 2006. The number of summer trips across the four principal bridges to downtown Portland from the east side of the Willamette River rose from 2 855 in 1991 to 14 563 in 2007, a 410% increase (Portland Bureau of Transportation, 2008). On 11 February 2010, the Portland Bicycle Plan for 2030 was adopted. The new plan, which sets the stage for vastly expanded bicycle transport in Portland, supersedes the 1996 plan.[20] It lays out key principles such as attracting new riders, forming a denser bikeway network and increasing bicycle parking. Recently, shops and restaurants have asked for car parking spaces in front of shops to be replaced by bike parking. Portland ranks first among the 51 largest US cities for bike commuting (Alliance for Biking & Walking, 2010). Pedestrian commuting has risen only modestly since the adoption of the 2040 Growth Concept and the Vancouver Comprehensive Plan. As a result of these trends residents have lower transport costs (7% less than households in other urban areas of the western United States in 2005, based on data from the Bureau of Labor Statistics) and a higher percentage are engaging in recommended activity levels (Metro, 2009).

Local Action Plan on Global Warming

The city of Portland adopted a strategy to reduce carbon dioxide in 1993 as part of the international Urban CO_2 Reduction Project co-ordinated by the International Council for Local Environmental Initiatives (ICLEI). It aimed to reduce the region's 1988 CO_2 emissions level, estimated at 10.1 million metric tonnes (mmt), by 20% by 2010 (emissions were predicted to reach 13.9 mmt in 2010). One element of the strategy was a 10% reduction in vehicle miles travelled (VMT) per capita compared to 1995 levels. To this end, the plan called for increased redevelopment; completion of Westside Light Rail and new light rail lines to the south and north; an increase in daily transit from 200 000 to 690 000 trips; ridership increases in other modes; and transport demand management. In 2001, the city and Multnomah County adopted a joint Local Action Plan on Global Warming (Multnomah County-City of Portland, 2001). While Portland's efforts in these directions failed to meet their targets, the improvements made helped to reduce carbon emissions to 1% below 1990 levels by 2008, despite rapid population growth (City of Portland, 2009). The city and county updated the action plan in 2009. It calls for an interim goal of a 40% reduction in emissions by 2030, with specific actions in eight areas. Action Area 2, urban form and mobility, calls for "20-minute neighbourhoods" in which 90% of city residents and 80% of county residents can walk or bicycle to meet all basic, non-work needs and a 10% reduction in VMT per capita from 2008 levels (City of Portland, 2009).

Growth in total VMT has levelled off despite significant growth in population (Metro, 2009). This is due largely to the drop in VMT per capita and declining travel distances; daily VMT per capita in the Portland metropolitan area peaked in 1996 and is now well below the US average (Figure 4.11).

Figure 4.11. **Daily VMT per capita in Portland metropolitan area**



Note: Travel data only refer to the principal arterial functional systems.

Source: Based on data from US Department of Transportation, Highway Performance Monitoring System (HPMS).

4.4. A comparative assessment

This section, based on the OECD survey and the case studies, presents a comparative assessment from three perspectives: first, how current policy practices respond to different local circumstances; second, whether appropriate policy instruments are utilised to address multiple policy objectives, including environmental and economic sustainability; and third, whether current policy practices incorporate complementary strategies to minimise the potential adverse effects of compact cities.

How do policy goals and strategies respond to different local circumstances?

As expected, the survey and the case studies illustrate different local urban policy contexts and different policy responses. Table 4.5 simply underscores that the local context and the major policy responses of the five case study metropolitan areas differ greatly. However, a comparative assessment of current practices reveals that there are several key "missing links" between local circumstances and policy responses.

Table 4.5. **Local context and policy instruments of the case study metropolitan areas**

	Melbourne (Australia)	Vancouver (Canada)	Paris (France)	Toyama (Japan)	Portland (United States)
Area studied	Melbourne Statistical Division	Metro Vancouver	Île-de-France	Toyama Prefecture	Four counties in Oregon and Washington states
Population[1]	3.8 million (2007)	2.4 million	12.0 million	1.1 million (2007)	1.8 million
Urban policy challenges	Deteriorated urban centres in 1980s; rapid population growth	Growth to advance liveability and sustainability; housing affordability	Protecting open space and agriculture; personal mobility; sufficient housing supply for growth	Maintaining public service at an affordable cost under declining population	Protecting agricultural land
Major policy instruments	– "Melbourne 2030"/ Melbourne@5 Million (State of Victoria) – Urban Growth Boundary (State of Victoria) – Deregulation for mixed land use, incentives to convert offices to residences (City of Melbourne)	– Regional Growth Strategy – Urban Containment Boundary – Frequent Transit Network – Laneway housing, secondary suites, basement suites	– SDRIF 2008 – Minimum density requirement	– 2008 Master Plan – Incentives for development along public transport corridors – Transport (LRT) investment using PPPs	– 1973 state law – Urban Growth Boundary – 2040 Growth Concept – Portland Streetcar – "20-minute neighbourhood" initiative

Notes: 1. Population is based on the case study areas. 2. For Melbourne, a new metropolitan planning strategy is to be established over the next two years.

Policy responses to different population sizes

The case studies concerned metropolitan areas with different population sizes. It was clear that the policy tools appropriate for small to medium-sized metropolitan areas may differ from those for large metropolitan areas, although it did not become clear what the best mix of policy tools would be in a given context. For example, the Toyama case study shows that smaller metropolitan areas face a serious challenge for maintaining their public transport system,[21] because its feasibility depends on the size of the region's population. However, such areas seem to have fewer policy options because their budgets are smaller. This suggests the need for policy options that are better adapted to the local contexts of smaller metropolitan areas. For example, less expensive public transport systems (such as bus systems, light railways, etc., rather than undergrounds/subways), as well as innovative financing options, need to be explored. Likewise, large metropolitan areas' urban-rural linkage policies and open space policies should be developed differently from those for smaller metropolitan areas. The distance to urban fringes tends to be greater in large metropolitan areas, assuming that the density of the built-up area is uniform. Thus, the promotion of urban-rural linkages (urban agriculture, renewable energy strategies) is a greater challenge in large metropolitan areas, as the trip distance to rural areas is longer. Large metropolitan areas also need more careful consideration of how to maintain and enhance open space and green areas in urban centres under strong development pressure. While some interesting examples were found (e.g. Toyama), few policy practices seem adapted to population size.

Policy responses to different trends in urban growth

As the case studies illustrate, compact city policies in Melbourne are driven by rapid population growth whereas those of Toyama are dealing with a decreasing population. Compact city policies are relevant to both but appropriate strategies and policy tools may differ. The relevant question is how to adapt policy practices to different trends in urban growth.

A comparative assessment of current policy practices finds a wide range of policy instruments for metropolitan areas with moderate urban growth. In contrast, it reveals the lack of compact city tools both for rapidly growing and for declining areas. For example, a challenge identified for Melbourne is that, although regulatory tools are extremely important for preventing uncontrolled urban expansion, such measures tend to be less supported politically. Moreover, while the effectiveness of regulatory tools alone under very strong development pressures is being questioned, there appear to be few market-based tools. In a region with a shrinking population such as Toyama, measures to contain urban development may seek to avoid further urban sprawl and guard against inefficient public service delivery. However, such measures may be politically difficult because policy makers may fear that this will weaken competitiveness and accelerate the hollowing out of the population.

Policy responses to changes in industrial structure

The industrial structure of a metropolitan area also creates a very important local context. For example, in metropolitan areas where heavy industries are the main economic drivers, retaining industry is a priority and conversion of vacant brownfields to residential land may not be desirable. The OECD Compact City Survey reveals that most countries have introduced tools to redevelop brownfields in existing urban centres. However, few policies considered maintaining manufacturing industry near urban centres to keep jobs closer to residents. Two exceptions were Portland and Vancouver, which recognised the benefits and were discussing ways to reconcile the need for residential development near industrial sites while maintaining the competitiveness of their manufacturing industry.

Other important local contexts to be considered

In addition, the assessment also found that other local contexts need to be considered. First, while this study did not look at compact city policies in developing countries, there are significant differences in the urban contexts of developing and developed regions (Box 4.1). Second, compact city policies have not yet addressed effectively large metropolitan areas with an already very dense urban structure, such as those often found in Asian countries. Are densification strategies no longer necessary in such metropolitan areas? Policy experience in Hong Kong, China, which has struggled to maintain density while improving quality of life, might provide some ideas (Box 4.2). Third, landscape plays a role. Whereas metropolitan areas surrounded by natural land-use restrictions such as mountainous and coastal areas tend to contain urban development successfully, flat urban terrain may allow more urban sprawl and generate more intense competition between urban and rural land use. Policy tools may need to reflect such differences. Moreover, coastal metropolitan areas need to pay special attention to the location of density, as areas close to water are vulnerable to climate change and more affected by natural disasters such as hurricanes and tsunamis. Finally, cultural aspects need to be respected when determining what urban form should be adopted. Peoples' preferences as

regards urban form differ across the world, in part because of cultural differences. For example, living in high-rise apartments has been widely accepted in Korea, which may be why urban population densities in metropolitan areas are very high in that country. While Paris has the highest density profile, the region has not accepted high-rise buildings, especially in the city of Paris. Culture also affects modes of transport. In North America, for instance, private cars seem to be valued as more than just a means of transport; people there are less inclined to use trains and prefer to commute by car. Such cultural contexts may change over time, but not rapidly. To what extent and how policy makers take cultural contexts into account when designing policy instruments can substantially affect compact city policy performance.

Box 4.1. **Application of the compact city concept to developing countries**

The compact city concept is valid for sustainable urban development in developing regions. However, its application should take into account some significant differences in the urban contexts of developing and developed regions. These include: *i)* faster demographic, spatial and economic urban growth; *ii)* higher urban density; *iii)* generally inefficient regulatory, institutional and technical frameworks; *iv*) limited financial resources for urban investments; and *v)* the existence of many informal settlements. Chronic financial constraints make it hard for these regions to finance urban infrastructure investments in higher-density areas. Furthermore, low-quality residential areas often extend into geographically complicated areas (e.g. gullies, hillsides, riverbanks); this increases investment costs (Burgess, 2000). In such urban contexts, good design of compact city policies is crucial. While dense urban form is still desirable, measures must be taken to improve urban quality of life and be combined with measures to tackle excessive density, which may aggravate congestion, environmental conditions and poverty.

In spite of these challenges, several cities in developing regions are striving to adopt some compact city concepts in their sustainable urban development schemes. These are still in the initial stages of policy adoption and implementation. Continuing attention to their implementation processes and outcomes will be important in order to draw lessons from their efforts.

Amman, the Hashemite Kingdom of Jordan

Since its independence in 1946, Amman has faced severe land shortages for development combined with dramatic population growth, an increase of 20-fold in 56 years (Abu-Dayyeh, 2004). The Amman Plan (2008) contextualises the idea of compact urban growth for sustainable development, encouraging both infill and green development while promoting mixed land use, public transport, a safe and convenient pedestrian environment and conservation of the cultural heritage (Greater Amman Municipality, 2008).

Metropolitan cities in South Africa

In South Africa, apartheid policies favoured low density and a fragmented spatial form aligned with power (i.e. those with power had the favourable locations and spaces for residences and work places). A modern urban development trend from the west that gave preference to independent, roomy spaces for individuals also contributed to spatial expansion (Dewar, 2000). In addition, fragmented responsibilities and minimal co-ordination among local governments facilitated sprawling development. In 2000-2001 unified metropolitan authorities were created to promote urban integration and to realise “one city, one tax base” (South African Cities Network, 2011). Some metropolitan governments are now adopting transit-oriented development (TOD) in their urban development scheme, encompassing elements of the compact city concept, and intend to adopt high density and mixed land use in the rapid transit bus corridor.

Source: Based on an interview with the World Bank.

Box 4.2. **The density strategy of Hong Kong, China**

Although it was not developed following the principles of sustainable development, Hong Kong, China's mechanism for managing densities is extremely thorough. It is interesting less for the level of densities achieved, which are certainly impressive, than for the interlinking of the instruments put in place and the convergence of varied sectoral policies. Hong Kong, China's "concentrated deconcentration" strategy aims to reduce high densities in dilapidated neighbourhoods, where urban quality is mediocre (old built environment, lack of facilities, lack of green spaces), by concentrating development in central neighbourhoods and creating very dense new cities. The densities allowed in these new cities are greater than those in the already very dense existing urban fabric. In the existing fabric, the aim is to substantially reduce densities, but above all to improve living conditions: to this end, regulations call for very tall buildings in order to free up ground space while maintaining a certain density (the principle of the Athens Charter): the allowable densities are higher when the covered area is smaller. Everything is done to encourage high densities in the sectors with the best subway and train coverage: densities are in relation to the distance to stations, rail companies can build buildings (residential or otherwise) above their stations, etc. Cars are heavily taxed and their place in the city is deliberately restricted because they take up too much space compared to public transport. In Hong Kong, China, the desire to limit car dependency is justified less by environmental issues than by a concern to maximise land usage.

Hong Kong, China's economic, social, and cultural context makes this density policy non-reproducible, for example, in Europe. One key difference to bear in mind when comparing Hong Kong, China to places in Europe, lies in land and building prices. In Hong Kong, China, space is a source of wealth (and belongs to the government, which draws substantial revenue from it); the amount of building land is reduced, despite the fact that a large amount of demand could potentially be met. The public authorities thereby ensure that developers maximise the building capacities they receive.

Source: Fouchier, V. (2011), "Density implications regarding sustainable development", presentation to the OECD.

Are policy instruments being used to address multiple policy objectives?

The case studies make clear that innovative use of price mechanisms can be effective for co-ordinating different policy objectives, including economic growth. For example, in Portland, tax reductions for owners of farm and forest lands seemed to enhance the competitiveness of these land uses at the urban fringes. Toyama fully recognised in its master plan the economic benefits of compact city policies: more efficient public service delivery. Public investment in Toyama Light-Rail Transit was combined with fiscal incentives to guide private development within the urban centre and near public transport stations. While deregulation of land use played a crucial role in the revitalisation of Melbourne's central business district (CBD), it was combined with various economic measures, including grants for the conversion of offices to residential buildings. France recently introduced an interesting scheme for taxing development that does not meet minimum density requirements. Such innovative practices can greatly improve the effectiveness of compact city policies.

While these policy examples show the existence of policy instruments with multiple goals, they are still rare. One reason observed from the study is the technical difficulty of developing effective policy instruments that include price mechanisms. For example, while economists argue that it is more effective to use price mechanisms such as a fuel tax to control urban sprawl than it is to use urban growth boundaries, few policy practices

of this kind were found. First, designing a tax system is not easy and raises a number of questions: who needs to pay? What is a fair tax rate? Who should collect it? The impact on low- and medium-income households as well as on transport-related industries needs to be carefully examined. Due to the complexity it might be hard to get taxpayers to agree to pay. More studies are needed in order to understand the impacts of policy instruments with diverse goals and to develop more effective measures. At the same time, pilots and experimental projects should be encouraged.

The analysis also shows that many countries and metropolitan areas still conceive compact city policies solely in terms of environmental policy (that is, simply as a way to preserve agricultural and natural land). Consequently, many policy instruments are still traditional land-use measures, which are mostly regulatory. In fact, few policies explicitly make economic growth a policy goal. However, if compact city policies are viewed in a broader perspective, and include economic and social aspects, it would be easier for policy makers to develop such policy instruments because compact city policies could complement and even replace existing economic and social policy instruments. In sum, it is essential to encourage policy makers and experts to see compact city as a multi-objective policy approach.

How do current policy practices incorporate complementary strategies?

The study revealed that, to deal with the potential adverse effects of compact city policies, some case study regions incorporate policies to minimise them into the compact city policy package. Prominent examples include Portland's green infrastructure initiatives, which address the restoration of the hydrologic cycle and tackle urban heat islands, and Vancouver's EcoDensity initiative, which combines densification with the provision of affordable housing options.

So far, however, such practices are on a limited scale; these issues are viewed as general problems to be addressed and dealt with separately. For example, many cities use parking taxes/fees/charges to maintain the public parking facilities in urban areas. While in some cities they are utilised in order to discourage unnecessary private car use in urban centres, very few cities see them as part of a package of compact city policies. Similarly, although congestion charges/fees/taxes are also increasingly discussed as an urban policy tool, they tend to be designed and implemented simply as a tool to alleviate traffic congestion in urban centres. When combined with densification and public transport policies, for example, a package of policies could be complementary and more effective than those designed and implemented separately.

4.5. Conclusion

Overall, the comparative assessment underscored the need for developing three important aspects of compact city policies. First, the study identified several local contexts that current policy practices have not yet addressed appropriately, such as differences in population size, urban growth trends (very rapid or declining), industrial structure, landscape and culture. This confirms the need for policy makers to address "missing links" between local circumstances and policy response. Second, more diversified policy instruments can be an effective way to ensure the necessary multi-dimensional approach. For example, from a green growth perspective, the use of market-based instruments or price mechanisms should be encouraged and combined with other policy tools so that the policy package generates synergy between environmental, economic and social goals. This approach is particularly important from the viewpoint of

green growth. Third, the analysis illustrated the importance of incorporating a balance of policies to address potential adverse effects.

In addition, regarding local context, the exercise identified the need to study how compact city policies can be applied in rapidly growing metropolitan areas in developing countries. Although developing countries were beyond the scope of the study, compact city could be a sound, reasonable model for regions in developing countries as well if adapted appropriately. This should certainly be addressed in future studies.

Finally, while the OECD Compact City Survey and case studies represented the OECD's first attempt to collect policy practices in member countries, a continuation of such studies would help policy makers to benchmark their policies against those of other metropolitan areas and use the information gained to improve their policy design and implementation.

Notes

1. Policies include laws, policy documents (directives, plans, guidelines, etc.), subsidies, tax incentives and disincentives, reward programmes, etc.
2. Greenbelts inside cities to create open space rather than outside to separate them from the countryside should be considered an open space tool rather than an urban containment tool.
3. Hereafter, in this case study section, Melbourne Statistical Division is used to refer the Melbourne metropolitan area.
4. However, since the 2010 expansion included land to be protected for biodiversity and areas of encumbered land, such as drainage, the land available for urban purposes is approximately 26 000 hectares. If 26 000 hectares is used for the 2010 extension, the land within the urban growth boundary increased in eight years by 21%.
5. Hereafter, in this case study section, Metro Vancouver is used to refer the Vancouver metropolitan area.
6. For affordable housing provision, while Metro Vancouver has a mandate, every city in the Metro Vancouver also fulfils this role independently.
7. The resale prices are based on sales activity recorded through the MLS® by the Canadian Real Estate Association (CREA).
8. While this might be the cultural opinion, it is not the reality in the City of Vancouver: the data on housing tenure in the City of Vancouver indicates 52% are rental and 48% are owned.
9. For example, in 1994, the City of Surrey voted to reject the higher residential densities specified in the draft LRSP (Liveable Regional Strategic Plan).
10. The corporate target is to reduce emissions by 20% from the 1995 baseline by 2010. The community target is to reduce GHG emissions community-wide by 6% compared to projected levels by 2010.
11. Hereafter, in this case study section, Île-de-France is used to refer the Paris metropolitan area. More information about Île-de-France is available at: *www.iau-idf.fr*.
12. Three ring roads surround Paris: the *périphérique*, the A86 and the A104 (*Francilien*). The *périphérique* is the innermost ring and runs basically along the border of the city of Paris.
13. It is worth noting also that, in 2001, personal travel (recreation, shopping, etc.) exceeded the number of "required" trips (travel to work, etc.) for the first time. In the *Grande Couronne* (outer ring), less than 8% of inhabitants' travel is connected to Paris; travel is developing inside small residential catchment areas.
14. An agreement in 2011 between the state and the region, following public debate, has resulted in a combination of the two projects, for a total cost of EUR 32 billion.

15. Hereafter, in this case study section, the Toyama Prefecture is used to refer the Toyama metropolitan area.

16. According to the Residential Survey on Public Transport at Toyama City conducted in 1996, the "satisfaction rate" exceeded 50% for bus service frequency above two departures an hour.

17. Hereafter, in this case study section, the four counties mentioned above are used to refer the Portland metropolitan area.

18. Vancouver, Washington, is a city in the United States, with the same name as Vancouver, a Canadian city in British Columbia.

19. *www.oregonlive.com/portland/index.ssf/2011/07/portlands_1483_million_eastsid.html*.

20. Portland's original Bicycle Master Plan was created by Portland residents and city staff to keep Portland a bicycle-friendly city. It was adopted by Portland City Council in 1996.

21. In fact, large metropolitan areas face the same challenge in their suburbs.

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Chapter 5

Key compact city policy strategies

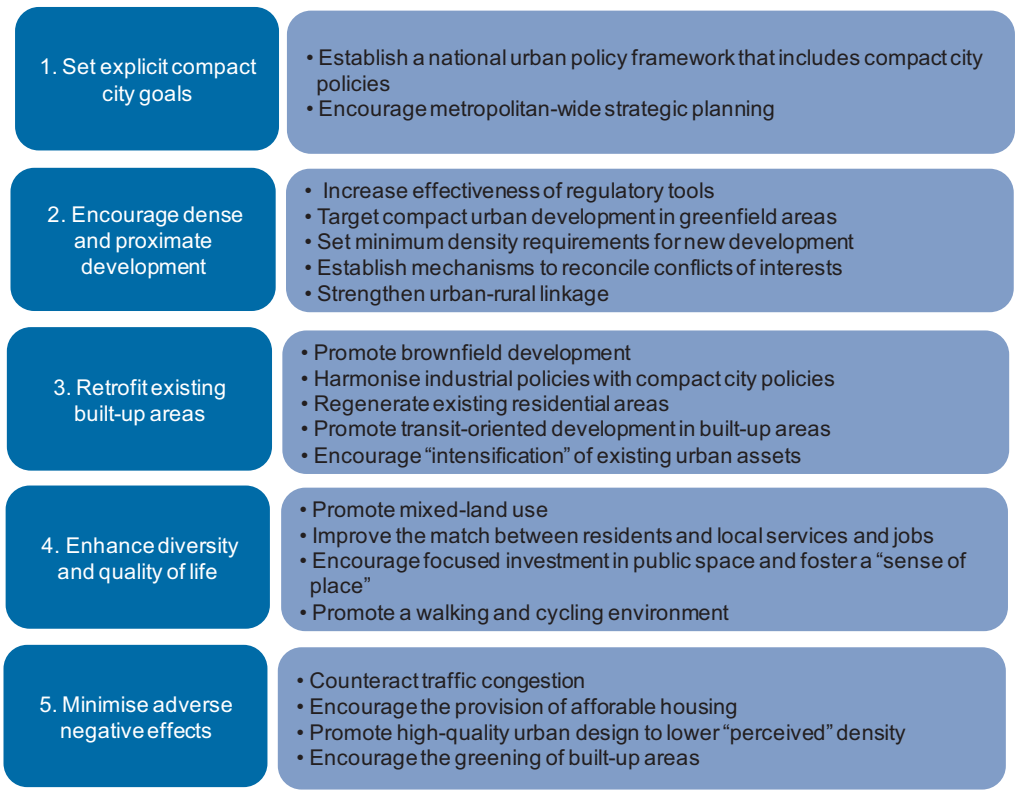
This chapter, based on the findings and assessments of current compact city policies in Chapter 4, proposes five key compact city policy strategies to be shared among OECD member countries: i) *set explicit compact city goals;* ii) *encourage dense and proximate development;* iii) *retrofit existing built-up areas;* iv) *enhance diversity and quality of life; and* v) *minimise adverse negative effects. Under the five strategies, 20 sub-strategies are also presented.*

5.1. Introduction

As the OECD Compact City Survey and the case studies illustrated (Chapter 4), there is no single, comprehensive compact city model that is applicable to all cities and metropolitan areas, because each has local circumstances that must be taken into account. Policy makers face the challenge of designing the best strategies and policy tools to address the specific, context-dependent attributes of a given metropolitan area. They also face the need to diversify policy instruments in order better to address multiple compact city objectives including environmental and economic sustainability. Moreover, it is essential to incorporate a balance of policies to address potential adverse effects in the policy package.

How can the policy makers in OECD countries address such challenges? This chapter, coupled with the following chapter on metropolitan governance, proposes key policy strategies to be shared among OECD member countries, based on the findings and assessments of current compact city policies in Chapter 4. It considers the following five strategies: *i)* set explicit compact city goals; *ii)* encourage dense and proximate development; *iii)* retrofit existing built-up areas; *iv)* enhance diversity and quality of life; and *v)* minimise adverse negative effects. Under the five strategies, 20 sub-strategies are also presented for consideration in metropolitan areas (Figure 5.1). The key strategies and sub-strategies are explained and several best practices are identified from the OECD Compact City Survey and the case studies.

Figure 5.1. **Key policy strategies and sub-strategies for the compact city**



5.2. Set explicit compact city goals

The first key strategy concerns a vision for a compact city. A vision with explicit compact city goals is crucial because long-term strategic planning can demonstrate the public sector's commitment, and this can encourage the private sector to invest in the vision.

Establish a national urban policy framework that includes compact city policies

The OECD Compact City Survey revealed that an increasing number of national governments have established a national urban policy framework that includes compact city policies (Chapter 4). This trend should be accelerated. A national urban policy framework could take various forms depending on the country's circumstances, from a legally binding planning document to an informal guideline. The core value is to signal to urban developers, citizens and sub-national governments that national urban policy is heading towards compact cities. Among a number of recent policy practices, Japan's Low Carbon City Development Guidance in 2010 is a non-binding policy document to encourage local governments to work towards low-carbon urban development (Box 5.1).

Box 5.1. **Japan's Low Carbon City Development Guidance**

The Ministry of Land, Infrastructure, Transport and Tourism formulated the "Guideline for Building Low Carbon Cities" in August 2010. To tackle global environmental concerns from the point of view of urban development, it encourages the following policies:

- rebuild urban structures so that urban facilities are more concentrated by regulating urban sprawl and by combining land-use regulatory measures with investment in public transport;
- encourage the reconstruction of buildings by districts, efficient use of energy and utilisation of unused and renewable energy; and
- promote preservation of green districts that absorb greenhouse gases and urban greening.

The aim of the guideline is to enable local authorities to effectively lower the levels of carbon emissions of a city as a whole by combining measures related to above three policies.

Source: Japanese Ministry of Land, Infrastructure, Transport and Tourism (2010), "The Guideline for Building Low Carbon Cities", MLIT, Tokyo.

Encourage metropolitan-wide strategic planning

Metropolitan-wide planning that includes explicit compact city goals is a strategy which national and regional/local policy makers should consider. This will call for: a clear compact city concept based on local circumstances; a comprehensive approach (with multi-dimensional goals); and identification of concrete tools. For example, metropolitan-wide planning should discuss: the location of urban development (growth areas) and its density; the link between urban development and public transport systems; matching between homes, local services and jobs; and concrete tools to achieve such

compact city outcomes. Besides, because improving cities is a long process, metropolitan-wide strategies should have both long-term and short-term goals.

The new Paris Master Plan (SDRIF) is interesting for its clear compact city goals, with minimum density targets and a wide variety of instruments (Chapter 4). Melbourne @ 5 Million, Melbourne's metropolitan-wide strategy, designated growth areas which concentrate new greenfield residential development and established the Growth Area Authority as an institution to help the development and planning of these growth areas (Chapter 4). Montreal's Master Plan is also a comprehensive metropolitan strategy with clear compact city goals. Stockholm's Comprehensive Plan has a municipal focus but sets a clear priority on inner-city development – with "building a city inward" as a development concept.

It is particularly important for planning to target the whole functional metropolitan area which may encompass multiple local government jurisdictions. Planning will help all the players in metropolitan areas (including local constituents and private investors) share the overall vision of a compact city. Wide stakeholder involvement and co-ordination among government levels are important in order to establish metropolitan-wide consensus on compact city policies and on the strategies best suited to implementing them. In this regard, Paris is a good example of the extensive participation of local stakeholders, including nearly 1 300 local governments, in the preparation of its Master Plan. The negotiations between the Île-de-France regional government and the state also offer important lessons (Chapter 4).

5.3. Encourage dense and proximate development

The second key strategy mainly targets greenfield development at urban fringes. Because urban structure changes slowly, compact city policies are most effective for new development. As most new development (particularly in fast-growing metropolitan areas) still takes place in greenfield areas on urban fringes that involve both urban and rural land use, compact city strategies at urban fringes are very important. They aim to ensure dense and proximate urban development in order to avoid low-density, mosaic and leapfrog development. With effective policy design and implementation, this strategy can lead to optimal land use on urban fringes, and thus protect agricultural land and natural areas and enhance rural economic development opportunities. The following sub-strategies are mainly derived from the case studies and can be considered as examples for other metropolitan areas.

Increase effectiveness of regulatory tools

While urban growth boundaries and greenbelts are often used for urban containment (Section 4.2), the effectiveness of such regulatory tools in preventing urban sprawl is debated. On the one hand, a study in Switzerland demonstrated that urban growth boundaries confined most development to building zones and promoted increased building density (Gennaio et al., 2009). On the other hand, it is argued that the greenbelts in London and Seoul failed to prevent sprawl and, in fact, aggravated it as strong development pressures generated leapfrog development, causing urban expansion to "jump the greenbelts". This resulted in long commuting distances, a result that was contrary to the original policy objectives (Cheshire and Sheppard, 2005). The potential

adverse effects on housing affordability and economic growth are also widely debated (Section 2.3).

To better understand the challenge, several issues should be considered. First, it is important not to misunderstand the purpose of such regulatory tools. They should serve to guide private development towards appropriate locations but should not limit opportunities for growth. In this regard, greenbelts that lead to further suburban development, in particular leapfrog development, are not working properly. Second, urban containment tools must be accompanied by tools that enhance development within built-up areas. For example, when strict urban growth boundaries are adopted, it is important to be sure that there is enough room within the boundaries to accommodate urban growth. Professional judgement plays an important role in assessing how much space is available for development within the boundaries and how much land expansion is needed to accommodate growth. Third, the effectiveness of regulatory tools depends on a balance between stability and flexibility. Land-use regulations are a strong tool with a long-term perspective and should therefore guide development in a stable and predictable way. At the same time, however, flexibility is needed to adjust to changes in the urban policy context, such as the pace of urban growth (or decline), which are not easy to foresee. An important point to note is the difficulty of reconverting rural/agricultural land once it is converted to urban land. The conversion of a piece of land to urban land use should therefore be carefully considered from a long-term growth perspective.

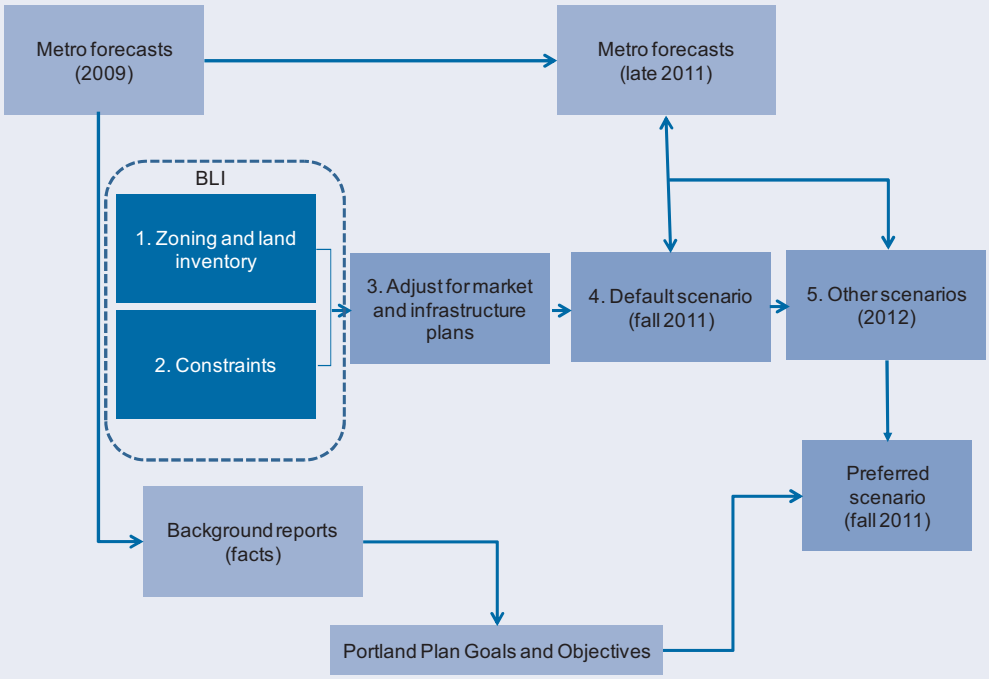
A good solution is a formal, institutionalised process of regular monitoring of urban growth pressures and the space available for development. Portland's Buildable Lands Inventory ensures periodical revisions of the boundaries by prudently weighing the necessity of enlargement. While a state law requires Metro to review the capacity of the UGB every 5 years to ensure a 20-year land supply, Metro has developed a detailed and sophisticated land-monitoring process to inventory vacant land and track the refill rate. Metro's most recent review provided a 20-year development capacity (2002-2022) by relying upon refill at the rate of 29% for residential land, 45% for industrial and 52% for commercial, plus a modest expansion of the UGB (20 000 acres) (Box 5.2). Similarly, the State of Victoria, Australia, has an ongoing programme of analysis and regular reporting on the supply of and demand for residential and industrial land in the Melbourne metropolitan area. This is reported annually through the Urban Development Programme (Box 5.3).

