URBAN EUROPE

URBAN MEGATRENDS: TOWARDS A EUROPEAN RESEARCH AGENDA

A report by the Scientific Advisory Board of the Joint Programming Initiative Urban Europe:

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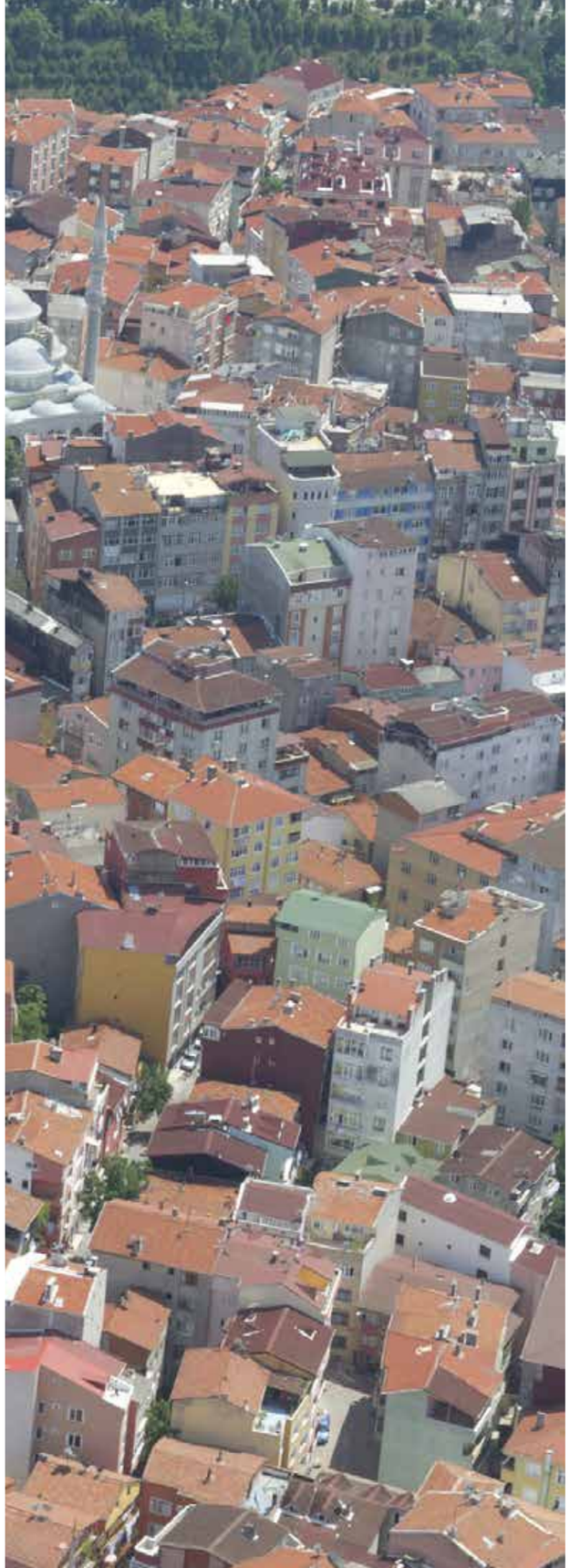


Content

2 Introduction

3 Global Trends
3 Introduction
3 Globalised economy
4 Geopolitics and conflict
5 Demographic change
5 Social inequalities
6 Global environmental change
8 Urbanisation

9 European Trends
9 Introduction
9 Economic development
11 Governance and government
12 Demographic change
14 Climate change mitigation and adaptation
15 Urbanisation
15 Transport

17 City Functioning
17 Spatial dynamics
17 Metabolism
19 Infrastructures and smart cities
20 Social tensions, welfare and inequality
21 Culture, heritage and tourism
22 Urban governance and planning processes

23 European Urban Research
23 Key trends and challenges
24 A framework for Urban Europe research

25 References

Introduction

Evidence of the first urban settlements can be traced back a couple of millennia. Until the end of the 18th century, however, cities remained relatively small in size and contained a small proportion of the overall population. However, from this point onwards, the process of urbanisation - the movement of people from the countryside to the city and the rapid development of the built environment and urban infrastructures - accelerated in conjunction with industrialisation. In Western countries, cities became the drivers of regional and national economies and the proportion of the population living in urban settlements rapidly increased throughout the nineteenth and twentieth century. At present, we are witnessing an economic slow down in the developed and largely urban economies of North America and Europe and unprecedented growth in South America, Africa and especially in the rapidly growing economies of Asia. These Asian Tigers are also experiencing mass rural-urban migration, as their citizens search out employment opportunities and better living standards for themselves and their families. Indeed, the global urban population is forecast to more than double by 2050, turning the human condition into an urban condition, with more than 90% of this larger urban population being accommodated in developing countries.

Europe is already around three-quarters urbanised and its citizens enjoy, on the whole, high standards of living and good access to healthcare and welfare services. However, public services are deteriorating and the welfare state is being eroded; inequalities are rising; the population is aging; and the livelihoods of cities are becoming increasingly sensitive to the vagaries of extreme weather events. Urban governance is facing new and multi-scale challenges and responding to these effectively may require hitherto unknown degrees of cooperation and indeed co-creation, as urban settlements gear up to accommodate these challenges. Effective decision making will also be contingent upon a comprehensive and holistic understanding of how cities function and of which types of strategy for change will be most effective at achieving targets that better articulate social, economic, political and environmental aspirations.

Renewed approaches to urban research and to urban governance are required to address these multifaceted challenges and the changing nature and scale of the “urban”: from cities and urban agglomerations to wider urban regions; increasingly subject to flows of energy, materials, information, finance and people. In this report we discuss these changes and the challenges facing urban societies, with a view to identifying the most relevant and pressing research and innovation priority areas.

We begin by discussing global trends, focussing initially on the interrelated processes of demographic change, globalising economies, social inequality, technological innovation and environmental change; identifying broad global challenges. We then focus on the role cities play, how they are affected by these global trends and at the same time how they contribute to shape them.

In the second part of the report, we examine the challenges and opportunities associated with these global trends within the European context, highlighting the impacts of political and economic transitions as well as the pressing agenda for climate change adaptation and mitigation. We then reflect on the main facets of city functioning (the drivers of urban economies and revenues; how cities metabolise their resources: energy, matter, finance, information; the infrastructures and services that support and drive these metabolic processes; the dynamics of urban societies) and on the interactions between these dimensions. In the fourth, concluding part of this report, we identify some of the key challenges that need to be addressed by the European urban research community in the short to medium term and outline a research framework by which they may be realised, throughout the lifecycle from basic research advances through to their translation into utilisable techniques and technologies and actionable policy measures.

Global Trends

INTRODUCTION

It is thought that the first substantial human settlements started to form around 10,000 years ago, as humans cooperated in agricultural activities. Such collaboration increased steadily accompanied by the trading of goods and exchange of knowledge so that by 1800AD the urban fraction of the 0.5B strong global population stood at around 10% (Sachs, 2008). The Industrial Revolution transformed how societies were organised. As new industries grew they required and attracted large, concentrated pools of labour and associated urban infrastructure. The urban centres that developed provided dense new markets for new commodities and became hubs of trade and commerce and the drivers of economic growth. At the same time, mechanisation of agriculture massively increased the area of land that could be sewn and harvested, fertilisers replenished soil nutrients and pesticides reduced crop losses, and reduced the numbers of workers needed to work the land. This in turn enabled a greater proportion to live in urban settlements and engage in other productive activities. The urban fraction of the global population (Fig 1.1) has increased from around 13% in 1900 until parity was reached with the rural population in 2007.

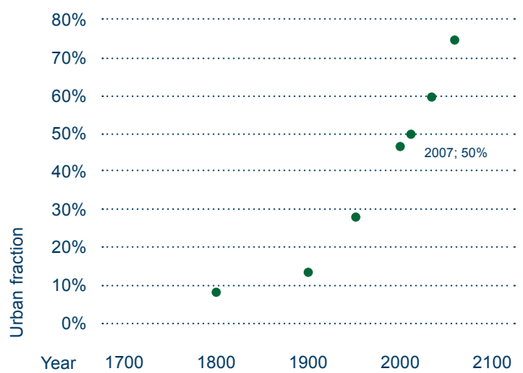


Fig 1.1 Growth in the urban fraction of the global population (Based on Robinson, 2011)

The United Nations (2012) estimates that the global urban population will increase from 3.6B in 2011 to 6.3B in 2050, with almost 90% of this increase taking place in developing countries, whose urban population is set to almost double from 2.7B to 5.1B. Developing countries are expected to accommodate more than the 80% of the global urban population by 2050, as rural-urban migrants search out a better quality of life for themselves and their families.

