

Chapter 2

The Dynamics of Peri-Urbanization

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2.1 Introduction

The peri-urban (sometimes also called the urban fringe) may be the dominant urban form and spatial planning challenge of the twenty-first century. In older industrial or post-industrial countries the peri-urban is a zone of social and economic change and spatial restructuring, while in newer industrializing countries, and most of the developing world, the peri-urban is often a zone of chaotic urbanization leading to sprawl. In both cases the peri-urban can be seen as not just a fringe in-between city and countryside, a zone of transition, rather it is a new kind of multi-functional territory. While it resists simple definitions, there are common features wherever such areas are found, such as a relatively low population density by urban standards, scattered settlements, high dependence on transport for commuting, fragmented communities and lack of spatial governance. Many global challenges arise from the ways that cities grow and change, especially the emerging mega-cities in developing countries where massive social and environmental problems can be found in their peri-urban hinterlands.

This chapter is a broad review of the peri-urbanization phenomenon, in its global and European context. We explore physical, socio-economic and political dynamics of change and we set out a framework for understanding different

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levels of change in the peri-urban system. We outline the methods and results of the European scenario and modelling work from PLUREL, and draw out the implications for the rest of this book.

2.1.1 *Global Context*

The peri-urban zone may become the most common type of living and working situation in the world in the twenty-first century. In some parts of the world it is characterised by affluence and conspicuous consumption. In others it is where poverty and social displacement are more common, a front line between the problems of the city and the countryside. Underlying this is the changing nature of the city itself – as well as the physical expansion of urban or suburban form, there are wider economic, social and cultural dynamics of change. Therefore, we need to look beyond the conventional divide between ‘urban’ and ‘rural’, to a new kind of territory where the ‘peri-urban’ is the central feature – one which is not fixed, rather being in continuous flux and transition. The peri-urban is where the urban structure transitions into the rural landscape so that it can be a significant territory in area terms that must be looked at in the context of the wider transitioning between dense urban cores and rural hinterland – to examine it in the context of the wider city or rural–urban region. The peri-urban acts as a litmus test of change and transition, not just locally at the interface of urban and rural, but in the shape of the whole city-region, or as described below, the ‘rural–urban-region’.

Over-shadowing the European peri-urban agenda is the challenge of the global urban system. In one 2005 World Bank study, cities in developing countries were found to have three times the population density of cities in industrialized countries (Angel et al. 2005). However, the current trend is for density to reduce by 1.7% per year; so if this trend continues to 2030, the built-up area of these cities will triple to more than 600,000 km², while their population doubles. A global remote monitoring study found that there are four main types of urban growth: low-growth cities with modest rates of infilling; high-growth cities with rapid, fragmented development; expansive-growth cities with extensive dispersion at low population densities (generally North American); and ‘frantic-growth’ cities with very high land conversion rates and population densities (generally found in developing countries) (Schneider and Woodcock 2008). Each of these types had different spatial patterns, whether dispersed or constrained and scattered or contiguous development. To this could be added a fifth type, that of negative growth, more commonly referred to as shrinking cities (Bauer et al. Chap. 7 in this volume). Generally, these definitions of ‘urban’ include what we term here the ‘inner peri-urban’ or urban fringe, directly adjacent or within the shadow of the denser urban area. The ‘outer peri-urban’ – i.e. where the rural areas are in a transition and responding to urban fringe pressures – has not yet been studied at this scale.

Generally the process of urban expansion should not only be seen as a negative change, but also one with positive benefits, particularly for the majority of the world’s population, who occupy on average a space of 3.5 m² per person (Hardoy

et al. 2001). However, the implication is that cities in both developed and developing countries should be making realistic plans for large scale physical expansion, building capacity for governance, investing in basic infrastructure and managing sensitive or hazardous areas. Each of these applies in particular to the fast changing peri-urban areas which are the frontiers of expansion.

2.1.2 European Trends

Europe is a highly urbanised continent. Over 75% of the population lives in urban areas today, with a projection for this to reach 80% by 2020 (EEA 2006). The dense urban network contains almost 1,000 cities with more than 50,000 inhabitants, but only a few very large cities. In the EU only 7% of the population live in cities bigger than 5 million inhabitants, compared to 25% in the USA (CEC 2008). In recent decades, the most prominent result of the ongoing urbanisation in Europe has been the development of ‘functional urban regions’ (Nordregio 2005). This process includes the integration of even relatively peripheral areas into the urban system, the connection of neighbouring cities to form polycentric networks and the formation of large-scale metropolitan regions.

Urbanisation in Europe is, however, extremely unevenly distributed. The metaphor of the ‘Blue Banana’ (Brunet 1989) illustrated the concentration of economic and population development in some core regions in western Europe, while for regions outside the area, in the former CEE countries and in the European periphery, it becomes more difficult for them to compete economically. Since the publication of the European Spatial Development Perspective (ESDP 1999), ‘territorial cohesion’ became the key concept for counter-balancing this trend, promoting a harmonized development across the continent. The challenge of territorial cohesion is, however, not limited to this macro scale but is also an issue within countries, regions and even cities.

Areas close to cities have historically been subject to high development pressures strongly linked to an increasing per capita consumption of urban land. From the 1950s to around 1990, urban areas expanded their surface area by 78% while the population increased only by 33% over the same period (EEA 2006). This trend continued to 2000 where the population in the EU25 increased by 2% while the urban area increased by more than 5%, mainly as a result of increased numbers of households and decreasing size of households (Jansson et al. 2009). The low level of population growth in Europe in recent decades suggests that the growth of urban areas is slower than in other regions of the world. However the ratio between urban and population growth is comparable to other regions in the world such as the USA and China, creating a trend towards continued de-concentration and urban sprawl. Urban sprawl in the form of low density, discontinuous and dispersed urban development is now a common phenomenon throughout Europe (EEA 2006).

2.2 The Nature of the Peri-Urban

2.2.1 *Theoretical Concepts*

'Peri-urban' and peri-urbanisation are generally loose definitions. Often they are used to describe newly urbanised zones at the fringes of cities, especially in developing countries, which are then called the 'peri-urban interface' (Adell 1999; McGregor et al. 2006). From a European perspective, peri-urban areas are often understood to be mixed areas under an urban influence but with a rural morphology (Caruso 2001). The Council of Europe (CEMAT 2007) defines the peri-urban as a transition area moving from strictly rural to completely urban, related to a high pressure towards urban development (Bertrand 2007). Conversely, peri-urban areas can be far from ephemeral, but instead can form a new kind of permanent landscape. Furthermore, the development is not necessarily limited to purely physical development with urban characteristics, but is often marked by the emergence of urban activities in rural areas like hobby farms and second homes (Briquel and Collicard 2005; Caruso 2001). The fact that the residents can be considered urbanised even if they do not live in a strictly urban spatial type, because of their lifestyles and social focus on the urban, for example, emphasises the uniqueness of the zone. These urban transformations which take place outside the urban cores can be summarized by the term peri-urbanisation.

The peri-urban is something between, neither urban nor rural. The historical dichotomy of urban and rural space started to blur in Europe with the formation of nation states, industrialisation and the liberalisation of the economy in the nineteenth century (Bengs and Schmidt-Thomé 2006). However, firstly with the introduction of mass commuter transport systems such as suburban railways, and finally with the increased affordability of the car, the countryside close to towns became a potential place for living, recreation and sometimes also working for former urbanites. This development led to an expansion of cities not only in physical terms with low density housing but also in terms of functional relationships, creating an area of urban influence around cities, also called the urban field (Friedmann and Miller 1965). In this urban field a variety of places developed, characterised by a mixture of urban and rural features.

The blurring of the urban–rural boundary inspired research into the idea of an urban–rural continuum. Bryant et al. (1982) illustrated this by a model where the urban–rural region ranges from core city through inner and outer fringe, a zone of an urban shadow and out to the rural hinterland. However, in reality, while this model works in general, the complex pattern of actual cities and their surroundings, with all their different spatial structures that emerged through geographical and historical as well as political precursors, is often difficult to fit completely if at all. This is the case regardless of the fact that the idea of the continuum includes several dimensions (or several continua) of urbanisation in the urban–rural space, which can result in complex spatial patterns (Robinson 1990). Most recently the term

urban–rural interface appeared in research, emphasizing the mixed character of these areas without fixing them on a single, simple gradient.

The factors leading to this multifaceted character are many. Several different concepts have been used to try to account for it. One popular concept is ex-urbanisation, originally coined as ‘ex-urban’ by Sectorsky (1955), who described the development of a ring of wealthy rural communities around New York City, characterized by urban professionals living there but commuting to the urban core for work. Today many of these areas could also be called suburban, and Nelson and Sanchez (1999, p. 689) argued that ex-urbanisation does not differ from suburbanisation, but that exurbia ‘is simply the latest incarnation of the continued suburbanisation of American cities.’ Ex-urbs are nowadays found in a different manifestation in places like southern Spain, where they form specially built estates for retired people from northern Europe (Zasada et al. 2010).