Alternatively, instead of relying only on regulatory tools, regulatory tools could be combined with price mechanisms, because price mechanisms allow more flexible co-ordination of different policy objectives. In fact, regulatory policies and fiscal policies are not mutually exclusive but complementary. For example, introducing taxes to discourage excessive automobile use could supplement urban containment regulations. This would allow residents to make market-based decisions and could avoid suburban development. Revenues generated by such taxes could be used to implement other compact city policy instruments. Also, an advantageous tariff policy for public transport users could be effective to translate densification policies and investments in public transport systems into an actual reduction in automobile use.

Box 5.2. **Portland's Buildable Lands Inventory**

The Buildable Lands Inventory (BLI) helps to understand what Metro's forecasts might mean for Portland. Do the zoning and regulations allow for the development needed to accommodate the projected household and job growth? To help answer this question, the City of Portland uses its own computer model to project "development capacity". Development capacity is defined as the likely number of new dwelling units or jobs that could be accommodated in the city under existing regulations assuming the continuation of recent market trends.

Determining development capacity is a five-step process. Step 1 estimates the gross acreage of land that is available for development and redevelopment in the city. This includes: inventory of the vacant sites/acreage in the city (*a*); and selection of other sites that are underdeveloped and likely available for redevelopment (*b*). Step 2 subtracts constrained lands (*c*) from the Step 1 results [(*a* + *b*) – *c*]. Constrained lands include sites that lack needed urban infrastructure (for example, sites without sewer service), and also include physical and regulatory barriers to development (such as environmentally sensitive areas, historic landmarks, flood hazards, etc.). Step 3 examines market factors, past development trends, and expected near-term infrastructure improvements. In this step, the capacity estimate for some areas may be adjusted upward or downward by some factor (*d*). Step 4 combines the results of Steps 1 through 4 into a "default scenario," and estimates the net acreage of land available for development and redevelopment in the city [(*a* + *b*) – *c*]**d*. The result is a capacity estimate, expressed as the number of new dwellings that can be accommodated. The default scenario is based only on existing policy and development allowances. Step 5 creates other scenarios based on desired outcomes (Portland Plan Goals and Objectives). For each step, assumptions must be made. The approach used in this analysis is intended to be transparent, and relatively conservative. Finally, the city will create a "preferred scenario", based on which policies will be designed and implemented.



Source: City of Portland Bureau of Planning and Sustainability (2011), "Buildable Lands Inventory – summary of residential capacity", City of Portland, Portland, *www.portlandonline.com/portlandplan/index.cfm?a=350182&c=54647*, accessed 2 January 2012.

Box 5.3. **Monitoring and assessing change in the urban area of Melbourne**

Since 2002, the Victorian Government has produced an annual Urban Development Program (UDP) Report, which provides advice on the availability and supply of residential and industrial land within metropolitan Melbourne. Annual monitoring and reporting through the UDP provides up-to-date information to government and industry on the availability and development of large-scale sites, including broad hectare land releases and strategic redevelopment sites.

To complement monitoring and reporting by the UDP, the Victorian Government has commissioned the collection of housing development data for small sites. This new housing development data show changes in the subdivision and amalgamation of sites, changes in land use and the demolition and construction of new housing between 2004 and 2009. It has committed to collect a further four years of data.

The government has also appointed a consortium, led by SGS Economics and Planning, to assess metropolitan Melbourne's capacity to accommodate future housing development. This will provide a comprehensive picture of opportunities and constraints affecting new housing in existing urban areas. In consultation with local government, the consortium will identify the baseline capacity, the likely take-up/supply of new housing, and the scope to enhance capacity to meet future housing needs. Detailed housing development data have been commissioned to inform the capacity assessment process. The data will provide detailed information on housing development across Melbourne over the last five years. Reports were intended to be made available to councils and other agencies in late 2011. In April 2010, grants totalling AUD 1.5 million were announced to help metropolitan councils deliver more housing choice for Melbournians. Further support to councils will be considered in future years as implementation proceeds.

Source: State of Victoria Department of Planning and Community Development (2011), "Housing capacity", DPCD, Melbourne, Australia, *www.dpcd.vic.gov.au/planning/plansandpolicies/housing/housing-growth*, accessed 28 November 2011; State of Victoria Department of Planning and Community Development (2009), "Urban Development Program", DPCD, Melbourne, Australia, *www.dpcd.vic.gov.au/planning/plansandpolicies/urban-development-program*, accessed 28 November 2011; State of Victoria Department of Planning and Community Development (2008), "Housing development data", DPCD, Malbourne, Australia, *www.dpcd.vic.gov.au/planning/plansandpolicies/housing/housing-development-data*, accessed 28 November 2011.

Target compact urban development in greenfield areas

Greenfield development is still necessary in most OECD metropolitan areas, and especially in growing regions in developing countries. Compact city policies are of great importance for appropriate greenfield development. Orderly urban expansion combined with densification of existing built-up areas is not inconsistent with the compact city concept. Among the many efforts to promote compact urban development (also called sustainable neighbourhoods and/or eco-neighbourhoods) (Section 4.2), the French Government's EcoQuartier programme is an interesting example which can be used both for greenfield and brownfield development (Box 5.4). This urban form is characterised by high density, access to public transport, high-quality urban design, district heating/cooling systems and other technologies to reduce carbon emissions. This type of development is typically denser than existing neighbourhoods and therefore contributes to densification. Well-designed compact urban development can also serve to showcase compact urban form. However, special care must be taken when selecting the location for such development, so as not to accelerate further urban expansion. For example, while Songdo New City in Incheon, Korea, has been recognised as a low-carbon compact

neighbourhood (Box 5.5), it is crucial to assess how such a large-scale urban development project affects overall "compactness" at the metropolitan scale.

Box 5.4. **An eco-neighbourhood in Paris: the *éco quartier fluvial de l'Île-Saint-Denis***

An eco-neighbourhood (*éco-quartier*) is an urban neighbourhood designed to have minimal environmental impact owing to sustainable resource management (energy, water, waste); compact, mixed-use development; and sustainable transport (public transport, walking, biking). In France, the concept was developed as part of the government's Sustainable City Plan (*Plan ville durable*), established in the framework of the Grenelle environmental legislation.

The *éco quartier fluvial de l'Île-Saint-Denis* is a riverside eco-neighbourhood currently under development on a 100-hectare islet located on the Seine River, in Île-Saint-Denis, north of the city of Paris. The 22-hectare plot is located in a former industrial zone with abandoned department store warehouses and light industrial activities. Plans for the development include a significant residential component (1 000 new housing units, 30% of which is to be managed as public housing, student residences), commercial and office space (neighbourhood retail, restaurants and offices), leisure and cultural activities (hotel, arts centre), social services (health centre, day care, primary school) and open space (approximately 70 000 m^2 of parks, squares and quays along the river).

As an eco-neighbourhood, the new development must comply with Kyoto agreements and meet the environmental objectives of France's Grenelle legislation. It must provide energy-efficient housing that meets regional housing targets, mix uses and limit the consumption of land; preserve biodiversity; promote sustainable mobility; and create jobs. Compact development is both a necessity, given the physical constraints (relatively small project site and natural boundaries) and a social and ecological objective (social and functional mix, access to open space and natural amenities, sustainable mobility). Project designers proposed to meet these multiple objectives by compact spatial organisation featuring dense (80 housing units/hectare), vertical mixed-use buildings (ground-floor commercial with residences on higher floors) and restriction of private vehicles to the periphery so as to limit the land needed for parking and circulation. Walking and bike paths will be developed throughout the site and provide access to both public spaces and transport links (metro, tram, bus).

Upon completion, the new development is expected to house more than a fifth of the city's 7 254 inhabitants. It is one of a number of major investments in the area that will lead to several major residential, commercial and leisure sites and new public transport infrastructure (notably, the extension of an existing tram line). The project is being developed by the Plaine Commune agglomeration, with financial support from the ERDF (European Regional Development Fund), the state, the region, and the department of Seine-Saint-Denis.

Source : IAU-IdF (2011), "Nouveaux quartiers urbains: les neuf premiers lauréats", *www.iledefrance.fr/lactualite/logement-ville/ville/nouveaux-quartiers-urbains-les-neuf-premiers-laureats*, accessed 24 November 2011; Le Moniteur (2011), "Trois futurs éco-quartiers de la Plaine de France présentés au Mipim", *www.lemoniteur.fr/133-amenagement/article/actualite/602413-trois-futurs-eco-quartiers-de-la-plaine-de-france-presentes-au-mipim*, accessed 24 November 2011; Plaine Commune (2011), "Un éco-quartier fluvial à l'Île-Saint-Denis", *www.plainecommune.fr/page/p-449/art_id-*, accessed 24 November 2011; Plaine Commune Development (2011), "Zac Bi Site de l'eco-quartier Fluvial – l'Île Saint-Denis", *www.semplaine.fr/realisation/zac-bi-site-de-l-eco-quartier-fluvial-l-ile-saint-denis*, accessed 22 November 2011.

Box 5.5. **Songdo New City, Incheon, Korea**

Built on a man-made island within the Incheon Free Economic Zone (FEZ), about 60 kilometres from Seoul and in close proximity to Beijing, Shanghai and Tokyo, New Songdo City is a low-carbon city intended 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 observed in cities of similar size. The new city will host 250 000 inhabitants by 2020 and will include residential complexes, a university and the Songdo International Business District (IBD). Project developers hope to attract multi-national corporations by providing high-quality hotels, schools, technology infrastructure, and convention centres. The project has an estimated cost of USD 35 billion.

Ecological design features, underpinned by strong technological coherence, make New Songdo City a futuristic, advanced technology city. Green building design is an important element of the programme, with elements such as green roofs, passive solar design, and a number of buildings that meet the LEED standard. LED public lighting will be used. Measures will be implemented to reduce the urban heat island effect, improve wastewater management and collect rainwater. Korean designers also plan to take advantage of their comparative advantage in broadband investment by combining information and communication technologies and clean technologies in order to diffuse the city's computer-based technologies widely. 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 investments required for the project will enhance the country's competitiveness.

Source: Alussi, A., R.C. Eccles, A.C. Edmondson and T. Zuzul (2011), "Sustainable cities: oxymoron or the shape of the future?", Working paper of the Harvard Business School, Boston.

Set minimum density requirements for new development

The density of greenfield development tends to be low for several reasons. First, home buyers have a preference for low density because they tend to have a negative perception of density and a strong demand for space. Second, from the developer's point of view, the current unstable real estate market conditions in many OECD countries can also guide low-density development, because developers prefer real estate products that sell quickly, even if they do not use all of the allowed floor area capacity. Minimum density requirements would thus be an effective tool for ensuring the space is urbanised more effectively; they would avoid excessive consumption of natural space and make public transport more feasible. In fact, minimum density requirements should be coupled with maximum density requirements, which are needed to prevent excess construction, with the attendant risks of congestion, inadequate provision of facilities, loss of open spaces, etc.

Setting an appropriate minimum density level is a challenge. In London boroughs, land-use plans specify a minimum density, but most set it too low and therefore do not sufficiently support density. In the Master Plan project for the Paris metropolitan area, instead, a minimum density was set for future urban extensions at 35 dwellings per hectare. Since this is much higher than the density used for development at urban fringes, existing communities do not support the project. They fear that the new high-density development will negatively affect the neighbourhood's character. Finally, minimum density requirements may be irrelevant in cities in which market forces encourage developers to build as densely as allowed at all times (for example, Hong Kong, China). It is important to understand the local circumstances fully. It is also important to remember that there is no absolute standard for density or for optimal density. Perception of density may vary among cultural groups. A study found that in Israel, 290 dwellings

per hectare is considered high-density, while in the Netherlands 100 dwellings per hectare is considered high-density (Churchman, 1999). These variations in the perception of density may lead to different policies and measures to achieve densification goals (Rapoport, 1975).

Zoning regulations for minimum lot sizes could be a powerful tool to meet both consumer demands and compact city policy needs. A key is monitoring urban development patterns and reflecting them in the regulatory framework. In Portland, for example, the average size of lots created during 2001-2006 for new dwellings ranged from 4 000 to 4 700 feet², compared to 5 700 feet² during 1997-2001 (Metro, 2009). The change was partly due to market forces (household preference for smaller homes and developers' response to consumer demand).

Establish mechanisms to reconcile conflicts of interests

As discussed in Chapter 2, compact city policies create unbalanced geographical outcomes: one part of a metropolitan area may benefit substantially from a given policy while another may suffer. For example, while compact cities can enhance a metropolitan area's economic growth as a whole through better access to a diversity of services and jobs, those who live on the urban fringe may lose opportunities for economic development. In particular, those who live just outside urban growth boundaries may feel that they are treated less favourably than those who live just inside. To gain support for compact city policies, it is crucial to address this conflict of interests, especially at urban fringes.

It would be helpful to establish mechanisms to reconcile conflict of interests. For example, decisions on regulatory schemes for land use should include a consultation process with wide participation by interest groups, including landowners and private developers, in order to ensure accountability and a transparent decision-making process. A long-term spatial vision that explicitly indicates future development patterns is also crucial to allow landowners and private developers to anticipate where development will be allowed in the near future. Finally, a mechanism to settle disputes on land use (whether judicial or quasi-judicial) should also be developed to ensure equality and protect individuals' rights.

Strengthen urban-rural linkage

On the urban fringes, there is competition for the use of land for urban and rural/agricultural purposes. Coherent urban and rural policies and means of resolving competing interests are central to achieving effective compact city outcomes.

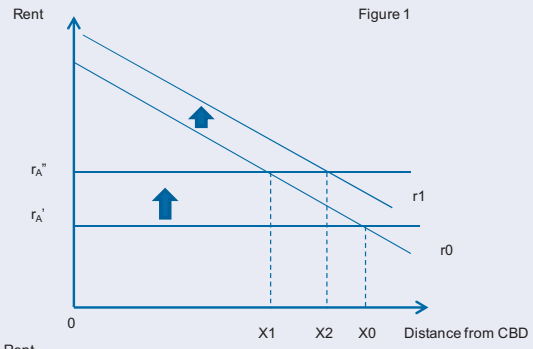
The case studies show that the success of compact city policies lies in protecting and fostering economic opportunities on rural land. Theoretically, when rural/agricultural use is productive and yields high agricultural rents, urban land use shrinks; in contrast, when urban land use is more competitive, urban land expands (Box 5.6). This implies that, in addition to policies to prevent rural/agricultural land use from urban development, strategies to make rural/agricultural land use more economically attractive can help prevent urban sprawl. Portland and Vancouver effectively protected farmland and the natural environment for their intrinsic value, and this contributed to meeting compact city objectives (Chapter 4). This suggests that strengthening urban-rural linkages would be an effective strategy in a compact city policy context. For example, encouraging farmers to produce fresh fruits and vegetables near urban centres and establishing a consumer market for fresh local food products (instead of imports) would be an interesting linkage strategy. Both Portland and Vancouver fully recognise the link between a compact city

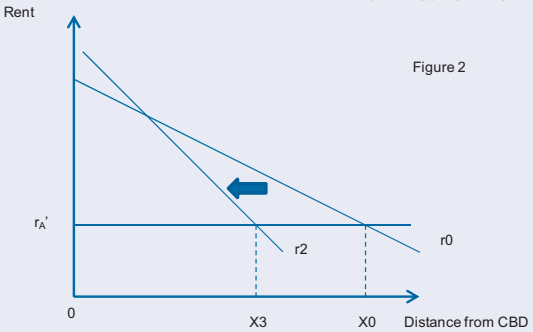
and agricultural industry and try to make it stronger. Vancouver's EcoDensity Charter includes urban agriculture to reduce "food miles" (the distance it takes to get food to consumers) and strengthen local food security (City of Vancouver, 2008).

Box 5.6. **What determines land use: agricultural rent and transport costs**

Economic theory states that land use is decided by the competition between different uses. In the figures to the right, the horizontal axis measures the distance from the **central** business district (CBD) and the vertical axis measures the amount of rent different uses can offer at a point within a city. Urban market rent curves are depicted as r_0, r_1 and r_2, each of which has a negative slope which reflects the higher rent revenue of lands closer to the CBD.

In Figure 1, the curves r_A', r_A" represent agricultural rent curves. These are flat because for agricultural land use, the distance from the CBD does not change the revenue from agriculture production. When agricultural rent is r_A', lands located from CBD to X_0 are used for urban land use while lands located farther than X_0 from the CBD are used for agriculture. This reflects the choice to seek higher revenues. When the agricultural rent goes up to r_A" for some reason, such as innovation in agriculture, urban land use shrinks to X_2 (note that the agricultural rent increase limits urban land supply, creates excess demand for housing and thus results in the shift of rent curve from r_0 to r_1). Productive agricultural land is thus more resistant to urban expansion than unproductive land, reflecting the operation of the "invisible hand" (Brueckner and Fansler, 1983; Brueckner, 1987, 2000).





When transport costs (commuting costs) increase, commuting travel of any length becomes more expensive, and spatial distances shrink in response (Brueckner, 1987). Although it is not as simple to illustrate this case graphically as in the case of an increase in agricultural rent because more complicated factors enter the picture, Figure 2 depicts a situation in which the market rent curve rotates clockwise with the increase in transport costs. Here again, urban land use shrinks to X_3.

Source: Brueckner, J.K. and D. Fansler (1983), "The economics of urban sprawl: theory and evidence on the spatial sizes of cities", *Review of Economics and Statistics*, 65(3): 479-482; Brueckner, J.K. (2000), "Urban sprawl: diagnosis and remedies", *International Regional Science Review*, 23: 160; Brueckner, J.K. (1987), "The structure of urban equilibria: a unified treatment of the Muth-Mills model", in *Handbook of Regional and Urban Economics*, Vol. 2, E.S. Mills (ed.), North Holland, pp. 821-845.

5.4. Retrofit existing built-up areas

Retrofitting built-up areas allows existing urban space to accommodate more activities. All built-up areas should be a target, from the central business district to single-family neighbourhoods.

Promote brownfield development

Although brownfield sites are often located near urban centres and occupy a considerable part of urban built-up areas, only a small share of brownfield sites are redeveloped.[1] Thus, brownfield development is one of the most important compact city strategies. Like greenfield compact development, well-designed brownfield development can serve to showcase high-quality urban design and innovative green technologies, as demonstrated in South East False Creek, Vancouver. Private developers often face a trade-off between redeveloping a brownfield site, which may allow better use of existing infrastructure but involve high demolition and clean-up costs, and a greenfield site that requires investing in new public infrastructure. From a commercial point of view, development of a greenfield site may appear advantageous to developers because they do not, or not fully, bear the costs of the required infrastructure, while they often have to bear the full redevelopment costs of a brownfield site (OECD/European Conference of Ministers of Transport, 2007). In this regard, a solution is to create a better environment for investment. One way would be to provide fiscal incentives (e.g. subsidies, tax breaks) for brownfield developers and/or disincentives for greenfield developers so that the costs of brownfield and greenfield development become competitive. In Japan, after the economic crash of the late 1990s, the importance of key metropolitan areas to national economic recovery was recognised, and a number of programmes were introduced to support urban regeneration, including deregulation and tax incentives under the 2000 Urban Renaissance Law (OECD, 2005). Many programmes targeted brownfield sites and underutilised land in the inner city. This scheme, together with the decreasing trend in land prices at that time, stimulated brownfield redevelopment in Japan. A split-rate property tax, which applies a different tax rate on land and structures built on it, is popular in the United States and could facilitate revitalisation and replacement of obsolete buildings in older central cities. The effect of this tax is to reduce the tax burden on land-intensive uses (e.g. apartments) and increase the tax burden on land-extensive uses (e.g. parking lots) (Bengston et al., 2004). A disadvantage of such a tax might be the transaction costs of valuing urban land separately from built structures and the risk of premature land conversion in outlying areas.

Harmonise industrial policies with compact city policies

While brownfield development is a favoured path to compact city outcomes, special care must be taken to protect prime industrial land in built-up areas. While industries are often an essential economic base of a metropolitan area and an important source of employment, they are typically land-intensive and sometimes consume large amounts of land in urban centres. Because of negative externalities, manufacturing and residential land are normally kept separate. However, with strong growth pressures, more development tends to take place near manufacturing locations. However, residential development within or near industrial sites renders industrial operations more difficult and may result in the relocation of industry to suburbs, which in turn makes possible more residential development in the vacant brownfield land. For policy makers who favour a compact city, such changes in land use may seem positive. However, such a

solution means that workers will need to commute longer distances. Moreover, if displaced industries cannot find appropriate land for their operations, they may move out of the region and thus reduce the area's economic and employment base. Policy makers need to carefully consider what compact city policies may mean for industrial policies.

In fact, some cities have recognised the underlying conflict between residential and industrial land use and have begun to protect industrial land use from conversion to residential development. For example, Vancouver's new Regional Growth Strategy stipulates that Metro Vancouver's role is to monitor the supply of, and demand for, industrial land in the region with the objective of assessing whether there is sufficient capacity to meet the needs of the regional economy (Metro Vancouver, 2011).[2] In the strategy, industrial areas are located not only in Vancouver suburbs but also in the city core. In the same vein, the City of Vancouver, which is located at the centre of the Metro Region, has adopted "Guiding Principles for Economic Development in the City of Vancouver" which state that the City of Vancouver will reserve an adequate supply of industrial and commercial zoning (Vancouver Economic Development Commission, 2006). Vancouver's business and community leaders published a report recommending the establishment of strong land-use policies for industrial and commercial land to eliminate the possibility of conversion to residential development (Vancouver Economic Development Commission, 2007). The report points out that even the slightest hint from the city that current commercial or industrial land might be considered for conversion to residential use is often sufficient to inflate land value to a level that is uneconomical for business use and that only through firm and consistent application of land-use policies can this speculative pressure be defused. Similar views are observed in Portland.

Regenerate existing residential areas – "built in my backyard"

While brownfield and greenfield development is important, these areas occupy only a small part of the built-up areas that form a metropolitan area. Many OECD metropolitan areas typically have low-density residential suburbs developed during the period of rapid urbanisation in the 1960s and 1970s. Such suburbs are ageing and their renovation represents a huge challenge. The term "greyfield" has been used to describe "the ageing, occupied residential tracts of suburbs which are physically, technologically and environmentally obsolescent and which represent economically outdated, failing or under-capitalised real estate assets" (Newton, 2010). Compact city policies should also target these greyfield areas.

Greyfield suburbs are often protected from change by zoning and other land-use controls (minimum lot size, exclusive single family zoning, restrictions on floor-area ratios, restrictions on units per acre, height restrictions, etc.). These can restrict the local community's opportunities to enjoy the services corresponding to this type of residential density levels. While restrictive zoning measures need to be re-examined, sophisticated measures will be needed to densify greyfield areas. Residents in such neighbourhoods are very keen to retain the neighbourhood's character. They dislike change because they fear that the neighbourhood's quality of life and property values will decrease as a result of densification. Laneway Housing and related programmes introduced by municipalities in the Vancouver metropolitan area can be considered a "best practice" for addressing this challenge. The programmes allow additional housing units in existing residential areas but are careful to preserve the neighbourhood's character (Chapter 4). Similar programmes have also been introduced in the United Kingdom. Such a strategy can be beneficial in many ways. First, an incremental density increase or "mild" densification

would affect the overall density of a region, as greyfield areas can account for large parts of a region. Second, more local services (shops, restaurants, etc.) are likely to be provided in renovated neighbourhoods and thus improve their quality of life. Certain types of collective transport (car pooling, etc., if not mass transit) would be feasible at a certain density level. As opposed to NIMBY (not-in-my-backyard), "BIMBY" (built-in-my-backyard) could be used as a new concept.

Another important tool for densifying existing residential areas is the community amenity contribution (CAC) used in Vancouver, Canada. Developers provide CACs in their urban development project (both in cash and in the form of libraries, parks, childcare, community centres, etc.) to mitigate the impacts of higher density on the surrounding community. CACs can therefore help to address the potential negative adverse effects of high-density development and meet the needs of the surrounding community (Chapter 4).

Promote transit-oriented development in built-up areas

Transit-oriented development (TOD) is a prominent example of policy complementarities. It can reduce traffic congestion and rationalise densification by facilitating the use of public transport. At the same time, steady – or growing – ridership ensures the health of the public transport system. From the compact city point of view, TOD should especially be promoted in existing built-up areas (greyfield and brownfield). Although TODs for suburban greenfield development are important as viable alternatives to auto travel, urban expansion can generate additional demand for development on land not served by the new public transport systems and eventually lead to auto-dependent urban sprawl. For example, Copenhagen's Finger Plan has been regarded as a successful example of TOD at the metropolitan scale, but it has not prevented urban sprawl. It has succeeded in keeping large green wedges between the urban fingers, but the fingers have become much longer and "fatter" than originally intended owing to population growth and outward development of economic activity (OECD, 2009). The case studies of Toyama and Portland offer excellent examples of TOD in existing built-up areas. Toyama renovated its existing mass-transit system and introduced an incentive programme to encourage residential development near the transit stations in urban centres. As a result, the city is seeing an increase in public transport use and a gradual migration of citizens from the suburbs to the targeted areas. Portland's TOD with streetcars has stimulated brownfield redevelopment in the centre of the metropolitan area. The Pearl, Portland's new high-density, transit-oriented neighbourhood, has 7 200 new dwelling units and 4.6 million ft² of new commercial space along the streetcar line in the existing urban areas, as illustrated in Chapter 4.

A key challenge is to link private investment for dense development with public investment in a mass transit system. Incentives to attract more residents to areas near transport stations should be considered. The city of Toyama provides direct subsidies to residents and developers (Chapter 4). In the United States, families that want to live near the transit nodes can obtain location efficient mortgages (LEM). These provide a larger mortgage for urban homebuyers by taking into account the money they save by living in dense, walkable neighbourhoods that are close to public transport. Use of such a policy should, however, weigh the advantages of densification and reduced traffic congestion carefully against its shortcomings, notably the higher mortgage default payment rates among LEM borrowers. The mortgage calculation is based on the presumption that the household will reduce its car use, but the programme does not limit the use or ownership of automobiles (OECD, 2010b).

Furthermore, TOD can be more effective if it is combined with tools to encourage private car users to change their travel behaviour and use more public transport. It will not be considered effective if the increase of mass-transit ridership comes solely from walking and cycling commuters rather than from private car users. Monitoring such behavioural change is important.

Encourage "intensification" of existing urban assets

Policy design must take account of the fact that urban structure changes slowly. For example, in England new buildings represent less than 1% of the total existing stock each year, and two-thirds of the homes that currently exist are likely to exist in 2050 (UK Department for Communities and Local Government, 2006). Therefore, compact city policies need to address the existing urban fabric (i.e. existing building stock) as well as new development (i.e. new building construction). More intensive use of existing buildings without further construction can be referred to as "intensification".

Many attempts have been made to promote more intensive use of existing urban buildings and infrastructure. A typical instrument is a subsidy for renovation and conversion of vacant houses and offices. Flexibility in the use of existing building stock is extremely important in built-up areas to avoid vacancy and to accommodate more families and firms without developing additional land. Promoting more intensive use of land is important, too. For example, Freiburg, Germany, uses fees/charges to promote the use of underutilised land (such as parking lots).

The concept of intensification can also extend to mass-transit systems. Renovating old freight railway infrastructure for passenger service is one possibility. In Toyama, a private railway line which had been scheduled to be phased out was renovated. While the renovation required extensive public investment, it cost much less than new investment of similar scale. Other examples include public investment to increase connectivity with multiple transport modes such as: smooth transfers (Tokyo, Osaka); integrated fee systems (London); university student passes to promote ridership (Vancouver); special purpose taxes for mass transit investment (France); and real-time signage systems to communicate expected arrival times to mass transit customers (Stuttgart, Paris).

5.5. Enhance diversity and quality of life

The fourth key strategy mainly targets urban centres, although some of the sub-strategies also apply to existing built-up areas. Urban centres here include not only the CBDs of a metropolitan area but also urban agglomerations on a smaller scale such as regional and community centres. Lively urban centres help to sustain the centrifugal power of a metropolitan area. Urban centres typically consist of offices and housing and commercial and residential functions, and their diversity can play a key role in the economic growth potential of a compact city. A mismatch in residents, local services and jobs (less diverse urban centres) may cause inefficient use of urban land and infrastructure. As well, quality of life is an essential part of the attractiveness of an urban centre. The case studies offer several relevant strategies.

Promote mixed land use – "zone for form, not function"

Traditional zoning regulations in North America tend to restrict mixed land use, as they were originally intended to avoid negative externalities due to differences in land uses.[3] While such traditional zoning still makes sense in many places, it has not led to

diversity and accessibility to a variety of local services and jobs within walking distance, a valuable characteristic of traditional urban centres. Deregulating land-use zoning and introducing form-based zoning can be a way to revive urban centres from a compact city perspective. The establishment of mixed-use zones that allow a combination of business and residential uses can help revitalise city centres that have lost their liveliness. In Melbourne, the city succeeded in giving new life to the central business district by establishing "dual purpose zoning" (see Section 4.3). However, this is used only in specially designated districts so that its impact is limited (Hirt, 2007). Mixed-use zones are often exceptions to traditional land-use zones and therefore limited in their reach. In particular, in traditional residential zoning, commercial and business uses have been excluded to respect people's need for a quiet living environment. It is crucial to extend the mixed-use concept to all areas of a compact city including the urban fringes. At the same time, instead of prohibiting commercial and business activities from residential neighbourhoods, new ways of ensuring quiet living environments should be explored, for example through agreements and/or regulations on their operations to avoid noise at night.

It is also important to locate universities that create "liveability" in mixed land-use neighbourhoods. A large student population is a vital part of a creative city, as concentrations of creative people result in a concentration of creative economic outcomes (Florida, 2003). Melbourne has expanded the number of educational institutions in the city centre over the past decade, in most cases integrating the facilities into the city fabric. The number of students attending academic institutions and/or living in the city centre has expanded by 62% since 1993 to reach nearly 82 000 in 2004 (Section 4.3). A large proportion of Melbourne's students are international students and are likely to already be familiar with apartment living.

Improve the match between residents and local services and jobs

As described in Chapter 3, urban centres tend to have few residents in comparison to the local services available. Promoting residential development in urban centres is thus a good way to ensure a better match. It also allows more efficient use of urban infrastructure because it balances peak demand for urban facilities (transport, electricity, etc.) and reduces average commuting distances. However, it is also important to ensure local services in suburban neighbourhoods. This is especially a challenge in less densely built-up areas. Portland's 20-minute neighbourhood programme aims to ensure everyday services within 20 minutes (by walking, cycling or mass transit) and to promote the location of services in neighbourhoods in which they are insufficient (Section 4.3).

Encourage focused investment in public space and foster a "sense of place"

Public parks and green spaces in urban centres are an essential element of a compact city. When public space is well designed and delivers high-quality services, density is perceived positively. Strategic ways to secure sufficient open spaces should be explored. One solution is to connect to existing open spaces. For example, the City of Paris promotes green corridors based on the Urban Planning and Sustainable Development Plan (*Projet d'aménagement et de développement durable, PADD*).[4] Figure 5.2 illustrates the planning map for green space. The city not only invests in public parks and avenues but also uses regulatory zoning schemes (for example, *Espace vert protégé*, EVP) to protect privately owned green space (Mairie de Paris, Agence d'écologie urbaine/Direction des espaces verts et de l'environnement, 2011). The City of Portland is coupling existing open space systems with better connections to and from surrounding contexts to provide residents and workers a maximum of amenities. A report on future urban design in

Portland points out that a citywide plan that stitches open space systems together more deliberately would re-establish and strengthen Portland's long-standing approach to open spaces (City of Portland Bureau of Planning and Sustainability, 2010). Another possibility is more intensive use of existing open spaces. In Portland, public parks are supplemented by public schools with baseball fields and other active recreation facilities which can be used by the public when schools are not in session. Many of these areas are managed in partnerships between Portland Parks and Recreation and Portland Public Schools (City of Portland Bureau of Planning and Sustainability, 2010b).

Figure 5.2. **Planning map for green space in Paris**

Biodiversity corridors

Source: Mairie de Paris, Agence d'écologie urbaine/Direction des espaces verts et de l'environnement (2011), "Paris climate protection plan: a comprehensive strategy", presentation at the seminar on Low Carbon Initiatives of Cities for GHG Mitigation and Adaptation to Climate Change, 16-17 May 2011, Bangkok.