GLOBALISED ECONOMY

The economic processes of globalisation, whereby people, places, regions and countries become both more interlinked and interdependent, have been in progress for many centuries. Since European colonisation and industrialisation the scale and depth of interconnections and interdependencies have increased rapidly, with the development of trade relations between locales, spatially-extensive markets, and the creation of multinational companies. From the 1970s onwards economic globalisation has been further accelerated through the end of the Cold War and China’s move towards global capitalism, the use of structural adjustment programmes which made developing countries more export-orientated and open to overseas competition, the development of supranational bodies such as the World Trade Organization and trade agreements that reduce barriers to investment and trade, and innovations in telecommunications and transportation that increased the speed and volume whilst reducing the unit costs, of cross-border interaction. Together these have helped make political borders and geographical distance less relevant to commodity production and trade, monetary investment, and commodity consumption than previously. As such, whilst each place around the globe has a functioning local economy, this set of economic relations are bound into chains of logistics, inter-firm connections, flows of global finance, and firm and political decision making at a variety of scales. The global economy

is thus characterised by increased extensity (long distance transborder connections), intensity (inter-dependence and functional integration), velocity (the speed at which connections can be made and used), and impact of relations (changes in one part of the world affecting distant localities) (Held *et al*., 1999). This trend of economic globalisation is set to persist given the continued emphasis on open trade and the unhindered circulation of capital.

A key aspect of economic globalization has been increasing urbanization accompanied by an impressive growth of transport demand, both of people and freight. Cities provide key sites of agglomeration for production (labour, skills, services) and markets, as well as fixed sites of investment for capital in the form of property and infrastructure. They thus attract flexible capital and migrant labour and grow as the local economy and global interconnections expand. Cities are becoming evermore interconnected given the transportation, communication and transnational service links between them, creating what Taylor (2003) terms a world city network. Nevertheless, it is well recognized that globalization creates uneven development, so that whilst many cities around the world are growing rapidly, others are stagnating, and some are in decline, most notably in Eastern Europe and the rustbelt of North America. In recent years, many developing countries have been experiencing unprecedented economic growth, accompanied by very rapid urbanisation. The total gross domestic product in PPP (Purchasing Power Parity) terms of the E7 states, the world's leading emerging economies (China, India, Brazil, Mexico, Russia, Indonesia and Turkey) is predicted to overtake that of the developed nations group, the G7 (US, Japan, France, Germany, Italy, UK and Canada) within a few years. The E7 group is also forecast to become 75% larger than the G7 by the middle of the century (PwC Economics, 2013). The position of these emerging economies in international finance is escalating (KPMG, 2013), changing the direction of global business activity, spending power and the trade and the flow of commodities, as well as the political landscape (PwC Economics, 2013).

GEOPOLITICS AND CONFLICT

Geopolitics concerns how political and legal decision making and processes shape regional and world politics, inter-state relations, and conflict over territory, resources and ideologies. In addition to national governments and systems of governance, since the Second World War and the formation of the United Nations and its various agencies, and the Bretton Woods Agreement that led to the World Bank and IMF, there has been an increasing trend towards multi-scalar systems of institutions and organizations, inter-governmental organizations, international NGOs, shared military alliances (such as NATO) and supra-national bodies (such as the many elements of the European Union) that shape how territories are governed and managed.

These bodies work to create stable global geopolitics that prevent conflict and facilitate and regulate the flows of people, goods and services between jurisdictions. Nevertheless, there are still numerous sites of political discord around the world, with many wars taking place and contestations over territory, differences with respect to how societies are managed and governed, and variations in accessibility to resources such as energy, food, and water. With regards to the latter, Michael Klare (2002) argues that future conflicts will be less driven by ideology, as they were in the Cold War, but more by the race to gain access to key resources. Climate change, resource depletion and phenomena such as peak oil, it is contended, will intensify the prospects of such conflicts.

Armed conflicts affect processes of urbanization by shaping flows of investment and migrants, and by causing destruction of built environments. Moreover, political power at the regional and global levels is shifting with the rise of the E7 and other developing countries as their economies grow and they exert influence on other locations. For example, China has become a significant influence on African countries given its investments into national economies (Carmody, 2011). At the level of nation states, urban regions and cities have been gaining more autonomy in shaping and driving policy related to their jurisdictions, with city mayors in particular seen as being key actors in urban governance (Barber, 2013). Over the next fifty years the geopolitical world order will continue to be reshaped, with knock on consequences for cities. City governance will be increasingly enmeshed within multi-scalar systems of governance that run from the local to global levels.

DEMOGRAPHIC CHANGE

Demographic change results from a combination of migration, both rural-urban and cross-border, as well as due to gradual changes in life expectancy and birth rate. The global population is currently estimated to be 7.0B, but further growth is expected until 2050, when the population is forecast to peak at 9.3B (United Nations, 2011; United Nations, 2012). This growth is linked with economic development and associated improvements in living conditions, including food security and health services. Thus, mortality rates are decreasing and the population ageing. Worldwide, the population aged 60 or more is growing at a faster rate than is the population of younger adults and children. It is expected, that the share of 12% in 2013 will grow to 21% in 2050. This development will impact on the labour market, housing, services, consumption patterns (United Nations, 2013); as well as care provision for the elderly.

Although the population is globally increasing, this continued growth will be concentrated in developing countries, whilst fertility rates in many of the more developed economies are already reducing. At present, in approximately 90 countries (amongst them, many European countries), the fertility rate has stabilised at around 2.1 (the natural replacement rate) or below.

The number of megacities, those with a population of 10 million residents or more, increased from 2 to 23 between 1970 and 2011. The majority of these megacities are located in developing countries, with 13 in Asia alone; a continent that is expected to gain another 9 by 2025 when it is estimated that there will be a total of 37 megacities (United Nations, 2012). Besides these immense concentrations of population, urban growth is also taking place in smaller urban areas. According to UN statistics urban areas with 500k inhabitants are home to around half of the total urban population (United Nations, 2012). These urban areas perhaps provide more straightforward opportunities to deliver diverse, appropriately dense, well serviced and liveable environments and thus to maximise their sustainability; given the means and knowhow to do so.

SOCIAL INEQUALITIES

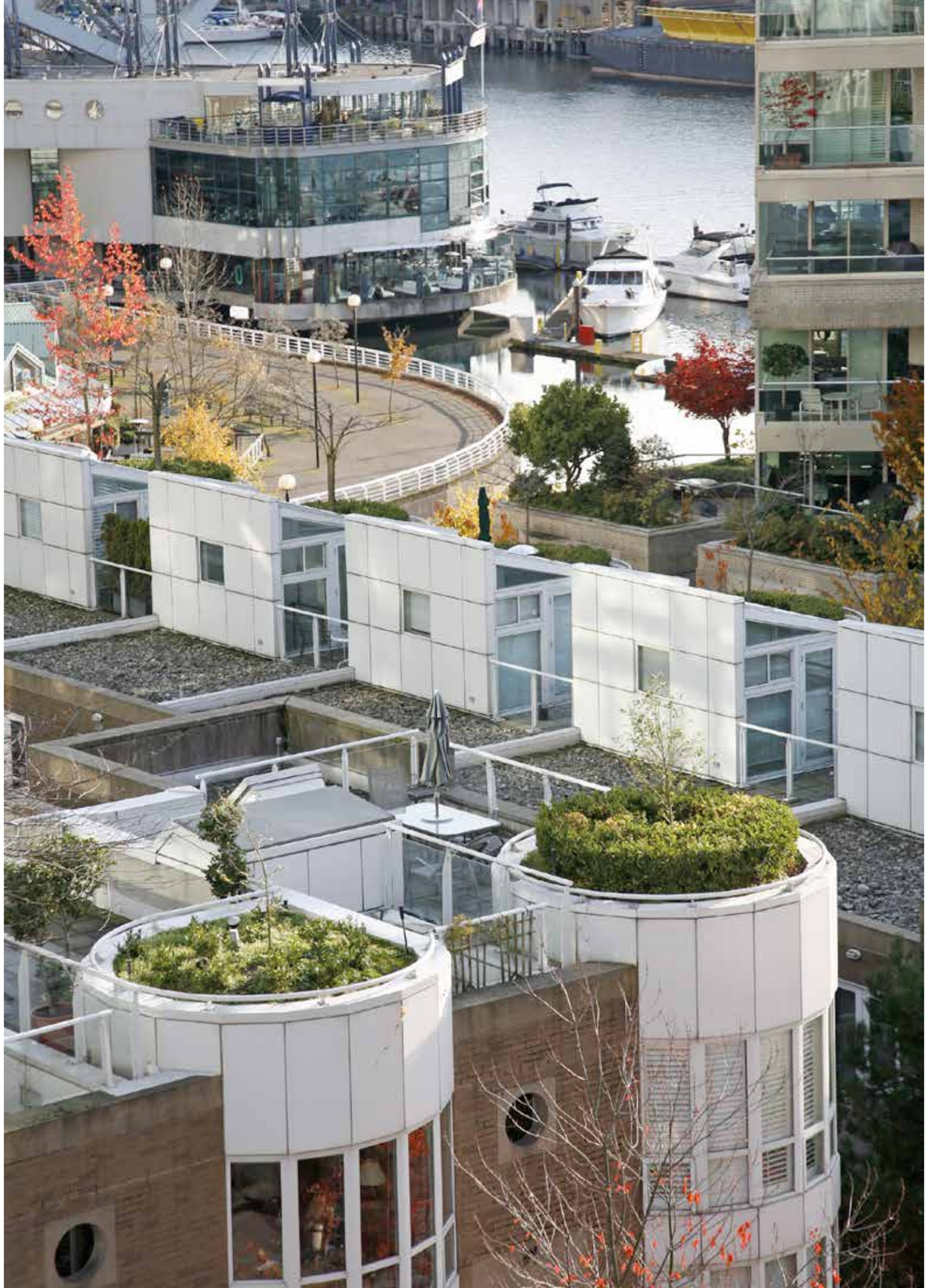
As nodes of regional, national and increasingly global economic and population flows, cities have historically been both areas of concentration of poor populations and places of opportunity to escape poverty. As noted, migrants have continuously moved to cities in search of more opportunities and a better quality of life, often successfully. Yet at the same time, social inequalities and disparities in the standard of living between people and places, including within many urban areas, are growing. The United Nations' Report on the World's Social Situation (2005) underlined the growth of health and education inequalities, including between men and women. Such social inequalities lead to social polarization between communities and to a breakdown in social cohesion, creating unrest and conflict between groups.