Another widely used concept describing a form of urban–rural dynamics is ‘counter-urbanisation’. This implies an opposite trend to urbanisation, i.e. an increase in migration from the city to the countryside, and was observed in the 1960s and 1970s in the United States and Western Europe (Robinson 1990). Besides the relocation of services and industry into rural areas, the development of part-time farming, second homes and retirement migration play an important role in this process. Champion et al. (1989) emphasized that it is not a unidirectional movement but a tendency towards de-concentration, resulting from a complex pattern of flows.

However, peri-urbanisation also includes other transformations, ones not necessarily dependent on the migration of people. These include movements for commuting or recreation as well as other behavioural changes by old and new rural residents caused by the further integration of the rural area in the system of an urban region. Also, linkages related to human-ecosystem interactions are decisive for peri-urban land use relationships, and will be further discussed below. The impact and significance of these processes, as well as how to turn them towards sustainable development, was the major issue in the PLUREL project and the focus of the case studies presented in Chaps. 4, 5, 6, 7, 8, 9 and 10.

It is clear from this brief overview that one of the main challenges of the PLUREL project was how to develop a research approach to understand the interactions among such multiple forces and complex patterns.

2.2.2 Geographic Definitions of the Peri-Urban as a Basis for Research

The PLUREL project used the term ‘rural–urban-region’ (RUR) as the main unit of analysis, with a range of area types, shown below as nesting circles (Fig. 2.1). This was based on a wide literature review (e.g. Bryant et al. 1982; Champion 1999; Loibl and Toetzer 2003; Gallent et al. 2006; Leontidou and Couch 2007). It was

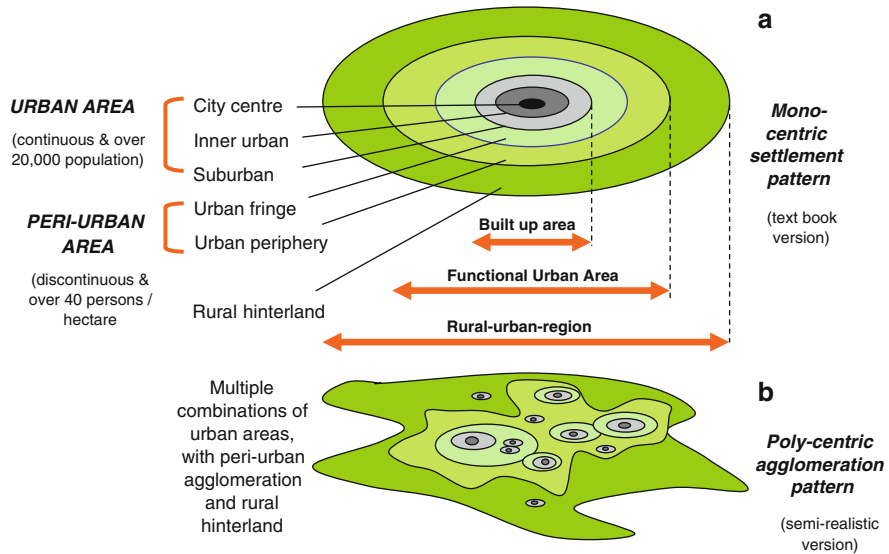


Fig. 2.1 PLUREL concept of peri-urban areas and rural-urban-region

also found that the meanings of each of these terms could vary between different countries and languages. The basic spatial types which define the RUR include:

- **Urban core:** including the Central Business District and the site of many other civic and cultural functions and some public spaces associated with these;
- **Inner urban area:** generally higher density built development (built-up areas) including residential, commercial and industrial types of uses and some public open and green space;
- **Suburban area:** generally lower density contiguous built-up areas, which are attached to inner urban areas, and where houses are typically not more than 200 m apart, with local shops and services, parks and gardens;
- **Urban fringe:** a zone along the edges of the built-up area, which comprises a scattered pattern of lower density settlement areas, urban concentrations around transport hubs, together with large green open spaces, such as urban woodlands, farmland, golf courses and nature reserves;
- **Urban periphery:** a zone surrounding the main built up areas, with a lower population density, but belonging to the Functional Urban Area, as below: this can include smaller settlements, industrial areas and other urban land-uses within a matrix of functional agriculture;
- **Rural hinterland:** rural areas surrounding the peri-urban area, but within the rural-urban-region and accessible within a practical commuting time and so their rural character is affected by residents with urban incomes and lifestyles.

The peri-urban area therefore includes both the urban fringe and urban periphery segments of the above description: defined for the PLUREL project as

‘discontinuous built development, containing settlements of each less than 20,000 people, with an average density of at least 40 persons per km² (averaged over 1 km cells)’.

Each of these area types is part of a larger ‘urban system’. There are different concepts in use to describe urban systems with different boundary definitions – some of them flexible, some specific. The PLUREL project focussed on two main levels:

- Functional urban area: (FUA): ‘an urban core and the area around it that is economically integrated with the centre, e.g. the local labour market. Belonging to a commuter catchment area, FUAs represent common local labour and housing markets’ (Nordregio 2005). This overlaps with the statistical unit of the ‘Larger Urban Zone’, as used in the European Urban Audit.
- Rural–urban-region (RUR): spatial clusters of three interrelated regional sub-systems – the urban core, the peri-urban surroundings and the rural hinterland. Areas of recreational use, food supply and nature conservation located in predominantly rural areas are also part of the rural–urban-region. (see Chapter 1). Rural–urban-regions were the overall territorial unit of analysis for the PLUREL project. They include both the ‘Functional Urban Area’ (zone of daily commuting), and the surrounding rural hinterland. For modelling and analysis, PLUREL defined rural–urban-regions in statistical terms (see Chap. 2) but in policy (and indeed in practical) terms, the boundaries are necessarily more flexible, in order to respond to changing problems and opportunities (see case study chapters).

Figure 2.1 shows two interpretations of this scheme. The upper picture shows a simple text-book version of a mono-centric settlement pattern, surrounded by nested circles. The lower picture is a little more realistic: this shows a poly-centric agglomeration of settlements with different sizes and patterns, surrounded by a rural hinterland with a complex boundary. In the poly-centric version, the peri-urban areas are not only surrounding the urban, they become a geographical type and territory of their own, and the reality on the ground is often complex and fast changing. FUAs overlap and merge to form urban agglomerations, existing settlements change their shape and function and in larger FUAs there are many areas with a combination of infrastructure, housing, industry, open space, and land in transition – a challenge for any kind of definition.

In each of these examples, similar questions arise, in particular, that the conventional measure of radial commuting patterns is only one of a range of factors in urban–rural relationships and fields of influence. This is why the ‘rural–urban-region’ is important and topical, but also challenging for analysis.

Perhaps the most important definition is that of ‘urban sprawl’ – generally seen as a land use pattern with lower density, inefficient or wasted land-use, car dependency, and so on. This raises many questions: – which scale or spatial unit is to be counted? Is an airport or industrial complex to be defined as part of urban sprawl, or as economic development or both? A more technical definition looks for low values in one or more of eight measures: density, continuity, concentration, clustering, centrality, nuclearity, mix of uses, and proximity (Galster et al. 2001). In simple

terms we use two definitions for sprawl – ‘unplanned incremental urban development, characterised by a low density mix of land uses on the urban fringe’ (EEA 2006) and also: ‘Low density, scattered urban development, without systematic large scale or regional public land-use planning’ (Bruegmann 2008, p. 18; Reckien and Karecha 2007). Such definitions can be explored further by looking at the key factors in sprawl, as discussed below.

2.2.3 The Peri-Urban Metropolis and Megalopolis

The context for the ‘rural–urban-region’ is the broader picture of growth and change in human settlements. The process starts with the expansion of free-standing cities into their rural hinterland, absorbing villages into the urban fabric. At some point, if these separate cities are reasonably close together, a regional agglomeration process takes over. If the agglomeration process scales up, the result can be an ‘extended metropolitan region’ or ‘megalopolis’ of over 100 million population, containing within it many types of peri-urban areas, rural areas, or whole rural–urban-regions.

Mumford (1938) defined a megalopolis (also called ‘megacity’, ‘megapolis’ or ‘mega-city-region’) as an agglomeration of adjacent metropolitan areas. Gottmann (1961) used this term to describe the continuous urbanization of the north-eastern seaboard of the USA. Such thinking was then used to inform ‘Ekistics’, the science of human settlements, and a hierarchy of scales was proposed, including a ‘metropolis’ of 4 million, a ‘small megalopolis’ of 25 million, and a ‘megalopolis’ of 150 million population (Doxiades 1968). Interestingly, the largest examples from around the world (Pearl River Delta, Yangtze Delta, Gangetic Plain) are each in this range (Lacquan 2005).

The role of the peri-urban and the rural hinterland in these cases may be different from the typical EU situation. In the Asian megalopolis type there is a focus on the rapid transition from peasant agriculture towards a globalized economic development pattern (Jones and Douglass 2008; Ginsburg and Koppel 2004). By contrast, in the North American type, there is a focus on the ‘edge city’ as a new kind of CBD, and the rural as a zone of enterprise and opportunity (Garreau 1991; Daniels 1998). The peri-urban and rural hinterland is not so much a fixed thing ‘out there’, but highly inter-dependent and inter-woven with urban areas.