Streets are another important element of the public space, and streetscape and better use of streets can also enhance quality of life even in high-density neighbourhoods. Central Paris maintains its attractive avenues, streets, squares and parks with high-density, six- or seven-storey buildings, most of which are the 19th century's legacy of Baron Georges Eugène Haussmann (Largentaye, 2009). Portland is currently discussing removing one-street segments to reintroduce hierarchies, create more distinctive places for residents, and encourage more visibility of retail and other commercial businesses.[5] A clearer street hierarchy in the central city would offer a more distinct set of options around which to organise residential communities and business districts. Differentiated streets and street functions, such as prioritised pedestrian/bicycle facilities, stronger orientation to the river and its ecology, and improved wildlife habitat could allow for a more targeted relation to adjacent land uses and the development of distinct places (City

of Portland Bureau of Planning and Sustainability, 2010b). In Melbourne also, attempts to use streets to create a lively public space succeeded, for example in Flinders Lane.

At the neighbourhood level, public outdoor spaces can often compensate for the lack of private yards. Their position and configuration with respect to residences and roads are important. In successful examples, communal spaces did not enter the zone of private space but were visible. In cases where distances from houses and roads were insufficient, residents' sense of privacy was affected.

Fostering a "sense of place" in urban centres is another important strategy. A common feature of many successful efforts to create an attractive and lively city centre is identity-related projects that pay attention to the tradition and identity of the city and its people. City centres in many regions often have a history, and redevelopment plans tend to stir up heated debates. For this reason, public involvement in the project is very important to reach an agreement that makes most citizens happy and that makes citizens appreciate and frequent the city centre (Box 5.7).

Box 5.7. **Investment in public space in the case study metropolitan areas**

Pioneer Courthouse Square (Portland)

Pioneer Courthouse Square, located in the heart of downtown Portland, is a public space that hosts more than 300 programmed events each year. With more than 26 000 people visiting the square every day, it is the single most visited site in Portland. In 1875, Pioneer Courthouse, the second oldest federal courthouse in the west, opened here. Then, Portland Hotel was constructed in 1890. In 1951, the hotel was closed and a two-level parking structure was built. Later, an 11-story parking garage was proposed on the block. Permission was denied by the city after a series of heated public hearings. In 1972, Portland's Downtown Plan proposed development of an open space. This plan set in motion the lengthy administrative and political negotiations that resulted in the purchase of the block by the City, and Pioneer Courthouse Square eventually opened in 1984. Today the square thrives with volunteer leadership and community support at every level through a management agreement with the City of Portland. A unique feature of this square is the name-engraved bricks that symbolise the people of Portland. Each of the 71 165 named bricks permanently placed at the square reflects a sense of Portland community. The organisation still invites people to participate in this campaign by purchasing an individual brick, which costs USD 100. To commemorate the purchase, the organisation sends the purchaser a frame-worthy Certificate of Brick Ownership, signed by the mayor, and sends a "brick map" to its location. The location can also be checked on the organisation's website. This is a good way to visualise citizens' support for a city centre revitalisation project.

Woodward's redevelopment (Vancouver)

The Woodward's building, located in the 100 block of West Hastings in Vancouver, combines market and non-market housing, along with commercial/retail and institutional arts space, all of which are designed to be socially, environmentally and economically sustainable. It is part of a larger effort to revitalise one of Vancouver's historic neighbourhoods with the addition of up to 6 000 students and faculty, residents, shoppers, office and other workers. Woodward's has long played a pivotal role in the city. It once provided food, household goods and employment to many people in the local community and beyond. Today, it is the focus of a neighbourhood's hopes and dreams. The City of Vancouver purchased the Woodward's building from the Province of British Columbia in March 2003. It began a process to involve the community and other Vancouver residents in designing and planning the redevelopment of the building in a way that is socially, environmentally and economically sustainable.

Box 5.7. **Investment in public space in the case study metropolitan areas** (*cont.*)

Grand Plaza (Toyama)

Toyama's Grand Plaza is a new citizen's indoor plaza located in the city centre which is well connected to light rail transit. Covered with glass walls and a ceiling which allows sunshine to come through but keeps out the wind, it makes a comfortable space in a snowy country. It was constructed in 2007 and is managed by a kind of public-private partnership (PPP) scheme, in which the City of Toyama, the chambers of commerce and SMEs join together. Concentration of investments in the city centre is a basic and effective compact city strategy. A PPP is desirable to obtain leverage from public investments and to induce private stakeholders to commit to compact city policies. Concentration of investments is also necessary for public facilities such as schools and hospitals in order to maintain the attractiveness of the city as a whole and to cope with public finance problems in a society with a declining population. The strategic location of public facilities is an important policy tool for regions in which population is decreasing, as strict regulations and tax disincentives may result in faster hollowing out.

Source: City of Portland; City of Vancouver; City of Toyama.

Promote a walking and cycling environment

Promoting walking and cycling by focused investment in the public space is crucial. The case study found that the City of Portland has been making comprehensive efforts to promote cycling with remarkable results, as described in Chapter 4. Cycling policies have been popular in Europe, including in Denmark and the Netherlands. Louvain-la-Neuve, Belgium, made an early attempt to promote a car-free, walkable city in a university town. Velib' in Paris, France, is a strategy to promote cycling that has been adopted in many other metropolitan areas.

5.6. Minimise adverse negative effects

Finally, all the strategies discussed above should be combined with tools to minimise potential adverse effects that might offset the expected positive outcomes (Section 2.3). In other words, compact city strategies should be coupled with strategies to combat unwanted effects. The strategies considered most important in this respect are: suppressing traffic congestion; encouraging provision of affordable housing, promoting urban design and focused investment in the public space; and encouraging green buildings.

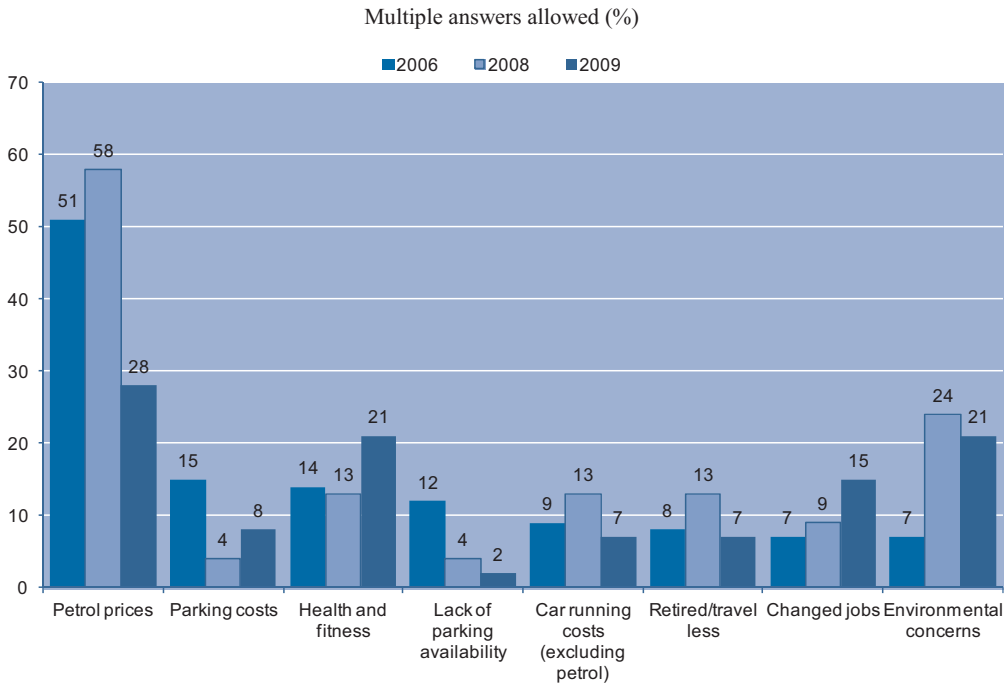
Counteract traffic congestion

Traffic congestion is among the most important targets, as it can reduce or even offset the economic and environmental benefits of compact city policies.

Taxes/fees/charges on private car use can help to discourage private car use in a number of ways. Parking taxes/fees/charges can be effective, as higher parking fees can discourage the use of private cars. Taxing petrol is another powerful tool. A study of Melbourne residents indicated that the price of petrol was the main reason why people had reduced their use of private vehicles. Many subsequently used public transport and walking and cycling on a more regular basis (Gaymer, 2010) (Figure 5.3).[6] Congestion taxes/fees/charges are another option. A typical congestion tax system charges users for using a congested section of a transport network during peak-use periods (OECD, 2010b).

A more radical approach is to discourage car ownership by taxing. Plowden (1983) argued that "there is no more effective way to limit the nuisances due to cars than to reduce the level of car ownership". This is the principle applied in Hong Kong, China, where taxes on car purchases are prohibitive: high levels of car ownership would cause serious problems of lack of space. However, it is probably generally better to reduce unnecessary use rather than to reduce the opportunity to use private cars when necessary, since private cars are strongly related to people's quality of life.

Figure 5.3. **Main reasons for reducing vehicle use, 2006-2009**



Note: Respondents are those who indicated a recent reduction in private vehicle use.

Source: Gaymer, S. (2010), "Quantifying the impact of attitudes on shift towards sustainable modes", *Australasian Transport Research Forum 2010 Proceedings*, 29 September-1 October, Canberra.

In addition to discouraging private car use, comprehensive strategies to shift from private cars to public transport are needed. Because private cars are still the most convenient means of transport for many people, even in densely built-up areas, unless public transport systems become competitive, people will continue to use private cars and this will inevitably lead to traffic congestion. The relative price of public transport and car use may have an impact: in many countries, the price of public transport has risen continuously, while fuel prices have been relatively stable until recently.[7] Obviously, such a trend will not encourage increased use of public transport. A basic strategy is to increase the competitiveness of public transport systems (in terms of price and service quality). For example, a commuting allowance for the use of public transport could make it a more attractive option. However, economic viability is a huge challenge for public transport. New ways of financing public transport systems need to be explored – for example, congestion taxes/fees/charges could be used not only to finance road infrastructure but also to encourage the use of public transport. Governments can use

revenues generated by the charge to expand and improve public transport networks (Box 5.8). Similarly, policy makers could give higher priority to the benefits of reducing traffic congestion and consider expanding support to public transport operators. Finally, integrating land use and public transport planning should be emphasised, as densification strategies can help make public transport operation less costly.

Box 5.8. **The link between congestion charges and mass-transit investment in selected countries**

In **London**, the Greater London Authority (GLA) introduced the London congestion charge covering parts of central London in February 2003, and extended the area to part of west London in February 2007. The extension increased the resident coverage from 150 000 to about 230 000. The main objectives of the charge are to reduce congestion and to raise funds for investment in London's transport system. The charge was originally GBP 5 per day, but was later increased to GBP 8 per day. An entity called Transport for London (TfL) manages the charging system. The TfL estimated that the level of traffic of all vehicle types entering the central congestion charge zone was consistently 16% lower in 2006 than pre-charge levels in 2002. TfL also reported improved air quality in the zone. TfL's annual report for 2006-07 shows revenues from the congestion charge of GBP 252.4 million over the financial year (8.5% of TfL's annual revenue). It spent more than half of the revenue on the operating costs of the charging system. After deducting operating costs and other charges, net income was GBP 89.1 million. The law requires TfL to spend all net income raised through the charge on reinvestment in London's transport infrastructure. TfL invested about 80% of net income in improving the bus network. New routes were introduced, existing routes were extended, and frequency of service was increased. As a result, bus use increased in Central London. In October 2008, GLA introduced a completely new charging structure. The new system charges cars based on potential CO_2 vehicle emissions. Certain cars and pickup trucks are charged GBP 25 per day, while low-emission cars are free of charge.

Stockholm introduced a congestion charge on a permanent basis in August 2007, after a seven-month trial between January 2006 and July 2006. The charge area covers Stockholm city centre. The trial resulted in reduced traffic and improved air quality. The national government introduced the congestion charge as a tax and has managed the revenue. It will use the revenue entirely for new road construction in and around the Stockholm area, including the construction of a new major bypass road. It spent all the revenue from the trial period on public transport in Stockholm. The national government also provides grants to the transit agency to compensate for the additional costs due to the introduction of the congestion charge (e.g. installation of toll facilities).

Congestion pricing in **Norway** is levied as tolls in the main "ring road" rather than as an area-based charge. Though it was initially intended to raise revenue to finance the ring road, it had the same impact as a congestion charge. The revenue has also provided funds for improvements in public transport and environmental projects.

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

Encourage the provision of affordable housing

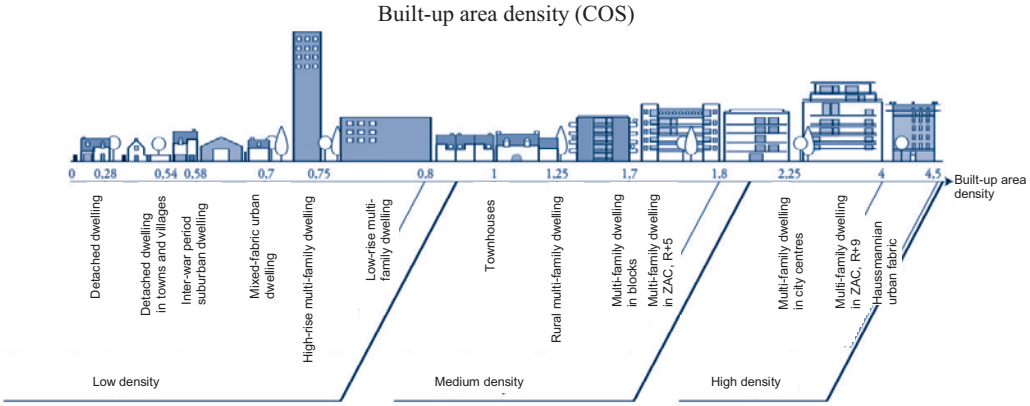
Housing affordability is also a critical issue, as the price of land and rents may rise in built-up areas and affect low- and medium-income households' ability to live where their jobs are. Careful observation of both the land and the housing market is needed to understand the mechanism and to see the key issues for policy design. First, compact city policies that focus only on controlling urban sprawl on the urban fringe will cause housing affordability problems, because limiting the supply of land inflates property

values and therefore raises housing prices and rents. This means that compact city policies need to be designed to supply the housing that is necessary for a metropolitan area by using less land on the fringes and more land in or near urban centres. Increasing the housing supply in existing built-up areas is especially important. Vancouver's secondary suite programmes and laneway housing programmes are good examples of ways to address the housing affordability issue in a compact city strategy (Section 4.3). Fiscal measures to promote brownfield development and to discourage long-term holding of underutilised land should also be considered. Second, even though there may be a sufficient housing supply in existing urban land, housing affordability problems will occur if there is not enough housing for medium- and low-income households. In urban centres where the price of land is high, developers tend to target high-income households and are less motivated to provide affordable housing. This issue needs to be addressed when designing compact city policies, and horizontal co-ordination of compact city policies and housing policy is essential. For example, when designing housing policies, special care needs to be taken that housing investment does not promote urban sprawl. Third, housing affordability needs to be understood as a combination of housing expense (housing prices, rents) and transport costs (Inbakaran and Shin, 2010).

Promote high-quality urban design to lower "perceived" density

Whereas high density is often viewed positively in public areas because it contributes to their vitality and creates a sense of place, it is often viewed negatively in residential areas (Mitrany, 2005). Many consider that residential density reduces neighbourhood satisfaction and thus quality of life.[8] This can be an obstacle to the creation of a compact city. Understanding the reasons for this negative perception would help to find solutions. First, it is important to consider how to lower "perceived" density. It is not actual density but "perceived" density that creates a negative impression. Perceived density is different from real, or objective, density. A study conducted in newly developed neighbourhoods in Dublin's inner city concluded that the way density is configured and designed is likely to be more important than the overall density figure. A study in Israel found that, although density may be objectively identical, it is perceived as lower when a neighbourhood is smaller, isolated from other neighbourhoods by the open spaces around it, and has a hilly topography (Mitrany, 2005). UK research found that building form and layout influenced how density is perceived by residents, in particular characteristics such as: *i)* space between buildings; *ii)* open space ratio; and *iii)* building height and layout (Raman, 2010). It is also argued that building façades can also influence perceived density (Figure 5.3). Fouchier (1997) showed that perceived density decreases with the volume of vegetation (number and height of trees) in the same building plot. Second, and closely related to the preceding, it is important to increase neighbourhood satisfaction in high-density areas. The level of neighbourhood satisfaction can be strongly influenced by the physical environment and other socio-economic factors (Howley et al., 2009). Litter, pollution and lack of greenery affect the perception of the physical environment. Relevant socio-economic factors include lack of facilities and open space, secure parking, good quality shops and facilities for children. Another important item for neighbourhood satisfaction is privacy. At neighbourhood scale, unwanted noise and overlooking buildings are the major sources of the violation of privacy within a home.

Figure 5.4. **Different perceptions of density according to building types in France**



Source: IAU-IdF (2005), "Appréhender la densité, formes urbaines et densités", Note rapide n°384, June.

As discussed in Chapter 2, high density is often associated with lower quality of life. For example, tower buildings with poor urban design and/or in unsuitable locations have given people a strong impression that density is not good for quality of life. However, high-quality urban design can enhance the well-being of residents (Urban Task Force, 1999).[9] It is particularly crucial in a compact city context, because it is a means of alleviating many of the problems associated with high density (Howley et al., 2009). Moreover, promoting excellent urban design is a good example of policy complementarities. For example, when introducing minimum density requirements, it would be useful to provide at the same time design guidelines to alleviate negative perception of density. At the neighbourhood scale, for example, the following design considerations can be helpful:

- People are uncomfortable when they can be seen or heard in certain spaces in a house, such as lounges, bedrooms and bathrooms (Mulholland, 2003). Kitchens and offices are less privacy-sensitive. Outside the home, in private outdoor spaces, a higher level of visibility is accepted and in communal outdoor spaces a moderate degree of privacy is expected. When privacy-sensitive spaces are shielded by less sensitive areas, privacy is enhanced. One successful design included a combination of well-insulated walls and the carefully planned design of the properties; bedrooms and lounges did not abut directly the party walls with adjacent properties; less sound-sensitive spaces such as hallways and kitchens were used as barriers.
- The frequency with which respondents can hear neighbourhood noise in their homes is affected by the distance to the nearest dwelling and whether the dwelling is detached or not. The space afforded detached dwellings seems to provide a sufficient barrier to noise.
- Outdoor spaces and views of nature reduce negative feelings about density (Kearney, 2006). A study examined the impacts of shared nature spaces and the density level on neighbourhood satisfaction in alternative residential patterns. Results indicated that actual density might not affect neighbourhood satisfaction as much as people think. The presence of shared outdoor areas and in particular, the opportunity to visit these areas, was more significant. Not surprisingly, the visual proximity to forests, landscaping and generally natural elements together with shared outdoor spaces increased satisfaction.

- Private yards are the intermediate space between private and public space. This space can act as a buffer zone, in terms of noise and visibility, by providing views of nature rather than other residences (Day, 2000).

High-quality urban design can also alleviate negative perceptions of density at the metropolitan scale. In Vancouver, while the city promotes high density in most neighbourhoods, it also respects views of mountains and water and sets urban design guidelines so as to avoid concentration of high-rise buildings which restrict the view. The city also promotes urban design that respects neighbourhood character, as when it determined urban form in the redevelopment of Southeast False Creek, the site of the Olympic village during the 2010 Winter Olympics. Among several urban design options including high-rise tower development, the city chose low-mid rise for this part of the city given its history of lower "ambient" scale. The city wanted to ensure and maintain overall "civic legibility" by selecting a form that reinforced the historic role, uses and activities of Southeast False Creek and the adjacent industrial lands (Figure 5.5). Innovative urban design allowed the same volume of development as the tower option but with low to medium-high buildings. The city foresees that maintaining and fostering its neighbourhood character can eventually enhance the attractiveness and the economic value of the city. The redevelopment also demonstrated several innovative green technologies, including a sewage heating system that achieved high energy efficiency.

Figure 5.5. **Southeast False Creek, in contrast to downtown Vancouver**

Source: City of Vancouver.

Although the case studies describe similar urban design policy practices, in general, there is still a lack of understanding of the concept of urban design as part of a holistic sustainable development vision (European Union, 2004). Design codes could be elaborated to address the density issue. As Gallent and Tewdr-Jones (2007) assert, policy makers aiming at more intensive use of land must deal more specifically with the critical link between density and design. Moreover, while there have been a plethora of design and planning guidelines for urban design at the neighbourhood scale since the

1960s, most are based around concepts of optimal density, mix of use and access to local facilities. They do not focus on the importance of spatial layout in achieving accessibility or better perception of the built environment (Raman, 2010). In essence, the potential benefits of high-quality urban design should be more widely recognised by policy makers. Finally, there is a need for an institutional framework to assess and promote high-quality urban design, as urban design is often seen as being subjective. Portland's design commission is a good example.

Encourage greening of built-up areas

A compact city can reduce energy consumption at the metropolitan scale by promoting dense and proximate development (Section 2.3). However, increased development in densely built-up areas may cause problems at the local scale. For example, while additional demand on the existing electricity network may require additional investment in replacing old infrastructure, the cost of the improvements may be prohibitive. In such cases, compact city policies need to consider not only potential benefits of reduced energy consumption at the larger scale but also potential adverse effects of increased local energy demand.

Many studies have examined energy models and techniques for improving the energy performance of buildings and curbing electricity demand. The potential savings can be very significant. In fact, combining efforts towards green building design with technology and responsible occupant behaviour can reduce electricity demand by up to 90%-95%. The design of buildings has a high share of that reduction: an intelligent bio-climatic "green" building form and location can reduce GHG emissions by up to 50%. Figures of this magnitude show that green building practices can reduce the increase in energy demand caused by compact city policies. Many cities and countries are promoting green design in buildings by combining building codes with various types of incentives. Since 2010, the City of Vancouver, based on its EcoDensity initiative, requires LEED[10] Gold or above for all new development resulting from rezoning. In addition, sites of two acres or more are expected to meet a number of sustainability measures (City of Vancouver, 2008). The City of North Vancouver combines downtown redevelopment with a district heating system to achieve greater energy efficiency. In addition, given that most energy demand comes from the existing building stock, retrofitting buildings in densely built-up areas is an important policy goal. New York City, for example, recently passed legislation requiring all buildings over 50 000 ft², i.e. almost half of NYC space, to conduct an energy audit every ten years. It is estimated that New York's Green Building Plan will save USD 700 million in costs annually and 5% of GHG emissions (City of New York, 2009). A floor area bonus combined with requirements for energy efficiency, district heating, heat and power combined, local energy production, and so on, could be encouraged.

Compact cities may aggravate urban heat islands (UHI), as discussed in Chapter 2. There are three important issues to be considered when tackling the problem. The first is changes in urban surfaces owing to reduced vegetation and the properties of urban materials. The built environment plays a significant role in temperature increases in cities through the combined effects of the removal of local vegetation and natural surfaces and the addition of heat absorbing surfaces such as dark roofs and pavements. As cities develop, more vegetation is lost and more surfaces are paved, while the materials in buildings and roadways (low albedo, high thermal emissivity and high heat capacity)[11] absorb sunlight and re-radiate heat (OECD, 2007). Second, compact urban form, especially the spacing of buildings and open spaces within a city, may aggravate the UHI

phenomenon because they influence wind flow and energy absorption. While continuous building patterns can help reduce heating and cooling,[12] adjacent facades create "walls" that impede air circulation (Wong et al., 2009). When tall buildings are lined on both sides of a street they create what is known as "urban canyons". The solar radiation within the urban canyon is reflected on nearby surfaces, such as building walls, where it is absorbed rather than escaping into the atmosphere. Narrow and deep streets also tend to trap air pollutants, particularly at the bottom (the pedestrian level) (Wong et al., 2009). The circulation of air in the urban fabric is necessary not only to reduce temperatures but also for public health and comfort.

There are three major strategies for UHI mitigation. They also have potential to reduce CO_2 emissions by reducing energy demand for cooling buildings and provide benefits in terms of reduced risks of black-outs during extreme heat events and health benefits associated with reduced air pollution:

- Increase vegetation cover mainly in the form of urban forests and parks. Water surfaces such as lakes and rivers can also play a significant role (Moriyama and Tanaka, 2009). Santamouris (2005) reported that trees can help significantly by reducing temperatures in cities through evapotranspiration and the filtering of dangerous pollutants. Moreover, trees can provide solar protection to buildings. Dispersing vegetation rather than concentrating it in a few areas is an effective tool that affects the microclimate. When vegetation is combined with other design techniques such as shading and water-evaporating surfaces, the results are magnified (Santamouris, 2005).

- Reduce absorption of radiation by urban surfaces through the use of reflective materials and cool elements. Pavements and roofs constitute over 60% of urban surfaces, 40% and 20%-25%, respectively (Akbari et al., 2009). For cool pavements, asphalt (a very warm material) road surfaces are often sealed with white chips or coated with a light concrete cover called white topping. In Athens, the use of a coloured thin layer on the asphalt reduces average temperatures by 5°C and up to 12°C at maximum heat intensity (Stathopoulou et al., 2009). Cool roofs mainly rely on increased roof reflectivity and vegetation. Increased roof reflectivity results in better air quality and savings in air-conditioning costs in excess of 20% (Akbari et al., 2009). A US study estimated the CO_2 offset potential of cool roofs and cool pavements to be 44 Gt per year (Energy Information Administration, 2003).

- Facilitate air circulation within the urban fabric though appropriate urban (building and street) geometry. The geometry of streets and buildings can help air circulation to mitigate the UHI effect and enhance the quality of the pedestrian environment. Topography, solar radiation, humidity, wind, and ground and urban forms are elements of the ventilation of a city. Building design features that deal with these aspects can facilitate the permeability of urban environments. The basic concern is to minimise wall effects at both lower and higher levels of streets, with particular attention to prevailing wind direction and speed (Wong et al., 2009; Ng, 2009). The presence of water, such as sea or rivers, also regulates humidity. It is beneficial in dry climates but can be problematic in humid ones. The cooling effect can be maximised through design to encourage diffusion of cooled air and direct it to inhabited spaces (Santamouris, 2005). The

design principles that influence ventilation are related to the geometry of the canyons, in particular the ratio of the height of the buildings to the width of the streets (Wong et al., 2009; Ng, 2009). Design principles also concern the length of buildings and the distance between them and other city blocks. Appropriate separation can allow air to pass to the neighbouring area.

It is important to use various instruments against UHI at different scales. First, at the building scale, regulations, guidelines and various fiscal tools can be used to promote the use of materials with better environmental performance. While most building codes and guidelines have thermal regulations for energy efficiency techniques in buildings, such as building insulation for indoor-outdoor air transfers, there seems to be a lack of incentives to expand the use of the cool materials and cool roofs that can produce microclimate benefits that reduce the heat island effect (Akbari et al., 2009; Bouyer, 2009). UHI mitigation should have more emphasis in green building certification systems. For example, while the LEED accredits UHI mitigation, it is not a requirement for certification and accreditation is currently limited to the use of shading techniques and the use of cool materials only for pavements and roofs. More innovative techniques could be evaluated in the specifications indexes. Second, at the neighbourhood scale, there is a need for geometrical design standards for greening neighbourhoods. These can guide the form, materials and dimensions of roads, sidewalks and pathways, as well as the height of buildings, the width of streets and the distances between buildings. These standards could be integrated in development guidelines, zoning codes and subdivision regulations. Cool pavements should be promoted for walkways, parking lots and plazas. Cool roofs and green roofs should also be promoted. The Hong Kong, China guideline with respect to "sustainable urban living space" promotes better air ventilation for UHI mitigation, enhancement of pedestrian environments, and provision of more greenery. It includes specifications regarding the height and length of a building facade in relation to the dimensions of the streets and open spaces. Specific dimensions are provided for appropriate separation of buildings higher than 60 metres (Wong et al., 2009). Finally, at the city scale, land-use policies can promote green space that can cool surrounding areas and allow wind circulation in the city. The German cities of Freiburg, Stuttgart and Manheim have included in their regional plans networks of green spaces to create "green corridors". They give minimum standards for open spaces, including a minimum width of 500 meters for "green corridors" and 250 meters for "green breaks" (OECD, 2010a). Stuttgart released the "Climate booklet for urban development – references for zoning and planning" (Office for Environmental Protection of Stuttgart and the Federal Ministry of Economy, 2004). The Federal Ministry of Economy hopes to assist all those concerned with urban development and planning to have proper consideration of climate concerns. The urban climatic map in the booklet serves as information about proposed developments rather than a regulatory tool. The Master Plan for the Paris Region includes strengthening the green spaces network that runs through the central agglomeration. InJuly 2005, the Tokyo Metropolitan Government developed the "Guidelines for UHI mitigation measures" to encourage private businesses and the public to develop mitigation measures according to the thermal environment in which they operate or live. The guidelines comprise: *i)* the thermal environment map; *ii)* area-specific mitigation measures guidelines; and *iii)* building-specific mitigation measures guidelines (CUHK, 2009).

5.7. Conclusion

This chapter has proposed five key policy strategies for a compact city. They cover a wide range of policy instruments including regulatory, fiscal and informative measures. They also cover geographical locations ranging from urban fringes to urban centres. In particular, the chapter emphasises that compact city policies should target not only a particular part of a metropolitan area (e.g. brownfields and new suburban development) but also the existing built-up areas. This is a particularly important message for mature metropolitan areas.

Since all of the five strategies are inter-related and complementary, they need to be co-ordinated and harmonised. In particular, it is important to take a comprehensive approach to address all the geographical elements of a metropolitan area; a strategy to encourage dense and proximate development at urban fringes needs to be co-ordinated and harmonised with strategies to retrofit existing built-up areas and to enhance diversity and quality of life in urban centres. Besides selecting a set of sub-strategies and developing particular compact city instruments, it is important to remember the importance of respecting local contexts as discussed in Chapter 4. Finally, such policy strategies can produce the desired outcomes only when they are implemented appropriately. Who should implement them and how this should be done needs to be considered. These governance issues will be discussed in detail in the next chapter.

Notes

1. The US Environmental Protection Agency, using a restrictive definition and focusing on commercial sites, estimates that there are about 450 000 brownfield sites in the United States. British authorities estimate that there are 660 km² of brownfield sites in England alone (OECD/European Conference of Ministers of Transport, 2007).
2. It also states that the role of municipalities is to adopt regional context statements that include policies for industrial areas to support and protect industrial uses and to exclude uses that are inconsistent with the intent of industrial areas, such as medium and large format retail or residential uses (Metro Vancouver, 2011).
3. In the United States in 1926, *Euclid v Ambler* legitimised zoning by municipalities.
4. PADD is the central document of the Local Development Plan (*Plan local d'urbanisme, PLU*), the official urban planning document, and aims to improve the environment and the daily lives of all Parisians through urban design that conforms to the principles of sustainable development.
5. In Portland, it has been argued that the street grid lacks a clear hierarchy of streets. Over time, to discourage trips through the central city, larger boulevards were phased out in favour of paired one-way streets, or "couplets". Co-ordination of traffic signals in a one-way grid system controls vehicle speeds and increases transport-mode flexibility.
6. In Melbourne, public transport patronage grew significantly between 2004 and 2008. Market research by DOT and Metlink tracked the reasons users gave for their change in behaviour over the period.
7. In France, for example, the cost of fuel, which represents about 40% of the cost of using a car, decreased by 33% between 1959 and 1992 while the cost of using public transport increased by 65% (Orfeuil, 1993).
8. Neighbourhood satisfaction has been found to play a significant role in general in the quality of life at all socio-economic levels (Fried, 1984; O'Brien and Ayida, 1991).
9. Although there is no clear definition of quality design, residents benefit when they perceive their environment to be of high quality (Dempsey, 2009).
10. Leadership in Energy and Environmental Design (LEED) is a rating system devised by the United States Green Building Council which evaluates the environmental performance of a development, a building or a neighbourhood.
11. Albedo refers to the percentage of energy reflected by a surface. The greater the albedo, the smaller the energy stored. Urban materials generally have low albedo (Wong et al., 2009). Thermal emissivity refers to the surface's ability to release heat. Most construction materials have high thermal emissivity. Heat capacity is the ability to store heat. Most building materials have higher heat capacities than rural materials.
12. Individual buildings have more exposed surfaces and the consequent loss of heat leads to higher energy demand.

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Chapter 6

Key compact city governance strategies

This chapter draws on the case studies to discuss metropolitan governance for compact city outcomes. It looks at the issue of horizontal co-ordination of municipalities into a single functional metropolitan area for policy design and programme delivery purposes as well as co-ordination within local government structures in view of the integrated, multi-sector nature of the compact city policy model. It then turns to vertical coherence among levels of government within a single metropolitan area. The chapter also takes stock of arrangements to foster ongoing citizen participation in the development and implementation of compact city policies. It considers fiscal issues, particularly in relation to investment to fund core infrastructure to achieve compact city outcomes. Finally, issues related to transparency, measuring performance, accountability and reporting are discussed.