Income inequality increased by an estimated 11% from 1990 to 2010; primarily arising from disparities amongst the urban populations of developing countries. Since income determines purchasing power, income inequality is also linked with inequalities in related quality of life indicators (UNDP, 2013). For example slum dwelling is estimated to have increased from 650M in 1990 to 863M in 2010, with most lacking access to modern services, drinking water and sanitation (UN-Habitat, 2012). Furthermore, socio-economic and ethnic inequality may reinforce the poor appearance of slums, social segregation and aggravate internal crime and unrest (Lall et al, 2006). But urban poverty is not exclusive to slum and informal dwelling. Indeed, many of the urban poor live in non-slum settlements, and not all slum dwellers are located below the (income) poverty line.

Overall, the Gini coefficient of income "is larger in cities than in rural areas in the large majority of developed and developing countries, with the important exception of China" while "evidence available on intra-urban disparities suggests that the health disadvantages suffered by the urban poor differ little from those experienced by rural residents" (United Nations, 2013).

GLOBAL ENVIRONMENTAL CHANGE

Some 90% of the forecast 1.8B increase in the global population through to 2050 is expected to take place in developing countries, whose economies are also expected to grow from their present comparatively low base. As of 2012, the EU average gross domestic product, expressed in purchasing power parity per capita (GDP/Capita), was $32k as compared for example to $9k for China and $4k for India (IMF, 2012), which together presently accommodate around 40% of the global population. This could lead to significantly increased environmental impacts, since without radical improvements in the efficiencies with which economic activities and associated living standards are sustained, the environmental impacts of our future larger and more economically active population may increase considerably. This is because population (P, Capita or Ca) and economic activity (A, GDP/Ca) as well as the environmental impacts per unit of economic activity (T, tCO_2/GDP) – are thought to be proportional to environmental impact (I, tCO_2 in this example): I = P.A.T. But this is not a forgone conclusion. Following the 1973 oil crisis, Europe's energy expenditure and CO_2 emissions reduced considerably. This was due to improvements in for example: standards of energy conservation and efficiency in buildings; industrial process efficiencies (and reduced industrial activity); vehicular mechanical efficiencies; deployment of renewable energy technologies; use of more efficient energy conversion technologies in power stations. By reducing the environmental impacts of our economic activity, it could be possible to accommodate both population and economic growth without increasing impacts on our global and local environments.



Since the majority of our future population will reside in towns and cities in which the majority of economic activity takes place, it stands to reason that these settlements will play a pivotal role in this quest. New ways of accommodating more and wealthier people must be invented, having increased standards of living in towns and cities, with reduced environmental impact. A global challenge is to radically transform how cities function. We will discuss this more later, but before doing so it is important to consider more fully the relationship between cities and their bounding environments.

Cities are increasingly interconnected, in terms of flows of finance, labour, information, goods and services. Whereas pre-industrial cities functioned as relatively closed economies, modern cities have become expansive and city dwellers have become more disconnected with the natural environment. Ecosystem services are the benefits that people derive from functioning ecosystems. These include provisioning services (including food, freshwater, materials and fuels), regulating services (e.g. climate, flood and disease regulations and water purification), cultural services (including aesthetic and recreational services) which all are based on supporting services (including primary production, soil formation and nutrient recycling) (MA, 2005). Cities depend on ecosystem services produced outside cities, yet humanity is causing global environmental change, particularly climatic, at an unprecedented rate (Steffen et al, 2011).

Climate change is mainly caused by the use of fossil fuels and land use change. Continued emissions of greenhouse gases (GHGs) will cause further warming and changes in all components of the climate system (IPCC, 2013). Limiting climate change will require substantial and sustained reductions of GHG emissions, of which CO_2 is the most significant. The flows of carbon, as well as of nitrogen and phosphorous, are examples of where biogeochemical cycles are influenced by human activities. Other primary human impacts include changes in land use, either for dwelling purposes or for the appropriation of resources to sustain human settlements. In some case these land use changes lead to the irreversible destruction of virgin natural habitats, with associated species extinction. It is thought that species biodiversity, the

degree of variation of life, both flora and fauna, is now being reduced at a rate commensurate with the last (natural) global mass-extinction event. Climate change is expected to further increase this, as many species are not able to evolve quickly enough in response to changes to their environment.

Extreme weather events linked with climate change, such as heat waves, heavy precipitation events and high sea levels are expected to increase during the 21st century (IPCC, 2013); to the extent that the United Nations is planning to set up a fund with the aim of reducing loss and damage due to climate change (Nature, 2012). Meanwhile, our larger and increasingly urban future population will be concentrated in cities that all too often are located in regions vulnerable to extremes in weather. To reduce this vulnerability we need both to find ways of decoupling our cities from extreme weather events where possible, for example through tidal and flood risk protection, and adapting to such extremes where not. This future proofing might take the form of protection from extreme wind and in better bioclimatic design of buildings integrating more efficient indoor climate control systems. But we must also play the long game; to reduce the magnitude of climate change by reducing greenhouse gas emissions. In this, cities will play a pivotal role.

URBANISATION

Cities are loci of economic and political power. Foreign investment flows into a country through its cities, where industry and commerce are focussed and where jobs and capital are generated, and goods and services flow out to other markets. It is to be expected then that cities attract migrants in search of employment opportunities and improved education, healthcare, social interaction, recreation, and better standards of living. With their diversified populations and the opportunities available to them, cities are places of concentration of social change, where new ideas, scientific and technical development, and innovation emerge; leading to a better quality of life for the population (UN-HABITAT, 1994) and attracting yet more migrants. Urbanization can thus be self-reinforcing. Mainly occurring in the developing and emerging economies of the global South (Asia, Africa, South America), the so-called “second wave” of urbanization (UNFPA, 2007) results in the generally sustained, sometimes extremely rapid growth of cities of all sizes. Although the number of megacities is growing (c.f. s1.4), the bulk of rural-urban migration is happening in middle-sized cities and also larger towns. This raises specific issues as towns frequently lack the expertise and capacity to act to address the challenges of urban growth. At the same time, in many cities in Eastern Europe and North America, the population is in decline due to economic out-migration, creating a different set of issues such as service provision and job creation in declining economies.

Indeed, it needs to be recognized that processes of urbanization are shaped by many forces, including agglomeration economies (the concentrating of interlinked and interdependent economic activities in one location), glocalization (inter-relationships between the forces of globalisation and local characteristics wherein local regions moderately shape the operation of global processes whilst themselves being transformed by them), counter-urbanization (wherein smaller towns grow at a faster rate than larger cities, as people move from cities to rural areas), natural population increase and patterns of migration. Planning systems are designed to try and anticipate, plan for, and manage such processes and to accommodate changes in population and provide the necessary urban infrastructure (e.g., buildings, transport, utilities) for new residents and industries.

But urbanisation can be so rapid that it outpaces the construction of infrastructure, services and housing. Unplanned and uncontrolled urbanization is associated with discontinuous and scattered urban growth, as well as poor living conditions primarily in urban slums. Suburban sprawling patterns, with fragmentation of built-up areas and low residential density, increase the extension of cities, resulting in the creation of interstitial open spaces and the waste of agricultural land that would be necessary to feed the growing population (UN-HABITAT, 2012). Such sprawl also makes rapid public transit unviable, increasing travel times of those on lower incomes to inner employment centres.

European Trends

INTRODUCTION

European patterns of human settlement, shaped over centuries, rest on a spatially dense network of middle-sized urban regions (0.2 to 2 million inhabitants) with high densities of associated infrastructure (e.g., transport, utilities). The share of the urban population in Europe (ca. 80% on average) is higher than in most parts of the world. However, population growth in Europe, which results primarily from immigration, is much slower than it is in Africa, Asia or South America; and the population in many European regions is constant or decreasing.

