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Urbanization in Europe

Past Developments and Pathways to a Sustainable Future

David Evers · Ivana Katurić · Ries van der Wouden

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To Setsko, because the future is yours

Foreword by Wiktor Szydarowski

This book comes at an opportune time. There is widespread concern that urban growth in Europe is unsustainable. Land is a finite resource, and once built upon, it is rarely converted back. Significantly, the Belgian European presidency has identified 'land take' as one of its political priorities. In addition, a proposal for a Soil Monitoring Law, including land take, has now entered the European legislative procedure. This political process should not be conducted in a fact-free manner but should take empirical evidence into account. This is where ESPON comes in.

ESPON is an EU-funded programme for policy-oriented research housed in Luxembourg. For over twenty years, it has provided territorial analyses, data, and maps to support public authorities in their decision-making. Often this concerns supporting and evaluating European policies, especially Cohesion Policy, but also policies within and between European countries. The evidence produced by ESPON is often pan-European but has a distinctly territorial focus, which means that the analyses are sensitive about the specificity and needs of the people and the places we are looking at. The ESPON SUPER project, completed in 2021, is a good example of this.

The goal of that study was to show how sustainable land use can be promoted and how land take, soil sealing, and urban sprawl can be avoided, reduced, and compensated. More specifically it asked: What does the current European land use look like? Which cities and regions in Europe show the biggest challenges in terms of sustainable land use,

land take, and urban sprawl? Which regions and cities showed positive developments on this respect? In what ways can the urban structure of Europe evolve and what consequences does this have for sustainability? And what can policymakers do? The answers to these questions were combined into a series of reports as well as the *SUPER Guide to Sustainable Urbanization* aimed at policymakers.

The present book has expanded on these reports for a different audience: the academic community. This is beneficial in that practising scholars and students are made more aware of the ESPON programme. This will hopefully result in more take-up in the scientific community as well as inspire some of them to apply for ESPON research opportunities.

Luxembourg
April 2024

Wiktor Szydarowski
ESPON EGTC Director

Foreword by Sebastian Dembski

Urbanization and urban form have been the subject of planning conversations almost since the beginnings of the discipline at the turn of the twentieth century. Ebenezer Howard, Patrick Geddes, Patrick Abercrombie, and many others since have been concerned about sprawling cities and the disappearance of the countryside. Despite ideals such as the compact city and the protection of open spaces having almost the status of planning doctrine among planning professionals, we have witnessed the relentless expansion of urban settlements and the fragmentation of open spaces.

The climate emergency has put urbanization and thus the continued transformation from non-urban to urban land uses firmly on the agenda. The ratio of land consumption rate to population growth rate is one the key indicators of the UN's Sustainable Development Goals on Sustainable Cities and Communities (SDG11) and 'no net land take' has become enshrined in EU policy, even if only indirectly. However, even before the drafting of the EU Soil Monitoring Law, many European countries had policy goals in place to achieve a more sustainable urban form. Germany aimed to reduce net land take to 30 ha per day in 2020, though had to postpone the target date to 2030. Switzerland adopted a new Spatial Planning Act that prohibits oversupply of building land.

This book thus comes at a crucial moment. Earlier pan-European studies on urban sprawl in Europe by Couch et al. (2008) covering the 1990s, Siedentop and Fina (2012), and the EEA-FOEN (2016) both

covering the early 2000s are becoming a little dated, so having a study drawing on the latest available CORINE land cover data from 2018 is timely. This book provides an important snapshot of urbanization in Europe, showing the diversity in terms of urban and population growth, density, and urban structure. This kind of empirical research is important as perceptions sometimes deceive. The Netherlands are often depicted as the world's best planned country, yet it has urbanized at the same rate as neighbouring Belgium that is often considered as Europe's most sprawling country. Sustainable urbanization comes in different guises.

Urbanization in Europe thus makes an important contribution to comparative research. Still, many challenges lie ahead for researchers. While the Copernicus programme allows for a uniform dataset on land cover in Europe, most other statistical databases on planning issues are far from harmonized. While some countries offer small area data for the whole territory available at a mouse click via a central portal, in others, data is restricted to local government units. Data availability is patchy on house prices and landownership and differs in how it is recorded, such as house types. This makes comparative research challenging and the achievements of the present study all the more impressive.

Apart from data availability and comparability, the study also highlights that institutional contexts in which urbanization occurs are very different. Local government structures and the planning instruments to address sustainable urbanization vary at the metropolitan and regional scales, not to mention the sincerity with which these issues are addressed. The book only provides a glimpse on some of the underlying factors that may explain some of these differences.

Finally, I would like to highlight the social justice aspect of sustainable urbanization, which arguably would require a book in its own right. Affordable housing has become a dominant policy issue in most metropolitan areas in Europe. However, densification and other measures to achieve sustainable urban form should not be blamed for this in entirety. Part of the issue is that over many decades the true costs of sprawl have been borne by society at large: land may be much cheaper on the outskirts of cities, but that does not account for the costs of infrastructure and environmental externalities. The retreat of the welfare state has helped create this situation, and the signs of a rediscovery of a 'new municipalism' offer hope for implementing more sustainable development practices.

This short book will hopefully stimulate researchers and policymakers alike. Researchers like myself are supplied with insights into the patterns and drivers of sustainable urbanization across Europe, enriching our comparative perspective. In addition, I hope this book makes policymakers take sustainable urbanization seriously and apply some lessons contained herein. In this, the present study also shows that planners can hopefully play a role in informing and shaping these decisions.

April 2024

Sebastian Dembski
University of Liverpool
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Acknowledgements

Gazing at the printed full draft of the present book, I am reminded of a heavily criticized remark made by former US President Barack Obama during his re-election campaign. In a speech, he derided the widespread hero-worship of CEOs by pointing out that they were not solely responsible for their success.[1] The provision of a nurturing business climate, critical infrastructure, and investments made by the government over generations had enabled this: "You didn't get there on your own". Whereas the production of a small academic book can hardly be compared to the achievements of a multinational corporation, Obama's remark applies with equal veracity.

First of all, I must acknowledge the continuous and ongoing support of ESPON. In the early years of the programme, the researchers, policymakers, and administrators involved were referred to as the 'ESPON family' due to the bonds created by working together within—at the time, and perhaps still so—a rather obscure and esoteric niche of inquiry. Perhaps it could even be considered clandestine given that spatial planning, once called a *Geheimwissenschaft* by Klaus Kunzmann (2000), is not even a competence of the European Union (so why set up a European

[1] The offending remark, "You didn't build that", was taken out of context. It seemed to refer to the businesses themselves but was meant to refer to the infrastructure that enabled the businesses to flourish. This statement has since received scientific backing (Mazzucato, 2014).

observatory to study it?). The ESPON family is now several generations older and has seemed to carve out a place within the science-policy ecosystem and branched out into new territory. I am very pleased that during the last programme, it issued a call for tender on one core theme in spatial planning: urbanization and land use. Our proposal SUPER (Sustainable Urbanization and land-use Practices in European Regions) made a point of rejecting the supplied policy terminology 'land take' and 'urban sprawl' (both deemed *a priori* unsustainable) and suggesting that both phenomena should be operationalized and assessed in terms of sustainability. This approach was honoured and comprises a central tenet of this book. I was fortunate to be backed by a "super" team for the project, including the likes of Giancarlo Cotella (POLITO), Volker Schmidt-Seiwert (BBSR), Mailin Gaupp-Berghausen (ÖIR), and Albert Llausàs i Pascual (UVEG). Thank you all.

We were not alone in carrying out the project. ESPON supported our work by setting up a panel of policy experts to provide feedback on drafts in addition to supplying their substantive comments. This would be compiled into a single well-organized document. Thanks to a great rapport with our project manager Marjan van Herwijnen, the process was smooth. However, the reporting pace was relentless: as soon as one report had been approved, I would commence writing the next. As a result, the project produced a large knowledge base, not all of which could be incorporated into the final deliveries. Within the scope of the project, we wrote a practical *SUPER Guide to Sustainable Urbanization* for policymakers (Cotella et al., 2020), but did not produce a comparable product for the scientific community. My idea for reworking the SUPER project for the Palgrave Pivot series was immediately embraced by ESPON, which generously offered to pay for open access. For that, I am very thankful to the ESPON family, my home away from home.

My home base is of course the Netherlands Environmental Assessment Agency (PBL). Here I have to acknowledge the substantial professional and personal support given by my supervisor Marc Hanou. As a spatial planner in practice, he is keenly aware of the messiness of the profession and the related discipline, and that any advances in sustainability will need to address the everyday muddling-through practices (tinctured by optimistic idealism) that characterize land-use decision-making. I hope that the analyses presented here can indirectly contribute to future practices by inspiring and informing students and those who teach them. Throughout the process, Marc has given me critical moral support and made me feel

that this undertaking is worthwhile. Thank you! In addition, I would like to those who helped me hone my thinking about urbanization at the PBL over the years like David Hamers, Ed Dammers, Arjan Harbers, Joost Tennekes, Kersten Nabielek, Anton van Hoorn, and Like Bijlsma. In particular, I would like to thank those colleagues who were part of the SUPER project: Frank van Rijn (LUISETTA model), Jan Ritsema van Eck (urban typology), Ries van der Wouden (sustainability assessment), Maarten van Schie (quantitative analyses), and especially Lia van der Broek (project management).

I also would like to acknowledge an old and new home: the University of Amsterdam. This is where I did my Ph.D. research and currently teach part-time. Through the initiative of my colleague and friend Jochem de Vries, I received a five-year honorary fellowship to work on scientific publications. Over the years, PBL and ESPON have allowed me to amass a great deal of empirical work as I jump from project to project, and the fellowship offered the time to reflect on this academically. This book is a direct result. I look forward to theoretical discussions and collaboration with UvA colleagues such as Maria Kaika, Tuna Tasan-Kok, Jannes Willems, Federico Savini, and Jochem de Vries for the remainder of the fellowship.

Finally, let me thank my co-authors for contributing directly to this work. Ries wrote the first versions of the first and third chapters, while Ivana wrote part of Chapter 4 and supported me throughout the process with her comments, ideas, and encouragement.

Amsterdam
April 2024

David Evers

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Abbreviations

CBD	Central Business District
CHA	Corine Land Cover Change
CLC	Corine Land Cover
EEA	European Environment Agency
EGD	European Green Deal
ESDP	European Spatial Development Perspective
ESPON	European Observation Network for Territorial Development and Cohesion
EU	European Union
FUA	Functional Urban Area
GDP	Gross Domestic Product
GHSL	Global Human Settlement Layer
GUF	Global Urban Footprint
GVA	Gross Value Added
JRC	Joint Research Centre
LAU	Local Administrative Units
LUISETTA	Land Use-based Integrated Sustainability Assessment Model (light version)
NNLT	No Net Land Take in 2050
NUTS	Nomenclature of Territorial Units for Statistics
SDG	Sustainable Development Goal
SUPER	Sustainable Urbanization and Land-Use Practices in European Regions

TOD	Transit-Oriented Development
UK	United Kingdom
US	United States
WSF	World Settlement Footprint

Member states of the European Union are referred to by their official abbreviations.

About the Authors

David Evers obtained a B.A. degree in political science at Reed College (Portland, OR) and an M.A. in Comparative Social Science at the University of Amsterdam in the Netherlands. This was followed by a Ph.D. at the same university. David has published on a wide variety of subjects such as growth management in the USA, retail policy, European spatial planning and development, territorial cohesion, metropolitan governance, renewable energy, and institutional theory. He is a senior researcher at the Netherlands Environmental Assessment Agency. Since 2012 he has also worked as a lecturer in planning at the University of Amsterdam, focusing on the science-policy interface. Since 2007 he has been the ESPON contact point for the Netherlands and participated in the ESPON projects such as Territorial Scenarios (3.2), ARTS, COMPASS, TERRCOV, and SUPER (as project leader).

Ivana Katurić Ph.D., earned a doctoral degree at the University of Milan—Bicocca, URBEUR, with a module at KU Leuven in Spatial Development Planning. She is the director of Urbanex, an independent think-tank, advisory, and research organization in the field of sustainable urban development policies and research. She works on a wide range of territorial development issues for the World Bank, European Bank for Reconstruction and Development, ESPON programme, and many others. Katurić was a coordinator of numerous studies in the field of strategic spatial planning and integrated territorial development

on topics such as circular cities, climate change and ecosystems of the future, and recovery and resilience plans.

Ries van der Wouden received an M.Sc. and Ph.D. in Political Science at the University of Amsterdam, in 1983 and 1990, respectively. He also taught at the University of Amsterdam and the Free University in Amsterdam. In 1988, he switched to the Netherlands Institute for Social Research (SCP) and after that became department head at the Netherlands Institute for Spatial Research (RPB) which has since become the Netherlands Environmental Assessment Agency (PBL). His works focus on Dutch planning, particularly urbanization policy and strategy. He is currently retired.

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CHAPTER 1

Understanding Urbanization

Abstract This chapter provides an overview of the historical context and contemporary perspectives on urbanization within Europe, emphasizing the sustainability challenges associated with land-use changes. A conceptual framework is presented which introduces key concepts and illustrates the input (drivers), production (decision-making), and outcomes (land conversion and urban form) of urbanization. The driving forces include exogenous factors, such as demographic shifts and economic changes, and endogenous factors, such as infrastructure development, finances, and spatial planning. Production consists of land development practices. Outcomes are described by the amount of urbanization as well as its form (compact, polycentric, and diffuse). The chapter closes with a reflection on sustainability.

Keywords Urbanization · Sustainability · Urban sprawl · Land take · Spatial planning · Urban form

1.1 Introduction

This book within the *Sustainable Urban Futures* series treats an age-old topic. Urbanization can be understood as the intensive concentration of people and human activities into a small area as well as the land-use changes made to support this concentration. It is an integral

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part of human history and civilization since the first cities emerged in Mesopotamia during the fourth millennium BC (Kostof, 1991; Mumford, 1961). In Europe, urban history began in Greece and then in Rome, the latter's capital reaching an estimated population of nearly 1 million during the reign of Augustus (Carcopino, 1943, p. 18).

The desire to manage urban growth for the public benefit is as old as cities themselves. Urban design and planning strove to ensure accessibility, reserve space for public use, and separate incompatible functions. For example, outside Rome's city walls was the so-called *suburbium*, the domain of industries that could not be accommodated in the city and of poor residents who could not afford to live in the city, but also of the elegant villas of the Roman elite atop hills or near the coast (Bruegmann, 2006, p. 26). During the seventeenth and eighteenth centuries, elites of affluent cities like London and Amsterdam also bought land at a comfortable distance from the city to build summer (and sometimes permanent) residences. The construction of railways in the nineteenth century accelerated this process, resulting in the first commuter suburbs (Couch et al., 2008, p. 11; Hall, 2014). The first half of the twentieth century saw the genesis of modern planning. Amsterdam and Copenhagen adopted 'finger plans' with protected green wedges between districts, while London's appetite for urban growth was tightened by its famous Green Belt (Kühn, 2003).

The Second World War marked a turning point. Car ownership in combination with growing prosperity allowed the suburban ideal to be enjoyed by an increasingly greater number of people in the Western world (Jackson, 2006). In Europe, the 1960s and 1970s were the heydays of suburbanization, often in the form of planned communities. For the first time in centuries, more families were leaving cities than arriving, plunging the cores into socioeconomic and fiscal crises, aggravated by deindustrialization (Anderson et al., 1996). Alerted by the massive report *The Costs of Sprawl* in the US (Real Estate Research Corporation, 1974) and similar findings in Europe, politicians began to worry about the effects of uncontrolled urbanization. In the United States, some states implemented growth management strategies (Carruthers, 2002) while Europe largely mobilized existing planning traditions to manage urban growth. By the turn of the millennium, most major American and European cities had recovered from the urban crisis and started to grow again, both in population and in wealth (Dembski et al., 2021). Yet the urbanization of rural hinterlands, coastlines, and along infrastructure continues.

Today, the policy discourse on urbanization in Europe is largely framed by the concept of sustainability, usually by pitting compact city ideals and transit-oriented development against the menace of rampant, land-consuming urban sprawl (Bruegmann, 2006; Roo & Miller, 2019). Especially in Europe, there is a concern that current land-use practices are undermining long-term economic prosperity, social cohesion, and ecological vitality (Hennig et al., 2015; Jehling et al., 2018). The European Environment Agency has called urban sprawl 'the ignored challenge' (EEA, 2006), and the European Union has adopted a goal to reduce net 'land take' (i.e. greenfield development) to zero by 2050 (Science for Environment Policy, 2016).

The twin notions of 'urban sprawl' and 'land take' are powerful metaphors. They are also, partly for this reason, rather poor analytical terms for conducting scientific research. Both are inherently normative and pejorative. Moreover, 'urban sprawl' has the additional disadvantage that the attributes of the phenomenon are regularly confounded with its perceived causes and effects (Galster et al., 2001). Consequently, as much as possible we will refer to the phenomenon whereby land is converted from rural to urban use as urbanization and describe its manifestation (e.g. density, shape) using neutral terminology.

This book aims to provide a general and contemporary overview of knowledge on the sustainability of urbanization in Europe, contributing to both the academic literature on the topic as well as providing insights for practitioners and students. It is largely built on the empirical evidence produced in the ESPON project Sustainable Urbanization and land-use Practices in European Regions (SUPER) (Evers et al., 2020).

1.2 Conceptual Framework

The process of urbanization and its relation to sustainability is the central theme of this book. The remainder of this introductory chapter will discuss the conceptual framework underpinning the thematic chapters (Fig. 1.1). As illustrated, we conceive of urbanization as a causal process involving inputs, a decision-making arena, and outputs. The totality or parts of this process can be assessed in terms of sustainability.