6.1. Introduction

The spatial unit used for the compact city concept is the functional metropolitan area. Municipalities in a functional metropolitan area need to collaborate regularly with other municipalities and with higher levels of government operating in the same area – as well as with the private sector and non-governmental stakeholders – to gain the authority, technical expertise, community support and funding needed to articulate and achieve compact city policy goals and to deliver programming and services to citizens effectively, efficiently and affordably. Policy design, planning and implementation, along with programme and service delivery aimed at achieving compact city outcomes, inevitably imply multi-level governance arrangements. This requires vertical co-ordination of local, regional and national governments, horizontal co-ordination of responsibility centres within a local government or shared among local governments, between the public and private sectors, and with residents in the region (OECD, 2010a).

Compact city policies as defined in this report (dense and proximate development patterns, urban areas linked by public transport systems, and accessibility to local services and jobs) tend to be viewed as the responsibility of local governments. However, in many areas, central or sub-national governments have responsibility for policies that materially affect the spatial structure of metropolitan areas and thus the ability of municipalities to implement compact city policies effectively. For example, the fiscal framework for metropolitan development includes tax and expenditure policies that are routinely implemented by levels of government other than municipalities (e.g. housing subsidies, zero-interest housing loans, fiscal transfers for everything from infrastructure to health and educational institutions, etc.). Responsibility for spatial planning seldom if ever is the exclusive responsibility of local authorities: spatial and land-use planning clearly requires vertical co-ordination.

Governance arrangements are therefore a tool – a necessary and inevitable instrument in the metropolitan area's "toolkit" – to achieve policy outcomes effectively and efficiently. Since the compact city model is multi-level, multi-sector and integrated, networked governance arrangements are an essential prerequisite to effective compact city outcomes. A key purpose of governance tools is therefore to provide the means – policy and fiscal – that will allow public and private stakeholders in the metropolitan area's long-term prosperity and well-being to define and coalesce around a vision for the area. This vision is usually articulated as part of a multi-sector, comprehensive strategic plan for the metropolitan area that focuses on a matrix of compact city outcomes over a planning horizon of 20 to 30 years (see Section 5.2).

Effective governance allows for the design and implementation of a strategic plan that reflects the needs and objectives of all key metropolitan stakeholders. It allows for the development and implementation of the initiatives required to turn the strategic plan into a reality over time. It allows for the monitoring of progress towards the achievement of the goals of the plan. Effective governance therefore provides a framework in which stakeholders can be held accountable for their role in implementing the strategic spatial plan and through which the community can monitor progress towards its objectives and, when necessary, ensure that the area's actors adjust their strategic approaches to reach them.

6.2. Governance and financing challenges in the pursuit of compact city outcomes

Limited horizontal co-operation between municipalities within a single metropolitan area

One of the most difficult challenges for ensuring effective metropolitan governance to achieve compact city outcomes is the fragmentation of administrative jurisdictions within metropolitan areas. The case studies illustrate a variety of institutional contexts (Table 6.1). For example, the Paris metropolitan area has 1 281 local municipalities, each with an elected mayor and a municipal council (Fouchier, 2009). While a government structure that covers functional metropolitan areas exists in the Vancouver and Paris metropolitan areas, no such governments exist in the other metropolitan areas studied. Administrative fragmentation within metropolitan areas adversely affects the ability of key municipal actors to engage in a regular dialogue on the state of the region and on their place in it. However, administrative borders have their own logic, and it is not easy modify them for reasons of metropolitan governance.[1]

Table 6.1. **Metropolitan governance in the case study areas**

	Melbourne	Vancouver	Paris	Toyama	Portland
Major sub-national governments involved in compact city policies	State (Victoria), municipalities	State (British Columbia), Vancouver Metro, municipalities	Region (Île-de-France), *départements*, communes	Prefecture (Toyama), municipalities	States (Oregon and Washington), Metro, counties, municipalities
Number of municipalities in the metropolitan area	31 municipalities	21 incorporated municipalities and 1 unincorporated area	1 281 communes	8 communes (in the Toyama-Takaoka city planning area)	26 municipalities (25 in Oregon and Vancouver, Washington)
Governance structure at the metropolitan level	No government structure (State of Victoria takes initiative for metropolitan planning)	Metro Vancouver (multi-sectoral), Translink (transport)	Region Île-de-France	No government structure (Toyama Prefecture takes initiative for metropolitan planning)	No government structure covering both states

This absence of effective ongoing dialogue tends to preclude the development of a sense, on the part of these actors, that the region is in fact a region. A number of metropolitan areas – from Toronto's Greater Golden Horseshoe to Chicago's tri-state metropolitan areas – are true functional metropolitan areas according to data on commuting and other key indicators. Yet municipal leaders seldom act as though the region's whole is greater than the sum of its parts. This generates periodic political tensions among the region's municipal leaders and can lead to inequitable service delivery in sub-regions. In some cases it can lead to petty, unhealthy intra-regional competition for scarce resources – particularly infrastructure investment or private-sector location decisions – which tend to drive up the costs of public services over time. It can also lead to an ongoing lack of co-ordination in areas such as land-use policy and infrastructure planning and investments. The inability (or unwillingness) on the part of municipal leaders within a functional metropolitan area to identify with the area instead of with their own locality can thus lead to increased intra-regional disparities, particularly in terms of access to public transport, housing and other core social and human services illustrative of compact city outcomes.

The case study in Portland, United States, illustrates the governance challenge. The Portland functional area encompasses parts of two states with different systems. This creates challenges for compact city policies. In spite of fundamental similarities in the governance structures of Portland (OR) and Vancouver (WA), there are significant differences in their growth management. Moreover, no formal governmental links connect the Oregon and Washington parts of the region (see details in Chapter 4). The tax structure of the two states also plays a role: Oregon levies state income tax but no sales tax, while Washington levies sales tax but no state income tax. People therefore tend to live in Washington and work and shop in Oregon. There is no regulatory or legal mechanism to compel the two sides of the river to co-ordinate planning, let alone a dispute resolution mechanism to address conflict. For example, a new bridge on the Columbia River has been under discussion since the 1980s but no agreement has yet been reached.

Too many silos within government also impede horizontal co-operation. Effective ongoing inter-municipal co-operation in policy design and service delivery within a functional metropolitan area is often affected by other levels of government whose mandates and programming influence compact city strategies. For example, the urban planner or transport official who understands the need for sustainable transport and wishes to do something about it may well be unable to do so. In most cases, such authorities probably do not have the mandate, responsibility, power or support to make decisions that are consistent with sustainable development. Perhaps the most common problem is the division in responsibility between transport authorities and land-use planners (Kennedy et al., 2005). The lack of coherence within a given level of government – at the policy design stage or at the programme delivery stage – can significantly affect the degree to which compact city outcomes are achieved efficiently and effectively.

Lack of vertical coherence between levels of government

It takes a long time to improve cities, and it is difficult to maintain a broad consensus on how best to transform sprawling cities into compact ones over the long term. There are many examples of policy initiatives taken by a city administration and then abandoned after a change in leadership following an election. Exacerbating the effects of this instability is the existence in many cases of a disconnect between the beneficiaries of a given compact city policy initiative and the groups bearing the costs of this initiative. For example, the benefits of urban growth boundaries (e.g. protection of natural resources and green spaces) tend to be felt widely by all citizens in the metropolitan area, while the costs associated with land values, for instance, are borne by groups such as landowners just outside urban growth boundaries, developers and intensive users of private cars.

In many cases, the impact of a change in government following an election, or of a mismatch of political interests and policy initiatives, on the ability to implement compact city strategies is itself made worse by a lack of vertical coherence between national sectoral policies and metropolitan-level multi-sector plans, so that when one spatial policy focuses on compact city outcomes, a national sector-specific policy may work at cross-purposes.

In effect, vertical co-ordination is still a hit-and-miss proposition in the cases studied. In British Columbia, for example, a regional growth strategy (RGS) is an agreement between a regional district and its member municipalities on social, economic and environmental goals and priority actions. Its objectives are to co-ordinate action on

housing, transport, infrastructure and economic development in recognition that collaboration on a regional level will make individual municipal action more effective. Under provincial legislation, all regional district bylaws, all official community plans (OCP) of member municipalities and all infrastructure decisions must be consistent with an RGS. Each municipality internalises an RGS by adopting a regional context statement in its OCP. The statement sets out how the municipality will meet the goals of the RGS through policies and bylaws. However, inter-municipal co-operation in Greater Vancouver to abide by regional plans has not always been successful. In 1994 the City of Surrey voted to reject the higher residential densities specified in the draft of the Liveable Regional Strategic Plan (LRSP), and Langley Township and the City of Richmond also resisted aspects of the plan (Taylor and Burchfield, 2010). Settlements eventually helped these municipalities be in favour of the plan. Most recently, in the planning process of the current 2011 RGS,[2] many individuals and organisations voiced concerns, specifically with respect to proposed zoning for agricultural lands. The goals of the RGS are to create compact urban areas; support a sustainable economy; protect the environment and respond to climate change impacts; develop complete communities; and support sustainable transport choices (Metro Vancouver, 2011). However, several parcels of land located within the provincially zoned Agricultural Land Reserve (ALR) have been designated for general urban development within the urban containment boundary (UCB) in the draft RGS.[3] As a result, the provincial Agricultural Land Commission (ALC) formally opposed the RGS. Under the laws of British Columbia, even though an RGS designates some lands it must still be reviewed by the ALC in order to remove the ALR designation, and the ALC Act takes precedence over local government bylaws: if the ALC determines that the lands must remain within the ALR that decision prevails over local government bylaws that are inconsistent with it. This underscores the need for greater co-ordination between the province and local governments from the early planning stage of an RGS.

Transport policies in many countries, including the United States, offer another example of lack of vertical coherence. In Portland, although many state and local initiatives attempted to promote public transport and walkable neighbourhoods, federal and state transport funding practices encouraged low-density, auto-oriented development patterns. Nearly all proceeds of federal and state gas taxes were devoted to road construction. Federal legislation in 1991 allowed states more flexibility to use their share of federal gas taxes for transit, pedestrian and bicycle improvements. Oregon and Washington are among the few states to use these flexible funds for modes other than auto. But these policy changes came too late to prevent the establishment of low-density patterns in the region's suburbs. Even today, the Oregon Constitution limits the use of state gas-tax revenues to roads. In addition, federal subsidies for single-family housing have also worked against compact urban form.

Coherence is also an issue for housing and compact city policies. For example, policies to promote home ownership tend to increase the development of low-cost housing in urban suburbs and may lead to sprawl. The need for affordable housing also encourages new development in urban suburbs where land is less expensive and this also works against compact city policies.

Citizen support may be limited and not sustained over time

Even well-designed compact city policies can encounter resistance from residents. Citizens' concerns about congestion, local taxes or home values may be at odds with the metropolitan area's long-term policy agenda, such as economic growth and climate

change (US National Research Council, 2009). Regulatory measures on land use are among the most criticized by land owners and developers because they are seen to cause severe depreciation of property values. Reaching consensus among local constituents and maintaining it over time is a real challenge.

The failure to consult, include and negotiate with potential opponents of mixed-use development projects exposes the project to important risks of complication and ultimate failure, despite the best of intentions. The aim of the Stuttgart 21 project was to revamp the city's old central train station to make it an important link in European transport networks and create the space for new, multi-functional and vibrant inner city districts (Stuttgart-Ulm Rail Project, official website). Stuttgart residents had a strong sentimental attachment to the old station building, considered to be one of the most important examples of 20th century architecture in southern Germany, and to the adjacent Rosenstein Park, whose trees would be harmed. They were also not convinced of its costs and viability. In spite of initial resident consultation, the leaders of the project did not show serious interest in the concerns and claims of opponents of the project. Ten years down the line it continued to be highly contested, eventually with huge regional and national political ramifications. The future of the project is still unsettled, and Deutsche Bahn's CEO threatens some EUR 1.5 billion in claims if the new state leadership tries to derail the plan (DAPD, 2011).

Daunting infrastructure costs and uncoordinated fiscal arrangements

Many projects (public transport investment, large public investment in urban centres) have not been fully implemented owing to a lack of fiscal capacity at the local or metropolitan level. Innovative funding mechanisms and fiscal tools can sometimes address disparities in fiscal capacity, whether between levels of government or between municipalities within a given metropolitan area. One increasingly popular initiative is collaboration with the private sector through the establishment of a public-private partnership (PPP or P3) arrangement to manage a particularly large or complex public infrastructure project. Promoting private investment by creating an environment in which private investors are willing to invest is essential for successfully establishing and managing PPPs.

There are many examples of market signals from governments that are incoherent when measured against compact city results. For example, the same government can tax carbon, subsidise parking, price greenfield development artificially low and subsidise carbon-based energy consumption for businesses or home-owners. Such a mishmash of fiscal signals will not lead to the achievement of compact city goals, particularly in terms of slowing sprawl and densifying/intensifying the central business district (CBD).

Outputs vs. *outcomes: how to measure success?*

While it is relatively easy to measure the output and immediate impact of public investments in infrastructure – for example the number of construction jobs created or the kilometres of subway built – it is more difficult to measure the impact of an investment in a transit system on greenhouse gas (GHG) emissions or on the modal share of transport in a metropolitan area. Moreover, since the administrative boundary of a metropolitan area is seldom correlated with its functionality, defining true metropolitan-level data for the purposes of benchmarking success in achieving compact city results can be a significant challenge, as shown in Chapter 3.

The dearth of compact city outcomes-based indicators and metropolitan-wide data makes it all the more difficult for stakeholders and the general public to understand clearly the nature and scope of whatever progress is or is not being made to achieve the compact city results outlined in the region's vision and strategic plans. This underscores the difficulty faced by politicians and policy makers for engaging in a meaningful debate with stakeholders and residents on how best to make strategic choices for compact city outcomes.

6.3. Strategic approaches to improve compact city policy results

Improve horizontal co-ordination

Between municipalities in the functional area

The case studies suggest that at every stage of policy design and implementation, the following key governance issues tend to guide the broad metropolitan development policy framework:

- **A spatial approach to development:** inter-municipal or metropolitan planning should take into account the interdependence of transport, housing, workplace and leisure land use/infrastructure.
- **Multi-sectoral, cross-cutting strategies articulated around an organising strategic vision** should be devised and implemented to achieve more integrated, coherent policy outcomes (e.g. infrastructure development/renewal **and** environmental protection).
- **Policy linkages** are needed to other cross-cutting objectives (e.g. environmental protection **and** economic growth).

For example, the case of Portland illustrates integrated governance towards greater spatial sustainability. The principal challenge to achieving compact city outcomes in the Portland metropolitan area is the low-density, auto-dependent development pattern that emerged in the decades following World War II – how to retrofit these low-density, auto-oriented development patterns across the area. To take up this challenge, the state of Oregon initiated a dramatic shift in its growth management policy. The essence was the 1973 Comprehensive Land Use Planning Co-ordination Act (Oregon Revised Statutes, Chapter 197), which established a new state agency to manage the programme, gave it money to distribute to cities and counties to support their planning efforts, and authorised the agency to withhold transport and other state funds from local governments that refused to comply. It also directed the agency (Land Conservation and Development Commission) to adopt state-wide planning goals for city and county plans (see Chapter 4 for details). By 1985, all cities and counties had plans and ordinances in place that complied with the state-wide planning goals. In 1995, Metro Portland adopted its 2040 Growth Concept.

What was the result of adopting these governance mechanisms? Development in the region is shifting from the low-density, auto-dependent pattern to a higher-density, compact form (see Chapter 4). As the region demonstrated progress, its efforts began to attract national attention, as reflected in scholarly journals and evaluations by non-profit organisations. In short, these governance initiatives show that concerted, ongoing vertical and horizontal co-ordination can lead to the achievement of integrated compact city outcomes efficiently and effectively. Establishing an institution with the authority to

guide growth management and transport planning in functional metropolitan areas that is of regional and interstate interest should be encouraged.

One governance model does not fit all

The case study areas point to a "cardinal rule" in the compact city development model, particularly with respect to governance: one governance model definitely does **not** fit all. Indeed, the norm is the existence of a diversity of institutional arrangements. For example:

- top-down amalgamation of municipalities;
- top-down creation of metropolitan government;
- bottom-up voluntary forums/associations of municipalities, strategic planning partnerships;
- bottom-up voluntary investment co-ordination;
- urban partnership agreements (charters/contracts);
- inter-governmental memoranda of understanding.

They also demonstrate a second "cardinal rule": when it comes to governance, it never pays to reinvent the wheel. The evidence points to the importance of building on **existing** institutions to maximise policy coherence and co-ordination in programming and service delivery. In the case of Vancouver, for instance, the Greater Vancouver Regional District, having evolved from previous institutions created at the beginning of the 20th century, became Metro Vancouver by the century's end (Box 6.1). Indeed, it could be argued that building on existing governance mechanisms in fact facilitates the development of more holistic, multi-sectoral approaches to addressing compact city issues: key actors from across the metropolitan area already know each other's mandates on a given issue. This tends to allow for a greater degree of trust at the beginning of a policy development or planning process which can then be sustained. The case studies highlight a few best practices, which so far tend to be sector-specific as opposed to multi-sectoral institution-building initiatives.

Coherence among the metropolitan institutions in the functional area

The design and implementation of land-use and transport policies need to be highly co-ordinated and mutually reinforcing. The nature and scope of specific institutional set-ups in some of the case study cities provide useful insight into the impact of such co-ordination. Traditionally, cities' land use and transport are managed by different organisations, although some have integrated their planning functions. The institutional set-up is not a significant issue if the separate institutions responsible for land use and transport maintain productive, ongoing relations. Lack of transparent, positive relations can, however, create serious challenges for the orderly, coherent development of a metropolitan area. For example, after a long period of integrated organisation (GVRD), Vancouver again had separate land-use planning (Metro) and transport and placed all transport functions, from planning to investment to operation, in a single agency (TransLink). It is now essential for the two organisations to work together closely and ensure the linkages between land use and transport.

Box 6.1. **A metropolitan approach to planning: Metro Vancouver**

A metropolitan approach to planning and governance has been a feature of the Vancouver metropolitan area for nearly 100 years. In 1913, the municipalities of Vancouver, Point Grey and Burnaby established the Burrard Peninsula Joint Sewerage and Drainage Board. This board was renamed the Greater Vancouver Sewerage and Drainage District in 1957 and became the Greater Vancouver Regional District (GVRD) in 1971. It has voting power and provides financial contributions in proportion to the populations of member municipalities and the quantity of services provided. Planning collaboration among communities has also been in place since the 1930s. In 1937, the City of Vancouver Town Planning Commission met with neighbouring municipalities to create the Regional Planning Committee, which served as a forum for discussion of cross-jurisdictional issues and for lobbying the provincial government for common needs (Taylor and Burchfield, 2010). In 1945, a preliminary report on a proposed lower mainland regional plan was produced. An amendment to the provincial Town Planning Act in 1948 allowed for the creation of advisory regional planning boards. In that year a massive Fraser River flood destroyed much of the region's infrastructure for services and many homes. The Lower Mainland Regional Planning Board was established in 1949 and undertook a 15-year study of regional planning options and concluded that the supply of urban land would be exhausted by the 1990s and that the best option was to pursue infill and redevelopment opportunities at a metropolitan scale while protecting agricultural land (LMRPB, 1963). These principles were included in the 1966 Official Regional Plan of the Lower Mainland Planning Area (Taylor and Burchfield, 2010).

Regional districts were created by the Province of British Columbia in 1965 and allowed municipalities to collaborate on a voluntary basis to provide services. Sparsely populated areas without incorporated municipalities were called "electoral areas". Although the regional districts began with limited powers, by 1972 the GVRD had absorbed all of the functions of the special-purpose bodies and planning boards in the region (Tennant and Zirnhelt, 1973). The first Liveable Region Plan was produced by the GVRD in 1975 as a set of proposals to guide planning policies. This first plan was worked on and redeveloped into the Liveable Regional Strategic Plan (LRSP), which was adopted in 1996 by the GVRD. However, municipal plans are not legally required to conform to it.

GVRD has since changed its name and is now called Metro Vancouver.

Source: Taylor, Z. and M. Burchfield (2010), "Growing cities: comparing urban growth patterns and regional growth policies in Calgary, Toronto, and Vancouver", Neptis Foundation, Toronto; Lower Mainland Regional Planning Board (1963), *Chance and Challenge: A Concept and Plan for the Development of the Lower Mainland Region*, New Westminster, British Columbia, Canada; Tennant, P. and D. Zirnhelt (1973), "Metropolitan government in Vancouver: a strategy of gentle imposition", *Canadian Public Administration*, 16(1): 124-138.

Breaking silos open to maximise coherence

Cross-sectoral policy co-ordination is crucial to maximise synergies and complementarities. For example, compact city policies can be more effective when combined with building policies that improve energy efficiency in buildings. They also work well when combined with renewable energy policies that require district heating for new housing development. Congestion charges and high parking fees combined with mass-transit expansion can be mutually reinforcing. While infrastructure projects can take a long time to complete, transport policies that encourage the use of public transport (and discourage private car use) are likely to affect GHG emissions even in the short term. Similarly, combining compact city policies with other urban economic policy initiatives,

such as innovation policy (e.g. cluster building) and labour policy (e.g. a job-creation tax credit), would produce desirable short- and medium-term results, while continuing the long-term effort towards a compact city.

There is also a need to co-ordinate policy among government departments. The US Government has a Partnership for Sustainable Communities (Box 6.2). In Melbourne, the review of the Melbourne @ 2030 metropolitan growth strategy pointed out a lack of co-operation between land-use policy and transport policy within the Government of the State of Victoria (State of Victoria, 2008). The lack of overarching objectives for transport was also identified as a major issue by the Victorian Competition and Efficiency Commission in its 2006 report on transport congestion. The state government reacted quickly to improve the structure by creating a new legislative framework. The Victorian Transport Plan (VTP), released in 2008, includes a commitment to a more integrated and sustainable system (State of Victoria, 2009). The Transport Integration Act of 2010 applies to the entire transport portfolio and highlights the importance of the integration of transport and land use. Indeed, the Melbourne @ 2030 integrated regional growth plan explicitly recognises the links between transport, jobs and land-use planning (State of Victoria, 2008). It calls for greater planning co-ordination linking housing construction and transport as the region moves towards greater polycentricism. The planning documents emphasise the links between jobs, transport corridors and housing as a means to reduce commuting times by providing meaningful employment opportunities for residents in the various CBD-like central activities districts and along the planned "employment corridors" linking these districts together and to the central business district.

Policy leveraging to achieve integrated outcomes

Policy leveraging is more than policy co-ordination. It implies a holistic approach to defining policy outcomes and recognising at the beginning of the policy design process that certain policies can achieve more than one outcome, and that taken together, implementing several related policy initiatives simultaneously or in a co-ordinated fashion will achieve better outcomes than if each is implemented alone. In other words, instead of designing policies by sectors in silos and then co-ordinating their implementation, all actors meet together to create policies designed to create synergies among them. Portland's Green Infrastructure programme offers a good example of policy leverage (Chapter 4). Canada's Building Canada infrastructure investment programme also encourages applications for infrastructure projects that aim to achieve more than one policy objective (e.g. transport funding aimed at enhanced urban liveability and attractiveness as well as reduced congestion costs for business and reduced GHG emissions).

Enhance vertical coherence to optimise policy design and implementation

It is essential to maximise inter-governmental complementarities and each level of government has a role to play. Most best practices are sector-specific; the Vancouver Agreement is one of only a few cross-sectoral initiatives to date that have driven both vertical inter-governmental co-operation and horizontal intra-governmental co-ordination (Box 6.3).

Box 6.2. **The US government's Partnership for Sustainable Communities**

On 16 June 2009, Secretary Ray LaHood of the US Department of Transportation (DOT), Secretary Shaun Donovan of the US Department of Housing and Urban Development (HUD), and Administrator Lisa P. Jackson of the US Environmental Protection Agency (EPA) announced the formation of an interagency Partnership for Sustainable Communities. This action marked a fundamental shift in how the federal government structures its transport, housing and environmental policies, programmes and spending. The three agencies are working together to support urban, suburban and rural communities' efforts to expand housing and transport choices, protect their air and water, attract economic growth, and provide the type of development residents want.

Sustainable communities provide homes working families can afford; safe, reliable and economical transport options; and access to jobs, schools, parks, shopping and culture. All residents enjoy the same protection from environmental and health hazards and share in the economic and social benefits that can come from development. By co-ordinating housing, transport and other infrastructure investments, the Partnership is promoting reinvestment in existing communities, expanding residents' access to employment and educational opportunities, and catalysing community revitalisation.

HUD, DOT, and EPA have distributed nearly USD 2 billion in grants for vital transport infrastructure, equitable comprehensive planning and brownfield cleanup and reuse. Some grants are targeted to areas in which disinvestment and industrial pollution have left a legacy of abandoned and contaminated sites. Others require recipients to have clear plans for involving underserved populations in their proposed activities. The three agencies are also working to integrate sustainability and environmental justice into their programmes and to remove federal regulatory and policy barriers to sustainable community development in distressed areas. The Partnership is also helping to build the capacity of environmental justice and equitable development organisations to engage in planning their neighbourhoods' and regions' futures. A working group is examining how the Partnership can support the efforts of environmental justice communities to achieve sustainability. Additionally, the three agencies help to convene an annual equitable development workshop offering information and training on current policy trends, opportunities for collaboration, and successful initiatives around the country. Major projects include:

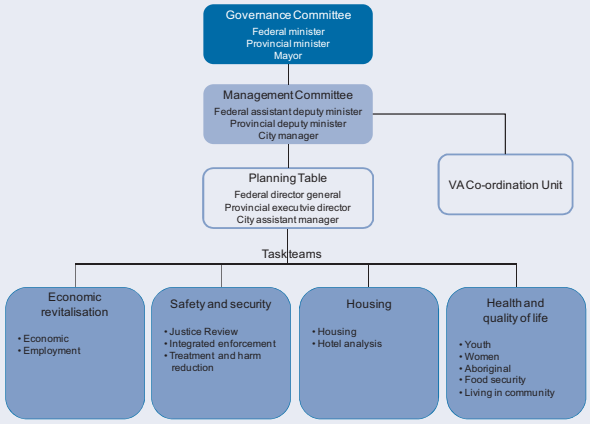
- Team-EJ, the Partnership's Environmental Justice Working Group;
- HUD Sustainable Communities Regional Planning Grants
- Joint DOT TIGER II-HUD Community Challenge Grants;
- Brownfields Area-Wide Planning Pilot Initiative;
- Brownfields Pilot Communities;
- Equitable Development Workshop.

Source: US Environmental Protection Agency (2009), "Partnership for Sustainable Communities: supporting environmental justice and equitable development", US EPA, Washington, D.C., *www.epa.gov/smartgrowth/pdf/partnership/2010_1230_psc_ejflyer.pdf*, accessed 18 November 2011.

Box 6.3. **The Vancouver Agreement: an example of cross-sectoral vertical governance**

The Vancouver Agreement (VA) was an agreement among three levels of government to support local community solutions to economic, social, health and safety issues. The VA was triggered by an acute health crisis in the Downtown Eastside (DTES). Although the area had experienced decline for more than two decades, the late 1990s brought a spike in fatal drug overdoses and HIV infection. With the inter-related problems of poverty, crime and mental illness, the crisis in Vancouver's inner city exceeded the mandate, resources or expertise of any single government or organisation. The situation urgently needed comprehensive strategies and solutions that could only be addressed by collective action. The VA, a visionary concept at the time, was a tripartite commitment that focused the interest of all levels of government on the issues and developed co-ordinated approaches. It succeeded in leveraging nearly CAD 28 million over 10 years to support 96 projects with close to 50 partners.

The VA was signed in 2000 and renewed in 2005 by the Governments of Canada, British Columbia and the City of Vancouver. Its purpose was "to co-operate in promoting and supporting sustainable economic, social and community development of the city of Vancouver, focusing initially on the area known as the Downtown Eastside". The VA vision was to create "healthy, safe and sustainable communities where all organizations, from informal groups to governments, work effectively together to improve the quality of everyone's life". Government partners formed the VA because they recognised that by working more closely together and with community and business groups, they could successfully address problems in a way that would achieve long-term, sustainable solutions.



The VA realised its mandate through four strategic objectives: economic revitalization, safety and security, housing, and health and quality of life. For example, for housing, the VA partnered with the City of Vancouver, BC Housing, Canada Mortgage and Housing Corporation, Vancouver Coastal Health Authority and the Ministry of Housing and Social Development to implement joint initiatives that would address homelessness and the poor quality of much of the affordable housing stock in the DTES. The VA invested CAD 4 million and worked with three other organisations to deliver seven projects for housing. Highlighted achievements include Kindred Place, a leading-edge 87-unit apartment building for people who previously lived in inner-city single room occupancy (SRO) hotels. This supportive housing project provides a variety of services to its tenants, who include people with mental illness and addiction issues. The initial VA investment of CAD 2.7 million kick-started the project and also helped attract other funding to make this much-needed type of housing a reality. The future of Kindred Place is secured by a long-term sustainable plan, thanks in part to early VA negotiations that ensured ongoing management and support services for the facility.

During ten years of action, the VA promoted partnerships involving governments, community organisations and businesses. It strengthened relationships, found collective solutions and built a strong foundation for ongoing efforts and future collaborative initiatives.

Source: Vancouver Agreement (2010), "Vancouver Agreement: 2000-2010 highlights", *www.vancouveragreement.ca/wp-content/uploads/VA2010_Report_0810_15.pdf*, accessed 30 November 2011.

National governments play a key role in setting the framework conditions under which other levels of government and key stakeholders develop and implement compact city strategies and plans. They do so by introducing legal frameworks and national policies to support and promote local action. For example, in its recently released national urban policy, the Australian federal Government **sets out** the different critical roles that the three tiers of government play in planning, managing and investing in cities (Box 6.4). Canada sets certain conditions for federal infrastructure funding to ensure that provinces work with municipalities to define priorities.

Box 6.4. **National urban policy in Australia: roles played by the three tiers of government**

On 18 May 2011, the Minister for Infrastructure and Transport released "Our Cities, Our Future – A National Urban Policy for a Productive, Sustainable and Liveable Future". It sets in place the government's objectives and directions for Australia's cities in the decades ahead. For the first time, an Australian Government has sought to outline its goals for the nation's cities and its role in making them more productive, sustainable and liveable. "Our Cities, Our Future" recognises the critical roles that the three tiers of government (federal, state and territory, and local), the private sector and individuals play in planning, managing and investing in cities.

- Role of the Australian Government: the planning and co-ordinating of the government's activities affects Australia's cities both directly and indirectly. The Australian Constitution establishes that state and territory governments have primary responsibility for the planning and management of cities. Nevertheless, since federation, the Australian Government has had a substantial role in cities through: direct investment in housing and social and economic infrastructure and economic policy settings; property ownership; labour market regulation, immigration and taxation policies; and regulatory functions. In this way, over the years, the government has helped to shape cities. The government considers that its role complements, but should not duplicate, the roles played by other levels of government.

- Role of state, territory and local governments: state, territory and local governments shape and manage cities. They provide most of the facilities and services that maintain community well-being such as health, education, law and order. They invest in infrastructure such as roads and railways and invest in or regulate utilities such as power and water. Together, these levels of government have primary responsibility for planning for urban growth and change and for statutory land-use planning development approvals.

- Role of industry and the community: the private sector is a powerful shaper of cities. Through individual decisions and investments, market forces have a strong impact on cities' economic, environmental and social fabric. Increasingly, the private sector provides critical infrastructure in cities, such as power, gas, telecommunications and transport infrastructure, areas which were previously the domain of governments. Individuals and households, as consumers of goods and services, and as employees and citizens, interact with governments and businesses to influence how cities are planned and operate. Continued engagement with the community and industry is essential for the successful planning and operation of cities.

The National Urban Policy states that, while there has been strong support for the Australian Government to increase its involvement and leadership in cities, its involvement has not always been based on clear principles and objectives. It therefore outlines how the Australian Government's future actions will be shaped to produce better outcomes for cities.

Source: Australian Government, Department of Infrastructure and Transport (2011), "Our Cities, Our Future – A National Urban Policy for a Productive, Sustainable and Liveable Future", Department of Infrastructure and Transport, Canberra, *www.majorcities.gov.au*, accessed 18 November 2011.

Maintain effective citizen engagement practices

The case studies suggest that strong local leadership is needed to implement the necessary measures. For example, in Toyama, the city's project for a new tram car line was realised in about three years, an exceptionally short period of time. This can be attributed to a number of reasons, but extensive dialogue between the mayor and the citizens was essential. It is often pointed out that many cities have difficulty gaining citizens' consent to construct a tram line because they are reluctant to pay extra taxes for the construction or are opposed to reducing the number of lanes for cars. However, in Toyama, the mayor held more than 200 meetings in three years in the districts not only near the new tram line but throughout the city, explaining its significance and purpose in order to gain citizens' consent. He especially emphasised the significance of investing for the future for a society in which people do not have to rely on cars and in which a decreasing and ageing population may be unable to drive but will lack alternative public transport (Mori, 2009).

A bottom-up approach also plays a crucial role in reaching consensus at the local level. There is a need for ongoing, not just short-term, community consultation and politically driven information sharing. The public needs to be involved from an early stage and in various ways: different types of meetings with citizens, provision of information, requests for input on policy implementation, on whether or not to take a decision, etc., with feedback loops from citizens, NGOs, business and academia. Local leadership and citizen involvement help make a vision effective, as urban policies are directly linked to the activities of private firms and households. The role of NGOs and citizen groups in Portland offers a good model.