2.3 Dynamics of the Peri-Urban

To explore the dynamics of peri-urban change and the peri-urbanization process, we have to look at more than one aspect, not only in physical scales, but also in understanding the complexity of the system. This is not only an academic question, but a practical question for policy makers, who need to understand the peri-urban in order to work with it. The 5-dimensional framework here has developed out of the PLUREL research, together with an extensive review of literature. The aim is to

provide practical routes into a complex situation and to identify the main processes which are visible at different levels. The effects of these in practice can be seen in the regional case study examples in Part 1.

These five dimensions also represent a kind of generic ‘story’ of how peri-urbanization takes place. The first aspect is where urban expansion occurs as a direct result of growth in population, economics and space demands. Next, as cities expand further, they form regional agglomerations, with step-changes in economies of scale taking place, and a new type of peri-urban territory developing. Thirdly, underlying these developments are the effects of various deeper political and cultural forces which shape the peri-urban territory. The fourth factor is where the whole urban system can go through rapid transitions, with radical change and restructuring. The final aspect concerns policy responses to these changes and transitions which often feed back into the mix, and become ‘dynamics’ themselves. In practice, the situation is rarely clear or simple, and each aspect will overlap and inter-connect with the others.

Below we set out the main features of each of these five aspects.

2.3.1 Direct Factors of Urban Expansion

In simple terms, peri-urban change is a direct result of urban expansion, the peri-urban area spreading outwards into rural areas. This is firstly a result of population and economic growth, which result in demand for housing and commercial areas. The location of housing is then determined in part by transport accessibility to employment and services and in part by the attractiveness of the environment as well as land values. There are usually physical and policy constraints to expansion. Each of these interacts with the others, and each raises further questions, e.g. how do the physical or policy constraints work? What drives the growth in demand for land and buildings, and enables the supply of development? (Fig. 2.2). The following sections outline some of these drivers:

Demographic and social dynamics are driven by population change due to fertility and mortality rates and migration. While fertility and mortality are relatively slow to change, over several decades some very different demographic profiles can emerge. International and inter-regional migration flows are more volatile and dependent on political factors and global economic swings among others (Bell et al. 2010). The continuing decrease in average household size as the population ages will also affect housing demand. Urban–rural migration – inwards or outwards – is dependent on spatial policy, the relative attractions of cities or rural areas for jobs and quality of life, as well as transport and communications (Loibl and Bell 2011).

Economic and employment growth drives the rate of urbanization. The rate of savings and capital investment feeds into expansion of the building stock and land-use conversion, as both a supply-side push factor of production, and a demand-side pull by consumers. Economic structures and employment patterns also affect

Showing direct factors in urban development, as typically used in urban & regional modelling:
together with responses and counter-effects in peri-urban and rural areas

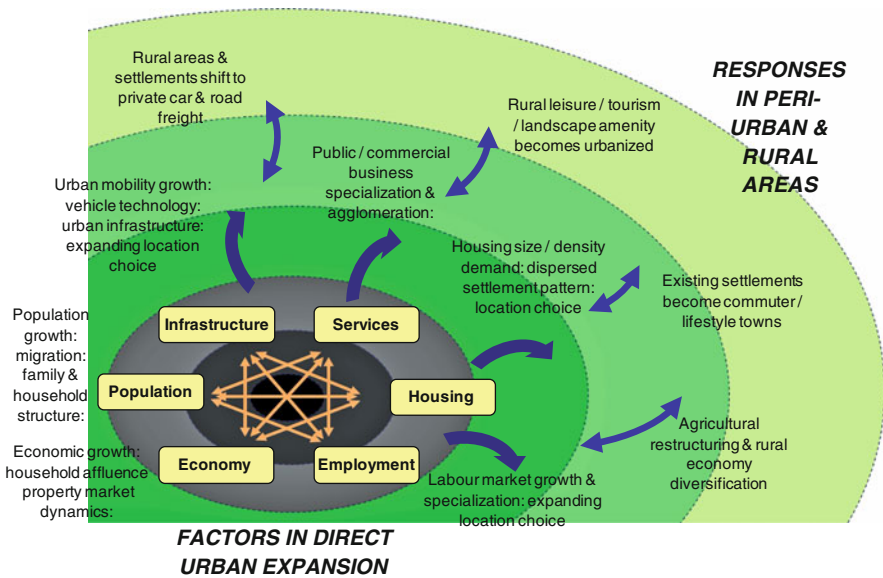


Fig. 2.2 Dynamics of the peri-urban: (a) urban expansion

the trends of peri-urbanization, e.g. if home-working becomes more popular for the service sector. Business technology affects not only employment but supply chain logistics, the distribution of production, services and consumption (Korcelli et al. 2011).

Environmental dynamics and constraints include fixed geographic features such as rivers, coasts, wetlands or mountains, which shape the pattern of urban development. Beyond that is a wide range of dynamic factors which are more complex to analyse. Local urban climate factors such as the Urban Heat Island effect may make urban environments less comfortable in summer and broader climate change may possibly affect sea-levels or flooding, for example. As a result, some urban environments may become more unpleasant and hazardous, which may encourage out-migration. Meanwhile increases in sealed surfaces in larger urban territories will affect local hydrological systems, necessitating better water resource and flood management which in turn are likely to put pressure on peri-urban development such as to maintain open flood storage areas along the edges of rivers. Also, there may be pressure on peri-urban land use for the production of bio-mass and other forms of renewable energy (Zasada and Berges 2011).

Urban built structures and infrastructure are the components of the physical urban system itself. The floor space per person for living and working, and the land intensity of such floor space, are the primary determinants, especially when household size is taken into account. Then, the pattern of housing investment, housing form, community services, settlement density and morphology, are each relevant to the

growth and pattern of peri-urban development. Transport and communications are the other key factors, as infrastructure can encourage or inhibit urban/rural migration, counter-urbanization, or re-urbanization. Transport is not only a matter of direct expansion: there has been a systemic change from a public transport-based radial pattern, to car and highway based network pattern (Ristimäki 2011).

2.3.2 Regional Agglomeration and Urban–Rural Linkages

The urban expansion scheme described above is not a simple one-way process; it also generates responses and changes in the surrounding peri-urban and rural areas. Nor are these only local-scale responses, but they involve a more inter-urban and regional scale in the reshaping of spatial relationships. These peri-urban and rural responses are important feedback loops, which over time can lead towards major peri-urban changes.

Such feedback causes the dynamic of change to evolve towards the inter-urban or ‘regional agglomeration’ effect. The concept of the free-standing city in rural surroundings is replaced by a wider regional urban system of inter-connected and polycentric settlement forms (Hall and Pain 2006). As the urban markets and peri-urban ‘shadows’ expand, there comes a point where the agglomeration effect takes over in economic-financial terms, in labour markets, shopping markets, and housing location choices. The rural processes of economic restructuring, land market changes and agricultural modernization can also lead to a more rapid shift towards agglomeration. In order to gain access to larger consumer and labour markets there are clear incentives for new business parks, shopping malls and airport zones to find new locations, not within but between major cities, in order to serve larger populations more efficiently.

The result is that previously separate peri-urban areas can become the linking spaces, forming continuous, functional, low density zones, which provide for most living/working/shopping needs for the majority of suburban or ex-urban car-based residents (see also Soja 2000).

In reality this inter-urban or regional scale agglomeration is not a homogenous space, but more like a diverse territory shaped by many types of ‘land use relationships’:

- Urban to peri-urban links: urban demands and pressures on suburbs and peri-urban surroundings; space for housing, business, infrastructure. In the other direction, the peri-urban requires urban markets, services and innovations.
- Peri-urban to rural: the relationship of people to landscape, in functional-economic terms such as food, water, minerals, or tourism. There are also services which are more socio-cultural, such as aesthetics, amenity, recreation and cultural identity. In the other direction are relationships of employment, investment, and access to services.
- There are also relationships within peri-urban communities: the potential for economic and social development within settlements and across the peri-urban zone.

This extends the 'ecosystems services' approach to a wider view on 'services, linkages, functions, values': for integrated development policy in the rural-urban-region (based on Ravetz, 2011).