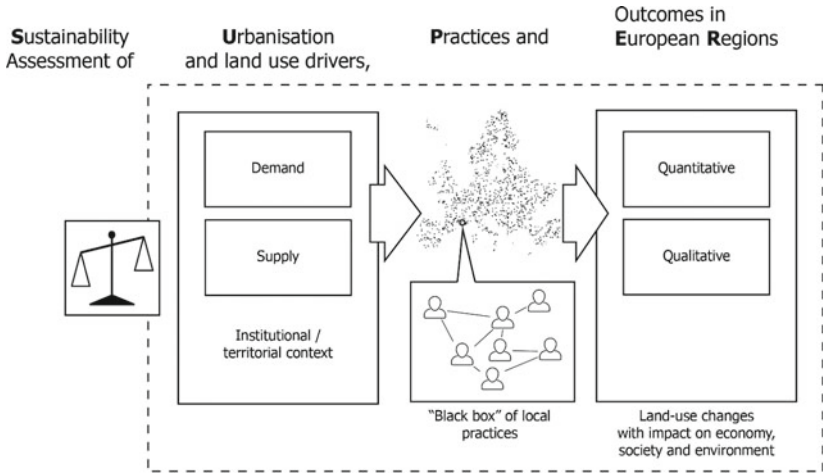

Fig. 1.1 Conceptual framework

1.3 Drivers of Urbanization

We begin the discussion with a consideration of the causal factors (drivers) of urbanization. An important starting point is a review article that compiled the most important factors cited in the academic literature contributing to urban development (Colsaet et al., 2018). Their findings are displayed in Fig. 1.2. These concern both relatively autonomous factors such as economic, demographic, and cultural developments as well as public-sector interventions that directly (e.g. land-use plans) and indirectly (e.g. fiscal policies) help determine where and how much land is converted to urban use. If we consider the urbanization process as a system of land development, we can then make a distinction between those factors which cannot be easily influenced by public-sector interventions (exogenous, labelled as 'other factors' in black) and those which comprise part of the system (endogenous, labelled as 'policy and institutional factors' in white). These factors will be discussed below using slightly different groupings and terminology.

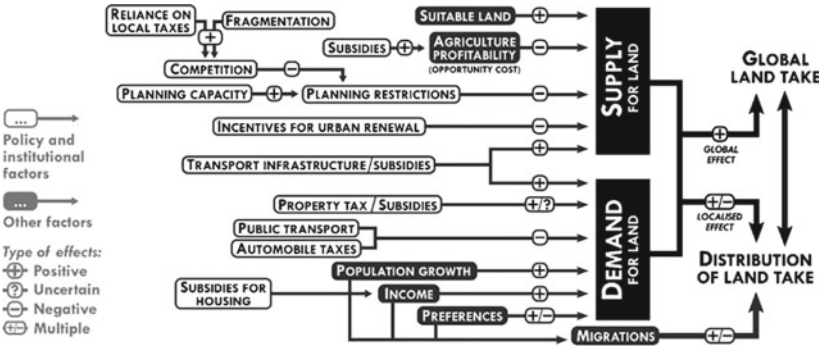

Fig. 1.2 Drivers of urbanization

1.3.1 Exogenous Drivers

- *Demographic change*. Population growth is strongly related to urban growth because people need somewhere to live. Regions with a shrinking population are more likely to exhibit deurbanization, the conversion of urban land to natural or rural areas. Migration is an important element in this, but hard to predict. Demand for housing is furthermore driven by household development, which may show different tendencies than population development. In many countries, average household sizes are decreasing significantly, meaning that more homes are needed per capita. In Amsterdam, for example, the average home had about 4.5 occupants at the end of the nineteenth century, but a hundred years later this number had shrunk to under two even though the floorspace of the average home had increased (Wintershoven, 2000, pp. 128–129). In this situation, cities must physically expand just to retain their population.
- *Economic change*. Rising prosperity allows for more individual consumption of space: larger houses, gardens, parking space for cars, and perhaps even a second home. Job growth also implies more room for commercial development, be it offices, industry, or retail. Here too there is a clear relationship with urban development. Industrialization created a logic whereby workers were located near factories (themselves often located near rivers or natural resources) or well-connected by transport infrastructure. Deindustrialization broke this relationship, and the advent of the knowledge

and creative economies created new preferences for business and residential locations. Arguably digitization, fuelled by the Covid-19 pandemic, has again altered this driver: homes and cafes have now become workspaces.

- *Culture*: The demands placed on the home and its surroundings are also a matter of taste. Cosmopolitans or young professionals tend to prefer urban settings, while other groups such as middle-class families tend to prefer more suburban environments. These preferences can be highly unpredictable and vary over time or space. Indeed, people can change their minds about the ideal living situation quite often throughout their lives. Still, some societies tend to have more stable preferences, as can be read in the locations where the cultural or economic elite tend to congregate. During the Covid-19 pandemic, there was great speculation about whether this event would have a lasting imprint on housing preferences.
- *Physical constraints*: The availability of buildable land is another determinant of urbanization; the density of Manhattan Island or Hong Kong can be partly explained by the fact that the only space to develop is usually upwards. Steep slopes can also thwart expansion, and many mountainous settlements run the course of their valleys. Some physical impediments are manmade, such as the Berlin Wall or West Bank Barrier or, less dramatically, the dividing effect on neighbourhoods of highways running through cities. As byproducts of land-use decision-making, this last type can be seen as straddling the distinction between exogenous and endogenous factors.

1.3.2 Endogenous Drivers

- *Infrastructure:* Transport infrastructure, as shown in the figure, is a driver both on the supply and demand side. Its provision increases the attractiveness of nearby locations for urban development due to the enhanced accessibility. It can also act to increase demand for housing and commercial space as it facilitates agglomeration economies. The advent of rail transport (train, tram, underground) allowed for the extension of cities far beyond their former borders, whereas the shift to the private car accelerated urban expansion to unprecedented levels (Antrop, 2004). More recently, broadband

networks and mobile communication have been studied as factors shaping the growth of cities (Graham & Marvin, 2001).

- *Finances*: land development is often an important source of revenue for local authorities, either through property taxes or by taxing or participating in the project itself. A common phenomenon is inter-municipal competition to attract development, which can undermine planning efforts (Knox & McCarthy, 2005). In addition, housing demand is driven by subsidies for affordable housing, tax relief to homeowners, etc. (Burchell et al., 1998; Nivola, 1999). Therefore, this driver can be seen as the legal and fiscal systems which determine the financial payoffs of development (Buitelaar & Leinfelder, 2020; Rothenburg, 1978).
- *Spatial planning:* National and regional/local spatial planning systems influence the process of urbanization (Couch et al., 2008). The ability to control urban growth depends on the institutional setup, such as the powers and responsibilities of planning authorities (Pagliarin, 2018). There are a variety of potential 'interventions' that can be applied in this regard, such as regulation (e.g. zoning, generic rules), public investments (to encourage regeneration, and densification), and persuasion (strategies that bind and commit relevant stakeholders).

1.4 Land Development Practices

As a next step, we acknowledge that, barring illegal or informal development, these drivers are not directly determinative of urbanization, but instead structure or inform an official decision to allow a particular parcel of land to change use. In this decision-making, other factors can come into play than the drivers listed above, such as local politics. It is a 'black box', which can only be investigated with in-depth case study research.

Nevertheless, a few commonalities can be identified for most major land-use decisions. In many cases, a strategic document is drawn up stating the challenges facing the region and formulates general objectives, usually following a public consultation or debate and some coordination between governmental offices. Ideally, local plans should be in line with this strategy, but in some cases, there is a mismatch, especially in cases where unbuilt land is given urban development rights (it is easier—and cheaper—to grant than remove rights). Spatial strategies can exist at

various levels of scale, and are not always coherent or consistent, partly due to continually changing circumstances.

Most of the time, planners or public officials do not initiate urban development, as this is often lucrative enough for the private sector. If no development rights exist, a property developer will typically request planning permission or a zoning change, sparking an official process to evaluate this proposal. This can involve checks for compliance with European or national policies, environmental impact evaluations, marketing research, site visits, public consultation, financing arrangements, and the like. Depending on the size, location, and interests at stake, it can involve stakeholders at various levels of scale creating a highly complex decision-making environment. In addition, the site in question can change hands multiple times in the process as land transactions are made to facilitate the development (municipalities in some European countries have the practice of buying land on the urban fringe to guarantee they are in control of urbanization). The final decision to approve the project is usually both a political/official decision (and hence dependent on a certain level of public approval) as well as a legal decision (and hence subject to legal rights to appeal). It also is fraught with dilemmas regarding core beliefs about democracy and property (Davy, 2016; Foglesong, 2015).

The above account is of course a vast simplification; every European country and territory within it has its own variation on the 'development game' depending on the exogenous and endogenous driving forces. While it is not always possible to peer into the black box of these practices, their result can be read in the structure of and changes to the natural and built environment. It is to this that we now turn.

1.5 Urbanization Outcomes

Many variations of contemporary urbanization can be distinguished in Europe, from faux historical tourist-oriented projects in traditional villages to massive holiday complexes, datacenters and logistic hubs, luxury apartments on former industrial land, out-of-town shopping centres and strip malls, edge cities near major airports, ecovillages, leafy suburbs, university and health campuses, scattered holiday homes in coastal and mountainous regions and even deurbanization (conversion of urban land to natural or rural uses). Most developments require ample road and parking space, but others cater to alternate transport modes. Some developments include large tracts of public open spaces

and services, while others are oriented towards private green spaces and self-sufficiency. Viewed from above, some new developments are coloured completely 'grey' from the cement, rooftops, and asphalt, while others are so green as to be barely distinguishable from a forest or countryside.

To align with, but also break beyond the common compact versus sprawl dichotomy, we, following others (e.g. Anderson et al., 1996; Rice, 1978), discern three archetypical modes of urbanization to be used throughout this book. These are: *compact urbanization* (i.e. high-density compact cities, often the result of urban containment strategies or geographical limitations), *polycentric urbanization* (i.e. clustered, medium-density urbanization, often the result of policies like new towns, smart growth, transit-oriented development, and new urbanist designs) and *diffuse urbanization* (i.e. low-density scattered urban development like monofunctional car-oriented suburbs, ribbon development and exurban, often informal, construction, often the result of inter-municipal competition, and laissez-faire planning). Other urbanization modes certainly exist, but we concentrate on these three for the sake of analytic clarity. For the same reason, even though we acknowledge that these modes are not mutually exclusive and can be combined in practice, we use them as discrete types in our analyses (Fig. 1.3).

1.6 Sustainability Assessment

The original definition of sustainability in its current sense regards a *temporal balance*, that is the ability to 'sustain' the quality of life on the planet, which ties into notions of generational justice (WCED, 1987). Temporal measures of sustainability often use the notion of 'carrying capacity' to assess whether resource consumption exceeds the recovery rate (Neuman & Churchill, 2015). One could argue that land, as a finite resource, can never be sustainably 'consumed' by definition—a notion that is implicitly suggested by the term 'land take'. A less austere view would be that urban (re)development enhances sustainability if it creates a more future-proof urban form or if it accommodates human demands as efficiently as possible. A final consideration concerning temporal sustainability is the durability of policies over time (e.g. stability of funding, vulnerability to political/economic cycles) and governance quality and capacity to effectively steer long-term processes such as urbanization. We call this institutional sustainability.

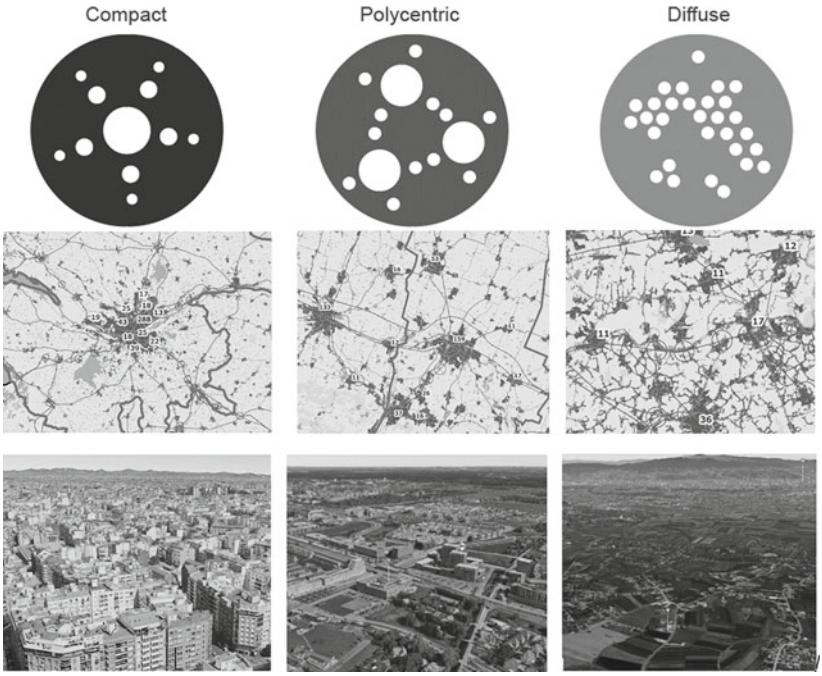

Fig. 1.3 Compact, polycentric, and diffuse urban form (*Source* Icons drawn by Kersten Nabielek [PBL] for the *SUPER Guide to Sustainable Urbanization* [Cotella et al., 2020], Maps produced from Corine Land Cover [CLC] depicting Loire [F], Modena, [IT], Flanders [BE]; Photos: Google Maps 3D views of Valencia [ES], Leidschenveen [NL], Zagreb [HR])

Another common conceptualization of sustainability regards a *thematic balance*, usually between three dimensions, commonly referred to as the 'three Es' (economy, ecology, equity) or the 'three Ps' (people, planet, profit). Sustainable development, therefore, advances one or more of these dimensions without sacrificing the other. Urban planning and urban design often try to improve all three simultaneously (Campbell, 2016). Given that social and environmental interests are traditionally the first to be sacrificed, the thematic conceptualization of sustainability has been recast as a 'donut economy' where economic development occurs within social and planetary boundaries (Raworth, 2017). This is also the stance taken by the United Nations, which uses the three dimensions to argue

that: "urbanization processes should benefit, not handicap, all residents who live in urban areas. As a transformative force, sustainable urbanization should accelerate the ability of governments to meet the diverse needs of residents' lived experiences, aspirations and wellbeing" (UN Habitat, 2020, p. 45).

Given these two conceptualizations, we can then ask ourselves various questions about urban development in Europe. To what extent and under which conditions can a given amount of land converted to urban use (urbanization/land take) be considered sustainable? How can the right balance be found between dimensions of sustainability? To what extent are current development practices a product of exogenous driving forces? The answer to this last question can provide cues towards drafting interventions to adjust the parameters towards a more sustainable urban future.

1.7 Plan of Book

The chapters follow the same logic as the sections of this introduction and the conceptual framework, but in a slightly different order because some information is more useful as a knowledge basis. Although the chapters can be read and understood separately, they are intended to be read in succession, as reference will sometimes be made to previous chapters. The organization is as follows: Chapter 2 is devoted to a quantitative and a morphological analysis of urbanization in Europe 2000–2018. Chapter 3 will discuss how the creation of this European urban structure is in part the product of public interventions, focussing especially on the role of spatial planning. Chapter 4 imagines future urbanization pathways using scenarios. Chapter 5 will focus on sustainability, assessing whether developments over the past two decades can be deemed sustainable, what kinds of urban forms are most sustainable, and the extent to which interventions can promote more sustainable development practices. Chapter 6 will draw conclusions for practitioners and theoreticians.

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CHAPTER 2

Urbanization in Europe 2000–2018: Amount, Density, and Form

Abstract This chapter provides an overview of urban development in Europe in the 2000–2018 period, which has been greatly enabled by new land-use data. Urbanization (land take) was found to be greatest in the largest countries, but most intense in the Netherlands. When controlled for population, a different picture emerges with countries like Poland, Spain, and Iceland exhibiting relatively high urbanization rates. One drawback of the analysis was the failure of the data to adequately capture small-scale developments. Various measures were employed to measure densities, showing the complexity of this relatively simple but essential concept. Finally, European regions were evaluated by a manual assessment of urban form. This again revealed the heterogeneity of Europe, but also hotspots of 'diffuse' (urban sprawl) development.

Keywords Land cover · Urban form · Population density · Urban sprawl · Land take

2.1 Introduction

When one gazes at the famous satellite view of Europe at night (Fig. 2.1), the constellation of lights reveals a distinctly polycentric urban structure. Unlike other continents, there are few megacities or large swathes

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of uninhabited regions. Instead, a relatively dense network of interconnected towns and midsize cities is visible, many of which had been founded centuries ago (Servillo et al., 2017; Wandl, 2019). Over time, the positions of these cities in Europe's urban hierarchy have changed, for example by the introduction of new technologies (e.g. revolutions in transport and communication) or new economic bases (e.g. industrial revolution). Such processes continue to the present day (tech-hubs), and since 2000 there is reasonably accurate data to track urbanization in Europe.[1]

Improved time-series data has allowed for advances in the scientific and policy debates on 'urban sprawl' and 'land take' in Europe. While attention for urbanization processes is welcome, urban sprawl is a problematic analytical concept because it is internally inconsistent and inherently normative. In general, it refers to (1) urban growth that is (2) low-density and (3) scattered (Galster et al., 2001; Siedentop & Fina, 2012; Steurer & Bayr, 2020). These three elements will be investigated more closely in this

Fig. 2.1 Europe at night (istockphoto.com)

[1] In this book, 'Europe' specifically refers to the entirety of the European Union (EU27), UK, and ESPON partners (Norway, Iceland, Switzerland, and Lichtenstein). Because of this selection, our figures may differ from other studies.

chapter by providing analyses on spatial distribution, changes over time and reflections on sustainability.