Financing compact city implementation strategies more effectively

Use innovative fiscal arrangements to fund core compact city investments

A compact city's infrastructure requirements are expensive. For example, the public transport system may require significant new investment. As no one level of government can fully fund this, there is a need to co-ordinate different levels of government, vertically in particular (federal, state, metropolitan area, municipal). Collaboration with the private sector is also essential. Because of local governments' fiscal constraints, there is an increasing need for innovative tools to encourage private investment for compact development and to achieve results with less public expenditure.

New tools for financing infrastructure need to be developed. For example, tax increment financing (TIF) is a fiscal tool that can be used to influence land development and finance improvements in distressed or underdeveloped areas in which development might not otherwise occur. TIF uses future gains in taxes to finance current improvements. With public investment in roads, schools and parks, the value of the surrounding real estate often increases as does new private investment. Increased property values can generate increased tax revenues. TIF uses the additional tax revenue collected from properties in the district that benefited from the public investment to pay back the cost of that investment, usually over a period of 20 years. TIFs are not always viable as a financing method, however, because they may not generate enough additional revenue. In the United States, state-level legislation gives local governments the authority to designate and administer TIF districts (OECD, 2010b).

The Canada Line, a rapid transit line in the Metro Vancouver, is a typical infrastructure project using the PPP (or P3) model. It brought all three levels of government and the private sector together because of the project's complexities and cost. It is also important to secure financial resource (taxes, etc.). Besides, as Toyama's Light Rail Transit (LRT) shows, market-based strategies (congestion pricing, higher parking fees) that favour dense, mixed-use development linked to public transport can promote compact cities and ensure the budget necessary for public investment (Box 6.5).

Box 6.5. **Public-private partnerships for funding compact city investment**

Paris (public bicycle rental schemes - Vélib')

As part of its strategy to reduce car use, the City of Paris undertook to promote the bicycle as an alternative public transport mode for short distances in Paris. After an open call for tender in 2007, the City of Paris awarded the private company JC Decaux the concession to build, maintain and operate this system for a ten-year period. The investment and operational costs of the bike rental system are borne by the private company, in exchange for a right to 50% of the total surface of city billboards (this generated EUR 57 million in 2008). Total investment costs for the system were around EUR 110 million; additional Vélib' infrastructure is financed by the City of Paris (estimated to be EUR 8 million a year). Revenue generated by Vélib', through user payments and subscriptions, goes to the City of Paris (EUR 15 million in 2008), but the private company can earn additional revenue when its operations reach a very high level of quality as determined by six criteria. In order to run the system, JC Decaux hired 400 employees .

The public bicycle rental system was inaugurated in July 2007 with 10 600 self-service bicycles available at 750 stations. It reached 24 000 bicycles and 1 751 stations in June 2009. The Vélib' system is considered a success: the average number of trips reached 76 660 a day in 2008 and bicycle use in the city has increased. The model proved profitable for the city, but not for JC Decaux which underestimated the costs of repairing and replacing damaged bicycles. It was responsible for bearing this risk. In order to avoid the bankruptcy of JC Decaux and the end of their operations, the City of Paris renegotiated the contract and provided more favourable terms. There has been no analysis of whether this agreement is better value for money than if it were run by municipal workers.

Toyama (Toyama Light Rail Transit)

A public-private setup was used to ensure profitability from the start of the operation. The cost of installing the rail line and the maintenance cost for facilities and train cars after opening are assumed by the city, and operational costs for running the company are covered by fare receipts. A variety of sources, such as central government subsidies, are used for maintenance costs to reduce the city's burden. Local businesses invested in the Toyama Light Rail Co., Ltd. A fund was also established by the city, and many citizens and local businesses donated to the fund. Benches for the train stops were installed with donations from citizens. Sponsorship from local businesses was used for maintenance of the walls of the railway station. It is also possible to pay to name lights of the new railway station.

Source: Largentaye, H. de (2010), "Velib': a case of successful co-operation between the City of Paris and the private sector in the framework of a sustainable development strategy", presentation for the OECD's 3rd Annual Meeting on Public-Private Partnerships, 13 April; City of Toyama (2010), "Toyama City's efforts toward compact urban development", presentation to the OECD delegation, Toyama, 12 October 2010.

Better vertical fiscal coherence can achieve compact city outcomes more effectively

Vertical co-ordination of the fiscal framework is necessary to achieve compact city outcomes effectively. If national governments have certain business-related tax abatements to facilitate business use of small trucks by small entrepreneurs, it is counterproductive for sub-national governments to tax these trucks more heavily on the basis of fuel-emission standards. Similarly, cost pricing for greenfield property development on the periphery of a metropolitan area should ensure that homeowners pay the true cost of running electricity, water, sewer, road and transport services to the edge of the region. At the same time, parking subsidies in the downtown area for office workers are unlikely to help achieve the policy objective of discouraging homeowners from living in low-density suburbs. In short, the diverse financing tools for compact city investment need to be coherent in order to signal clear market messages. It is essential to examine the coherence of the fiscal tools currently in use in different policy sectors from the perspective of compact city policies.

Accountability and reporting: monitoring progress in reaching compact city goals

Transparency is essential

Policy makers require monitoring and reporting on the implementation of compact city policies. Transparency is necessary to ensure accountability – and to measure progress towards the achievement of key strategic objectives. A recent example is the codification of the process to amend Melbourne's urban growth boundary. In the 2008 update, the Victoria State Government committed to ensuring that future changes to the UGB are assessed on "criteria that the government has adopted to help determine whether and when changes may be required". These criteria – articulated in the public document – include:

- The need to maintain an adequate and competitive land supply, including redevelopment and greenfield sites, to meet future housing needs.
- The need to consider and analyse current population projections, the development capacity of existing urban areas to accommodate projected growth, longer term urban growth issues such as economic and employment opportunities, and transport investment requirements.

Outcomes-based indicators and metropolitan-level data are essential

Progress towards the compact city vision should be monitored through the evaluation of the strategies designed to implement it. It is equally important to create governance mechanisms that allow for modifying or adjusting key strategies if they are not achieving their objectives. A clear definition of the roles and responsibilities of each relevant public and private actor should be defined at the start. Ongoing performance assessments help ensure that they are held accountable for their part in implementing the overall strategic vision for the metropolitan area.

As discussed in Chapter 3, it is useful to develop indicators to measure the "compactness" of urban spatial structure. Such indicators may be necessary to understand the current urban spatial structure and assess the future impacts on the environment and the economy. It is important to recall that there is a fundamental difference between

outputs and **outcomes** when assessing the performance of programmes designed to implement a policy or strategic vision. For instance, it is one thing to measure performance of infrastructure investments in transport by measuring the number of construction jobs created during the life of the project and the number of kilometres built once the project is completed, and quite another to measure the impact on GHG emissions of the new transit system by examining its impact on modal share in the metropolitan area. The first set of measurements is about outputs. The second is about outcomes.

Another issue is the spatial unit used for most indicators. Since functional areas are rarely, if ever, coterminous with a metropolitan area's administrative boundary, securing reliable metropolitan data is a real challenge. Even more challenging is the ability to compare data across metropolitan regions for benchmarking purposes. More research is needed in order to develop comparable indicators for compact city policies.

Finally, the role of indicators in the context of citizen engagement needs to be stressed, as indicators can be used as a communication tool. In Portland, the Greater Portland-Vancouver Indicators offer an interesting example of the use of indicators as a communication and management tool (Box 6.6).[4]

Box 6.6. **Greater Portland-Vancouver Indicators**

The aim of the Greater Portland-Vancouver Indicators (GPVI) is to track the ups and downs of the Portland's well-being. They should provide a shared lens to track social, environmental and economic well-being. They are to serve as a common language to help communities collaborate across boundaries to expand their strengths and create a better future. This project is about more than creating a collection of indicators, data and a website. It is about:

- Choosing indicators, a political and strategic process. What are the goals of communities and organisations across the region? How are they measuring progress? How can these efforts be leveraged to form a collective vision, goals and regional indicators of progress?
- Measuring indicators, a technical process. How can the data be gathered and reported with clarity, accuracy, reliability and validity without having to spend a lot of money?
- Using indicators, a communication and results management process. How can the data best be shared to learn the meaning behind the data and create the most effective paths forward? How can the data be used to drive better results and accountability?

During 2009, Portland State University and Metro collaborated with Washington, Clackamas, Clark and Multnomah Counties; the Portland Development Commission's Greenlight Greater Portland; the City of Portland; and POSI (Portland + Oregon Sustainability Institute) to draft a framework for regional indicators. In 2010, after considerable discussion, one of the eight categories (healthy, safe people) was split into healthy people and safe people. The final nine categories are: 1) education; 2) quality housing and communities; 3) economic opportunity; 4) healthy people; 5) safe people; 6) healthy, natural environment; 7) arts, culture and creativity; 8) access and mobility; and 9) civic engagement and connections.

Source: Portland State University (2011), "Greater Portland-Vancouver Indicators Brochure", *www.pdx.edu/ims/indicators*, accessed 28 November 2011.

6.4. Conclusion

The case studies, while rich and textured in their variety, allow for the identification of four common thematic elements that together can lead to the achievement of compact city outcomes:

- a metropolitan-wide, integrated, long-term vision;
- a clear articulation of the roles and responsibilities of all key actors and stakeholders – public and private – in implementing the vision;
- vertical and horizontal co-ordination – networked governance arrangements – to implement the vision;
- accountability, transparency and reporting regimes to measure progress in implementing the vision and to adjust strategies accordingly.

The vision

A vision that frames an integrated strategic regional development plan helps to ensure the effective implementation of compact city strategies. In this sense it is a governance tool, because it sets out objectives and presents plans to achieve them which imply co-operation among key public and private stakeholders in the metropolitan area. City and metropolitan governments need to commit to compact city policies by designing and implementing this metropolitan-wide long-term vision. This will help residents and private investors see the spatial image of the future and enable development in accordance with the vision. The central government has an important role to play by committing itself to compact city concepts and by providing direct policy, governance and financial support to the city's and metropolitan governments' strategic plans to implement the vision.

The vision, along with its implementing strategies and plans, whether articulated in a single comprehensive spatial plan for the region or in a series of spatial plans prepared by one or more levels of government operating in the region, needs to be the subject, through sustained public and stakeholder consultations, of a broad consensus on the region's compact city objectives, the ways and means to achieve them, and the roles and responsibilities of all relevant actors in implementing these strategic plans. In other words, there has to exist a broad-based community consensus on the **why**, the **what**, the **how** and the **who** for compact city outcomes to be achieved successfully over time. Examples abound, but the Paris Master Plan, Vancouver 2040, the Toyama City Plan and the Portland 2030 Growth Strategy were all, in one way or another, conceived, articulated and implemented in this fashion.

Another key point emerging from the case studies about the design and implementation of a compact city vision or strategic plan is **scalability**. Toyama is not Paris. The population of metropolitan Toyama is about a tenth that of Paris, yet compact city outcomes can be and are being defined and implemented in both. In very large metropolitan areas, such as Paris, Vancouver or Melbourne, compact city strategies focus on polycentric densification, while Toyama focuses on densification strategies around transport nodes within a single urban core. Yes, polycentric densification is as much a pattern of compact city development as is monocentric densification of a central business district.

Clear delineation of roles and responsibilities

In designing and implementing compact city strategies, the case studies demonstrate that a clear understanding of who does what – within governments, between governments and between the public and private sectors – is central to the successful achievement of compact city goals. Given that by definition compact city strategies implicate all levels of government, since no single tier controls all the policy, regulatory and fiscal tools to implement them, it is vitally important for all key actors to understand their roles and responsibilities from the outset, as this understanding determines the tools that each player will use and frames the extent of the policy, financial and regulatory co-operation that will be required to implement the strategies effectively. Therefore, vertically and horizontally integrated governance structures work best, especially if they are designed to drive several policy objectives simultaneously. The Vancouver Agreement arrangements that enforced vertical and horizontal co-ordination between and within levels of government to achieve certain social and economic outcomes simultaneously in the Downtown Eastside, including compact city outcomes related to densification, housing and inner-city liveability, clearly demonstrate this.

In addition, particularly for large, strategically important and costly public infrastructure projects (such as a major transport initiative), the private sector's role must be clearly understood by all stakeholders. A public-private partnership arrangement must clearly assign roles and responsibilities to each partner and articulate what in the partnership relates to the **community's** interest, and what in the partnership reflects the private sector's interest. This was certainly the case of Vancouver's Canada Line subway project.

Networked, co-ordinated governance

The case studies demonstrate that where vertical and horizontal co-operation work effectively, the community benefits and compact city outcomes are achieved more smoothly. But aside from traditional co-operation between municipalities within a metropolitan area and between levels of government in an urban agglomeration, innovative institutional relationships beyond those between governments can enhance the potential to achieve compact city outcomes. The relationship between Portland State University's School of Public and Urban Policy and Metro Portland is a case in point: metropolitan spatial planning has over the years benefitted from the academic expertise of the university's school, but perhaps more important from a practical viewpoint is the fact that the university and Metro joined forces to plan the streetcar lines around and through the campus. Over time this drove densification and business development across the CBD and vastly improved the quality of life for students and residents in the neighbourhoods in and around the campus.

Accountability, transparency and reporting

This is the one set of governance tools that appears to be the most underdeveloped in the case study cities. Certain key elements of transparency and accountability are relatively sophisticated: Vancouver's and Portland's citizens' engagement strategies are a case in point. That said, in none of the case studies was there a robust set of comprehensive accountability arrangements. Glaring by their absence were metropolitan-level performance indicators to allow stakeholders and the general public to measure progress towards the achievement of economic, social and environmental outcomes related to the compact city vision. Data are crucial to transparency and to

ensure that decision makers can adjust strategies in ongoing consultations with residents and key stakeholders when objectives are not being met.

Ultimately, compact city strategies are not an end in themselves. They are a means to improve business productivity, enhance public service delivery and increase its cost-efficiency, and improve urban quality of life. In other words, they are a means to enhance the lives of people living in the city. What better way to achieve this objective than by ensuring that the beneficiaries – the residents themselves – can see who is supposed to be doing what, measure whether they are achieving what they are supposed to be achieving, and help them change course if they are not? Over the next 50 years, as populations in OECD countries age and many begin to decline, it will be more important than ever to ensure that urban residents guide the process of building compact cities through transparent accountability and performance measurement systems. Their quality of life and well-being will depend on it.

Notes

1. For example, in Portland, antiquated laws governing annexation to cities have slowed efforts to change development patterns in the region's suburban cities. The Oregon legislature enacted reforms to make it easier for cities to annex territory in 1995. However, resistance to higher property taxes to pay for city services caused the legislature to repeal the reform in 2005.
2. Metro Vancouver's new RGS, replacing the 1999 LRSP, was adopted on 29 July 2011.
3. The urban containment boundary (UCB) is a stable, long-term boundary designed to protect agricultural, conservation and rural lands and make predictable the location of urban use and the related major regional transport and other infrastructure investments.
4. Vancouver represents the city of Vancouver (state of Washington) in the United States.

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Annex A

Compact city policies: country profiles

Australia

National urban policy

In May 2011 the Australian Government released *Our Cities, Our Future – A National Urban Policy for a Productive, Sustainable and Liveable Future*. Under the goals of productivity, sustainability, liveability and good governance, 14 objectives for Australia's major cities are outlined, in order to:

- Improve labour and capital productivity by aligning workforce availability and capacity to meet labour force demand. "We must harness the agglomeration benefits that cities provide, and foster better connections between people and businesses."
- Integrate land use and infrastructure by integrating planning of land use, social and economic infrastructure. "There are several ways to maximise yields on land use, improve productive capacity, and leverage investments in infrastructure. One such means is to increase densities surrounding transport corridors, interchanges, and activity centres…. Most state and territory governments have planning policies that target a certain percentage of infill development to meet population growth... Maximising the potential yield of land along public transport corridors and around major activity centres is a key to reducing urban sprawl and metropolitan expansion, and gives people the opportunity to live close to jobs, facilities and other activities. Better integration of land use with transport and social infrastructure can also increase the operational efficiency of existing infrastructure and reduce the need for expensive capital outlays."
- Protect and sustain the natural and built environments by supporting sustainable development and refurbishing the built environment. "The high intensity nature of our cities provides opportunities to exploit economies of scale in reducing our impact on the environment. How cities are planned, their density and spread, and the buildings and infrastructure within them, provide an enormous opportunity to reduce greenhouse gas emissions."
- Support affordable living choices by locating housing close to facilities and services, including jobs and public transport, in more compact mixed-use development. "Low density urban expansion has been the standard solution to accommodating population growth in Australian cities. The upfront capital cost may be cheaper for home owners, but the long-term costs for households (travel, time and social), the impacts on the natural environment, and the costs of infrastructure and maintenance for governments, are considerable. One the other

hand, simply infilling existing areas without improving the amenity for existing residents, is problematic. A suitable balance between infill and greenfield development is required. Polycentric development, which aims to create additional centres outside of a city's central business district, is one solution. Creating more compact development around public transport corridors and activity centres is another."

- Improve accessibility and reduce dependence on private vehicles by reducing travel demand by co-locating jobs, people and facilities. "Reducing travel demand is an important step in reducing traffic congestion. There are several interrelated components to reducing travel demand in our cities: one is to plan for more integrated, compact and mixed land uses in order to reduce average distances travelled; another is to reduce peak work flows, including through telecommuting and flexible work hours; and another is to reduce demand through measures such as road pricing."

The national urban policy was preceded in December 2010 by "Our cities – building a productive, sustainable and liveable future" (discussion paper), and "Our cities – the challenge of change" (background and research paper). Noting the high levels of population growth in Australia, the discussion paper highlighted the importance for urban policy makers to address how and where Australia can accommodate growth in order to maximise economic efficiency, minimise impacts on the environment and retain a good quality of life for communities.

Commitment of Australian governments to urban reforms

All three tiers of government increasingly recognise the importance of cities and how they are structured. This was apparent in the agreement of the Council of Australian Governments (COAG) in December 2009 on a national objective and set of reforms "to ensure Australian cities are globally competitive, productive, sustainable, liveable and socially inclusive and are well placed to meet future challenges and growth". As part of the COAG reforms, states and territories agreed to have in place, by January 2012, capital city planning systems that are consistent with agreed criteria. These include the need to provide for planned, sequenced and evidence-based land release and an appropriate balance of infill and greenfield development. The Australian Government's commitment will involve co-ordination of its activities in cities, and the linking of its investments to capital city strategic plans. The development of a national urban policy is an important component of meeting these commitments.

Infrastructure Australia, an advisory body to the Australian Government on critical infrastructure needs, has "transforming our cities" as one of its priority themes. In its June 2010 report (*Getting the Fundamentals Right for Australia's Infrastructure Priorities*) to the COAG, it refers to the need for integrated long-term strategies to manage land-use planning, density, population and urban congestion. The report emphasises the need for a national strategy, and, in discussing sustainability it refers to the need to address: *i)* the contribution that the structure of cities can make to reducing greenhouse gas emissions and managing climate risks; and *ii)* the need to deliver high amenity and convenience while pursuing more compact urban forms that demonstrate best practice sustainable urban design. In considering "liveability" the report highlights the need to consider the concept of "living affordability", with regard to the costs of running a home and access to transport options, as well as the costs of land and dwelling construction. For the Australian Government's contribution to infrastructure, it suggests

that public transport infrastructure investments should leverage higher intensity land-use outcomes in and around transit hubs, such as mixed-use development and the sale of air space rights over transit hubs.

Compact city policies at the metropolitan level

Most Australian capital cities have planning frameworks that advocate more compact city forms and a diversity of lifestyle and housing options.

The metropolitan area of Sydney has the most compact urban form among Australian cities. The current metropolitan plan developed by the New South Wales Government aims to locate at least 70% of new homes within the existing urban area and 80% within walking distance of centres with good access to public transport: "By 2036, Sydney will be a more compact, networked city with improved accessibility, capable of supporting more jobs, homes and lifestyle opportunities within the existing urban footprint." (Metropolitan Plan for Sydney 2036)

Victoria has developed a comprehensive planning framework for metropolitan Melbourne. The Victorian state Government has set a target of 53% of new dwellings to be accommodated in established areas, with the remaining 47% in new growth areas (Melbourne @ 5 Million).

In southeast Queensland, the state government has set various targets for each of the local government areas (South East Queensland Regional Plan 2009-2031).

In the 30-Year Plan for Greater Adelaide, the South Australian Government recognises that "there is an urgent need to rethink the designs of new housing, new neighbourhoods and new suburbs, to create a more compact and efficient city and to break the nexus between growth and unsustainable resource consumption." It intends to gradually shift from the existing 50:50 ratio of infill development to fringe development, to a ratio of about 70:30 over the next 30 years.

The Western Australian Government has likewise set a target for the Perth region, with 47% of new dwellings within infill development, up from the current rate of 30% to 35% (Directions 2031 and Beyond).

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Austria

In Austria legal competence for urban planning lies at the level of provinces (*Länder*) and local communities. A variety of instruments and incentives promote compact city development as a general aim of planning; however, there is no single and clearly defined policy. The most frequent instruments are:

- legal protection of greenbelts or limitation of development zones;
- subsidies and technical assistance to encourage urban renewal and brownfield development (to reduce the need for land consumption); and
- quality requirements for housing subsidies which include, among others density, nearby infrastructure or environmental impact.

Austrian Spatial Development Concept – a guideline at the federal level

The Austrian Spatial Development Concept was developed under the ÖROK framework, a platform for informal co-ordination among provinces and municipalities operated by the federal government. Although the federal level has no enforcement power, the document sets how sub-national governments should proceed in terms of spatial development. It is revised every ten years. In 2001, it set the following major priorities and measures:

- Compact urban agglomeration development, resource- and energy-efficient spatial structures for future mobility systems to be achieved by focused and synergetic planning, (public) real estate policy, housing policy and mobility/transport policy acts.
- Restructuring of existing, inadequate spatial structures in terms of location and building quality through thermal restructuring of existing buildings co-ordinated with strategies to improve local/urban spatial structures.
- Renewable energy production and distribution with attention to natural resources, landscape and rural-urban interface qualities by linking renewable energy production strategies with agricultural policies, landscape and local development strategies.

- Grouping of economic activities and residential functions with competitive locations for business, excellent public transport links, a better mix of economic, service and residential functions through directing turnover in economic activities, strategically attracting businesses to prime locations and creating modern mixed use centres of activity (residential, economic, service functions).
- Good public service provision in rural areas to address the issues of ageing population and rising service needs and shrinking public finance revenues through multi-purpose regional service provision instead of provision by small municipalities, especially in rural areas.

The Vienna Urban Development Plan (STEP05)

The Vienna Urban Development Plan (*Erstellung des Stadtentwicklungsplans für Wien*) encompasses the entire metropolitan area of Vienna.[1] It was first established in 1984, and amended in 1994 and 2005. The current plan (STEP 05) pursues compact settlement development through the definition of greenbelt and development zones, development priorities, density recommendations and traffic infrastructure requirements. It pursues the following goals:

- To offer attractive locations, infrastructure and innovative facilities to create a climate that fosters investment activity (headquarters, trade, commerce, small and medium-sized enterprises, services, technology clusters) and to preserve an adequate local supply of shops and businesses.
- To preserve, in collaboration with Lower Austria, the diversity and quality of the living space in the Vienna region by securing and expanding the greenbelt around Vienna and the Danube landscape as a regional structuring principle.
- To concentrate settlement development along high-capacity public transport, to use land prudently, to encourage the vertical mix of uses, and to prevent functional and social segregation.
- To increase the share of environmentally friendly transport (bicycle, footpaths, public transport) in total transport; to reduce the share of individual motorised traffic; to reduce traffic in general.
- To safeguard, stabilise and advance the quality of life in Vienna by ensuring equal opportunity for all inhabitants, taking into account the diversity of lifestyles, origins, social backgrounds and the special needs of people with mobility handicaps, enabling all to live a meaningful life through access to cultural life, to social, educational, health care and care for the aged facilities, to housing of sufficient size and quality, and to nature and recreational spaces, and also to guarantee social security, personal safety and the protection of property, and uphold social integration.

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Canada

Integrated Community Energy Solutions (ICES): a federal initiative for sustainable development

Integrated Community Energy Solutions (ICES), started in 2009 by Natural Resources Canada, promotes opportunities to improve energy efficiency beyond individual buildings and houses to whole communities. It encompasses how energy is supplied and consumed in all sectors – including transport, land-use planning, industry, water management, waste management and others, and the role of government at the federal, provincial, and local level. A Roadmap for Action uses compact city components to achieve more sustainable development; it clearly states that density should increase, in particular around transport areas. Public transport needs further improvement; commuting distances are shorter with mixed land use.

Provincial initiative towards the compact city

LiveSmart BC Green Cities Award, started in 2006 by the Government of the Province of British Colombia, is promoting sustainable city development at the city and community level. It provides substantial cash awards to local governments that achieve integrated community design and management that encourage physical activity, energy conservation and environmental benefits. British Colombia follows the ICES guidelines in promoting more density in cities. To achieve densification, cities have to use tools such as transit-oriented development, urban growth boundaries, or mixed land use.

Ontario's Places to Grow Programme was initiated in 2005 by the Places to Grow Act, to plan for growth and development in a way that supports economic prosperity, protects the environment and helps communities across the province achieve high quality of life. Through the programme the Ontario Government develops regional growth plans that guide government investments and policies. For example, the Growth Plan for Northern Ontario identifies the need to develop mixed land use in order to provide easy and quick access to various services. It also defines the need for a wide range of sustainable transport options. It assesses the importance of developing and revitalising city centres. Current redevelopment projects aim at increasing city density.

Compact city policies at the metropolitan/local level

Metro Vancouver develops regional growth strategies for the greater Vancouver region that contain compact city elements such as urban containment boundaries. The City of Vancouver aims at more sustainable development through several charter and action plans. The Climate Change Action Plan uses some smart growth strategy elements, and particularly emphasises the need for higher density, mixed land use, and more developed and efficient transport services. The Eco-density Charter aims at higher density in already built-up areas. The Greenest City Charter 2020 is an action plan to develop

solutions for sustainable development. It emphasises the need to combine higher density with mixed land use in order to shorten commuting distances and to provide diverse transport solutions. It will also increase the efficiency of existing public infrastructures.

The City of Saskatoon has had specific policies regarding compact urban form in the Official Community Plan (OCP) since 2000. An example is one of the fundamental land use policies, set out in Section 3.2.2a of the OCP: "The development of a compact and efficient urban form shall be encouraged by setting overall density guidelines for new residential development areas, facilitating infill development in existing areas, and gradually increasing the overall density of the city."

Ottawa's Growth Management Strategy (Ottawa 2020) is a good example of a compact city policy at the metropolitan level. Its main goal is to increase citizens' quality of life while promoting development inside the city's boundaries, with cycling and walking pathways, more efficient transport nodes, and the promotion of mixed land use. Dense development is encouraged for both residential and employment areas especially in rapid transport corridors. It gives a particular attention to the densification of already built-up areas through the redevelopment of parking lots, and vacant and underused parcels of land. It also considers the development of apartments above shops on main streets. Ottawa's Growth Management Strategy gives special attention to citizen participation.

Examples of compact city policies are also found in the following: Nodal Development Policy (City of Nanaimo); Regional Growth/Sustainability Strategy (Victoria Capital Regional District, British Columbia); "The Way We Grow" Plan (City of Edmonton, Alberta); Smart Growth (City of Calgary); Regional Development Plan (City of Regina); Our Winnipeg Plan (City of Winnipeg); "Shaping the City" Chapter 2 (City of Toronto); Downtown21 Master Plan (City of Mississauga); Sustainable Development Plan (City of Montreal); Green Neighbourhood (Quebec City); Integrated Community Sustainability Plan (City of Charlottetown); Municipal Plan (City of St. John); and Smart Growth Development Plan (City of Yellowknife).

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Czech Republic

Urban policy context

The Czech Republic does not yet have a comprehensive urban development policy.[2] However, some aspects of urban policy are reflected in the document "Regional Development Strategy of the Czech Republic" which was developed by the Ministry for Regional Development and adopted in 2006 (Ministry for Regional Development, 2006). This document was followed by "Principles of Urban Policy", adopted in 2010, which establishes general directions for a comprehensive urban development strategy at the national level, leaving room for regions to design and adapt their own policies and instruments (Ministry of Regional Development, 2010). It defines six principles, followed by strategic guidelines and development activities. Principles 2, 3, 4 and 5 make compact city aspects part of the general national framework:

- **Principle 2: Polycentric development of the population pattern** emphasises the need to create a balanced and polycentric urban structure and to reinforce the inadequate potential of some regional centres. To achieve this, it is necessary to use the land-use planning tools available to regions and municipalities, regional territorial development principles and municipal land-use plans. They are also a means to ensure the efficient utilisation and protection of greenfields. It is also essential to prevent negative manifestations of suburbanisation (urban sprawl).
- **Principle 3: A strategic and integrated approach to urban development** argues that competitive towns require efficient transport, reasonable infrastructure and a healthy environment. One of the existing instruments which support the implementation of this vision in the programming period 2007-2013 is the Integrated Urban Development Plan.[3] In the future, such plans should encompass larger territories so as to develop an integrated approach to the city and its surroundings. Strategic plans for the development of cities are recommended as a first and essential policy instrument to develop compact cities.
- **Principle 4: Promotion of the development of towns as development poles in a territory** explicitly advocates a strategy based on compact settlement structures with mixed functions to "increase the attractiveness of towns and the quality of public spaces". The economic success and competitiveness of towns is closely related to the attractiveness and quality of the urban environment and the range of services offered. A favourable urban environment is an important "localisation" factor which attracts knowledge-economy businesses and an influx of educated and skilled residents, and encourages tourism. Nonetheless, a negative trend in the lives of many of Czech towns is the displacement of residents from the centre, which is then converted into commercial and administrative zones. Urban expansion requires a larger energy supply, more extensive transportation infrastructure and other land grabbing. This process damages the landscape, in particular blighting its natural value, increases greenhouse gas emissions, and is a source of air pollution and noise. This urban sprawl has a direct impact on the quality of life of the inhabitants of towns and their environs. Actions are therefore needed to regenerate urban cores, revitalise neighbourhoods, complete and reconstruct buildings, and regenerate abandoned and derelict sites (brownfields) and make adjustments to public spaces. In addition, the quality and social availability of housing is a major determinant of labour mobility. Attention should also be paid to the demographic structure, the needs of families with children, the growing number of seniors and persons with disabilities. Principle 4 also stresses the importance of public transport. Lifestyles and growing mobility are sources of constant growth of road traffic, which increases traffic congestion and pollution of the urban environment. Attention needs to be paid to the development of urban (and peri-urban) public transport, co-ordinated with urban-regional transport networks, the organisation of transport in towns, the definition of quiet zones, and improvements in the transport infrastructure, including for cyclists and pedestrians. An important aspect of mobility is easy walking distance to services and green areas with predominantly recreational functions. The key target for public transport is to provide a viable alternative to private cars and to reduce road traffic in the centres of towns.

- **Principle 5: Care for the urban environment** stresses the need to improve the protection and care of public spaces, the system of urban vegetation and other natural components of the urban environment. It is necessary to protect existing green spaces which play a recreational and ecological role. In new residential development, it is also necessary to incorporate green recreational and ecological spaces in the plan adequately and encourage investment in their implementation. The rehabilitation and development of these green spaces improves the quality of human life in the urban environment. This principle also argues that negative environmental impacts with a cumulative effect in towns require an integrated approach to care for environmental components and interconnection with other urban development policies. A fundamental issue is to reduce the adverse effects of traffic, which causes air pollution, emissions of harmful gases and noise, on the environment and public health. The importance of land-use plans in dealing with the organisation and functioning of urban areas is increasing. The urban development policy emphasises the revival of former (now abandoned) industrial buildings and the revitalisation of derelict areas, thus reducing pressure on the use of greenfields, the development of green spaces, parks, etc. The conversion and use of these sites will help address problems related to the lack of building space.

Compact city policies at the regional and local level

Regional and local governments in the Czech Republic have responsibility for the territory as a whole and they adopt strategic development documents in their self-governing competencies. These documents are updated on a regular basis. The municipalities have their own strategic development documents in which they reflect trends at the national and EU level.

The main strategic document of the city of Brno is Brno City Strategy. This document formulated the strategic vision: Brno wants to be a city with a positive image, a good economic basis that ensures its competitiveness in Europe, optimal transport accessibility, good conditions for life of its inhabitants and a healthy environment as well as a centre of intelligence, education, research and innovations (City of Brno, 2007).

In Pilsen, the main strategic document, the Pilsen Development Programme, establishes a long-term process of strategic planning in the city. The development goals are focused on innovation and the location of modern industries with high added value, development of culture and creative industries, development of technical and transport infrastructure, and improvement of the city environment in terms of rivers, parks, brownfields, etc. The spatial policy aims to develop interconnections between individual urban areas, the surrounding countryside, and neighbouring municipalities (City of Pilsen, 2003).