European nation states and city regions also differ widely as a result of different histories and geographies. European countries enjoy different geographical and geopolitical conditions and different degrees of availability of resources and exposure to, or immunity from, risks, nuisances and pollutions. European states have been diversely organized (from more centralized to more federal forms); exhibit variegated forms of economy, planning regime and social policies; and are culturally diverse. Cities and their hinterlands hold different positions in regional, national and European systems and are diversely inserted in international communication, migration and economic networks.

Changes in the international geography of manufacturing, service and financial industries and the eastward shift of global economic power, combine to exert pressure on European national and urban societies and their governments. In this context, European cities display very diverse dynamics: uneven forms and degrees of metropolisation and of integration in the networks of economic globalization; variegated capacities to attract and retain populations and activities, to develop or renew infrastructures and the built environment, to control urbanization processes (urban form, structure, etc.); growth vs. stability or even decline in populations, activities, and/or revenue; aging vs. rejuvenating urban populations; more or less effective policies and processes of urban change.

Urbanisation in contemporary Europe is complex and the future success of these settlements will rest upon the effectiveness of future policy and its capacity to shape economic, social, environmental and technological change; the understanding of which requires renewed interdisciplinary research approaches and instruments.

ECONOMIC DEVELOPMENT

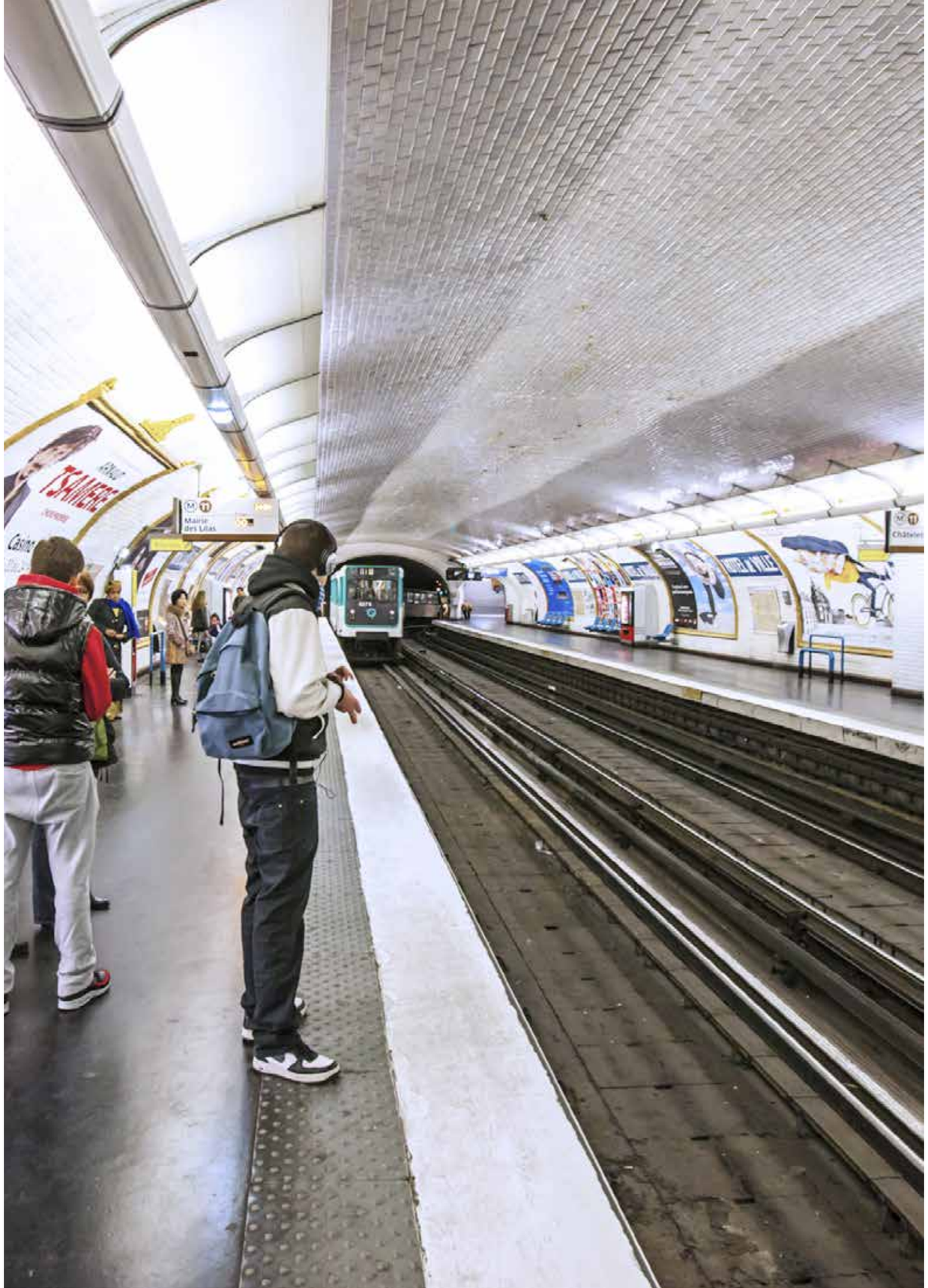
Europe consists of a large and diverse economic region, with a variety of local, national and supra-national economic and political forces at work across its territories. Prior to the early 1990s and the end of the Cold War the continent was economically split in two, with a number of Soviet bloc, Eastern European countries forming a set of managed/planned economies that were largely stagnant. Western Europe in contrast has been largely characterised by varieties of capitalism, with the exception of some countries such as Spain, Portugal and Greece who have all experienced authoritarian periods of governance.

Since the 1970s, the economies of western countries have been in transition. Throughout the 1970s and 1980s a new international division of labour led to deindustrialization in Western economies, with manufacturing jobs moving to newly industrializing countries as footloose transnational companies sought to reduce their cost base and expand into new markets. This was accompanied by a shift from an economy dominated by a Fordist model of business practice in which firms mass produced a narrow range of products on assembly lines to one of flexible accumulation, reducing inventories and moving to ‘just in time’ ordering of raw materials and components and product delivery to wholesalers and retailers. Firms reduced the number of permanent or full time workers, employing fewer trade union workers, and offered a greater diversity of products and choice to customers. With a more flexible economy, labour has also become more flexible, with workers

performing non-standard employment roles, characterized by variations in working time, tasks and conditions, and few expectations of occupying a job for life. In response to a loss of manufacturing jobs, and exploiting the potential of new ICT developments, Western economies have become more service and consumer orientated, developing what has been termed the information or knowledge economy.

Since the early 1990s, the European economy has been reshaped by a number of key factors. First, the falling of the Iron Curtain led to a fundamental change in the economic models of Eastern Europe as they transitioned to a capitalist mode of production. These countries have been undergoing rapid economic restructuring, including the collapse of businesses that were unviable in open markets. Second, the EU has expanded from 15 member states to 28 states, to encompass most European states, providing an overarching set of economic policies aimed at creating economic cohesion and stability, and promoting free-trade and the free movement of workers across Europe; leading to mass migration to the West of younger workers seeking better opportunities. This has been accompanied by the introduction of the Euro and pan-European financial controls, including the setting of interest rates. Third, there has been a general adoption of neoliberal economic policies such as the deregulation of finance, leading to the financialization of a number of sectors including property and former state monopolies of transportation, communications and utilities; opening up such markets to competition and eroding state provision of public services. Fourth, the role of cities as key drivers of economic growth has deepened, with cities adopting entrepreneurial and competitive strategies designed to stimulate local growth and attract inward investment through tools such as tax incentives and free trade or enterprise zones.

Despite these processes, which seek harmonisation and cohesion whilst promoting competition and growth, the European economy remains diverse. The financial crisis from 2008 has revealed the extent of differences in the robustness of national and regional economies, with several countries experiencing severe economic difficulties including



banking failures, property market collapses, and rising unemployment, particularly amongst the young. Indeed, rates of unemployment vary markedly. In December 2013, the unemployment rate in Austria was 5% compared to 28% in Greece (Eurostat, 2014a). In the age group 15-29, rates varied in 2012 from 6% in Switzerland to 44% in Spain, with only seven countries having a rate of less than 10% (Eurostat, 2014b). Thus there are strong regional and personal inequalities in wealth and opportunities. A key challenge for Europe in the coming decades will be to create a stable economic system that balances regional disparities with global competiveness.

GOVERNANCE AND GOVERNMENT

The governance of Europe has for centuries been in a process of transition with numerous reconfigurations of borders and forms of government/governance following wars and political upheaval. The present period is no different, with four recent processes reshaping how Europe and its constituent countries are presently governed.

First, the falling of the Iron Curtain radically reshaped the political landscape, with the reunification of Germany and the reformation of a number of new independent states. The effects of this new landscape and the expansion of liberal democracy are still playing out, with the transference to new forms of governance and different political horizons, and countries such as Turkey and Ukraine increasingly looking to Europe politically and economically.

Second, and partially as a result of the first, there are on-going geopolitical tensions across Europe that are expressed through wars and ongoing rivalries, such as in the Balkans, and through nationalist, independence and devolution movements, with several regions and nations seeking political recognition and new powers.