With respect to the first element urban growth or 'land take' is usually taken as a sign of success: good cities attract people, jobs, and business. Urbanization brings many benefits, providing agglomeration advantages and capacity for higher-level services, and with it, prosperity and high quality of life (Glaeser, 2011). It is therefore no surprise that most city governments are staunchly growth oriented. Growth, however, has drawbacks such as the loss of green space and fertile land, housing shortages, traffic congestion, and pollution. Many public policies, particularly urban planning, seek to mitigate these effects to varying levels of success (see Chapter 3). The European Union's 'no net land take by 2050' target goes a step further (European Commission, 2011) by saying urbanizatoin itself should be curtailed. Section 2.2 will shed light on this debate by calculating urbanization in Europe in the 2000–2018 period at varying levels of scale, revealing that this matter is more complex than simply tallying 'taken' hectares.

A second element within the urban sprawl debate is density, which is often assumed to be positively related to sustainability. As an indicator, it is beguilingly straightforward. However, like land take, definitions (e.g. population versus building densities) and levels of scale can have a large impact on values and, consequently, findings of whether density is increasing or decreasing. Section 2.3 will reflect on this issue in more depth.

Finally, urban settlements do not only change size and density over time but also their shape. Some cities expand contiguously, others radiate along transport routes while in other cases development is channelled through valleys, clings to coastlines, leapfrogs over rivers or protected areas, or fans out over the countryside. Some new extensions are compact and self-sufficient while others are more organic and diffuse. Section 2.4 will examine the state and evolution of urban form since 2000 providing the results of a morphological analysis conducted within the framework of the ESPON SUPER project.

2.2 Evolving Urbanization

Due to a seemingly insatiable demand for housing, jobs, mobility, recreation, and profit, land in most European regions is being converted to urban uses, from tourist development in traditional cities and leisure

resorts (Gurran & Phibbs, 2017; Tsilimigkas et al., 2022), shopping malls (Evers, 2004), edge cities near highways and airports (Bontje & Burdack, 2005; Graham & Marvin, 2001; Kasarda, 2008) and ecologically conscious developments (Hall, 2013). There is also a body of literature covering shrinking cities and deurbanization (Couch & Cocks, 2013; Martinez-Fernandez et al., 2012). This section will seek to quantify this transformation, and where possible, offer an explanation.

2.2.1 Absolute Urbanization

Europe is a highly urbanized part of the world, with almost 5% of land being devoted to urban use as opposed to under 1% built-up area globally (Liu et al., 2014).[2] Within Europe, there are large differences in the share of urban land cover: Malta, Belgium, and the Netherlands are all above 15% whereas Nordic and Baltic nations have 2% or less. The share of urban land in Germany is almost twice that of France or Italy. Zooming in from the country to the regional (NUTS 3) level largely reveals the familiar polycentric urban pattern of large cities, towns, and rural areas in Europe mentioned in the introduction. At this level of scale, the top 20 most urbanized regions have well over 90% of their surface area covered by urban use.

A note on sources

Never has so much high-quality data been freely available to track urbanization trends in Europe and globally. These come from a variety of sources, each with its own strengths and limitations. Unfortunately, differences in measurement dates, geographical coverage, resolution, and classification make combining sources tedious and prone to error.

[2] These two measures are not exactly the same; for Europe, we can isolate urban use from other uses, whereas for much of the rest of the world we have to rely on data on imperviousness, which can include non-urban uses (livestock sheds) and exclude some urban uses (gardens, parks).

- The Corine Land Cover (CLC) dataset covers Europe and Turkey with 44 land-use classes for four iterations during the 2000–2018 period. The state data is provided at a comparatively low resolution (minimal mapping units of 25 hectares), but the dynamic Corine land cover change database (CHA) provides information at the 5-hectare level. The difference in resolution between CLC and CHA data has the disadvantage that differences in state data (comparing years) do not match up to the more accurate change data. The EU's Joint Research Centre (JRC) is currently attempting to enrich Corine state data with information derived from other sources and to enhance its classification accuracy and improve its resolution.
- The German Aerospace Centre's Global Urban Footprint (GUF) data registers built-up area (buildings) at a very high resolution (approximately 12m) but only for 2011. The same satellite (Copernicus) provides time-series data on imperviousness at an even better level of detail (10m) but this contains no land-use information.
- The JRC's Global Human Settlement Layer (GHSL) includes spatial information on built-up areas and population density for 1975, 1990, 2000, and 2014. Recently, this has been combined with Copernicus data to produce the World Settlement Footprint (WSF) which also provides time-series maps since 1986 (WSF evolution).
- The European Space Agency's Sentinel-2 land cover data offers high-resolution (10m) worldwide data with annual updates since 2017. It has 10 classes, but all urban uses fall under 'built area' making it no more useful to track urban development than the datasets on imperviousness.

The ESPON SUPER project created a database that combines socioeconomic, environmental, and land cover data into a single Excel spreadsheet to ensure maximum comparability, compatibility, and ease of use. The data was collected at or converted into NUTS 3 areas (2016 boundaries) for the four Corine Land Cover dates (2000, 2006, 2012, and 2018). A second database was made for land-use change at the NUTS 3 level. Both databases were adapted

to allow for user-generated queries via the pivot table function and can be obtained from the authors. Most calculations in this chapter were made using this database and should be readily verifiable.

In Europe (ESPON space), approximately 1.26 million hectares of land were registered as being converted to urban use in the 2000–2018 period (CHA data).[3] About a third of this land was used for 'urban fabric' (mostly housing), another third for commercial/industrial use, and the remaining third is split between infrastructure and urban green. Only about 176,000 ha was converted back to non-urban use, most of which (69%) concerned transitions away from 'artificial land' like mines and dump sites, rather than buildings (the categories 'urban fabric' and 'industrial' only comprise about 20,000 ha of this total). This is in line with findings at the global level on relative (de)urbanization (Li et al., 2022). In policy terms, this data tells us that approximately a net total of 160 ha (184 ha gross) was urbanized daily in the 2000–2018 period, exceeding by the same measure the 'no net land take' target for 2050.

At the national level, large differences become readily apparent in the magnitude of urbanization or land take (see first bar graph in Fig. 2.2). Not surprisingly, large countries head the list in absolute terms: Spain, France, Germany, Poland, the UK, and Italy. The relatively small Netherlands is next in line. There is also significant regional variation in daily urbanization rates. Hotspots, where growth was extremely rapid with respect to the national and/or European average, include regions in northern Poland, southern France, central Spain, and Scotland. Many concern rural areas in the vicinity of a large urban settlement such as near Prague, Budapest, and various Polish cities as well as the outskirts of Barcelona and Madrid, indicating suburbanization. Regions exhibiting negative urban growth are generally found in Bulgaria and Romania, and as stated, this usually relates to the abandonment of construction sites or re-naturalization of artificial surfaces (mines, quarries) rather than the actual demolition of buildings (Fig. 2.3).

Importantly for debates on sustainability and the land take reduction target, the pace of urbanization has decelerated: 44% of all conversions

[3] Again, this includes non-EU member states. To get an idea of the difference between the two, the figure is 1.13 million ha for the EU27.

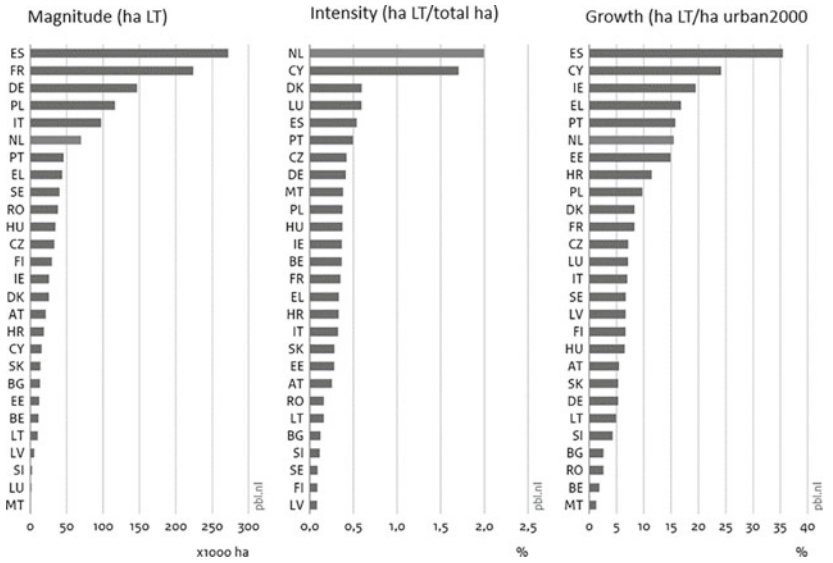


Fig. 2.2 EU27 ranking of urbanization magnitude, intensity, and growth (2000–2018)

to urban use took place in 2000–2006, 35% in 2006–2012, and only 21% in 2012–2018. Some countries resisted this trend, with almost the entire UK urbanizing primarily after 2012, as well as many regions in Turkey, Poland, and Romania, the east of Hungary and Croatia, the west of Austria, parts of the Western Balkans, and a few other regions scattered throughout Europe. The largest accelerating countries—Turkey and the UK—are not EU member states and therefore not immediately subject to the 'no net land take' target.

2.2.2 Intensity and Growth

More insight into sustainability can be gained if we look beyond the absolute magnitude of hectares being converted to urban use. Two easy to calculate indicators can be considered (see the second and third bar graph in Fig. 2.3). The first, intensity, is measured as the amount of urbanization as a share of the total land area. As a relatively small country with considerable urban development in 2000–2018, the Netherlands

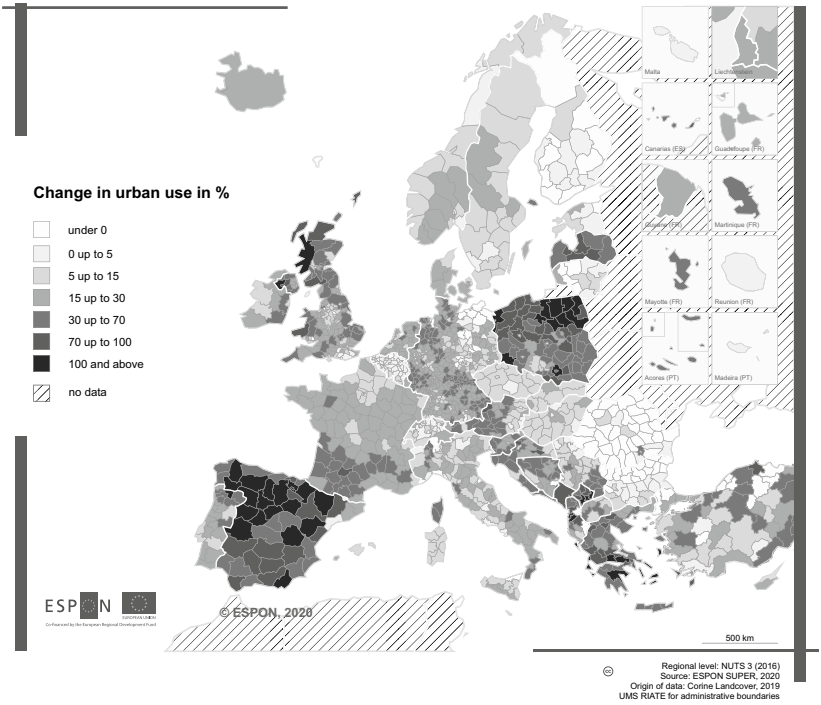


Fig. 2.3 Urbanization rate in percent (2000–2018)

tops the list, followed by three other small countries. Spain, the largest absolute urbanizer in Europe, comes in fourth. Growth in urbanization is obtained by dividing the amount of urbanization in the 2000–2018 period by the amount of urban land use in 2000. This measure also helps to account for the different baseline levels of urban land use. By this measure, Spain again tops the list with Cyprus (again) second, followed by Ireland, Netherlands, Portugal, and Greece. All these countries would need to drastically alter their development practices to meet the 'no net land take' target.

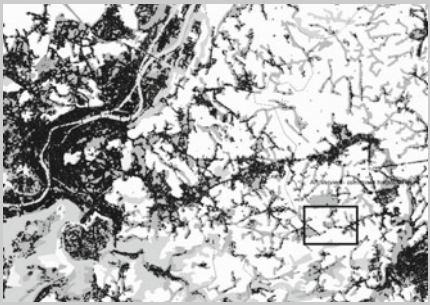
Mapping out the intensity of urbanization at the regional level can reveal significant differences within countries. The Netherlands is consistently high, but many larger countries are more heterogeneous. Here we

can observe that the most intensive changes are taking place near existing cities.

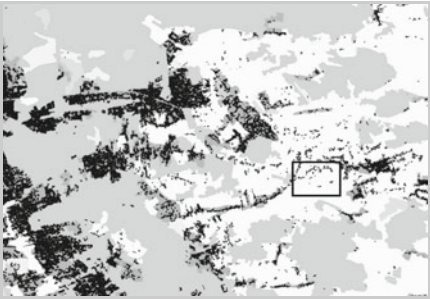
Data idiosyncrasies and limitations

Due caution is needed when using Corine data to draw conclusions on urbanization, particularly for low-density scattered development. This can result in two types of errors.

In the first case, CLC can record urban use in areas with few or no buildings. This leads to an overrepresentation of urbanized area, and, in turn, disregards new urbanization within these areas. If, for example, homes were built in the relatively empty urban zones to the East of Liège (pictured to the right), this would not be registered. This could result in an erroneous finding that urbanization is highly efficient and sustainable because it makes use of existing built-up areas. This phenomenon is common in Belgium, Poland, and parts of France.



In the second case, CLC may not register urban use even though buildings are present. This leads to an underrepresentation of urbanized areas. This is apparent in the eastern outskirts of Warsaw (pictured to the right) where diffuse settlement is registered as agricultural. When combined with population data, this would give the impression of a vital rural area, where it may actually be losing its function to urban encroachment. This inaccuracy is particularly prominent in Portugal.



Recently, the EEA published a report on land take using high-resolution Urban Atlas data, which should reduce the intensity of both error types. Unfortunately, this data is only available for Functional Urban Regions (FUA), representing less than a quarter of the European territory, making it unsuitable for our purposes. A ranking at the FUA level is quite different from Fig. 2.3 (pan-European). There, Romania takes the most FUA land and Greece the least (EEA, 2022, p. 28); FUA boundaries may play a role in this.

2.2.3 Per capita Urbanization

Whereas the EEA's land take indicator is absolute (hectares), the SDG indicator 11.3.1 on sustainable urbanization is relative, comparing the land consumption rate to population development (ha/capita). The underlying rationale is that if a city is rapidly growing in population, it should be able to sustainably 'take' more land than a stable or shrinking city. Most of the time, however, the trend is unsustainable.

Mapping out per capita urbanization reveals clear differences between European countries and regions, with Romania and Finland showing relatively low values (presumably sustainable) whereas the opposite is seen, for example, in Poland, Scotland, Iceland, and Spain. At the NUTS 3 level, the most dramatic drop in population densities per hectare urban land occurred in conjunction with population decline, primarily in Spain. This map must be interpreted carefully: a shrinking region could score well on per capita urbanization if it was accompanied by deurbanization and a rapidly growing region could do the same if it was built compactly. Moreover, not all urbanization is driven by population; quarries, dump sites,

industry, and distribution centres obey a different logic than housing. To gain more insight into whether urbanization outstrips demand or not, we identified four types of regions: above/below-average urban fabric (mainly residences) and above/below-average population development. These are displayed and map below Fig. 2.4.

The first group of regions have below-average growth in population and above-average growth of urban fabric (black: top left quadrant). This group generally occurs in rural and peripheral areas of Europe and denote regions where urbanization processes might be driven by supply-side factors rather than a quantitative need. The question remains to what extent this increase in urban fabric is related to local population dynamics (e.g. the population might not be increasing much, but households are)

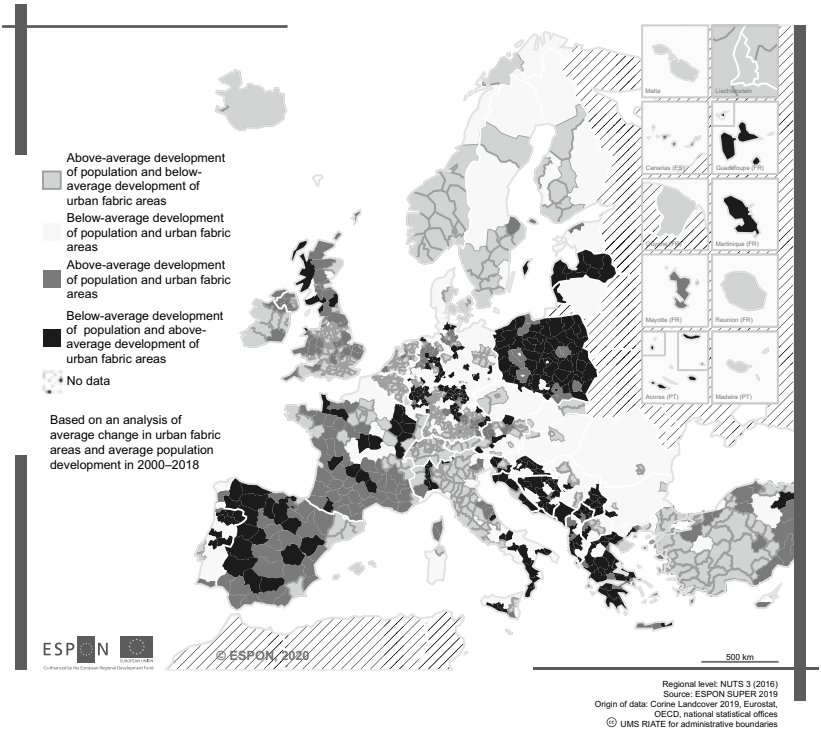


Fig. 2.4 Typology of urbanization and population development

or economics (e.g. second home development or businesses located in city centres and neighbourhoods). The second group of regions have both high population and urban fabric growth (dark grey: top right quadrant). This includes areas like the South and West of France, South of Spain, and East England. This suggests areas where planning is oriented to accommodating demand. The third group of regions has high population development but low urban fabric growth (bottom right quadrant), suggesting efficient urbanization. This is a mixed group, consisting of highly urbanized regions (the Netherlands, southern UK) but also regions with a large share of natural areas (Norway, Austria, Switzerland, rural Iceland). The last group of regions have below-average development in both categories (white: bottom left quadrant). These are usually rural regions sometimes facing depopulation.

