Redefining "Urban"

A NEW WAY TO MEASURE METROPOLITAN AREAS

OECD

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Foreword

There is no shortage of research on the changing nature of cities and the ways the increasing urbanisation is shaping modern life. Yet too often we fail to ask this simple, but fundamental question: What is a city? How do we determine what is, and what is not an urban reality. Of course we know that London is a bustling UK city, and sparsely populated farmland and moorland in Cumbria are not. In South Africa, we are aware that Gauteng province is urban, while Northern Cape province is not. Increasingly, however, geographical areas are emerging that do not so clearly fit inside or outside such a classification. As metropolitan areas evolve, as mid-sized cities reveal characteristics that are both urban and suburban, as cities and rural life are increasingly interconnected, defining just what we mean when we talk about cities becomes crucial.

By establishing a clear definition of "urban" and an internationally recognised definition of urban areas as functional economic areas of similar size across countries, we believe that research into all aspects of metropolitan life can greatly benefit, helping us to more clearly understand the current reality and design better policies for cities, large and small alike. Policy makers are paying increasing attention to the capacity of urban areas to contribute to economic growth and the delivery of social and environmental goals. At the same time, researchers are actively debating the role of economic agglomeration in fostering growth, and regional policies in maximising and re-balancing national economic performance. This report contributes to the policy debate, by enhancing the tools available to researchers and policy makers at local, national and international level to build robust evidence.

This report is published to set out the progress on the work led by the OECD, with delegates of the OECD Working Party on Territorial Indicators (WPTI) and in co-ordination with the European Commission, to set a functional definition of urban areas that can inform discussions on our economies, societies and shared environment. It draws on OECD work on regions and urbanisation, including *OECD Regional Outlook* (2011), *OECD Regions at a Glance* (2011), *Cities and Climate Change* (2010), *Regions Matter* (2009). It is intended to be a first step in redefining the way we study

urban areas and the interactions within and between them in OECD countries and beyond. The next step is to enhance its scope to compare the development of cities and metropolitan areas, which will require the active involvement of governments and statistical experts and authorities. The OECD looks forward to taking this work further.

Acknowledgements

This publication is the final report of two years' work led by the OECD on the functional definition of urban areas. The work was carried out with delegates of the OECD Working Party on Territorial Indicators (WPTI), in co-ordination with the European Commission and with financial support from the Northern Way (United Kingdom).

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- Roundtable on "Environmental indicators for cities", organised by the OECD Working Party on Territorial Indicators (29 November 2010).
- Discussion of interim results at the Northern Way Research Forum in Leeds, United Kingdom (14 December 2010).
- Workshop on "Measuring regional development: issues from emerging economies", organised by the OECD Working Party on Territorial Indicators (14 June 2011).
- Presentation of Prof. Juwei Wang on "Urbanisation trends in China" at the OECD Working Party on Territorial Indicators (7 December 2011), with the support of the Norwegian Institute for Urban and Regional Research.

This report was co-ordinated by Monica Brezzi, Head of the Regional Analysis and Statistics Unit, under the supervision of Joaquim Oliveira Martins, Head of the Regional Development Policy Division at the OECD, Directorate for Public Governance and Territorial Development. Richard Baker (Director at RBLS) provided overall advice on the project, as well as contributions to the draft.

Chapter 1 was written by Monica Brezzi, Mario Piacentini, Konstantin Rosina and Daniel Sanchez-Serra (Directorate for Public Governance and Territorial Development). Chapter 2 was written by Hermanus S. Geyer, Danie J. Du Plessis, Hermanus S. Geyer Jr. and Amanda van Eeden, from the Centre for Regional and Urban Innovation and Statistical Exploration, Department of Geography and Environmental Studies, Stellenbosch University, South Africa. Juwei Zhang and Yifei Cai from the Chinese Academy of Social Science wrote Chapter 3 and Richard Baker from RBLS Consulting wrote Chapter 4.

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Reader's guide

Acronyms and abbreviations

CCS	Census Consolidated Subdivision (Canada)
CO_2	Carbon dioxide
CSD	Census Subdivision (Canada)
CUPS	Centre for Urban Policy Studies (United Kingdom)
EEA	European Environmental Agency
FEA	Functional economic area
GDP	Gross domestic product
GHG	Greenhouse gas
GVA	Gross value added
IPEC	Institute for Political and Economic Governance (United Kingdom)
LAU	Local administrative units
LEP	Local enterprise partnerships
MOHURD	Ministry of Housing and Urban-Rural Development (China)
NBS	National Bureau of Statistics (China)
NDP	National Development Plan (South Africa)
NSF	National Spatial Framework (South Africa)
NUDF	National Urban Development Framework (South Africa)
$PM_{2.5}$	Particulate matters of 2.5 mm diameter
RDA	Regional development agencies
TFR	Total fertility rate
UFI	Urban Function Index

Glossary

Connected areas	Resident places of local county government, which have not been classified as cities, and the resident places of town level government and the connected residents' committees as well as other places (China).
Densification index	Ratio between the increase of population and the increase of urbanised land in a certain period.
Differential urbanisation	Framework to explain the position and evolution of urban areas in a country by means of main migration patterns.
Fringe zone	Area that lies just outside the metropolitan built-up area but still within the declared "urban edge" (South Africa).
Functional urban area	Urban area composed of densely inhabited urban core(s) and hinterland.
Growth in urbanised land	Ratio between the net change of urbanised land and the total area of urban class.
Inner city zone	Represents the more or less continuous built-up areas of the metropolitan cities consisting of the central business district and adjoining central city areas, the inner and outer residential areas containing a mixture of commercial and service corridors and sub-centres (South Africa).
Inner peripheral zone	Area between the daily and weekly urban zone limits of the metropolitan city (South Africa).
Large metropolitan area	Functional urban area with a population of 1.5 million or higher.
Medium-sized urban area	Functional urban area with a population between 200 000 and 500 000 people.
Metropolitan area	Functional urban area with a population between 500 000 and 1.5 million people.
Monocentric functional urban area	A functional urban area constituted by a high densely populated urban core and its surrounding hinterland.

Polarisation reversal	Phase in the urbanisation process when the tendency of industries to locate in the economic core of a country gives way to spatial dispersion towards the periphery.
Polycentric functional urban area	A functional urban area where the hinterland's space, the transport infrastructures and the provision of services are organised around multiple connected urban cores.
Satellite city	City outside the urban core of a metropolitan area but still within the "daily urban zone" of the urban core (South Africa).
Small urban area	Functional urban area with a population above 50 000 and below 200 000 people.
Urban area of cities	Refers to municipal districts, cities without districts, the locations of governments and the connected residents' committees as well as other places (China).
Urban area of towns	Refers to the resident places of local county government, which have not been classified as cities, and the resident places of town level government and the connected residents' committees as well as other places (China).
Urban area type	Functional urban areas classification according to population size.
Urban core	High densely populated contiguous municipalities.
Urban hinterland	Municipalities connected to the urban core by having a certain share of their employed residents working in the urban core.
Urbanised land	Land classified as artificial with residential and non-residential buildings or for urban uses such as major roads and railway, airports, sport facilities or urban parks.
Urban population, share	Share of urban population in a certain region or province on the total urban population of a country.
Urbanisation rate	Percentage of population living in urban areas.

Executive summary

Urbanisation is a dominant trend worldwide, affecting economies, societies, cultures and the environment. More than half the world's population now lives in cities, and as much as two-thirds is expected to do so by 2050. The coming together of people, business and other activities in cities is a key process in the development and maturing of economies and societies. How urban systems function is crucial to future economic prosperity and a better quality of life for more than three billion people, and counting.

Nevertheless, urban development is still poorly monitored, and statistically robust comparisons of urban areas across countries are lacking. But even when there is a commitment to measure policies in cities, researchers are hindered by a lack of international agreement on what exactly it is we are measuring. What is "urban"? What comprises a city's labour market? Such questions must have clear responses if we are to design better policies for metropolitan areas. An internationally recognised definition of urban areas as functional economic units can better guide the way city governments plan infrastructure, transportation, housing and schools, space for culture and recreation.

This report is published at a time when maximising the economic performance of urban areas and their delivery of social and environmental goals is at the top of the policy agenda in many OECD countries and emerging economies. At the same time, researchers are actively debating the role of economic agglomeration in fostering growth, and regional policies in maximising and re-balancing national economic performance. This report contributes to the policy debate by specifically addressing:

- The growing consensus that public policies should be concerned not only with the scale of urbanisation, but also with its geographic shape. The functioning and efficiency of linkages between cities, and those between urban and rural areas, can lead to important changes in how and where economic production takes place.
- The role of large metropolitan areas in the global economy and their capacity to realise the benefits of economic agglomeration, industrial clustering and innovation.

- The potential of medium-sized cities to drive more sustainable urban development, without the costs and inefficiencies associated with mega-cities.

This report not only engages with policy, but offers concrete tools for countries to better track and benchmarks their urban areas. It begins with a new definition of urban areas based on their economic function rather than their administrative boundaries that enhances existing analytical tools and allows for better comparison of the economic and social performance across countries. It then describes work, led by the OECD, to promote a new agreed definition of "functional urban areas" as relevant units for territorial policy and spatial planning.

It then applies this methodology to 28 OECD countries and (re)classifies more than 1 100 urban areas into groups by broadly similar scale, thus enabling comparisons of "like with like": large metropolitan areas, metropolitan areas, medium-sized urban areas, and small urban areas. Two case studies are highlighted to demonstrate the potential to extend this work beyond the OECD, identifying the key issues for applying this methodology in China and South Africa; a third case study highlights broader economic linkages among urban areas in the United Kingdom, and adds insight on economic performance and sustainability of different functional geographies for further extensions of this methodology.

Key findings from this report:

- Monitoring urbanisation and comparing the performance of urban areas require new definitions based on economic function rather than administrative boundaries.
- Analysis of competitiveness of large metropolitan areas to guide regional development policy would benefit from a clear measure of the functional economy of these areas.
- The emergence of medium-sized cities as a measurable urban category offers an opportunity to compare their respective performance in achieving sustainable development, and benchmark them against larger metropolitan areas.
- National and City governments need an improved evidence base on the shape of and linkages among cities for better strategic planning.
- A common global framework for collecting social, economic, environmental and governance data in urban areas would help to better evaluate policies and improve conditions of citizens around the world.

Chapter 1

Redefining urban areas in OECD countries

by
Monica Brezzi, Mario Piacentini,
Konstantin Rosina and Daniel Sanchez-Serra*

This chapter sets out a new methodology for defining urban areas, as functional economic places, in a consistent way across countries. The methodology is applied to 28 OECD countries, where more than 1 000 urban areas (with population greater than 50 000) are identified and compared according to their size, form of development, density and population growth.

The derivation of a methodology able to describe urban areas can help respond to relevant policy questions. First, it can be used to better analyse the links between urbanisation and economic growth, by taking into account that development does not necessarily imply further increases in the size of the metropolitan areas. Development can occur through a strengthening of linkages among medium-sized urban areas. Second, it opens up to monitoring the quality of life of the people living in urban areas and the sustainable use of resources. The work presented is, thus, meant to be a first step towards the development of a new international dataset aimed at monitoring more inclusive forms of growth and sustainable development of both large and medium-sized urban areas.

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Introduction

The share of people living in urban areas is growing worldwide. This is a consequence of the continuous expansion of mega-cities in emerging countries and the coming together of people and business in urban centres of different scales in other parts of the world. In China and India, urbanisation is regarded as a critical component of the development process and the two countries have ambitious goals to build a vast network of new cities to fuel their industrialisation goals (Song and Ding, 2007).[1] While the concentration of people in dense urban centres of "established" OECD cities has slowed down or even decreased in some cases, other agglomerations of varying sizes including London, Milan, Tokyo, Manchester and Lyon have not stopped changing.

Such changes are often changes in form, in what constitutes a city's geographic footprint, rather than increases in population density. Some urban areas are evolving from monocentric agglomerations to more complex systems made of integrated urban centres (cores) and sub-centres. In other territories, a number of cities and towns are increasingly linking up, forming polycentric integrated areas. This changing spatial organisation of cities and the wider territories within which they are located directly affects the quality of life of their inhabitants, the demand for transport infrastructures, the surrounding landscape, the directions of human and capital flows, and the global environmental footprint of urbanisation. Moreover, the reduction of transport and communication costs will continue to make urban centres increasingly interconnected. It is important to better understand the functioning and efficiency of these inter-city connections since they represent key links between urbanisation and productivity growth ("agglomeration economies") and can lead to important changes how and where production takes place.

The role of cities in countries' and regions' economic and social performance has increased policy makers' awareness of metropolitan areas as strategic places. Currently, these areas are experiencing profound economic, environmental and social changes. As a result, attention is turning from traditional conceptions of agglomeration economies to the capacity of urban areas to adopt a sustainable model for their natural resources and to reduce income disparities and marginalisation (Brender *et al.* 2007).

Yet despite the recognised effects of urban development on the economy, quality of life and the environment, urban development is still poorly monitored and statistically robust comparisons of urban areas across countries are lacking. This knowledge gap is mostly due to the absence of an international agreement on what we wish to measure. What do we mean by

"urban"? By "functional urban area"? A harmonised definition of functional urban areas can help assess the links between the scale and type of urban growth, better understand processes of change, development and relative performance; and address opportunities and challenges for sustainable development of a country at even the national level.

The poor knowledge of urban dynamics has important consequences on regional policy making. Regional policies need to better account for the fact that urbanisation can take many forms and to recognise that they have an impact on the form and speed of urban development. Key goals of regional policies, such as increased social cohesion, critically depend on how cities grow and on how they interact among themselves and with their urban/rural hinterlands. Therefore, regional policies need sound information on efficient use of resources in urban areas.

This chapter presents recent work carried out at the OECD to develop an international methodology for measuring urban areas. This methodology is based on a harmonised definition that identifies urban areas as functional economic units. Using population density and travel-to-work flows as key information, urban areas can be characterised by densely inhabitated "urban cores" and "hinterlands" whose labour market is highly integrated with the cores. Maximising the sustainable growth potential of urban areas is at the heart of policy agendas in many OECD countries (European Union, 2011a, 2011b; HM Government, 2011; HIS Global Insight, 2011). A harmonised definition of functional urban areas has the potential to improve analysis of urban growth and performance, enabling comparative evidence about drivers and constraints.

This report contributes to the policy debate and to research through its:

- **New international methodology for the definition of urban areas.** This definition is applied to 28 OECD countries and 1 148 functional urban areas are identified. The methodology identifies urban areas as "functional economic units", thus overcoming previous limitations linked to administrative definitions and increasing the possibility of cross-country comparison.[2]
- **Understanding that urban areas can be** polycentric, with physically separated "cores" linked together in the same larger urban area. This better illustrates the economic and spatial organisation of urban areas and the linkages between such places. It thus opens up the analytical possibilities when examining on governance challenges and economic development of these complex systems.

- **Integration of geographical information and population data, allowing a better understanding of urban forms and urbanization processes.** It thus enables further analysis of the ongoing transformations of peri-urban areas and the ways in which urban areas become more "sprawled" or conversely grow more "compact".[3]

- **Identification, for each OECD country, of all urban systems with a population of at least 50 000, enabling analysis of the population distribution among cities of different size.** Within countries, different patterns of urban development can be identified, as some regions are characterised by a single large urban centre, while others host a network of medium-sized urban areas with no clear hierarchy among them. The methodology can represent a useful tool for comparative analysis of these different urban forms. In particular, it can lead to a critical assessment of the potential of medium-sized urban areas as drivers of more sustainable urban development as several studies suggest (OECD, 2010b; Mayfield et al., 2005).

- **Harmonised methodology, a first step to determining an international dataset through which to monitor urban areas performance across countries.** Such methodology helps to overcome the large differences in administrative definitions of cities across countries. The 1 148 urban areas in OECD countries are, for simplicity of analysis, classified in four categories on the basis of population size: large metropolitan areas, metropolitan areas, medium-sized urban areas, and small urban areas. A preliminary set of statistics for these four categories are presented. The OECD intends to increase the set of available statistics for the metropolitan areas and provide annual updates. However, further "populating" the functional urban areas with comparable statistics and improving the information base on urban dynamics require some methodological innovations and a clear engagement for wider dissemination of data for small areas by countries. On the methodological side, the report argues for a more systematic use of geographic data on population, land cover and use, transport networks and service infrastructure and air quality. Data from different sources (censuses, registers, geographical information system) can be applied to the new definition. For the two largest types of cities, statistics can be developed both for the densely inhabited urban core and the hinterland. The comparison of indicators for cores and hinterlands enables a better understanding of within-city differences. Moreover, the finalisation of the dataset

will require a high level of co-operation with national statistical offices and Eurostat for the dissemination of data for small administrative units, for their collection and harmonisation, and for the construction of headline indicators of urban economic, social and environmental performance.

The OECD is currently working to apply this methodology to the remaining member countries: Australia, Chile, Iceland, Israel, New Zealand and Turkey. The main constraint to further extend the geographical coverage is the availability of travel-to-work (commuting) data to define hinterlands of the functional urban areas. Further methodological work is in progress to identify a suitable substitute for the commuting data, so that additional countries can be included. Chapters 2 and 3 discuss the possible adaptation of this methodology to South Africa and China, respectively.

On the basis of this new methodology, as applied to the 28 OECD countries, the results suggest:

- A common trend of urban densification across OECD countries especially in the hinterlands of large metropolitan areas.
- A low growth or decrease in population density in the cores of urban areas. Examples from the period 2000-06 include expansions of land for urban uses in the hinterlands of metropolitan areas in Estonia, Ireland, Japan, the Netherlands, Portugal, Spain and the United States. During the same period, the rate of population growth in the cores of metropolitan areas in Estonia, Italy, Japan, Portugal and Spain was lower than the rate of urbanised land growth.
- There is no evidence of a clear linear relation between population size and population growth. Small urban areas and metropolitan areas – respectively the smallest and the second largest type of functional urban areas – have increased their population faster than the medium-sized urban areas or the large metropolitan areas.
- There is evidence of large differences in the levels of estimated CO_2 emissions per capita and air quality across metropolitan areas. These differences suggest that many cities have the potential to better decouple their economic production from carbon emissions. Forthcoming statistics on different aspects of the well-being of urban population (such as poverty, crimes, housing market, quality of education and health, etc.) are crucial to better understand the sustainability of the current urbanisation patterns.

The rest of the chapter is organised as follows: Section 1.2 reviews the methodology and provides details on the data used; Section 1.3 describes the urban systems of 28 OECD countries derived by the application of this

definition. Some descriptive statistics are provided on urbanisation and densification according to the size distribution of the functional urban areas. In addition, estimates of economic output, CO_2 emissions and air quality are provided as examples of indicators to be produced for urban areas. Section 1.4 concludes.

Methodology

Data inputs and selection of geographical units

Given that data are generally disseminated according to administrative jurisdictions or statistical geographic units, urban areas are best defined as aggregations of these nationally defined subdivisions. The first key issue for a functional definition of urban areas is thus the choice of an appropriate geographic building block. Here the obvious trade-off is between the precision in the delineation of metro areas and the availability of data for smaller administrative units. For all European countries, the definition uses municipalities (LAU2 in Eurostat terminology).[4] In non-European countries, the selected building block is generally the smaller administrative units for which national commuting data are available. In the following description of the methodology for delineating urban areas, the general term "municipalities" will be used for indicating the building block in the analysis.

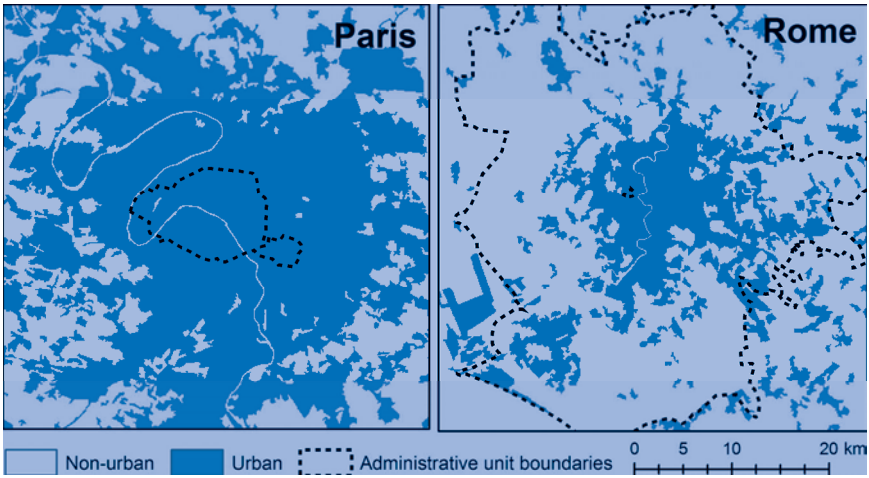
Defining urban cores through gridded population data: rationale and application

The OECD has traditionally used thresholds based on population density (the ratio between population and the total area of the administrative unit) to classify regions as either urban or rural. While this approach has the obvious benefit of simplicity and performs well for several applications, it has clear limitations when applied to the analysis of urbanisation patterns and their effects on the economy, the environment and social relations.

One clear problem when using population density as the unique criterion for defining urban cores is the fact that administrative units are unevenly sized and highly heterogeneous within and between countries. It is fairly common to observe municipalities that, for historic or economic reasons, cover surfaces that are much larger than those of the other municipalities of a country. These municipalities often host a relevant urban centre, but their administrative borders extend also over large mountainous areas, or include vast water surfaces, woodland and shrub. Large administrative borders are a key reason why we can observe low density values even for municipalities that contain non-negligible urban agglomerations (in Europe, more than 250 communes above 20 000 inhabitants have a density lower than 150 and

the majority of them host fairly large urban cores). At the other extreme, considering simply the ratio population/area of the municipality, it is easy to end up classifying as "urban cores" some municipalities that have in reality a marked rural connotation.[5] The problem is non-negligible also when we focus only on large metropolitan areas, such as Paris or Rome. In Figure 1.1, it can be seen that the difference in population density between the two cities depends mainly on the boundary definition; the actual population distribution in the cities plays a secondary role.

Figure 1.1. **Urban and non-urban population density: Paris and Rome**



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

Source: OECD calculations based on population density disaggregated with Corine Land Cover, Joint Research Centre for the European Environmental Agency.

The methodology uses population grid data at 1 km² to define urban cores in a way that is robust to cross-country differences in administrative borders. The source of the population grid data for European countries is the population density disaggregated with Corine Land Cover dataset, produced by the Joint Research Centre for the European Environmental Agency (EEA). For all of the other countries, harmonised gridded population data from the Landscan project are used.

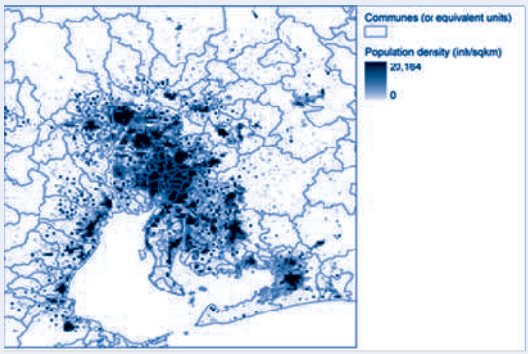
The methodology consists of three main steps: the first step identifies contiguous or highly interconnected densely inhabited urban cores. The second step identifies interconnected urban cores that are part of the same functional areas, and the third step defines the commuting shed or hinterland of the functional urban area.

Step 1. Identifying core municipalities through gridded population data

In the first step of the procedure, the gridded population data are used to define urbanised areas or "urban high-density clusters" over the national territory, ignoring administrative borders. High-density clusters are defined as an aggregation of contiguous high density 1 km² grid cells.[6] High-density cells are those with a population density of at least 1 500 inhabitants per km^2 in Europe, Japan, Korea and Mexico. A lower threshold of 1 000 people per km² is applied to Canada and the United States, where several metropolitan areas develop in a less compact manner. Small clusters (hosting less than 50 000 people in Europe, Canada and the United States, 100 000 people in Japan, Korea and Mexico) are dropped, as they are likely to capture small agglomerations of built-up areas which cannot be characterised as an urban area. As Box 1.1 shows, a municipality is defined as being part of an urban core by calculating the fraction of its population living within an urban cluster. If the percentage of the population of a municipality living within the urban cluster is higher than 50%, then the municipality is considered "densely inhabited". The final part of the procedure consists simply in aggregating contiguous densely inhabited municipalities in an "urban core".

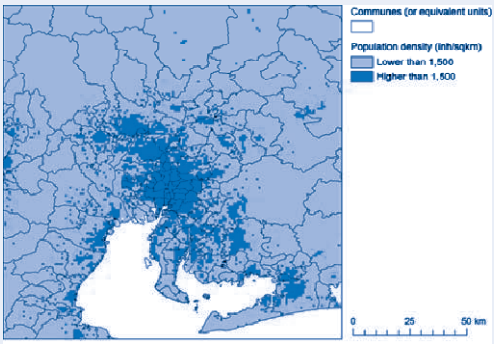
Box 1.1. **Defining the urban cores, an illustration for Nagoya (Japan)**

1. Overlay input datasets – population density grid and boundaries of small administrative units.

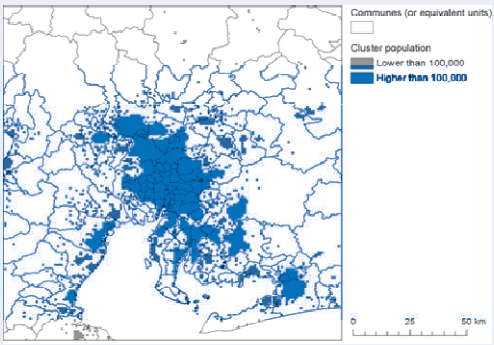


Box 1.1. **Defining the urban cores, an illustration for Nagoya (Japan)** *(cont'd)*

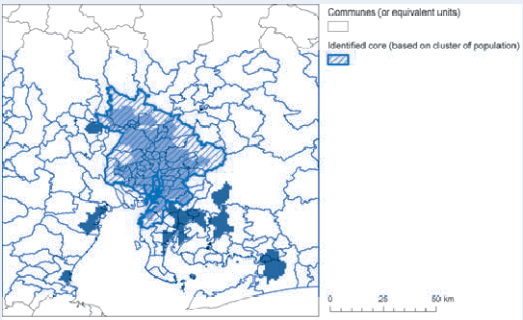
2. Apply a threshold to identify densely inhabitated grid cells.



3. Identify contiguous high-density clusters and enhance them by majority filtering. Only clusters with a population over specified thresholds are kept.



4. Identify core commuters are identified as those with more than 50% of the population living within a high density urban cluster.



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

Source: OECD calculations based on LandScan database.

Step 2. Connecting non-contiguous cores belonging to the same functional area

The urban cores defined through this procedure are found to be good approximations of contiguous, highly built-up surfaces. As already said, not all of the urban areas in the OECD are characterised by contiguity in built-up development. Many of them are developing in a polycentric way, hosting high densely inhabited cores that are physically separated but economically integrated. An important innovation of this work identifies which urban areas have such a polycentric structure. This is done by simply looking at the relationships among the urban cores, using the information contained in the commuting data.[7] Two urban cores are considered integrated, and thus part of the same polycentric metropolitan system, if more than 15% of the residence population of any of the cores commutes to work in the other core. This intermediate step allows a correction for possible discontinuities in population density within the same urban centre (e.g. natural surfaces larger than 1 km^2 splitting one city into two parts).

Using this simple functional criterion, it is possible to identify several polycentric metropolitan areas.[8] These polycentric metropolitan areas are generally constituted by one central city with a large population nucleus and a set of smaller sub-centres which have a high degree of integration with the nucleus. There are also examples within which there are a number of inter-linked smaller areas without a defined core. The direction of the relationship is not necessarily from the small sub-centres to the large central cores, as in many cases the sub-centres develop as dynamic industrial and service hubs, rather than as dormitory spaces for the workers in the big cities. For large metropolitan areas and in countries where commuting distance is steadily increasing, it is easy to find sub-centres situated far from the central city core. This is, for example, the case of London, whose increased connectivity with urban sub-centres has been the result of the combined effect of infrastructural improvements and increasing spatial re-organisation of production activities (firms keeping their administrative headquarters in the central core, and relocating production facilities to well-connected agglomerations outside the central core).

Step 3. Identifying the urban hinterlands

Once the densely inhabited municipalities are aggregated to form urban cores and polycentric metro areas with tied cores are identified, the final step of the methodology consists in delineating the hinterland of the metro areas. The “hinterland” can be defined as the “worker catchment area” of the urban labour market, outside the densely inhabited core. The size of the hinterland, relative to the size of the core, gives clear indications of the

influence of cities over surrounding areas. Getting distinct information for cores and for hinterlands is also very important to understand where change is taking place.

We assign to each core as hinterland municipalities all those municipalities which send to the core a percentage of their workers above a given threshold.[9] After extensive sensitivity analysis, the threshold has been fixed at 15% of the residents employed for municipalities.

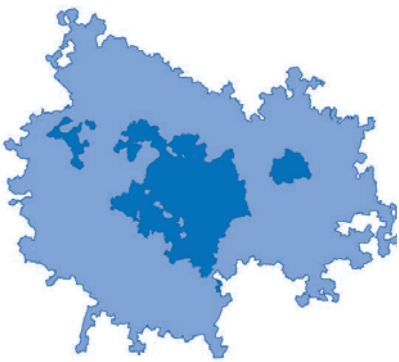
We consider the multiple cores within a polycentric metropolitan area as a single destination. In this way, a hinterland municipality is assigned to a polycentric municipal area if the level of its commuting to the tied cores exceeds the threshold. This adjustment is needed to take into account the fact that workers within the catchment areas of a polycentric system tend to commute towards multiple employment centres.[10] For the cases in which a municipality has commuting levels over 15% to cores in different metropolitan areas, it is linked to the core to which it sends the highest share of its employed population.

Municipalities surrounded by a single functional area are included as part of the functional urban areas and non-contiguous municipalities are dropped. Figure 1.2 provides an illustration of the results for the cities of Rome and Paris. As can be seen from the images, Paris has a more marked polycentric structure than Rome.