Third, through the broader European project of the European Union and its goals of social, economic and territorial cohesion, new forms of supra-nation-

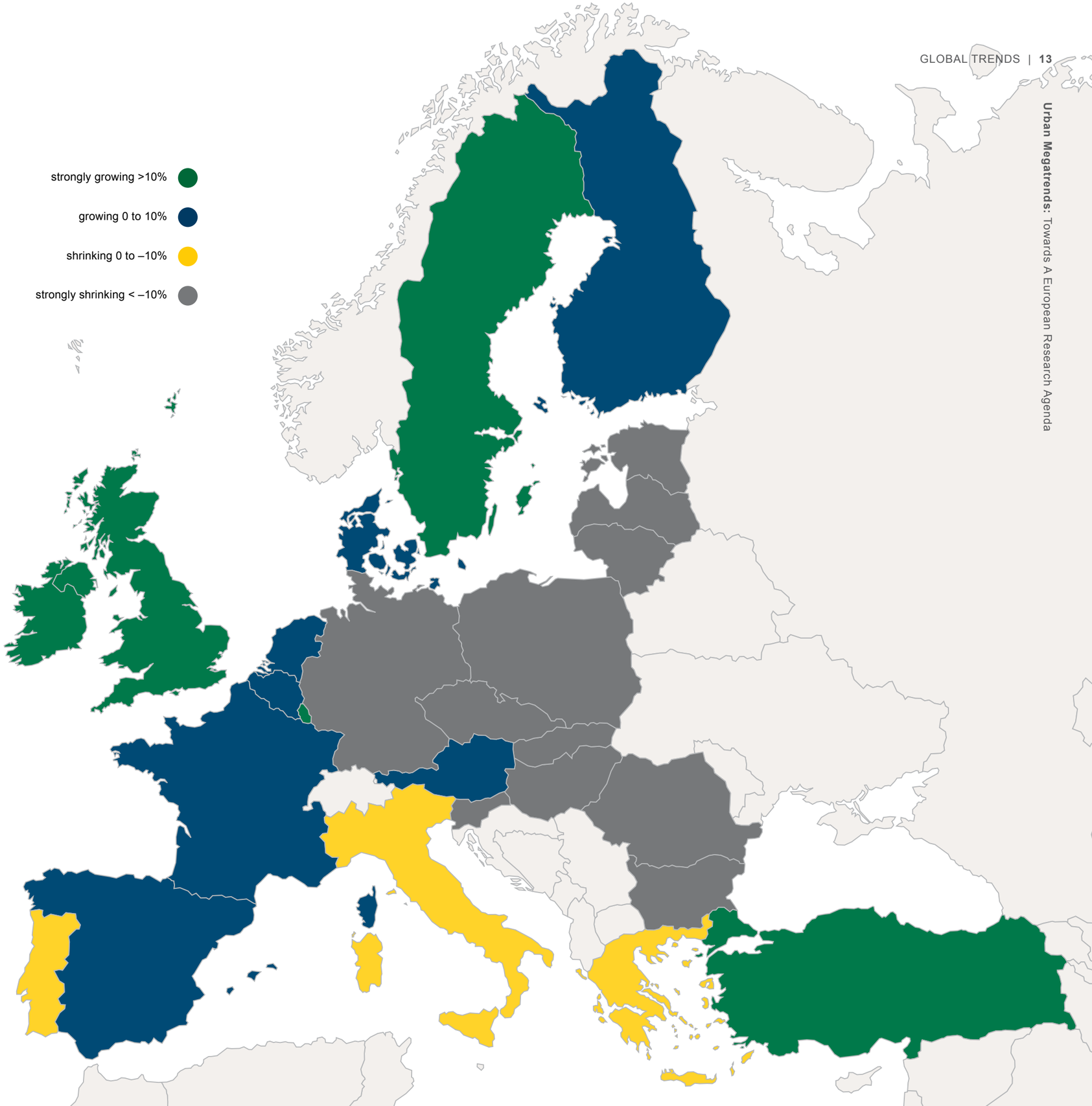
al, multi-level and cross-border governance have been put in place, with the formulation of policies and directives designed to harmonize national and regional approaches to social, economic and environmental issues. Such a project is also designed to re-define and strengthen Europe's position in the global political landscape, being able to exert wider political influence and to promote democracy and enlightened, modernist views. Just as the formulation of multi-level governance has shifted some power upwards to Europe, it has also devolved power to regions and cities, with more localised governments taking a more active role in political decision making, policy formulation, and administering governance.

Fourth, there has been a general shift from state-centred government to wider practices of governance with greater involvement of civil society and corporate bodies in the management of public affairs. The latter is increasingly underpinned by the ideas of neoliberalism that promotes privatization of public goods, the marketization of state services, the withdrawal or diminution of state intervention in certain areas of social, cultural and environmental life, deregulation of certain industries or market-friendly reregulation, and the use of market proxies in the residual state sector making them more market-like in their operations. All four of these trends are still in the process of unfolding and will continue to shape the wider political landscape of nations, regions and cities.

DEMOGRAPHIC CHANGE

Europe, in contrast to other continents, is characterized by a stable or declining population. Causes are the very low fertility rate (an average of 1.6 for 2009 in the 27 EU member states, far below the rate required for population stability of 2.1) and unstable as well restricted migration patterns; though there are considerable variations throughout the EU states (Based on Hungarian Ministry of Interior, 2011; see Figure 2.1).

Figure 2.1: Population development in Europe 2005-2050



Prospering urban regions attract migrants whereas the opposite is true for regions in weaker or shrinking economies. Reflecting this tendency, Western Europe is growing, whilst Southern and Eastern Europe are shrinking. Furthermore, almost 42% of the larger cities having populations of more than 200k inhabitants have experienced shrinkage during the last two decades (Turok and Mykhnenko, 2007, Haase et al., 2013). Young, mobile and well-trained people are leaving their home regions, migrating in the search for employment or vocational education.

Such migration has led to many cities having the characteristic of super-diversity; whereby migrants and ethnic minority groups, from many different places of origin, constitute a high percentage of the population (Vertovec, 2007).

These quantitative trends in population growth and shrinkage are accompanied by qualitative changes concerning fertility decline, ageing and diversification of household patterns. The fertility decline is the result of sustained postponement of childbearing, reducing the number of children born per woman and increasing childlessness. Low fertility rate and an increasing life expectancy cause population ageing, which in particular affects urban regions and large cities. The population aged 65+ has more than doubled in Europe since 1950 and will almost double again through to 2050 (United Nations, 2011). Thus, the welfare state will be increasingly challenged by the need for health care, social services and pensions.

However, many elderly people are still active; they want live in their own homes and stay connected to the world outside for as long as possible. It is thus essential to find solutions for a continued independent living for this group. Herein lies a quandary. E-services (e.g. e-shopping, e-healthcare) and home care visits can reduce the necessity for travel and for those struggling with mobility; but they do not necessarily reduce the desire for mobility, particularly amongst the more able. Social contact remains important, so much so that single seniors often suffer from depression and psychosomatic disorders (CRSP, 2010), and mobility choices need to reflect this need; particularly in more rural locations where accessibility to basic (even e-) services is reduced. These tendencies are exacerbated by a continued fragmentation of the family unit; there are increasing numbers of one and two person households and, in contrast, fewer instances of large households in which multiple generations cohabit. It is increasingly unusual for care for the elderly to be provided from within their immediate family.

These contemporary demographic features are expressions of fundamental transformations within the urban population, who call for appropriate and affordable housing, social infrastructure, employment and leisure facilities.

CLIMATE CHANGE MITIGATION AND ADAPTATION

Mitigating climate change requires significant reductions of greenhouse gases. Reaching the 2°C target requires near-zero emissions by 2050 and with this in mind the EU is committed to reducing greenhouse gas emissions by 80% of 1990 levels by 2050 (European Comission, 2011). A significant challenge for European cities is thus to reduce emissions significantly during the coming decades.

Many European cities have formulated climate strategies and targets. Differences in the definition of system boundaries conspire against meaningful comparisons (Kramers et al, 2013). One of the significant differences concerns whether a life-cycle or a consumption perspective is used or if only emissions within city limits are considered. Since much of what is consumed within European cities is produced somewhere else and therefore is causing emissions somewhere else, this difference can have significant impacts on reported emissions.

Reducing environmental pressures from cities is clearly a global challenge. In this transformation technological development is important but it is unlikely to solve the climate problem alone (Höjer et al, 2011). Innovations in a broader sense are needed; for example in urban planning, mobility, consumption and other social practices (Shove et al, 2012).

While longer term commitments to mitigate climate change are crucially important, adapting to climate change is also necessary. The number of heat waves is likely to increase as is the frequency of heavy precipitation events (IPCC, 2013), leading to inland and coastal flooding. The global mean sea level will continue to rise during the 21st century and beyond (IPCC, 2013). We are in the midst of a complex global climate change experiment and as with any experiment, surprises can occur, both positive and negative. Climate change adaption strategies need to be flexible, to include contingencies to account for the uncertainties inherent in this complex system.