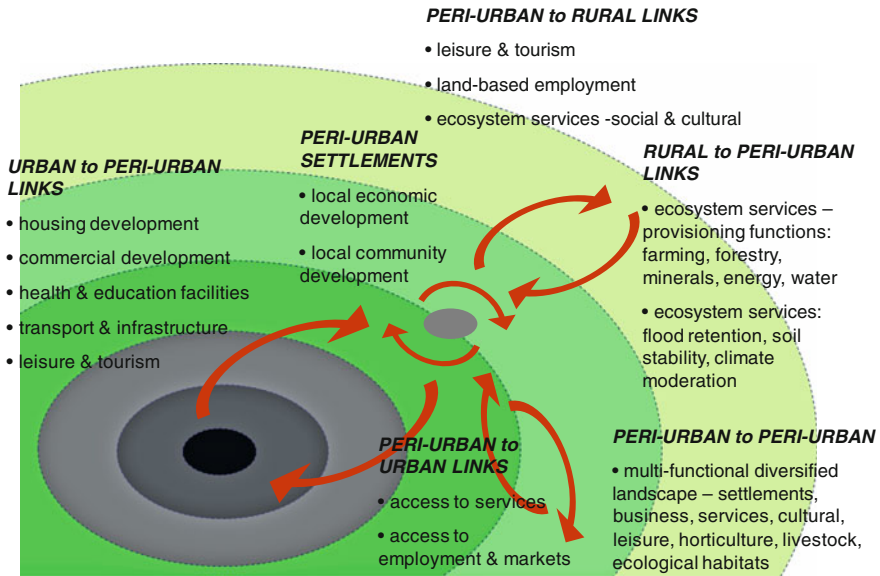


Fig. 2.3 Dynamics of the peri-urban: (b) agglomeration and linkages

Managing such relationships is at the core of the policy agenda for 'integrated development for territorial cohesion in the rural-urban-region' (Ravetz 2011a). This is a broad sustainable development agenda aiming to identify the economic, social or environmental functions and services between different areas, to identify their values, monetary or otherwise and then to construct spatially-based policies for obtaining the best balance of services and values. The implication is that chaotic urban sprawl and unplanned agglomerations can be improved by establishing such relationships, in order to enhance the internal 'territorial cohesion' within and between rural-urban-regions (CEC 2008) (Fig. 2.3).

2.3.3 Global-Local and Structural Dynamics

Behind the physical processes of expansion/agglomeration are powerful social, economic and political forces at work. The first of these is *globalization*, exerting economic effects on the structure of business and finance, political effects on the urban hierarchy and cultural effects through the media and information and communications technology (ICT). There is also a counter-trend of *localization*, where the cultural identities of people and places are being re-invented in new ways. The *liberalization* process involves privatization, franchising and cost recovery, with far-reaching effects on urban governance and public services. Meanwhile

the *consumption* culture affects the identity and perceptions of peri-urban places through leisure, tourism and other location decisions. The tension between *risk* and *security* is also a powerful shaper of places and spaces. In search of security, the affluent may seek gated enclaves away from city centres, in a peri-urban ‘archipelago’ (Beck 1995; Borsdorf and Salet 2007).

All these start with very topical questions – what is the peri-urban landscape for, and who should decide? Who gets the benefits or bears the costs of investment or restructuring? Whose land is it, and why? (Shoard 1983). Large parts of the peri-urban are open to a wide range of possible uses – tourism, high-value housing, business sites, agriculture, nature conservation, flood mitigation or energy production and distribution. There are economic, ecological, historical, and residential aspects in competition with each other and many of the critics of sprawl are the more affluent peri-urban residents, seeking to maintain their own quality of life by limiting further development which might affect their environment negatively.

A structural approach looks beyond physical land use, at the underlying dynamics of power, wealth and ideology. Urban expansion can be seen as one of the paths of the ‘dual circuit’ in the capitalist system: investment in land and buildings as an alternative to investment in production and consumption (Harvey 1985, 1987). In an alternative version, the peri-urban space is firstly a financial commodity, where the imperative for global capital accumulation drives a system of ideology, as well as the physical system of infrastructure, construction and property speculation (Maciocco 2008). We can also see the peri-urban as a place of dependency and colonization: alongside power stations and waste landfills are the service zones of low income housing for workers and dependents or public housing in ‘peripheral estates’ (Davis 2005). There is also a discourse on the peri-urban as a kind of frontier capitalism – promoted by business/science park investors with images of green fields and fast road connections to the airport. Favoured parts of the peri-urban are framed as a cultural-cognitive-capitalist zone of creative enterprise, which attracts global investors and entrepreneurs, alongside local utopians and free-thinkers (Scott 2000). This also points the other way, towards many kinds of informal or illegal activity such as farmers trading in scrap vehicles, unlicensed waste dumping or alternative free festivals in the forest (Farley and Roberts 2011).

The ‘urban archipelago’ concept sees this in terms of a series of increasingly disconnected islands of wealthier and poorer populations, another phase in the so-called ‘splintering’ of cities (Borsdorf and Salet 2007; Graham and Marvin 2001). By contrast a ‘spatial ecology’ perspective sees a peri-urban territory with many types of relationships and connections (although not all are positive). A diversity of typical peri-urban land uses and locations is shown in Fig. 2.4, as a ‘spatial ecology’ (Ravetz 2011b). A wide range of land use relationships as above, is shaped by structural forces, and overlaid on a diverse landscape of ‘real places’ (Clay 1994).

One axis in this scheme concerns globalization versus localization. Cities become hubs in a geo-political hierarchy, a ‘global urban system’ (Knox and Taylor 1995). There are also counter forces of localization when commuters seek ‘fields at the end of the garden’, or citizens participate in new forms of local enterprise. The result can be a diversification of land uses and enterprises; it can also be the NIMBY

Showing a 'spatial ecology' / urban archipelago of multiple land-uses and location values, as shaped by structural dynamics of global / local and public / private : (adapted from Clay, 1994)

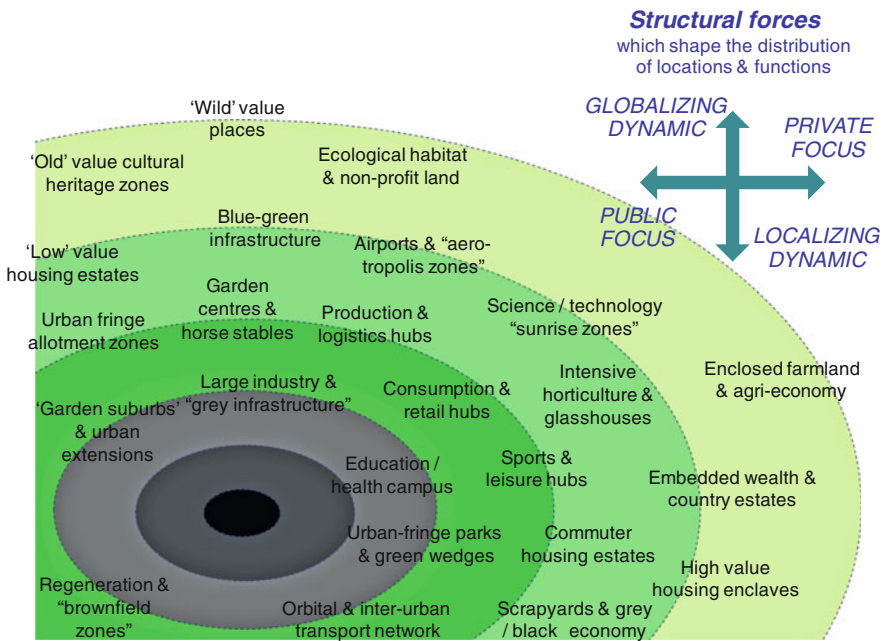


Fig. 2.4 Dynamics of the peri-urban: (c) global–local and structural

(‘not in my back yard’) response of those living there already. The other axis in the scheme focuses on the political-economic aspects of public versus private sector, and the tension between public policy and market processes.

Such questions are crucial for the future of the peri-urban space, where governance is often fragmented and where coordination across boundaries can be more difficult. The diverse land uses each compete for space, access and investment and the line between public and private objectives is closely debated.

2.3.4 Complexity, Transition, Resilience

Each of the above factors – urban expansion, regional agglomeration, and structural effects – can work in combination, with many feedback loops between them, amplifying the processes of change. The result is not always smooth and predictable, but may be a rapid transition, a ‘discontinuity’, or in some cases a catastrophic failure. Transitions are system-wide changes, which can involve economic systems, social structures, political systems, spatial patterns, technology and infrastructure systems (Geels 2005). There are often parallel transitions in socio-cultural roles, identities, perceptions, and the city’s ‘reason for being’ – a common question in

many cities which no longer retain their original function industrially, economically or politically. This is not only a physical and functional transition, but one of overall role and identity as areas evolve from a supporting role as commuter suburb, to a fully functioning low density urban system – a ‘post-metropolis’ (Soja 2000), or ‘metro-scape’ (Krafczyk 2004; Giannini 1994). Some typical transitions are:

- *Rural transition*: away from primarily agricultural production towards a more diverse multi-functional landscape and settlement pattern;
- *Peri-urban transition*: re-structuring for globalized systems of production and consumption;
- *Urban transition*: restructuring towards a networked economy with different patterns of green/grey infrastructure.

Each of these transitions can be micro-, meso- or macro-level in their effects, ranging from individual places, to whole urban systems (De Roo and Silva 2010). Each then generates some kind of response from the system affected. In some cases there is negative reaction and resistance, while in others there are positive responses, to build resilience to shocks, or creative innovation for new roles in a new environment. Such responses may then become incorporated as an objective of policy. For example, a typical response to an economic transition in the Manchester case can be seen where rural development policy aims for new kinds of skills and business models (see Chap. 6). A range of responses focused on economic, governance, community or spatial planning are shown in the diagram as circles; the overlaps reflect the policy links between multiple objectives.