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Denmark

Denmark's national and local planning policies are not explicitly compact city policies, but they reflect in many respects the compact city concept. The Danish planning model gives primary planning responsibility to municipalities. Many of the policies of the 98 municipalities support compact city development. Several municipalities have cycle policies, policies to ensure the quality of public space, reuse of brownfield areas and much more.

The Planning Act: urban boundaries and zoning in Denmark

Denmark's policy tradition is to restrict urban development to urban areas and keep countryside as countryside. The Planning Act of 1969 was most recently amended in 2007 following substantial reforms of municipal structures and functions. The Minister for the Environment is responsible for overall national spatial planning and for conducting any necessary investigations. The Planning Act provides not only guidance for municipality and local planning, but also binding guidelines on the separation of urban and rural areas and their development in close connection with transport structures. It gives the Ministry of the Environment the right to require every municipality to develop local plans. These are tools to guide development through zoning and various requirements concerning density, use and design of buildings, energy standards, etc. The Planning Act also provides for national planning reports; gives the Minister for the Environment the right to veto planning that is not in the national interest and to oversee national interests (brownfield development, separation of rural and urban areas, integration of spatial planning and traffic infrastructure). It covers environmental assessments; planning directives for legally binding municipal plans and district plans; provision of information and guidelines; and specific planning directives for the Copenhagen metropolitan area.

Urban boundaries: the Copenhagen Fingerplan 2007

The Fingerplan has been the Copenhagen metropolitan area's urban spatial strategy since 1947. Since 2007 it is part of the Planning Act and enforced though a national planning directive for the capital region (Fingerplan 2007). In essence, it is a central government regulation to keep urban development inside the regional structure of the Fingerplan. It aims to concentrate urban development along public transport corridors, to ensure that "the green wedges are not converted to urban zones or used for urban recreational facilities", and to concentrate transport-generating functions close to public transport hubs. The plan ensures "that urban development in the rest of greater Copenhagen is local in nature and takes place in connection with municipal centres or as the completion of other urban communities" (Ministry of the Environment, 2007a: 9).

Planning and retail trade: reinforcing town/city centres

In the 1990s, studies showed that most development of retail trade was taking place as large shopping centres in the outskirts of large cities, and that this harmed the vitality and modernisation of inner city life. This issue was addressed in the 1997 Planning Act, and refined in later amendments, stressing the importance of "a diverse supply of retail shops in small and medium-sized towns and in individual districts of large cities". In order to "ensure that areas are designated for retail trade purposes in locations to which people have good access via all forms of transport, including especially walking, bicycling and public transport", "the areas designated for retail trade purposes shall be located in the centre of a town or city (town centre) or, in individual district centres in larger cities". "New secondary centres may only be established in Greater Copenhagen and in Aarhus" (Ministry of the Environment, 2007a: 10-11).

Copenhagen, a city of cyclists

The City of Copenhagen has a long tradition of promoting the use of cycles for transport. In 2002 the cycle policy stated: "The cycle policy goals are to increase the proportion of the workforce who cycle to work, to improve safety and a sense of security when cycling and to increase travelling speed and cycling comfort. The goals are to be met within 11 years." (City of Copenhagen, 2002: 5) Recent data show substantial progress, and a new policy initiative is also under discussion.

In addition to the cycle policy, Copenhagen has several other policies that support the development of a compact city. The goal of the municipality plan is to develop a more compact and plural city (City of Copenhagen, 2009a), a parking strategy that leads to fewer cars in the city centre (City of Copenhagen, 2009b), the development of small pocket parks, upgrading of the metro lines, and a long-term plan to make swimming possible in the harbour and much more.

As the supply of affordable family housing within 50 kilometres of the Copenhagen centre was not meeting demand, the City Council of Copenhagen adopted a policy in its Housing Plan 2005 that makes compact city policies an important part of the solution. It aimed to zone more sites for residential use, increase density requirements in municipal and local plans, co-finance the construction of social housing, provide urban renewal grants, and convert commercial property and brownfield plots for housing. It emphasises meeting urban expectations for vibrant city life through mixed land use (City of Copenhagen, 2005).

Århus – four new cities: transport networks

As the main city of western Denmark, the most important challenge for Århus is to find space to develop new employment opportunities and housing, while remaining a functional and attractive place to live (Ministry of the Environment, 2007b: 19). The 2009 Development Plan of Århus municipality identifies four "new cities" in order to limit urban development to strategically placed areas in proximity to the city centre and transport networks. The plan's main compact city principles are: seeing the city in movement with the identification of 33 areas for urban regeneration; a good city is a sustainable city in terms of energy and the environment; infrastructure must be developed.

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Estonia

Urban policy at the national level

Estonia's national regional development strategy and the ESF (European Social Fund) Operational Programme for the Development of the Living Environment contain urban development principles and policy instruments. These principles make green sustainable development, and thus the development of public transport, a priority. In its Transport Development Plan 2006-2013, the Estonian Government examined the main objectives of EU transport policy, the country's National Development Plan (2010) and Estonian sectoral plans in order to create an overall transport framework. The plan serves as a basis for legislative amendments in transport regulations and emphasises the need for: a more sustainable transport infrastructure with limited environmental impact; and convenient light public transport and improved access to diminish the use of cars in cities.

It is also intended to spread urban policy programmes/support schemes to smaller regional centres as well (there is a scheme to support the development of five larger urban areas) to strengthen the development of other smaller urban/labour force commuting areas. The main aim is to make these urban areas more attractive and competitive in comparison with Estonia's larger centres of growth.

Urban policy at the regional/local level

Many larger urban areas (cities and their surrounding municipalities) manage joint initiatives to prevent the negative effects of urban sprawl and territorial inclusion (for example public transport and light-traffic network improvement and co-ordinated land-use planning), but these have been single projects rather than comprehensive (urban) policies or strategies.

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Finland

Coherent urban structure: the Finnish compact city concept

The government uses national land-use guidelines to steer policy on land-use issues that are important for the whole country. The guidelines relate to the regional and urban structure, the quality of the living environment, communication networks, the energy supply, the natural and cultural heritage and the use of natural resources. They: *i)* ensure that issues of national importance are taken into consideration in regional and municipal planning and in the work of the state authorities; *ii)* promote ecologically, economically, socially and culturally sustainable development and create preconditions for a favourable living environment; *iii)* act as an advance guidance tool in local planning in issues of national importance and promote the consistency and uniformity of advance guidance throughout Finland; *iv)* promote the implementation of international agreements; *v)* create a basis in terms of land use for the implementation of national projects. Under the Land Use and Building Act, the national land-use guidelines must be taken into account and promoted in regional planning, municipal planning and the work of the state authorities.

The guidelines have been a national policy for many years. One of the main areas of focus in the recently revised land-use guidelines (2009) is "A more coherent urban structure and reducing the volume of traffic". This goal is mainly motivated by the need to curb climate change and stresses the importance of public transport, walking and cycling. The Finnish concept of compact city policies is often referred to as "coherent urban structures"; it slightly differs from the idea of "denser" or "more compact" cities:

> Centres and especially their central areas are to be developed as diversified areas for services, housing, workplaces and leisure… Major retail trade units should be located so as to support the urban structure... A more coherent urban structure means that new construction should mainly be located in areas that are already built through controlled expansion and relying on the existing infrastructure. (Ministry of Environment, 2009: 10, 11 and 19)

Urban sprawl as a challenge

Urban sprawl in Finland is quite widely recognised as a challenge to which attention is paid in various ways at both the national level and in cities. However, no restrictive tools (such as Copenhagen's limiting of housing in the vicinity of rail stops) have been created. Nevertheless, the idea of the "urban growth boundary" is now being explored.

Restructuring the metropolis: the PARAS project

The PARAS project aims to put the services for which municipalities are currently responsible on a sound structural and financial basis in order to secure their future organisation and provision with due regard to the required standards of quality, effectiveness, availability, efficiency and technological advancement. Behind the project are the major demographic and economic changes expected in the operating environment of municipalities in the coming decades that will challenge municipalities' ability to provide services to citizens. A sub-project of the municipal reform focuses on the 19 most important city regions. The aim is to develop a more coherent urban structure and a well-functioning urban region through better co-ordination of land-use planning, housing and transport. This can be achieved either by more comprehensive planning at the functional urban region or by amalgamation, or both. The work done in the PARAS project is expected to lead to changes in the national Land Use and Building Act.

A more coherent urban structure in the Helsinki region

The Helsinki metropolitan region does not have an encompassing compact city policy. However, the principle of a more coherent urban structure is clearly visible in many planning documents and practices in the region's individual municipalities. Also, the idea of a Metropole Plan, a comprehensive master plan for the region, has been introduced, but no specific steps have been taken. Overall policy for the Helsinki region is at a turning point. Amalgamation and/or an elected regional body for land use, housing and transport are being discussed and should lead to policies for a coherent urban structure.

The national land-use guidelines map out special guidelines for the development of the Helsinki region. They emphasise the development of a rail network and a strict policy for major construction. The Helsinki region's future spatial structure will be a polycentric, networked entity based on good public transport connections, particularly rail, with regional, urban and rural centres connected by development corridors. Helsinki's regional master plan prohibits construction of buildings beyond the existing urban structure and restricts major construction in areas served by public transport.

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France

The Grenelle de l'Environnement

Recent developments in the French legislative framework have significantly affected the means available to encourage urban densification. The aim is to limit the consumption of natural areas by urbanisation, to promote urban renewal, and to promote alternatives to automobiles and reduce energy consumption and greenhouse gas emissions. Previous instruments were strengthened and new tools made available for planning and taxation, such as density bonuses, minimum density, tax sub-density, obligation to set specific goals for space consumption, etc. (IAU-ÎdF, 2011).

The *Grenelle de l'Environnement* launched in 2007 was to "define an agenda promoting sustainable ecology, development and planning". As a result, the planning code was modified to include new goals for city planning. These new goals should be included in the main French local planning instruments: territorial coherence schemes (*Schéma de cohérence territoriale*, SCOT) and local urban planning *(Plan local d'urbanisme*, PLU).

The Law on the Modernisation of Agriculture and Fisheries (13 July 2010) aims to halve the loss of farmland by 2020. It provides for monitoring the consumption of agricultural land, provides benchmarks for local authorities to try to contain its loss, and creates commissions in each department to advise on planning documents. It establishes a tax on capital gains realised from the sale of farmland for construction.

In urban or urbanising areas, councils may now exceed the limit imposed by the local planning document by 30% for buildings that meet performance criteria or use energy-efficient equipment fed by the production or recovery of renewable energy. Greater density, which cannot exceed 50% of that allowed by the authorised coefficient of land or volume, may also be allowed in certain areas for housing programmes that include social housing for rental. Part of the excess building is not subject to payments resulting from exceeding the statutory maximum density. The combination of these two "bonuses" should not exceed the density allowed by the coefficient of land use or the amount allowed by the template by more than 50%.

The supplementary 2010 budget of 29 December 2010 provides for a tax on sub-density (VSD). The purpose is to fight urban sprawl. The municipality determines a threshold density (SMD) on the basis of which the payment amount will be calculated. The payment is owed by any beneficiary of a planning permission relating to a construction of lower density.

Compact city policies at the regional/local level

The PLU and the SCOT are documents produced by local authorities. They have to respect the national city planning code. The guidance document and goals of the SCOT define "conditions of controlled urban development and the principles of restructuring of urban spaces" and set "targets for efficient use of space and fight against the urban sprawl", which can be broken down by geographic area. It can make the opening of new

areas for urban development subject to service by public transport. SCOT may also prescribe preliminary studies, such as an impact study or a study of the density of developed areas, and it can regulate density. The report presenting the PLU must include an analysis of the consumption of natural, agricultural and forestry resources and justify the proposed development against sustainable development objectives and the consumption of fixed space. The development and phases of programming of the areas to be developed can also impose a minimum density for buildings in areas close to existing or planned public transport.

For example, the Montpellier SCOT is developing a more compact metropolitan model, by setting minimum density norms for various parts of the metropolitan area. It has also promoted integrated development along the new tramway lines, including a new strategy for retail activities. At the local level, the City of Grenoble decided to renovate a former barracks neighbourhood that was no longer used as a military facility. The *Quartier de Bonne* project is to renovate a central area in Grenoble and develop a wide green space surrounded by dense buildings so as to create a compact and green environment (Le Moniteur, 2011). The project was launched in 2001 and is slowly becoming a mixed neighbourhood with offices, shops, leisure activities and housing organised around the central park. All the buildings of the former barracks are low energy-consumption buildings – the European Union's experimental programme Concerto provided the funds to conduct the energy-consumption evaluation studies.

Interesting changes have also occurred in the Île-de-France region and in Paris. The *Schema dirécteur pour la Région Ile de France* (General Plan for the Île-de-France Region, SDRIF), first voted in 2007, explicitly approved compactness as a goal for 2030 (Batiweb, 2007). Compactness should be achieved by building in existing urban areas without compromising existing forest and agricultural lands and with a strong public transport system. The projects at the regional level echo the "Grand Paris" project which associates actors at all levels of decision making and aims to create a polycentric Paris. The main idea is to promote a city strongly connected both to the region and to other cities by giving the Seine River a central place, and by reinforcing polycentrism through a very ambitious programme to reorganise public transport. All of these projects at the regional and local level are based on the strengths and opportunities of the local urban fabric and use the idea of compactness and sustainable development as a basis for new ideas.

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Germany

Policies at the federal level

In 2007 the German federal Government launched an initiative to bundle and strengthen urban development programmes and strategies. The National Urban Development Policy is a platform where citizens, policy makers at communal and national level, and urban scientists promote the development of sustainable, compact, social, fair, economically strong and environmentally friendly cities. It also covers the main federal funding programmes. Those for urban restructuring and active city cores and quarters are related to compact city policies.

A recent ExWoSt study, *Cities of the Future (Sustainable Urban Development)* is a field-tested manual for sustainable urban development (BBR, 2004). It highlights the careful use of natural resources to respect the vital interests of future generations as a key issue for urban and housing policy (BMVBS/BBR, 2003). It also stresses the importance of performance reviews based on clear objectives. Achievement of objectives must be verifiable by reliable indicators that are transparent and understandable (BBR, 2004). Another ExWoSt project, "Climate-friendly urban development", discusses integrated approaches to urban development to mitigate and adapt to climate change in cities and urban regions. It presents three strategies: protection (mitigation); adaptation; and co-ordination of activities with other sustainable urban development challenges such as climate change-friendly housing. Major areas of concern are control of settlement development, transport and technical infrastructure, and water resources/flood control. This includes disaster or civil protection, health, nature conservation and soil protection (BBSR, 2011). A first model project, Urban Approaches to Climate Change, was launched in December 2009 (BBSR, 2009).

In 2011, the Construction and Transport Committee of the German Association of Cities conducted a study on sustainable and fair urban restructuring (Deutscher Städtetag, 2011). It discussed the upcoming challenges resulting from current problems of urban development, urban housing and local transport policy, increasingly unequal spatial development, and social and economic polarisation between and within cities. It highlighted the importance of close co-ordination of the various technical and policy areas and the relevant ministries at the federal and state level in developing an integrated and sustainable strategy for urban development.

Compact city policies at the metropolitan/local level[4]

"Strategic Cornerstones for Sustainable Development in Municipalities" is a declaration by 17 lord mayors, by which they commit themselves to assuming holistic responsibility for sustainable development (German Council for Sustainable Development, 2010). The four cornerstones are:

- Sustainability is conceived by people: concrete, spirited, hands-on, together with people who increasingly support sustainability. For this reason, we set store on dialogue, participation and the assumption of responsibility and give sustainability a face through concrete local projects.
- Sustainability entails not consuming more resources, including financial ones, than available. For this reason, we champion a balanced budget and the reduction of debt for the benefit of generations to come, and we call for municipalities to be given structural relief.
- Sustainable development requires integrating departments and issues into a broader picture. For this reason, we have to ensure that sustainability becomes a matter for all senior decision makers and integrate this in policies and administration.
- The potential to implement sustainable development can only materialise if all governmental levels pull together. For this reason, we want more co-ordination of municipalities, the *Länder*, the federal government and the European Union.

The "Report on sustainable development in the city of Nuremberg" (2005-2008) is concerned with three fields that can be addressed by political decisions and administrative actions: ecological sustainability, urban solidarity and a sustainable economy. Ecological sustainability covers resource consumption; green, traffic and residential areas; mobility; ecosystems and biodiversity; and healthful food. Urban solidarity covers demographics, integration, poverty, a family-friendly city, and health. Economic sustainability is indicated by the development of a mission statement by the European Metropolitan Region of Nuremberg, new opportunities and markets, strong SMEs, environment and quality of life, and environmental management.

The Hamburg Metropolitan Region promotes inner development before outer development (i.e. reuse of brownfield sites in city districts). After a long period of suburban growth the suburban population is stagnating but the urban population is growing. As a result, demand for urban dwellings is high. The government has therefore decided to develop former military and ineffectively used areas in the core city. This means an urban zone with space reserved for future use in implementing a compact city (Behörde für Stadtentwicklung und Umwelt Hamburg, 2007). In the framework of the REFINA programme of the Ministry of Education and Research, Hamburg designed a programme (Changing Awareness of Land Consumption) to raise citizens' awareness of a comprehensive and land-saving approach to settlement development. To this end, it makes the costs of settlement development and living in suburban zones transparent and organises thematic workshops.

The metropolitan area of Rhein-Neckar covers seven counties and eight cities in three *Länder* (Baden-Württemberg, Hessen und Rheinland-Pfalz). It is a polycentric structure dominated by three big cities. The administrative federation Region Rhein-Neckar takes a leading role in the regional development plan for the whole metropolitan area. The plan envisages sustainable and land-saving development with the

preservation of free space for flora and fauna, reduced land consumption for settlements and support of environmentally friendly land use. The area's polycentric structure is a good basis for the future economic and social development of the area.

Rhein-Neckar also targets inner development before outer development. Larger cities do not necessarily have good potential in this respect; the potential is higher in areas with lower land prices. Therefore, the Raum+ (2007-2009) and Raum+ AKTIV (2009-2011) programmes were established to monitor potential areas for settlement development in core areas. The results of the monitoring are the basis for mobilising strategies and for the commercialisation of central areas.

Land-use planning for Berlin (FNP Report, 2009) targets urban challenges including socially responsible, proactive urban renewal, demographic change (older and more international city population), and anticipated effects of climate change. In addition to economical use of land and ensuring open spaces, it is necessary to reduce emissions (by promoting environmentally friendly transport modes) and energy consumption. The plan's strategic objectives are: *i)* strengthening of internal development, urban mix, quality of the stock; *ii)* balanced use of structures in all areas of the city; *iii)* protection of and careful additions to residential stock in the built-up urban area; *iv)* promotion of employment, particularly in areas with good public transport; *v)* strengthened polycentric structure through integrated development centres; *vi)* protection of open space, green areas, the ecosystem; *vii)* securing the locations of parent community facilities; and *viii)* short distances, improved public transport, city-friendly economic exchange.

In the Capital Region Berlin-Brandenburg, the Joint Spatial Planning Department Berlin-Brandenburg developed the State Development Plan in 2008, with binding objectives for spatial planning:

- Orderly settlement: new settlements connected to existing settlement areas. In commercial and industrial space exceptions are permitted when specific needs for pollution control or appropriate traffic development exclude adjacency to existing settlements.
- No more scattered settlements and fragmentation.
- Control of housing estate development in central locations and rail axes in the Berlin area. In non-central locations internal and additional development is possible. The additional development option is 0.5 hectare per 1 000 inhabitants (as of 31 December 2008) for a period of 10 years for additional residential settlements.
- Protection of key service areas and local supply (regulations on location of large-scale retail facilities, factory outlets, etc.)

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Greece

Compact city policies at the national level

Greece has two policy frameworks at the national level for urban spatial policy. The Ministry of Environment, Energy and Climate Change is responsible for both. First, the Law 2508/1997 for the Country's Sustainable Development of Cities and Settlements of 1997 aligns Greece with the EU's restrictions regarding land use with a view to the sustainable development of cities. The main strategic guidelines of the law concern environmental protection and criteria for urban expansion in order to halt urban sprawl. Second, in 2008, the Parliament approved the National Spatial Plan (*Government Gazette* No. 128/A/3.7.08), which sets guidelines for the country's integrated territorial spatial planning and sustainable development for the next 15 years. Avoidance of urban sprawl is

an important goal for environmental protection and enhancement of Greece's fragile ecosystems, cultural heritage and landscape.

Compact city policies at the metropolitan level

Athens Metropolitan Area

The Athens Regulatory Master Plan adopted in 1985 (Law No. 1515/1985) was a significant government initiative to deal with the structural problems of the conurbation in a comprehensive way, with an emphasis on environmental protection and control of peri-urban growth. A central government agency, the Organisation for Planning and Environmental Protection of Athens, was created to oversee its implementation. The plan is now being revised. The proposed regulatory plan (New Blueprint, Athens Regulatory Master Plan 2021) is aimed at limiting urban expansion, introducing measures for farmland and the Attica landscape in general. New policies and measures being introduced include urban regeneration through land recycling, sustainable mobility, etc.

Thessaloniki Metropolitan Area

The Thessaloniki Regulatory Master Plan was adopted in 1985 (Law No. 1561/1985). The Organisation for Planning and Environmental Protection of Thessaloniki was created to oversee its implementation. The plan is currently being revised to include means to halt urban sprawl and revitalise the city as well as rehabilitation incentives.

Hungary

Compact city policies at the national level

There is no explicit compact city policy in Hungary. However, the compact city approach is implicit in urban planning regulations. It also appears in the National Spatial Plan (Law No. 2003/XXVI), which mainly addresses land use and the question of limiting the extension of built-up areas and protecting areas of particular value (landscape, high-quality arable lands, ecological network). The plan also provides an option to set up common planning practices for the main cities and their surrounding areas. The Ministry of Interior is responsible for the plan.

For urban planning, the Law on Protection and Formation of Built Environment (No. 1997/LXXVIII) deals with fundamental requirements, instruments, rights and commitments related to the built environment. It is under the responsibility of Ministry of Interior and covers the regulation of local plans and the efficient use of space and avoidance of waste of resources. The Requirements of Urban Planning and Construction, a government order based on the law, emphasises intensive and efficient use of areas, the best location of different functions and avoidance of chaotic spatial patterns.

Finally, the National Spatial Development Concept, a parliamentary decree (1998, 2005), addresses the issues of suburbanisation and co-operation in agglomerations in the context of the sustainable and efficient use of space. The Ministry for National Economy is in charge of this. This is the first legal document in Hungary to set specific goals for certain towns. It addresses polycentricism in relation to Budapest and the other seven regional poles. One of its main goals is to promote the development of a highly competitive Budapest metropolitan area and to create an important hub at the European level by providing a connection to the Balkans. Another aim is to strengthen the development of the hinterland.

Compact city policies at the metropolitan level: Budapest Agglomeration

At the metropolitan level, a clear policy aims at co-ordinating the development of the Budapest agglomeration based on a compact city approach. The Hungarian Act on Regional Development and Spatial Planning (No. 1996/XXI) defines the Budapest agglomeration as a functional region of national importance. The Budapest Agglomeration Spatial Plan (No. 2005/LXIV) was then adopted by the national parliament in 2005. The main aspects of the plan are: *i)* to keep open spaces in built-up areas; *ii)* to co-ordinate land use and transport infrastructure within the agglomeration; and *iii)* to protect areas with particular value (landscape, high-quality arable lands, ecological network). The local governments concerned are legally obligated to follow the plan.

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Italy

Policies at the national level

Italy is a highly decentralised country (in the near future, as reforms are enacted, it may be quasi-federal) and its regions are possibly the main locus of responsibilities and investment planning. In general, municipalities are responsible for municipal matters. Urban policy is essentially local. The national government can support compact city initiatives only indirectly, through sector-based policy schemes (e.g. energy and sometimes local transport) or regulation (e.g. classification of private and public real estate according to energy efficiency levels). For example, the Inter-regional Energy Programme 2007-2013 (EU co-funded), operated by Ministry of Regional Affairs, is measuring and subsidising energy efficiency in different sectors (public buildings, housing, transport) in regions in the south.

Regions can support and influence municipal decisions on compact city issues. For example, they approve long-term master and land-use plans submitted by municipal governments, co-fund local transport investments, and plan and implement metropolitan and sub-regional transport systems. In addition, all regions include in their development programmes (particularly, the Regional Operational Programmes for 2007-2013) measures and funds for sector-based investments that push the green/compact city agenda in municipalities.

Owing to its limited authority to intervene in local urban land policy, the central government emphasises transport planning as a tool to shape spatial patterns. Since the early 2000s, the central government has campaigned for sustainable mobility. In 2007, the Fund for Sustainable Mobility was set up to support the improvement of underground railways, trams and trains, to promote inter-modality and to provide incentives for urban mobility (UNEP/MAP, 2009).

Policies at the metropolitan/local level

Urban policy in local municipalities – mostly in central-northern Italy – includes some compact city elements. These include: low or no-emission light rail public transport systems (Milan, Naples, Turin, Florence, Rome); smart land-use planning and strong limitations on private automobile traffic. In addition, there are various energy-saving initiatives. For example, as of 2007, 24 (of which 4 in the south) provincial capital cities (out of 111) had adopted a municipal energy plan. Solar thermal and photovoltaic power are still under-used (especially in the south) but interest is increasing. Ten cities (none in the south) had district heating serving more than 100 per 1 000 inhabitants as of 2007. However, there is no link between the energy plans and city performance.

In Rome, nature conservation was made a priority issue in urban development in 2006 and a greenbelt was created soon after to prevent unregulated expansion. The Province of Trento in the north of Italy began to promote "a plan for sustainable development", one of the few sustainable development initiatives at a supra-municipal level in Italy (Diamantini and Zanon, 2000).

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Japan

National policy framework for a compact city

In Japan, local authorities (prefectural and municipal governments) are responsible for urban planning on the basis of national laws. The national City Planning Act sets the framework for city planning, decisions on city plans, and restrictions on city planning. The law was voted in 1968 to resolve a serious socio-economic issue. At the time, urban sprawl was a nationwide problem. It was due to the concentration of population and activities in urban areas during the rapid economic growth of the 1960s. Because of the need to control the development of housing and industrial estates, the act prescribed "city planning areas", within which are defined "urbanisation promotion areas" (in which urban areas already existed and where urbanisation was to be implemented preferentially in a well-planned manner) and "urbanisation control areas" (in which urbanisation was to be controlled to prevent unregulated urbanisation). The act also defined a "development permission system" to control the degree of development within the city planning area. This is the basis for the Japanese compact city policy.

From the 1990s, motorisation and a preference for shopping in large-scale suburban retail stores led to the decline of central urban areas, which had symbolised the cities' local culture and traditions. This led in turn to social problems, with vacant stores, unused land, and the decay of local communities. The central government therefore enacted laws in 1998 to renovate these communities: the Act on Measures by Large-Scale Retail Stores for Preservation of Living Environments which regulates the development of large-scale

retail stores to preserve local living environments; the Act on Revitalisation of Central Urban Areas to revitalise central urban areas suffering from depopulation and de-industrialisation; and the revised City Planning Act which enables local authorities to control the development of large-scale retail stores in suburban areas. These three acts aimed to stimulate economic activity in central urban areas and affected the framing of Japan's compact city policy (MLIT, 2000).

With the advent of population decline and ageing since 2004, the central government saw the need to review a city planning system which had been premised on urban growth in order to assure liveability in urban areas. The three acts were amended to promote compact city policies. The development of large-scale facilities is restricted, except in commercial districts, and requires the modification of the city plans of the municipalities concerned in order to ensure that such development reflects local decisions. As well, the standards for development permission were strengthened, and the construction of public facilities, such as hospitals and welfare institutions, must also obtain permission.

Japan has three main compact city strategies:

- Promotion of a comprehensive transport strategy by packaging policies such as construction of public transport (e.g. light rail transit), improvement of transport connections, and improvement of the environment for bicycle use and pedestrians.
- Concentration of urban facilities through revitalisation of central urban areas and promotion of living in urban areas, regulation of the development of new urban areas in suburbs, and effective utilisation of natural and unused energy.
- Building of a green network through the development of urban parks, conservation and promotion of urban green areas, and greening of public facilities.

The central government helps local authorities to choose and combine their strategies in accordance with local conditions.

Policies for low-carbon cities

In Japan, it is estimated that the sum of greenhouse gas emissions from the residential and business sectors and the transport and logistics sector represent approximately half of the total amount. Compact city policies not only prevent urban sprawl but also help reduce greenhouse gas emissions and global warming by reducing travel distances, a shift in the main means of travel to public transport and improved energy efficiency through the use of district heating and cooling systems. For example, Maebashi City and Kochi City are similar in terms of population and land, but the higher dependency on vehicles in Maebashi City, where the density of urban facilities is lower than in Kochi City, results in 40% higher annual CO_2 emissions per capita in the transport and logistics sector. This shows the need to rebuild urban structures to reduce emissions through the concentration of urban facilities.

In March 2008, the government revised the Kyoto Protocol Target Achievement Plan to: develop durable buildings and infrastructure, promote low-energy environments in urban areas and take measures against the heat island; and foster a low-carbon urban and regional society through urban renovation and concentration of urban facilities to put them within walking distance.

These directions are also incorporated in the New Strategy of Growth, one of the basic policies of the current administration, compiled in June 2010. Specifically, the strategy supports efforts to build ecological societies by promoting the use of public transport, developing renewable energy and smart grid to optimise energy use, intensively promoting the proper recycling of resources, using information and communication technologies, and eliminating emissions from houses and other buildings.

For its part, the Ministry of Land, Infrastructure, Transport and Tourism formulated Low Carbon City Development Guidance in August 2010. The aim is to enable local authorities to lower the levels of carbon emissions in the city as a whole by combining measures for urban concentration and reduction of emissions.

Compact city policies at the regional/local level

Several Japanese cities actively pursue compact city objectives. The City of Toyama is pursuing transport-oriented growth by concentrating city functions such as residential, commercial, business, and cultural facilities along a newly established light rail line built over an under-used long-distance rail line (Chapter 4). The City of Aomori has aimed at becoming a compact city in order to achieve more efficient urban management and comfortable urban life in a context of depopulation and ageing. The compact city concept was put in place in the 1999 Master Plan. The strategy consists of: *i)* well-functioning and efficient land use; *ii)* prioritised urban development in the designated urban centres; and *iii)* transport systems based on public transport.

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Korea

Korea has urban problems such as rising congestion costs, which amounted to KRW 25.8 trillion (about 2.87% of GDP) in 2007 (Cho and Lee, 2008), environmental degradation and shortage of a decent housing supply in cities, which is closely related to the strict greenbelt policy around metropolitan cities, notably Seoul (Box A.1). To address these issues, the government is trying to develop cities more "compactly", by adopting urban development strategies that focus on developing or redeveloping city centres. Although the compact city concept [5] still seems to be controversial, the government, mainly the MLTM (Ministry of Land, Transport and Maritime Affairs) established several policy initiatives including incorporating the concept into development plans, issuing guidelines, and launching compact city development projects.

Incorporating the compact city concept in territorial development strategies

The second revision of 4th National Comprehensive Plan (2011), the fundamental plan for Korea's territorial development strategy, aims to develop a comprehensive "Korean compact city". In order to achieve this, the government's strategy reflects the characteristics of two types of city. In developed or developing cities, it will establish a high-density development strategy and develop under-utilised land within cities, while avoiding overcrowding. In stagnant or declining cities, it will promote multi-land use around public transport nodes and attract public facilities to the city.

Box A.1. **Greenbelt policy in Korea**

Greenbelts were first established in Seoul in 1971 and subsequently in 13 other cities to stop excessive urban expansion and loss of open space. They were viewed as an effective way to control the rapid expansion of Seoul within the Seoul Metropolitan Area (SMA) and have successfully protected open spaces. Urban development has generally been strictly prohibited within the designated greenbelt areas. As of 2009, the SMA's greenbelt measured 1 540.8 km^2, about 13.1% of the total area of the SMA. The Korean Government has taken a very conservative position on greenbelt policy and the physical boundaries of the SMA's greenbelt remained virtually unchanged for three decades. However, after intensive research and discussion, the government specified the possible release of greenbelt land in the SMA's Metropolitan Plan. It has been decided that 125.8 km^2 would be gradually released to accommodate new development (see table).

Greenbelt areas by region (1979-2020, km^2)

	1979	2009	2020
Nationwide	5 397	3 925	3 629
7 metropolitan areas	4 294	3 925	3 629
Seoul Metropolitan Area	1 566	1 453	1 318
Seoul	167	154	152
Incheon	96	91	87
Gyeonggi-do	1 302	1 208	1 152
7 small and medium-sized cities	1 103	0	0

Source: The Korean Ministry of Land, Transport and Maritime Affairs.