URBANISATION

As previously noted, European patterns of urbanization rest upon a dense network of predominantly middle-sized cities, which has developed incrementally/progressively over a very long period of time. The European population is now largely urbanized and the growth of urban populations is limited. There is, however, significant migration towards wealthier cities, meaning that some of the origin cities and regions are depopulating (Kabisch and Haase, 2011).

In most cases a process of suburbanisation is at work: population increases tend to occur predominantly in the outer parts of urban areas, sometimes in remote, low-density areas distant from the main urban agglomeration on which they depend, while populations in urban centres remain constant or reduce. The ancestral distinction between the urban and the rural is dissolving; and the urban condition increasingly diffuses to non-urban areas through the expansion of transport, telecommunications and utility infrastructures and the ever increasing distances of daily mobility. The notion of “metapolization” (Ascher, 1995) points to the expansion of urban ways of life beyond urbanized areas. It involves a radical shift in the size of urban regions and daily transport infrastructures, a transformation of daily (ways of) life and mobility practices, cultural transformations in value systems and attitudes to cities, the countryside and nature, and raises environmental and governance challenges.

Larger metropolitan areas have become increasingly polycentric, as more and more activities progressively relocated outside the centres of agglomerations. This structural transformation from mono- to polycentric urban areas is reflected in patterns of daily travel behaviours: the share of daily trips between periurban, suburban or even exurban locations is increasing, to the detriment of trips to or from the centre of agglomerations. Long distance commuting from one urban region to another is also increasing (Schneider and Collet, 2010)

The spatial expansion of urban regions and the generalization of urban ways of life are concomitant with sustained and frequently increasing patterns of social and socio-spatial inequalities, both in the layout of residential areas and in mobility patterns. In many European cities, high-income or elite socioeconomic groups de facto colonize urban centres (gentrification) and some suburban areas, and more general socio-spatial differentiations tend to grow.

Recently, urban densification or “smart growth” strategies and policies have been promoted. They are expected to favour less space-consuming urbanization patterns; to facilitate the development of diverse transportation modes; to foster a greater mix of urban populations and activities and greater urban “intensity”; to help preserve natural and agricultural lands; to allow for a greater diversity in housing options; to reorient urban development toward already established communities. But these policies struggle to achieve a significant shift from spatially scattered urbanization patterns (Couch et al., 2007).

TRANSPORT

Industrialisation, urbanisation and transportation have been historically intertwined. The industrial revolution led to mass rural-urban migration and a shift from an agricultural to a manufacturing labour base. This manufacturing required high calorific value fuels (e.g. coal) for steam engines as well as the raw materials that were to be processed into products for export to consumers in other towns and cities. Investments in inland waterways, followed by steam railroads and in conventional roads satisfied this

burgeoning demand for the transport of raw materials and goods as well as for passenger travel. Bolstered by ocean freight and more recently by air freight and passenger travel, Europe's transport infrastructure is largely a legacy of this industrial revolution.

Greenhouse gas emissions and other externalities including noise and particulate pollution related to the transport sector continue to grow in line with globalisation and the increased demand for commuter and personal travel; this latter facilitated through low cost airlines. Herein lies a quandary. Commercial transport plays an important role in maintaining the ECs competitiveness in the global market place, and personal mobility positively influences perceived quality of life; but changes in the transport sector and in mobility practices will be instrumental in achieving Europe's greenhouse gas emission reductions, with a targeted reduction of 60% by 2050 (European Comission, 2011). Achieving these conflicting objectives will require strategic planning, investments in multimodal and trans-European networks, which will also help improve territorial cohesion, increased investments in high speed rail as well as the adoption of intelligent transport systems.

But European policy to better connect its member states will place more pressure on its urban transport networks as they become more interconnected. This is important, as cities suffer most from congestion, poor air quality and noise exposure. Urban transport is responsible for around a quarter of transport-related CO_2 emissions in Europe and some 70% of road accidents. Transport in Europe's cities also needs to be better planned and underpinned by policy and investment, new technologies and innovative business models.

There is considerable potential for improvements in freight and personal transit efficiency, in using lighter more efficient and more electric vehicles and intelligent transport systems to regulate them; better planning and delivery of slow mobility (walking and cycling); more widespread use of park and ride and congestion charging schemes; removed distortions in taxation to encourage public transportation and perhaps also to moderate road freight and air travel; reversing the trend to privatise public transportation.

City Functioning

Cities are complex systems, whose emergent physical and social structures and the associated metabolism of resources, and the very wellbeing of their citizens, depends upon the bottom-up [inter] actions of the firms and individuals that inhabit them; these in turn responding to financial, regulatory and educational stimuli as well as to the actions of peers and to technological innovations – both within and between cities. In this chapter we introduce this complex landscape, and in so doing identify areas where further research endeavours are needed to further deepen our understanding, with a view to improving upon the functioning of cities and the holistic sustainability of our increasingly urban global population.

SPATIAL DYNAMICS

Household size may change as a consequence of birth, death or the decisions of members of the household to relocate. This in turn may lead the household itself to relocate in the search for a better overall quality of life. Members of the household may be unemployed, be in full time education, be a full time carer at home or be in full time employment elsewhere. In the latter case, the firm employing them engages in the exchanges of goods and services with other firms within and outwith the city. If times are good the firm's profitability improves and the contrary in less good times. Either situation may cause the firm to relocate. Natural population growth and reductions in household size increase housing demand. In times of strong economic growth, firms may buy additional premises to increase the scale of their operations, thus increasing job availability; and new firms may also be attracted to the city, also increasing job availability and the demand for business premises. These job opportunities attract migrants to the city, which further increases housing demand and places additional pressures on services such as healthcare and education. Construction activity needs to increase to satisfy the demand for housing, business and tertiary accommodation; which in turn leads to the construction of new infrastructure; roads, services utilities (energy, water, telecommunications etc). This construction activity creates new job opportunities, which may attract further migrants to the city or those elsewhere to join other commuters to the city. These migrants and commuters wish to dispose of a portion of their income in the city's retail and leisure sectors… and so the cycle continues; the reverse being true in times of recession.

Although the choices of firms and individuals may be largely determined by self interest; they are also influenced by regulatory controls, planning decisions and fiscal incentives; by policy makers and those responsible for implementing such policies.

Firms and individuals self-organise from these bottom-up interactions; clusters emerge at different hierarchical scales that depend on the relative success of the economies emerging from firms' productivity, their interactions with other firms within and outwith their city of origin (indeed they may increasingly be parts of hierarchically scales multinational firms), perhaps underpinned through local planning and governance structures, as well as in response to the formation of social groupings amongst individuals. Emergent forms may also depend upon local constraints; planning restrictions, topographical features such as mountains and hills, seas and lakes. But these forces and constraints appear to be somewhat general in nature.

METABOLISM

To understand how cities behave physically, it is helpful to consider the thermodynamic concept of entropy. Entropy is a measure of the dissipation of order; increasing as the thermal disorder of a substance (the thermal motion of its atoms) becomes more vigorous and the positional disorder of that substance (the range of available positions of its atoms) increases. If we heat the air in a room, the air molecules will increase in positional disorder – entropy will increase and be dis-

sipated to the surrounding environment. This is known as the arrow of time: in any isolated physico-chemical system entropy always increases (order is always dissipated), until equilibrium is reached.

But in common with living organisms, cities do not obey this arrow of time. They achieve this by exchanging entropy across their boundaries: cities are open systems, they import relatively low entropy energy and materials and export higher entropy wastes. In other words, and as coined by Schrodinger (1944), they consume negative entropy (entropy imported less entropy exported is negative), Negentropy.

Thus, although entropy is produced internally due to irreversible internal processes, such as the combustion of fuel and the heating of buildings, cities may maintain or increase their orderliness. In common with the metabolism of living organisms in which life can be sustained and orderliness can be maintained or increased, we may call the processing of resources to sustain city life *urban metabolism* (Baccini and Brunner, 1991). Through these exchanges, cities are dependant on their surroundings for the provision of food, water, materials and energy. With increasing globalization, great quantities are drawn from all over the world (Seitzinger et al, 2012).