Figure 1.2. **An illustration of the results for Paris and Rome**

The functional urban area of Rome

The functional urban area of Paris



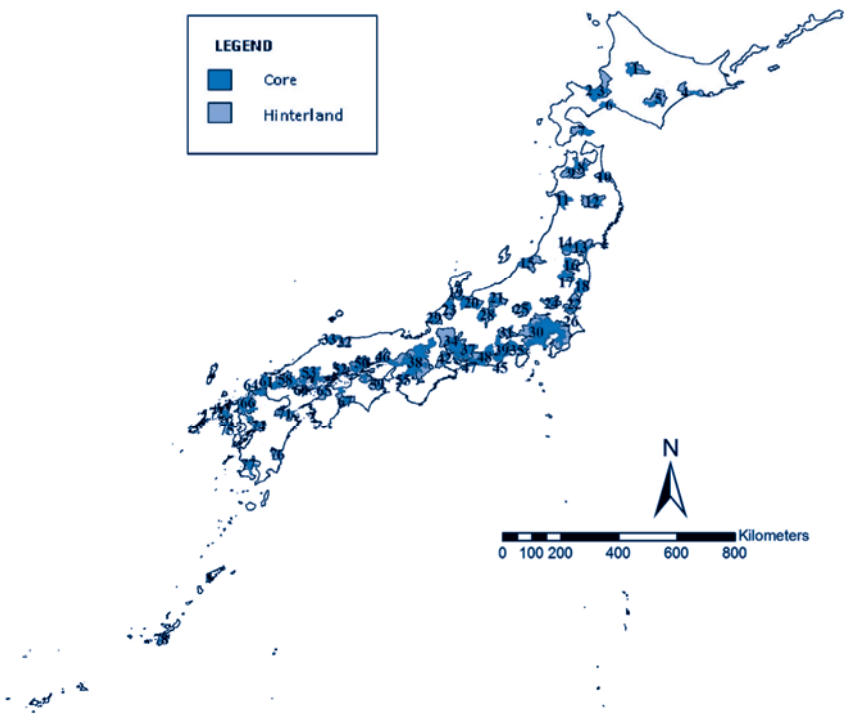
Note: These maps are for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD calculations on population density disaggregated with Corine Land Cover, Joint Research Centre for the European Environmental Agency.

As a result of this methodology it is possible to obtain an accurate representation of each country's "urban system".[11] These systems are constituted by all the functional urban areas taking shape around high-density clusters with population higher than 50 000 people (100 000 in Japan, Korea and Mexico). The simple visualisation of the results is already informative about the concentration of urban people in particular regions of a country, and about the size distribution ("hierarchy") among the different urban centres.

The result of this methodology applied to Japan is shown in Figure 1.3. For this country, 76 functional urban areas are identified, of which 6 are large metropolitan areas and 30 metropolitan areas.[12]

Figure 1.3. **Functional urban areas in Japan**



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

Source: OECD calculations based on LandScan database.

In order to ensure international comparability of the statistics obtained for the functional areas, a particular effort was made to use administrative building blocks of comparable size and to reduce to a minimum country-specific adjustments in the methodology. Extensive sensitivity analysis was carried out to set the common values of the thresholds in the methodology. Only limited variations in population density and size to define the urban cores and in the commuting threshold of the hinterlands were allowed to adjust for the large cross-country differences in the form of urban settlements. This search for international comparability might come at the cost of a loss of accuracy in the delimitation of the urban borders. In addition, data availability for the resulting functional urban areas may at present be scarce. For these reasons, validation work with national experts has been carried out with national experts both on the data inputs and on the results, to ensure a good representation of the national urban systems and allow adjustment to improve data availability. The relatively simple steps of the methodology make the result replicable by interested countries and possible to update, as new data from censuses become available or administrative units are modified.[13]

Box 1.2. **National definitions of functional urban areas: the examples of Canada and United States**

Several methodologies to identify and classify urban systems have been developed at national and international level. The US Office of Management and Budget (2000) and Statistics Canada (2002) use a functional approach similar to the one adopted here to identify metropolitan areas, respectively, in the United States and in Canada. The conceptual frameworks include the use of a **defined core area** as the starting point of the delineation of functional areas, and the use of **commuting data** as a proxy measurement of the relationship between defined core areas and peripheral or hinterland areas.

The main differences between the American and Canadian methodologies and the one presented in this chapter relate to the choices of geographical units and thresholds for commuting. More precisely:

- **Geographic building blocks:** Statistics Canada uses the Census Subdivision (CSD) as the building block to form Census Metropolitan Areas (CMA) and Census Agglomerations (CA) (functional areas) while the OECD uses the Census Consolidated Subdivision (CCS) as the building block to form functional areas in Canada. In many cases CCSs are larger and often have a lower population density than many of the component CSDs. The US Office of Management and Budget (OMB), the agency responsible for the delineation of metropolitan and micropolitan statistical areas in the United States, uses counties as building blocks while the OECD has used Census tracts as the basic geographical unit for the delimitation of the metropolitan areas in the United States in order to have building blocks of comparable size with the other OECD countries.

Box 1.2. **National definitions of functional urban areas: the examples of Canada and United States** *(cont'd)*

- **Density and population thresholds for defining core areas:** both the density threshold and the minimum population concentration set by the OECD are higher than those established in Canada and the United States. The OECD identifies core areas in Canada and the United States as those high-density clusters with a population density of 1 000 inhabitants per km² grid and a minimum population size of 50 000. Statistics Canada identifies core areas as those with a population density of 400 or more people per km² and a total population of at least 10 000 inhabitants. The US Office of Management and Budget defines a core area as those counties that have at least 50% of their population in urban areas of at least 10 000 populations or have within their boundaries a population of at least 5 000 located in a single urban area of at least 10 000 population. These differences might likely produce fewer OECD cores than the comparable Canadian and American cores.

- **Commuting thresholds:** the OECD uses different minimum forward commuting thresholds than Statistics Canada or the US Office of Management and Budget (15%, 50% and 25% respectively). Additionally, the OECD does not test for commuting from the core, or reverse commuting, to the hinterland areas when considering the strength of the core hinterland relationships. Statistics Canada and the US Office of Management and Budget use a 25% threshold of reverse commuting.

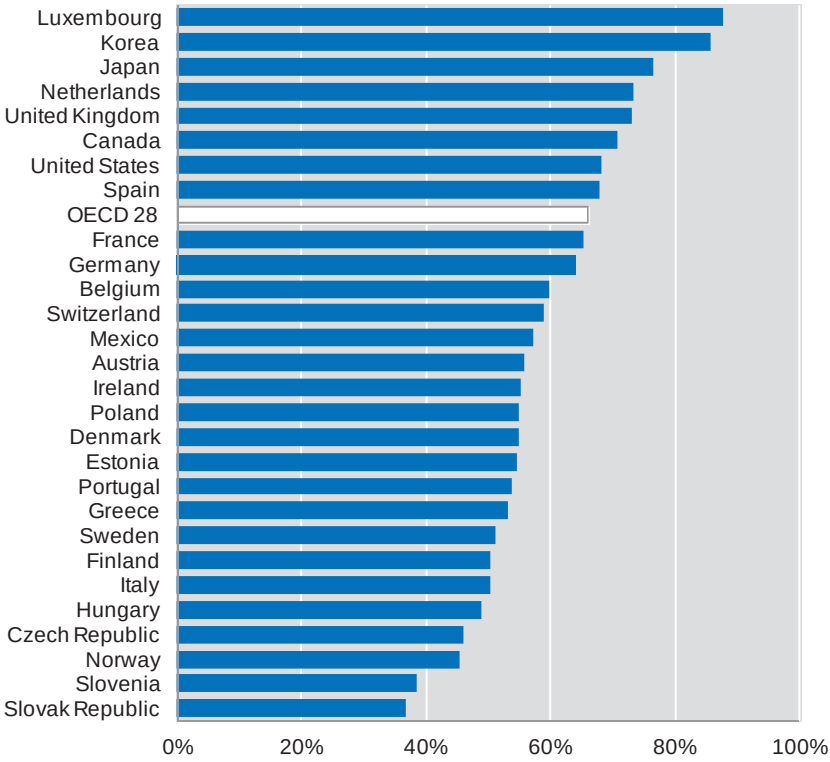
The validation work carried out with national experts has brought some adjustments to specific functional urban areas in Canada. In order to increase the available statistical information to monitor economic, social and environmental changes in functional urban areas in the United States, the US Census Bureau and the US Department of Commerce have suggested adjusting the urban areas derived by the OECD methodology according to the boundaries of counties. This adjustment consists in the following four steps:

1. Step 1: identify the counties that overlap the OECD functional urban areas defined by Census tracts.
2. Step 2: compute the percentage of population in a functional urban area contained in a county.
3. Step 3: select all counties with a percentage above 50% in Step 2.
4. Step 4: drop non-contiguous counties.

A description of urban systems in OECD countries based on the new methodology

The above described methodology is applied to 28 OECD countries, where a total of 1 148 functional urban areas have been identified. According to this definition, the proportion of population living in urban areas with cores larger than 50 000 (100 000) inhabitants in OECD countries is around 66% ranging from almost 90% in Luxembourg, to less than 40% in the Slovak Republic (Figure 1.4).

Figure 1.4. **Percentage of national population living in an urban area, 2006**



Note: The national population living in an urban area is defined as the population living in an identified functional urban area with more than 50 000 people (100 000 in Korea, Japan and Mexico). Population data for Austria, the Czech Republic, Germany, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, Sweden, Slovenia, the Slovak Republic and the United Kingdom refer to 2000; Norway, Japan, Luxembourg and Mexico refer to 2005; the United States refer to 2007; Korea and Portugal refer to 2010 and 2011 respectively.

Source: Author's calculations based on OECD Regional database.

For the remaining OECD countries (Australia, Iceland, Israel, New Zealand and Turkey), work has not started yet while it's under way for Chile. It is more challenging to extend this definition to those countries for which there are no commuting data available for small administrative units. The absence of commuting data from the censuses is particularly frequent in emerging and developing countries. Different options to approximate the definitions of the hinterlands, either by using proxies for commuting data or by making inference from "matched", similar cores in other countries with defined hinterlands, are under consideration.

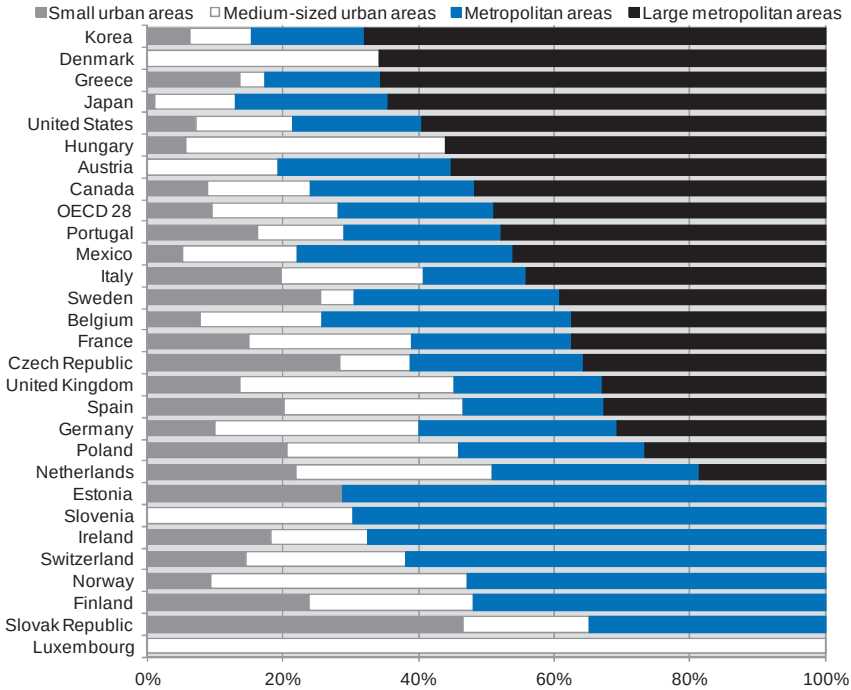
As already mentioned, a crucial innovation of this methodology is the possibility of comparing functional urban areas of similar size across countries. A classification of urban areas into four "types" according to population size is proposed:

- small urban areas, with a population below 200 000 people;[14]
- medium-sized urban areas, with a population between 200 000 and 500 000 people;
- metropolitan areas, with a population between 500 000 and 1.5 million people;
- large metropolitan areas, with a population of 1.5 million or more.

On the basis of this classification, it is possible to study the relative importance of medium-sized urban areas with respect to large metropolitan areas in each country.[15] The eight countries on the bottom of Figure 1.5 do not have any large metropolitan areas, while in all the other countries the urban centres with 1.5 million people or higher host at least 20% of the urban population. The primacy of large metropolitan areas is particularly clear in Denmark, Greece, Japan, Korea and the United States where at least 60% of the urban population lives in cities of this class.

Among the 1 148 functional urban areas identified in the 28 OECD countries, 74 are large metropolitan areas with more than 1.5 million people, 190 are metropolitan areas, 400 are medium-sized urban areas, and 484 are small urban areas (Figure 1.6). A larger share of urban population lives in large metropolitan areas in North America, Japan and Korea than in Europe, and the average size of the large metropolitan areas is much bigger in Japan (more than 10 million inhabitants), Korea (almost 9 million) and North America (around 4 million) than in Europe (around 3 million). On the other hand, the weight of population in small and medium-sized urban areas is bigger in Europe than in Japan, Korea and North America, even though the average size of these two city types is comparable across OECD

Figure 1.5. **Distribution of population across OECD urban areas, 2006**



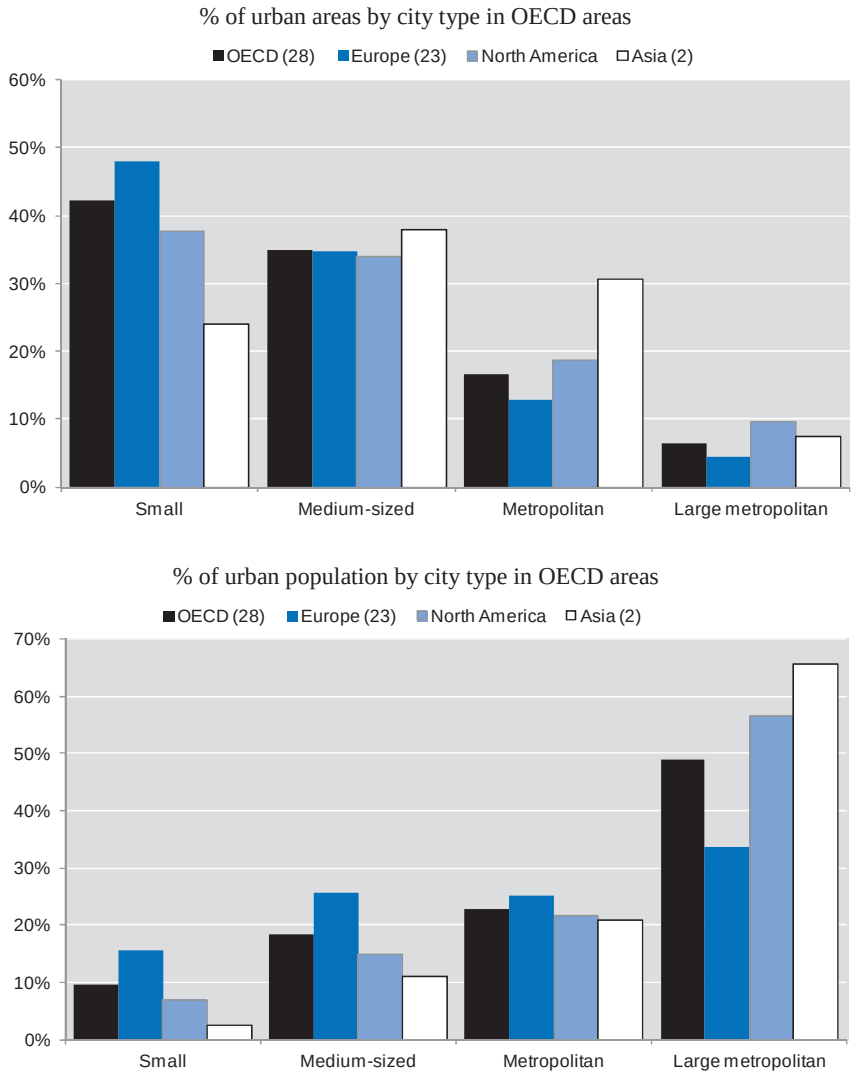
Note: Population data for Austria, the Czech Republic, Germany, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, Sweden, Slovenia, the Slovak Republic and the United Kingdom refer to 2000; Norway, Japan, Luxembourg and Mexico refer to 2005; the United States refer to 2007; Korea and Portugal refer to 2010 and 2011 respectively.

Source: Author's calculations based on OECD Regional database.

countries (Figure 1.6). Additionally, the category of small urban areas is the most represented in Europe and Korea (they account for almost 50% of all functional urban areas), while 45% of the functional urban areas in Japan are classified as medium-sized urban areas.

The crucial role of large metropolitan areas as key players of national and transnational flows is well documented. The largest of these cities is the vast urban agglomeration around Tokyo (Table 1.1) that extends on a highly built-up surface of over 10 000 km^2 with few discontinuities in density. This labour market area has integrated different cities over time (Yokohama, Kawasaki, Saitama, Chiba to mention only the largest centres within this functional city). The second and the third largest cities, Seoul Incheon and Mexico City, have a more marked monocentric configuration. Mexico City

Figure 1.6. **Share of urban areas and population by urban area type in OECD countries, 2006**



Note: North America includes Canada, Mexico and United States. Asia includes Japan and Korea. Population data for Austria, the Czech Republic, Germany, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, Sweden, Slovenia, the Slovak Republic and the United Kingdom refer to 2000; Norway, Japan, Luxembourg and Mexico refer to 2005; the United States refer to 2007; Korea and Portugal refer to 2010 and 2011 respectively.

Source: Author's calculations based on OECD Regional database.

Box 1.3. **Classification of urban areas by size: absolute versus relative thresholds**

Our main purposes in developing a common definition of functional urban areas are to provide tools to analyse urban systems in an international context and to measure how cities work and contribute to economic, social and environmental imbalances. For these reasons, once all of the functional urban areas in a country have been identified, cities are regrouped in four categories (small, medium, metropolitan areas, and large metropolitan) by setting absolute (and somehow arbitrary) thresholds of population. As a result, almost all countries have cities belonging to all four class types. Differently, if we used relative thresholds on the basis of the share of population in functional urban areas, we would find that one-fourth of the total urban population is concentrated in just 12 large metropolitan areas (less than 2% of total cities), half of the urban population is concentrated in 74 large metropolitan areas (7% of total cities) and a little more than 25% of cities host 75% of the total urban population.

This methodology identifies the urban systems within a country and does not consider functional economic areas which lie in more than one country. Therefore, we have a comprehensive picture of the national urban system which could be used to enhance our capacity to study the relative importance of large *vs* medium-sized urban areas and the interconnections among cities of different sizes within countries.

Countries may be interested in using relative thresholds on national population in urban systems to identify the different categories of cities (small, medium, metropolitan areas, and large metropolitan). For example, by looking at the percentile of national population living in the urban areas ranked by population size, we would obtain a country-specific picture of the relative concentration of population in urban areas.

The extent to which urban systems are balanced, both at national and at other spatial levels, can be also investigated by looking at the estimated coefficient of a regression of the rank of each functional urban area on its size in terms of population (both in log scale, hence applying the so-called rank-size rule). The steeper the slope of the line interpolating data – hence the higher the coefficient in absolute terms – the more concentrated the population in the largest metropolitan areas. Generally, the estimated coefficient ranges, in absolute terms between 0.8 and 1.2, due to an empirical regularity known as Zipf's Law, under which the estimated coefficient is close to 1. This law implies that the largest functional urban area is twice as large as the second largest area, three times the third largest area and so on along the whole urban hierarchy. Preliminary results show that this law approximately also holds for the set of functional urban areas in OECD countries. Similar results hold for urban areas in China (Box 3.1).

has undergone a process of extension of its core area in the last decades, with the emergence of several employment clusters located outside the traditional central business district. As a consequence of this dispersion of employment in the metro area, the vast majority of the population of Mexico City is now living in "core" municipalities. The fourth city in the ranking is a network of urban centres that developed around the main agglomeration of Osaka. The tight integration of Osaka with the other cities of Kyoto, Kobe, Nara and Otsu has generated a very large functional area (more than 7 800 km^2, larger than Mexico City), with continuous, high levels of population density in the large space between the different historical centres.

Once a richer set of statistics are available for the functional urban areas belonging to the types "large metropolitan areas" and "metropolitan areas", this dataset can replace the current *OECD Metropolitan Regions database* with the clear advantage of an improved comparability among the metropolitan areas in different countries, as they are defined using the same methodology.

Urbanisation and densification of OECD metropolitan areas

Dynamics of population change and distribution can be described using population and land cover data from different points in time. Figure 1.7 provides statistics by type of metro area and by core/periphery for a first set of countries[16] for which data in three points in time (around 1990, 2000 and 2006) have been collected. Faster rates of population growth are observed in the metropolitan areas and small urban areas rather than in large metropolitan areas and medium-sized urban areas. In small urban areas, the acceleration of population growth after 2000 is particularly marked in the city cores. Across all the four types of functional urban areas, the population of the hinterland has been growing at a faster rate than the population of the core, suggesting a common trend of "sub-urbanisation" or densification of peri-urban areas. The largest increases in population are observed in the hinterlands of the large metropolitan areas, with a yearly population growth of 2% in the period between 2000 and 2006 (and around 1.8% for the whole period 1990-2006). This evidence on the fast growth of the hinterlands of metropolitan cities warrants further analysis on the consequences of such a trend. The development of peri-urban areas has, in fact, important impacts on liveability and equity in access to job opportunities, as well as relevant effects on the environmental footprint of cities. Important lessons for spatial planning could be derived by comparing cities growing according to the classic monocentric model with respect to polycentric cities, where the hinterland's space, the transport infrastructures and the provision of services are organised around multiple cores.

Table 1.1. **20 largest metropolitan areas among 28 OECD countries, 2006**

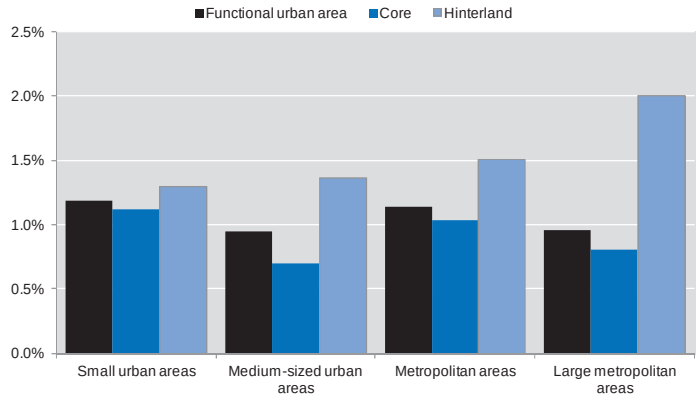
Country	Functional urban area	Total population	Core population	Hinterland population
Japan	Tokyo	33 775 770	31 498 118	2 277 652
Korea	Seoul Incheon	22 451 402	20 493 781	1 957 621
Mexico	Mexico City	18 538 957	17 776 591	762 366
Japan	Osaka	17 161 637	15 664 318	1 497 319
United States	Los Angeles	16 741 516	16 741 516	0
United States	New York	16 548 400	16 152 383	396 017
France	Paris	11 435 042	9 088 394	2 346 648
United Kingdom	London	10 609 400	8 397 221	2 212 179
United States	Chicago	9 309 853	6 654 126	2 655 727
United States	San Francisco	6 636 738	4 636 987	1 999 751
Japan	Nagoya	6 305 108	5 213 180	1 091 928
Spain	Madrid	6 166 200	4 912 893	1 253 307
Canada	Toronto	5 965 105	5 236 325	728 780
United States	Miami	5 465 183	5 465 183	0
United States	Houston	5 289 344	4 417 499	871 845
United States	Washington	5 000 254	4 151 593	848 661
United States	Atlanta	4 408 952	1 724 536	2 684 416
Germany	Berlin	4 334 215	3 522 837	811 378
Mexico	Guadalajara	4 075 595	3 728 465	347 130
Italy	Milano	4 061 399	3 092 874	968 525

Note: Population data for Berlin and London refer to 2000; Tokyo, Mexico City, Osaka, Nagoya and Guadalajara refer to 2005; Los Angeles, New York, Chicago, San Francisco, Miami, Houston, Washington and Atlanta refer to 2007; Seoul Incheon refer to 2010.

Source: Author's calculations based on OECD Regional database.

Figure 1.7. **Population growth by urban area type and core/hinterland**

Average yearly growth rates 2000-2006



Note: The period of growth in the case of Korea is 2005-2010 and Portugal 2001-2011.

Source: Author's calculations based on OECD Regional database, LandScan database and population density disaggregated with land cover.

There is important heterogeneity in population growth across countries. On average, urbanisation was faster in Mexico (with the exception of large metropolitan areas), the United States (especially in metropolitan areas) and Canada (especially in large metropolitan areas) than in Japan and European countries during the period 1995-2006. However, in Spain, population in small urban areas and in large metropolitan areas has grown at an annual rate higher than 1%, likewise Oslo (Norway) and Luxembourg. A decrease of urban population is observed in the small urban areas of Japan as well as in the three functional urban areas of Estonia (Table 1.2).

The urban population density, that is to say the ratio of total population and the area which is urban (see Box 1.4 for the definition), in large metropolitan areas and metropolitan areas is around 2 000 persons per km^2. The concentration of population in the cores of cities is clear in both city types: the urban population density of the cores is more than 3 000 people per km^2 in large metropolitan areas and 2 600 people per km^2 in metropolitan areas (Figure 1.8).

Table 1.2. **Population growth by country and urban area type**

Yearly growth rates, 1995-2006 circa

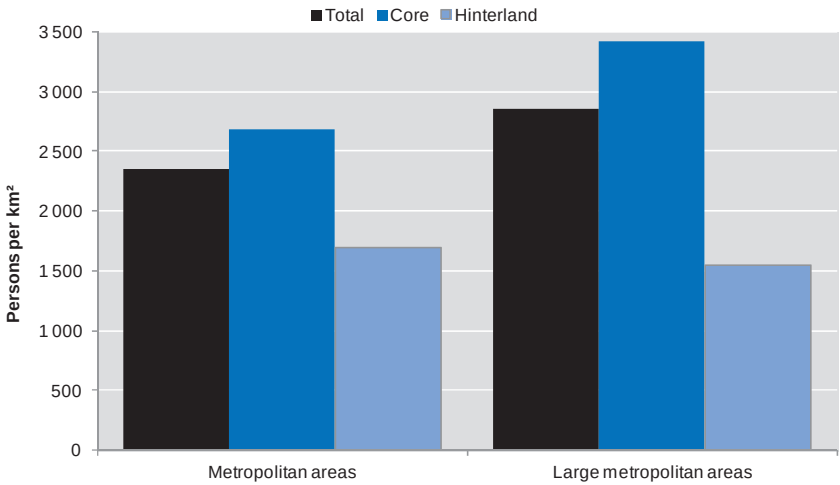
	Small urban areas	Medium-sized urban areas	Metropolitan areas	Large metropolitan areas
Belgium	0.01%	0.19%	0.19%	0.57%
Canada	0.85%	0.79%	1.33%	1.45%
Denmark		0.46%		0.49%
Estonia	-0.17%		-0.14%	
France	0.44%	0.50%	0.83%	0.55%
Italy	0.26%	0.43%	0.01%	0.29%
Japan	-0.02%	0.25%	0.50%	0.48%
Korea	0.52%	0.98%	0.53%	0.79%
Luxembourg		1.29%		
Mexico	2.04%	1.87%	2.09%	1.31%
Norway	0.81%	0.91%	1.41%	
Portugal	0.68%	0.55%	0.46%	0.42%
Spain	1.35%	0.92%	0.80%	1.05%
United States	1.24%	1.12%	1.42%	1.20%

Note: The period of growth in the case of Korea is 2000-10, Estonia 2001-06 and Portugal 1991-2011.

Source: Author's calculations based on OECD Regional database, LandScan database and population density disaggregated with land cover.

Figure 1.8. **Urban population density in metropolitan areas**

Total population over urbanised land, 2000

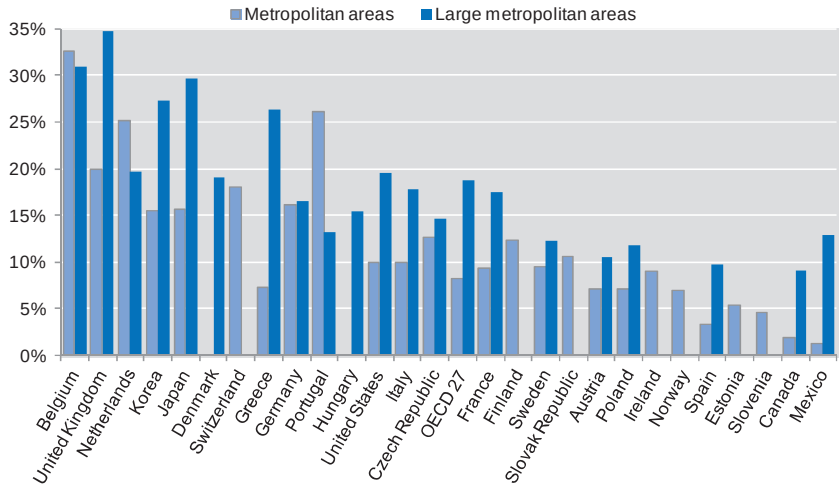


Source: Author's calculations based on OECD Regional database, Corine Land Cover, Japan National Land Service Information data, Modis and National Landcover Dataset.

Urbanisation not only concentrates people but also triggers a variety of land-change processes in natural environments. Recent analysis at the OECD has argued that policy makers concerned with sustainable development should focus more on the form and quality of urbanisation processes rather than simply on the volume and speed of urbanisation (OECD, 2010). Detailed spatial information on the changes in land cover can help identify which areas have been exposed to larger urban pressure, guiding targeted policy interventions where this expansion threatens the quality of the landscape or bio-diversity.

Making use of global land cover datasets at high geographical resolution, we can derive a measure of the share of "urbanised land" (land with built-up cover or urban use such as parks and sport facilities) within the functional urban areas and its change over time (see Box 1.4). The percentage of urbanised land over total area in metropolitan areas varies from less than 4% in Canada and Mexico to around 30% in Belgium, the Netherlands and the United Kingdom. This percentage is generally higher in large metropolitan areas than in metropolitan areas, especially in Japan, Korea and the United Kingdom, with the exception of Belgium, the Netherlands and Portugal (Figure 1.9).