Complexity and transition theory draws on current ecological thinking on ‘complex adaptive systems’. These show evolutionary, ‘non-linear’ and self-organizing behaviour in systems of multiple relationships at multiple scales (Waltner-Toews et al. 2009). The implication for policy is crucial – i.e. managing a complex adaptive system is a very different task to managing a linear system, where outcomes are a direct result of inputs. Similar views on complexity and evolution come from the ‘fractal city’, composed of endless levels of self-organizing complexity (Allen et al. 1986; Batty and Longley 1994). At the root of such complex cities are the self-organizing patterns of individuals, households, firms and other units – not only economic but social, cultural and political (Portugali 2000). Overall, a ‘human’ complex adaptive system (in contrast to biological) will aim to build capacity for collective knowledge and social learning, and focuses on the ‘shared intelligence’ which enables strategic thinking and creative innovation (Ravetz 2011b).

2.3.5 *Spatial Governance and Policy Responses*

The final piece in this framework concerns the responses of policy, spatial planning and the governance system itself. These come with the aim of solving problems, but they can also become part of the problem which they aim to solve. Beneath the surface the role of policy is often to try to turn the ‘problems’ of transition

and restructuring, into ‘opportunities’. The systemic responses to transitions – building resilience, adaptive capacity, shared intelligence etc. – then become the objectives of policy, which again becomes part of the system to be addressed.

An example is the Green Belt policy in the UK, seen as successful in its objective of solving one problem – preventing sprawl – by urban containment: but also shaping or distorting the land and property market, and so generating other problems. In the Manchester case-study in Chap. 6, these second-order problems of vacant or neglected land then become the objective of further layers of policy, and so on.

There are questions concerning the overall scope and effects of ‘spatial governance’ – the system of territorial government, spatial planning, and the policy system. Main factors in direct urban expansion, with alternative modes of spatial governance are:

- *High or low land intensity*, i.e. the amount of land area required per unit of housing or business. This factor could be further analysed into economic intensity, in terms of value or production or social intensity in terms of welfare measures. Environmental land intensity is also relevant, where the urban system demands land for ecosystem services, material supplies, waste management, leisure and amenity. The land intensities are normally assumed to be on a growth trajectory which is similar to that of economic GDP. In the scenario modelling (next section), land intensity is assumed to be correlated with economic growth and capital investment.
- *Strong or weak spatial governance*. This ranges from active and coordinated spatial planning and governance in the public interest to ad hoc and fragmented governance for short term enterprise and private profit.

The analysis is set out in Table 2.1 below. This shows the different effects of population growth and land use growth, mapped on to strong or weak governance. It also shows a third category of ‘partial governance’, to describe governance which is patchy, or stronger/weaker for different social groups. It also includes ‘urban shrinkage’, which is a powerful trend in many older cities (see Chap. 7 on Leipzig/Halle).

The foregoing analysis raises questions about the overarching goals of policy, generally as assumed to be *sustainable development*. In principle, sustainable development combines economic, social and environmental ‘pillars’ or goals, to be achieved both locally and globally and in both the short and longer term. In this case, the principles must begin with the complex, messy reality of peri-urban areas. One approach is to look at the European policy on ‘territorial cohesion’, and the implications for urban/rural policies and local/regional/national planning (Duhr et al. 2009). Another approach is to explore the ‘sustainability tension’, between competing urban/rural, and development/conservation agendas (Ravetz 2000; CURE 2003):

- Urban development: a growth and modernization perspective;
- Urban conservation: a containment and regeneration perspective;

Table 2.1 Combination of growth, expansion and governance effects

	Strong spatial governance	Partial spatial governance	Weak spatial governance
Urban growth + expansion: (population + space per person)	Hi-growth poly-centric 'social city-region' model (lower density)	Planned agglomeration with enclaves	Hi-growth urban sprawl (lower density)
Urban growth: (population)	Poly-centric 'social city-region' model (higher density)	Planned higher density enclaves	Urban sprawl (higher density)
Urban expansion: (space per person)	Poly-centric 'social city-region' model (lower density)	Planned lower density enclaves	Urban sprawl (lower density)
Urban stability	Compact city and urban containment	Restructuring city within spatial envelope	Ad hoc low-growth or stagnation
Urban shrinkage	Planned transition, focused on green infrastructure	Growth in selected zones/enclaves, surrounded by decline	Chaotic decline with derelict/vacant land and buildings

- Rural development: more local, rural-focused enterprise;
- Rural conservation: an environmental protection approach.

The peri-urban can be seen as being pushed and pulled by these competing aspects. In a dynamic rural–urban-region each of these will be evolving and can be shaped by spatial governance processes. The result can be complex and inter-dependent.

There are basic questions about the degree to which an urban system can be sustainable given its heavy reliance on resources imported from beyond its boundaries – a city region is difficult to consider as a 'unit of sustainability' in its own right and this fact should be recognised.

2.4 Scenarios and Modelling Results

The discussions above show that the dynamics of the peri-urban and of land use change are complex and multi-level; they are also the subject of conflict and competition between different social and political groups. To describe this accurately is beyond the scope of any technical analysis or modelling system. One solution to this problem as a route into the exploration of the complexities of processes and dynamics is to work with scenarios. The first thing to make clear is that scenarios are not 'forecasts' or 'predictions'. Instead, scenarios are useful tools in asking a wider set of 'what-if?' questions, and comparing the results of policy options. Technical analysis and modelling, using starting parameters

and decision rules based on these scenarios, can be combined with broader exploration of possibilities in terms of social, economic, cultural and political change. Technical modelling forecasts are useful but never good enough to describe complex environmental, economic or human problems fully. Scenarios are not new tools – they are used all the time to test how policies or plans could deal with sudden unforeseen emergencies of all types. War games, earthquake responses, economic modelling and foreign policy analysis all use them in one form or another – a ‘what if?’ story is prepared and different models used to test what might happen in the event of the storyline taking place. Scenarios are most useful for helping to prepare governments for what experts might consider to be the least likely but most devastating contingencies and so for that reason in the PLUREL project a number of ‘shock scenarios’ were used (see below).

2.4.1 Scenario Method and Framework

PLUREL developed a scenario framework for the peri-urban research agenda. As a source for these, given that the project was funded under the ‘Climate change and ecosystems’ programme, was the IPCC Special Report on Emissions Scenarios (SRES) (IPCC 2000) (Fig. 2.5).

- Adapting the IPCC global context scenarios to the EU space, up to the years 2025 and 2050.
- Focusing these on the peri-urban issues.
- Building in a set of ‘shocks’, i.e. rapid changes, which were relevant to the scenario and the theme.
- Translating the scenarios into economic, demographic and land use modelling parameters.
- Completion of EU-wide scenario model results, including spatially explicit maps.

The scenarios were used mainly as the basis for ‘top-down’ modelling work on economic, demographic, and environmental and land use changes. In the study of spatial typologies and governance systems, they were applied to different urban types and governance types. In each of the case study regions, the focus of this book, the top-down scenarios became the starting point for modified, localised ‘bottom up’ scenarios within each of the regional case studies. These took inputs from regional policy-makers and stakeholders, in the form of issues, questions, and policy options which were then modelled in the MOLAND system and the implications of these results were fed back to policy-makers and stakeholders for their reaction and response. More detail on the technical methods can be found in Chap. 3.

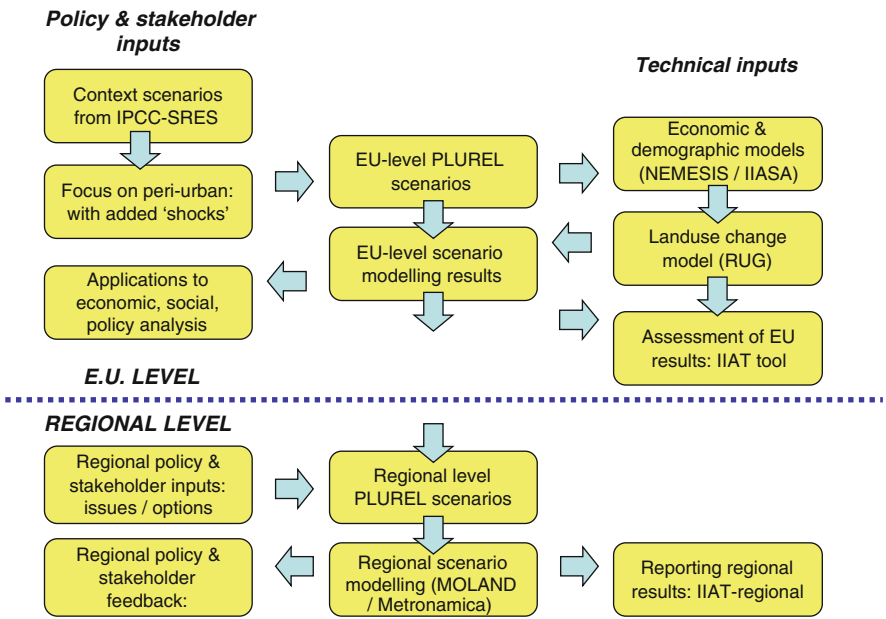


Fig. 2.5 Outline of scenario and modelling process

The result of the initial scenario development was four main scenario types aligned along two conceptual axes as illustrated in Fig. 2.6. ‘Storylines’ to flesh out the bare bones of the types were then produced as follows.