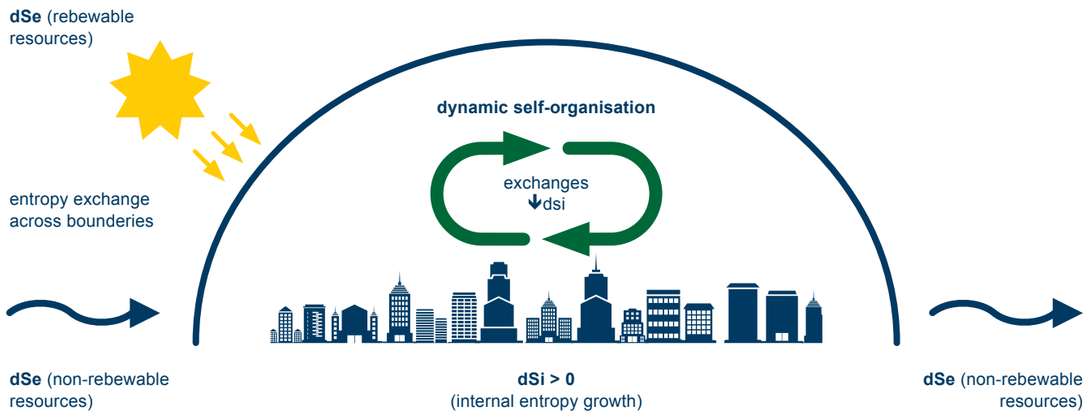


Figure 3.1 The city as a conceptual open thermodynamic system (Based on Robinson, 2011)

As shown in Figure 3.1, the exchanges of non-renewable energy and matter across the city boundaries can be minimised, by increasing the import of renewables (e.g. sun, wind and local organic materials) and by minimising net internal entropy production through synergetic energy and matter exchanges between processes and actors within a city. Just as natural ecosystems like forests largely succeed in closing their nutrient cycles due to the synergetic exchange of resource between complementary organisms (waste products from one act as a resource for another), so cities can maximise the circularity of resource flows. We can take inspiration from nature to understand how sustainable a city really can be.

Although imperfect, some inspirational examples of where principles of ecology have recently been employed to minimise net waste production through synergetic exchanges and the utilisation of renewable resources, include the symbiosis project at Kalundborg in Denmark, an example of industrial ecology; and the districts of Bo01 in Malmo and more particularly Hammarby Sjostad in Stockholm, Sweden.

Although we have some conceptual understanding of how cities function physically, and there are some tentative examples of the application of principles from ecology to improve the efficiency of this functioning, considerably more research is required to deepen this understanding and in so doing to determine just how sustainable cities can theoretically and practically become; by applying principles from nature.

But in this we must not consider our city in isolation from its underlying purpose: to act as a hub of economic and social activity and interaction and in this to consider how aspirations for environmental sustainability need to be balanced with the interrelated and possibly competing demands for economic and social sustainability. This is considerably more complex than it may seem.

INFRASTRUCTURES AND SMART CITIES

Infrastructures and networks have been at the heart of urbanisation in advanced industrialised countries since the mid-19th century, in response to the need for fresh water, sanitation and waste disposal, the transport of goods and people and the provision of energy (thermal and electrical) to service increasingly densely occupied settlements; to provide economic, health and lifestyle benefits.

Many of these infrastructures have strongly impacted on the nature, structure, regulation and enactment of urban life, in particular utilities, transportation, communication, and building infrastructure. These technologies often have paradoxical and adverse effects (e.g., factories that create wealth but also pollution), or become overloaded (e.g., overcrowding or traffic congestion), or produce dependencies that can become socially unsustainable (e.g., long distance commuting). Nevertheless, cities' social, economic and political success is absolutely contingent on having reliable, robust and efficient infrastructure; a dependency that only increases in this age of globalisation. The envisaged future of infrastructure is smart in nature.

The term 'smart cities' has gained much traction in academia, business and government in recent years to describe cities that, on the one hand, are increasingly composed of and monitored by pervasive and ubiquitous computing and, on the other, whose economy and governance is being driven by innovation, creativity and entrepreneurship, enacted by smart people (Kitchin, 2014). In general, the emphasis is shifting to the former and the role a range of digital technologies can play in creating 'smart' systems and infrastructures that be used to efficiently and effectively run cities and provide solutions to the problems created by previous rounds of technological-led development.

There is no doubt that digital technologies have been exerting a growing influence on the nature, structure and enactment of urban infrastructure, management, economic activity and everyday life. Various forms of networked computing are being built into the very fabric of urban environments (e.g., fixed and wireless telecom networks, digitally controlled utility services and transport infrastructure, sensor and camera networks, building management systems, and so on) that can be used to monitor, manage and regulate city flows and processes, often in real-time. Forms of mobile computing (e.g., smart phones) are increasingly being used by urban citizens to engage with and navigate the city. Connecting up, integrating and analysing the information produced by networked and mobile computing provides the opportunity for a more cohesive and smart understanding of the city that enhances efficiency and sustainability (Townsend, 2013) and provides rich seams of data that can used to better depict, model and predict urban processes and simulate the likely outcomes of future urban development (Batty et al., 2012; Robinson, 2011).

Smart technologies work to make a city knowable and controllable in new, more fine-grained, dynamic and interconnected ways, whilst also providing the supporting infrastructure for enhanced business activity and growth. Rather than basing decisions on anecdote or intuition or clientelist politics or periodic/partial evidence, it is possible to assess what is happening at any one time and to react and plan appropriately. For their advocates they provide the basis for more efficient, sustainable, competitive, productive, open and transparent cities. Others warn that smart city technologies signal the possibilities of the panoptic city (undermining citizenship), technocratic forms of governance (a city run by algorithms rather than politics and policy), the corporatisation of city man-

agement (through the marketisation of city services to multinational companies), and the creation of city infrastructures that are buggy, brittle and hackable (Townsend, 2013; Kitchin, 2014). As such, the roll out and impact of smart city technologies are still being negotiated, though there is little doubt that they will become a feature of all cities in some shape or form.

SOCIAL TENSIONS, WELFARE AND INEQUALITY

Particularly in Western Europe, cities are growing and become more diverse through in-migration. But in parallel the nature of the state is changing; public services are being rolled-back and the welfare state is being cut as economies liberalise; changing the social characteristics of urban locations. After a century of societies becoming more equal and egalitarian, cities in many cases are once again becoming more socially polarized, with growing wealth inequalities, increased segregation between groups, and rising social tensions. Wolff (2010) notes that in the US, which has one of the most iniquitous distributions of wealth in the world, 62% of all wealth was held by just 5% of the population in 2007; with poorest 40% owning just 0.2% of assets. A similar situation exists in Europe. For example, in Germany the share of total wealth owned by the wealthiest 10% rose from 45% in 1998, to 53% in 2008, with half of all households owning just 1% of wealth (Globalresearch, 2012). Likewise, the wealthiest 10% in Finland and the UK owned 45% of the wealth, 43% in Italy and 58% in Sweden (EAPN, 2011). In the UK, it is predicted that the living standards of low- and middle-income households will see incomes fall by up to 15% by 2020. Over 80M people are now considered to be at risk of poverty in Europe (EAPN, 2011). Moreover, wealth inequality between nations has been widening, this in turn extending the gap between developed and developing countries, but also between countries in Europe.

Rising levels of inequality and levels of absolute and relative poverty are leading to social polarization and social exclusion, with sections of society being denied full participation in everyday activities and marginalized with respect to resources such as housing, work, social services and the political sphere. This is often manifest in social stratification and fragmentation, segregation to certain parts of the city, alienation, and undermines social cohesion leading to social unrest, protest and riots; as witnessed recently in a number of European cities.

Such issues pose significant threats to cities' long-term social stability, unless adequately addressed. Recent responses include social justice movements and civil actions, combined with social programmes aimed at tackling crises in employment, social exclusion, urban regeneration, and access to services and environmental goods (Social Polis, 2011). However, such programmes can have limited impact in the face of neoliberal economic forces and the decline of the welfare state.

CULTURE, HERITAGE AND TOURISM

Most cities in Europe have a long history, sometimes covering a time span of more than two thousand years. They reflect a significant part of the rich political, economic, scientific, cultural and architectural part of Europe. As a consequence, most European cities house a wealth of cultural and historical heritage. These assets, which are decisive for the 'cityscape' of urban areas in Europe, are sometimes seen as an impediment to a fast development or transformation of European cities. But this cultural and historical capital offers considerable opportunities for a more sustainable urban development (see also Fusco Girard and Nijkamp, 2009).

The cultural history of Europe (in terms of performing arts, theatrical performance, paintings, museums, religious heritage etc.) has led to an abundance of cultural expressions, which attract millions of visitors annually. The economic benefits of culture-rich cities in Europe are formidable. Thus, tourism and leisure activities lead to economic advantages for Europe.

The rich cultural heritage of Europe's cities also creates an interesting and unique urban 'ambiance', that

provides interesting locational opportunities for various professional groups, in particular, the creative class. Consequently, such cities are able to enjoy a 'double dividend': they are a source of tourism revenues and are a centre of attraction for the creative classes, but this needs to be carefully balanced with risks of excluding other less advantaged segments of society.

URBAN GOVERNANCE AND PLANNING PROCESSES

Planning processes vary throughout Europe, but in general land use plans define the types of development that are permitted in a particular location, the spatial scope of these plans varying between countries. In certain (exceptional) circumstances, this is in itself sufficient; otherwise specific planning consent will be required, with the level of detail required in the application also varying considerably between countries. Public participation is either positively encouraged for larger public projects, or simply enabled through planning notices; it is not systematically facilitated.