Figure 1.9. **Share of urbanised land over total area in metropolitan areas by country, circa 2000**



Note: It must be noted that for Canada, Korea and Mexico data are derived from medium spatial resolution (500m) satellite imagery (MODIS) and should be taken as rough estimates. The functional city of Luxembourg is classified as a medium-sized city so it is not included in this figure. The data for Japan refer to 1997.

Source: Author's calculations based on Corine Land Cover, Japan National Land Service Information data, Modis and National Landcover Dataset.

Box 1.4. **Measuring land use and change in urbanised land**

In order to measure the different uses of land and its changes with respect to small portions of territory, we take advantage of data from the Earth's surface collected using remote sensing and geographic information systems. In particular, we use the Corine Land Cover for Europe, the Japan National Land Information, the National Land Cover Database for the United States, and MODIS Land Cover Data for Canada, Korea and Mexico (OECD, 2011a).

"Urbanised land" is defined by including the land classified as artificial with built-up cover or urban use in the different datasets. It includes, for example, residential and non-residential buildings, major roads and railways, port and airports, open urban areas like parks and sport facilities. The remaining land of the functional urban areas is classified as water, agriculture, forest or natural vegetation (no forest).

The growth in urbanised land is defined as the ratio between the net change of urbanised land (i.e. the newly formed areas of urban class minus areas that changed from urban to another class) and the total area of urban class at the beginning of the observed period. It is expressed in average yearly growth rates.

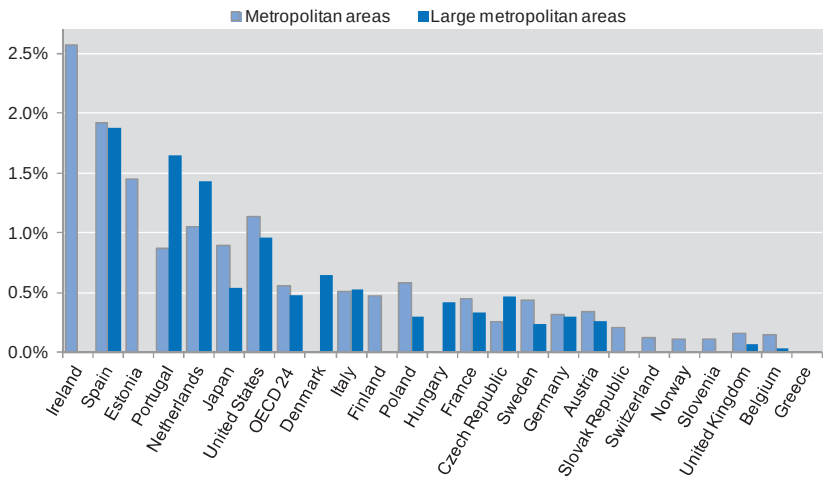
Urbanised land in the metropolitan areas and large metropolitan areas in the United States have grown at almost 1% per year, while at 0.7% in Japan and 0.4% in Europe. Among European metropolitan areas, a very steep increase in urbanised land is observed in Dublin (Ireland); La Palmas, Madrid, Murcia and Zaragoza (Spain); Tallin (Estonia); and Lisbon (Portugal) (Figure 1.10).

The pace of urbanised land growth has been faster in the metropolitan areas (0.5% yearly) than in large metropolitan areas (0.4% yearly) in Europe, Japan and the United States. In both types of cities, the growth of urbanised land is mostly concentrated in the hinterlands.

As a result of the population and urbanised land dynamics, i.e. fast population increases in the hinterlands of large metropolitan areas in particular and sustained growth of urbanised land in metropolitan areas, on average we observe an increase of population density in the hinterlands and a decrease of urban population density in the cores[17] (Figure 1.11).

Figure 1.10. **Growth of urbanised land in metropolitan areas, by country**

Average annual growth, 2000-2006

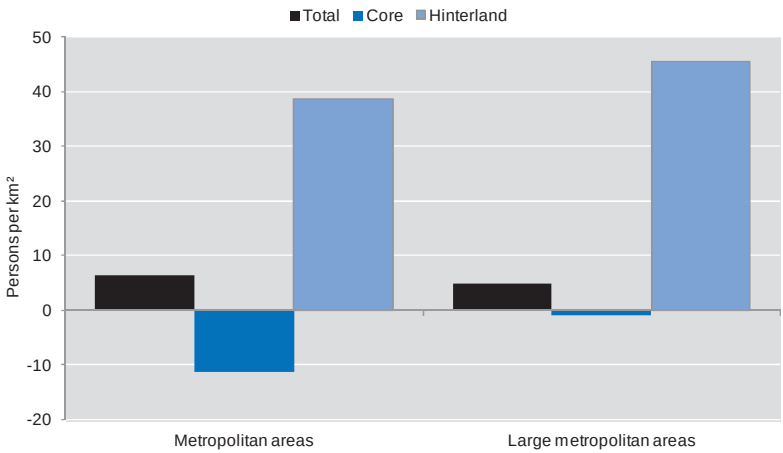


Note: The functional city of Luxembourg is classified as a medium-sized city so it is not included in this figure. The data for Japan refer to 1997. In Canada and Mexico data are only available for one year, so changes cannot be computed.

Source: Author's calculations based on Corine Land Cover, Japan National Land Service Information data, and National Landcover Dataset.

Figure 1.11. **Difference in urban population density in metropolitan areas**

Difference between 2006 and 2000



Note: The calculations are made on a sample of ten countries for which population and land changes refer to the same period.

Source: Author's calculations based on OECD Regional database, Corine Land Cover, Japan National Land Service Information data, and National Landcover Dataset.

We define a **densification index** as the ratio between the increase of population and the increase of urbanised land. This ratio gives an indication of tendencies towards a more "compact" residential development – i.e. when population increases at a faster rate than urbanised land. Increases in "compactness" are observed in Brussels (Belgium) and Oslo (Norway), in particular in the city cores. Similarly, large metropolitan areas in France and Italy and also metropolitan areas in the United States have increased their population faster than the built-up area. On the contrary, Denmark, Japan, Portugal and Spain experienced a reduction of density. In Japan this is essentially due to an increase of land dedicated to urban use in the city hinterlands despite a very low growth of population. In Spain, even if population has increased in the core of cities, the densification of land has been faster (Table 1.3).

Caution has to be taken in the interpretation of the densification index, in particular when considering the average growth of population and urbanised land for different functional urban areas in a country, as we do in Table 1.3. The densification index is not normalised (so it can take any value) and it takes negative values if either the population or the built-up area has decreased in the period. In addition, we keep the boundaries of the functional city fixed over the two periods of time, therefore these measures do not catch the rate of expansion of urban areas in the surroundings.

Table 1.3. **Densification index of metropolitan areas, by country**

2000-2006

Country	Metropolitan areas			Large metropolitan areas		
	Total	Core	Hinterland	Total	Core	Hinterland
Belgium	2.13	2.35	1.85	16.92	-106.39	11.08
Denmark	.	.	.	0.41	0.17	0.67
Estonia	-0.10	-0.41	-0.02	.	.	.
France	2.37	2.28	2.96	2.69	4.84	2.00
Italy	0.70	-0.11	1.64	1.55	1.26	2.44
Japan	0.16	0.22	0.03	0.74	0.92	0.05
Norway	5.07	12.64	5.56	.	.	.
Portugal	0.37	0.21	0.92	0.28	0.00	0.77
Spain	0.66	0.54	0.92	0.89	0.57	2.21
United States	1.41	1.37	2.47	1.05	0.97	1.71

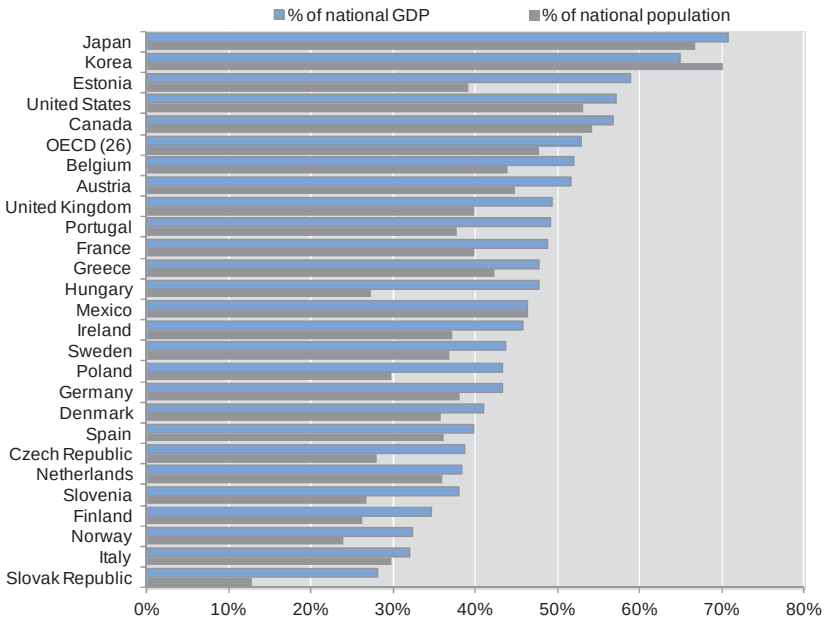
Note: The densification index is defined as the ratio between the population growth rate and urbanised land growth rate. It is computed on a sample of ten countries for which population and land changes refer to the same period.

Source: Author's calculations based on OECD Regional database, Corine Land Cover, Japan National Land Service Information data, and National Landcover Dataset.

GDP concentration in metropolitan areas

Metropolitan areas concentrate high shares of population and economic activity. Economies of scale brought by economic agglomeration can be powerful drivers of national growth. On the basis of the new definition of functional urban areas, 53% of the OECD national GDP is produced by the 261 metropolitan areas with population above 500 000. More than half of GDP and population are concentrated in metropolitan and large metropolitan areas in Canada, Japan, Korea and the United States (Figure 1.12). High economies of agglomerations are observed in metropolitan areas of northern and Eastern Europe, Portugal and the United Kingdom where the share of GDP is higher than the share of national population (Figure 1.12). On the other hand, these results seem to suggest that in Korea and Mexico large metropolitan areas concentrate a higher share of national population than of economic output.

Figure 1.12. **Concentration of population and economic activity in OECD metropolitan areas**



Note: GDP values year 2008, current prices and PPPs. Population data for Austria, the Czech Republic, Germany, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, Slovenia, the Slovak Republic, Sweden and United Kingdom refer to 2000; Japan, Mexico and Norway refer to 2005; the United States refer to 2007; Korea and Portugal refer to 2010 and 2011 respectively. The figure includes the 261 metropolitan and large metropolitan areas with a population of more than 500 000 inhabitants.

Source: OECD calculations based on methodology described in Box 1.5.

The results of Figure 1.12 are estimates of gross domestic product (GDP) at functional urban level, hence they are subject to errors and they should be carefully interpreted. Since most of the socio-economic indicators of interest to monitor the characteristics and the performances of the functional urban areas are usually available at administrative levels, some estimates are necessary. Future steps will involve applying the adjusting technique to different years (so as to increase evidence on the competitiveness of urban areas of different sizes), to all the typologies of urban areas (so as to assess the economic prospect of medium-sized cities), and to other economic and social variables (so as to have a more comprehensive picture of the quality of life in urban areas).

Box 1.5. **Methodology to adjust GDP at metropolitan level**

Socio-economic statistics at sub-national level comparable across countries are generally available for administrative regions (TL2 and TL3 regions of the *OECD Regional database*). While a set of indicators may in the future become available for the OECD functional urban areas defined in this chapter, at present we suggest to derive estimates of the main economic indicators by adjusting existing regional data to the non-administrative boundaries.

Two broad typologies of methods have been used in the literature to adjust indicators at small-scale geography. The first one makes use of Geographic Information System (GIS) tools to disaggregate socio-economic data. GIS techniques are increasingly adopted in the literature, especially in the field of environmental indicators and other issues that are particularly attached to the geography of the territory, rather than their functional or political organisation (Nordhaus et al., 2006; Milego and Ramos, 2006; Doll et al., 2000). The second typology, instead, scales down the values of interest by using correlated statistics available at different levels of geography from surveys or other statistical sources. Such a methodology, for example, is used by the UK Office for National Statistics to provide income estimates at ward level, downscaling the regional values through Census data such as household size, employment status, proportion of the ward population claiming social benefits, proportion of tax payers in each of the tax bands, etc. (Goldring et al., 2005). A similar method is used by the US Bureau of Economic Analysis to estimate the GDP for US Metropolitan Statistical Areas (Panek et al., 2007).

The methodology applied in this Chapter uses a GIS-based methodology for the estimation of GDP at the functional urban level in OECD countries, since the amount of data required is relatively small and already available; in addition, this methodology is less dependent on the types of information available from surveys in different countries and therefore more easily applied consistently in different countries. The methodology is similar to that applied by Milego and Ramos (2006) to downscale socio-economic data from European administrative regions to a 1 km² regular grid level within the context of an Espon research (European Observation Network for Territorial Development).

The proposed methodology is composed by four main steps, each of which is to be carried out using GIS software.

1. Taking the GDP at TL3 level and intersecting with the population grid (LandScan 2000).
2. Attributing each 1 km² cell a GDP value by weighing for population in each cell.
3. Intersecting the layer of GDP in each cell with the boundaries of metro areas. Cells that are not entirely included in one metropolitan area can be aggregated proportionally to the share of their area that falls within each metropolitan area (proportional calculation criteria) or, alternatively, by using a maximum area criterion.
4. Sum of cells' GDP values belonging to each metro area.

Environmental impact of metropolitan areas

The development of statistics on the state and changes of local environmental assets is a challenging task. While countries have started to invest more resources in the monitoring of key environmental variables, data are rarely collected and analysed at the sub-national level. This is problematic given that national averages hide great geographical differences in contributions to natural resource depletions and exposure to environmental risks.

In this section, we present a novel attempt to build estimates of environmental indicators for metropolitan areas from geographical data sources. In particular, among the set of indicators that can be covered through geographical data, we derive estimates for CO_2 emissions and air quality because of their relevance as measures of current life quality and sustainability.

Both indicators are obtained through data that are available at the national level and downscaled to the geographical level of interest using additional data inputs that capture how the phenomenon is distributed across space. So, for example, the estimates of CO_2 emissions are obtained by the *EDGAR Global Emission database* that provides country emissions levels, and have been downscaled to regularly spaced "grids" (e.g. 1 km by 1 km squares) using additional data inputs that are correlated with the production of emissions, such as population density, roads and factories, energy and manufacturing facilities.[18]

Greenhouse gas carbon dioxide (CO_2) from the combustion of fossil fuels and from biomass is a major contributor to greenhouse gas (GHG) emissions and to the enhanced greenhouse effect. Accounting for over 80% of total GHG emissions, CO_2 is a key factor in countries' ability to deal with climate change. The levels of atmospheric concentrations of CO_2 continue to increase worldwide due to anthropogenic activities, having roughly doubled since the early 1970s (OECD, 2011b). Given the increasing urbanisation and industrialisation in emerging and developing countries, there are projections of further increases in CO_2 concentrations over the next decades unless strong national and international strategies are put in place to decouple CO_2 and other GHG emissions from economic growth. In Table 1.4, estimates of CO_2 emissions in the ten largest metropolitan areas are derived. With respect to available data, our estimates enable a high level of comparability of the results for metropolitan areas in different countries. In fact, the data do not depend on the location of monitoring stations and the boundaries of the metropolitan areas are defined in a consistent way across countries.

Table 1.4. **Estimates of CO_2 emissions in the ten largest OECD metropolitan areas, 2006**

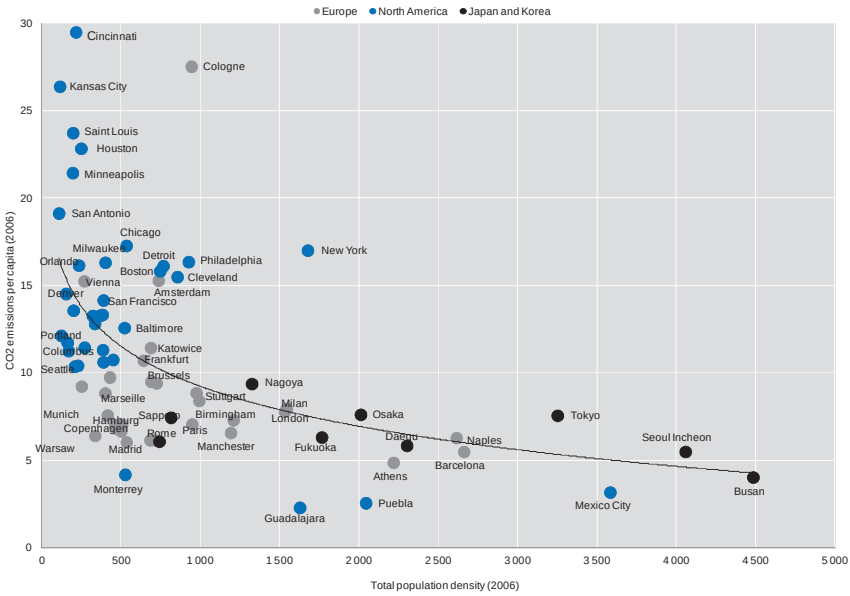
Rank	Country	Metropolitan area	CO_2 emissions per capita (tons)	Share in country's total emission (%)	Share in country's total population (%)
1	Japan	Tokyo	7.81	22.47	25.75
2	Korea	Seoul-Incheon	5.87	26.11	42.69
3	Mexico	Mexico City	3.42	12.59	17.47
4	Japan	Osaka	7.66	11.50	13.44
5	United States	New York	17.44	4.77	5.72
6	United States	Los Angeles	14.50	3.85	5.56
7	France	Paris	7.45	18.19	18.38
8	United Kingdom	London	7.78	15.62	18.02
9	United States	Chicago	17.92	2.73	3.18
10	United States	San Francisco	14.39	1.59	2.31

Source: Piacentini, M. and K. Rosina (2012), "Measuring the environmental performance of metropolitan areas with geographic information sources", *OECD Regional Development Working Paper*, OECD Publishing, Paris.

Several studies suggest that the urban structure can provide some partial explanations to the different levels of CO_2 emissions. Since Newman's and Kenworthy's work in 1989, the role of urban density has been discussed as a means to reduce CO_2 emissions. There is increasing understanding that urban and regional policies (e.g. compact city policies) can complement global climate policies (e.g. a carbon tax) by reducing global energy demand and CO_2 emissions. Figure 1.12 shows an inverse relation between population density and per capita CO_2 emissions. American and Canadian cities are in the top left side of the figure. These cities are characterised by large per capita CO_2 emissions but low levels of population density. For the same levels of population density, European cities produce lower levels of CO_2 emissions. Korean, Japanese and Mexican large metropolitan areas are located at the bottom, showing thus lower CO_2 emissions per capita and high population density levels. However, this relation should be further investigated by controlling for other variables such as level of GDP, source energies such as coal, oil or gas and energy prices.

Similarly to CO_2 emissions per capita, the population's exposure to air pollution is a key indicator of quality of life in metropolitan areas. The increasing use of private vehicles for commuting in urban areas of emerging economies is greatly increasing the number of people that are exposed to toxic pollutants. Urban air pollution is estimated to cause about 2 million premature deaths (a loss of 6.4 million years of life) each year (OECD, 2010).

Figure 1.13. **Population density and CO_2 emissions per capita in large metropolitan areas**



Source: Author's calculations based on Piacentini, M. and K. Rosina (2012), "Measuring the environmental performance of metropolitan areas with geographic information sources", *OECD Regional Development Working Paper*, OECD Publishing, Paris.

Health-damaging air pollution is often measured by the concentration of particulate matters (PM) in the air.[19] By overlaying these data on fine particulate matter with data on population distribution, it is possible to conclude that a large fraction of the world population breathes air whose pollution exceeds the World Health Organisation's recommended level of 10 micrograms of $PM_{2.5}$ per cubic meter. The average concentration of $PM_{2.5}$ in the ten largest metropolitan areas is shown in Table 1.5. The highest level of $PM_{2.5}$ concentration is observed in Seoul (Korea) while the inhabitants of San Francisco (United States) are exposed to the lowest level in this sample of cities (Table 1.5). It has to be noted that, as for ground-based measurement, it is not possible to distinguish the fraction of particulate matters originating from human activities and the fraction that is due natural sources.

Table 1.5. **Estimated air pollution in the ten largest metropolitan areas**

Average levels of $PM_{2.5}$, 2001-2006

Rank	Country	Metropolitan area	Population weighted average levels of $PM_{2.5}$ concentration (µg/m³)
1	Japan	Tokyo	22.35
2	Korea	Seoul-Incheon	27.10
3	Mexico	Mexico City	25.75
4	Japan	Osaka	21.16
5	United States	New York	19.61
6	United States	Los Angeles	13.35
7	France	Paris	18.28
8	United Kingdom	London	19.67
9	United States	Chicago	16.37
10	United States	San Francisco	8.07

Source: Piacentini, M. and K. Rosina (2012), "Measuring the environmental performance of metropolitan areas with geographic information sources", *OECD Regional Development Working Paper*, OECD Publishing, Paris.

The estimates of CO_2 emissions and air quality have the clear advantage that they can be compared across countries – data from satellite observations are available worldwide – and across metropolitan areas, since the boundaries are defined through a common methodology. However, the main limitations of these environmental indicators are due to the difficulty to obtain comparable measures over time so as to monitor improvements induced by targeted policies and behavioural changes. In addition, since data are downscaled from national data, the resulting values may differ from the ones obtained by surface-based air pollution sensors, for those cities where ground sensors have been installed.

Conclusions

The lack of an agreed definition of urban areas across countries has halted our capacity to compare the economic, environmental and social performances of cities. This chapter presents the results of a joint effort of the OECD and the European Commission to:

- develop a harmonised definition of urban areas that reflects the functional connections among places;
- apply this definition to more than 1 000 urban areas in 28 OECD countries;

- identify a preliminary set of socio-economic and environmental indicators to be produced with different methods according to the functional boundaries of urban areas;
- provide such a definition, so as to move towards robust comparative assessments of urbanisation trends and city performance.

The derivation of a methodology able to describe the full set of cities characterising an urban system (including medium-sized urban areas) has clear advantages. First, it allows the identification of the "urban hierarchy" within countries and the linkages between cores and hinterlands, showing that the pattern of urban development differs from place to place. Second, it can be used to better analyse the links between urbanisation and economic growth, by taking into account that development does not necessarily imply further increases in the size of the large metropolitan areas but can happen through a strengthening of medium-sized urban areas. Third, it opens up to further analysis on the potential of inclusive growth in medium-sized urban areas, by comparison with large metropolitan areas on a wide range of indicators. Finally, it would potentially produce new relevant evidence in the policy areas of urban competitiveness, social equity across space and within cities, and the environmental sustainability of urbanisation.

Notes

1. In the next two decades, China will create nearly 30 new cities of 1 million inhabitants; India is expected to add 26 cities of this size during the same period (Seto, 2009).

2. The definition of functional urban area was agreed on with member countries participating in the OECD Working Party on Territorial Indicators and applied in collaboration with the European Commission.

3. Different definitions of "compact" cities are in use and often the concept is subject of debate. OECD (forthcoming) addresses this issue and proposes that the key characteristics of a compact city are: *i)* dense and contiguous development patterns; *ii)* built-up areas linked by public transport systems; and *iii)* accessibility to local services and jobs.

4. The only exception is Portugal, for which commuting data are only available for LAU1 regions.

5. An example is the municipality of Aldea de Trujillo, a small rural town of 439 inhabitants in 2000 which has very high density because its communal territory measures only 0.3 kilometres. See other examples by Gallego (2008)

6. Contiguity for high-density clusters does not include the diagonal (i.e. cells with only the corners touching). Gaps in the high-density cluster are filled using the majority rule iteratively. The majority rule means that if at least five out of the eight cells surrounding a cell belong to the same high-density cluster, the cell will be added. This is repeated until no more cells are added.

7. The integration of different clusters of urbanised areas in a unique functional urban area considers only the information provided by travel-to-work data. In some countries, additional sources of information on functional linkages between different areas could be used to better identify polycentric patterns of development. For example, the Northern Way has used information on relative concentrations of employment by 4-digit sector across neighboring urban centers to proxy sectoral business linkages, and thus the likelihood that different centers form part of the

same economic area (Northern Way, 2009). In general, different choices on how to measure the economic linkages among areas would of course result in different boundaries and size for the functional urban areas.

8. For example, the application of the criterion leads to the pairing of 94 urban cores in 20 countries in Europe.

9. Because of unavailable data in most OECD countries, reverse commuting is not considered in this methodology.

10. Without the adjustment, a hinterland municipality with 14% commuting to three tied urban cores (thus strongly integrated into the urban agglomeration, with 42% [14 times 3] of its resident population moving to work to the urban centres), would be excluded from the metropolitan area.

11. It must be noted that few functional urban areas in Europe spread over national borders.

12. The complete set of maps of the functional urban areas in the 28 OECD countries can be found *www.oecd.org/gov/regional/statisticsindicators*.

13. Such consultation, carried out by the European Commission-Eurostat for European countries and by the OECD for the non-European countries, has introduced some changes described in the document available at *www.oecd.org/gov/regional/statisticsindicators.*

14. Given that cities are identified on the basis of high-density clusters with a minimum size of 50 000 people, there is a lower bound in the population of the functional urban areas. The smallest cities identified (Thousand and Palm Desert in the United States, Granollers in Spain) have a total population of around 45 000 people.

15. Several studies confirm the important role that medium-sized cities play in the national economic development. In fact, medium-sized cities are often seen as a vehicle of diffusion of opportunities of growth and as a more sustainable form of urbanisation, with lower footprints on the natural environment (Mayfield et al., 2005).

16. Belgium, Canada, Denmark, Estonia, France, Italy, Japan, Korea, Luxembourg, Mexico, Norway, Portugal, Spain and the United States. The population in urban systems of these 14 countries represents around 80% of the population in urban systems of the 28 OECD countries included in this report.

17. The results refer to the following countries where data on population and land changes are available for the same period: Belgium, Denmark, Estonia, France, Italy, Japan, Norway, Portugal, Spain and the United States.

18. A thorough discussion of the larger set of environmental indicators produced with different methods from geographical sources can be found in Piacentini and Rosina (2012).

19. Particulate matters (PM) consist of small liquid and solid particles floating in the air and include sulphate, nitrate, elemental carbon, organic carbon matter, and sodium and ammonium ions in varying concentrations. Particular focus in the measurement has been given to particles that are less than 2.5 microns in diameter ($PM_{2.5}$) as they are considered of greatest concern to public health.

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Chapter 2

Urbanisation and migration trends in South Africa: theory and policy implications

by
Hermanus S. Geyer, Danie J. Du Plessis,
Hermanus S. Geyer Jr. and Amanda van Eeden*

This chapter classifies and defines cities in South Africa from a migration vantage point. It first focuses on the differential urbanisation concept as a systemic framework that can explain how urban systems evolve and how the process determines the position and expected dynamism of individual cities within the urban hierarchy. Within this theoretical framework, the chapter reviews population redistribution patterns in South Africa since the mid-1990s and compares them to population redistribution processes in the three largest urban agglomerations of South Africa. Finally, population redistribution movements in and around these core cities are used to explain: i) *current morphological trends;* ii) *the relationship between the core cities and their surrounding cities;* iii) *the interpretation of functional and administrative space in terms of these trends. The chapter also reflects on the potential value to adapt the OECD methodology of functional urban areas to South Africa.*

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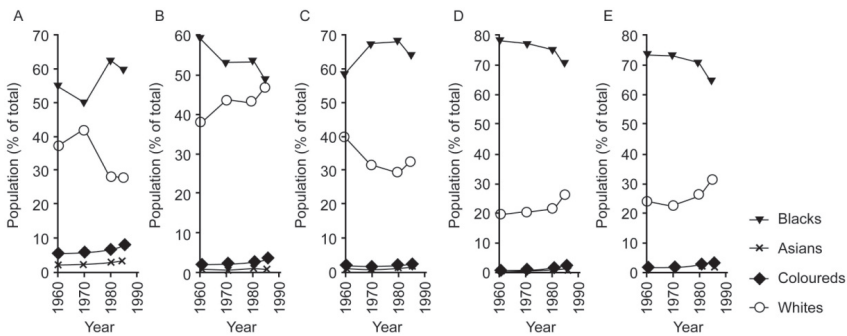
The differential urbanisation concept

The term differential urbanisation, which links production- and environmental-driven migration (Hart, 1983) with the concepts of main and sub-stream migration, was first introduced in the late-1980s within a South African setting (Geyer, 1990). In an attempt to understand the underlying driving forces of main- and sub-stream migration patterns in and between cities in South Africa, interesting differential urbanisation patterns were uncovered. In a study in which population redistribution patterns between different zones of the urban agglomerations of Gauteng and its surrounding intermediate-size cities were analysed, significant proportional shifts in the distribution of different population groups between the zones over time (1960-1985) were uncovered (see Figure 2.1). Functionally, the urban agglomeration was subdivided into an inner core (Figure 2.1A), intermediate suburbs (Figure 2.1A), outer suburbs (Figure 2.1C), city fringe zone (Figure 2.1D), and intermediate-sized cities around the Gauteng megalopolis (Figure 2.1E). The figure shows how the representation of certain population groups increased and declined at different time periods in different parts of the agglomerations, trends that led to the introduction of the differential urbanisation model.