The new town planning standards[6] (2010) aim at sustainable green growth in new towns. According to the standards, the developer should promote the compact development of urban or regional centres, with land-use plans, improved mass transport and intensive development of rail and multi-modal transport areas. The Urban Planning Guidelines for Low Carbon and Green City (2009) also emphasises reorganising urban planning to achieve a more energy-efficient and energy-saving spatial structure. Notably, the guidelines ask urban planners to incorporate transport policy in the design of urban spatial structure and especially to promote easy access to transport modes.

According to the Decree of the Special Act on Urban Regeneration, local governments can designate special high-density and mixed-use redevelopment districts for compact development and offer incentives to developers. Special districts can be designated in areas within 500 metres of the national railroad, subway and light rail stations or road intersections. Once designated, requirements for school facilities and

parking lots may be eased, and small houses of less than 60 m^2 can be constructed according to the floor area ratios prescribed in the ordinance.

Introducing the compact city concept in development projects

Bogeumjari Housing (launched in 2010) is a good example of mixed-use, high-density development. It is basically a new public housing model. According to the MLTM's Bogeumjari Housing Construction Plan (2008), 1.5 million new dwellings will be provided to homeless people by 2018. They will be located inside cities or in the surrounding greenbelt area rather than in new cities. To achieve compact development, the MLTM will connect facilities and land and develop a high-density city around subway and bus stations.

Korea aims to develop ten multi-modal transfer centres by 2012 in order to achieve seamless connections and transfers among transport modes. According to the Master Plan (2010), rail station areas will be developed as mixed-use, high-density areas that reduce journey time from home to work. They will increase connectivity between mass transport and cyclists by allowing them to take bicycles on the bus or rail. Eight trial projects were designated in 2010: Dongdaegu, Iksan, Ulsan and Songjeong stations in 2010, and Bujeon, Dongrae, Daegok and Namchuncheon stations in 2011 (Box A.2).

Box A.2. **Development of multi-modal transfer centres**

The Multi-Modal Transfer Centre (MMTC) Development is a flagship project to promote transit-oriented development and green transport. As a first step, the Ministry of Land, Transport and Maritime Affairs established the Five-Year Multi-Modal Transfer Centre Development Master Plan (2011-2015) in 2010. Its key objectives are to:

- concentrate transport facilities such as railway stations and bus terminals in each MMTC to reduce transfer time/distance (by 50%) and improve convenience;
- connect the public transport service lines with MMTCs;
- develop MMTCs as multi-functional areas by installing neighbourhood living facilities such as commercial and cultural facilities, and offices;
- promote non-motorised transport modes such as walking and bicycling around MMTCs by reinforcing regulations designating public transport zones or pedestrian zones.

There will be three types of MMTC, to be decided on the basis of each region's or city's circumstances. Large-scale national MMTCs will be constructed at KTX or major railway stations to meet inter-regional traffic demand. This type of MMTC will be designated by the MLTM. Regional MMTCs will be constructed at normal railroad or subway stations to deal with regional traffic demand and designated by the mayor or Do governor. General MMTCs will be built at subway stations to handle intra-city traffic demand and can be designated by the mayor or Do governor.

The MLTM expects to have nearly 15 multi-modal transfer centres by 2015. According to the plan, total expenditure is around KRW 4 trillion, to be mainly funded by the private sector and supported by central and local government as well.

Source: MLTM (2010), "The Multi-Modal Transfer Centre Development Master Plan", MLTM, Gyeonggi-do.

Song-do New City is planned as a centre for global business in which residents have easy access to cultural, business and residential facilities, international schools, international hospitals, etc. It will cover 53.4 km², with a projected population of 252 000. It is connected to Yeongjong (Incheon International Airport) by a 7.4 mile (12.3 kilometre) highway bridge (Incheon Bridge). Major projects include the Song-do International Business District (IBD), which features the 68-storey Northeast Asia Trade Tower (NEATT) and the 151-storey Incheon Tower. The district's International School Song-do, hospitals, apartments, office buildings and cultural amenities will be constructed. The compact city concept here is an autonomous and highly concentrated but very efficient city. The location of facilities is planned so as to be close to all residents and to facilitate the flow of human traffic. In a radius of five kilometres, there are buildings for businesses, residence, education, hospitals and shopping. Convenient and fast public transport will be available, but the city of Incheon will promote walking and bicycling for residents' health and the environment. Pedestrians and bicycles have priority over automobiles in the city planning (*Korea ITTimes*, 2010). Song-do should reduce carbon dioxide by 30% compared to other major cities. Song-do IBD is part of the LEED-ND (Neighbourhood Development) Pilot Programme. The KGBCS (Korean Green Building Certification System) is also used on selected parcels within Song-do IBD.

The SHIFT housing project was launched by Seoul Metropolitan City to supply long-term rental housing. Seoul decided to expand the supply of private SHIFTs in 2010 by redeveloping houses in station areas and easing the floor area ratio of redevelopment projects by up to 500% for high-density development by changing the use of land.

Korea has various policy instruments for creating compact cities. However, Korea needs to clarify the definition and scope of compact city in the Korean context; terms such as "green city", "ubiquitous city" and "ubiquitous Eco city" are also used and there are no comprehensive policy packages with specific policy objectives. The national government needs to develop compact city action plans that take account of local differences in population, economic performance and social structure.

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Luxembourg

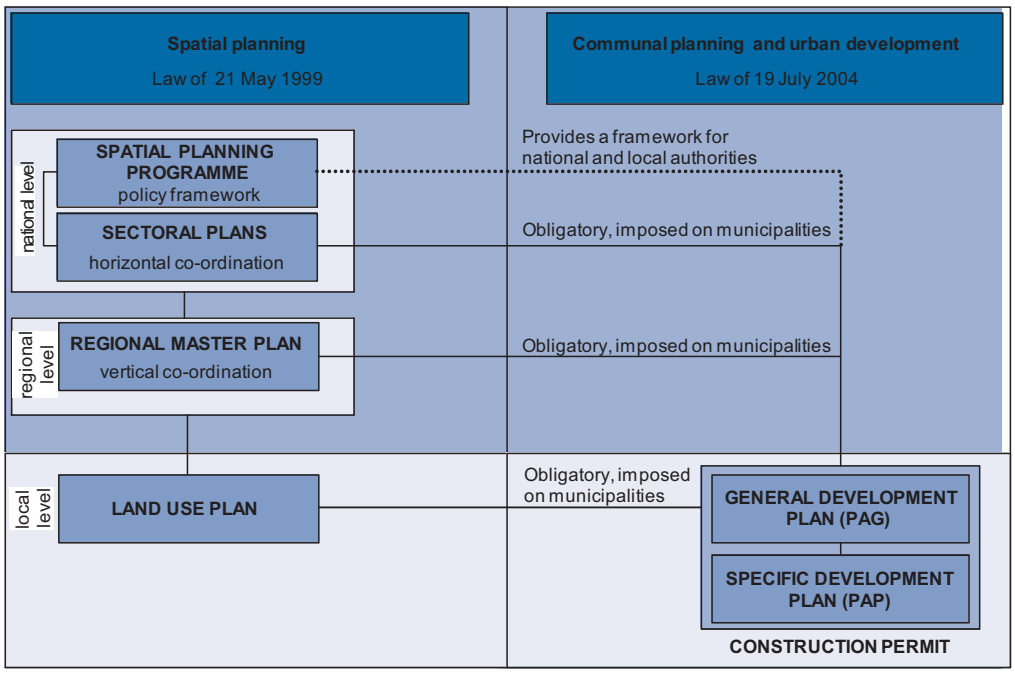
Spatial development policies

The Law of 21 May 1999 makes the planning programme the key instrument of national spatial planning. The programme is a policy framework whose purpose is to co-ordinate sectoral programmes to achieve spatial planning objectives.

The *Programme directeur d'aménagement du territoire* (PDAT) was adopted in March 2003 by the Spatial Planning Department. It identifies 15 centres of development and attraction (*centres de développement et d'attraction* – CDA). These are regional centres that provide services and amenities for their own citizens and those from adjacent areas. There are three types of CDAs: superior, intermediate and regional. Together they form a coherent, hierarchical system based upon the principle of concentrated deconcentration. PDAT also identifies three types of urban areas: the monocentric Luxembourg agglomeration, the polycentric agglomeration of the former mining basin in the south (an area to be redeveloped), and Nordstad in the north. At the moment, about 55% of the population lives in the central and southern urban areas, which cover 18% of the Grand Duchy's territory.

The re-establishment of a polycentric territorial balance will be achieved through a range of complementary actions: restructuring the agglomeration of the City of Luxembourg, redeveloping the former mining area in the southern part of the country by focusing on urban renewal to upgrade brownfield sites, and developing the economic potential of Nordstad as a major urban centre.

Figure A.1. **Legal framework on spatial planning in Luxembourg**



The Integrated Transport and Spatial Development Concept for Luxembourg (*Integriertes Verkehrs- und Landesplanungkonzept für Luxemburg* – IVL), developed in 2003 by the Spatial Planning Department, stimulates the implementation of the targets set out in PDAT. It relies on a spatial model called "polycentric urban structures integrated in the landscape embedded in functional regions". Its advantages are:

- the creation of a critical mass for local public transport, i.e. sufficient homes close enough together to ensure adequate demand for good local public transport;

- steering of growth to strengthen the country's spatial structure and develop a city with European stature;
- urbanism with different functions in the south, in Nordstad and in the Luxembourg agglomeration with a complementary suburban development axis in the Alzette Valley north of the capital;
- development of rural areas to strengthen their specific qualities and avoid the emergence of dispersed housing developments.

The model defines networked system of cities and towns, linked by greenbelt areas. Other areas should be developed into regions that are functional in the long term, preserving their structure, cultural and landscape attractiveness and regional identity.

Luxembourg's local authorities are granted planning authority by the Constitution. However, the Minister of the Interior and the Greater Region has administrative guardianship over local authorities and approves or disapproves municipal urban development plans, following the appraisal of the Spatial Planning Commission.

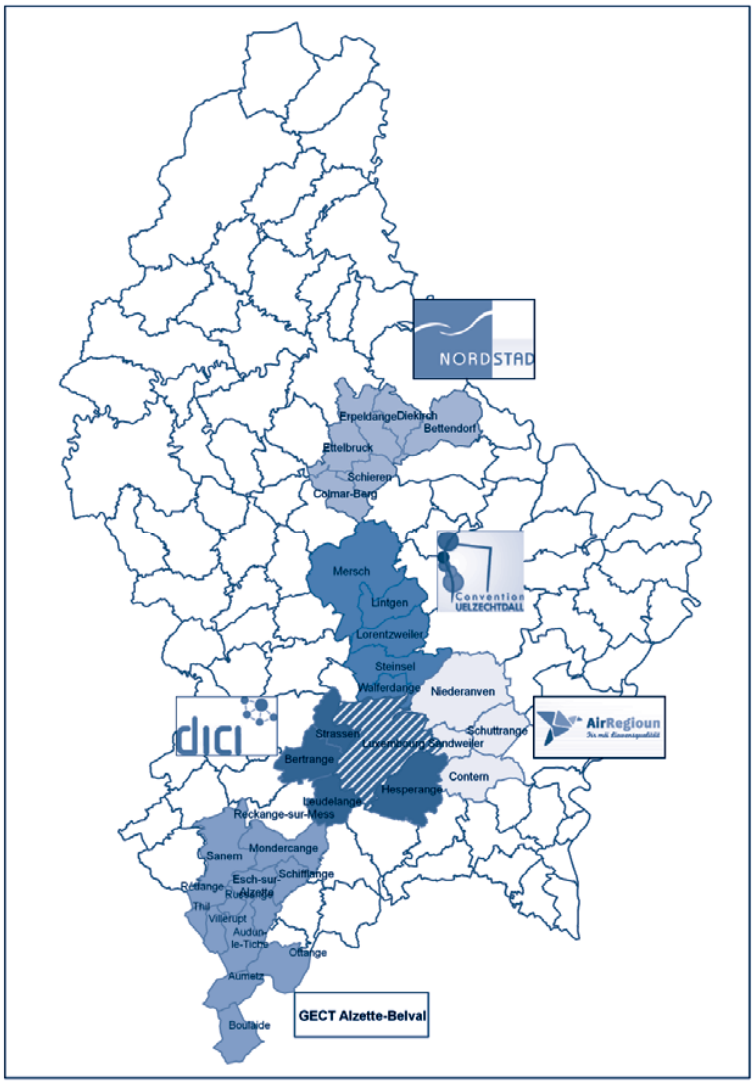
Convinced of the value of integrated urban planning, the Ministry of Sustainable Development and Infrastructures, responsible for spatial planning, has initiated several integrated urban planning processes. A number of cities and adjacent municipalities have signed formal agreements or "conventions" with the ministry, aimed at ensuring more sustainable development, implementing the objectives of the PDAT and the IVL by ensuring more balanced polycentric development, and co-ordinating and integrating the territorial development of the municipalities involved.

A first convention, *Développement intercommunal coordonné et interactif* ("dici") between four municipalities of the south-west part of the Luxembourg city agglomeration was signed by the city of Luxembourg and the ministry responsible for spatial planning in June 2005. The main commitments needed to implement a strategic sustainable territorial development were identified and summarised in the PIDP (*Plan intégré de développement pluricommunal*) which was signed on 7 July 2011. To implement the goals set out in the development scenario, one concrete project was identified for each of the four main themes – economy, urban development, transport/mobility and landscape – to be carried out in the near future. The pilot project for the economic development scenario is a common pool for commercial/industrial areas. For urban development, the housing issue was chosen. Common rules for management of parking space for automobiles are the topic for the transport/mobility theme. Finally, an inter-municipal plan for non-motorised traffic which emphasises the landscape potential of the co-operation area is being worked out.

In a second convention in 2006, local as well as ministry authorities worked out, together with the inhabitants of Nordstad, an implementation strategy, which is defined in a spatial development plan, the Masterplan. This lays the foundation for the future urban development of the Nordstad region and defines the goals to be achieved. These include the creation of 7 000 new jobs and housing for some 8 000 people by 2020. It is used as a reference in discussions or meetings about the future legal entity Nordstad. The major development principles are: quality urban planning and sustainable social and cultural infrastructure in harmony with the creation of housing and jobs in order to improve the quality of urban life for its current and future population.

The Northern Alzette Valley Convention between the five municipalities north of the capital and the ministry responsible for spatial planning was signed in December 2007 for three years and extended for two years to the end of 2012. The aim is fruitful co-operation by the municipalities to ensure the balanced and harmonious development of the whole agglomeration. These peri-urban municipalities near the city of Luxembourg are mainly characterised by urban sprawl. The convention aims to achieve more compact forms, with higher density housing replacing older forms of residential development. Other aspects to be addressed are related transports issues.

Figure A.2. **Four "conventions" in Luxembourg**



In 2008, a fourth convention (AirRegioun) was signed between the ministry responsible for spatial planning, the City of Luxembourg and the eastern municipalities of the agglomeration. These municipalities are located near the national airport. The region's urban and economic development is strongly influenced by the development of the

airport. The aim of the convention is co-ordinated and integrated development of the region by combining the economic and spatial growth of the airport and the adjacent municipalities for balanced development. Profit and costs are shared in a fair manner. As a first step, the municipalities take a regional approach to creating and managing economic areas. Urban development must also take a regional approach and the region's traffic issues have to be solved in common. The convention was extended in July 2011 to the end of 2013.

Finally, for the cross-border agglomeration Esch/Belval between France and Luxembourg, the ministers responsible for spatial development agreed to create a European Grouping of Territorial Co-operation (EGTC) around Belval/Alzette in the south of Luxembourg. The EGTC, which is based on a European regulation, facilitates cross-border co-operation to promote the integrative development of the territory around Belval-Alzette. The aim is to ensure harmonious social, economic and territorial development and so develop a true cross-border compact urban agglomeration. The first mission of the EGCT will be to develop a common spatial development plan for the agglomeration with particular emphasis on urban development.

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Mexico

National urban development policies

The Federal Ministry of Social Development (SEDESOL) through the Vice Minister of Urban Development and Territorial Management (SDUOT) sees as a main priority of urban development the promotion of policies that help to form compact cities in which

the citizens' quality of life is a pre-eminent concern. Some of the problems to be overcome are the differences between occupied and vacant areas and the increasingly irregular and spontaneous growth which does not correspond to a planned and organised process of orderly land use. This situation calls for densification and/or re-densification policies.

For the federal government re-densification is a main priority. Intra-urban planning policies are needed to guide urban development and to create more efficient infrastructure networks and urban services through lower operating costs and improvements in the environmental quality of existing urban services. Cities such as Villahermosa, Tabasco or even Mexico City are looking to the re-densification of central areas for greater urban efficiency. Villahermosa focuses on less vulnerable areas to avoid constant risks of flooding. Mexico City seeks to avoid the high costs of bringing new urban infrastructure and services to expanding settlement in reserved areas. For the other metropolitan cities of Mexico that are growing significantly in terms of inhabitants (border areas and the southeast) SEDESOL has recommended the urbanisation of wasteland within the cities, so as to strengthen urban structures and become more efficient in terms of intra-urban structures. The main goal for peri-urban land has been to maintain it in reserve for future growth.

In formulating an integrated urban development policy known as DUIS for new developments involving the large housing settlements rapidly being developed, the fundamental purpose is the establishment of developments of improved environmental quality with links to the city to ensure the inhabitants' quality of life. Projects with these characteristics are being created in northern Mexico in Tijuana, Nogales and Sonora and commit housing developers to meet the criteria established by DUIS.

The guidelines on infrastructure, equipment and services (Article 73 of the Housing Act) establish the standards to be met on certain housing projects, in particular for social housing, for up to 25 000 residents. The standards cover equipment, service delivery, infrastructure provision and adequate connectivity to the suburbs of the nearest town.

SEDESOL authorises the General Department of Urban Development and Land (DGDUS) to provide local governments with advice and technical opinions regarding urban development during the planning and/or implementation of state-level urban development programmes. In addition, DGDUS can work on other projects of interest to a city or cities upon request. The training acquired by the cities can then be useful in other fields of urban development, including the design of registries.

SEDESOL has different mechanisms to facilitate the development of urban planning tools. The Annual Operative Programme (POA) of the DGDUS has different budget items that can be used to develop urban planning instruments. The Habitat Agenda also provides funds on an annual basis for urban planning. Finally, in addition to SEDESOL, instances such as BANOBRAS, the Metropolitan Fund or the Ministry of Finance can support such initiatives.

Metropolitan urban policy

The Metropolitan Plan 2021 for Urban Development in Monterrey City and Metropolitan Area, released in 2000, aims to increase the density of strategic areas, to occupy large vacant areas, to fill in the already urbanised areas and to rehabilitate urban centres. It draws on the support and technical advice of the Secretariat for Environment and Natural Resources (SEMARNAT) and the Commission of Land Tenure

Regularisation (CORETT) at the national level, the Secretariat for Urban Development and Public Work (SEDUOP) from the state of Nuevo Leon and the city councils of the municipalities of the Metropolitan Area of Monterrey at the local level.

In the Metropolitan Area of Guadalajara, the Management Plan for the Metropolitan Area of Guadalajara involves three programmes. One is based on the urban strategy of the Management Plan. The second aims at increasing the density of the municipalities of Guadalajara, Tonala and Zapopan in the state of Jalisco. The third focuses on the re-densification of strategically selected locations in Guadalajara county. The second and third programmes were started in 2000 and correspond to strategic efforts shared by the Guadalajara Metropolitan Council and the Urban Development Board of state of Jalisco in terms of planning instruments and land management.

In the Puebla-Tlaxcala Metropolitan Area, the Urban Management Programme for the Suburban Areas of Puebla-Tlaxcala has two central objectives: occupation of vacant lots and densification of under-developed urban areas. It will address the growth of towns by identifying the area needed for physical expansion. The programme began in 2003 and is supported by SEDESOL at the national level, by the state Governments of Puebla and Tlaxcala, and by the Institute of Social Sciences and Humanities of the Autonomous University of Puebla.

The metropolitan area of the valley of Mexico is moving in a similar direction with the Management Programme of the Metropolitan Area of the Valley of Mexico, the aim of which is to discourage the expansion of urban areas by promoting intensive land use. The main axes of action are to: maintain a balance in regional development with the rest of the national territory; increase population density in Mexico City and its surrounding cities in order to use existing infrastructure and to avoid territorial expansion; establish strict controls to avoid settlements in protected natural areas of the metropolitan region. The programme was initiated in 1997 and will finish in 2020. It is implemented by SEDESOL, the Federal District, the México and Hidalgo state Governments and the Metropolitan Commission on Human Settlements (COMETAH).

In the capital city, the General Urban Development Programme for the Federal District (2001) lays out the following policy directions:

- reverse urban sprawl for intensive development and growth by densification;
- recover and improve the city's existing infrastructure (i.e. promote renewal of the city centre, which has had the most investment in infrastructure);
- place buildings on a maximum of 5% of the surface of the Federal District's properties used as forest, parks, sports areas and gardens for public use which are not classified as protected areas;
- forbid new construction on protected ecological reserves and the natural environment;
- promote rational and efficient use of natural resources;
- identify building land reserves (i.e. degraded areas, under-utilised and vacant areas) in order to accommodate the city's growth trends;
- improve the road network and stimulate the development and use of environmentally friendly public transport (Metrobus, Zero Emission Corridor, Public Bicycle Programme, etc.).

This programme is implemented at the city rather than the metropolitan level. However, the Federal District and other entities (states of Mexico and Hidalgo) collaborate occasionally on certain issues (e.g. water, transport) via the Metropolitan Commissions.

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The Netherlands

National framework

In the Netherlands, since 2006, the National Spatial Strategy and the Frame of Reference on Urbanisation set the national framework for spatial planning. The framework was established in 2001, and the current document was released in 2009, although the compact city concept was already an issue in 1970s.[7] The document provides for cities that are sustainable, more compact building, less urban sprawl and restructuring of brownfield areas rather than creating new ones. At the same time, attention is paid to energy and climate change. A clear distinction should be maintained between red (urban) and green/blue (climate, recreation, open spaces) zones. The policy document emphasises the concept of "urban network" and identified six urban networks in the Netherlands: Randstad Holland, Brabantstad, Zuid-Limburg, Twente, Arnhem-Nijmegen and Groningen-Assen. It states that to achieve the sustainable development of these areas, a spatial strategy of more compact construction and less urban sprawl will be necessary. Some general compact city principles are mapped out: "urban development, infrastructure and economic activities will be subject to a location policy and a compact city policy under which new residential and commercial development must be located, wherever possible, in or adjacent to existing built-up areas and infrastructure". The framework is administered by the new Ministry of Infrastructure and Environment.[8]

The provinces and cities base their spatial plans on this framework. Most big cities such as The Hague, Amsterdam, Rotterdam and Utrecht have compact city policies. Often these policies are more ambitious than what is required in the Reference Framework for Urbanisation.

Randstad: Green-Blue Delta

Among the metropolitan-level spatial strategies, Structure Vision Randstad 2040 stands out. Randstad is the conurbation constituted by the four largest Dutch cities: Amsterdam, Rotterdam, The Hague and Utrecht and their surrounding area. It is famous for its "green heart", a series of cities and towns surrounding a central area of undeveloped green farmland. Randstad's current population is 7 million, and it is

projected to increase by at least half a million by 2040. It is estimated that at least 500 000 new homes will be needed by 2040. This presents a threat to Randstad's "green heart". The aim of the Randstad region is to build "a green, attractive and climate-resilient living environment" and "competitive, sustainable and climate-resilient cities". It seeks to be a Green-Blue Delta by protecting inhabitants against higher sea levels due to global warming on one side and conserving its valuable "green heart" from rampant urban expansion on the other.

In the Structure Vision, the compact city principle is framed in a set of complementary urban development policies that include upgrading transport, natural conservation, mixed-use urban land and more diverse neighbourhoods in the cities. Randstad aims to build 40% of the needed new homes within the existing urban areas through "restructuring and transformation" and "concentration and consolidation". It also intends to transform unused industrial sites into new urban areas with a residential and employment function. To achieve higher density in the existing urban area, Randstad encourages developing high-rise buildings to complement existing low-rise ones. According to the vision, high-rise buildings can be an inspiring interpretation of urban consolidation, restructuring and transformation. They can be in locations where high housing and employment densities coincide with infrastructure interchanges, such as the station districts of The Hague Central and Amsterdam Zuidas. Randstad's strategy emphasises transit-oriented development, with investment concentrated in or around the major transport axes in the Randstad and its offshoots. The urban growth boundary expands to form buffer zones with a large-scale green structure that provides recreational and leisure space. The public favours more creative solutions, based, for example, on double land use, or double "time use", by using vacant office buildings for temporary, or more permanent, housing. In the vision it is stressed that the scale of the Randstad is too large for many spatial topics (concerning for instance the building of dwellings, offices, recreational facilities, etc.), too small for others (water safety), and fitting for some (transport and "green heart"). Cities outside the traditional Randstad area can, however, be just as close and as linked to the Randstad as cities that are right in the middle of it. For example, Eindhoven and Arnhem are to some extent linked in the Randstad conurbation.

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New Zealand

Compact city policies at national level

In October 2010, "Building competitive cities: reform of the urban and infrastructure system" was released. This consultation document focuses on the problems identified with the current system for urban planning and infrastructure development and sets out a range of possible options for consideration by the community. It builds on the 2008 reforms of the Resource Management Act. A key component of the government's economic growth agenda is ensuring that New Zealand cities are internationally competitive. This means cities that enable citizens to enjoy a good lifestyle and affordable

housing; cities that are efficient for business and encourage investment and jobs; cities that are attractive for visitors to support New Zealand's increasingly important tourism industry. In this document, the government recognises that compact urban form is increasingly seen as a core feature of sustainable cities throughout the world (Ministry for the Environment, 2010).

Auckland

In 1999, all councils in the Auckland region adopted the Regional Growth Strategy (RGS), New Zealand's first regional development strategy. It framed the vision for the Auckland region for the coming half century. The RGS's "growth concept" is based on a compact urban pattern. In 2007, the first evaluation of the RGS was released and in response, the regional council developed One Plan in 2008. One Plan includes a strategic framework and plan of action that embraces the multiple goals of economic development, environmental conservation and urban design. In terms of urban design, the plan emphasises the importance of a compact city, listing it as one of the six quality urban design goals. One Plan was developed out of an unprecedented partnership between the local and central governments. Its implementation is the responsibility of the Regional Sustainable Development Forum (RSDF), a collaborative political forum for Auckland's long-term sustainable development. The forum has representatives from each of the region's district councils (One Plan, 2008).

In 2010 a discussion document, the Auckland Plan, was released by the Auckland Council, following the amalgamation in 2010 of Auckland into a super-city, rather than separate districts. This spatial plan will guide the future growth and development of the new Auckland city region over 30-40 years and help achieve the mayor's vision of Auckland as the world's most liveable city. A city is "liveable when it has cohesive, resilient communities; an excellent transport system; a productive, high-value economy; and quality urban, rural and natural environments". The plan was adopted on 29 March 2012 to be the basis for the 2012-2022 Long-Term Plan. The Future Land Use and Transport Planning Project 2010 sought to identify a long-term spatial vision for the region, including the location of future development and supporting infrastructure, to accommodate 2.3 million people by 2051 (Auckland Regional Council, 2010). The report focuses on the evaluation of three land-use and transport scenarios (two compact scenarios and one expansive scenario) to determine which spatial form can best meet agreed regional outcomes. In the expansive scenario Auckland grows to the north and south, infringing on boundaries of other regions. The two compact scenarios make use of existing space.

Wellington

In 2006, the Wellington City Council published the Urban Development Strategy (UDS). In this document, "more compact" is listed as one of the five long-term goals. UDS recognises that the compact layout of Wellington's urban areas near to major commercial centres and good transport linkages has been a competitive advantage (UDS, 2006). Wellington is often said to be New Zealand's most compact city. UDS states that urban form is an important factor in unlocking economic potential and assisting economic flows, thereby building more a prosperous Wellington. The city centre, an area with 12 000 inhabitants and a projected increase of 9 000 before 2030, has its own unique strategy. Future housing needs are mainly realised by infilling housing in the planned "area of change", and restricting supermarket and retail development to the urban centre. UDS also states that Wellington will have a more compact urban form, through

intensification in appropriate areas and mixed land use, structured around a vibrant central city, key suburban centres and major transport corridors. The edges of Wellington urban areas are effectively defined by the Outer Green Belt and rural areas. To assess whether the city is becoming more compact, Wellington has developed a series of indexes, including building density in the central city, inner-city/suburban residential areas, and the proportion of houses located within 100 metres of public transport (Wellington City Council, 2006).

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Norway

Compact city policies at the national level

In Norway, compact city policy is integrated in the general land-use and transport policy and in the sustainable urban policy. At the national level, the Ministry of the Environment is in charge of these policies. White papers from the early 1990s stress the need for effective land-use policy to limit the need for transport, particularly by private car, and to lighten the pressure on agricultural land and other areas of natural and cultural value. Cities and city regions have to define boundaries with agriculture and green areas, and principles and means for high-quality densification in built-up areas have been developed (Ministry of the Environment, 2001-2002).

Since 1993, the Planning and Building Act has been the legal basis for the national guidelines for achieving better co-ordination of land-use and transport planning, both in municipalities and across municipalities, sectors and administrative levels. The guidelines specify a compact city policy, such as the location of regional public or private services in the existing and planned centre structure and public transport junctions (Ministry of the

Environment, 1993). As a follow-up, new national guidelines were adopted in 1999 and strengthened in 2008, in order to avoid localisation of large shopping centres outside cities and towns.

Cities of the Future represents collaboration between the government, the 13 largest cities in Norway and the business sector to reduce greenhouse gas emissions, meet climate change objectives and make the cities better places to live. The programme period is 2008-2014. A main objective is to develop the spatial urban pattern in a way that strengthens sustainable transport and reduces CO_2 emissions. The government has established reward funds which are reserved for urban areas that sign agreements with the state for implementing schemes aimed at reducing the use of private vehicles and promoting public transport and cycling.

Compact city policies in Oslo metropolitan area (Oslo and Akershus counties)

The Capital Region is composed of many municipalities, and it is a great challenge to co-ordinate their land-use and transport policies. Oslo has successfully carried out a compact city policy, but the surrounding municipalities have developed urban sprawl and the road traffic has grown heavily. Efforts have been made in recent years to co-ordinate public transport in the Oslo region (metro, tram, boat and main bus services), and initiatives have been taken to develop a common regional land-use and transport strategy based on compact city principles to be carried out in an action-oriented regional plan and followed up in local plans (City of Oslo, Akershus County Council).

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Poland

Compact city policies at the national level

Poland does not have compact city policies as such but this is recognised as an important issue and will be taken into account in the work on national urban policy. The modification of the Act on Spatial Planning and Management, currently under discussion within the Polish Government, will establish:

- new lawful means and planning procedures to limit industry in areas without spatial management plans;

- procedures to counteract urban sprawl; and
- conformity with standards of balanced development.

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Portugal

Compact city policies at the national level

The current spatial planning framework dates from 1998, with the adoption by Parliament of the Spatial and Urban Development Policy Act. It defines spatial and urban development policy as actions undertaken by the state to ensure appropriate organisation and use of the national territory with a view to its European stature and to the economically, socially and culturally integrated, harmonious and sustainable development of the country, its different regions and urban settlements.

Although Portugal has no specific compact city policy, it is implicit in the Spatial and Urban Development Act. Achieving this goal is a specific objective of the Action Programme of the National Spatial Development Policy Programme. The ministry responsible for spatial and urban development policy is currently the Ministry for Agriculture, the Sea, the Environment and Spatial Planning (through the Directorate General for Spatial Planning and Urban Development).

The main operational tools are the territorial plans, adopted at national, regional and local levels. The National Spatial Development Policy Programme, the sectoral plans with territorial impact and regional spatial plans are strategic territorial development instruments. Plans adopted at the local level are defined as land-use planning instruments. They are binding both for the administration and the private sector; the territorial development instruments are only binding for the administration.

The National Spatial Development Policy Programme (NSDPP), adopted by Parliament in 2007, establishes national guidelines for all other spatial plans. The regional spatial plans set the strategic reference framework for the preparation of municipal master plans, urban development plans and detailed plans to be adopted by the municipalities. The municipal spatial and urban development strategies are outlined in the municipal master plan, which also stipulates general rules on densities, land use and services of general interest and infrastructure networks.

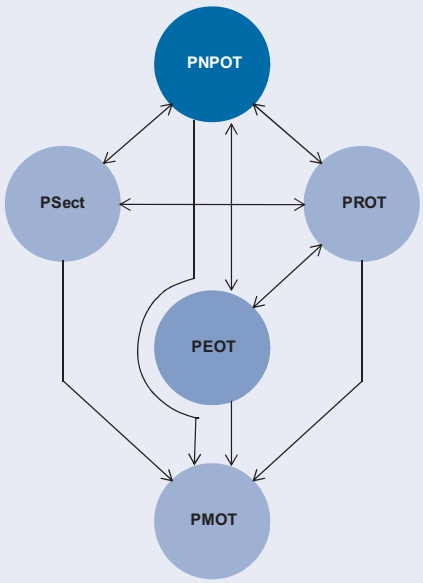
The Spatial and Urban Development Act and the NSDPP are binding for the autonomous regions of Madeira and Azores. Within this legal framework, the two regions have autonomy to adopt regional planning legislation and their regional spatial plans.