A1 – ‘Hyper-tech’ scenario (globalizing and privatizing dynamics)

This visualises a future world of rapid economic growth, a global population that peaks by mid-century and the rapid spread of more efficient technologies. Investment in research and development is high and nations share knowledge and pool resources in a global research market place. Energy prices decline because supply is driven by new developments in renewable energy production and nuclear fission. The shock concerns the rapid acceleration of information and communication technology (ICT), which transforms home and work as never before.

For peri-urban areas in Europe, this scenario would be expected to result in a range of smaller ‘polycentric’ towns and cities becoming even more popular. New transport technologies would lead to more rapid journeys and the expansion of the commuting distances around towns and cities. New forms of ICT would enable people who prefer country life to work from home or a neighbourhood centre, and this would lead to peri-urbanisation and ‘metropolization’ of rural areas on a widespread scale.

A2 – ‘Extreme water’ scenario (localizing and privatizing dynamics)

This imagines a more diverse world of self reliance by people and the preservation of local identities. While the population increases, economic development would be primarily regionally-orientated, and per capita economic growth and technological change would be more fragmented and slower than in the other storylines. The shock

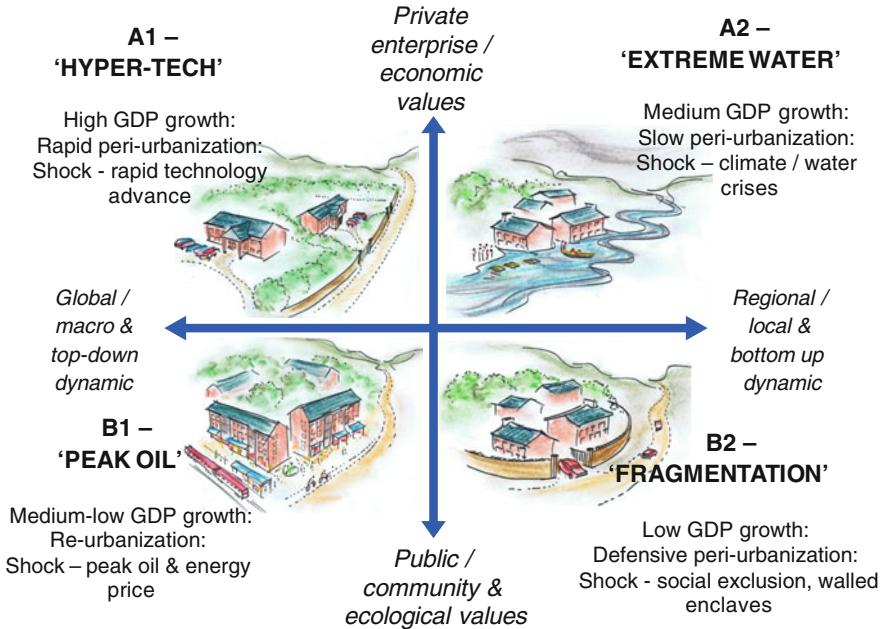


Fig. 2.6 PLUREL scenario framework and images

here is subtitled ‘extreme water’, and is based on rapid increase in sea level rise accompanied by flooding in some areas and drought in others.

Peri-urban areas would be expected to be strongly affected; affluent yet vulnerable city-regions such as London or the Dutch Randstad would spend large sums of money on flood defence and adaptation strategies. Population growth due to climate-change induced immigration would put more pressure on urban infrastructure and services.

B1 – ‘Peak oil’ scenario (globalized community dynamics)

This scenario envisages a future of environmental and social consciousness – with a global approach to sustainable development involving governments, businesses, media and households. Economic development would be more balanced with major investment in resource efficiency, social equity and environmental protection. The ‘shock’ in this scenario is driven by the arrival of the point of ‘peak oil’, that is, a decline in global oil availability following maximum production levels, leading to rapid increases in energy prices and many resulting social and economic effects.

For peri-urban areas, rising energy prices would have an enormous impact on residential location choices because transport costs limit commuting distances. Although tele-working would be encouraged, most people would attempt to return to larger cities and towns, and many of the more remote rural areas would be expected to decline.

B2 – ‘Social fragmentation’ scenario (localized community dynamics)

Here, the vision is of a fragmentation of society, in terms of age, ethnicity and international distrust. The voter-strong older population would become increasingly dependent on the younger generation, but the working-age population would be disinclined to transfer their resources, leading to growing intergenerational conflicts. Cities would become more socially fragmented as younger migrants would tend to dominate city centres and older ‘natives’ to favour the outskirts and enclaves outside the cities – so that peri-urban areas would also become ‘peri-social’ areas. New development would slow down but much existing urban form would change its function.

The scenarios shown here are only four possibilities out of an almost infinite number. What is interesting is that each scenario suggests not only a very different spatial development path but a different direction for the research and modelling focus. For instance, one of the first technical parameters in spatial development is the gravity function, i.e. the field of attraction of urban areas. Each scenario suggests not only variations in the gravity function, but also different kinds of functions which take priority. The A1 scenario suggests a network effect; the A2 suggests disaster management; the B1 suggests an energy/climate policy focus; and the B2, a localized repulsion effect which replaces attraction.

Again, these differences pose not only academic questions but ones which concern practitioners, as seen in the case study chapters to follow.

2.4.2 *Scenario Applications and Assumptions*

The scenarios were applied to the issue of land use change through modelling and statistical analysis based on assumptions for economic growth, development and employment as well as demographic growth and change. Environmental issues such as resource consumption and climate change were not modelled at the European level. The overall modelled assumptions are summarized in Table 2.2.

Using the macro-economic model NEMESIS, various assumptions on economic growth and employment restructuring were modelled at national level for each EU27 country. A limited ‘downscaling’ provided a breakdown at regional level (NUTS-x¹), together with analysis of housing and land use demand factors. Demographic projections were modelled using the IIASA model (Samir et al. 2008), also at national and regional levels. The base assumptions for each scenario included estimates for fertility and life expectancy, as well as internal and cross-border migration.

¹ NUTS = Nomenclature of Units for Territorial Statistics, a geocode standard for subdivisions of countries for statistical purposes. For modelling and analysis of rural–urban-regions across Europe, we used NUTS-x units, a combination of NUTS2 (regional) and NUTS3 (sub-regional) units. In our analysis 510 NUTS-x regions are included, each with an average population of 900,000 inhabitants.

Table 2.2 Summary of scenario assumptions

	A1	A2	B1	B2
	‘Hyper-tech’	‘Extreme water’	‘Peak oil’	‘Fragmentation’
Population growth	Medium-high	Medium	Low	Medium
Fertility	Medium	Medium	Low	Medium
Mortality	Low	Medium	High	Medium
International migration	Medium	Medium	Low	Medium
GDP growth	High	Medium-high	Medium-low	Low
Urban population growth	Low	High	Medium	Medium
Peri-urban/rural population growth	High	Low	Very low	Medium
‘Shock’ storyline	Rapid technology advance	Extreme water events	Peak oil	Fragmentation, social exclusion

Urban transport/land use interactions were modelled using a combination of the Regional Urban Growth model (Rickebusch and Rounsevell 2009) and, in case study regions, application of the MOLAND model (Barredo et al. 2003). These models are described in detail in Chap. 3. As above, the technical inputs and results need to be seen in combination with a wider set of driving forces and assumptions including technological change, infrastructure investment, socio-political and cultural issues.

2.4.3 Scenario Modelling Results

The key result of the scenario modelling is the calculation and allocation of built development (i.e. ‘artificial surface’) growth for the period 2000–2025, for each of the four scenarios. The definition of artificial surface includes urban residential, industrial and commercial areas, as well as transport infrastructure, leisure and non-green public spaces in urban areas. These types and the baseline state for 2000 were derived from the CORINE land cover database, managed by the European Environmental Agency (EEA 2000). The projected growth was based on the scenario assumptions and the respective projections for economic growth and population change, as downscaled to NUTS-x regions.

2.5 European-Wide Development Trends

As described at the beginning of this chapter, there is a gap between population growth rates and the growth of urban areas in Europe. During the post-war period European cities grew between 40% and 300% in size but considerably less so

Table 2.3 Annual growth by scenario 2000–2025, EU27^a

	Projected annual increase by scenario			
	A1 (%)	A2 (%)	B1 (%)	B2 (%)
Population	0.16	0.14	0.13	0.15
GDP/capita ^b	2.22	1.92	1.53	1.43
Artificial surface	1.86	1.55	1.10	1.09

^aWithout Bulgaria.^bData for 2005–2025. Prices 2000.**Table 2.4** Growth of artificial surface in urban, peri-urban and rural areas, 2000–2025, EU27^a

Sub-region	Artificial surfaces area in 2000 (with share of total area) ^b	Annual increase by scenario			
		A1 (%)	A2 (%)	B1 (%)	B2 (%)
Urban	48,765 km ² (79.1 %)	0.65	0.61	0.50	0.48
Peri-urban	47,532 km ² (8.3 %)	2.46	2.06	1.44	1.44
Rural	72,182 km ² (2.5 %)	2.13	1.75	1.24	1.24
Total	168,478 km ² (4.7 %)	1.86	1.55	1.10	1.09

^aWithout Bulgaria.^bThe remaining areas which are not classified are unpopulated areas as water, rocks and glacier surfaces.

in population (EEA 2006). According to all four scenarios, this gap would increase further up to 2025, meaning increasing per capita consumption of urban land.