Figure 2.1. **Historical population redistribution patterns in and around Gauteng, 1960-1985**

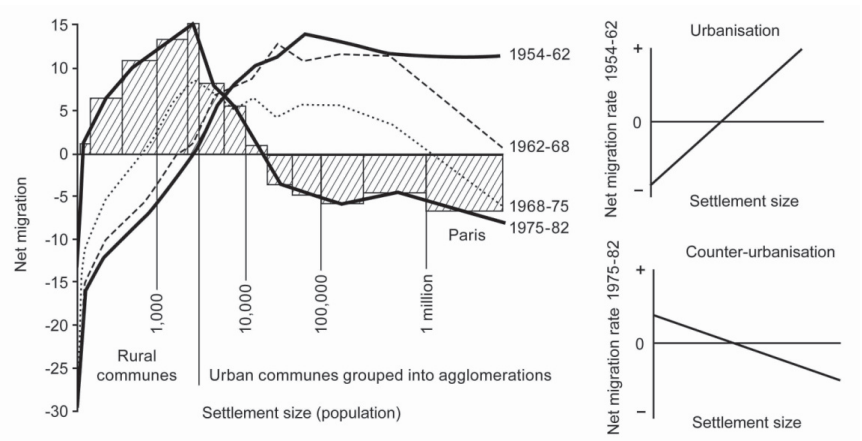


Source: Geyer, H.S. (1990), "Implications of differential urbanisation on deconcentration in the Pretoria-Witwatersrand-Vaal Triangle metropolitan area (PWV), South Africa", *Geoforum.*

The step-wise migration pattern of a heterogeneous population, a common feature of differential urbanisation in the developing world, was inadequately dealt with in migration literature in the first world. At the time, urbanisation and counter urbanisation were identified as the only

two distinct net migration phases in the north (Beale, 1977; Berry, 1976; Champion, 1989; Vinning and Strauss, 1977; Vinning and Kontuly, 1978; and many others). Analysing the European situation, Fielding (1989) interpreted urbanisation as a positive relationship between the net rate of migration to cities and city size, while the relationship was negative during counter urbanisation as indicated in Figure 2.2. This figure reflects the general consensus on the issue at the time. French net migration data from 1954 to 1982 was used to prove the position taken. It was argued that the curve reflecting the net migration rates between 1954 and 1962 in Figure 2.2 generally reflects urbanisation, while the rate from 1975 to 1982 generally reflects counter urbanisation. Following the law of population concentration, (Clark, 1967) in which the location of population and industry tends towards concentration following agglomeration forces into urban areas (urbanisation), counter urbanisation was seen as an adverse reaction to this force.

Figure 2.2. **Prevailing view of phases of European urban growth before 1970 and after**

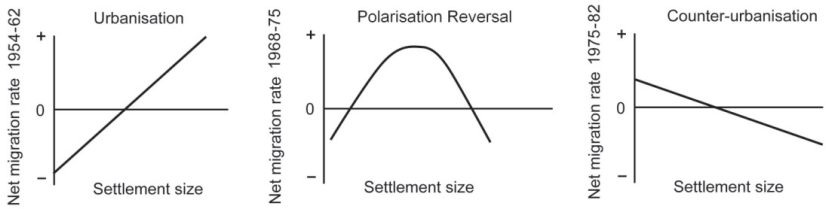


Source: Fielding, A.J. (1989), "Migration and urbanization in Western Europe", *The Geographical Journal*.

Polarisation reversal, a phenomenon that was coined by Richardson (1977; 1980) and which had received significant attention in the developing world during the 1970s (Hwang, 1979; Linn, 1978; Lo and Salih, 1979; Renaud, 1977), developed separately from urbanisation and counter urbanisation theory, although both sets of theories have some commonalities. Polarisation reversal is defined as the point in time when the tendency of spatial polarisation of industrial location in the economic core

of a country gives way to spatial dispersion to locations in the inner periphery (Richardson, 1980). In the differential urbanisation model, the polarisation reversal process, which originally was aimed at explaining industrial deconcentration, was interpreted in terms of population migration processes. It was regarded as a particularly significant transitional phase of migration from urbanisation to counter urbanisation in both developed and developing world settings (Figure 2.3). The view was taken that, once the urbanisation process has run its course as a main migration trend in a country, counter urbanisation could not commence without polarisation reversal first taking place.

Figure 2.3. **Polarisation reversal phase between urbanisation and counter urbanisation**



Source: Geyer, H.S. (1996), "Expanding the theoretical foundation of differential urbanization", *Tijdschrift voor Economische en Sociale Geografie*.

In 1993, the differential urbanisation model was introduced. In the introduction to the model, five propositions were made with regard to the development of urban systems (Geyer and Kontuly, 1993), all of which are of relevance in this study. In a slightly revised format it was stated that:

- Most national urban systems initially go through a "primate city phase" in which a large proportion of economic development and large numbers of migrants are attracted to one or a few primary centres.
- As the national urban system expands and matures, new urban centres are added to the lower ranks while existing centres develop and move up through the ranks. In this process, economic development gets dispersed, while the urban system becomes spatially more integrated.
- Expanding national urban systems develop various strata of territorially organised sub-systems, from the macro-level through the regional and sub-regional levels to the local level. Such urban sub-systems consist of groups of hierarchically arranged cities that

interact more with one another inside the sub-system than with cities collectively elsewhere in the national system.

- The sequence of tendencies observed in the development of urban systems, first toward concentration and then toward dispersal, is not limited to systems at the national level only, but also at each of the lower levels of territorially organised subsystems. In an expanding urban system, the odds normally favour the development of larger centres closer to primary centres, unless an outlying centre is located in an area with exceptional locational attributes.

Essentially, the differential urbanisation concept integrated four issues: first, it introduced polarisation reversal as an intermediate phase of migration between population concentration (urbanisation) and deconcentration (counter urbanisation). These form part of the sequence of migration phases through which an urban system goes in the course of its evolution. Second, it highlighted the importance of both main- and sub-stream migration as determinants of the phase of development of the urban system of a country, irrespective of the country's level of economic development. Third, it recognised the relevancy of productionism (economic benefits of migration) and environmentalism (social and aesthetic benefits of migration) as forces that drive main- and sub-stream migration in developed and developing countries, irrespective of the specific combinations of factors that create these forces. Finally, it brought together certain elements of two bodies of literature on urban system development which until then had developed quite separately from one another (Geyer, 1996).

The differential urbanisation theory is based on several hypotheses. First, differential urbanisation suggests that migration deconcentration could occur in both developed and developing countries. Normally, deconcentration in the developed world is associated with very low population growth rates or no growth, even negative growth in the large metropolitan areas while population deconcentration in developing countries could occur while their metropolitan areas still show signs of significant growth. This hypothesis was based on a similar observation made by Richardson in an industrial-economic sense. Secondly, polarisation reversal – in population migration terms – should follow on the urbanisation phase and precede the counter urbanisation phase during the course of evolution of an urban system of any country.

The third hypothesis was that traces of clearly identifiable sub-streams of migration deconcentration could be visible in urban systems of developed and developing countries while nationally they still found themselves in the urbanisation phase of development. Traces of the beginning of deconcentration should be observable well before the official onset of

deconcentration as a dominant migration trend in any country. The opposite applies to a country that finds itself in the deconcentration phase. Sub-streams of concentration should still be visible in a country well after deconcentration has already set in as the dominant migration process. These under-current migration streams are important in the sense that they could serve as early indicators of a future dominant migration stream or as the remains of past dominant trends.

The fourth hypothesis was that although deconcentration may have set in as a dominant process in a country at the national level during a certain period, concentration could still remain a dominant process in the same country at the sub-national level. The opposite could also be true. While urbanisation could still be occurring in a developing country as a dominant process, deconcentration may have already set in as a dominant process in a subset of the functional regional system of the country. This hypothesis is based on Berry's (1976) view of cities as systems within systems of cities and Friedmann's (1972) premise of functionally organised urban systems in a hierarchy of higher and lower order regions of urban systems from the national to the regional and local levels. Urbanisation and counter urbanisation could therefore simultaneously occur as dominant processes in the same country, but at different levels of spatial aggregation.

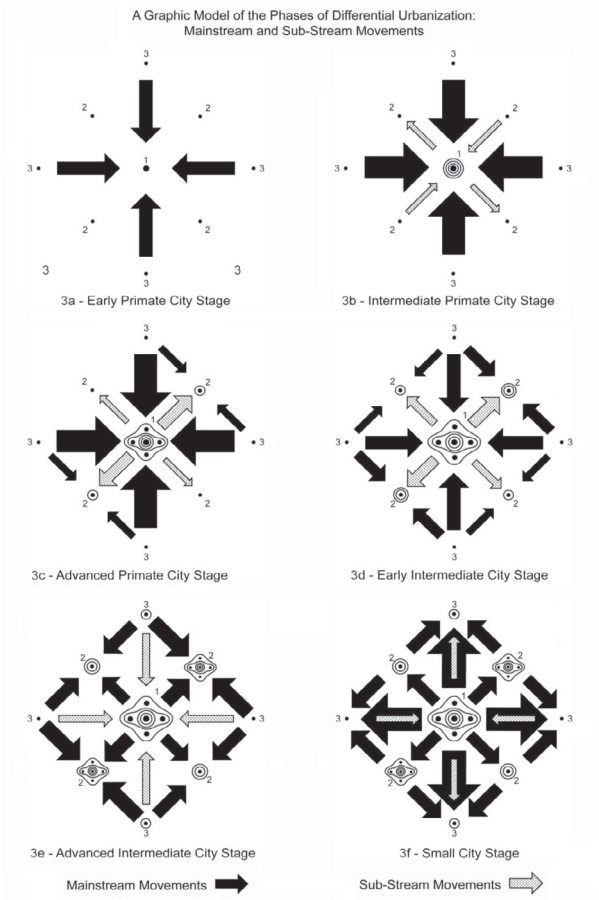
Finally, it seems as if there is a correlation between the level of development of people and their migration preferences. Older age groups, higher income groups and highly skilled groups tend to migrate to areas that are environmentally more appealing, while younger working-age groups and lower income groups tend to settle in areas where they think they have a better chance of obtaining employment. This hypothesis is based on Fielding's (2007) premise of cities serving as social and economic escalators. This general trend implies that the first group will tend to deconcentrate first when a country enters the counter urbanisation phase whilst the latter group will tend to concentrate in large urban agglomerations during this phase.

Cycles of differential urbanisation

By differentiating between fast and slow growth periods within small, medium-sized, and large urban areas, the differential urbanisation model shows that urban systems go through particular cycles of population migration and population growth on their way to maturity. Each cycle displays characteristics of urbanisation, polarisation reversal and counter urbanisation. A temporal graph was developed (Figure 2.4) demonstrating how one can distinguish between the phases of urbanisation, polarisation reversal and counter urbanisation during the middle part of the

history of an urban system's development towards maturity (Geyer and Kontuly, 1993).

Figure 2.4. **Differential urbanisation phases based on mainstream migration**



Source: Geyer, H.S. (1996), "Expanding the theoretical foundation of differential urbanization", *Tijdschrift voor Economische en Sociale Geografie*.

During its infancy, a community tends to be spatially dispersed and largely dependent on the land for subsistence. As populations become more mobile over time, convergence (urbanisation) starts setting in as a dominant migration force (Zelinsky, 1971). Eventually, as social and economic agglomeration externalities increase relative to the size of urban agglomerations (Richardson, 1973; 1977; 1980), forces of population convergence increasingly start giving way to forces of divergence. In the

latter phase of urban development, counter urbanisation becomes the dominant migration force, thus concluding the long-term inverted "U" growth path of population redistribution (Geyer and Kontuly, 2008).

In Figure 2.3, the polarisation reversal phase serves as the turning point between population convergence and divergence. This means that when the urban system has reached a particular level of primacy, polarisation reversal starts setting in. At this stage the populations of the largest urban agglomerations in the system might still be growing overall, but forces of agglomeration are now giving way to forces of dispersion (Richardson, 1980) causing the economic and population growth of those cities to taper off. Intermediate-sized cities, especially those closer to the large urban agglomerations, now start attracting migrants from the latter (Gordon, 1979). Simultaneously intermediate-sized cities attract people from rural areas who otherwise would have migrated to the primate cities. This progression is indicated in Figure 2.4.

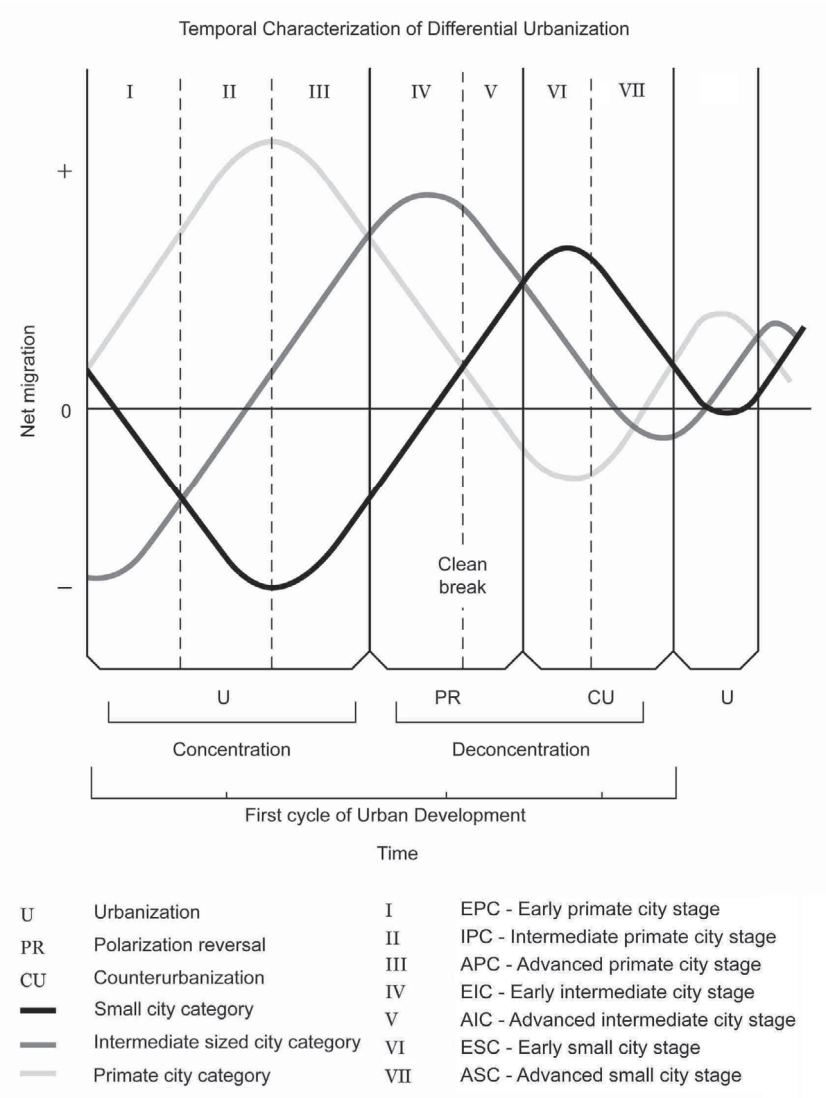
It could therefore be concluded that the polarisation reversal phase signifies the beginning of a regional wave of deconcentration which, over time, could turn into a national migration pattern of counter urbanisation. All the while, social and economic centripetal and centrifugal forces have worked in tandem to create the urban system – the former causing compaction and the latter dispersal. While the forces of economic convergence are still nationally dominant, deconcentration forces are at play locally causing monocentric (mononodal) cities to develop into polycentric (multi-nodal) cities. As the urban system matures and reaches primacy, centrifugal forces dominate, becoming greater than centripetal forces. The change in migration patterns first becomes visible at the regional level at certain locations, but eventually these migration patterns become nationally dominant.

During the latter phases of differential urbanisation, metropolitan polycentric cities show typical signs of maturity: *i)* the metropolitan city becomes extended with the primate city and some of its satellite cities merging; *ii)* the core CBDs of the primate city changes from vibrantly multi-functional economic centres to declining CBDs losing local and regionally oriented businesses to the periphery while retaining some specialised national and multi-national control and command functions; *iii)* some suburban nodes within the metropolitan hierarchy develop from small locally oriented economic centres to large multi-functional edge cities that absorb some of the former functions of the CBD; *iv)* a hierarchy of urban corridors develop linking nodes within the city and between the metropolitan city and other cities regionally.

During the urbanisation phase, large cities gain proportionally more migrants than intermediate- and small-sized cities in a country. This phase is characterised by dominant large-scale migration from peripheral regions to primate cities, although intermediate-sized and small cities in and around the core areas of a country usually also benefit from urbanisation. The urbanisation phase is followed by the polarisation reversal phase when the growth of larger cities tend to taper off, due to factors associated with agglomeration diseconomies, while a larger proportion of urban migration is directed to secondary or regional cities. Metropolitan satellite cities and intermediate-sized cities closer to large metropolitan areas tend to gain more migrants during this phase than distant intermediate-sized cities in the periphery, except in cases where new resources or technology have been discovered or where areas have gained new strategic importance due to changing social and political circumstances. Finally, counter urbanisation sets in when a growing proportion of migrants migrate to intermediate-sized regional centres and smaller cities further away from the metropolitan areas. However, even during this phase, cities – small and large – closer to the metropolises continue to benefit from their locational advantage. Here, the mainstream migration trend of the urbanisation phase is reversed, although sub-stream migration to large cities may still continue. The differential urbanisation model presented in Figure 2.4 demonstrates how sub-stream migration processes could warn decision makers of future significant migration processes long before they materialise. It serves to show how important it could be to study migration sub-streams because a sub-stream could, over time, become a migration mainstream with significant economic and social consequences.

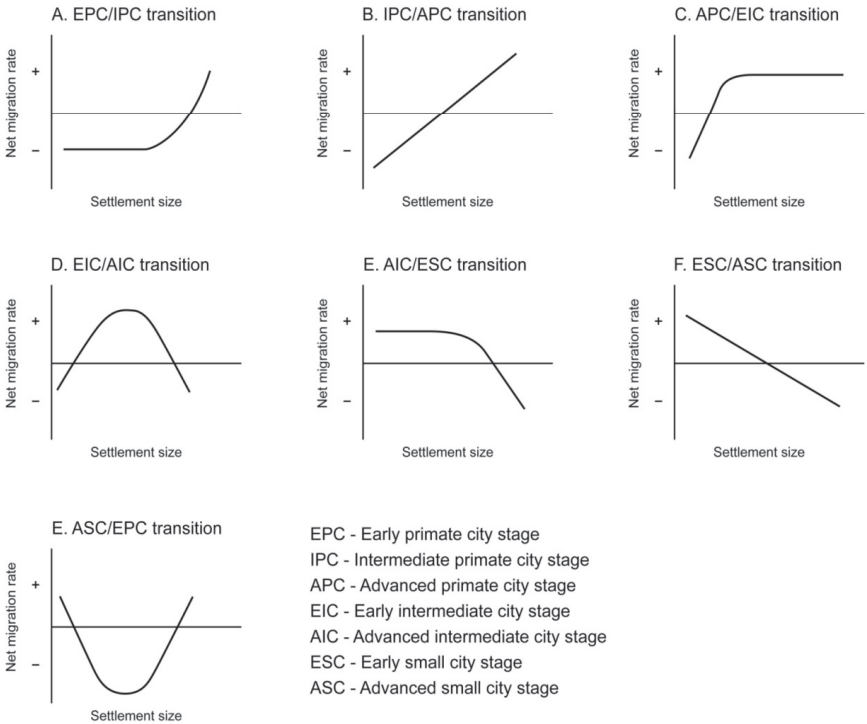
In the evolution of an urban system, more phases than the three depicted in Figure 2.3 can be identified. By plotting the positions of each size category of cities in an urban system at each consecutive phase in the differential urbanisation process (Figure 2.5), several other phases of urban growth can be identified, each phase as distinct as the urbanisation and counter urbanisation phases indicated by Fielding (1989) in Figure 2.2. Together, the graphs in Figure 2.6 illustrate the progression of an urban system during a complete development cycle (Geyer, 1996). Figure 2.6 indicates that migration patterns and urban development do not follow punctuated phases of concentration and deconcentration as the urbanisation-counter urbanisation and polarisation reversal models suggests in Figure 2.3 but follows an ever changing progression of cyclical change between concentration and deconcentration where different groups of cities are effected differently at different points in time by the same sets of generic migration forces.

Figure 2.5. **Differential urbanisation cycles based only on mainstream migration**



Source: Geyer, H.S. and T.M. Kontuly (1993), "A theoretical foundation for the concept of differential urbanization", in N Hansen, K.J. Button and P. Nijkamp, *Regional Policy and Regional Integration,* Vol. 6 of Modern Classics in Regional Science, Edward Elgar, Cheltenham.

Figure 2.6. **Different phases of migration based on the idealised differential urbanisation model**



Source: Geyer, H.S. (1996), "Expanding the theoretical foundation of differential urbanization", *Tijdschrift voor Economische en Sociale Geografie*.

"Productionism" and "environmentalism" (Hart, 1983) are the two main generic motivations behind each of the phases of development depicted in Figure 2.6. "Productionism" refers to the economic drive to benefit from agglomeration economies, i.e. higher wages, better services, and increased opportunities for economic transactions. "Environmentalism" refers to the social and aesthetic drive to increase living quality, benefit from lower living costs, and to escape negative spillovers from agglomeration economies and diseconomies of scale. At best, productionism and environmentalism only serve as very general indicators of the direction of migration. However, as will be demonstrated in the following section, both productionism and environmentalism could lead to contradictory outcomes. The concept of productionism and environmentalism emerged from historical studies of population growth rates in cities in the developed and developing world. While metropolitan agglomerations in the United States

were losing population in absolute terms during the sub-urbanisation phase in the 1970s, African Americans and Hispanics continued migrating to large cities (Berry, 1976). Todaro (1982) called the tendency of large numbers of the rural unskilled and unemployed to migrate to cities in the developing world the "bright lights" syndrome.

Following on earlier studies, discussions and applications, the relevancy of elements of the original concept of differential urbanisation was subsequently positively tested at different levels of spatial aggregation in a number of countries differing from one another in terms of their level of development from developed to emerging economic settings (Bonifazi and Heins, 2003; Champion, 2003; Gedik, 2003; Geyer, 2003; Heikkilä, 2003; Kontuly and Dearden, 2003; Mookherjee, 2003; and Tammaru, 2003). Several other discussions and studies followed, which, together, elevated the concept from model to theory status (Abe, 2005; Campuzano, 2006; Champion, 2008; Dangschat and Giffinger, 2008; Gwebu, 2006; Kontuly and Tammaru, 2006; Mitchell, 2004; Mookherjee and Geyer, 2011; Ouředníček, 2007; Suárez and Delgado, 2006; Tammaru et al., 2004). It was found, however, that the exclusion of rural to urban migration streams from the original model hampered its applicability in areas with a high rural population component (Kontuly and Geyer, 2003, Pederson, 1999). To address this shortcoming, an attempt was made to look at the impact of different economic and social sectors historically in the evolution of urban systems and how these dynamics could be interpreted in terms of the differential urbanisation theory.

Revisiting differential urbanisation in South Africa

Since the end of the apartheid era significant population migration movements have taken place in South Africa. While there were indications that the white population, which was already highly urbanised towards the end of the apartheid era, was about to enter the polarisation reversal phase towards the end of the 1980s (Geyer, 1990; 2003), the abolishment of influx control and apartheid settlement legislation subsequently triggered a flood of rural-urban migration, unprecedented in scale and tempo. From the early 1990s, literally millions of African people who were trapped in the deep rural areas by the apartheid legislation started moving to the cities. Most of these people engaged in upward stepwise migration from agricultural areas to cities of varying sizes. Surveys showed that the expectation to find employment was the most important reason for people to move to urban areas, whether those urban areas were small or large (Cross, 2006). This confirms Todaro's (1982) bright light syndrome.

The spatial patterns of the apartheid city, which usually consisted of a white urban core and concentrated African settlements around the urban fringe, became extended in the current post-apartheid city structure. In this city structure urban flight is evident with middle to high-income white populations moving to the periphery while African populations also move to new settlements close to existing informal settlements along the periphery of the city. In this process, the post-apartheid city exhibits enduring spatial stratification following historic path dependencies during urbanisation.

The resulting typology of urban and rural settlements has become more complex as the boundaries between core and periphery are increasingly becoming blurred. The National Urban Development Framework (Republic of South Africa, 2009) recognises the importance of the interaction between cities and towns and their hinterlands and puts forward the view that the concepts of urban and rural should be viewed as "parts of a continuous regional, national, and international system interrelated through a web of economic, social, political and environmental linkages" (Republic of South Africa, 2009: 2). The NUDF has provided a list of six urban typologies and two rural typologies as indicated in Table 2.1. The city-regions under investigation in this study (i.e. Cape Town, Johannesburg/Ekurhuleni and Tshwane) can be classified as polycentric metropolitan cities connected to satellite cities. Cities and regional service centres are comparable to what we refer to as intermediate-sized regional cities in our study. Service towns and local niche centres are comparable to our small cities.

City regions generally consist of clusters of cities with populations over 1 million. City regions are polycentric and have highly diversified economies. Cities and regional service centres have populations between 1 million and 100 000 and are usually monocentric in structure. These intermediate-sized cities have a well-established economic base, reliable infrastructure, competent local governments and provide essential services to their hinterlands but often struggle in diversifying their economic base. Service towns and local niche centres provide some economic services to the immediate area but usually lack an urban core and extensive bulk infrastructure.

However, some overlapping occurs between these categories. Although farms, clusters and dispersed settlements are generally categorised as rural settlements, dispersed settlements have many features of urban settlements, particularly spatial agglomeration based on social interaction and high population densities, but lack a discernible economic node, public amenities or commercial activities. Some regional service centres and service towns are located close enough to city regions to be included within the daily

Table 2.1. **Urban typologies as defined by the National Urban Development Framework**

Topology	Type	Population size	Number of places	Population	Economic activity	Poverty level below MML
Gauteng city region	Metropolitan city	11 million	1	22%	39%	14%
Coastal city regions	Metropolitan city	> 1 million	3	16%	25%	10%
Cities	Intermediate sized city	400 000 – 1 million	5	6%	5%	6%
Regional service centres	Intermediate sized city	100 000 – 400 000	14	14%	15%	14%
Service towns	Small city	<100 000	44	4%	3%	5%
Local and niche settlements	Small city	<100 000	600	9%	5%	12%
Clusters and dispersed rural settlements	Rural	<100 000	NA	21%	2%	31%
Farms	Rural	<100 000	NA	8%	6%	8%

Source: Author's calculations from Republic of South Africa (2009), "National Urban Development Framework", Department of Co-operative Governance and Traditional Affairs, Pretoria.

urban system of the cities and therefore form satellite centres within city regions as opposed to independent regional centres. Furthermore, some regional service centres in tribal authority areas such as Phuthaditjhaba are functionally classified as regional service centres due to their large population and established local government. However, these cities do not have an established formal economy, nor do they provide service functions to the hinterland required of small and intermediate-sized cities (Republic of South Africa, 2009).

Population migration patterns since the 1990s have become increasingly complex. An overwhelming proportion of the total population has moved from rural areas to large metropolitan and intermediate-sized cities as indicated in Figures 2.7A, 2.7B and 2.7C. In Table 2.1, the municipalities were classified in terms of four categories. Category 1 includes all municipalities that, together, experienced negative population growth overall. Category 2 represents municipalities which collectively accounted for the lowest 10% of the national population growth. The third category

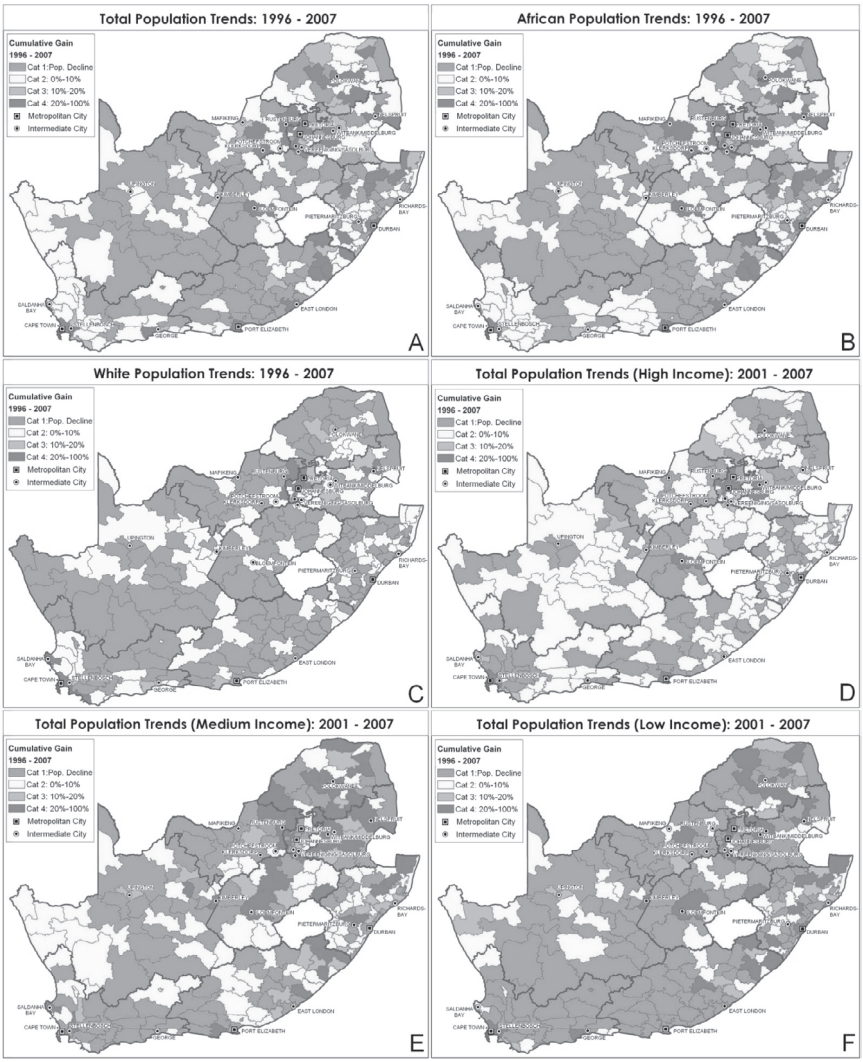
represents municipalities which together accounted for the next lowest 10% of the national population growth (i.e. between 10% and 20% of the cumulative population growth), and category 4, those municipalities that collectively account for the top 80% of total national population growth.

On the surface it appears that the national migration pattern has changed from polarisation reversal at the end of apartheid era back to urbanisation. African populations have also urbanised with strong population increases apparent in all metropolitan and intermediate-sized cities. The white population continued to move to metropolitan Cape Town, Johannesburg and Pretoria while their numbers declined in the large urban agglomerations on the east coast (Durban, East London and Port Elizabeth). Commercial agricultural areas across the country are generally experiencing population declines in both African and white populations, with 2001-07 showing the highest declines.