Urban governance describes the processes by which economic, social and political forces and those acting upon them are governed to shape city life. Governmental influence may be both at national and city (and regional) scales, but should incorporate other key industrial, business and service provision actors as well as members of the public; influencing and being influenced by exchanges with other cities, both nationally and internationally.

As the welfare state reduces and as public services diminish, the public are increasingly being called upon to self-organise to provide support and services to their peers. At the same time, digital services are transforming the ways in which services are delivered and the ways citizen navigate through them and the city. And cities need to become more robust to climate change impacts and to mitigate their influences on global climate change; especially cities in locations sensitivity to extreme weather, requiring heavy infrastructural investments to minimise damage and loss of life. These factors impact upon the ways cities are and should be governed, within increasingly intricate systems of multilevel and multi-locale governance. Digital technologies provide unprecedented opportunities to reach out to citizens to gauge their opinions on and support for emerging proposals, to resolve associated conflicts and even to mobilise them in implementing proposals.

Conflict and friction in the landscape of complex policy problem solving is a common dilemma in urban governance and planning (DG Regio, 2011); but this is aggravated in contemporary Europe due to increased complexity within and between cities; to the extent that cities' responsiveness to the need for change is limited and their room for manoeuvre in day-to-day urban management is constrained. One solution is to improve representation and give a voice to the public: representative and democratic urban governance leading to social innovation, participatory approaches and deliberate co-creation of environs. Governance can thus deliver more networked lateral decision-making (Metzger et al, 2014); with innovation-driven transition to resource efficiency going hand-in-hand with and public participation and other open deliberative political explorations (DG IPOL, 2014).

European Urban Research

KEY TRENDS AND CHALLENGES

This report discusses global and European trends which impact on and are impacted by the process of urbanisation and the ways in which cities function socially, economically and environmentally and how these behaviours can be influenced through planning and governance. The purpose of this report is to lay down the gauntlet, to identify some key challenges to be addressed by the interdisciplinary European urban research community in the years ahead.

The world is becoming more populous and more economically active, with potentially severe environmental consequences. The global population is continuing to urbanise at an unprecedented rate, so that the impacts on and from the environment are increasingly concentrated within our cities. We have an urgent need to understand how to accommodate a greater number of wealthier people aspiring to improve their quality of life whilst reducing impacts upon and from the environment.

Some 90% of the increase in urbanisation is expected to take place in developing countries, but this does not mean that the relatively developed continent of Europe should not be concerned; for we share the same global environment. Nor does it mean that Europe doesn't have an important role to play in reducing the environmental impacts of its cities. The nature of our challenge is simply different. Whereas in development countries (e.g. in Asia) the challenge is to accommodate growth, both spatially and economically, without increasing the carbon emissions arising from it; in Europe our focus is to transform the carbon intensity of our existing cities. In this our starting point is to better understand how cities function.

We know that cities are complex systems that operate across scales from individual households to global chains of flows of materials and services and are reliant on the metabolism of energy, matter, finance and information. We also know that cities are diverse in their forms and organisation, spatial dynamics, local economies, governance structures, cultural heritage, and that their footprints extend far beyond metropolitan areas. No two cities are then entirely alike.

In Europe urban centres vary from small, regional towns to large global cities. In some cases they are experiencing in-migration and are growing in population, in others they are shrinking in size as residents move to other locales seeking work and a better life. In some places, the economy is thriving and employment rates are low, in others, firms are going out of business and the government is cutting back services leading to high unemployment. Many are dealing with issues of super-diversity, household fragmentation, falling fertility, a rising aged population, widening social inequalities, reduced public services, congestion, poor air quality and noise exposure. Moreover, they are never fully in charge of their destiny to define their own future and tackle these issues given that they're embedding into supra-national, multi-level and cross-border forms of governance and the global economy.

Urban policy can rarely then be one-size-fits-all in nature. Rather, policy needs to be flexible and overarching enough that it supports the realities and aspirations of a diverse set of urban centres, and balances and ameliorates the inequities between them whilst ensuring that Europe remains globally competitive. At the same time, urban centres do share commonalities in terms of wanting to create sustainable forms of urban planning that foster economic development and enhancement of urban life. They all desire effective future policy than will improve the urban condition. This is the challenge of Urban Europe - to find ways to address the complex miasma of diverse and shared issues its cities face and to translate these into policy and concrete action.

High quality research is essential to effectively rise to this challenge. A long history of urban research has

created a wealth of knowledge and enabled cities to be planned and developed. It is clear, however, that substantially more research is required to guide the future development of cities given the present challenges facing them. Such research needs to be broadly conceived in nature, but be unified in the search of fundamental knowledge underpinned by rich empirical datasets, translated into practical techniques, technologies, planning solutions and policy instruments. We are thus advocating an ambitious interdisciplinary programme of research, to fundamentally deepen our understanding of how cities function and how to improve upon this functioning for the betterment of all concerned. Achieving this will require a framework for Urban Europe research that is suited to the purpose.

A FRAMEWORK FOR URBAN EUROPE RESEARCH

A significant challenge facing researchers and policy makers is how best to make sense of the contemporary processes of urbanisation discussed in this report and to proactively address the many challenges that cities face. What is clear is that an approach is required that possesses a number of qualities that enables a holistic yet nuanced understanding to be developed and contextual and relational responses to be delivered. Neither a silo approach to each issue or case, nor a one size fits all theory or policy, will produce the interdisciplinary, integrative, pluralistic, nuanced and contextual knowledge needed to understand and manage contemporary urbanism and urbanisation. And given the pressing nature of the challenges and problems facing cities, it is not enough to simply produce new knowledge through research; rather such fundamental knowledge needs to be translated into utilisable techniques and technologies and instrumental policy and action.

Our vision for such an approach is set out in Figure 4.1. In essence it consists of two phases, both of which are critical (i.e. it makes little sense to leap from challenges to policy actions without first thoroughly coming to understand the complexities of the issues involved). The first phase is to translate the challenges facing cities into theoretical understanding via in-depth empirical research. Rather than breaking down the issues facing cities into component parts and examining them in isolation through disciplinary lens, such research needs to grapple with the interdependencies and complexities of urbanisation and the multifaceted ways they play out in different locales and contexts. This means embracing an inter- and trans- disciplinary,integrative and multi-scalar approach that is comparative, relational, and pluralistic.

This is no doubt an ambitious task because it seeks on the one hand to be holistic, providing over-arching and integrative insights, and on the other, to avoid the trap of grand theory and one-size fits all conceptualization. However, if we are to make sense

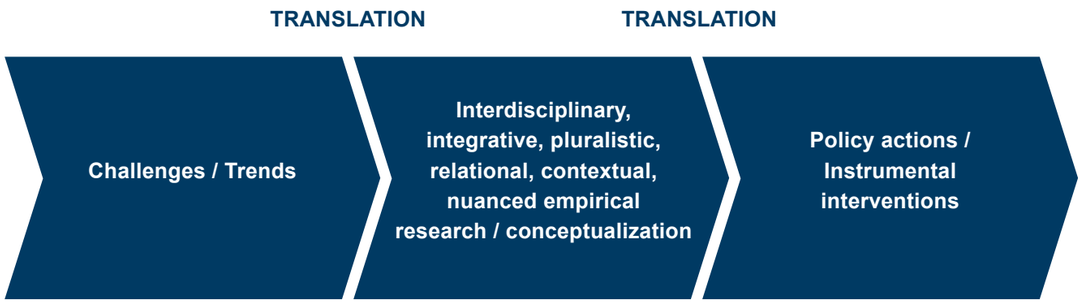


Figure 4.1 The European Urban Research Cycle

of the complex intertwining of the various factors influencing urban sustainability in its holistic sense, and thus to move beyond limited and limiting siloed approaches, it is a necessary step. The second phase is to translate new conceptual understandings into utilisable techniques and technologies, policy recommendations and instrumental actions in ways that take account of local contexts and constraints. Again, this is a challenging task, but one that is also necessary if we are to maximize the effectiveness of local, national and supra-national responses to complex issues.

At present, we know of no funding agency that is seeking to promote such an approach. Instead, funding is targeted at understanding particular issues from a specific perspective, sometimes mandating though seldom realising that such research be translated into innovations and policy actions; or is highly instrumentalist seeking innovations and policy actions from established but siloed knowledge rather than being research-led and integrative. As a consequence, the nature of the research being conducted and how it is applied in practice is sub-optimal in terms of its ambition with respect to pushing the boundaries of fundamental knowledge and conceptualization, and its impact in addressing real-world challenges based on a comprehensive and integrated understanding of the nature of these challenges.

The mission of JPI Urban Europe and the Strategic Research and Innovation Agenda that is currently under development, through a consultative process, is to fill this important gap.

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URBAN EUROPE

URBAN MEGATRENDS: TOWARDS A EUROPEAN RESEARCH AGENDA

A report by the Scientific Advisory Board of the Joint Programming Initiative Urban Europe:

Olivier Coutard, Göran Finnveden, Sigrun Kabisch, Rob Kitchin, Rafaela Matos, Peter Nijkamp (Chair), Cristina Pronello, Darren Robinson (Co-Chair).

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