Urban growth in the Netherlands and Greece

The Netherlands and Greece are similarly ranked in Europe in terms of the absolute amount of land being converted to urban use in the 2000–2018 period. In eighth place, Greece urbanized approximately 43 thousand ha and the Netherlands (sixth place) approximately 70 thousand ha (see Fig. 2.3). Their urban growth rate since 2000 is also comparable. Given their respective sizes, however, the intensity of urbanization is much higher in the Netherlands.

The two countries have marked differences in the composition of this land cover change (see Fig. 2.5), the most important being the large share of construction sites in the Netherlands. This suggests that the Netherlands is poised to urbanize in the near future more than Greece. The share of urban green is also substantially higher in the Netherlands, which is one of the forerunners in this regard. Finally, Greece has a far greater share of mineral extraction (the Netherlands largely ceased these activities following the decommissioning of mining in the 1970s). Infrastructure development is also much higher in Greece. In Athens, the 2004 Olympics was seen as a major driver of infrastructure development (Delladetsima, 2006; Salvati & Zitti, 2017) as well as the sustained injection of EU

capital via the structural funds, which is usually used for transport infrastructure.

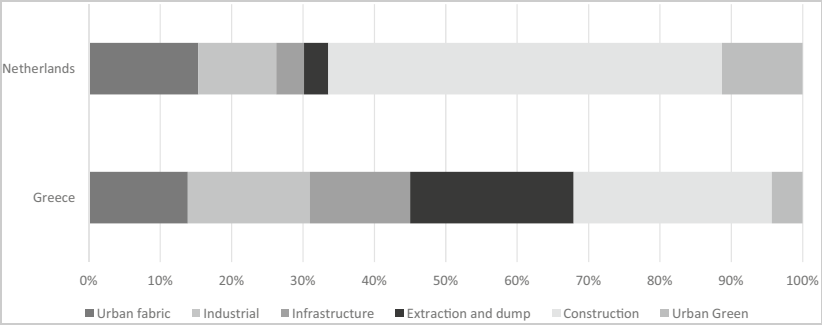


Fig. 2.5 Components of urbanization in Greece and the Netherlands

Urbanization per capita reveals an even starker contrast. While the population in the Netherlands grew by almost 1.7 million in the 2000–2018 period, it fell in Greece by about 35,000. Concerning economic development, GVA growth in the Netherlands was two to three times that of Greece, strongly suggesting that Greek urbanization was fuelled by a supply-side logic linked to economic development elsewhere (e.g. second homes owned by foreigners). The case of the island of Paros is illustrative: since 2000 there has been extensive exurban development even though ample room existed within the built-up area. Some authors point to the failure of urban planning as a cause (Tsilimigkas et al., 2022).

2.3 Evolving Urban Densities

One of the most important shortcomings of land cover data is that it does not account for density: the monumental urbanity of Rome's city centre and a leafy neighbourhood at the edge of Milton Keynes are both coded as 'urban fabric' in the CLC database. Density and urban land cover are certainly related—human beings require buildings to live

in—but not identical. Some very densely built-up areas have few or no inhabitants, such as a Central Business District (CBD), industrial zone, or an airport, while some low-rise neighbourhoods—such as shantytowns or tenements—concentrate many inhabitants on a small parcel of land. Density is a crucial measure for debates on liveability and sustainability and is commonly used in urban planning as a prescriptive norm (Forsyth, 2003). However, given that its value highly depends on the method of calculation, it is also slippery and contested. One study surveying the definitions and conceptualizations of density used by urban development professionals found that 23 different notions were being used simultaneously (Boyko & Cooper, 2011). The seemingly straightforward concept of density is anything but. To contribute to this debate, this section will approach the term from different directions, using the SUPER database as a guide.

2.3.1 Absolute Density

The most common density measure is area-weighted densities, obtained by simply dividing the unit of analysis (e.g. built-up land, population, parks, infrastructure) by the surface area at which it is measured (e.g. grid cell, municipality, region, nation). This is a useful way to gain a superficial understanding of density. On the other hand, the results are very dependent on the delineation of the areas under investigation. Notably and against conventional wisdom, New York City is reported as being denser than Los Angeles in official US Census data because its boundaries include many low-density suburbs, exurbs, water bodies, and open areas. Zooming to sub-metropolitan levels quickly reveals that New York contains neighbourhoods with population densities far beyond that of Los Angeles.

In Europe, the area-based density is about 1 person per hectare and 4.44% of the land mass is covered by urban functions. These figures of course do not say very much given the territorial diversity of the continent. Using the SUPER database we can calculate densities at the NUTS 3 level. The observation that big cities have high densities of people and buildings seems to hold as London and Paris head the list, but also—like the US example—that borders matter. The UK draws its NUTS 3 borders rather tightly around its core cities, resulting in higher densities

than cities which include more countryside in their NUTS 3 delineation.[4] At the NUTS 3 level, the density of Paris is tenfold that of Milan or Greater Amsterdam and almost thirty times that of Barcelona. Anyone who has experienced the bustling urbanity of the Catalonian capital would be surprised at its ranking among towns such as Prato, Kaiserslautern, and Kortrijk. This is because Barcelona proper—which incidentally contains the densest square kilometre in Europe with over 50 thousand inhabitants (Rae, 2018)—is but a small part of the expansive NUTS 3 region it inhabits. One could argue that zooming in to the municipal (LAU) level would provide more accurate information on densities. It does, but the problem persists, just at a different level of scale, with large parks and industrial areas rather than hinterlands skewing results. Since the picture can change so dramatically as one moves up and down scales, one has to define beforehand the most relevant level at which density should be understood: neighbourhood, city, region, etc.

Several methods have been employed to deal with this issue. Steurer and Bayr (2020, p. 2) argue that more meaningful measures of density can be obtained by disregarding all non-urban space in the calculation, or, to go a step further, disregarding all non-residential uses. This indeed produces different results, with Athens, the Spanish cities of Melilla and Ceuta, and Bucharest now appearing in the top ten (i.e. CLC class 'urban fabric' per capita). However, this is also an imperfect indicator, as an environment characterized by individual tower blocks surrounded by open countryside (such as many peripheral housing estates) would be considered just as dense as if they were situated within a major city centre. Contiguous non-urban uses, such as rivers, forests, and farmland, should not be completely discounted because they contribute to the overall experience, if not the function, of density. Another approach is to abandon administrative boundaries altogether and define areas in terms of a minimum population threshold (Ottensmann, 2018). This method is used by the US Census Bureau when calculating metropolitan densities and was applied by Tikoudis et al. (2022) for OECD countries. Others set 'buffer zones' around a site to take into account the densities in surrounding areas (Boyko & Cooper, 2011). Still, even here, it is possible to have two cities with the same footprint and population (and

[4] This was observed while carrying out the morphological analysis (see Sect. 2.4).

hence equal area-based density) but completely different internal structures (e.g. homogeneous distribution versus high local variation), with obvious implications for urban planning and service provision (Tikoudis et al., 2022).

Despite its prevalence and simplicity, the area-weighted methodology also fails to answer the question: At what densities do most people live? Population-weighted density (Craig, 1984) seeks to measure exactly this by dividing the area in question into different parts and weighing up the densities between them. If, for example, 90% of the people in a given metropolitan area live in its dense core city, and the other 10% in extreme low-density suburbs, the weighted density will be close to that of the core city and therefore be much higher than the area-based density. According to a study using a subdivision of 1 ha grid cells, Spaniards live at the highest densities—above 200 people per hectare and about 275 for those living in metropolitan areas—followed by Greeks and Slovenians. In most European countries, people tend to live at 50–100 people per hectare, roughly equivalent to a compact suburban neighbourhood. Within this range, France, Italy, and Malta are at the high end, while Germany and the UK are on the lower end. People in Luxembourg, Croatia, and Cyprus live below the 50-people/ha threshold (Kompil et al., 2015, p. 45). At the NUTS2 level (using NUTS 3 regions as units of analysis) it was found that the population-weighted density of Paris Île de France was six times higher than its area-based density, but for Inner London, it was about the same.[5] It should be noted that this measure has shortcomings as well. For example, the more subregions that are defined, the higher the weighted density becomes. Also, there is no consensus on how best to perform the calculation of the mean (e.g. absolute or relative difference), resulting in an array of similar indicators yielding different results.

Finally, we can consider how to visualize density. Cartographically, displaying absolute values such as population by colouring in (usually administrative) areas is strongly discouraged as this overrepresents geographic units with large surface areas. It is more accurate to display area-based density, but this can also downplay the importance of high-density regions given that these are usually small statistical units. Data can also be depicted using circles, but this can sacrifice readability. An alternative method is three-dimensional visualization. By observing

[5] This was done as a background analysis for the publication Lagas et al. (2015)

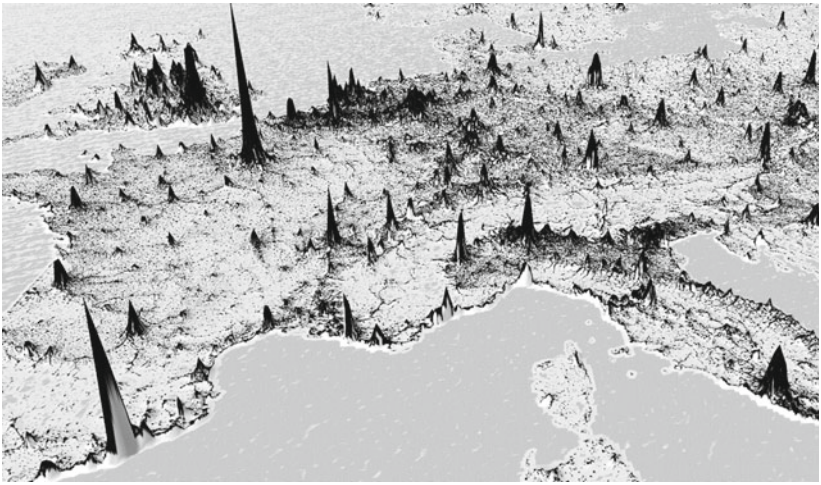


Fig. 2.6 Population visualization in Europe by Tjukanov (2022)

the spikiness of the shapes of this image of Europe created by Tjukanov (2022) using GHSL data, we can immediately see how certain parts of Paris and Barcelona are denser than equivalent cities such as London and Berlin as well as the 'hilly regions' in the Netherlands, western Germany, and northern Italy (Fig. 2.6).

From this image we can also see that bigger cities do tend to have higher overall densities as premiums are paid for space at central locations, and these densities tend to decline further from the centre (Berry, 1973; Short, 1996).

2.3.2 Changing Densities

A study by Li et al. (2022, p. 6) on urban and population growth at the global level found a decades-long trend towards decreasing densities, except for North American and European cities over 2 million inhabitants. From our calculations (CHA data), European NUTS 3 regions declined in density by about 4–5 people per hectare urban land between 2000 and 2018.

What explains the changing densities of cities is a topic of debate. A highly influential study by Van den Berg et al. (1982) argued that there

are four distinct stages that cities undergo in their evolution. The first, urbanization, is characterized by population gain in absolute terms but also relative to its surrounding area. The second stage, suburbanization, finds city growth outstripped by growth outside. In the third stage, deurbanization, growth is replaced by decline, which is more acute in the central city. The last stage, reurbanization, reverses this trend, marking modest population gains within a declining region. With the benefit of hindsight, we can see that European cities have not undergone all stages consecutively and that there are significant differences in urban trajectories. An early pan-European project in the ESPON programme found significant declines in urban population in the 1950–2000 period overall, particularly in Eastern Europe; Portugal exhibited the opposite trend (Bengs & Schmidt-Thomé, 2004). More recently, there is evidence of reurbanization in Northwest European countries, but again, with mixed results (Dembski et al., 2021).

What this means for sustainability can be illustrated by a hypothetical example (Fig. 2.7). Here, the relative density declines the further one travels from the centre until it reaches a threshold considered rural. This density could concern population density, but just as easily, the density of the built environment, or job densities (Central Business Districts often have fewer residents than their surrounding neighbourhoods). If all parts of the city grow equally (balanced growth), its footprint will extend outwards, indicating urbanization or 'land take' where densities within the existing urban fabric also rise proportionally (dashed line). On the other hand, the city can also 'sprawl' outwards together with falling densities in the original urban area (dotted line), with a more gradual density curve as a result. If one looks closely at the map of urbanization rates at the regional level (Fig. 2.2), one can discern cities (small NUTS 3 areas) that may fall into the latter category such as the Polish cities of Poznan, Wroclaw, Lodz, and Hungary's capital Budapest, where the adjacent regions are urbanizing much faster than the core city. This can have important implications for sustainability as it can signal a shift to different transport modes (i.e. car), higher energy consumption, and demand for services and infrastructure. We will return to this matter in more detail in Chapter 5.

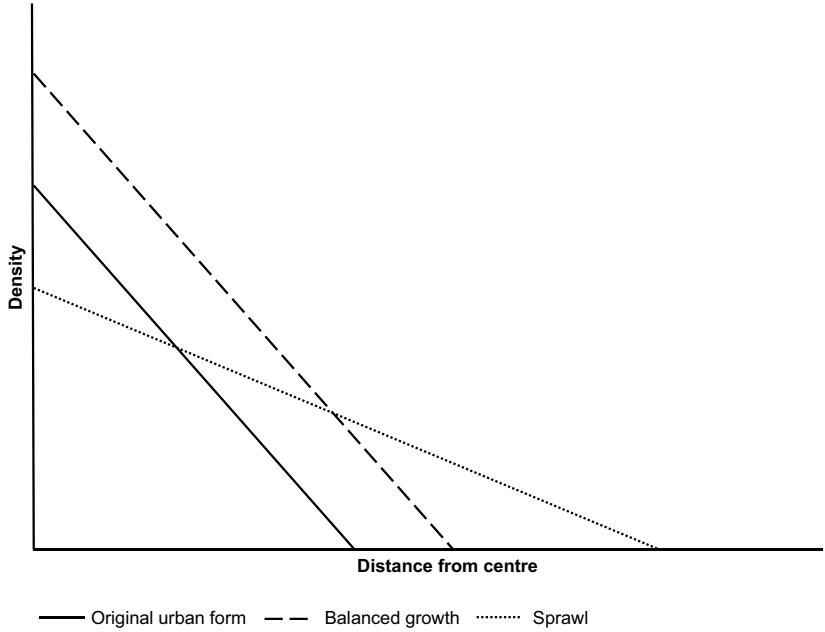


Fig. 2.7 Balanced urban growth versus sprawl (Couch, 2015, p. 104)

2.3.3 Relative Density

Density indicators are often criticized in the political debate because they do not reflect experience very well. This is because feelings which are evoked by a particular built environment are very subjective, both for individual cognitive preferences and cultural norms (Alexander, 1993). The same bustling city street will feel threatening to some and vibrant to others. Objective measures can also be misinterpreted. For instance, one could erroneously conclude from housing prices that people value high density (through their willingness to pay) and abhor open space. In addition, residential density is an important indicator for urban behaviour and can be used to predict flows of people, and their convergence, in space (Jacobs-Crisioni et al., 2014; Kompil et al., 2015). On the other hand, analyses of cell phone data in France reveal stark differences in the concentration of people in the country on weekdays and weekends and even greater differences during the summer vacation: Paris empties

and coastal towns become as dense as the nation's capital (Deville et al., 2014).

Since the pandemic, it has become crucial not to only understand the density of homes and workplaces, but also of people at a given place at a given moment (UN Habitat, 2020). This can also be hard to measure using the data available: crowding is extremely high at stadiums and airports even though no residents and few jobs are located there. Conversely, direct human contact can be extremely low in a high-rise complex (Hwang, 2006). Or formulated more positively: vibrancy and urbanity (or crowding) are not necessarily a direct function of density.

Urban designers have studied this relationship extensively (Berghauser Pont & Haupt, 2010). Poor planning and design can force people and vehicles into small spaces, creating congestion (Campoli & MacLean, 2007) and poor housing policies can create situations where people live in cramped quarters. In addition,

> Perceived density is not highly related to actual density but is profoundly affected by landscaping, aesthetics, noise, and building type. Often, when people say an area is dense, they base this assessment on a perception that a development is ugly, has little vegetation, and has caused parking problems for neighbors, rather than a count of the actual number of units per acre. Design can make an enormous difference to perceived density. (Forsyth, 2003, p. 4)

To illustrate this point further, the three figures below all have the exact building density (75 homes per hectare) but vastly different urban forms (Berghauser Pont & Haupt, 2010, p. 13). It is to this topic we now turn (Fig. 2.8).