However, the total population aggregations conceal significant sub-stream movements of particular socio-economic groups. Differential urbanisation is most apparent when differentiating between different income groups. The high income population groups are migrating towards metropolitan and satellite cities as well as intermediate-sized cities (Figures 2.7d and 2.8). This section of the population follows a migration pattern that is similar to the advanced primate and early intermediate-sized city phases shown in Figure 2.4 with dominant urbanisation and sub-stream counter urbanisation migration patterns.

The decline of the middle income population groups (see Figures 2.7E and 2.8) indicates an undermining of the core-periphery model as sub-stream spatial dispersal. The deconcentration of middle income population groups is linked to the growth of areas adjacent to metropolitan cities. This is defined as “deflected” concentration in which urbanisation occurs in the fringe areas away from the city core (Figure 2.8), but still within the daily urban system of the core. This deconcentration is the result of diseconomies of agglomeration and can be regarded as a precursor to polarisation reversal. This section of the population follows a migration pattern that is similar to the early and advanced intermediate-sized city phases shown in Figure 2.4 with dominant counter urbanisation migration patterns. Medium income groups show a high degree of continued population growth in rural areas and rural towns as well as movements to intermediate-sized cities (Figures 2.7E and 2.8).

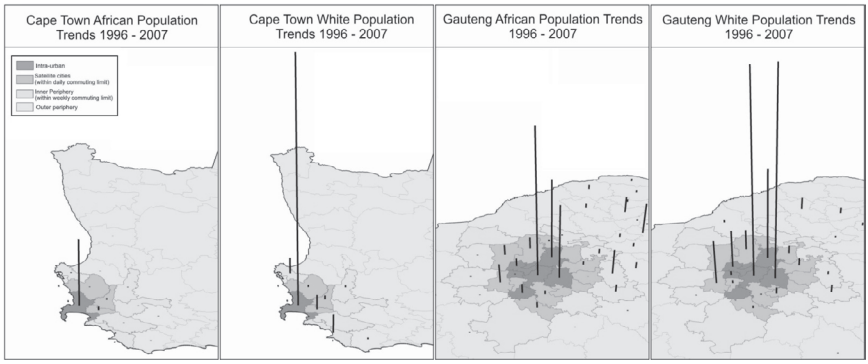
Figure 2.7. **Population redistribution trends in South Africa, 1996-2007**



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

Source: Geyer et al. (2011 a) *Differential Urbanisation: Recent Population Redistribution Trends in South Africa*, CRUISE Research Report.

Figure 2.8. **Migration to areas in and around main metropolitan areas in South Africa, 1996-2007**



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

Source: Author's calculations from Census data.

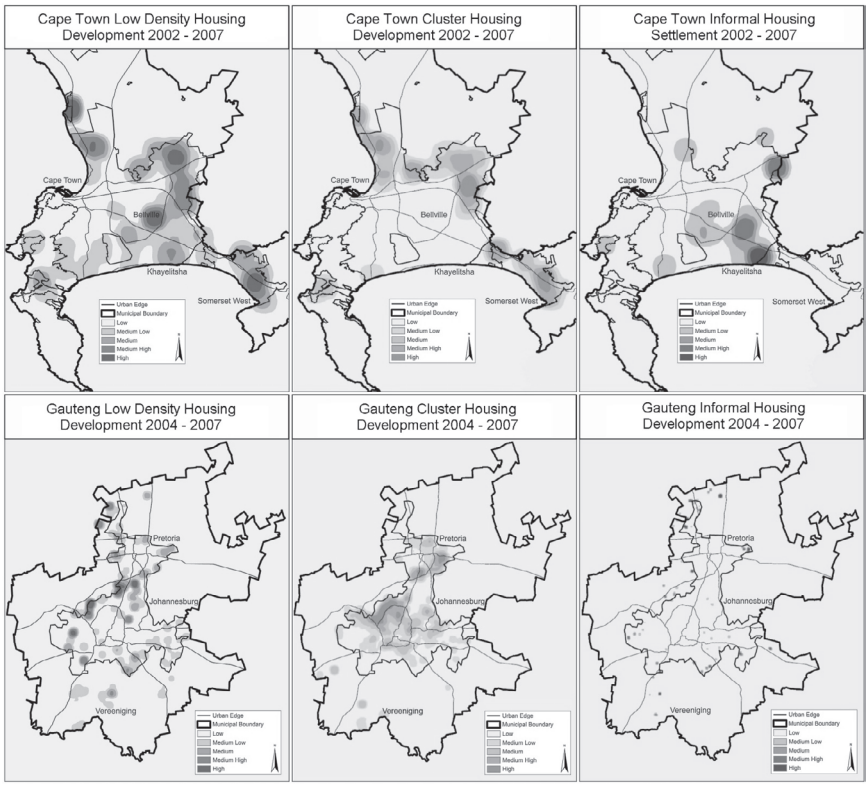
Low income groups show a strong tendency towards urbanisation, consistent with the drive for productionism as indicated in Figures 2.7f and 2.8. These population migration patterns correlate well with the main migration streams of the early intermediate-sized city stage (indicated by the black arrows in Figure 2.4), with strong concentrations evident in metropolitan and intermediate-sized cities. On the other end of the scale, the significance of income substitution and social embeddedness as locational factors are clearly demonstrated by the African population gains that were made over the study period in the former homeland areas. Informal subsistence agriculture combined with an expanding grant system has allowed significant numbers of former African urban migrants to move back to these rural areas, and prospective urban migrants to remain there. However, the strong population gains that were made in intermediate-sized cities and metropolitan cities (Figures 2.7b and 2.7f) show that most of the previously disadvantaged African population is still engaged in upwards step-wise migration.

The link between functional space in South Africa and European classifications of regions

When shifting the focus to population redistribution trends inside the core cities in Figure 2.9, a clear morphological picture emerges. Population decentralisation is the dominant trend. Very little residential development occurred within the city core while almost all high and low density

residential development, irrespective of income categories, occurred along the urban fringe.

Figure 2.9. **Recent residential development trends in Cape Town and Gauteng**

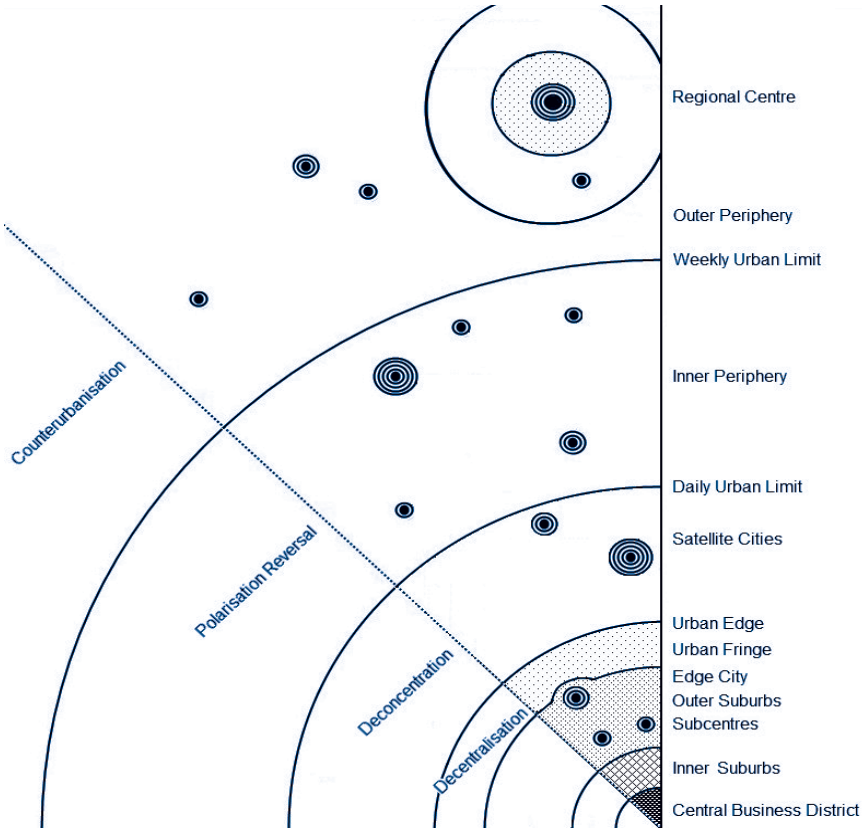


Note: This map is for illustrative purposes and is without any prejudice to the status of or sovereignty over any territory covered by this map.

Source: Geyer Jr., et al. (2011 b) *Recent Morphological Trends in Metropolitan South Africa*, CRUISE Research Report.

Based on the national, regional and metropolitan population redistribution patterns in South Africa, a distinction in metropolitan functional space can be made between what could be regarded as: *i)* the metropolitan inner city zones; *ii)* the metropolitan fringe zones; *iii)* the metropolitan daily urban zones; *iv)* the inner peripheral zones; and *v)* the outer peripheral zones (Figure 2.10).

Figure 2.10. **A diagrammatic representation of functional urban space in South Africa**



Source: Author's own work.

The inner city zone represents the more or less continuous built-up areas of the metropolitan cities consisting of the central business district and adjoining central city areas, the inner and outer residential areas containing a mixture of commercial and service corridors and sub-centres (some of the latter growing large enough to be regarded as "edge cities"). The fringe zones lie just outside the metropolitan built-up areas but still within the declared "urban edges." Most residential development over the past decade occurred in this zone whilst, comparatively, very little development occurred in the inner city zones (see Figure 2.9). From an official administrative point of view, all development occurring within the urban edge can be equated to a NUTS 3 region in the European designation, incorporating a single city located within its administrative boundaries.

The satellite cities are located outside the core cities (and their declared "urban edges") but still within what could be called the "daily urban zones" of the core cities. Sizable numbers of people living in these cities and their immediate hinterlands commute to the metropolitan suburbs and city centres on a daily basis for work, business or recreation while equally large numbers of people commute from the cities to these locations for the same reasons. Although the satellite cities and their surrounding areas are located outside the metropolitan "urban edges", they effectively form part of the city because they are functionally located within the city's daily activity sphere. Placing them administratively in an "extra-metropolitan" urban category does not functionally make them "extra-metropolitan." This can be clearly demonstrated by the contradictory situation in the Western Cape where Strand and Somerset-West, two satellite cities to the east of Cape Town, are no different from nearby Stellenbosch in terms of their location, function and distance from Cape Town, yet they have been administratively included in Cape Town as part of the metropolitan city, while Stellenbosch has been excluded. Functionally, all the aforementioned satellite cities form part of the greater Cape Town's daily social and economic activity sphere. Using different methodologies, this conclusion has been confirmed elsewhere (Du Plessis and van Niekerk, 2011). Topologically, integrated city regions within the daily urban limits of the core city could be integrated to the European NUTS 3 category.

The area between the daily and weekly urban zone limits of the metropolitan city is what could be termed the "inner peripheral" zone of metropolitan city. It lies within arm's-length from the metropolitan city. Few people living and working in this zone travel to the city on a daily basis but they do interact very regularly with locations within the functional confines of the core city – i.e. the city itself and its satellite centres. Development occurring in centres in this zone is the outcome of what Richardson (1980) termed "polarisation reversal." Cities linked to the metropolitan core city within the regional city hierarchy can be included to a NUTS 2 designation. This category of regional systems includes all cities within the weekly urban limits of the core city. Development in cities offering good quality of life beyond this zone could be regarded as "counter urbanisation" and may fall within the NUTS 1 designation.

Ascending in scale within administrative space in South Africa, a distinction is generally made between the following entities: local municipalities, most of which contain a distinctive local municipal centre each; district municipalities combining groups of municipalities – with metropolitan municipalities lying somewhere in-between the former two – and provinces. Local municipalities and provinces are the most common units used for the presentation of statistics in South Africa. National and

provincial studies have been performed to test the correlation between the economic and functional catchment areas of towns and cities in the country and their administrative municipal boundaries (Geyer et al., 2000; Geyer, 2004). Although the designated boundaries of local municipalities have significantly improved since the end of apartheid, correcting the spatial distortions of the past, unacceptably low correspondence between functional and administrative space, remains a challenge. Despite this shortcoming it could be said that the local municipalities generally correspond with the European NUTS 3 category; district municipalities with the NUTS 2 category; metropolitan municipalities sharing characteristics of both NUTS 2 and NUTS 3 categories; and the provinces correspond to the NUTS 1 category.

Conclusions

The theory of differential urbanisation attempts to explain the evolution of urban systems in a country by means of main- and sub-stream migration patterns. The motivations of these migrations are often complex, but can be grouped into two competing social and economic forces: productionism and environmentalism. Differential urbanisation assumes that, during the urbanisation phase, urban systems follow evolutionary growth patterns in which primary cities expand to become metropolitan areas with gaining polycentric urban structures. Subsequently, polarisation reversal results in growth of satellite centres around large urban agglomeration as well as intermediate size cities.

Although at an aggregated level migration patterns point to a continuing net population migration trend towards large metropolitan cities in South Africa, this does not take into account the migration patterns of individual population and socio-economic groups. When differentiated between ethnicity and income, separate population groups show a great variation in migration patterns, with the white population showing strong tendencies towards urbanisation at the national level with some local satellite centres also gaining population at the regional level. The African population tends to migrate to the large and intermediate-sized cities but significant percentages continue to live in and migrate to the traditional authority communal areas. The high-income population continues to migrate to large and intermediate-sized cities while the medium income population tends to move to intermediate-sized cities and the rural periphery. The low-income population shows a combined mainstream urbanisation and sub-stream counter urbanisation to the periphery. The analysis indicates that in reality population migration patterns are systemic and varied, resulting in complex migration patterns not apparent at the aggregated level. Population redistribution trends around the major metropolitan areas of South Africa

point to a disjunction between functional metropolitan space and the officially recognised administrative areas of government. This makes the rethinking of administrative boundaries, to bring them in line with functional urban space and the classification of functional urban space in Europe, an imperative. Whilst the current thresholds and classifications used in South Africa differ from those used in the OECD methodology (see discussion in Annex 2.A1), the data collection methodologies in South Africa are based on small enumerator areas which would lend themselves to aggregation to correspond to the OECD definitions, and most of the key performance indicators are available. This could be very useful. South Africa is currently finalising its "National Development Plan – Vision for 2030". The draft NDP also calls for the development of a National Spatial Framework (NSF) and the development of "properly integrated system of national spatial data". The application of the OECD methodology could contribute towards this process and allow for international benchmarking of South African cities against OECD countries.

Taking this matter further in South Africa, a study will therefore be undertaken to spatially distinguish between all the morphological elements of the major metropolitan areas and large intermediate-sized cities of the country (outlined in Figure 2.10) using methodologies similar to those suggested by the OECD. A study will also be undertaken to determine the current reach of the daily and weekly functional limits of these cities as diagrammatically outlined in Figure 2.10.

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Annex 2.A

Adapting OECD urban definition to South Africa: issues and data needs

Issues and transferability given current practice in South Africa

There are currently a variety of urban topological classification systems in use in South Africa. The most prominent of these include the topology identified in the National Urban Development Framework (NUDF) defined in 2009 consisting of seven categories, the Statistics South Africa classification of enumerator areas, and the settlement classification used by the Department of Water Affairs (consisting of ten categories, excluding farming areas). The NUDF classification (which is now also used in the South African Development Plan 2030) applies three main dimensions in the classification:

- size measured in terms of population;
- functional economic base and Urban Function Index (UFI);
- institutional legacy which reflects inherited characteristics of past policies, particularly land-use policies.

The resulting typology is summarised in Table 2.A.1.

The minimum threshold used in the OECD definition (50 000), and the population threshold of metropolitan areas to which the set of statistics will be applied (500 000) is somewhat different from this typology. According to the 2011 *State of the Cities* report (South African Cities Network 2011) the average density of the larger South African cities are 2 960 persons per km². The proposed OECD density threshold of 1 000 to 1 500 people per km² could be suitable for the larger cities in South Africa. The densities in smaller cities (above the 50 000 threshold) are, however, significantly lower.

Table 2.A.1. **Criteria for settlement typology**

Category and number	Classification criteria
City regions (4)	UFI value: above 40; size of population: above 1 million; size and nature of the economy: high level of economic activity in a diversified range of sectors; settlement structure: multi-nodal
Cities (5)	UFI value: between 11 and 40; size of population: between 400 000 and 1 million; size and nature of economy: medium-high level of economic activity in a diversified range of sectors; settlement structure: one dominant node
Regional service centres (41)	UFI value: between 2 and 10; size of population (three sub-classes): *i)* 300 000-400 000; *ii)* 100 000-300 000; *iii)* below 100 000; size and nature of the economy: medium level of economic activity in a diversified range of sectors
Service towns (44)	UFI value: between 1 and 2; size of population: between 10 000 and 100 000; size and nature of the economy: medium-low level of economic activity mostly in the service sectors; settlement structure/function: the principal node of a strong, predominantly agricultural or subsistence-focused local region
Local and niche settlements (600)	UFI value: between 0.1 and 1; size of population: varied; size and nature of the economy: medium-low level of economic activity mostly in the service sectors; settlement structure/function: nodes that provide: *i)* a limited range of services to a small or sparsely populated hinterland; *ii)* specific niche services (such as tourism)
Clustered and dispersed settlements	UFI value: zero; population density: two sub-classes: *i)* above 150 persons per km^2; *ii)* between 40 and 150 persons per km^2; size and nature of the economy: mostly low-level subsistence activity; settlement structure/function: non-nodal areas with a significant spatial footprint

Source: Republic of South Africa (2009), "National Urban Development Framework", Department of Co-operative Governance and Traditional Affairs, Pretoria.

These differences are the results of somewhat different definitions and thresholds and no data availability or collection methodology. The smallest unit at which demographic and some economic data is collected and managed by Statistics SA is enumerator areas which roughly corresponds with 150 visiting points (or households). The basic statistics can thus be aggregated to correspond to the OECD definitions.

The unique elements of the structure and morphology of South African cities resulting from its political history are well-known. Differences in urban densities may make the application of blanket approaches difficult. The application of the suggested criteria and indicators would need to be sensitive and responsive to these differences.

Table 2.A.2. **Availability of statistics at small geographic scale in South Africa**

	Availability/ source	Scale	Interval
Demography			
Population, total and by sex	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Population by class age (0-15; 15-64; 65+)	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Recent immigrants	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Economy			
GDP total and by six sectors	Commercially available derived datasets (e.g. Global Insight, Quantec)	Municipal level	Annually estimated
Household income	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Employment total: by sex and by six sectors	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Unemployment	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Educational attainment	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Housing affordability	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Social			
Youth unemployment	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Long-term unemployment	Statistics SA	Enumerator area	1. Full Census every ten years 2. On a sample base (General Household Survey) annually
Crime rates	Official crime statistics (per police station service area). Service areas will have to be aggregated to relevant metropolitan areas.	Police station service area	Annually

Table 2.A.2. **Availability of statistics at small geographic scale in South Africa** *(cont'd)*

	Availability/ source	Scale	Interval
Crime against property	Official crime statistics (per police station service area). Service areas will have to be aggregated to relevant metropolitan areas.	Police station service area	Annually
Life expectancy	Statistics SA	Provincial level	Annually
Doctors per inhabitants	Information on doctors will have to be sourced from secondary sources (e.g. medical professional organisation, telephone directories, etc.)	Metropolitan area	Intermittent
Percent of households without basic services	1. Statistics SA 2. Municipal plans and policies (e.g. integrated development plans, annual reports)	1. Enumerator area 2. Municipal	1. Full Census every ten years on a sample base (General Household Survey) annually 2. Intermittent

South Africa has also developed a set of National Development Indicators and the Office of the Presidency produces an annual report on these indicators. These indicators provide a framework to present aggregate data on progress in development and consist of a set of 76 indicators that are clustered according to nine themes. In the South African context it would thus make sense for the selected metropolitan indicators to be aligned with these national indicators where appropriate.

Chapter 3

Urbanisation in China today

by
Juwei Zhang and Yifei Cai*

China's rapid demographic transition is expected to lead to a contraction in the working-age population. Securing labour supply will depend on whether urbanisation can bring sufficient workers into urban areas. This chapter describes the urban system in China and examines how the urban population is defined. It then discusses the current level of urbanisation, analyses the regional spatial distribution of the urban population, and summarises general trends of urban population distribution. It uses this understanding to reflect on the potential for application of the OECD methodology of urban areas to China. Finally, the longer term urbanisation patterns in China are briefly discussed.

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Background

China has the largest population in the world, so it is not possible to fully understand economic and social development without a demographic perspective of China. China has become the second largest economy in the world after rapid economic growth over more than a 30-year period. The explanations for its success may vary, but one thing can be said with certainty: China has taken advantage of its labour abundance and the low costs resulting from rapid demographic transition. However, as the relationship between labour supply and demand is changing, the unlimited supply of labour which has been the key for past levels of rapid economic growth now seems to be in decline and labour is becoming scarce and expensive. This raises a question about whether China will be experiencing labour shortage in its future economic growth. Of course, this is not only an issue related to China but a worldwide concern as well.

The Sixth Population Census of 2010 shows that China's population was 1.34 billion, which is probably much lower than was expected 30 years ago when China began to implement family planning policy. The reason for this is due to the rapid decline of women's fertility. The total fertility rate (TFR) of women in China was 5.8 in the 1970s, and it declined to replacement level in the early 1990s and has declined further since then. At present, it is hard to be precise about the real value of TFR because of the unavailability of official data, but most researchers and scholars believe that the TFR is probably as low as between 1.4 and 1.6, comparable to most low-fertility countries. As a result, the population growth in China has slowed down very quickly. The average annual population growth rate was 14.4% between 1978 and 1990. It reduced to 10.4% between 1990 and 2000 and further to 5.7% between 2000 and 2010. The continuous decline of the population growth rate implies that the population in China will peak in the near future. According to the projection by the "National Report on Population Development Strategy" (National Population Development Strategy Research Team, 2007), China's population will stop growing in around 2033 with a maximum population of 1.5 billion. However, the projection from the United Nations gives a much lower number, estimating that China's population will reach its peak at around 2025 and maximum population will probably be around 1.395 billion.

With total population growth slowing down, the working-age population (defined as aged between 15-64) will reach its maximum earlier than the peak in the total population. Although the working-age population is still growing, the speed of growth is declining rapidly. The average annual growth of the working-age population was 15 million between 1995 and 2000, and it declined to around 10 million between 2000 and 2010.

Various projections suggest that the working-age population will stop growing at around 2015, and the total labour force will begin shrinking at this point (see Table 3.1).

Table 3.1. **Working-age population: levels and changes**

Period	Working-age population (tens of thousands)	Working-age population (%)	Annual growth rate (%)	Annual average change (tens of thousands)
1982-1987	71 985.0	65.9	2.86	1 893.6
1987-1990	76 305.8	66.7	1.96	1 440.3
1990-1995	81 393.3	67.2	1.30	1 017.5
1995-2000	88 910.0	70.1	1.78	1 503.3
2000-2005	94 197.0	72.0	1.16	1 057.4
2005-2010	99 938.0	74.5	1.19	1 148.2
2010-2015	99 581.9	72.7	0.52	505.7
2015-2020	98 893.8	71.3	-0.14	-137.6
2020-2025	98 126.1	70.3	-0.16	-153.5
2025-2030	96 008.2	68.9	-0.44	-423.6
2030-2035	90 981.0	65.9	-1.07	-1 005.4
2035-2040	85 855.7	63.1	-1.15	-1 025.1
2040-2045	82 896.5	62.2	-0.70	-591.8
2045-2050	79 001.0	61.0	-0.96	-779.1

Note: Working-age population is between 15 and 64 years.

Sources: Data for 1982-2009 is from *China Statistics Yearbook 2010;* data for 2010 is from *The Sixth National Population Census Major Data*; the projection for 2015 to 2050 is from the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

With the slowing down and even potential end of growth of the working-age population, the urban labour supply has to be largely dependent upon labour migration from rural areas. Hence, urbanisation is seen as key to China's economic development. With the urbanisation rate about 50% at present, there is still over half of the population living in rural areas, and it is possible that the labour demand will continue to be met by rural labour migration given that the driving forces underpinning this movement are remaining strong. In this regard, whether economic growth in China will be constrained by labour shortages is strongly linked to the question of the rate of urbanisation. For this purpose, this chapter is going to discuss the current situation and general urbanisation trends in China.

This chapter is organised as follows: Section 3.2 introduces China's urban structure and definition for urban population; Section 3.3 sketches out the process of urbanisation; Section 3.4 discusses the current situation of

urbanisation, including the spatial distribution of the urban population by provinces, regions and cities of different sizes; Section 3.5 briefly looks at the prospects for future urbanisation in China. Finally, Annex 3.A1 reflects on the potential to apply the OECD methodology of functional urban areas presented in Chapter 1 in China and the constraints which currently exist.

Urban structure and definition for urban population

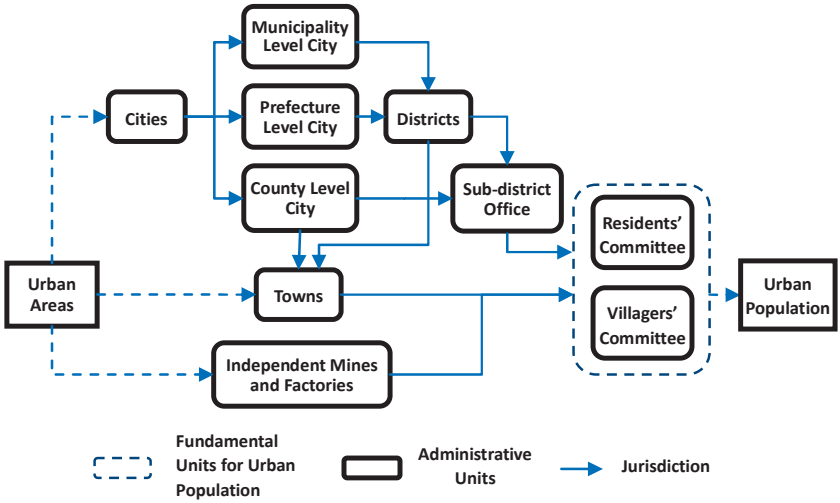
China's urban system is composed of two parts: cities and towns. The urban population therefore includes people living in both cities and towns. To understand urbanisation in China, it is necessary to clarify how cities and towns are defined.

In China, cities are not only functional areas but are also key units for administrative classification. There are three levels of cities: municipality level (equivalent to the province), prefecture level (between province and county), and county level (equivalent to county).[1] Generally, municipality level and prefecture level cities are composed of municipal districts. The districts of municipality level cities are parallel with prefecture level cities and the districts of prefecture level cities are parallel with county level cities according to China's administrative hierarchy. The county level city is generally composed of sub-district offices or towns. In China, towns are also part of the urban system, which are lower units than counties and county level cities according to China's administrative hierarchy. To sum up, China's urban system is composed of four levels: cities at municipality level, cities at prefecture level, cities at county level, and towns.

Not all of the population living in cities and towns can be classified as urban population as rural areas can also be contained within cities and towns. The urban population is defined as those who live in urban areas of cities and towns, where the lowest administrative units are residents' committee or villager's committees. Once residents' committees or villager's committees are classified into urban areas of cities and towns, all their regular residents (living there for more than six months) are recognised as part of the urban population. The urban structure and composition of urban population is summarised in Figure 3.1.

In China, the government has issued special regulations on the designation of cities and towns. The State Council's Decision on Designating Cities and Towns issued in 1954 was the first such regulation. Since then, the standards on designating cities and towns have been modified three times. The first modification was in the early 1960s. At that time, China was suffering from natural disasters and economic difficulties so severely that agricultural production could not meet the demand of the

Figure 3.1. **Structure of the urban system in China**



Source: Author's own work.

urban population for food, and the government had to raise the standards so as to reduce the urban population. As a result, there was almost no emergence of new cities and towns for a long period. The second modification was in the mid-1980s, following political reform and the opening up of the country, when the population gathered rapidly in many rural places with strong economic development performance. To meet the demand for development, the government lowered the standards for designating cities and towns in 1984 and 1986 respectively, which resulted in the rapid acceleration of urban development. The third modification was in 1999 and 2001, when the government further loosened the standards for designating cities and towns, which contributed substantially to the rapid growth of the number of cities and designated towns and added significantly to the urban population.

The ongoing standards for designating cities and towns in China include such indicators as total population, population density, economic scale, fiscal income, and infrastructure. According to the standards, a county can be designated a county level city if it is in line with the following requirements: *i)* when the population density is over 400 persons per km^2,

the number in non-agricultural employment is more than 80 000, and the percentage in total employment is more than 30%; *ii)* when the population density is between 100 and 400 persons per km², the number of non-agricultural employment is more than 120 000 and the percentage in total employment is more than 25%. When a city at county level needs to upgrade itself into a city at prefecture level, it has to meet the following requirements: its total non-agricultural population needs to be more than 150 000 while the non-agricultural population in the resident place of government must be no less than 120 000, and the percentage of the tertiary industry in total GDP needs to be no less than 30%. Nevertheless, the central government has not formed the detailed and unified standards for merging villages into designated towns, and it is at the disposal of the local government for defining standards for designating towns.

As cities and towns may include parts of rural areas, the calculation of urban population needs to first clarify spatial boundaries of urban areas in cities and towns, which is an issue of rural-urban classification. The central Government of China has modified the standards for rural-urban classification many times since 1949. The main reason for the modifications is to make the concept of urban areas closer to that of functional urban areas. The ongoing standards on rural-urban classification are mainly based on the Regulation on Statistical Classification for Rural and Urban Areas issued in 2008, which was also observed by the Sixth Population Census in 2010. According to the standards, urban areas in China include both urban areas of cities and towns. The urban areas of cities refer to municipal districts, cities without districts, the locations of governments and the connected residents' committees as well as other places. Urban areas of towns refer to the resident places of local county government, which have not been classified as cities, and the resident places of town level government and the connected residents' committees as well as other places. The connected areas refer to the places covered by public facilities, resident facilities and service facilities built or being built. To sum up, the rural-urban classification in China is mainly based on the criteria for functional urban areas, which is conceptually close to the one proposed by the OECD in Chapter 1. Table 3.2 summarises the main changes of rural-urban classification and statistical definitions of urban population since the 1950s.

In 2010, there were 657 cities, including 4 municipality level cities, 283 prefecture level cities and 370 county level cities. There was also a total number of 19 410 towns in China (see Table 3.3).