The NSDPP has six strategic objectives, divided into 36 specific objectives. Strategic objective 3 aims to promote polycentric territorial development and to reinforce the infrastructures supporting territorial cohesion and integration. This implies more compact and polycentric urban development to prevent scattered building and diffuse urbanisation and to encourage the strengthening of intra-urban central structures. All current regional spatial plans include specific guidelines regarding these policy objectives in order to achieve more compact urban development and control urban sprawl.

Box A.3. **Relationships among Portugal's territorial management instruments**

The relationships among the territorial management instruments are:

- The general rule is that land-use plans and special plans implement the guidelines set by territorial development plans.
- PNPOT, PSect and PROT are bound to reciprocal integration and compatibility.
- PSect implement the territorial development strategy and guidelines set by PNPOT.
- PROT details, at regional level, the territorial development strategy and guidelines set by PNPOT and helps implement PSect.
- PEOT is bound to reciprocal integration and compatibility with PNPOT and PROT. PEOT prevails over PMOT.
- PMOT must be compatible with the strategic framework defined by PNPOT and PROT and must comply with the guidelines set by PEOT.



Abbreviations: PNPOT (National Spatial Development Policy Programme); PROT (Regional Spatial Development Plan); PSect (Sectoral Plan with territorial impact); PEOT (Special Plan); PMOT (municipal spatial plans).

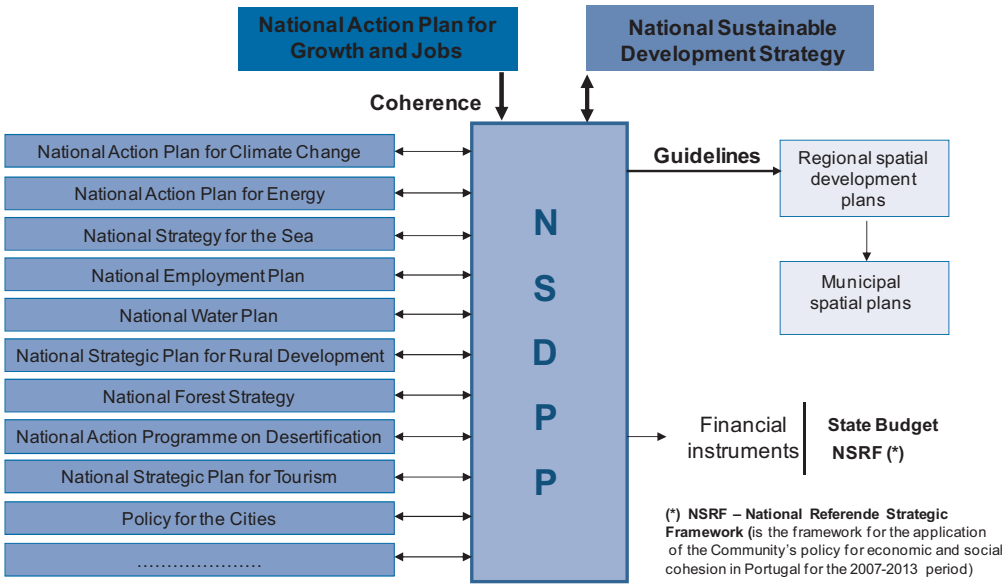
Source: OECD Compact City Survey.

About two-thirds of the municipal master plans are currently being revised according to the strategic framework set by the NSDPP and the regional spatial plans. Municipal master plans classify land either as urban or rural, define the boundary of major urban areas, the so-called "urban perimeter", and regulate land use. No urban development is allowed outside this perimeter, with some exceptions (e.g. tourist resorts and industrial parks).

The urban development plan applies to areas defined as urban in the municipal master plan. It is the reference framework for urban policy and defines the urban structure and

the zoning regulations. The detailed plan is an operational tool that regulates urban infrastructure, the design of public spaces, building forms, setting and integration into the landscape, and the location of public facilities and other activities of general interest. The area of intervention may range from a few blocks to a whole neighbourhood. All municipalities must have a municipal master plan in force. Most of the major cities and towns have formally adopted urban development plans and detailed plans. All national, regional and local plans in force can be consulted at and downloaded from at *www.snit.pt*.

Figure A.3. **Relationship of the NSDPP with national strategic documents and national sectoral plans and the regional and municipal spatial plans**



Source: OECD Compact City Survey.

Compact city policies at the regional and local level

The Metropolitan Area of Lisbon is the object of a specific regional spatial plan. The plan currently in force dates from 2002. An amendment was prepared in 2008-2010 and awaits approval. The institution responsible for the regional plan is the Regional Co-ordination and Development Commission of Lisbon and Tagus Valley (*Comissão de Coordenação e Desenvolvimento Regional de Lisboa e Vale do Tejo*, CCDR-LVT).

The metropolitan area of Porto does not have a specific regional spatial plan. It is included in the North Regional Spatial Plan. This plan has been approved and awaits publication in the *Official Journal*. As a sub-region within the North Regional Spatial Plan, the metropolitan area of Porto is subject to general and specific guidelines for territorial and urban development, such as:

- reclassification of rural land into urban land is exceptional;
- consolidation of existing urban areas is a priority;
- growth of urban areas is to be controlled, in co-ordination with accessibility and transport networks;

- land-use models and building regulations must promote concentration in urban and rural settlements and avoid scattered or linear patterns of settlement.

The institution responsible for the Regional Plan is the North Regional Co-ordination and Development Commission (*Comissão de Coordenação e Desenvolvimento Regional do Norte*, CCDR-N).

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Spain

Consolidated Land Law

Spain's Consolidated Land Law was implemented by the Royal Legislative Decree 2/2008 in June 2008. It clearly adopts the European concept of compact cities and criticises dispersed development. Its general provisions state that:

> There is no doubt that urban growth is still needed, but today it seems clear as well that urbanism must give an answer to the requirements of sustainable development, by minimising this growth's impact and encouraging the regeneration of the existing city. The European Union clearly insists on it, for instance in the European Territorial Strategy or in the more recent Commission Communication on a Thematic Strategy for Urban Environment, which proposes a compact city model and warns about the serious problems of dispersed or chaotic urbanisation: environmental impact, social marginalisation, economic inefficiency due to high energy, infrastructure building and maintenance, and costs of providing public services. Ground may be an inexpensive resource, but it is a natural, scarce and non-renewable one.

The Royal Legislative Decree also contains the principle of territorial and urban sustainable development, which addresses the need to avoid the problems and negative consequences of a dispersed urbanisation model and to pursue the compact city model. It states:

> By virtue of the principle of sustainable development, the policies mentioned in the previous section should favour the rational use of natural resources by harmonising the requirements regarding economics, employment, social cohesion, equal treatment and opportunities between men and women, citizens' health and security and environmental protection and pollution reduction, endeavouring particularly to ensure: *a)* the efficacy of measures for conservation and improvement of nature, flora and fauna and for the protection of landscape and cultural heritage; *b)* the protection of the rural environment according to its nature and the preservation of land that is not required to meet the needs of urban transformation; and *c)* an urban environment, in which land use is efficient, sufficiently provided with infrastructures and services, in which the uses are functionally combined and effectively implanted to meet their social function. The pursuit of these aims will adapt to the peculiarities of the territorial model adopted in each case by the competent public powers on territorial and urban organization. (Based on the Royal Legislative Decree, Article 2, §2)

Spanish strategy for urban and local sustainability

The Spanish Strategy for Urban and Local Sustainability (*Estrategia Española de Sostenibilidad Urbana y Local*) was released in 2009 by the Ministry of Environment and Rural and Marine Environment. This strategic framework summarises principles, aims, directions and tools that foster urban and local sustainability. It includes general guidelines and specific sectoral measures:

- To promote urban models that give priority to improvement (reuse or recycling of the urban network, management and rehabilitation of the built heritage, rather than consumption of land by extensive development of new networks and new building construction).
- To create urban structures based on density, complexity and mixed use in the new urban network by maintaining/developing cities in a consolidated way, restricting marginalised, mono-functional and auto-dependent spaces, linking urban network and collective and non-motorised transport, and using building types appropriate to these purposes.
- To organise urban structure on the basis of proximity and mobility networks, thereby reducing travel needs, promoting non-motorised means and public transport as a main means, restricting private vehicle traffic in certain areas (downtown, residential areas, etc.).
- To incorporate sustainable mobility in territorial organisation, in urban planning and in new urban development, through administrative co-ordination and co-operation mechanisms, especially in urban areas and their environment.
- To promote urbanism that decreases the need for trips, makes the use of alternatives to cars easier, and enhances multi-functional public space, balancing the use of private vehicles with more efficient and sustainable transport means.
- To encourage a new direction in technological innovation, using information technology to improve the efficiency, quality and safety of transport, especially to reduce the impacts of motorised travel by reducing emissions, power, speed and weight of vehicles and improving the management of sustainable mobility.

White Paper on the Sustainability of Spanish Urban Planning

The 2010 *White Paper on the Sustainability of Spanish Urban Planning* provides a set of proposals for action in order to achieve greater sustainability in the field of urban planning. It highlights the links between urban planning and sustainability principles. It sets criteria for issues such as the efficient use of oversized property assets that result in unused housing and homelessness.

Compact city policies at the regional and local level

With regard to land use and urban planning, the national government has no competence owing to decentralisation.[9] While local governments have no legislative competence, they do have competence for implementation, planning and management.

In October 2010, the Sixth International Congress of Territorial Organization was held in Pamplona. It emphasised promoting the vertical compact city based on concentration and high density rather than dispersion, revitalising the core of municipalities instead of suburbs and dormitory towns, and sustainable urban models in

seaside areas. Its conclusions may be considered a reference point for the autonomous communities.

The Strategy of Vitoria-Gasteiz 2015 promotes urban compactness based on the General Urban Organisation Plan. It gives priority to inward growth, recovery, reuse and re-densification, eco-efficiency and sustainable mobility. It establishes guidelines for the promotion of proactive policies for the systematic replacement and rehabilitation of the built city, the sustainable management of industrial estates and the implementation of the Sustainable Mobility Plan.

Barcelona's Metropolitan Transport Entity (*Entitat Metropolitana del Transport*, EMT) recently published a report on the use of bicycles in the municipalities of the metropolitan area, and sets targets to encourage their use as a means of sustainable transport. The objectives include promoting the availability and security of bicycle parking, integration of bicycles in public facilities, etc. The report also analyses experience with the bike park in Llobregat and the electric bike. It proposes the creation of a bicycle observatory, the standardisation of city acts relating to cycling, and promotion, education and awareness of cycling as a means of transport.

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Sweden

Compact city policies at the national level

In Sweden, urban planning is the prerogative of local authorities. However, the merits of compact city development are recognised by the government (and local and regional authorities) in different ways. National regulations and policies tend to be general, prescribing sustainability as an overall objective of local urban planning. The government and central authorities do not define how this should be achieved. They do, however, express their opinion. As an example, the latest government bill on Sweden's environmental quality objectives argued for compact city development as one important way of achieving urban sustainability (Government Proposition 2009/10:155, pp. 222-224).

The government bill "Objectives for Future Travel and Transport" (2009) meets some of the goals of a compact city strategy by improving citizens' commute (journey) through greater accessibility and comfort and by improving the conditions for choosing public transport, walking and cycling. Regional and local transport policies are determined at the national/country level.

Compact city policies at the regional level

In Stockholm, a comprehensive urban plan was implemented in the early 1950s. The model was "neighbourhood unit with social and commercial core, high-density housing close to stations and lower-density housing in the periphery together with self-built one-family homes". "Building city inwards" is a compact city concept, which aims at converting central brownfield areas to residential use and using left-over central space for the city's expansion instead of expanding outwards. The strategy/policy was introduced

for the first time in the Comprehensive Plan for Stockholm in 1999, and has been retained since. The Stockholm City Planning Department and the City Development Council are responsible for the plan. Stockholm's public transport (bus, tramway, subway) is efficient and widely used. Almost 95% of the city's residents (citizens) live in high-density areas located at transport nodes. Since 2007, Stockholm has enforced a congestion charge, a tax levied on all vehicles entering and exiting the capital city. The aim of the charge is to reduce traffic congestion in central Stockholm.

In Gothenburg, the "Gothenburg Comprehensive Plan" is a set of propositions/guidelines for urban planning policies and has no legal force. Since 1999, the comprehensive plan has had a special focus on compact cities. The most important objectives of the plan are:

- To build and develop centrally, complement and mix: redevelopment of Gothenburg's industrial, brownfield areas with mixed land use, especially around safe interchange transport nodes, and the development of the city core with the planning of mixed high- and low-density housing in order to obtain a high-density centre with diverse social communities living in the same area.
- To strengthen public transport: the traffic and public transport authority of Gothenburg was created in the 1980s to increase the city's public transport infrastructure. Today there are 12 tramway lines, more than 50 bus lines, 2 commuter train lines and 6 ferry lines. The congestion charges levied on vehicles entering and exiting the city are used to finance new transport infrastructure.
- To concentrate on key nodes: creation of high-density nodes to reduce urban sprawl and promote the use of public transport.
- To reserve outer areas for future development.

Malmo considers itself a compact city. Its public transport system, including bicycle pathways, is widely developed. In its master plan it emphasises three points:

- redevelopment of existing industrial areas in order to avoid urban sprawl and to preserve the surrounding arable land;
- promotion of gentrification in order to increase population density in the target areas and avoid urban sprawl while containing the present demographic expansion;
- incorporation of green areas in the city.

Malmo is the fastest growing city in Sweden and is therefore facing some urban sprawl issues. Some policies have been implemented in order to "densify" the city in specific areas.

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Switzerland

Compact city policies at the national level

The Government of Switzerland's Agglomeration Policy is closely related to the aims of compact city policies. Its three main long-term objectives are: to maintain and foster economic attractiveness and quality of life within the agglomerations, to limit urban sprawl by promoting densification within agglomerations; and to foster the polycentric development of urban spaces.

Since its creation in 2001, the main institutional bodies involved in the Agglomeration Policy at the national level are the Federal Office for Spatial Planning and the State Secretariat for Economic Affairs. As a federal country, Switzerland wants to make agglomerations sensitive to the densification strategy. However, it is the decision of the cantons and municipalities whether or not to move in this direction. To encourage them to adopt its vision, the national government works on the following five axes of the Agglomeration Policy: *i)* increased focus on agglomeration in various federal tasks; *ii)* improvement of vertical co-operation; *iii)* horizontal co-operation; *iv)* promotion of the integration of Swiss agglomerations in European cities networks; *v)* promotion of platforms for the exchange of experience on agglomeration.

In terms of policy tools, the urban growth boundary system is a major element of Switzerland's compact city policies.

Compact city policies at the cantonal/local level

At the cantonal level, the main instrument for spatial planning is the cantonal master plan. Each is different and adapted to its context but cannot be in contradiction with federal policies. In the Canton de Vaud, the cantonal Master Plan (*Plan directeur du canton de Vaud*) addresses the issue of the right balance between economic dynamism, quality of life and protection of the natural and cultural heritage. It also deals with the management of urban sprawl and land-use optimisation and considerations regarding mobility, housing and leisure. This master plan is the main spatial planning instrument of

the canton and is used to co-ordinate all activities with an impact on territorial organisation. It defines the development of the canton for the next 20 years.

Zurich and Lausanne represent two different examples of the implementation of federal recommendations in terms of agglomeration, in particular densification questions at the local level.

The Lausanne-Morges Agglomeration Project (PALM) embodies the federal recommendations on agglomerations and those of the Master Plan of the Canton of Vaud. Its main priorities are mobility, urbanisation and green networks. Concretely, it aims at the development of a compact high-standard agglomeration with four main city centres and ten priority sites for triggering regional development. The project also insists on the importance of developing multi-modal public transport and promoting pedestrian areas and bike paths. The last important axis is the creation of a green corridors network at the agglomeration level. In order to rationalise the creation and management of the project, the agglomeration will be divided into five sectors, each with its own master plan. The Pilot Committee (COPIL), composed of 11 members of the cantonal administration, representatives of the Cities of Lausanne and Morges, and representatives of regional associations, along with a technical board and the agglomeration conference, will co-ordinate, assess and support the implementation of the PALM. This project engages the country's three levels of governance: the Confederation, the Canton of Vaud and the 26 municipalities concerned by the project. After assessment of the project, the Confederation decided to support the PALM financially along with the canton and the municipalities.

The Zurich Agglomeration Project is a second example of the implementation of the Federal Administration Agglomeration Project at the local level. This project mainly concerns public transport and its main objective is to increase the mobility offer in order to contribute to the attractiveness of the region in economic, social and environmental terms. Concretely it consists in developing sustainable metropolitan poles, especially downtown Zurich, the Limmattal, Glattal and North Winterthur, improving and increasing the public transport offer and using the excellent local train network to drive urban densification. Rural areas will be protected for leisure activities and multi-functional agriculture. The harmonisation and improvement of public transport in the Zurich agglomeration will also meet spatial planning and environmental objectives. In parallel, specific projects will be implemented to solve some local public transport issues. For instance, the Glattal or Limmattal projects will create new tramway lines in these two valleys. These projects received the financial support of the Confederation in 2006, allowing them to be implemented. The Zurich Agglomeration Project brings together the Confederation, the Department of Public Economy and the Department of Public Works of the Canton of Zurich and 132 different municipalities.

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Turkey

Turkey does not yet have policies directly focused on the compact city approach. However, this is recognised as a significant issue and will be taken into consideration in the National Strategy for Regional Development, currently in preparation under the Ministry of Development. Objectives and policies that support the compact city approach exist in two national strategy documents, the 9th Development Plan 2007-2013 and KENTGES (2010-2023).

The 9th Development Plan, approved by the Turkish Grand National Assembly on 28 June 2006 through Law No. 877, is a national policy document which sets out an integrated approach to the changes to be made in the economic, social and cultural spheres. It forms the basis for other national and regional plans and programmes including the government's Medium-Term Programme, sectoral and institutional strategy documents, and documents required in the EU accession process such as the Pre-Accession Economic Programme and the Strategic Coherence Framework.

One of its main development axes is defined as "increasing competitiveness" and has two main objectives that support a compact city approach:

- Improving the energy and transport infrastructure:
  - A comprehensive national urban transport strategy that is sustainable and consistent with energy, environment, economics, housing and land-use policies will be set up. This strategy will be binding for the public sector and indicative for the private sector.
  - Rail transit system projects will be planned in corridors with insufficient alternative transit modes and where travel demand during peak hours is expected to be at least 15 000 passengers/hour in a single direction.
- Protecting the environment and improving the urban infrastructure: identification of the country's urban infrastructure requirements in order to protect the environment and preparation of an urban infrastructure master plan and financing strategy.

KENTGES, the Integrated Urban Development Strategy and Action Plan (2010-2023), is a national strategy document prepared under the Ministry of Public Works and Settlement in 2010. It establishes principles, strategies and actions for providing healthful,

balanced and liveable urban development as well as structural solutions for urbanisation. It also identifies implementation principles and connects them to an action programme. It is used as a reference framework document at the national level.

One of the main priority axes of the KENTGES, "improving quality of space and life in human settlements", promotes the compact city approach with the following objectives and strategies:

- Sustainable human settlements. In the urban development process, the urban form that decreases costs, uses resources efficiently and prevents extensive growth will be encouraged.
- Sustainable urban transport system. For urban transport plans, the principles of accessibility, safety, comfort, reliability, sustainability and cost-efficiency are to be considered.
- Sustainable and diversified land and dwelling supply.
- Development and revitalisation of central business districts and sub-centres through sustainable policies.
- Balanced distribution of social facilities and services in human settlements (under preparation).

United Kingdom

Planning and Climate Change – Supplement to Planning Policy Statement 1 (PPS 1)

In 2007, the UK Department for Communities and Local Government released *Planning and Climate Change – Supplement to Planning Policy Statement 1* (PPS 1). It sets out how planning can contribute to reducing emissions, stabilising climate change and preparing for the impacts of climate change. It includes the following decision-making principles which local authorities and developers are expected to take into account in plan-making:

- the proposed provision for new development, its spatial distribution, location and design, should be planned to limit carbon dioxide emissions;
- new development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy;
- new development should be planned to minimise future vulnerability in a changing climate;
- climate change considerations should be integrated into all spatial planning concerns.

The PPS 1 states that local authorities should plan new developments "so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form, together with the proposed density and mix of development, support opportunities for decentralised and renewable or low-carbon energy supply".

Planning Policy Guidelines Note 2: Green Belts (PPG2)

The Green Belt Policy pursued in London since 1935 was codified and extended to other areas and by 1995 greenbelts covered about 12% of England. The PPG2 on greenbelts was instigated by the Department for Communities and Local Government in 1995 and amended in 2001. The fundamental aim of greenbelt policy is to prevent urban sprawl by keeping land permanently open. The most important attribute of greenbelts is their openness, and their essential characteristic is permanence. Once established (in development plans), their boundaries may be altered only under very exceptional circumstances. The five purposes of greenbelts are: to check the unrestricted sprawl of large built-up areas; to prevent neighbouring towns from merging into one another; to assist in safeguarding the countryside from encroachment; to preserve the setting and special character of historic towns; and to assist in urban regeneration, by encouraging recycling of derelict and other urban land.

PPG2 establishes a general presumption against inappropriate development in greenbelts. Such development is, by definition, harmful to the greenbelt, and should not be approved, except when the harm would be outweighed by other considerations and very special circumstances justify permission. With minor exceptions (e.g. agricultural buildings, small extensions to existing dwellings, essential facilities for outdoor sport and recreation) new construction in greenbelts is inappropriate development. The carrying out of engineering or other operations, and material changes in the use of land, are also inappropriate, unless they maintain openness and do not conflict with the purposes of the greenbelts.

Planning Policy Guidelines Note 3: Housing (PPG3)

As 4 million new homes are projected over 25 years, the PPG3 on Housing of 2000 advises local planning authorities on the treatment of housing within the planning process so that these may be accommodated without further encroachment on the greenbelts or other areas of the countryside. The main aim of PPG3 was to steer policy away from spacious residential development on greenfield sites, and to encourage higher density development on brownfield sites (abandoned or underused industrial and commercial facilities or urban sites) wherever possible. The government introduced a brownfield target of 60% for new developments, as well as minimum net residential density guidelines of 30 dwellings per hectare. By 2005 "the density of new residential development had risen to 40 dwellings per hectare and the share of development on brownfield sites to 70%" (UTF, 2005: 12); the figures were 43 dwellings per hectare and 80%, respectively, by 2009. In addition, since buildings produce 50% of carbon emissions, to meet the government's target to reduce carbon emissions by 60% by 2050, from April 2006 all publicly funded new homes have had to respect a new code to make them more sustainable (UTF, 2005).

Since the change of government in May 2010, it is not clear how far the previous government's targets will continue to apply. The focus on encouraging more new development on brownfield land is likely to continue though possibly without specific national targets (to which the new government is opposed). Under the Localism Bill now going through Parliament there is a strong emphasis on community and neighbourhood planning so that such matters are likely to be decided locally.

PPS12: Local Spatial Planning

The Department for Communities and Local Government published in 2008 Planning Policy Statement 12: Creating Strong Safe and Prosperous Communities through Local Spatial Planning. It lays out the national policy for how local authorities should prepare a plan and a sustainable communities' strategy for their area. The goal of the plan-making process is to shape local areas to deliver positive social, economic and environmental outcomes, based on national and local policy objectives. These objectives, including those that may help form compact cities, inform the specific policies of local authority development plans, the basis for decisions on individual applications for planning permission. Guidelines are given on developing documents such as area action plans, which, by providing the planning framework for areas in which significant change or conservation is needed, should: deliver planned growth areas; stimulate regeneration; protect areas particularly sensitive to change; resolve conflicting objectives in areas subject to development pressures; and focus the delivery of area-based regeneration initiatives.

Compact city policies in London

The London Plan of 2008 places much emphasis on the regeneration of the inner city and "intensifying development and promoting more mixed uses, with a special focus on Opportunity Areas and Areas for Intensification that are well served by public transport" (Policies 2A.5 and 6) (Mayor of London, 2008: 41), in order "to accommodate significant growth in ways that respect and improve London's diverse heritage while delivering the Mayor's vision for an exemplary, sustainable world city, including the issues raised by climate change" (Mayor of London, 2008: 42). Concerning the suburbs, the London Plan recognises that "Areas in and around town centres will be most appropriate for higher density development and a greater mix of uses" and "development of these areas should be tailored to the level of public transport accessibility" (Mayor of London, 2008: 54). Emphasis is put on requiring new developments to "create or enhance a **mix of uses** within large buildings, within the development and/or between the development and its surroundings, including waterways" and "where mixed uses are problematic between housing and industrial areas, innovative design should be used to reduce noise and other nuisances." Design quality is thus seen as central to achieve more intensive development in places that are designed and managed to ensure efficient long-term use, "reducing energy use, maximising renewable sources of energy and using natural forms of shading and cooling" (Mayor of London, 2008: 246). In line with the national PPG3 on housing, the London Plan also states that "for commercial developments… plot ratios should be maximized" to achieve average site densities of at least 3:1 wherever there is, or will be, good public transport accessibility and capacity. Further, "in highly accessible areas within central London and some Opportunity Areas, especially in the Thames Gateway area, ratios nearer to 5:1 can be achieved." (Mayor of London, 2008: 246)

The London congestion charge imposes a fee for all motorists travelling within London's Congestion Charge Zone (CCZ) traffic area. The zone was introduced in central London in 2003 and extended westward in 2007. Although not the first of its kind, the London congestion charge remains one of the largest in the world, and remains a reference for other cities around the world when considering their own schemes. The congestion charge aims to reduce congestion by encouraging fewer trips and car-pooling, as the fee declines with the rise in the number of passengers. Further, it is an urban finance strategy, as its other major purpose is to raise funds for London's public transport system.

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United States

Regional innovation cluster initiative

The purpose of the regional innovation cluster initiative is to spur the growth of quality innovative jobs in key industry clusters in metro areas. It does this by building on the strongest industries, skills and assets of a particular region on the basis of an integrated plan developed by a regional consortium of leaders. Every metro area specialises in particular traded clusters (e.g. organic farming, telecommunications, health care) with an array of large firms, small businesses, suppliers, research institutions, and others that together produce the exported goods and services that generate growth and opportunity. Through interagency co-ordination, the federal government can encourage the creation of integrated regional cluster plans and support their implementation.

Partnership for Sustainable Communities

The Partnership for Sustainable Communities, initiated in 2009, aims at helping American families in all communities gain access to affordable housing, transport options, and lower transport costs (EPA, 2010). Six liveability principles guide the partnership:

- Provide more transport choices. Develop safe, reliable and affordable transport choices to decrease household transport costs, reduce energy consumption and dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.
- Promote equitable, affordable housing. Expand location- and energy-efficient housing choices for people of all ages, incomes, races and ethnicities to increase mobility and lower the combined cost of housing and transport.

- Enhance economic competitiveness. Improve economic competitiveness through reliable and timely access by workers to employment centres, educational opportunities, services and other basic needs, as well as through expanded business access to markets.
- Support existing communities. Target federal funding towards existing communities, through strategies such as transit-oriented, mixed-use development and land recycling to increase community revitalisation and the efficiency of public works investments and safeguard rural landscapes.
- Co-ordinate and leverage investment. Align federal policies and funding to remove barriers to collaboration, leverage funding and increase the accountability and effectiveness of all levels of government to plan for future growth, including smart energy choices such as locally generated renewable energy.
- Value communities and neighbourhoods. Enhance the unique characteristics of all communities by investing in healthy and safe rural, urban, or suburban neighbourhoods that are conducive to travel on foot.

Neighbourhood Revitalization Initiative

The goal of this interagency collaborative, initiated in 2010, is to create "neighbourhoods of opportunity" in cities and metropolitan areas by co-ordinating federal policies and programmes to maximise outcomes for low-income children whether they live in inner city neighbourhoods or struggling parts of older suburbs. At its core, this effort would serve to align federal housing programmes (e.g. Choice Neighborhoods) with federal education programmes, health services, and public safety initiatives. These programmes are also linked to partner agencies, such as the Department of Labor, to promote adult education and training, and the Department of Transportation to connect to metropolitan-wide job and retail opportunities or maximise neighbourhood benefits from transit-oriented development.

Compact city policies at the regional/local level

Located in the core of the rapidly growing Washington region with over 5 million residents, Arlington (Virginia) is an urban county with 204 000 inhabitants. Since 1970, Arlington County has embraced the principles of transit-oriented development in metro corridors (Rosslyn-Ballston Corridor, Jefferson Davis Corridor). The aims are to *i)* concentrate high- and mid-density redevelopment around Metro transit stations (highly targeted) and taper down to existing neighbourhoods; *ii)* encourage a mix of uses and services in station areas; *iii)* create high-quality pedestrian environments and enhanced open space; and *iv)* preserve and reinvest in established residential neighbourhoods. Arlington authorities consider its key policy tools to be the provision of multiple transit options, improving the design of stations, improving the attractiveness and functionality of the pedestrian environment, and public-private partnerships.

In Portland (Oregon), Metro is responsible for managing the Portland metropolitan region's urban growth boundary.[10] The Metro's current 2040 Growth Concept encourages efficient land use, by directing most development to existing urban centres and along existing major transport corridors. It also promotes a balanced regional transport system that accommodates a variety of transport options such as bicycling, walking, driving and public transit; and supports the region's goal of building complete communities by providing jobs and shopping close to where people live. For example, the Belmont Dairy

Partnership cleaned up and rehabilitated an abandoned dairy building to provide a variety of housing choices and retail services that led the revitalisation of a neighbourhood district in southeast Portland.

In Chicago (Illinois) GO TO 2040, launched in 2010, is a comprehensive compact city policy with the following key principles: *i)* global connections with international trade and information networks, providing economic opportunities and a broad range of jobs; *ii)* a diverse business community, skilled labour force and excellent higher education system; *iii)* modern, well-maintained infrastructure, including transport, energy, telecommunications and water; *iv)* an environment with ample open space and parks for recreation; *v)* active institutions for arts and culture, along with other amenities for a high overall quality of life; and *vi)* government that is transparent and highly accountable. It promotes nature conservation through retrofit programmes to increase urban densification and the expansion and improvement of parks and open spaces. GO TO 2040 also promotes public transit, by increasing gas (petrol) taxes, implementing congestion charges, revising parking strategies and prices, focusing on the maintenance and modernisation of the public transit system, improving fiscal health, and supporting local transit (CMAP, 2010). On 14 October 2010, the US Department of Housing and Urban Development's (HUD) Sustainable Communities Initiative announced a three-year, USD 4.25 million award to the Chicago Metropolitan Agency for Planning for technical assistance to communities seeking to implement GO TO 2040. The work plan includes projects that span the divide between addressing neighbourhood planning issues and creating wide-reaching policy initiatives and legislation.

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Notes

1. The City of Vienna is a federal province as well as a city with its own statutes. Therefore there is no provincial government between the city of Vienna and the state.

2. Current policies are dispersed in various documents including the Regional Development Strategy of the Czech Republic (up to 2013), the National Strategic Reference Framework of the Czech Republic (2007-2013), the Sustainable Development Strategic Framework, the Spatial Development Policy of the Czech Republic (2008) and other sectoral policies and concepts.

3. An integrated urban development plan is a set of actions, interlinked in terms of content, territory and time, which are implemented within a defined territory or within the scope of a thematic approach in cities. The aim is to achieve a common goal or goals of a region, town, municipality or locality. It can be supported by one or more operational programmes. The integrated urban development plan is a fundamental co-ordinating framework linked to an overall city development vision and strategy, and its purpose is to identify and resolve problems of developing city areas in relation to using support from the structural funds in the programming period 2007-2013.

4. For information about compact city policies at metropolitan/local levels in Germany, see Initiative European Metropolitan Regions (IKM).

5. Korea is inclined to link the concepts of compact city and with green city. MLTM defines this as a city with green growth elements such as compact urban spatial structure, mass transit transport system, use of new and renewable energies and water, resource circulation to minimise environmental pollution and greenhouse gas emission.

6. The MLTM defines compact development as high density, multiple land use and seamless mass transport for efficient land use and high sustainability.

7. In fact, different terms were used for compact city concepts in national urban spatial plans: “concentrated deconcentration” in the 1960s, “growth-centres” in the 1980s, “compact city” in 1990s, and in the most recent fifth National Spatial Strategy, compact city and location policy are embodied in an “urban networks” approach.

8. In 2010, the Dutch central Government placed its planning functions in one ministry, the new Ministry of Infrastructure and Environment, by merging the Ministry of Housing, Spatial Planning and Environment with the Ministry of Transport and Waterworks.

9. Since the 1978 Constitution, Spain is organised into state, regional and local levels. Legislative powers are divided between the state and the autonomous level (Constitutional Court Judgement 61/1997 of 20 March).

10. Under Oregon law, each city or metropolitan area has had since 1977 an urban growth boundary that separates urban land from rural land.

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