Fig. 2.8 Three variations of the same density. Drawn by Ozana Palić using Berghauser Pont and Haupt (2010, p. 13)

2.4 Evolving Urban Form

It is notoriously difficult to define, operationalize let alone measure urban form (Galster et al., 2001). Notable classifications include Kevin Lynch's (1961) typology of metropolitan areas and Jabareen's (2006) classification of sustainable urban forms. A new lexicon has emerged to describe hybrid forms of urbanization beyond the classical monocentric city, such as *Zwichenstadt* [in-between city] (Sieverts, 2003), peri-urban areas (Piorr et al., 2010), Edge City (Garreau, 1992), and Territories-in-Between (Wandl, 2019). This has been aided by new technologies which have allowed for more quantitative approaches, such as a fractal geometry method to estimate the growth of Chinese cities (Long et al., 2018) or the OECD's morphological analysis of metropolitan areas (OECD, 2018). This study attempted to quantify sprawl by employing a wide range of measures, mostly related to population density (e.g. the share of an urban footprint with a density below a predefined threshold or the share of the population living below a given threshold, but also the variation in population density and number of high-density peaks).

Some authors measure 'scatteredness' of urban form using entropy. In this case, the 'disorder' being measured is the level of density (measured either as a percentage of urban land cover or weighted by population) within a given area, under the assumption that a large variation in densities is indicative of sprawl (Steurer & Bayr, 2020). Other authors use inequality measures such as the Gini coefficient or Thiel index to similar ends. One study (Cabral et al., 2013) argued that entropy could signify urban problems, arguing that both low entropy (too much order: homogeneous neighbourhoods) could be as problematic as high entropy (too much chaos: mixing incompatible functions). This raises an important drawback of entropy for understanding urban form: a monocentric city with gradually decreasing density could have the same entropy score as a complex polycentric region with compact cores interspersed with rural functions (Steurer & Bayr, 2020, p. 4). To account for this, some authors employ the so-called Moran I index, which measures the degree of dissimilarity within an area (e.g. Tsai, 2005). Using the above example, the polycentric region would be considered more scattered—and therefore more sprawled—than the slowly thinning city. One can contest this interpretation as well. Moreover, the same low Moran I score (high correlation between neighbouring cells) can be obtained for a desert, a dense urban district, or a low-density suburb. Yet another measure is 'compactness'

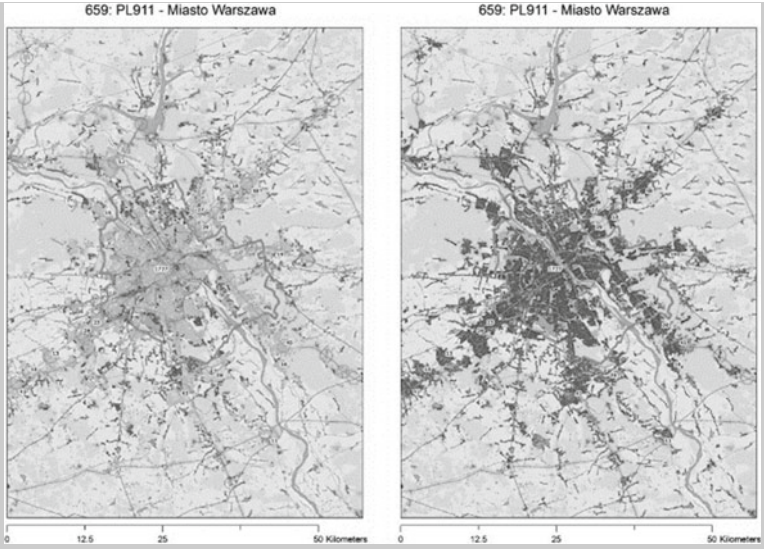
which measures the ratio between the perimeter and the area of a given form (Bribiesca, 1997). Given that the most efficient ordering of two-dimensional space is a circle, the more an urban shape deviates from this mathematically, the less 'compact' it becomes. A very important caveat is the resolution at which the area and perimeter are measured: a very (internally) fragmented circular urban region could seem quite compact if the edges are drawn roughly.

From this overview, we can conclude that there is no consensus on how to quantitatively measure urban form. In general, we can posit that the more sophisticated quantitative analyses become, the less intelligible they are to those with actual powers to affect spatial developments, that is, municipal officers, land developers, and policymakers. For this reason, the ESPON SUPER project created a new, more qualitative, measure. The basic philosophy is similar to the book *A Field Guide to Sprawl*, which uses visual information—in that case, aerial photography—to categorize urban form (Hayden, 2004).

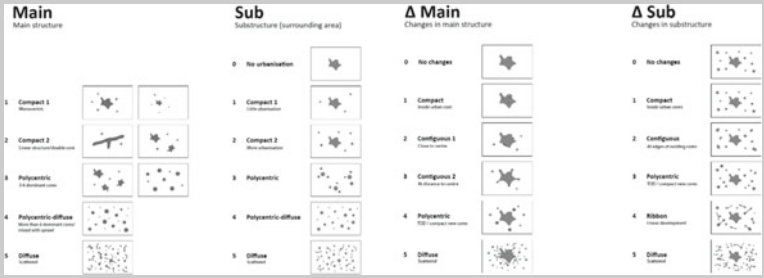
The goal of the SUPER morphological analysis was to produce an urban form typology of European regions in 2018 and an indication of how urban form changed over the 2000–2018 period. Rather than using automation like for instance, Huang et al. (2007), this was done manually by human beings using a visual assessment. Even though expert judgement can be accused of being inherently untransparent and nonreproducible, the criteria used to arrive at this judgment can be stated clearly and transparently, and therefore are verifiable. Wheeler (2015) did something quite similar at the neighbourhood level, creating an international urban typology by identifying and classifying morphological structures from satellite and street-view imagery, and then manually mapping these types onto a number of cities.

Explanation of the Morphological Analysis

The first step was to produce clear maps of each NUTS 3 region in Europe to facilitate the interpretation of urban form and its evolution. These maps used common land-use nomenclature and colours and included a background depicting rural land uses and infrastructure (including train stations).



The guidelines to visually evaluate the maps were drawn up by experts in architecture, urban design, and spatial planning at the Netherlands Environmental Assessment Agency (PBL). It was agreed not to assess the size or magnitude of the urban structure or changes, but only their *shape*. It was also agreed to adhere as much as possible to the compact-polycentric-diffuse typology used in the project. The result was a continuum of five morphological categories: compact, compact/polycentric, polycentric, polycentric/diffuse, and diffuse, allowing Likert-scale scoring. An additional category for no urbanization was also added.



Given that regions may exhibit significant internal variation, a distinction was established between the 'main structure' (i.e. the most prominent visual element) and the 'substructure' (the remainder). This allowed for a richer categorization, allowing, for example, the classification of a compact city with a compact or diffuse hinterland (for a full description of the methodology see Van Schie et al., 2020). A spreadsheet of the scores can be obtained from the authors.

2.4.1 Absolute Urban Form

After scoring the approximately 1,400 NUTS 3 regions in Europe according to their main urban structure and substructure, the first question asked was which kind of urban structures were the most common. To answer this, a simple frequency distribution of the scores was performed (see Fig. 2.9). This revealed that, in general, the main structure was judged to be more compact than the substructure. For the main structure, the most common urban forms were compact (generally monocentric) and polycentric (generally 3–5 urban clusters); relatively few main structures were classified as diffuse. By contrast, the substructure shows that the more diffuse a category became, the more common it was, except for the extreme 'diffuse' category. Finally, no urban structure could be identified for some regions ($n = 84$). Excepting four occurrences in the main structure (e.g. extremely sparsely populated regions in Iceland), this pointed to the absence of a substructure, generally indicating an extremely compact urban form with no building outside the main urban area(s) or very tight administrative boundaries.

A second question is whether, for example, diffuse urbanization occurs more often in compact/monocentric main structures. Figure 2.10 presents the results of this analysis, revealing that the diffuse categories (4 and 5) in the substructure—often labelled as urban sprawl—increase as the main structure becomes more diffuse. However, for the most extreme diffuse category, the first three main categories show roughly equal levels. For example, there were many monocentric regions with very compact or no development outside the core city (e.g. Oslo, Berlin, Coventry, and

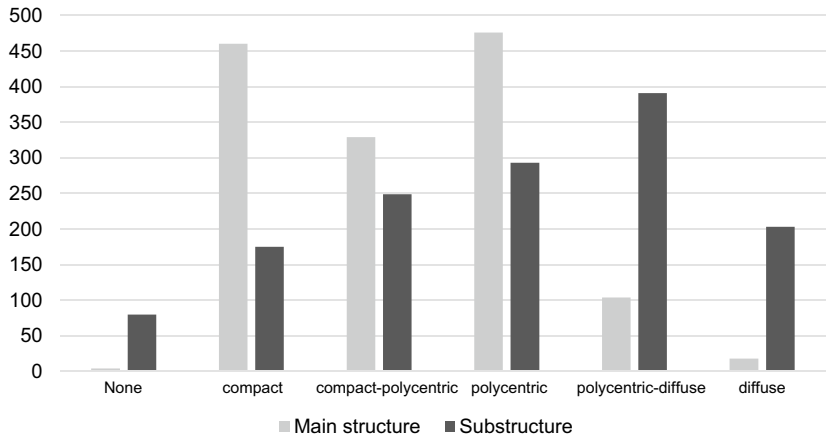


Fig. 2.9 Frequency of main and substructure scores

Budapest: sometimes explained by tight NUTS 3 borders) but also many with very diffuse development (e.g. Gliwicki, Milan, and Braşov).

Revisiting the title of the seminal article by Siedentop and Fina (2012) 'Who sprawls most?' we can now rank entire countries according to the shape of their urban structure. Given that averaging obscures internal variation, this ranking needs to be approached with caution. Nevertheless, it is noteworthy that Austria, Lithuania, and Slovakia show relatively more dispersed main structures than Iceland, Romania, and Norway. More interesting for the sprawl debate is the substructure: Poland and Slovakia

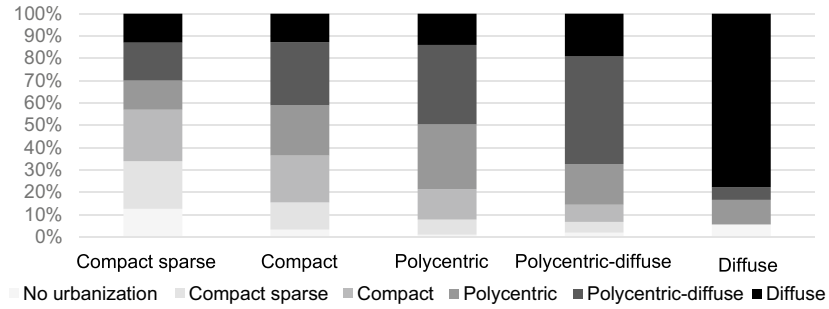


Fig. 2.10 Main structure (column) versus Substructure (shade)

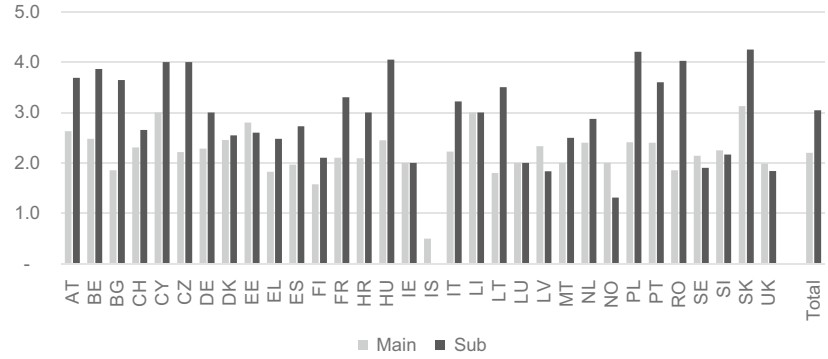


Fig. 2.11 National averages of NUTS 3 morphologies

are most diffuse whereas Ireland, Latvia, and the UK have relatively compact substructures (Fig. 2.11).

The territorial diversity of Europe is even better brought into view at the NUTS 3 level. When mapped out, national differences in the main structure remain readily apparent, with Iceland, Norway, Finland, and Spain generally being relatively compact and the Netherlands, Germany, Denmark, and Slovakia more polycentric. Still, differences within countries are marked. France, Romania, Bulgaria, Belgium, Italy, and Poland are all quite heterogeneous. Sweden reveals a compact north and polycentric south while Portugal and the Czech Republic have an east/west divide. These results challenge the conventional wisdom of a traditional compact Mediterranean urban form versus dispersed development in the more northern regions, or stereotypes of idyllic compact Italian cities versus urban sprawl in Belgium. According to this analysis, the distribution of the main urban form is quite diverse (Figs. 2.12 and 2.13).

The diversity of Europe is still apparent, but less so, when examining the distribution of substructures. The earlier statistical observation of a more diffuse substructure is immediately apparent, as shown by large areas in northern France, northern Italy, Ireland, much of central and eastern Europe (particularly Poland, Hungary, and the Czech Republic and Slovakia). More compact substructures are found in Spain, central France, Croatia, central Italy, the Netherlands, and northern Scandinavia.

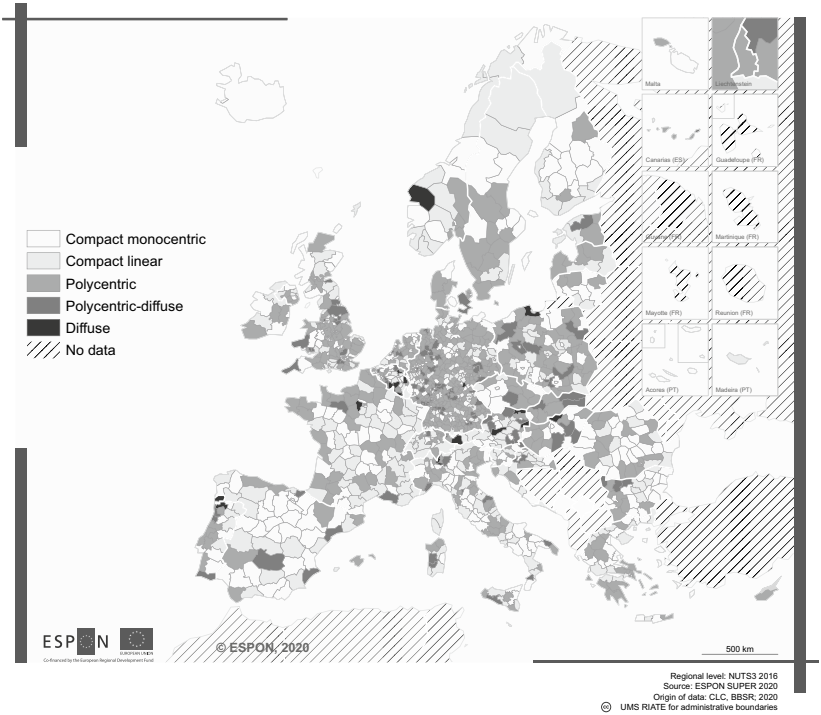


Fig. 2.12 Main urban structure of NUTS 3 regions in 2018

2.4.2 Changing Urban Form

Given that urbanization is a dynamic phenomenon, it is important to investigate whether changes are perceptible in the 2000–2018 period. Path dependency would suggest that the development of the main structure replicates the existing structure. However, this tendency is not particularly strong based on the data collected. Instead, we see a similar distribution across all categories. By far, the most common kind of urbanization is contiguous: either close by or on the urban fringe. It should be noted that contiguous development in a diffuse main structure is not likely to create a more compact structure, but instead reproduce fragmentation (Fig. 2.14).

Few spatial patterns are immediately apparent in the evolution of the main structure. Two hotspots of diffuse main structure development

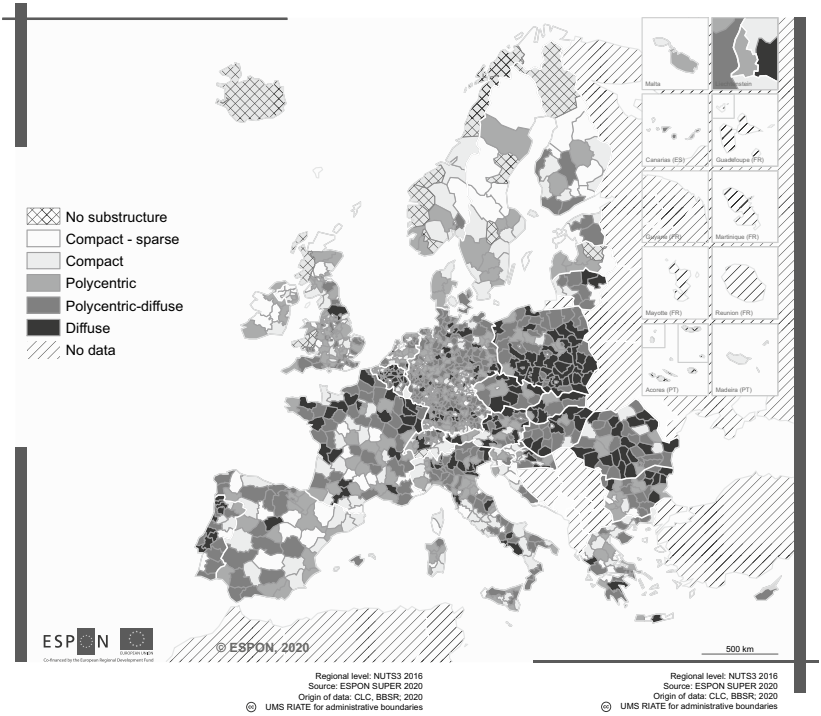


Fig. 2.13 Urban substructure of NUTS 3 regions in 2018

can be identified, indicating situations where edges of towns and cities scatter outwards: Poland (various regions) and northern England. Interestingly, Spain, which had the largest share of absolute urbanization (see Sect. 2.2.1), does this in a comparatively compact way. This is also the case in the Netherlands, Bulgaria, and Sweden.