Table 3.2. **Main modifications of the definition of urban areas and urban population**

Year	Documents	How to define urban areas	Urban population
1955	Order on Criteria for Rural-Urban Classification	1) Resident places of governments at county and above level; 2) Residents' areas with over 2 000 regular persons and over 50% of them employed in non-agriculture; 3) Areas of industrial enterprises, train stations, and business centres with over 1 000 regular residents and over 75% of them employed in non-agriculture.	All residents living in the city areas, market-town areas and town areas, including both agricultural and non-agricultural population.
1963	The Central Committee of CPC and State Council's Instruction to Modify the Setting-up of Cities and Towns and Reduce Suburban Areas	1) Resident places of governments at county and above level; 2) Residents' areas with over 2 000 regular persons and over 50% of them employed in non-agriculture; 3) Areas of industrial enterprises, train stations, and business centres with over 1 000 regular residents and over 75% of them employed in non-agriculture.	Non-agricultural population living in the municipal districts, suburban areas, and designated towns.
1953 1964 1982	First, Second and Third Population Census	Following the criteria in 1963	All regular residents living in jurisdictional areas of cities and towns.
1990	Fourth Population Census	Following the criteria in 1984 and 1986	Population living in municipal districts of cities, sub-district offices in cities without districts, towns under cities without districts, and residents' committees of towns under jurisdiction of the county.

Table 3.2. **Main modifications of the definition of urban areas and urban population** *(cont'd)*

Year	Documents	How to define urban areas	Urban population
1999	NBS's Stipulations on Statistical Classification for Rural and Urban (Trial) (applied to the Fifth Population Census)	1) Administrative areas under the city government's jurisdication where population density is over 1 500 persons per km²; 2) Government resident place of municipal district with insufficient population density, sub-district offices, towns and townships connected by the built urban areas. 3) Government resident place of cities without districts, sub-district offices under cities without districts, and all administrative areas of designated towns connected with urban areas.	All regular residents living in urban areas.
2006	Explanation to Tentative Stipulations on Statistical Classification for Rural and Urban Areas	1) City proper areas: residents' committee under sub-district offices, village areas connected with urban public and resident facilities. 2) Urban-rural fringe areas: the village areas connected with urban public and residential facilities. 3) Town-centre areas: residents' committees under sub-district offices and village areas connected with urban public and resident facilities. 4) Town-village fringe areas: the village areas connected with urban public and residential facilities. 5) Special areas: mine and factory areas and development zones with over 3 000 residents.	Regular residents living in city proper areas, urban-rural fringe, town-centre areas, town-village fringe and the special areas.
2008	Stipulations on Statistical Classification for Rural and Urban Areas (applied to the Sixth Population Census)	The urban areas include the urban areas of cities and towns. The urban areas of cities include: municipal districts, cities without districts, and the connected residents' committee and other areas. Urban areas of towns include: resident places of county government which are not classified as cities, and the connected residents' committee as well as other places.	Regular residents living in urban areas of cities and towns, and the connected other areas.

Note: The statistical definition in the 1990 Census is from Yu Hongwen (2002), "A discussion of the urban definitions in Chinese Population Censuses", *Population and Economy*, No. 6.

Source: Author's collection from various governmental documents.

Table 3.3. **Number of cities and towns in China**

Year	Municipality level	Prefecture level	Municipal districts	County level	Cities	Towns
1978	3	98	408	92	193	2 173
1980	3	107	458	113	223	–
1985	3	163	621	158	324	–
1990	3	185	651	279	467	12 084
1995	3	210	706	427	640	17 532
2000	4	259	787	400	663	20 312
2005	4	283	852	374	661	19 522
2010	4	283	853	370	657	19 410

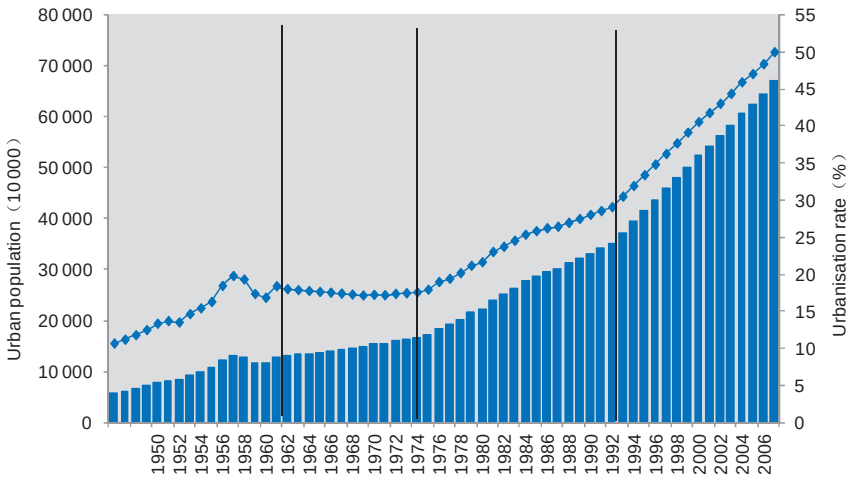
Overview of urbanisation in China

Brief history of urbanisation

Cities emerged in China a long time ago, and can be traced back to as early as 5 000 years ago; however, urbanisation developed slowly in its traditional agricultural society for thousands of years. By the time of the founding of the People's Republic of China in 1949, there were only 86 cities, and the urbanisation rate (i.e. the percentage of population living in urban areas) was about 10.6%, much lower than the world average. At present, the urbanisation rate is around 50% and the urban population has increased by 610 million compared with that of 1949. In the past 60 years, China's urbanisation has demonstrated a trend of fluctuation coupled with economic development and policy changes, which can be summarised into four stages (see Figure 3.2).

The first stage: fluctuation (1949-1966). Between 1949 and 1958, when the country was recovering from destruction caused by war, the government placed great emphasis upon economic development. To provide sufficient labour for industrialisation, migration from rural to urban areas was greatly encouraged. As a result, the urbanisation rate increased very quickly, with an annual average growth of the urbanisation rate of 0.46% and the annual growth of the urban population by 4.55 million in this period. However, in the period between 1959 and 1966, China's industrialisation and urbanisation were seriously hindered by a badly framed development strategy, natural disasters and political factors. Indeed, the urban population declined by 14.27 million from 1959 to 1963, and the urbanisation rate declined by 1.6%.

Figure 3.2. **China's urbanisation since 1949**



Source: National Bureau of Statistics of China, various years, *China Statistical Yearbook*, China Statistics Press, Beijing.

The second stage: stagnation (1966-1978). In this period, China experienced the "cultural revolution", and economic development was replaced with political movements, which resulted in economic crisis and stagnation of urbanisation. Since the urban population growth rate was lower than natural growth rate of total population during this period, the urbanisation rate decreased by 0.4% in spite of annual growth of urban population by 3.23 million.

The third stage: steady growth (1978-1995). During the early period of economic reform, the government endeavoured to promote economic development and urbanisation by implementing a series of reform initiatives, and urbanisation progressed smoothly. During this period, the urbanisation rate increased by 10.6%, with an annual growth rate of 0.62% and annual average increase of the urban population 10.55 million.

The fourth stage: rapid growth (1995-present). In the current period, China has fully established a market economy and achieved high-speed economic growth. Industrialisation has driven urbanisation rapidly, resulting in the fast growth of the urban population. From 1995 to 2010, the urbanisation rate increased by over 20% with an annual average growth rate of 1.3%, and an annual average increase of urban population 21.2 million (see Table 3.4).

Table 3.4. **Urbanisation in China, 1990-2009**

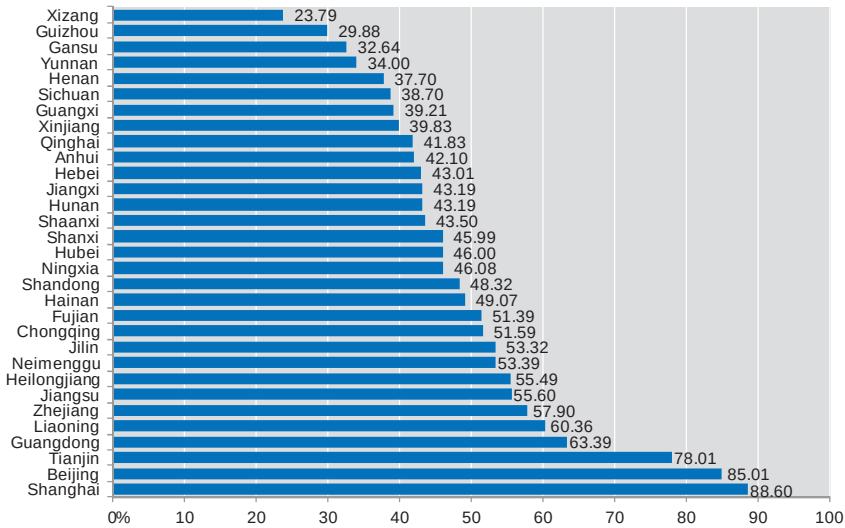
Year	Natural growth rate of urban population (%)	Urbanisation rate (%)	Urban population (tens of thousands)	Annual growth of urban population (tens of thousands)
1990	7.1	26.4	30 195	655
1991	6.5	26.9	31 203	1 008
1992	5.9	27.5	32 175	972
1993	5.4	28.0	33 173	998
1994	4.8	28.5	34 169	996
1995	4.2	29.0	35 174	1 005
1996	3.7	30.5	37 304	2 130
1997	3.1	31.9	39 449	2 145
1998	2.5	33.4	41 608	2 159
1999	2.0	34.8	43 748	2 140
2000	2.9	36.2	45 906	2 158
2001	2.4	37.7	48 064	2 158
2002	1.8	39.1	50 212	2 148
2003	1.2	40.5	52 376	2 164
2004	0.7	41.8	54 283	1 907
2005	2.7	43.0	56 212	1 929
2006	2.1	44.3	58 288	2 076
2007	1.5	45.9	60 633	2 345
2008	1.0	47.0	62 403	1 770
2009	0.2	48.3	64 512	2 109

Source: National Bureau of Statistics of China, various years, *China Statistical Yearbook*, China Statistics Press, Beijing.

The current status of urbanisation

With diversified natural endowments and different levels of economic development, China's urbanisation varies greatly amongst regions. In general, the regional urbanisation level has demonstrated a pattern of successive decline from the east to the west.[2] In 2009, among the top ten urbanised provinces, six were from the east and two were from the northeast. In the east, the highly urbanised provinces included Shanghai, Beijing, Tianjin and Guangdong, all of which had an urbanisation rate over 60%; in the northeast, Liaoning had the highest urbanisation rate, at over 60%, followed by Jilin and Heilongjiang Provinces, with urbanisation rates over 50%; in the centre of the country, Shanxi and Hubei Provinces had the highest urbanisation rate, at over 45%; in the west, the urbanisation rate in all provinces was not high, most of them were under 40% and only Chongqing had a rate above 50%. The urbanisation rate was even lower, at less than 30%, in the Tibet autonomous region and Guizhou Province.

Figure 3.3. **Urbanisation rate by province in China, 2009**



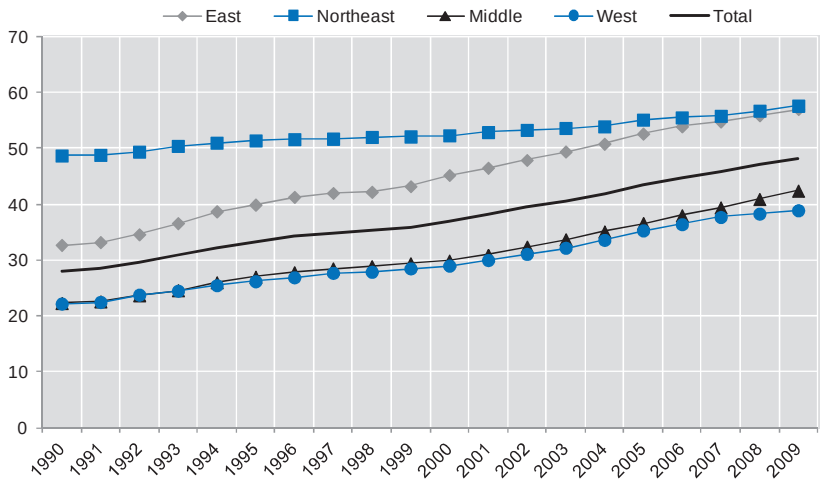
Source: Author's calculation based on National Bureau of Statistics of China (2010), *China Statistical Yearbook 2010*, China Statistics Press, Beijing.

In terms of tendency of urbanisation, the east has the fastest speed of growth, followed by the centre and the west, and the northeast is the slowest. In concrete terms, the urbanisation rate increased by 24.3% in the east, by 20.1% in the centre, by 16.7% in the west, and only by 8.9% in the northeast from 1990 to 2009.

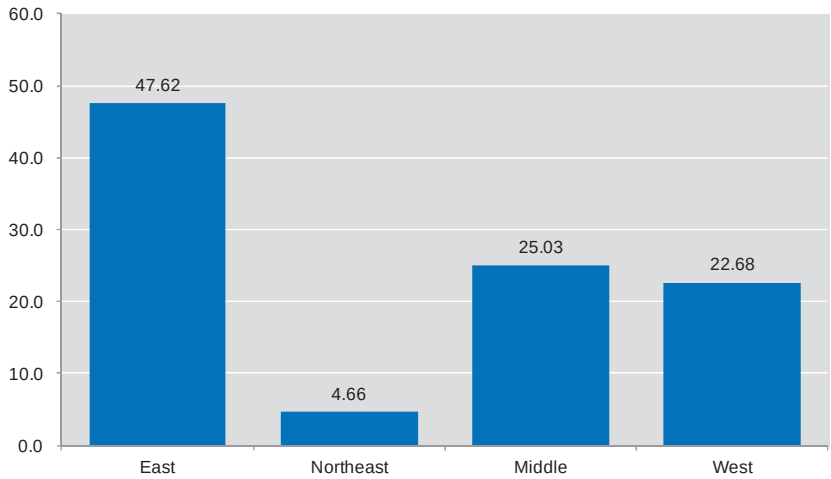
Because the pace of regional urbanisation varies in China, the contributions of different regions to overall urbanisation are also different. The east contributes the most, with a contribution rate of nearly 50%, followed first by the centre and then the west, but the contribution rate in both regions is just half of that in the east, and the northeast contributes the least. Thus, it seems that the pattern of urbanisation in China is mainly dominated by the east because it is not only the destination of rural labour migration within the region but also the main destination of the rural migrant labour from other regions.

Figure 3.4. **Urbanisation rate by region and contribution to overall urbanisation rate (%)**

Urbanisation rate by region, 1990-2009



Contribution to increase of urbanisation rate, 2000-2009



Source: National Bureau of Statistics of China (1991-2010), *China Statistical Yearbook*, China Statistics Press, Beijing.

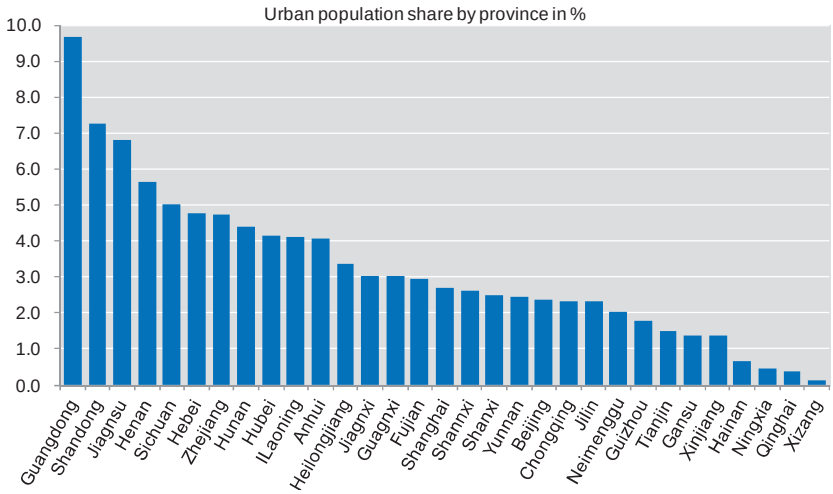
Spatial distribution of urban population and general trends

In China, the urban population has now reached over 600 million. How is this enormous population distributed spatially? What are the features of distribution? These questions will be explored in the following sections.

Regional distribution: concentration towards the eastern coast

The regional distribution of urban population is largely diverse amongst provinces. The population density is high in the east and low in the west, showing a trend of concentration of population towards the eastern coastal areas (see Figure 3.5). In 2009, Guangdong, Shandong and Jiangsu had the most concentrated urban population amongst the provinces, and each of them are located on the eastern coast. In Guangdong Province, the urban population is over 60 million, which is 9.7% of total urban population, and the number of cities is 44, which is 6.7% of the total number of cities in China. In Shandong Province, the urban population is 45.76 million, 7.2% of the total urban population, and the number of cities is 48, 7.3% of the total number of cities. In Jiangsu Province, the urban population is 42.95 million, 6.8% of the total urban population, and the number of cities is 39.6% of the total number of cities. On the other hand, Tibet autonomous region has the least urban population, which is only 0.69 million, about 0.1% of the total urban population, and there are only two cities there.

Figure 3.5. **Share of urban population by province, 2010**



Note: Total urban population is equal 100.

Source: National Bureau of Statistics of China (2010), *China Statistical Yearbook 2010*, China Statistics Press, Beijing.

At the regional level, the trend of urban population concentration towards the eastern coastal areas is also obvious. The urban population in the east took a share of 41.16% of the total urban population in 1996, and it increased by 3.23% to 43.45% in 2009, while the share of urban population in the centre only slightly increased by 0.94% from 22.88% to 23.82%, during the same period. On the other hand, the share of the urban population in the west and the northeast declined by 1.19% and 2.99% respectively, from 24.12% to 22.93% in the west and from 12.79% to 9.80% in the northeast during the same period (see Table 3.5).

Table 3.5. **Change of urbanisation rate and urban population share by region, 1996-2009**

Region	1996		2009		Change (1996-2009)	
	Rate	Share	Rate	Share	Rate	Share
East	41.16	40.22	56.66	43.45	15.5	3.23
Northeast	51.64	12.79	56.87	9.80	5.23	-2.99
Centre	27.83	22.88	42.26	23.82	14.43	0.94
West	26.87	24.12	39.42	22.93	12.56	-1.19

Source: National Bureau of Statistics of China, various years, *China Statistical Yearbook*, China Statistics Press, Beijing.

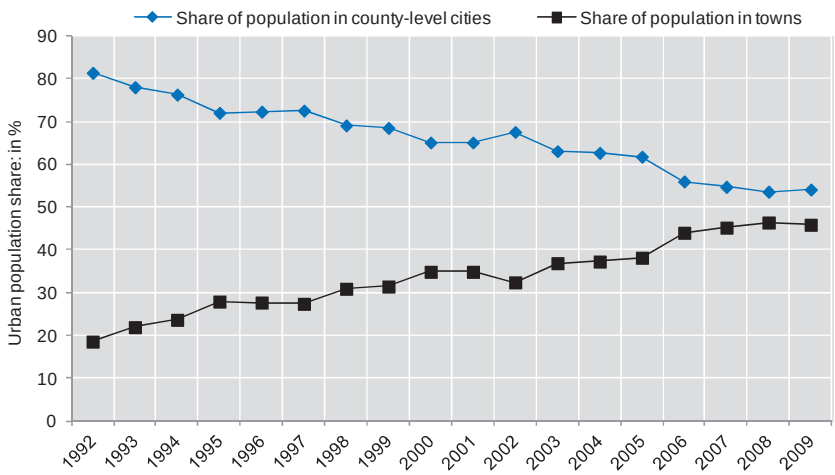
Distribution between cities and towns: increasing population living in towns

As mentioned above, the urban population in China can be divided into two parts: population living in various level cities and those living in towns. However, there have been no publications that reveal how the urban population is split between these two locations because of data limitations. To estimate the population distribution between cities and towns, we have collected two sources of data. One is from the Sample Survey of 1% of the Population by the National Bureau of Statistics (NBS), and the other is from the statistical data of the Ministry of Housing and Urban-Rural Development (MOHURD).[3] Based on these two sources of data, the percentage of population living in cities and towns has been estimated and this calculation is shown in Figure 3.6. From the figure, it can be seen that the majority of urban population lives in cities in 2009, for example, the city-based population is 54.1% of total urban population based on NBS data and is 55.8% based on MOHURD data, but the trend shows that the population levels living in towns have been increasing. According to NBS data, the percentage of urban population living in towns increased from 18.6% in 1992 to 45.9% in 2009, while that living in cities decreased from 81.4% to 54.1% in the same period. The data from MOHURD revealed a similar pattern of change, suggesting that the percentage of the urban population

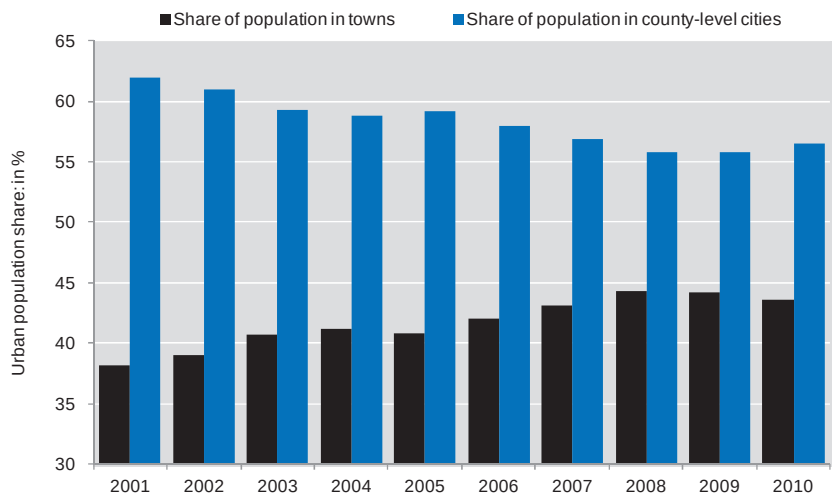
living in towns increased from 38.1% in 2001 to 43.5% in 2010 while that of the city population dropped from 62% to 56.5% during the same period. The changing pattern of urban population distribution suggests that towns are playing a more and more important role in the process of urbanisation in China.

Figure 3.6. **Distribution of urban population between cities and towns**

Data from NBS



Data from MOHURD



Sources: Chinese Ministry of Housing and Urban-Rural Development and National Bureau of Statistics of China.

Distribution by size of urban areas

The trends of urbanisation can also be observed by looking at population distribution by size of cities. Following the categories of city sizes grouped by the United Nations, we divide cities into the following groups: under 100 000 population, 100 000 to 500 000, 500 000 to 1 million, 1-5 million, 5-10 million, and over 10 million. We have calculated the share of population by size of cities since 1999. In 2010, cities with a population between 1-5 million represented the largest share of city population, with a percentage of 31.7% of the total population in cities, followed by cities with a population between 100 000 and 500 000, at a percentage of 25.7% of the total population in cities. The cities with population under 100 000 took the smallest share, at only 0.8% of the total population in cities (see Figure 3.7).

Looking at the changing of share by size of cities, we can find that different sizes have different patterns. Within the category of cities with a growing share, the largest cities with a population of more than 10 million were growing the fastest, their share increased from 3% in 1999 to 15.6% in 2010; they were followed by the cities with a population between 100 000 and 500 000, whose share of population increased by 6.3%; and the cities with a population between 5 million and 10 million grew the least, as their share increased by only 0.3%. The other sizes of cities all experienced decline in terms of population share, and the population share of cities with a population between 1 million and 5 million decreased by 9.0%, those with 500 000 to 1 million by 9.3%, and those under 100 000 by 1% during the same period.

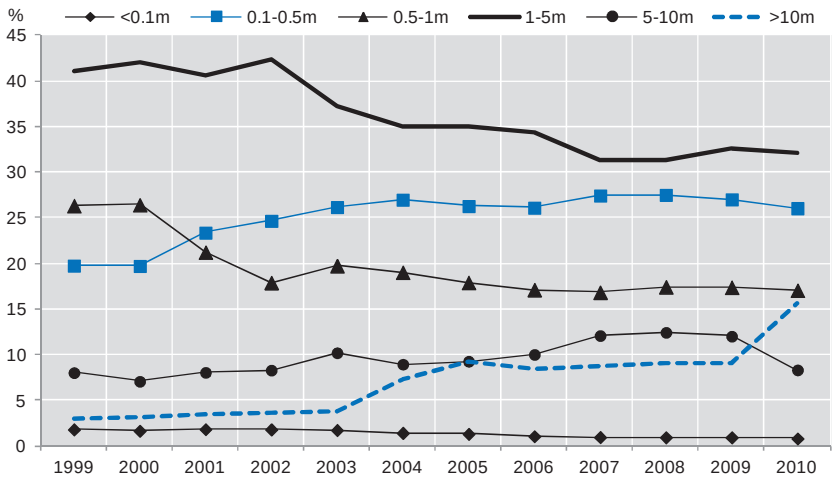
Prospects for urbanisation

For the last three decades, rapid urbanisation in China has been coupled with fast economic growth, and this economic growth is the main driving force for urbanisation. Given that the current urbanisation rate around 50% is still much lower than the average level of 80% in developed countries, it seems that the trend of urbanisation should be able to continue. In 2010, China's economic growth was 10.44% and the growth rate of urban population was 3.82%, which implies that every percentage increase in economic growth results in 0.37% growth of the urban population, or numerically, 1% rise in economic growth brings about 2 million inhabitants into urban areas. As surplus labour declines, 1% economic growth may not be able to drive the same amount of rural population into urban areas as before. However, even so, it is expected that economic growth will continue to drive urbanisation forward for at least the next 20 or more years.

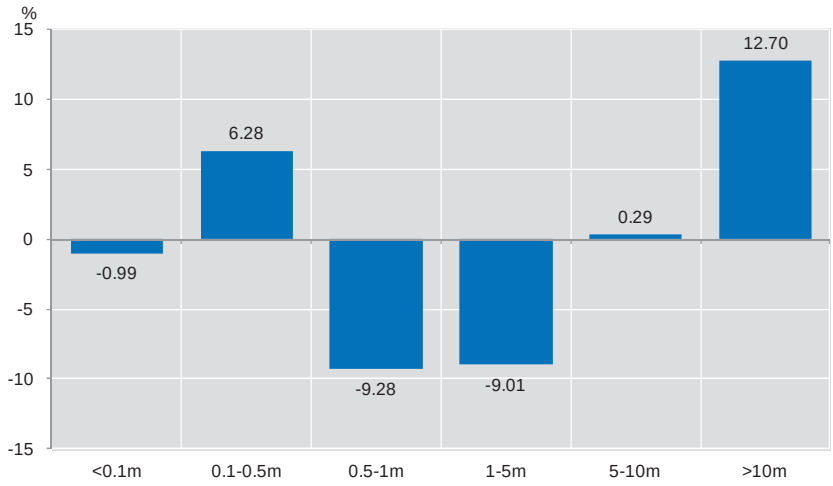
To look at the prospect for urbanisation in the future, we can make a rough projection on the general trends of urbanisation based on such simple assumptions: *i)* growth of total population follows the United Nation's

Figure 3.7. **Changes in urban population share by size of cities**

Share of different size of cities since 1999



Change of urban population share by different size of cities, 1999-2010



Sources: National Bureau of Statistics of China (1999-2010), *China's Urban Construction Statistical Yearbook*, China Building Industry Press.

projection, reaching 1.397 billion in 2020 and 1.393 billion in 2030; *ii)* the elasticity of economic growth to urbanisation will reduce to 0.27 in 2020 and to 0.15 in 2030; *iii)* the average economic growth rate is 8% between 2010 and 2015 and decreases to 7% between 2015 and 2020 and

further to 4% in 2030. The main results of our projection are presented in Table 3.6.

According to the results of the projection, it can be seen that urban population would increase by more than 200 million in next 20 years, from 669 million in 2010 to 891 million in 2030. So, it will not be an easy task to provide such a huge number of people with jobs, housing, health care, education and other public services. This raises the question about whether China is adequately prepared for these future challenges?

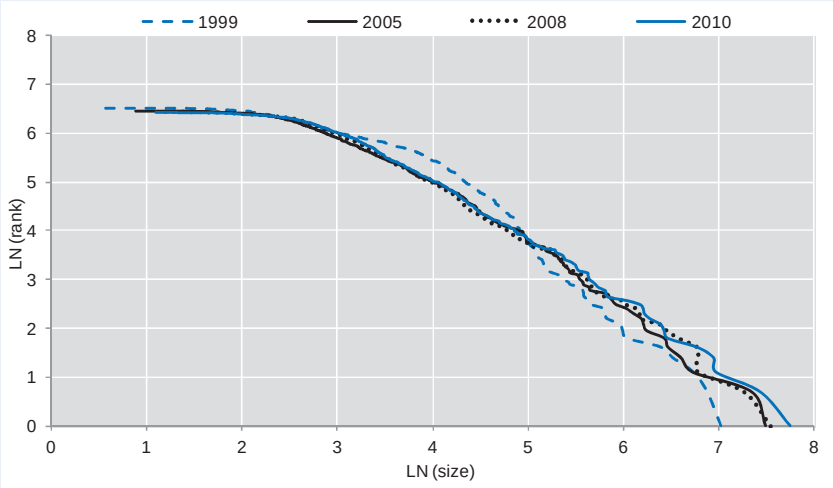
Box 3.1. **Change of city structure: Zipf's Law in China**

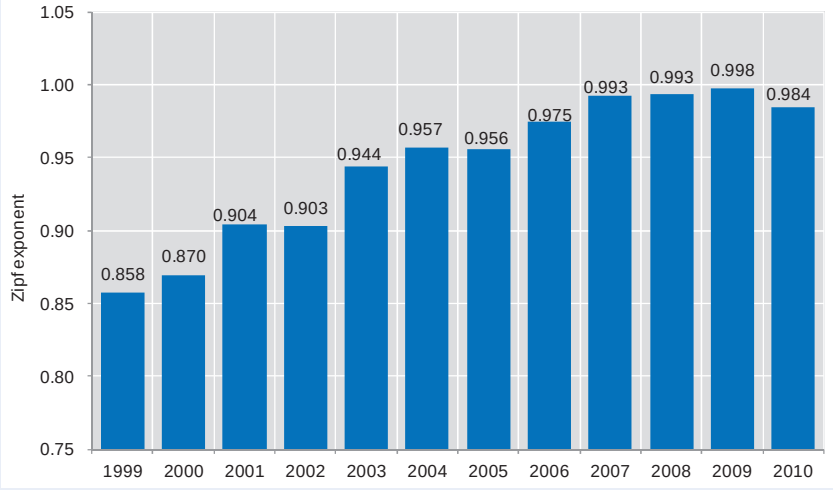
Empirical studies of cities in many countries find that the number of cities generally decreases as the size of cities increases, and the relative structure of cities in a country or region takes the shape of a pyramid. Mills and Hamilton (1994) explain the above relationship by using Pareto distribution function and posit the function of city size distribution as: $R(x)=Mx^{-a}$, in which *M* refers to the size of the primate city, *x* is the size of a particular city, and *a* is the parameter describing the distribution shape of city size. When the value of *a* is close to 1, the function becomes R(x)=M/x, which is also called the "rank-size rule" or "Zipf's Law". Here *R* is the rank of the cities (Gabaix, 1999). According to the law, if all the cities of a country or region are ranked according to population size, the sizes of cities will be inversely proportional to their rank. So, if all cities are placed in order from the largest to the smallest, each one will have a population half the size of the preceding city or, if the population of any city is multiplied by its rank in the urban hierarchy of a certain country, it will be equal to the population of the largest city in the country. This could mean that all differently sized cities of a country grow at an equivalent rate over a period of time. However, some recent studies such as Kwok (2002) suggest Zipf's Law does not hold uniformly across countries and that, whilst the actual population of cities in some countries is proven to be fit with the prediction of the law, in other countries reality does not fit with the prediction. According to Zipf's Law, if the value of *a* is greater than 1, the population size of a city in rank *R* falls off faster than it should in a proportionate manner with its rank of *R*, implying that primate city or large cities may grow faster than others as time passes (Malecki, 1975). If the value of *a* is lower than 1, it indicates the population size of a city in rank *R* decreases slower than a pace its rank *R* declines in a static mode.