There are, however, some differences between the scenarios at a pan-European scale, reflecting the various assumptions taken as the basis for each. Economic development would be 50% higher in scenario A1 than in B2, which would also have a strong influence on the increase of artificial surface. By contrast, population development would be rather similar in all scenarios, changing by only a very low annual increase. Table 2.3 summarizes the key drivers for each scenario.

In the PLUREL project a regional typology was developed, grouping the EU-27 territory into urban, peri-urban and rural areas at a resolution of 100 × 100 m cells. The typology incorporates population as well as land use data. Urban areas are defined as continuous areas with artificial surface (according to CORINE) and a minimum of 20,000 inhabitants. Peri-urban areas are those with more than 40 inhabitants per km² and adjacent to or very close to urban areas. Rural areas include all remaining populated areas. Details are explained in more detail in Chap. 2. Table 2.4 illustrates the results of projected artificial surface change broken down into the three sub-regional types.

All the four scenarios suggest a continued growth of artificial surface in Europe. Peri-urban areas would experience the highest growth rates, while areas which are already predominantly urban would experience relatively small changes. Many rural areas are also projected to have strong growth.

2.6 Land Use Dynamics

Table 2.4 already gives a first impression of the expected dynamics in peri-urban areas, which are shown as absorbing a large amount of future urban growth. However, these dynamics are, unsurprisingly, allocated very differently across Europe. In the following section some maps showing different aspects of these dynamics will be presented and discussed in terms of the regional variations across Europe. Before that, we will summarize the development of the economy, expressed in GDP, and the projected population development, which both are decisive for urban growth.

The scenario results for GDP growth present a well known picture. The new EU member states would experience a far higher annual growth rate than the rest of the EU, resulting in a relative convergence at country level in all scenarios. The lowest growth rates would be expected in Eastern Germany and parts of Italy. There is though, some difference between the scenarios. In the A1/A2 scenarios a generally higher rate of growth is projected than in B1/B2. Also, in the B1/B2 scenarios parts of Western Europe, especially France, Belgium, German, Austria, Italy and Portugal, would be expected to have a lower growth than other parts of the EU. Furthermore, the increase in GDP would not be linear, but a slowdown for the period of 2010–2020 is suggested in the B1/B2 scenarios and also in A2. Shock events introduced by the scenarios, such as ‘peak oil’ and a subsequent but delayed technological change, are reflected in this development.

Regarding population development, again, a well known picture emerges, showing a west–east divide, with population loss mainly in Eastern Europe and some peripheral regions due to a negative migration balance. Western Europe and especially the UK and parts of the Netherlands, Belgium, France and Spain, would experience the highest population growth rates in all scenarios. There are only minor differences between them as mentioned above, with slightly more increase of population suggested by scenario A1 but without differences in regional trends.

Against the background of these development trends we will now discuss the projected changes of land use, which is illustrated by the development of artificial surface, and not least the role peri-urban areas would be expected to play. We will only present some key results; more details will be found in Chap. 2.

2.6.1 *Loss of Natural Surface*

The maps in Fig. 2.7 show the projected transformation of natural into artificial surface up to 2025. In the economic growth scenarios ‘Hyper-tech’ and ‘Extreme Water’ the loss of natural surface would be highest. Geographically most natural surface transformation would be in the economic core area of Europe between London, Hamburg, Munich, Milan and Paris (the so-called ‘Pentagon area’).

Loss of natural surface 2000-2025

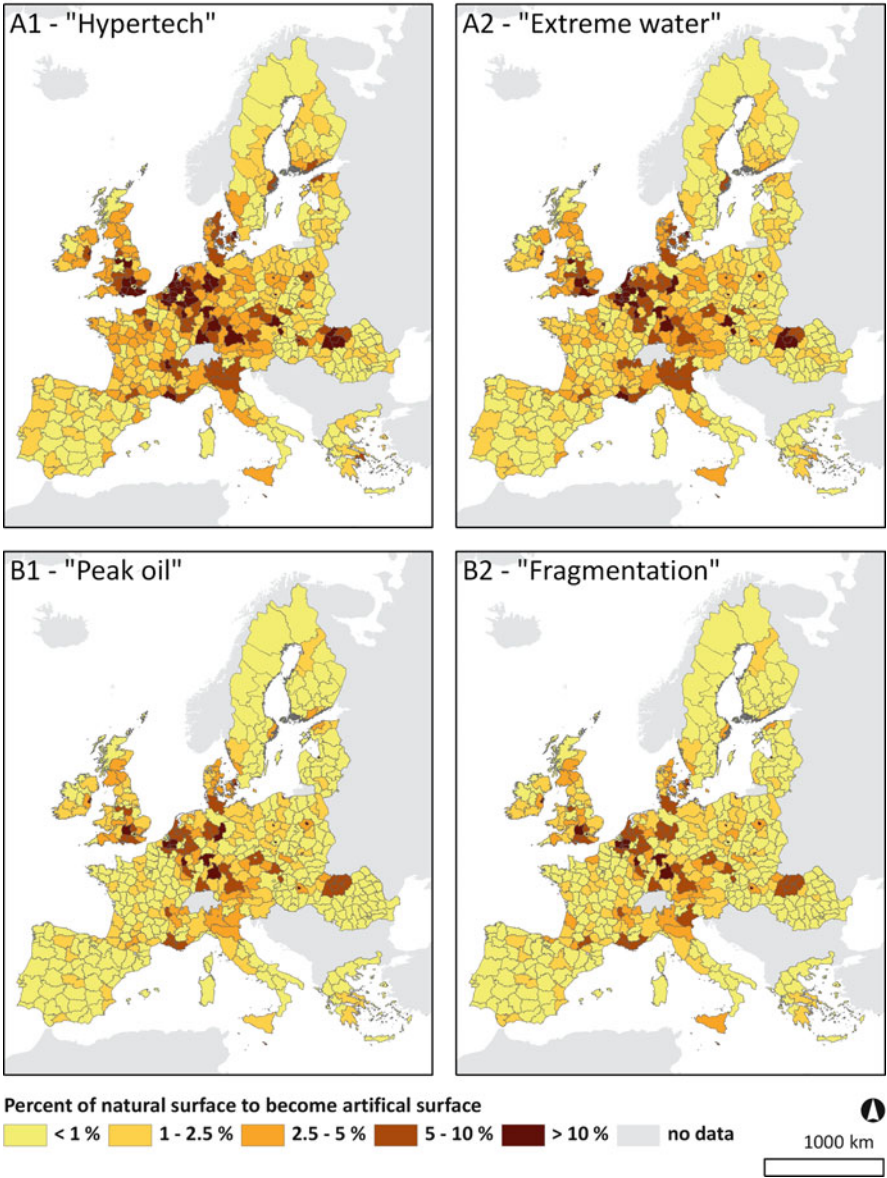


Fig. 2.7 Loss of natural surface

2.6.2 Type of Urban Growth

The maps in Fig. 2.8 illustrate the comparison of population change and changes of artificial surface. The scenarios ‘Peak oil’ and ‘Fragmentation’ seem to suggest more compact development than the other two, with more areas having a higher increase in population than in artificial surface. Most potential for this decrease in relative artificial surface consumption would be experienced in Western Europe, mainly because of strong population increase. Some parts of Northern Europe, Poland, Germany, Spain and Portugal would see a high artificial surface growth with a parallel decrease in population.

2.6.3 Peri-Urban Artificial Surface Share

The maps in Fig. 2.9 show the changes in share of artificial surface in peri-urban areas relative to the total area of artificial surface. An increase means that peri-urban artificial surface would grow faster than in urban and rural areas, resulting in relatively more artificial surface in peri-urban areas by 2025 compared to 2005. Again, in the scenarios ‘Peak oil’ and ‘Fragmentation’ the peri-urban share would be most stable, while in the other two a continent-wide increase of peri-urban artificial surface share would be expected. The UK, parts of the ‘Pentagon’ area and Northern Poland would experience a shift towards more peri-urban areas in all four scenarios.

2.6.4 Sensitivity to Choice of Scenario

While the scenario maps show many similar properties in the distribution of losses of natural surfaces and change of artificial surfaces within peri-urban areas according to the different scenarios, there are general differences in the sensitivity to scenario choice across Europe. From analysis of the deviations between scenario results Ireland and areas around the Baltic Sea (in Sweden, Finland, and the Baltic states) appear to be most sensitive to the choice of scenario.

In addition, there is a general difference between Western Europe and Eastern Europe and the Iberian Peninsula where the sensitivity to the choice of scenario tend to be less. The sensitivity towards the choice of scenario is related to sensitivity towards population growth scenarios – but not reducible to underlying population growth.