Finally, given that much urban development occurs in the substructure, and that this is where the sprawl debate is generally focussed, this was analysed with interest. Again, for the first three categories, we see more compact substructures growing in slightly more compact ways than polycentric regions. Here, infill or contiguous development constituted over 90% the vast majority of urbanization in the 2000–2018 period. For compact substructures virtually all new development was infill or contiguous. Diffuse development only really occurred in already diffuse

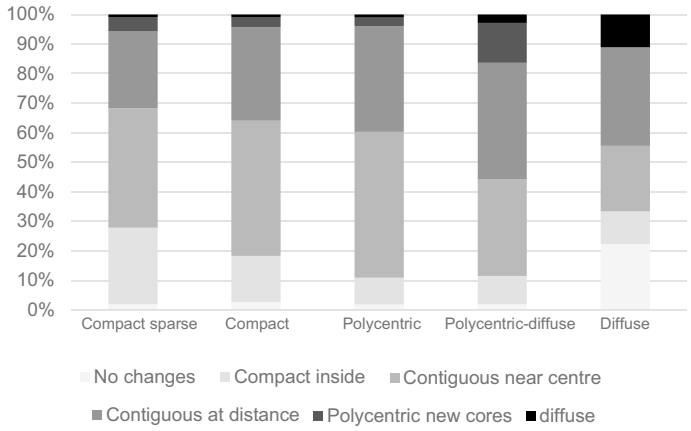


Fig. 2.14 Change in main structure by type

substructures, although the line is quite blurry between this category and polycentric new areas (scattered development). Again as we said with the main structure, if new development in relatively diffuse substructures occurs contiguously, this does not necessarily imply that a more compact structure is being created (Figs. 2.15 and 2.16).

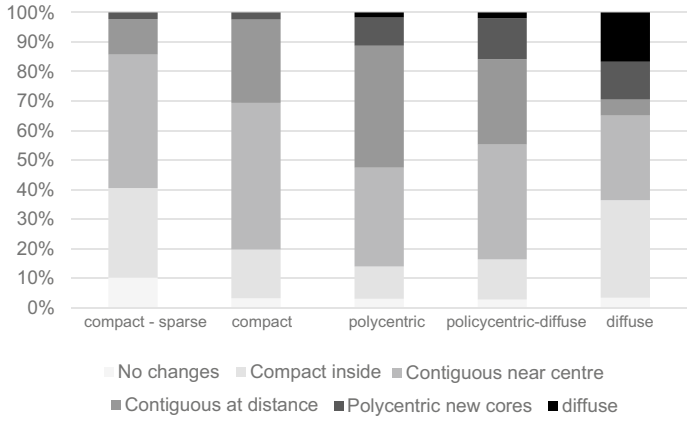


Fig. 2.15 Change in substructure by type

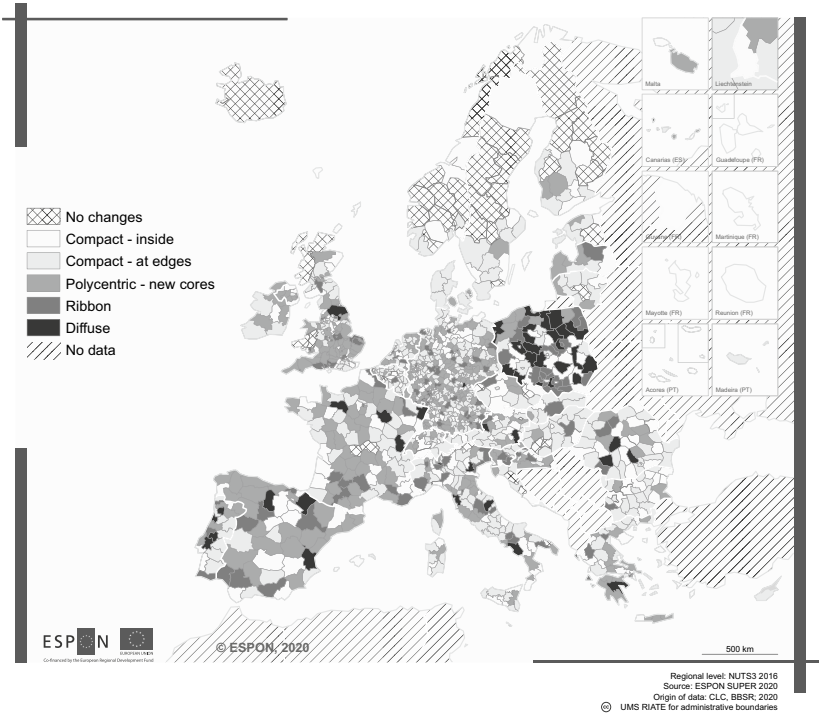


Fig. 2.16 Changes in the urban substructure of NUTS 3 regions in 2000–2018

With respect to the geographic distribution of changes in the substructure, similar hotspots of diffuse development appear as with the main structure: Poland and North England. Now, however, these areas are in good company: most countries have a region where the substructure is urbanizing diffusely (either scattered or along roadways). Scandinavia and the Baltic states seem to be an exception to this rule. It is also worth noting that some countries in central Europe which had fairly diffuse substructures are urbanizing in more compact ways, while Poland is not. If nothing else, this finding reveals that 'urban sprawl' is a very complex phenomenon and not necessarily path dependent. It may also suggest that targeted interventions could be effective in redirecting developmental trajectories towards more sustainable urbanization.

2.4.3 *Urban Form Analyses*

The morphological analysis allows us to revisit some nagging questions within the sprawl debate by comparing our measurement of urban form to other indicators. We first investigate whether compact urban forms are also more populous, dominant, and denser than non-compact forms. Afterwards, we explore the relationship with sustainability.

A simple comparison between the main urban structure and population at the NUTS 3 level supports the stereotype: monocentric regions have the highest average populations, followed by dual/linear and then polycentric regions. The top 10% of most populous regions are also predominantly monocentric. Interestingly, polycentric-diffuse main structures tend to have even higher populations, although these are few in number (see Fig. 2.9). For the substructure, the results are more striking. Here, diffuse substructures tend to have higher populations than the other types. This might be explained by the fact that compacter substructures have more open space between settlements with few inhabitants. It also confirms earlier findings that many regions exist with monocentric main structures (which were found to be more populous) and diffuse substructures. It should be pointed out that these analyses are hampered by the problem of jurisdiction size. This drawback can partly be addressed by comparing urban form to the density of residential areas (population/urban fabric) rather than population. For the main structure, the density analysis produced very similar results: monocentric regions tend to be denser than dual/linear and polycentric regions (as well as dense polycentric-diffuse main structures). For the substructure, the picture became reversed: more diffuse urban forms (e.g. ribbon development) have lower residential densities than compact substructures (e.g. villages).

The SUPER morphological analysis also allows for an investigation of whether more compact cities are also more dominant in their region. Regional dominance was determined by the primacy rate, which measures the ratio between the largest urban unit (measured at the municipal/LAU level) compared to the total population in the NUTS 3 region. For the analysis, a distinction was made between regions with a dominant core and more mixed regions. A rate over 50% was considered sufficient for 'dominance' for regions with a large population (>500,000 inhabitants), and 25% for less-populous regions (a cut off was made at 50,000 people). This analysis was performed separately for large, medium, and small regions.

The primacy rate analysis revealed that populous NUTS 3 regions are morphologically more compact and grow more compactly than smaller ones. For large regions, it was counterintuitively found that a dominant core was associated with slightly less compact main structures and significantly less compact substructures than mixed regions. Dominant large regions showed slightly more compact changes to the main structure but significantly less compact changes to their substructure than their mixed counterparts. This tendency was mirrored for mid-sized regions, although here changes to the main structure were more diffuse for dominant regions. It is difficult to draw conclusions from this analysis, but it should dispel the notion that a high concentration of population in a core municipality will always result in compact urban forms and development. Indeed, one could hypothesize that areas with high population densities may build up pressure that is released as more scattered development. If true, this would have implications for spatial planners trying to manage growth. Further research would be needed to explore, refute, or corroborate this.

Crucially for the sprawl debate, we can consider whether compact regions are more sustainable than polycentric or diffuse regions. A regression analysis could not establish a significant statistical relationship between the SUPER morphology analysis and a self-constructed sustainability index; a stronger (positive) relationship was found between sustainability and GDP (Lardinois, 2021). The most significant finding regarded the substructure, where the most diffuse category scored noticeably lower than the four other urban forms on sustainability (2021, p. 26). Still, even here, some diffuse regions scored higher than compact regions. In the end, economic development proved a much better (positive) predictor for sustainability than urban form (Fig. 2.17).

Before drawing hasty conclusions, a few drawbacks of the morphological analysis should be considered that likely affected the analyses performed in this section. First, the analysis was carried out using administrative units rather than grid cells. While this allowed for comparisons with other data collected at this level, it is not unproblematic. For example, one could expect that countries that designate large NUTS 3 regions would be evaluated as polycentric more often because they would be more likely to capture multiple cores by virtue of their size. A quick look at Germany (small delineations) versus, for example, Spain (large delineations) does not bear this out, however. Nevertheless, it would be interesting to repeat the morphological analysis (or a random sample) using grid cells and note

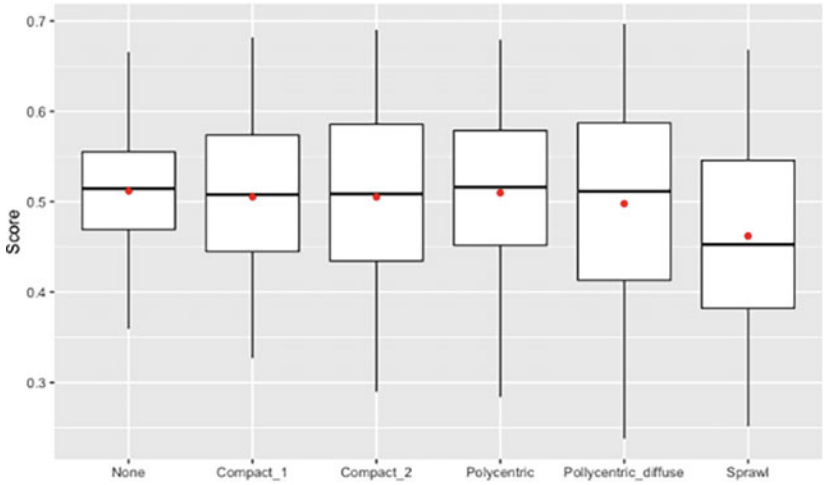


Fig. 2.17 Sustainability index score of substructure in 2018

whether the difference in scoring is structurally skewed. Second, because the analysis was performed by human best judgement, it is not reproducible. Since the regions were evaluated at random, differences between individual assessors should not have resulted in a systematic bias but still could have affected results at the micro-scale. It would be interesting to compare these results to entropy and Moran I analyses in further research.

2.5 Reflection

This chapter presented how much and how fast Europe is urbanizing (land take) as well as the density and form this takes (urban sprawl). This analysis revealed a strongly variegated Europe, making it difficult to make blanket statements at the pan-European level. For example, we see strong urban growth in some European regions, slower development in others, and even deurbanization in some instances. There are also indications of suburbanization where core cities are growing slower than their environs. We see sharp rises in infrastructural land use in some areas (also per capita), whereas others remain relatively stable. We see monocentric cities expanding through contiguous or clustered development while others display profound urban diffusion. Finally, it must be recognized

that urban form (particularly the main structure) is something that has evolved gradually over a long period and is difficult to manage; much of Europe's current urban structure is the result of seeds planted hundreds, if not thousands, of years ago. This has implications for the capacity of certain territories to become more sustainable and for planners to prepare interventions to this end. This is the topic of the next chapter.

This last point raises an interesting issue. There appears to be a disciplinary gap between (mostly quantitative) studies on measuring urban development and the (mostly qualitative) studies investigating the effect of policy interventions, a gap which has persisted for at least two decades (Whitehand, 2022).[6] Recently, Cortinovis et al. (2019) attempted to connect urban development trends to policy strategies in their evaluation of the position of European cities, but admitted that the link was weak and required further investigation. In the remainder of this book, we continue to explore the relationship between urbanization and its drivers, particularly in Chapter 5 where we consider the sustainability of not only outcomes but also the development practices that engendered them.

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[6] By organizing these topics into different chapters, this book is arguably also guilty of perpetuating this bifurcation.

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CHAPTER 3

Urbanization Interventions: Strategies, Plans, and Policies

Abstract This chapter explores the successes and challenges of managing urban growth. It examines the influence of formal and informal rules in society on urban development, drawing on examples of strategic planning and transit-oriented development in cities such as Stockholm, Amsterdam, and Paris. Despite ample qualitative evidence regarding the importance of national planning systems, it is difficult to establish a statistically significant causal link between planning systems and their ability to control urban development. The evidence also shows an increasing impact of European policies and strategies, such as the European Green Deal, on urbanization despite the absence of a mandate for planning.

Keywords Interventions · Spatial planning · Urban containment · Transit-oriented development · European policy · Institutions

3.1 Introduction

In the previous chapter, we saw that the rate at which urbanization is occurring in Europe is highly heterogeneous and that divergent urban structures and trajectories can be distinguished across the continent. As explained in Chapter 1, the drivers behind urban development are manifold. On the one hand, there are demand-side drivers such as the collective desire and willingness to pay for residential or business space.

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https://doi.org/10.1007/978-3-031-62261-8_3

On the other hand, there are supply-side drivers with landowners, local authorities, and developers seeking to profit from increases in property values. The force of these drivers is amplified and diminished by institutional factors such as land-use planning. This chapter seeks to examine how what we call public-sector 'interventions' (i.e. policies, plans, strategies, projects) help to shape the trajectory of urban development (Cotella et al., 2020a, p. 2; Gerber et al., 2018).

Section 3.2 discusses the basic theoretical concepts used in this chapter, such as institutions and interventions and their relationships with key organizations such as planning authorities. Given that the interventions that influence how urbanization occurs are formulated and implemented by different tiers of government, the chapter treats each level separately. The local and regional level, discussed in Sect. 3.3, is closest to the actual building process and is most directly responsible for guiding or even initiating urbanization. These local and regional interventions take place within larger systems of spatial planning established at the national level (Sect. 3.4), but sometimes national governments try to intervene in urbanization processes as well. Section 3.5 then investigates how, even without a mandate for spatial planning, European Union policies still influence urbanization. Section 3.6 then addresses the thorny issue of the extent to which the interventions and systems discussed can be considered effective or successful. We conclude by arguing that interventions can promote sustainable urbanization, but also that institutional factors play a crucial enabling or constraining role in this.

3.2 Urbanization, Institutions, and Interventions

Judging by the volumes of success stories and best practices (Bulkeley, 2006; Fioretti et al., 2020), there is good reason to believe that interventions can and do influence urbanization. To understand how this occurs, we will need to unpack and reflect on some terms. First of all, these interventions are generally introduced within a specific planning system, which can be understood as an institution. Institutions should not be confused with organizations that perform specific tasks; instead, they represent 'the rules of the game' in society, both formal and informal, that influence how individuals and organizations behave (North, 1990; Salet, 2018).

The institutional aspect of a planning system comprises the formal establishment (usually via national legislation) of planning entities and

their powers as well as the various instruments available to them to intervene in urbanization processes, such as spatial strategies, land policy, financial incentives, and zoning. Part of the planning system is also comprised of informal institutions, such as routines, governance traditions, concepts, and norms that define the prevailing planning culture or doctrine (Alexander & Faludi, 1996; Buitelaar et al., 2007). This influences the way that requests for planning permission are evaluated and the way planning agencies deploy instruments to solve the everyday 'puzzle' of reconciling competing land uses.

The power of planning systems to influence urbanization is indirect, and primarily found in the authority of planning agencies to draw up zoning plans, grant planning permission, or issue building permits.[1] Depending on factors such as statutory powers, political mandate, or the composition of its members, these organizations can be more or less interventionist with respect to urban development. Dutch planning theory makes a useful distinction between three different orientations, reflecting the evolution of planning in that country over the past few decades: passive planning, entrepreneurial planning, and facilitative planning. *Passive planning* refers to a non-interventionist situation where current zoning is considered the norm, and the burden of proof rests on initiators to argue that change is necessary. Planners act as gatekeepers and see themselves as champions of the public interest and enforcers of the status quo. This stance became highly criticized in the late 1990s and 'passive' planners were blamed for laziness and obstructing development (Hajer & Zonneveld, 2000). A similar debate occurred in the UK (Lord & Tewdwr-Jones, 2014). Spurred by institutional changes and popular opinion, an era of *entrepreneurial planning* commenced where municipalities (including planning agencies) took an active role in urban development, buying and selling land and participating in public-private partnerships (Meijer & Jonkman, 2020; van den Hurk & Tasan-Kok, 2020). This also found parallels in the post-Thatcherite UK with the establishment of Urban Development Corporations (Imrie &

[1] Given our focus on steering urbanization towards more sustainable ends, it is important to address how spatial planning systems can potentially make a difference. By setting the rules of the development game, their power to directly shape the built environment is limited. Governments are generally responsible for the construction of public facilities, parks, railways, roads, and airports, but planning agencies rarely initiate or even coordinate these developments. Similarly, new urban areas are built by private developers, construction companies or sometimes individuals and businesses, not planners.