Using the data on 664 cities from the MOHURD, we have estimated Zipf's exponent for cities in China since 1999, and the results are shown in the following figure. In 1999, Zipf's exponent for cities in China was 0.858, much lower than 1, suggesting that the large cities grew slower than would be expected and as a result their rank declines. Since then, the coefficient has demonstrated a tendency to increase, and by 2010, it increased to 0.984, getting very close to 1, suggesting that size-rank relationship of cities in China is converged to Zipf's Law.

Box 3.1. **Change of city structure: Zipf's Law in China** *(cont'd)*

Size-rank relationship of cities in China, 1999-2010





Source: Author's calculations based on data from the Chinese Ministry of Housing and Urban-Rural Development.

Table 3.6. **Projection for urban population growth and urbanisation rate in China**

Year	GDP growth rate (%)	Elasticity of economic growth to urban population growth	Urban population growth rate (%)	Total population projected by UN (tens of thousands)	Urban population (tens of thousands)	Annual growth of urban population (tens of thousands)	Urbanisation rate (%)
1978	11.67	0.30	3.46	96 233.3	17 245	576.00	17.92
1980	7.84	0.44	3.49	98 710.7	19 140	645.00	19.39
1985	13.47	0.33	4.48	105 837.2	25 094	1 077.00	23.71
1990	3.84	0.58	2.22	114 331.7	30 195	655.00	26.41
1995	10.92	0.27	2.94	121 122.6	35 174	1 005.00	29.04
2000	8.43	0.59	4.93	126 742.1	45 906	2 158.00	36.22
2005	11.31	0.31	3.55	130 756.0	56 212	1 929.00	42.99
2010	10.44	0.37	3.82	134 091.0	66 978	2 466.00	49.95
2011	8.00	0.36	2.88	134 662.8	68 907	1 928.97	51.17
2012	8.00	0.35	2.80	135 237.0	70 782	1 875.38	52.34
2013	8.00	0.34	2.72	135 813.6	72 604	1 821.80	53.46
2014	8.00	0.33	2.64	136 392.7	74 372	1 768.22	54.53
2015	8.00	0.32	2.56	136 974.3	76 087	1 714.64	55.55
2016	7.00	0.31	2.17	137 333.4	77 540	1 453.42	56.46
2017	7.00	0.30	2.10	137 693.4	78 947	1 406.54	57.34
2018	7.00	0.29	2.03	138 054.4	80 307	1 359.65	58.17
2019	7.00	0.28	1.68	138 416.3	81 619	1 125.23	58.83
2020	7.00	0.27	1.62	138 779.2	82 885	1 085.04	59.46
2021	6.50	0.26	1.43	138 928.2	83 843	957.79	60.08
2022	6.00	0.25	1.33	139 077.3	84 731	887.46	60.66
2023	5.50	0.23	1.15	139 226.6	85 501	770.25	61.15
2024	5.00	0.22	1.10	139 376.0	86 238	736.76	61.61
2025	5.00	0.20	1.00	139 525.6	86 907	669.78	62.02
2026	4.00	0.19	0.76	139 482.0	87 416	509.03	62.41
2027	4.00	0.18	0.72	139 631.7	87 899	482.24	62.69
2028	4.00	0.16	0.64	139 781.6	88 327	428.66	62.93
2029	4.00	0.15	0.60	139 781.6	88 729	401.87	63.21
2030	4.00	0.15	0.60	139 307.6	89 131	401.87	63.72

Source: Population data is from the Population Division, Department of Economic and Social Affairs, United Nations (2010).

Notes

1. There are four municipality level cities: Beijing, Tianjin, Shanghai, and Chongqing; and 283 prefecture level cities and 370 county level cities.

2. China is divided into four regions, including the east, the centre, the west, and the northeast. The east region includes: Beijing municipality, Tianjin municipality, Hebei Province, Shanghai municipality, Jiangsu Province, Zhejiang Province, Fujian Province, Shandong Province, Guangdong Province, and Hainan Province; the centre region includes: Shanxi Province, Anhui Province, Jiangxi Province, Henan Province, Hubei Province, and Hunan Province; the west region includes Inner Mongolia autonomous region, Guangxi Province, Chongqing municipality, Sichuan Province, Guizhou Province, Yunnan Province, Tibet autonomous region, Shaanxi Province, Gansu Province, Qinghai Province, Ningxia autonomous region, and Xijiang autonomous region; the northeast region includes Jilin Province, Liaoning Province and Heilongjiang Province.

3. The results of a sample survey of 1% of the population carried out by the National Bureau of Statistics is published in *China Population Statistical Yearbook*. The data from the Ministry of Housing and Urban-Rural Development can be found in *China Urban-Rural Development Statistical Yearbook*.

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Annex 3.A

Adapting OECD urban definition to China: issues and data needs

Finally, we turn to the question about the practicality of applying the OECD *Redefining Urban* methodology in China. While some parts of the methodology outlined in Chapter 1 are transferable, there are some important constraints both in terms of data availability and institutional characteristics of urban development.

Defining urban areas

As is set out in Chapter 3, in China, urban areas are defined in terms of both population density and the coverage of urban services and facilities. The OECD methodology for defining the core urban areas depends on the ability to build up population data from a small scale to a functional scale. In China, where cities are classified at three levels, municipal level (provincial level), city-prefecture level city, and county level city, both municipal level cities and prefecture level cities are built up from the county level unit and this data is relatively easy to access. As China is divided into more than 2 000 county level units, it is possible to define urban cores in terms which translate to the OECD method based on this county level data.

However, because data on commuting is not available, which is the essential second part of the OECD methodology, it would be more difficult to define wider functional areas as required once urban cores are defined.

There are also unique national characteristics which would impact upon implementation of the methodology in China, The *Hukou* system is unique to the development of urban areas in China, in that it creates the boundaries of social and public service provision. The system identifies the location in which a person is entitled to receive services. In general terms, should a rural resident migrate to an urban area, they would be excluded from the urban public service system, and could not equally enjoy the same treatment in areas such as social security provision, education and housing as indigenous urban residents. The 2010 Census revealed that there are about 220 million migrants living in urban areas who did not have access to *Hukou* in the areas they were living. Should these people be excluded from the urban resident population on the basis of the entitlement to *Hukou*, it is estimated that this would reduce the urbanisation rate by about 13%.

Availability of statistics for urban areas

There is a similar problem concerning the availability of data on performance indicators. There is some potential to provide equivalent data, but there are also some important gaps:

- Demography: the National Bureau of Statistics of China (NBS) is responsible for most of the data generated in China. Demographic data is available annually, but some detailed data on population by age group is only available in the Census year, which is undertaken every ten years. Immigration data is generally available at the Census year. Every five years, there is a top up to the Census, undertaken by a 1% population sampling survey, which generates additional population information which could provide some complementary population data. The Ministry of Public Security is responsible for population data by *Hukou* status, which is available annually, but there is no data on population age composition from this source.
- Economy: the NBS also compiles economic data including total GDP and GDP segmented by three sectors (primary, secondary, and tertiary). This is available annually, as is data for household income, total employment and registered unemployment. The other indicators are not available annually, including the surveyed unemployment rate, educational attainment and housing affordability, although educational attainment is generated by Census data every ten years.
- Social: the only available indicator in this category is the number of doctors per inhabitant.
- Innovation: there is no data available for this category of indicators.
- Environment: the only available indicator is the growth of urbanised land, which is collected by the Ministry of Housing and Urban-Rural Development.

Assessment of the relationship between economic functionality, governance and administration

In China, there is a clear trend of regional integration in economic development, and an increasing tendency for functional regions to cross administrative boundaries. Examples include the Yangtz River Delta Economic Zone and the Pearl River Delta Economic Zone.

The Chinese Government is placing great emphasis upon the development of key economic zones and these feature within national strategies for regional economic development that have been formulated in recent years.[1] Where these exist, the shape of the labour market makes an impact on decisions influencing the supply of housing, design of transport systems and commuting. It is necessary for the various administrative structures to take into account the functional relationships within labour markets, and the government plans regional development by taking these issues into account.

Several years ago, there were some discussions about making adjustments to administrative structures in China; however, integration of regional economic development has not yet led to the changes in administrative geographies, and China's administrative classification remains in place except for some minor adjustments within some areas.[2] There are also some counties that have been transformed to county level cities in China. However, geographical administrative adjustments across provincial boundaries have not been seen so far and these would be complex to deal with as they would need to address dimensions beyond economic development, such as political, cultural and ethnic factors which have been embedded in China's history over thousands of years, and who has preserved the basic administrative unit, the county, as a relatively stable boundary.

Above the county level, since 1949, the boundary of province has not been changed and the adjustments in administrative geography have taken place generally at prefecture level. At this level, however, the functional relationship is not linked to labour market geographies as in the proposed methodology, and changes in administrative structures have not necessarily reflected different economic, social and environmental functions in China.

Despite these constraints, there would be considerable value in continuing to discuss the development of the OECD methodology in China. It would offer a definition of urbanisation which is not only comparable over a time series but also across countries. The Chinese Government is always interested in learning from international experience as it takes forward policies for urban and economic development and the variety of existing definitions internationally create great difficulties in the learning process.

If the data on comparable urban definitions is made available over time it is expected that many Chinese Government departments would be interested in it. These include the National Development and Reform Commission, the Ministry of Housing and Urban-rural Development, as well as a range of local and sub-national administrations.

Notes

1. These include the Regional Development Plan for Yangtz River Delta Zone, the Reform and Development Plan for Pearl River Delta Zone, the Instructive Note on Accelerating Development of the Central Economic Zone in Henan Province by the State Council.
2. For example, in 2011 in Beijing, the Xuanwu district was merged into the Dongcheng district.

Chapter 4

Focusing on functionality: changing approaches to economic development in England

by
Richard Baker*

This chapter gathers evidence about the spatial geography of the UK economy and reviews the current direction of sub-national development policy in England. It discusses how increasing analysis of the functioning of the economy has influenced policy over the last decade, including recent decisions to abolish institutions operating at the regional administrative scale in favour of those operating at scales closer to the functional economy. In this context, it explores how the OECD common methodology to define functional urban areas could be a significant new tool for understanding the development, and measuring the performance, of key cities and their surrounding functional economies.

Further, the chapter illustrates other forms of economic functionality beyond the labour market definition which underpins the OECD methodology. It shows how working with different understandings of functionality can provide further insights about economic opportunities and challenges for further developments of the work on international comparison of functional urban areas.

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Introduction

The OECD-led work on a common methodology to define functional urban areas (*Redefining Urban* project of Chapter 1) is emerging at a time when there is considerable focus on the role of cities and key urban areas as sources of future sustainable growth in the United Kingdom and beyond.

In the United Kingdom, the coalition government has appointed a Minister for Cities to "champion the economic, social and environmental role of cities". A primary focus will be on boosting the economic performance of the eight English core cities[1] and their surrounding city regions. The government unveiled its forward strategy,[2] Unlocking Growth in Cities in December 2011, providing the context for a process of decentralising power through City Deals. This is part of a wider Localism strategy, underpinned by its Localism Act.[3]

In the field of economic development, this direction of policy connects strongly with debates in policy and research communities about the role and potential of agglomeration, urban labour market development, and clustering of innovation and production, and how these trends contribute to the maximisation of local and aggregate national economic performance.

More broadly, this direction of policy is developing across domains and is not limited to economic development. The Localism Act also provides the legal basis for the implementation of a series of measures under a narrative which argues that decision making should be devolved as far as possible to local scales.

In the context of economic development, notable features of the act included the completion of the abolition of the English[4] tier of regional structures: business-led regional development agencies (RDAs), government regional offices and local authority-led regional assemblies (RAs), and also the regional functions of a host of other non-departmental public bodies and agencies. These had been erected by the preceding government to deliver a co-ordinated strategic approach at the sub-national level in a range of areas of policy of direct relevance to the *Redefining Urban* project. These include the economic development roles of RDAs, the spatial planning responsibilities of RAs, and the more general co-ordination roles of government regional offices across a wide range of areas from public health to transport. These bodies have not been replaced; however, there has been a formal process of encouragement of local business and local government to come together around functional economic territories to collaborate on local economic development.

Whilst these are radical and controversial changes which have excited considerable debate, there is a common thread about the value of working

with the grain of economic functionality which links these changes to some of the analysis and thinking which prompted policy changes under the preceding government in an attempt to enhance economic performance, and in particular the maximisation of the performance of cities and urban city-regions.

The shift to localism

The Localism Act provides for a new "General Power of Competence" for local government. This replaces the previous environment within which local authorities could only act in areas designated to them by the central government, in favour of a permissive environment within which they can take action on areas which can be justified as "in the interest of their communities and in their own financial interest", unless it is specifically prohibited by national legislation.

The localism approach is not simply about empowering local authorities to do more. A suite of other policy reforms have also sought to place responsibility on other local actors. For example, provisions of the Localism Act provide for a significant role for local communities in decision making about development proposals; proposed reforms in health are being designed to diminish the involvement of state organisations in the governance of local health care decisions, with the replacement of health authorities and primary care trusts with consortia of local general practitioners; and there is an active encouragement of local schools to remove themselves from the influence of local authorities and to opt for one of a number of forms of independent status. The act provides for referenda in the main cities of England, to decide on whether to create elected executive mayors modelled on leadership roles such as those found in the United States, France and other parts of the United Kingdom, most notably London.

In the field of economic development, there has not been a local replacement for regional development agencies. Instead, the government invited local authorities and local businesses to come together to design business-led local enterprise partnerships (LEPs), to drive forward local economic development. Applying the localism concept to this initiative, the invitation from the government was loosely framed, justified by the Secretary of State for Business, Innovation and Skills as enabling LEPs to be "built from the bottom up… (with)… the flexibility to determine their own agenda, rather than have it handed down to them by Whitehall."

The three key requirements for LEPs set out in the invitation were that they:

- focus on strategic leadership functions to "create the right environment for business and growth in their areas, by tackling issues such as planning and housing, local transport and infrastructure priorities, employment and enterprise and the transition to the low carbon economy";
- be based on a principle of collaboration between economic partners, but with business sector leadership;
- reflect "natural" economic geography, calling on partnerships to "better reflect the natural economic geography of the areas they serve and hence to cover real functional economic and travel to work areas".

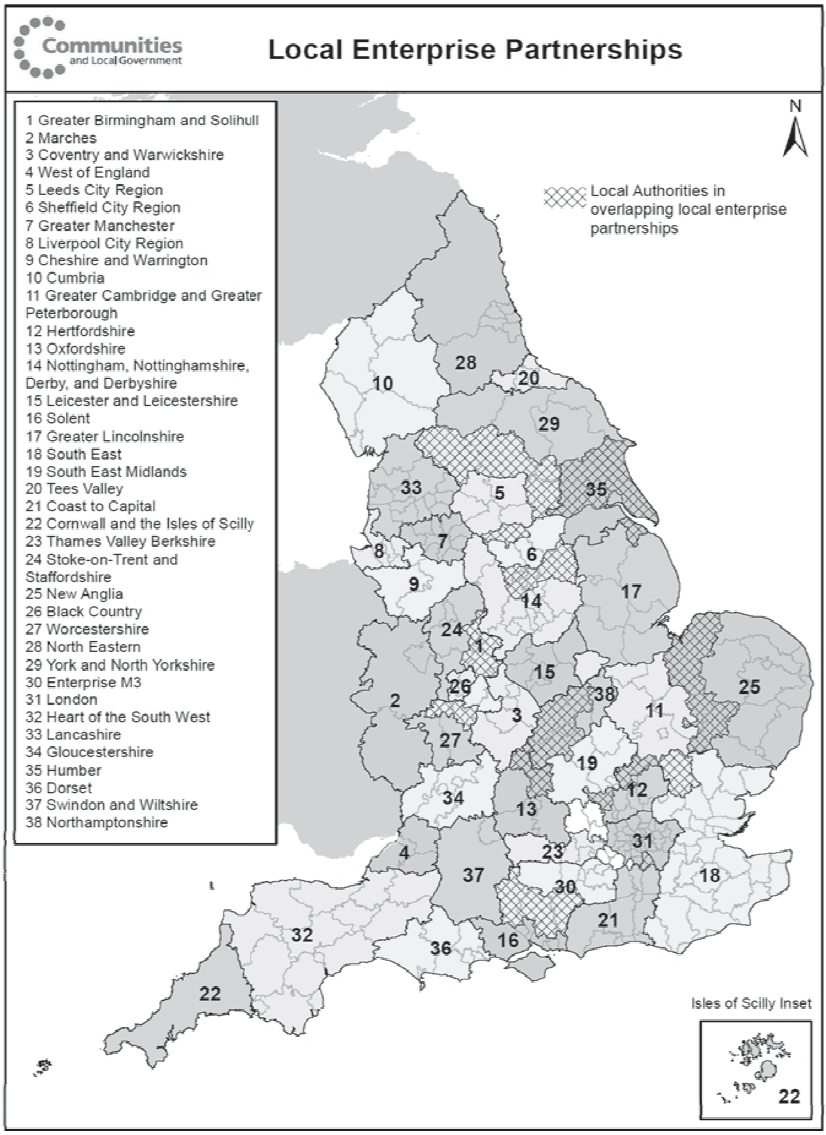
During the event, 38 LEPs were formed across England, providing a diverse and sometimes overlapping map of economic leadership (see Figure 4.1). A small number of areas have yet to decide to engage with the process or are still resolving the structure or geography of a partnership.

The focus on "natural" or "functional" economic areas, which is at the heart of the *Redefining Urban* project, is, therefore, a key part of the rationale lying behind this structural revolution in English economic development institutions. Given that many LEP's have sought to take functional urban areas as their footprints, an internationally agreed methodology to define urban areas could contribute an important new tool to provide comparative performance measurement information for these structures.

The rationale for change

It should be recognised that there has been considerable debate about these developments, particularly in the field of economic development and linked areas such as spatial planning, and that the rationale for the shift to localism has been built around a number of issues beyond the spatial economic agenda.

Figure 4.1. **Local enterprise partnership territories, November 2011**



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

Sources: Geographic Analysis Team, AID; Communities and Local Government.

The UK Government has cited a series of policy concerns and political challenges that it believes require urgent attention, and which underpin the new approach. They focus on:

- **Economic re-balancing:** aiming to address long-standing concerns about sectoral and spatial imbalances within the UK economy. It has been argued that a local approach to sustainable economic development can provide a stronger platform than a regional one, enabling business and public sector partnerships to focus on interventions at the scale of the functional economy, fixing blockages in the local labour and housing markets, and promoting business growth, supported by economic incentives such as tax relief to stimulate investment.
- **Political accountability:** responding to evidence that the electorate believes there is too much distance between political institutions and the real concerns of the population, including public anger with misuse of parliamentary expenses and the influence of business in politics. It is argued that a more local focus provides for more connected and transparent politics.
- **Deficit reduction:** radically and proactively reducing public spending by stripping out a tier of regionally based public administration considered to be unnecessary and unsuccessful, in favour of a local infrastructure built on existing local institutions and businesses, therefore contributing to a reduction in costs and volume of employment in the public sector.
- **A stronger civil society:** the "Big Society" agenda has provided a positive rationale for cutting back the public sector, to create space for more diversity and pluralism with business, communities and local institutions being encouraged to take responsibility for local issues, strategies and services.

Critics of the approach have expressed concern about:

- **Fragmentation of governance:** caused by the stripping away of strategic co-ordination functions in favour of the marketisation of processes like spatial planning and privatisation of key parts of the state infrastructure such as education and schools.
- **Incoherence and potential unintended consequences:** the speed of change has involved a lack of assessment of the impacts, and a lack of clarity about the roles and spatial scales of different parts of the emerging infrastructure. For example, critics point to the reforms

to strategic planning which, on the one hand, aim to promote community involvement in development planning, whilst also creating local enterprise partnerships (LEPs) with a brief to work at the "functional" scale to promote an infrastructure which can support growth. At the same time, a third measure provides for a legally defined presumption towards development proposals. It is argued that the latter presumption will overwhelm local community concerns and disempower planning processes.

- **Reduction in key capacity:** the rapid removal of a range of resources is reducing the capacity of local agencies to effectively pursue these agendas in any event. The deficit reduction strategy, which provides a challenging backdrop to these institutional changes, has seen the departure of key skills and knowledge bases from a number of institutions and structures which have been abolished or diminished, the removal of much strategic capacity in local authorities and the local voluntary sector organisations key to underpinning the "Big Society", and the rapid stripping back of public sector employment and procurement activity which has been important to jobs and business activity in those areas which are to be the beneficiaries of the "re-balancing" agenda.

- **Centralisation not localism:** the transition from the regional economic structures to the LEPs was undertaken at a speed which has had the net effect of centralising, rather than localising. Key functions such as innovation support, administration of European funds, and skills policy have been absorbed by the central government or its agencies, as LEPs and their partners were not ready to receive them.

It is not the purpose of this chapter to reflect in detail on this debate, but it is important to note that, despite the level of controversy around these changes, the specific focus on the functionality of the economy and on the urban systems at the heart of *Redefining Urban*, are points of continuity from the previous administration, largely uncontested in principle.

In fact, there has been an increasing and ongoing policy interest in the United Kingdom in the capacity for fostering economic improvement by focusing on functional economic challenges which gathered momentum under the previous administration. This provides fertile ground for the *Redefining Urban* project to add value. This chapter turns to this later.

But there are also wider issues about economic functionality – focused on different spatial forms such as growth corridors, linkages, supply chains and shared hinterlands – which need to be acknowledged in both the

emerging structures within England and within the *Redefining Urban* project, but which are yet to be addressed within the new arrangements. This chapter will also provide some reflection on these issues.

The wider context for localism: UK regional economic performance

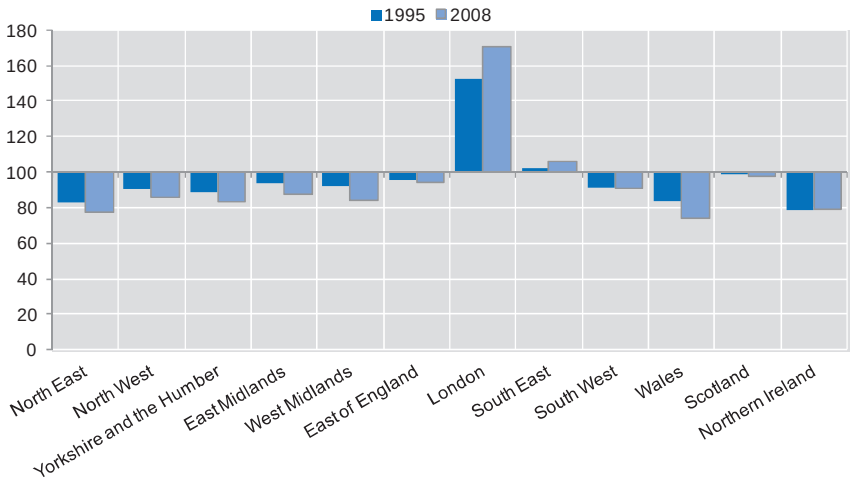
Within the United Kingdom, there has been a shifting debate about the balance of focus on urban economies, and the role and relationships of towns and cities within wider territories, including at national and international scale. Unlike in other countries, however, there is not a stable institutional structure from which to observe and work with different geographies. With the unwritten Constitution, UK parliaments have the facility to design and re-design institutional arrangements in line with emergent priorities within political cycles. As industrial change and economic restructuring have evolved, there have been a series of attempts to create governance and leadership infrastructures and performance management systems, and a range of nationally led initiatives which have aimed to deal with specific issues.

A key driver to these changing arrangements has been concern about levels of inter-regional economic inequality across the United Kingdom. Indeed, the current narrative of a need for "economic rebalancing" could have been applied to many of the previous policy prescriptions with little difficulty.

Comparison of regional economic performance in the United Kingdom shows clearly the economic dominance of London and the southeast corner of the country; Figure 4.2, for example, demonstrates the relative performance of the various regions and nations in terms of GVA per head over the years between 1995 and 2008. It shows how the relative contribution of GVA per head in the United Kingdom has increasingly been driven by the performance of London and the South East, with the relative contribution of all other regions and nations falling back.

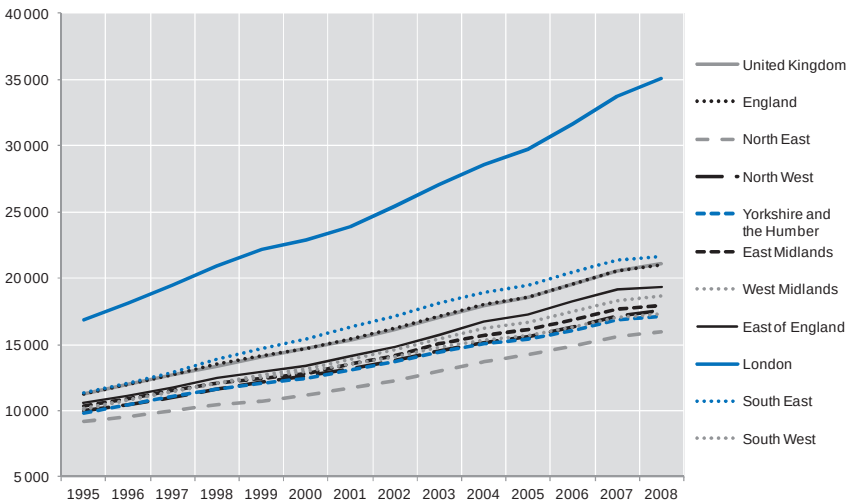
But, as Figure 4.3 shows, the focus on relative performance can be misleading. Over this period, during a time of national prosperity, growth was present in every region. Whilst the gap in growth rates widened between London and the rest of the country reflecting the increasing prominence of the capital in key service sectors, all of the other regions were able to grow and make a positive contribution to aggregate economic performance.

Figure 4.2. **Gross value added (GVA) per head change, 1995 and 2008**



Source: Office for National Statistics (ONS) (2009).

Figure 4.3. **Gross value added (GVA) per capita by region, 1995 and 2008**



Source: Office for National Statistics (2009).

Indeed, the total contribution of the United Kingdom's less performing regions was about 57% of total national output in the period before the economic crisis and there are considerable underlying opportunities for further growth in these regions (OECD, 2011).

Whilst this progress has been made, there are long-standing issues of concern which need to be addressed in many of these regions. By way of example, Table 4.1 provides a sense of the vulnerability of employment in the various regions to deficit reduction in the public sector. The less diversified regions of the three UK nations and the regions of the north and Midlands have taken the brunt of the impact of cuts in public sector employment.

Table 4.1. **Estimated job losses as a result of the public spending cuts**

	Count	%
Northern Ireland	36 000	5.2
Wales	52 000	4.3
Scotland	95 000	4.1
North East	43 000	4.1
North West	108 000	3.7
Yorkshire and the Humber	82 000	3.7
West Midlands	80 000	3.6
East Midlands	58 000	3.2
East of England	74 000	3.2
South East	112 000	3.1
London	122 000	3.1

Source: PricewaterhouseCoopers (2010), "Sectoral and regional impact of the fiscal squeeze", PWC.

Performance of urban areas

Underpinning these recent developments in the UK economy is the growth and consolidation of service and knowledge sectors, particularly as London became one of the key global financial centres in the 1980s, and the deregulation of the City of London (Ward, 2010) combined with transition in the north from its previous industrial economy.

However, imbalance is not a recent phenomenon. Over the last 140 years, London's GVA performance has been higher than elsewhere in the United Kingdom (BIS and CLG, 2010; Tomaney and Richardson, 2010). Regional imbalances reduced in the post-war period up to the 1970s, but since then, regional differences have increased,[5] coinciding with intensified trade liberalisation internationally and an increased focus on financial and legal service sectors within the United Kingdom.