Type of urban growth 2000-2025

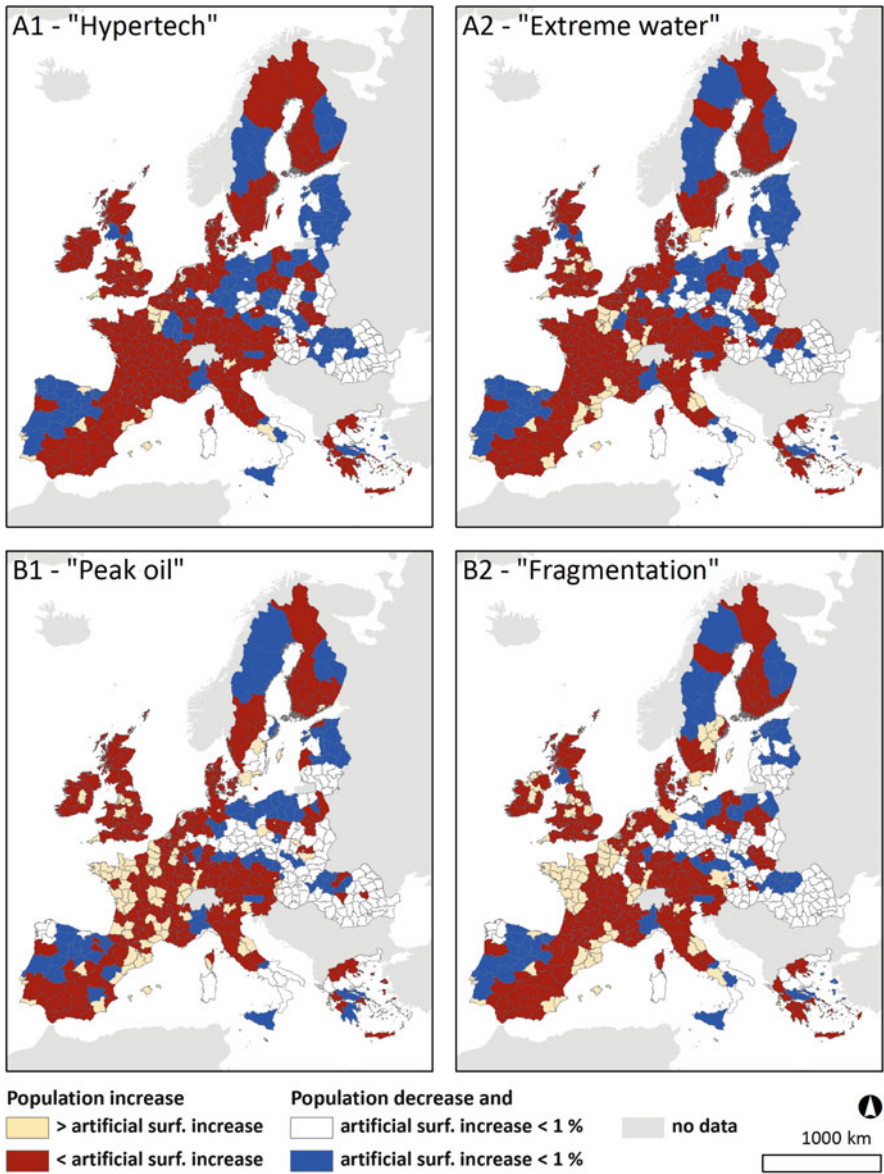


Fig. 2.8 Type of urban growth

Change of peri-urban artificial surface 2000-2025

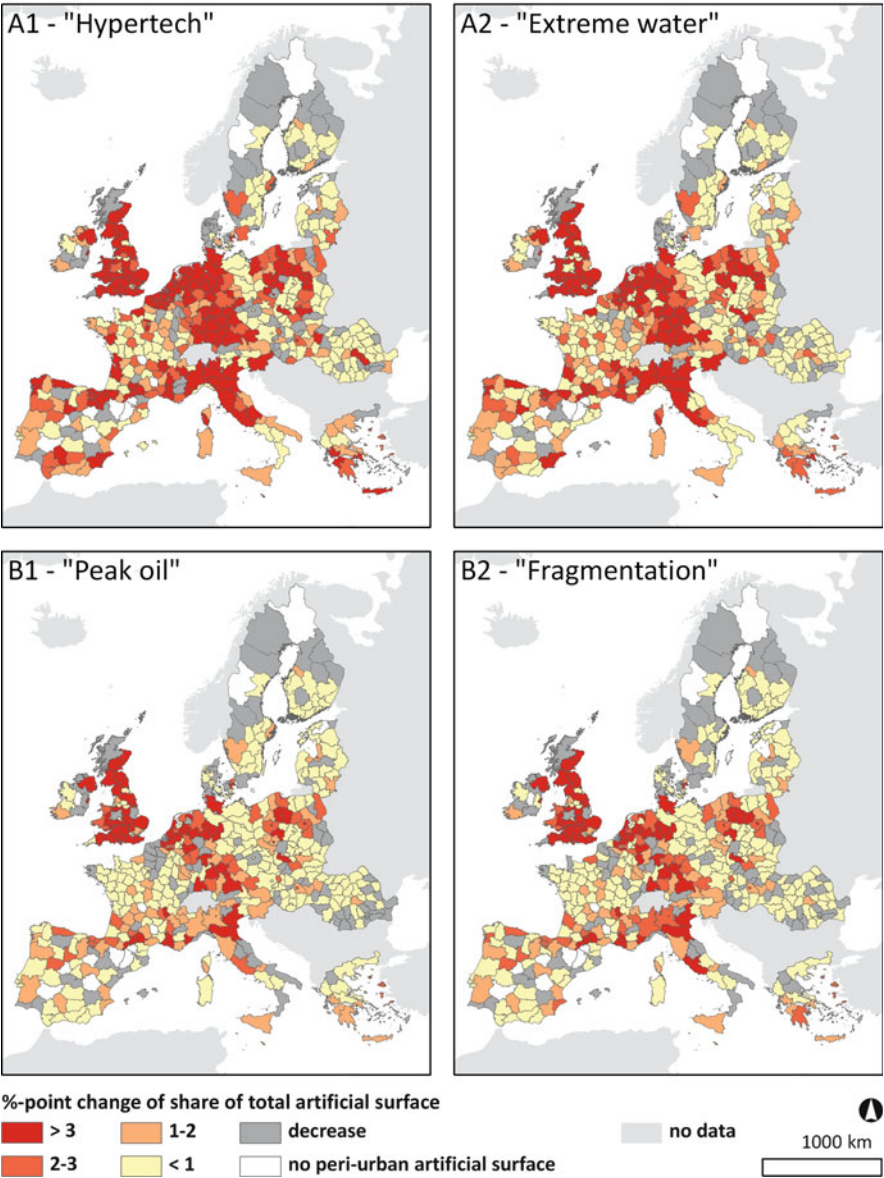


Fig. 2.9 Change of peri-urban artificial surface share (The maps show the projected change of the share in artificial surface in peri-urban areas relative to the total artificial surface in percent points. In the majority of regions the share of artificial surface in peri-urban areas would increase.)

2.7 Implications and Conclusions

This chapter has shown that the peri-urban is, by definition, something in-between, not clearly delineated, a hybrid result of different forces at different scales. It is often defined as a transition zone, on a spectrum from rural to urban, the direct result of urban development and expansion. However, there are other levels of understanding dynamic change such as the regional agglomeration process, the structural effects of globalization and capital accumulation, the transitions and complexity effects and the feedback and collective intelligence from policy and governance. Overall, these urban-driven transitions, which take place in a new kind of territory outside and between the urban cores, can be summed up by the word ‘peri-urbanisation’.

The PLUREL scenarios have systematically explored the driving forces and their uncertainties, and translated these into a pan-European modelling scheme. The results highlight some of these wider issues:

- Natural areas would become further marginalised in the ‘Pentagon’ area, in all scenarios.
- Artificial surfaces would increase the fastest in peri-urban areas, in all scenarios.
- In the B1 and B2 scenarios, with generally stronger governance and planning, the share of artificial surface in peri-urban areas would remain stable in many regions.
- The fastest increase of peri-urban artificial surface would take place in the already highly urbanised regions in Western Europe (Pentagon), UK, the Alpine region, but also northern Poland and northern Spain.

It should be clear from the above, that the peri-urban is a challenging and topical subject in many ways. It is certainly a challenge for scientific research. There are many physical and human processes and interactions to analyse and model and the reality is driven by inter-dependency, uncertainty and complexity. The modelling and analysis tools to describe this fully do not yet exist, so we need to look for other ways of generating useful evidence and insights.

This chapter has fulfilled the purpose of setting the scene for the rest of the book, and providing the larger-scale overview of the European picture, as a context for the case study regions. The scenarios will be used as the basis for the analysis of the issues of urban and rural development in the case study chapters, as a means of developing and testing the strategic thinking of policy makers in each region.

The PLUREL project focussed on the peri-urban, but did so in the context of the rural–urban region. How Europe can be divided into such regions is the next necessary step, and the focus of Chap. 2.

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