Thomas, 1999). During this period, public agencies sometimes played a dubious role in granting planning permissions for initiatives for which they were directly involved. This sometimes entailed a careful balancing act between financial gain and public interest. Aside from the ethical conundrums, which were often pragmatically dismissed or ignored, it exposed the public sector to market risks. The 2008 financial crisis put an abrupt end to this era of planning in the Netherlands: business cases evaporated overnight, and many municipalities faced severe financial hardships when they were unable to sell the land intended for large-scale urban development, but still had to make payments on its inflated value. Eager to recoup their losses, planners actively sought out ways to entice development through a combination of financial incentives and flexible regulation. This reorientation, called *facilitative planning*, can be viewed as a partial return to a non-interventionist orientation, albeit with an overtly pro-development stance (Zonneveld & Zwanikken, 2015). These vastly different orientations within the same statutory planning system demonstrate that informal institutions (practices, routines, beliefs) are a vital factor in determining how urbanization is carried out.

In the remainder of this chapter, we focus on interventions in Europe, building on the evidence base amassed in the ESPON SUPER project (Cotella et al., 2020a). The text box below describes how the data was collected and ordered. Although various tiers of government are involved in setting the rules of the urban development game (Lord, 2012; Samsura et al., 2010), or as active players, arguably the most important level at which this occurs is the local and regional level, the topic of the following section.

Survey of Interventions

The SUPER project compiled a database of interventions in Europe that affect, or try to affect, urbanization and land use. The data collection took a broad approach, with any measures influencing the distribution of development and land-use rights as being potentially eligible for consideration. Data was collected by (1) the research team based on own research and knowledge, (2) an analysis of unpublished ESPON COMPASS project reports, (3) an online questionnaire, and (4) a targeted search and literature review. The

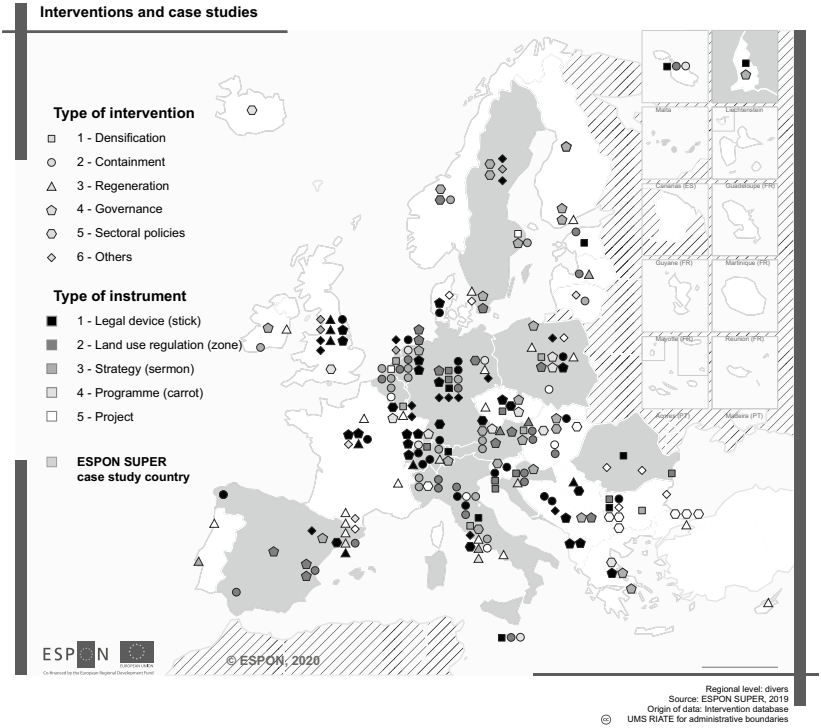

Fig. 3.1 Distribution of interventions in the ESPON SUPER project

third method yielded the most results, while the fourth was used to fill in gaps.

The 235 identified interventions were classified according to location, territory/scale, type (containment, densification), instrument (regulation, strategy), and status (binding, voluntary). Each contains a basic description of the intervention's aims and how it works. The interventions were also briefly assessed on success (efficiency, effectiveness and relevance), sustainability (economic, ecological, social and institutional), and side effects.

This map (Fig. 3.1) shows the geographic distribution of the interventions in the SUPER database. Although care was taken to

be as inclusive as possible, the research team's countries (and the UK) are overrepresented.

3.3 Local/Regional Interventions (Plans and Projects)

As long as cities have existed, local authorities have tried to steer how they develop. In Europe, ancient Greek cities had laws governing the location of streets and public spaces, and Roman settlements were laid out according to military specifications (Hall, 1998; Kostof, 1991; Talen & Duany, 2012). In medieval France, entire new towns (*bastides*) were laid out according to strict plans designating the location of squares and churches within a street grid of standard widths and setbacks. The early modern era also featured systematic urban development. The construction of Amsterdam's famous canal rings occurred within a strict planning regime dictating building attributes and uses (Abrahamse, 2019). Later, in the nineteenth century, Napoleonic law banned unhealthy industries from cities and Germany started zoning for allowed land uses within them (Talen & Duany, 2012, pp. 23–24). By the twentieth century, local authorities were becoming increasingly involved in matters of urban development. This section will provide a sample of how this occurs; it is not intended to be comprehensive or representative but merely wishes to show the range of interventions at this level of scale and some of their effects.

3.3.1 Wedding Urbanization to Transportation

During the first decades of the twentieth century, urban design and development moved from the city to the regional level. After centuries of more or less concentric urban extension, new models of urbanization emerged, often enabled by advancements in transportation infrastructure (Antrop, 2004). Long before the term *transit-oriented development* (TOD) was coined (Cervero, 1998), European cities were doing just that: building densely near suburban railway stops and creating internally connected regional conurbations. In general, these kinds of interventions often fall

into the facilitative planning category, with improved accessibility acting as a catalyst for development but are often bolstered by restrictions on unwanted alternative locations (passive planning).

Three iconic plans illustrate this: Hamburg's Feather Plan (1919), Amsterdam's General Extension Plan (1935), and Copenhagen's Finger Plan (1947), all of which are based on the radial network concept where urbanization is concentrated near rail lines extending outwards from the city centre, like fingers from a palm of a hand. The 'green wedges' between the urban fabric were believed to create a healthier residential environment and were instrumental in directing the growth of their respective cities to the present day. Similarly, Stockholm's extension plan was identified as "arguably the best example anywhere of coordinated planning of rail transit and urban development" by Robert Cervero (Cervero, 1998, p. 109). In this plan, densification of urban areas should preferably take place around infrastructure nodes, while natural areas should be preserved by developing a green infrastructure. However, Paulsson (2020) observed that by the 1980s, the development of Stockholm's public transport system slowed and cooperation between regional and municipal governments stagnated. Only after an intervention by the national government in 2012 did transit-oriented development resume (Paulsson, 2020, p. 2938). So even in strongly decentralized Sweden, one cannot discount the authority and involvement of higher tiers of government (we will return to this matter in Sect. 3.3). Finally, this kind of development has occurred on a larger scale. In 1965, Paris designated five satellite towns (*Villes Nouvelles*) situated 15–30 kilometres from the core city and connected by the regional light-rail system. By the end of the century, the cities lost their special status and accompanying subsidies and were considered a normal part of the urban fabric. Today, these areas provide housing for hundreds of thousands of people served by an excellent transport link.

Another example regards how train stations in Europe have been repurposed from monofunctional transport hubs into mixed-use areas. Retail activities, offices, and other commercial activities have been incorporated into these well-accessible and often majestic structures. One of the pioneers in this regard is Leipzig which used the redevelopment to strategically concentrate urban functions as a response to acute demographic decline in the early 1990s. King's Cross and the nearby St Pancras railway stations in the heart of London are other notable examples. The plan to open a St Pancras terminal of the Eurostar line, the railway connection

to continental Europe, provided an important stimulus for the redevelopment. The industrial area around these two stations was clearly in decay, but at the same time contained many Victorian industrial buildings, many of which were preserved and reused. The areas around the stations were transformed into new public spaces (Christiaanse et al., 2019, p. 467). Preserving cultural heritage while modernizing the railway infrastructure was also a goal of Antwerp's central station redevelopment. Antwerp had recently become an essential link in the high-speed railway to Brussels and Paris, and to preserve the monumental station building, the international line was placed underground and retail and other activities were added above, creating a vital mixed-use environment, providing an impetus for further development in the area.

3.3.2 Regeneration and Densification

Europe has a long history of densification. Renaissance Italy, for example, had regulations mandating that gaps between homes be filled up with buildings (Talen & Duany, 2012, p. 38). In the modern era, after decades of postwar growth and urban expansion, European cities found themselves in a crisis in the 1970s and 1980s. Suburbanization had siphoned off middle-class households, and with it, their tax contributions, plunging many core cities into penury. This was compounded by macroeconomic malaise and deindustrialization processes, which left many urban areas abandoned, impoverished, and dangerous (Hall, 2014). Born of necessity, cities started to reinvent themselves, seeking new uses for obsolete functions. Interventions falling into this category generally take the form of entrepreneurial planning.

One of the most important paradigm shifts was to reinterpret derelict, polluted, unsafe, and unsightly industrial sites, particularly waterfronts, as assets and economic opportunities. Following the lead of Baltimore, Barcelona was one of the first European cities to attempt this. In 1981, Barcelona adopted an entrepreneurial planning approach, initiating a small-scale urban renewal programme, carefully renovating squares, streets, houses, and parks and creating new public facilities. Over the next decade, the city leveraged the 1992 Olympic Games to scale up redevelopment. Railway tracks were uprooted, the industrial waterfront renovated, and an entire Olympic Village built. After that, the city moved on to projects on a metropolitan and regional level (Christiaanse et al., 2019, p. 417). Barcelona became a beacon for many other ailing cities

in Europe, demonstrating that strong local institutions could produce results. In a comparison between Barcelona and Milan, Pagliarin (2018) concluded that institutional differences regarding the regional authority were key factors in their ability to contain sprawl: the more comprehensive and consolidated spatial planning system in the Barcelona region performed better than the more fragmented Milan region. A similar comparative study found the same relationship between Amsterdam and Brussels, allowing the former city to manage growth more effectively (Terhorst & Van De Ven, 1997).

Amsterdam, Hamburg, and Copenhagen all followed Barcelona's lead. Amsterdam started the redevelopment of its abandoned harbour areas around the river IJ during the second half of the 1980s. The first megaproject was the Eastern Harbor district, which was transformed into a new residential area with more than 8,000 houses, partly by reusing existing industrial buildings. Bridges were built to connect the docks, islands, and peninsulas to the main city and public transport lines were extended to the new district (de Klerk & Van der Wouden, 2024). Copenhagen employed a similar strategy on a larger scale. Upon completion, the former harbour of Nordhavn should provide room for 40,000 residents and an equal number of jobs in an attractive, dense, and compact urban district surrounded by canals, water basins, and open sea (Ariza et al., 2019). Hamburg's massive HafenCity project situated at the North side of the river Elbe is transforming the former industrial zone into a mixed-use urban area, with 5,500 new houses and space for 40,000 workers. One of its landmarks is the iconic new music hall, the Elbphilharmonie. HafenCity has high standards for sustainability, not only in the field of energy efficiency but also in anticipating high water levels. A study comparing the waterfront developments in Amsterdam and Hamburg revealed that although there are signs of greenwashing in both instances, there are distinct and measurable indications that the development is sustainable (Nijman, 2019).

3.3.3 Urban Containment

Another way to promote compact development is to restrict or forbid (non-compact) development, often to protect natural habitats or the open countryside. Such policies have a long history, from medieval restrictions on building outside the city walls to Prussian laws restricting greenfield development in order to keep servicing and infrastructure costs affordable

(Talen & Duany, 2012, p. 38). The SUPER database contains 30 more recent examples of urban containment measures. These interventions almost always fall into the 'passive planning' category because they are used to evaluate requests for planning permission. Containment measures are usually set at higher levels of scale to overcome collective action problems, but there are some examples where this has been instituted more locally.

The compact city strategy pursued by Stockholm, Amsterdam, and Copenhagen discussed before can also be viewed as a de facto containment measure because they affected the evaluation of planning permission requests. More directly, in 1980, the Andalusia region in Spain introduced quantitative urbanization caps for medium and large municipalities (40% of the previously existing urban land or 30% of the previously existing population within eight years) as well as the coordination of management systems for protected natural areas. As such, it was singled out as a European best practice to limit, mitigate, or compensate soil sealing (European Commission, 2012). The Italian region of Lombardy levies a tax on greenfield development, increasing total construction costs by 1.5–5%, which is then placed in a fund for green space development (Mazzoleni, 2021). Another Italian region, Emilia-Romagna, doubles urbanization fees for greenfield development and reduces them up to zero for infill development (Cotella et al., 2020c). Inter-municipal cooperation in Vorarlberg Austria resulted in a plan, largely considered effective, that designated green corridors where development is restricted. Another Austrian example is Mödling where twenty communities adopted a plan to steer development and protect open space. Another example of a regional strategy is the 2014 'contour policy' of the Dutch province of Zuid-Holland, which designated different levels of protection for rural areas and specified the kind of development allowed in them. Similarly, the 'red for red' policy of the Dutch province of Noord-Holland allows urbanization in rural areas only if an equal amount floorspace is demolished. The most famous containment strategies are open space designations, such as the Grüner Ring in Leipzig, the Corona Verde of Turin, the Promenade Verte in Brussels, and green belts around Cork, Brussels, and London (Cotella et al., 2020b). London's Green Belt has attained an almost mythological status in planning due to its resilience and scale. It also required national policy to implement, the topic of the next section.

3.4 National Interventions (Spatial Strategies and Governance)

National spatial planning systems in most European countries face similar challenges: how to accommodate the demand for urban functions while preserving green spaces, how to keep cities affordable, vital, and inclusive while dealing with climate change. At the same time, many countries in Europe find that their spatial planning systems are unable to prevent informal development or the uncontrolled proliferation of second homes, business parks, out-of-town shopping malls and, more recently, datacentres and logistics/distribution complexes in the countryside and protect the livability of their historical centers.

3.4.1 Typology of Planning Systems

To understand how national spatial planning systems in Europe manage urbanization, it makes sense to first take stock of the divergent systems in place. There have been many attempts to classify European planning systems since the seminal work *Urban Planning in Europe* (Newman & Thornley, 1996). The first comprehensive comparative study occurred in 1997 with the voluminous *Compendium of Spatial Planning Systems* (European Commission, 1997). This study ordered systems according to four types: the comprehensive-integrated approach, the regional-economic approach, land-use planning, and the urbanism tradition. Less than a decade later, this landmark study was updated by the ESPON programme and extended to the new member states, showing that some planning systems had gravitated towards other types in the meantime (Farinós Dasí et al., 2006).

A decade later, ESPON decided to perform another update (Nadin et al., 2018). It discovered that much had changed for planning in the member states in the interim. First, a convergence of systems was apparent, partly due to the homogenizing influence of spatially relevant European policies such as structural funds, transport, and the environment (we will return to this in the next section). Second, spatial planning has become more strategic. Some European countries already had a long tradition of strategic planning, but it appeared that many were catching up. Similarly, policy integration was improving: spatial planning was being linked to more and more policy sectors. Third, in reaction to

the increasing complexity and uncertainty of economic and social developments, spatial planning was shying away from 'command and control' systems and becoming more flexible. Finally, more actors were becoming involved in national spatial planning: in addition to national government institutions, municipalities, private developers, and citizen groups populated the policy arena. Notwithstanding these changes, institutional path dependency in spatial planning is high, and significant differences between countries remain (Nadin et al., 2018, 2021).

The critical comparison of national spatial planning systems in 12 European countries bound together in a volume edited by Reimer et al. (2014) had arrived at similar conclusions, but with some important caveats. Yes, many spatial planning systems switched from land-use planning to a more strategic and development-led approach, but very often spatial planning follows economic development and infrastructure planning, not the other way around. In some countries, the reorientation of spatial planning was accompanied by a political wave of decentralization and deregulation (e.g. Denmark and the Netherlands) which weakened planning at the national level but sometimes strengthened it at the subnational level. This analysis underlines that spatial planning systems and territorial governance are deeply intertwined. For this reason, a more recent typology combines the two (Berisha et al., 2021). It distinguishes between state/market-led orientations, on the one hand, and performative/confirmative orientations, on the other. The latter distinction follows Faludi (2000) and others who distinguish between systems that view planning as successful if spatial developments are in accordance with plans (conformance) and systems that view planning as successful if plans are taken into account when making land-use decisions (performance). The fifth type (misled performative systems) can be seen as an outlier (Cyprus, Malta, and Poland) but comes closest to market-led performative systems (Berisha et al., 2021, p. 192).

The geographic distribution of planning systems according to this typology is striking: the northern part of Europe falls into state-led systems (France, UK, and Scandinavia) and market-led neo-performative systems (central Europe *sans* Poland, and the Baltic states). Southern Europe (and Belgium) all have conformative systems (except the Balkans which are all described as proto-conformative). To get an idea of how national spatial planning systems have tried to control urban development, the remainder of this section recounts experiences within various planning systems throughout Europe.

3.4.2 *Sweden and Denmark*

Scandinavian countries have much in common. In general, they are prosperous and enjoy high employment, both on a global and European scale, and have strong welfare states (Esping-Anderson, 1990). Most Scandinavian countries have embraced an ecological perspective on urbanization, typified by promoting public transport and compact urbanization. All Scandinavian planning systems are state-led according to Berisha et al. (2021).

In Sweden, the national government supports transit-oriented development and decides on major transport issues, even though most spatial planning is carried out at lower tiers (Celioska-Janowicz et al., 2020; Nadin et al., 2018). This combination of centralized and decentralized tendencies sometimes creates coordination problems but has largely succeeded in curtailing sprawl, except for the proliferation of second homes. In Stockholm, despite strong planning institutions, second homes once built for intermittent use are often turned into permanent residences.