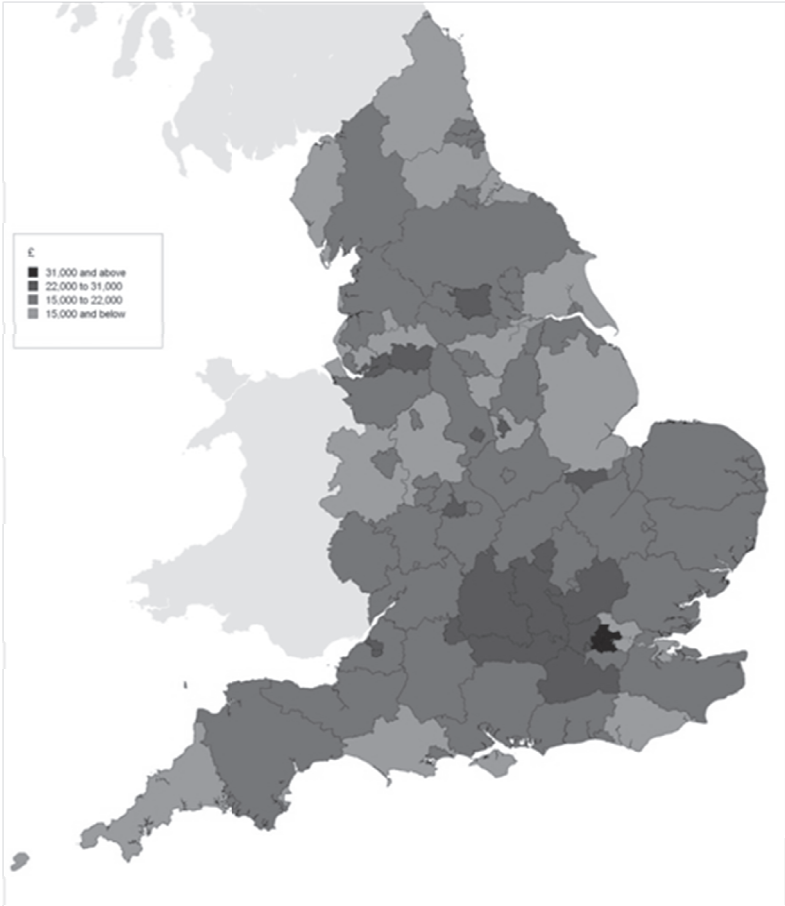
And within this overarching story, there is genuine complexity. Nuanced examination reveals differences both between and within regions, with different parts of the economy coming to the fore and different parts ebbing as the national economy has changed.

Overall, whilst there is a common history of unfinished industrial change and transition which binds those parts of the country which are the home to England's industrial base, in particular the north of England and its constituent towns, cities and regions, and the West and East Midlands, regional level data can also obscure diversity of performance. There are economic hotspots across the country, including in particular urban hotspots in the most lagging regions, which have performed very well in recent years – as they have diversified their economy and built levels of employment, skill, business growth and investment. In some cases, and on some indicators, they have outperformed similar places in the south. For example, Figure 4.4 highlights different levels of performance in terms of GVA per head across England in 2007.

It is important to note as well that there is also significant diversity in the south of England. Problems of unemployment and constrained growth similar in character to those of the north and Midlands can be observed in some parts of the south, driven by industrial change and spatial restructuring. However, other problems are very different, such as housing price pressures, congestion and exaggerated local inequality, particularly in and around London. These create policy concerns, especially in an era when sustainability is an increasingly important priority, and many of the interventions which are evident in the south are linked to the management of growth, or the management of the environmental and social issues. As this agglomeration continues to grow, negative externalities and inefficiencies may arise (OECD, 2009) and the re-balancing rationale also becomes resonant from the perspective of managing these pressures.

Looking in particular at the experience of the north of England, over the decade which preceded the recession, there was a significant turn-around in the economic fortunes of the major urban economies – around Manchester, Leeds, Newcastle, York and Sheffield in the north and other cities like Bristol and Nottingham. The service sector economy strengthened, new industries emerged and existing assets restructured and moved up the value chain. A number of distinctive assets are now evident and a focus for future investment and jobs (OECD, 2008; SQW Consulting, 2008). City centres have been regenerated and levels of growth and employment in some areas were amongst the best in the United Kingdom during the period before the economic crisis.

Figure 4.4. **GVA per head by NUTS 3 region, 2007**



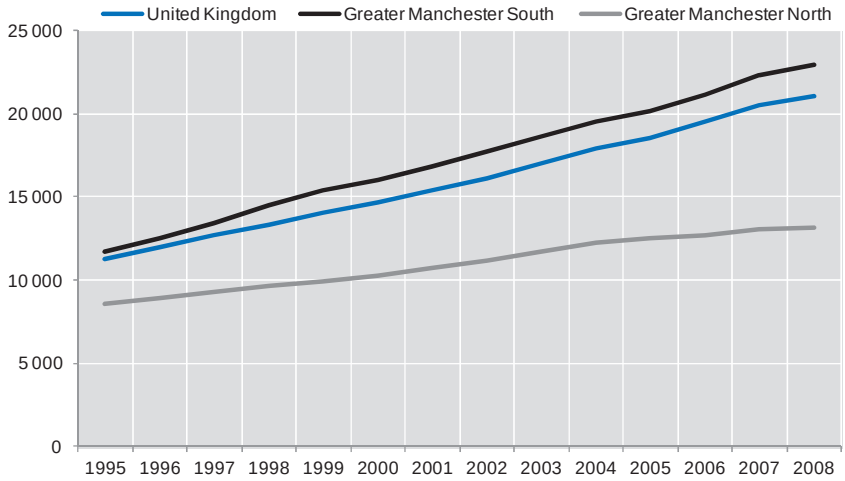
Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: BIS and CLG (2010), "Understanding local growth", *BIS Economics Paper No. 7*, available from *www.bis.gov.uk/assets/biscore/economics-and-statistics/docs/u/10-1226-understanding-local-growth.*

But challenges remain within these urban economies. By way of illustration, Figure 4.5 shows performance of GVA per head in the Greater Manchester City Region, arguably the most economically successful of the northern cities. It contrasts the performance of the south of the territory which includes many key economic sites including the airport and the university corridor, which exceeded the national average in 1995 and accelerated the gap in the ten years which followed, with the north, which

includes a number of areas of Manchester city centre and surrounding towns where there is much more to do to connect people to economic opportunities and to address unemployment and deprivation.

Figure 4.5. **GVA per head in Greater Manchester North and South**



Source: Office for National Statistics, 2009 prices.

This pattern would be found in common in other core cities in the north such as Leeds and Newcastle. And whilst other parts of the north and Midlands struggled through the recession, there has remained considerable resilience within these key economic centres which are significantly better positioned for recovery, as a result of their development in the last decade, than they were after previous downturns.

Nevertheless, it is recognised that however well these places have performed, London's significant advantages in scale and the concentration of economic assets, combined with ongoing restructuring of key growth sectors in the United Kingdom, explains the steady growth of the economic mass around the Greater South East into the East of England and East Midlands. In fact, economic analysis has suggested that, in the UK context, other urban centres have yet to achieve the scale that could be expected to maximise their economic potential (Overman et al., 2009).

For policy makers seeking to develop a strategy for growth in the face of recession, this combination of recent strong performance in urban centres and their surrounding hinterlands, combined with evidence that there is still

more potential in these centres, has provided a strong rationale for the current focus on them.

The role of "places" in sub-national economic governance

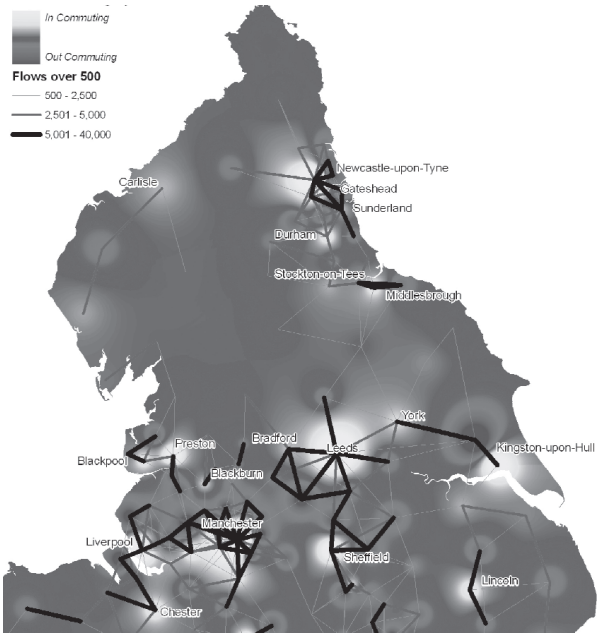
As has been noted earlier, the focus on urban economies in the United Kingdom given by the current government is not new. There is a strong measure of continuity in the focus on "functional economic areas" from a number of previous papers at European and national level (European Commission, 2005; Harding et al., 2006. In the United Kingdom, the Core Cities Network has been particularly active making the case for a stronger focus on the potential of urban economies (ODPM, 2003).

Within the north of England, the potential of the city regions was at the heart of the Northern Way Growth Strategy (Northern Way, 2004), a pan-regional economic strategy published in 2004 which aimed to improve the overall performance of the north of England as it continued its long-term economic transition. Eight city regions were identified within this document as both a growth opportunity for the north and a diversification opportunity for the wider national economy. Within a wide-ranging strategy aimed at identifying and exploiting the north's existing and potential assets, promotion of a strong focus on these city regions was central, given their collective contribution of the growth and jobs to the three northern regions. The Northern Way made a particular contribution to wider efforts to promote collaboration at the scale of the functional economy, by encouraging and supporting the development of practical, evidence-based city region development programmes in all eight urban areas.

In generating the underpinning evidence to support this programme of work, a number of researchers examined the current performance of the functional economic areas of the north of England and drew conclusions about their relative scale and strength. In their report, two teams from the University of Manchester identified the main urban economic areas in the north of England and their mass, scale and inter-connectedness as reported in Figure 4.6 (IPEG and CUPS, 2008).

The Manchester team identified a clear performance hierarchy in the north, with Leeds and Manchester the most strongly performing, and Sheffield, Liverpool and Newcastle the next strongest focus for economic growth. Data issues, such as the limited availability of information on economic performance at a small geographic scale, made some of this work challenging. More consistent availability of statistical information to monitor performance of functional urban areas would help significantly to build evidence at different geographies and aid efforts to measure performance and development of these territories.

Figure 4.6. **Spread and scale of the main northern urban economies**



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

Source: IPEG and CUPS for the Northern Way (2008), "The Northern Connection: assessing the comparative economic performance and prospects of northern England", University of Manchester.

In work that followed, a team led by the Work Foundation for the Northern Way identified the levels of economic interaction within the boundaries of six of the eight northern city regions, observing varying levels of local economic integration and highlighting local opportunities to strengthen density around local economic assets (Work Foundation, Centre for Cities and SURF, 2009a).

Both of these research programmes emphasised the importance of focusing on the functioning of the economy within these economic areas. These and other studies highlighted the importance of factors such as land for business and residential development, the attractiveness of housing stock and wider environmental factors (Tribal, 2009), the importance of key digital and transport infrastructure (Richardson and Tranos, 2010), and the role of business and research-based networking in promoting economic performance (OECD, 2008).

The work continued to identify the importance of an integrated approach to economic development and planning, with key co-ordination required through the city region around the housing market and wider infrastructure, to support innovation and business growth, and to understand and support business and sectoral linkages.

The issue of policy co-ordination at this scale was widely recognised as an ongoing challenge, in particular between economic development and spatial planning. The previous government's *Review of Sub-National Economic Development and Regeneration* (SNR, see HM Treasury, BERR and CLG, 2007), which reported in 2007, aimed to provide new mechanisms for securing this, at both regional and city region level, and also to provide the machinery for stronger collaboration with central government departments (HM Treasury, 2007). Parts of a package of reforms were put into place before the 2010 general election, for example multi-area agreements in a number of areas and city-region pilots in Manchester and Leeds were formally announced in the 2009 budget; however, the rest of the package was discontinued as the coalition government elected in 2010 set about its own strategy.

Nevertheless, whilst the coalition government has significantly trimmed back on the wider agenda and created a different institutional framework, many of their proposals and reforms can be rooted on parts of the same evidence base – promoting the need to focus economic development activities on local "functional economic areas" and a strengthening focus on urban areas.

As a result, for a group of key northern city regions in particular, but also in other parts of the country, the emerging LEP geography represents significant continuity from the previous arrangements which have evolved from the bottom-up to work on the issues. Whilst local enterprise partnerships aim to address the accountability gap exhibited by RDAs by linking them strongly to local government, they also borrow from the RDA approach by aiming to engage a business-focused approach, with private sector leaders taking leadership roles. Many of the more embedded and long-standing bottom up processes and institutions, such as the Combined Authority in Manchester, and city region structures in Leeds and Tees Valley, have been able to adapt to this new landscape with the shared overall aim of mobilising local government and business to work together through the partnerships at this scale.

It can be assumed, therefore, that there is an apparent consensus of the value of working with the functional scale as an important level for sub-national policy design. This raises two questions which go to the heart of the *Redefining Urban* project presented in Chapter 1: how do we measure

the performance of these new emerging territories given their nature and given the challenges mentioned earlier about current measurement scales and data availability; and how do we deal with other functional economic challenges which do not fit with local functional economic areas? These two issues will be addressed in the following paragraphs.

Performance measurement of functional economic geographies

As was discussed earlier in this chapter, comparative measurement at administrative scales within a national economic context only gives a partial view of performance issues within and between regions and localities.

It inevitably compares the performance of very different economic areas. In recent years, as it was illustrated earlier, whilst urban centres in the United Kingdom have made significant progress in addressing long-term economic challenges, the strong performance of an already dominant South East has meant that, absolute improvement at urban level is not clearly recognised amongst figures which focus on the relative position at regional level. However well the northern city regions mentioned earlier performed during this period, because of the structure of the national economy and the system of comparative performance at an administrative regional scale, the "north-south" divide continued to widen.

This is not to say that inter-regional comparison is not useful; these issues of imbalance and inter-regional inequality are important for both the region concerned and for understanding imbalances within the wider national economy. But a complementary framework for examining the contribution, performance and potential of different economic geographies with different assets and histories, can provide opportunities for more "like with like" benchmarking, which has the potential to add significant value.

However, direct comparison between functional economic areas is problematic. Aside from practical issues about short-term data collection and availability mentioned earlier, there are also issues about the relative scale and structure of functional economic areas which make comparison and benchmarking difficult and the fact that these functional economic areas operate within unique national systems with important exogenous impacts. Further complexity derives from the fact that the boundaries of these territories are not fixed (like administrative boundaries) and that, through a combination of planned change and market developments, there will be continuing shifts in the boundaries of labour markets and housing markets.

A further, more general, issue is the question of what would be measured as indicators of performance at that scale. In the context of long-term global challenges, there is increasing agreement that policy should not only focus on economic performance, but address issues of quality of life and sustainability over different time horizons. There is an increasing interest in measuring sustainable economic performance, taking into account and balancing economic, environmental and social goals.

As it develops, the *Redefining Urban* work programme therefore has the potential to make a significant contribution to addressing this combination of complexities, and by adding an additional performance measurement tool for policy makers. The features of the system which could add value in developing this horizontal measurement proposition would include:

- a common methodology for defining the scale and spread of urban functional economic areas at different scales and for understanding change over time;
- the creation of a basis for international comparison of the performance of these areas, by identifying them into a taxonomy or groups of areas which are broadly similar in terms of scale and character, to enable comparison of "like with like";
- an agreed basket of measures which can be reported by national statistical services at these functional scales on an ongoing basis to enable comparative performance across economic, social and environmental indicators.

The use of commuting as an indicator to define scale as proposed in the methodology is a recognised method and responds to the potential availability of data and is policy relevant, articulating to areas where public policy can genuinely influence development, through decisions on, for example, transport, spatial planning and housing.

For UK policy makers and researchers, the prospect of being able to compare the performance of places like Manchester, Bristol and Newcastle horizontally with comparable functional urban areas in developed economies across the OECD, using a recognised definition of scale and a standardised data set, would offer opportunities for statistical benchmarking, which could also lead for more in-depth comparative review.

Whilst it will always be the case that comparison between two places will need to take into account differences between those places, and indeed the impact of wider national performance and policy, given the increasing focus on functional economic areas, it would not only enable comparative assessment of the performance of individual urban economies over time, but

it could also have the potential to benchmark the impact of policy on a thematic basis in the wider group of urban economies.

Looking beyond local functional economic areas

But as this methodology is being developed and put into place, it is worth noting that other sub-national functional patterns also merit attention, and that a focus on these might lead to further and different thinking about the shape of local functional economies.

Economic functionality exists at wider scales in between national and local levels, and policy systems need to be able to recognise and work with these geographies as well as local ones. Looking at the available evidence for the United Kingdom, and in particular from the north of England, some of these are specific to the urban structure of the United Kingdom, and others offer further challenges to the OECD as it develops its suite of tools.

The scale of functional economic areas (FEA): one of the key challenges for this work has been to identify a way of defining the scale of functional economic areas. The generally accepted method of definition is the spread of, and linkages within, the labour market. The indicator which is most useful, and generally accepted, in measuring this spread is commuting. For the United Kingdom, this is in line with previous approaches and underpins the rationale for most of the key LEP geographies in England.

In order to boundary FEAs, the OECD team has worked to define a common threshold which can be adopted across the OECD to identify when a level of commuting can be understood to indicate the existence of an FEA. It has adopted indicators which recognise economically linked cores which cross administrative boundaries and linkages with adjoining areas and economically linked, but non-adjoining, areas at 15% of the workforce commuting. These thresholds have been tested in 28 member countries and are set at a level which "looks right", based on a general understanding of the functioning of urban economies across the OECD.

Applying these thresholds in the United Kingdom would lead to a map of functional economic territories in both the South East and many parts of the north which looks somewhat different to those which underpin current LEP geographies. If the rationale for structures such as LEPs is to genuinely work with the grain of the economy, this analysis would suggest the need to hold current LEP territories under review.

However, this also suggests the need for examination of issues of potential for growth in spread and density. This issue is examined below in the discussion of polycentricity.

Other local and sub-national functional geographies: as has been set out above, whilst this focus on labour market scale is derived from a commonly accepted understanding of FEAs, it is not the only sub-national functional geography which can be observed. The City Relationships research (Work Foundation, Centre for Cities and SURF, 2009) also worked to map and measure the patterns within the key economic sectors of the various city regions in the north of England in order to develop a wider understanding of economic functionality.

In Liverpool, for example, the important maritime industry has a spread across the wider city region and has complementary sectoral activities spreading across construction, logistics, education and legal services. At the same time, Liverpool has emerging digital and creative sectors which are more concentrated around the centre of the city, around the academic institutions from which they emerged.

Figure 4.7. **Map of key maritime, creative and digital sites in Liverpool City Region**

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

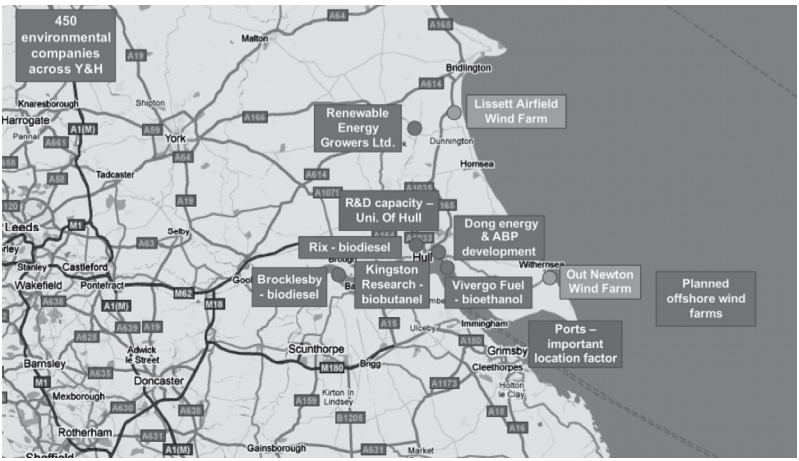
Source: Work Foundation, Centre for Cities and SURF (2009b), "City relationships: economic linkages in northern city-regions: Liverpool City Region", Northern Way, Newcastle upon Tyne, United Kingdom.

However, beyond this urban core, there is a wider functional economic geography linked to Liverpool which makes an important contribution to the Liverpool economy, extending to places such as Chester and Warrington which offer linked manufacturing and services sector capacity. Indeed, Liverpool City Region has recognised this within its own structures in the past, maintaining both "core" and "wider" city regional groupings to deal with issues affecting co-ordination across business sectors (Mersey Partnership, 2009).

A different set of challenges can be illustrated around the city of Hull, and the Humber Port towns on either side of the River Humber. The labour markets in these areas are fragmented, with relatively localised and isolated urban economies focused on manufacturing and port activities. But there are common issues affecting economic development of key sectors such as shipping and the emerging focus on renewable energy, which require policy co-ordination at a wider scale than labour market spread would justify, in particular focused around the river and the estuary and spatial planning around these natural assets. This has long been regarded as a genuine functional economic corridor (see Figure 4.6).[6] These issues found strong echo within the debates about different options for the formation of the local enterprise partnership structures in that part of the north.

Figure 4.8. **Key sites and linkages for renewable energy and logistics sectors**

Hull and Humber Ports



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

Source: Work Foundation, Centre for Cities and SURF (2010), "City relationships: economic linkages in northern city-regions: Hull and Humber Ports", Northern Way, Newcastle upon Tyne, United Kingdom.

Polycentricity: the OECD report also comments on how, as a result of ongoing market processes, agglomeration in stronger economic areas, such as the South East of England, has evolved over decades to produce a situation whereby production capacity in the wider functional geography has organised itself into different, but complementary, economic patterns in key towns and cities around London. Interlinked places have evolved differently, but complementary economic roles, with transport, skills, productive capacity and housing markets evolving in response to changing economic conditions. As has been recognised in other work, the same pattern has been emerging around other city regions in England, but to a far lesser extent to date.

It is recognised that this emergent polycentricity within the wider urban system has facilitated and spread growth, dynamism and resilience of the South East economy, and this resilience has been evident in the impact of the recession. This offers a platform for focused thinking, in the context of the policy objective to rebalance the economy, on whether there is potential for interventions to foster complementary and diverse economic roles for other urban centres outside of the South East, within a wider polycentric urban system. Could such a process be accelerated by policies which can stimulate integration and role definition?

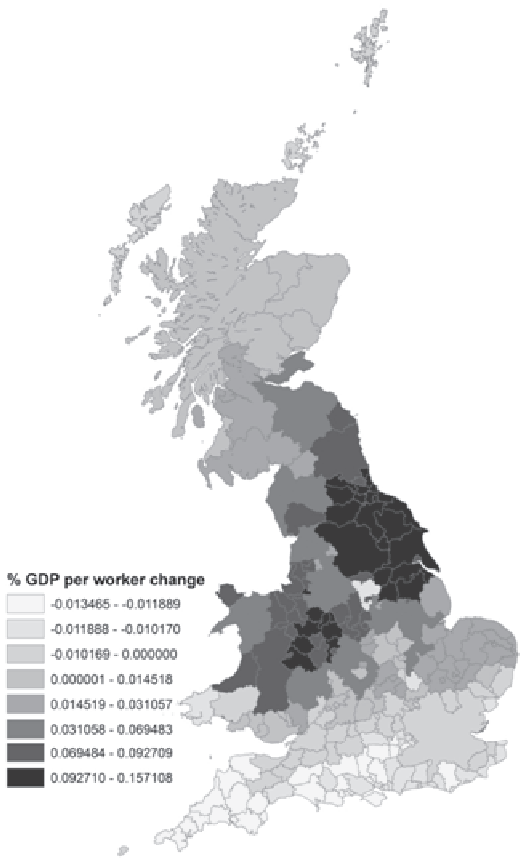
In this context, it is interesting to note that one recent significant study of the linkages around the central belt of the north of England has suggested that commuting between Leeds and Manchester is currently at a level some 40% less than might otherwise be expected compared with eight other pairs of UK city regions, and that the explanatory factor underpinning this is a combination of transport price and time costs. Given that the distance between the two centres is about 40 miles, addressing these constraints is possible through a combination of transport and planning interventions. Given current economic concerns, it is also notable that the same piece of research has suggested that addressing this issue and promoting stronger integration between the labour markets of the two city regions could realise additional growth for the north of England of GBP 6.7 billion (Overman et al., 2009; see Figure 4.7).

This is just one example of a number of functional economic opportunities and challenges which lie out with the current focus in the United Kingdom on local functional economic areas and which require policy thinking at a wider scale. There are other examples of key parts of the economic infrastructure, roads, rivers, water supply routes, energy supply infrastructure, which link and straddle these urban geographies but which remain crucial to their development. There are also shared assets such as surrounding rural spaces which are crucial to the economic futures of the different city regions, providing significant tourism assets, as well as key

supplies of food, water and energy, key sites for waste disposal and key opportunities for managing risks, for example from flooding.

Figure 4.9. **Increase in productivity by reducing travel time between Leeds and Manchester**

% change in GDP per worker due to a 20-minute reduction of travel time

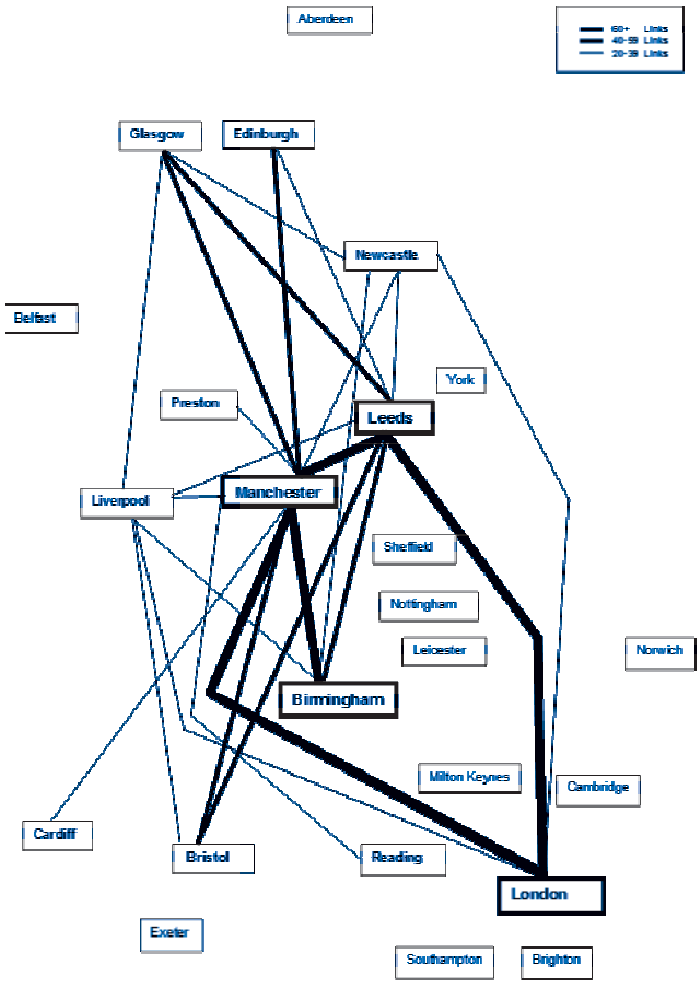


Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: Overman, H. et al. for the Spatial Economics Research Centre and Northern Way (2009), "Strengthening economic linkages between Leeds and Manchester: feasibility and implications", Northern Way, Newcastle upon Tyne, United Kingdom.

Indeed, in the northern context, looking at the scale of some of the north key growth sectors, evidence suggests that analysis of their structure needs to be taken forward at different scales beyond those of the LEPs. In the key financial and legal services sector, analysis by IPEG and CUPS (2008) recognises linkages and interactions at national scale (see Figure 4.10). However, in other sectors, there are significant clusters and supply chain opportunities which northern places hold in common and imply animation at that scale.

Figure 4.10. **Structure of the United Kingdom's financial services sector**



Source: IPEG and CUPS for the Northern Way (2008), "The Northern Connection: assessing the comparative economic performance and prospects of northern England", University of Manchester.

For example, recent analysis in the nuclear sector provides one example of how some of these could be best addressed at a wider functional scale than the local functional economic area, but one which is narrower than the national scale (Dalton Nuclear Institute, Manchester Business School and Nuclear AMRC for Northern Way, 2011).

Assessing potential: taking these two points together, the *Redefining Urban* measurement system could, over time, not only provide information to enable comparison between existing functional economic areas but, through comparative assessment and through further development to look at wider issues of economic functionality, provide insights into policy issues at wider territorial scales which could be targeted to improve aggregate performance.

From a policy perspective, this does raise the question about how this work at a wider scale can be taken forward, to provide this analysis and to manage the practical actions to take advantage of opportunities. In the current UK context, this could be fostered by groups of LEPs coming together or by partnerships between LEPs and central government or by business-led consortia working with a wider network of partners to focus on opportunities and challenges where there are overlaps as a result of shared existing or potential assets. Looking for examples from elsewhere, the German Spatial Planning Framework, for example, currently highlights both shared innovation assets and natural resources which cross the boundaries of existing authorities (Sinz, 2009), and there is a crucial role played by the regional and local authorities and agencies in identifying, assessing and promoting them and then following through on delivery.

Conclusions

The *Redefining Urban* project offers a new and significant tool for economic research which is highly relevant given an increasing direction of policy to focus on urban systems and the benefits of benchmarking in helping to shape and evaluate policy thinking. Successful completion of this stage of the work and further development in the future has the potential to enable useful comparative analysis across OECD member countries between urban economies of different scales.

But there are also challenges for the research deriving from the dynamism of the development of local economies and also in the need to recognise that there are different types of functional relationships between places, the geographies of which overlap the most widely used definition built around labour and housing markets.

In addition to these research challenges, the *Redefining Urban* programme also implies challenges for policy makers. Given the dynamism and diversity of local economic systems, policy makers need to think carefully about how they design systems of governance and leadership around functional economic areas to ensure that institutions can address the right issues at the right scale.

The recent approach in the United Kingdom has been to shift boundaries and shape administrative geographies in an attempt to map leadership to economic systems. An important insight from the body of work reviewed in this chapter is that in a context of dynamism of economic systems and differing maps of economic functionality, this will be an ongoing challenge.

Economic governance requires systemic stability, endowed with the relationships, skills, capacities and resources to focus on issues and opportunities. A key question is, therefore, how to build on the current institutions to secure this stability and how to endow institutions with the relevant capacities they need to ensure that they can address different functional issues, which are likely to span different geographies, effectively.

Notes

1. Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield.
2. See *www.communities.gov.uk/publications/regeneration/growthcities.*
3. The Localism Act received Royal Assent on 15 November 2011.
4. This does not affect Scotland and Wales where devolved administrations have powers in this area. However, separate national initiatives are also being pursued in these countries. For example, see Scottish Government (2011).
5. The narrowing or deepening of regional differences are known as convergence and divergence respectively.
6. See Work Foundation, Centre for Cities and SURF (2010).

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A NEW WAY TO MEASURE METROPOLITAN AREAS

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