Like Sweden, Denmark also promotes transit-oriented development, adopting a national rule in 1989 requiring all new office space over 1,500 m^2 to be located within 600 meters of a rail station (Mazzoleni, 2021). Major political, administrative, and legal reforms in 2007 and 2011 resulted in an upheaval of the spatial planning system. At the national level, planning became aligned with the environmental ministry in which it was housed, which sometimes clashed with planning interests at the local level. Regional spatial planning was abolished, although economic planning did continue at this level (Damsgaard, 2014). While the national government still plays an important role in the Copenhagen capital region, municipalities gained much more freedom. One national regulation that did not change was the restrictive policy on out-of-town retail development; this was identified as a European best practice (European Commission, 2012).

3.4.3 *Poland and Lithuania*

After the collapse of the Soviet Union, Poland underwent a rapid economic transition to a market economy and established new international interdependencies, joining NATO in 1999 and the European Union in 2004. In this time of transition, the communist planning

system was dismantled, and the free market became the guiding principle. An administrative reform in 1999 created a three-tier system with 16 regions/provinces, which could have effectively coordinated national and municipal planning. However, the regions were restrained by the dominant neoliberal ideology and national sectoral policies. Only local plans had a binding status, and municipalities were given insufficient time and capacity to develop them. In 2003 they were no longer even required (Halleux et al., 2012). Over time, Poland adopted more and more ideas and spatial concepts from the European Union: polycentric urban development, multifunctional rural areas, the improvement of transport, and the protection of nature (Cotella, 2014). Like the Czech Republic, Bulgaria and Slovakia, Poland levies an additional tax on greenfield development depending on the quality of the soil (Mazzoleni, 2021). In 2015, it also introduced new regulations to help deal with the problem that many areas had been zoned in the past as buildable.

However, these measures proved unable to slow suburbanization and sprawl, particularly in the capital region of Warsaw (Nadin et al., 2018, vol. 6). Indeed, about 80% of urban developments occur through a process where planning permission is granted to initiators on a case-by-case basis even if in conflict with the local plan (Cotella, 2014). At the local level, the low coverage of strategic plans and large number of ad hoc development decisions 'exacerbates the spatial chaos' (Rogatka et al., 2023). Furthermore, the 2015 reform proved too ambiguous to effectively curtail diffuse development (Kukulska-Kozieł, 2023). The tension between a clear desire to emulate leading European planning systems that allow for flexibility but a failure to implement this effectively in practice earned the Polish system the label 'misled performative' (Berisha et al., 2021), later toned down as 'misunderstood performative' (Berisha et al., 2023b).

Like Poland, the Lithuanian planning system and spatial development are closely linked to the collapse of the Soviet Union and entry into the European Union. In the interim, a new system was installed and is still being developed today. The shift to a market economy and injection of structural funds resulted in a development boom, particularly suburban housing, which then collapsed with the financial crisis (Bardauskienė & Pakalnis, 2011). Like Poland, the planning system proved ill-equipped to control urbanization. Not all municipalities had master plans up to 2009 and little attention was given to how projects should fit a

long-term strategy, an important shortcoming given the shrinking population. The situation was exacerbated by an administrative reform in 2010 that reduced tasks at the regional level, including spatial planning, which intensified inter-municipal competition for development. The main strategic planning document is effectively the Comprehensive Plan of the Republic of Lithuania. This has made sustainable urbanization a priority, promoting (1) a polycentric urban system (metropolitan, regional, and local centres), (2) compact urban development, and (3) a hierarchy of urban centres and connectivity (Cotella et al., 2021). Although widely supported, the plan's implementation remains a point of concern. In 2021, members of the ESPON SUPER team supported the Lithuanian government by reflecting on their situation by using similar experiences in Europe as an inspiration (Berisha et al., 2023a).

3.4.4 Italy and Spain

Traditionally, spatial planning in Italy has strong intellectual roots in architecture and urban design, making it the textbook example of the 'urbanism' (conformative) approach. The urban crisis of the 1970s and 1980s exposed the weaknesses of this approach: traditional planning instruments were unable to tackle blight in city centres, revitalize derelict industrial sites, or protect green areas. Strikingly, an estimated quarter of buildings constructed in Italy in the 1960–1980 period had no planning permission whatsoever—this figure was 70% in Calabria (Zanfi, 2013). Successive amnesties granted to homeowners of illegally constructed buildings did nothing to strengthen the status of the planning system. This was compounded by national fiscal reforms. In 2000, businesses were encouraged to reinvest their profits in Italy and a year later individuals who had evaded taxes by illegally storing it abroad were given amnesty. At the same time, the national government reduced local government funding. The influx of capital, coupled with greater municipal dependence on land development for revenue, resulted in a supply-side development boom.

Decades of reform followed to modernize the spatial planning system and tackle its rigidities and inertia. The reform of the Italian Constitution in 2001 reoriented spatial planning from 'urbanism' towards 'territorial government' (Lingua & Servillo, 2014, p. 128). The Constitutional reform also reallocated the task of coordinating interregional environmental and infrastructural issues to the national state, including urban

regeneration programmes. However, this process of modernization is still hampered by political fragmentation and instability at the national level. Attempts to address the issue of uncontrolled urban development resulted in two government bills in 2012 and 2014 but failed to achieve a political majority (Mazzoleni, 2021).

Like Italy, Spain is usually placed in the urbanist/conformative approach which stresses conformance to a plan (Berisha et al., 2021; Nadin et al., 2021). And, like Italy, this does not always result in sustainable urbanization. As noted in the previous chapter, of all European nations, Spain converted the most land to urban use in the 2000–2018 period (Evers & Van Schie, 2019). Most of this development was concentrated in the period before the economic crisis, and most intensively in and near large cities and tourist areas. The crisis brought many projects to a standstill, resulting in abandoned construction sites, vacant new buildings and unbuilt land zoned for urban use: "…the mismatch between offer and demand seems to be the result of a combination of factors grounded on the financialization of the economy and speculative investments by regional/national banks and foreign investors rather than relying on demographic growth or real market demand" (Farinós Dasí et al., 2020, p. 6).

Part of this can be traced back to the peculiarities of the Spanish territorial governance and spatial planning system. To encourage economic development, it was proclaimed that land be appraised by its expected exchange value (e.g. development potential) rather than use value (e.g. as farmland), encouraging speculation (Hurtado & Ruiz, 2021). Since 1995, the private sector has been largely responsible for providing infrastructure and services at the local level and massive national and European funding was provided for highway construction. Given a low level of financial accountability for the costs of urbanization, municipalities could more easily opt for diffuse urban forms (Fernandez Milan & Creutzig, 2016). On the other hand, the 2004 Spatial Planning and Landscape Law and Law of Rehabilitation, Regeneration, and Renovation in 2013 provide tools to manage urbanization. Much of the funding for regeneration however has come from the European Union rather than the national government (Carpenter et al., 2020). Still, the relatively successful example of Valencia's Huerta plan (preserving a belt of farmland) shows that, given the political will, it is possible to protect land on the urban fringe from development within the Spanish planning system (Farinós Dasí et al., 2020).

3.4.5 The Netherlands and Belgium

The Netherlands has a longstanding tradition of national planning. National spatial strategies have existed since the first one was drawn up in 1960. During the 1960s, the 1970s, and the first half of the 1980s, the main issue was to accommodate the booming postwar population in an orderly and efficient way. This was done by expanding the large cities and creating growth centres and new towns. Afterwards, the urban crisis and increasing European competition refocused attention on strengthening the core cities (de Klerk & Van der Wouden, 2024). National planning policy declined after 2000 (Zonneveld & Evers, 2014). By 2012, the only policy remaining was a 'comply or explain' rule called the sustainable urbanization ladder, mandating that all zoning plans granting new building rights justify the need for this development and, if sited on a greenfield, argue why no infill location was chosen. This rule was widely disregarded until courts began to strike down plans for noncompliance. Afterwards, it showed some signs of affecting urbanization and planning practice, arousing political backlash and the subsequent relaxation of the rule (Evers et al., 2020). Some outcomes of the more recent deregulation of urbanization policy are already apparent: 1996–2015 land-use data showed considerable diffuse urbanization in the western part of the country, including the (until 2012) protected 'Green Heart' of the Randstad. This did not primarily concern housing but commercial/industrial activities (Van der Wouden, 2021). Indeed, more homes were built in the existing urban fabric after the decentralization of planning (Claassens et al., 2020). At present, the convergence of urgent problems (e.g. housing affordability and climate change) has prompted a new cycle of recentralization, as evidenced in the publication of a national planning strategy with sustainability as its central theme (Denters, 2021; Ministerie BzK, 2019).

A well-known example of where a lack of intervention has produced diffuse urbanization in Europe is Belgium, the only non-Mediterranean country with a planning system classified as 'conformative' (Berisha et al., 2021). The ideological roots of this form of urbanization were laid out by the Catholic elite during the last decades of the nineteenth and the first decades of the twentieth century (Pagliarin & De Decker, 2018). The idea was that every Belgian worker should have access to a plot of land to build a house as a form of social emancipation and cultural conservatism (Evers & de Vries, 2013). The result was a laissez-faire policy and

minimal spatial planning at all governmental levels, which can be read in the spatial structure. For example, Flanders is known for its *lintbebouwing*, building homes (and other facilities) alongside the rural roads until they form a strip or 'ribbon' (a characteristic of diffuse development in the morphological analysis described in Chapter 2). This urbanization mode was stimulated by the 'fill-in' rule that grants landowners the right to build a home between two others on a road. The contrast with the neighbouring Netherlands is striking: that country passed a law specifically forbidding this kind of development in the 1940s. More recently, the 1997 Spatial Structure Plan Flanders promotes concentrated urbanization. However, the legacy of prior designations of land as buildable has undermined its implementation. Planning is further hindered by a lack of cooperation by local governments. Still, some municipalities have taken the initiative to implement more sustainable urbanization such as Ghent (Claus et al., 2020).

3.5 European Union Interventions (Sectoral Policy and Meta-governance)

The European Union has no formal competence in the field of spatial planning: there is no EU masterplan and no planning directorate-general at the European Commission (Faludi & Waterhout, 2002). However, EU policies have such far-reaching impacts on planning (and this impact is growing) that some authors have argued that a de facto European spatial planning exists, just not in a very coordinated or explicit manner. The most spatially relevant policy fields are nature, environment, water, transport, regional economic and urban development, competition, and agriculture, although their importance and impact vary from country to country and region to region (Tennekes & Evers, 2023). One could, as Evers and Tennekes (2016) did for the Netherlands, reconstruct the EU's implicit spatial strategy for urban development by interpreting and mapping out the impacts of its various policies.

The ESPON SUPER project identified 59 policies within 10 policy fields as potentially impacting urbanization (Cotella et al., 2020a). As an initial analysis, we can consider the kinds of instruments employed by these policies because this provides insight into their effects. Following the categorization by Bemelmans-Videc et al. (2011) we distinguish between sticks, carrots, and sermons. In this case, sticks refer to European legislation (directives, regulations) that can structure decision-making

on urban development, usually by setting restrictions. Carrots refer to funding instruments that (under conditions) can affect the feasibility of development initiatives. Finally, sermons often concern non-binding agreements or the exchange of information and practices. Binding strategies have a hybrid character: they can function as sticks once agreed upon, but also act as frameworks working through discourse and organization (sermon) (Fig. 3.2).

Of the 59 policies affecting urbanization, those in the environmental/climate domain (the most numerous category) generally work through legislation (sticks), as did energy, maritime, and competition policy for the most part. The second largest category consists of policies falling under regional policy like the structural funds, which predominantly function through funding instruments (carrots). Interestingly, the instruments employed by policies with a close affinity to planning such as urban development, transport, and sustainable land use were mainly non-binding and voluntary, hence 'sermons' (Cotella et al., 2020a).

The remainder of this section will discuss some of the most salient EU policies affecting urbanization. The examples provided are not intended to be representative or necessarily the most important; instead, they are used as illustrations to provide an impression of the different avenues by which the EU affects urbanization.

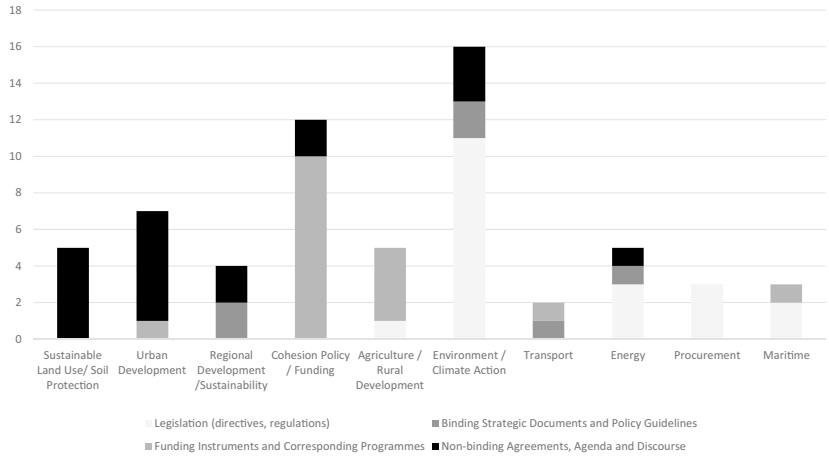

Fig. 3.2 Distribution of EU policy types

3.5.1 Sticks/Legislation

Some authors argue that environmental policy has the greatest impact on spatial planning in the member states (Tennekes and Evers, 2023; Nadin et al., 2021), and by association, its power to control urbanization. Most of this takes the form of legislation and, hence sticks. A few prominent examples work through area-based designation. Natura 2000, for example, aims to ensure biodiversity through the conservation of natural habitats for flora and fauna. Designation of protected areas takes place through the domestic spatial planning system. Similarly, the Seveso directive mandates that spatial plans designate zones around hazardous materials, while the Floods Directive establishes a framework affecting land use in flood-prone areas, including possible restrictions of land use for development. All these policies spatially restrict urban development and are thus akin to urban containment strategies. Another example is the Nature Restoration Act, which is in the process of being ratified. In addition to protecting and preserving habitats, it includes provisions to increase natural areas, for example, in cities by imposing norms on tree canopy cover and percentage of green space. On the one hand, this should improve the liveability and ecology of cities, but on the other hand, it could complicate planning efforts to densify the existing urban fabric.

Finally, various stick-like policies affect planning processes rather than content. An example is state aid, part of the EU's competition policy. It is common for governments to encourage urban regeneration with subsidies, tax breaks, or other means (e.g. selling land under market value) to create a positive business case. However, the EU Treaty stipulates that this is not allowed unless there are overriding public interests at stake. In practice, this means that governments must obtain permission from the European Commission beforehand. The implications for planning goals such as providing social housing and urban regeneration can be far-reaching (Tasan-Kok et al., 2013). EU rules on public procurement can also complicate delicate negotiations between local authorities and developers for mixed-use developments. Finally, the services directive and the 'freedom of establishment' enshrined in the EU treaty have made it more difficult for planners to conduct policies to control out-of-town retail developments (Korthals Altes, 2016).

3.5.2 *Carrots/Subsidies*

The EU provides funding instruments for a wide range of projects and programmes (such as regional and urban development, employment and social inclusion, agriculture, and rural development). Over three-quarters of this budget is managed in collaboration with national and regional authorities. For example, the implementation of the Europe 2020 strategy was primarily supported through the European Structural Investment Funds, which were sometimes used for urban development. These funds are managed by the member states through partnership agreements. Other funds (such as grants for specific projects concerning EU policies and contracts awarded through calls for tenders) are managed directly by the EU. The Cohesion Fund aims to reduce economic and social disparities and promote sustainable development by supporting member states whose per capita Gross National Income is under 90% of the EU average and the European Regional Development Funds. Much of this money is used for projects related to or affecting urbanization. Many encourage compact development, such as revitalization and regeneration and sustainable transport modes, but the funds have also been used in ways that stimulate diffuse development, such as highways and out-of-town business parks (van Ravesteyn & Evers, 2004). Additionally, EU agricultural subsidies can make it easier for young farmers to take over the business, rather than sell the land for urban development (May et al., 2019).

3.5.3 *Sermons/Strategies*

Various policy fields make use of strategies and policy guidelines, and sometimes these have a relatively obliging character due to their high political status. This can potentially affect urbanization even before their contents are translated into policy instruments. A few notable examples are the Europe 2020 Strategy and the European Green Deal. These strategies act as sermons that coordinate other policies towards a common goal.

Adopted in 2010, the Europe 2020 strategy set three mutually reinforcing priorities—namely smart, sustainable, and inclusive growth. It is a very broad framework impacting numerous sectoral policies of the EU and member states over a long time; hence its impact is quite indirect. Part of the Europe 2020 Strategy is the Roadmap to a Resource Efficient Europe (European Commission, 2011), which envisages a set of

measures regarding land and soil, topics which are very relevant to urban development. Notably, it established the 'no net land take in 2050' target which essentially calls for a halt on all greenfield development. This has yet to be mandated in legislation (stick), but already various member states (e.g. France, Italy, Germany, Austria, Luxembourg, and Belgium) are anticipating its arrival and implementing similar policies.

The *European Spatial Development Perspective* (ESDP) is arguably the closest the European Union has come to drafting a spatial planning strategy (Committee on Spatial Development, 1999). It raises key territorial issues and suggests policy options to tackle them, some of which directly concern land-use planning. A section is devoted to curbing urban sprawl. Even without any binding force or budget, the ESDP has been influential in many member states and regions (Stead, 2009). A more recent example is the *Urban Agenda* which calls for limiting greenfield development (land take) and promotes polycentric development. It also provides local and regional recommendations for sustainable land use.

More recently, the aforementioned 2019 European Green Deal (EGD) aims to make the EU climate-neutral by 2050. It has acted as a framework for mobilizing many spatially relevant policy sectors, such as transport, energy, and nature. Significantly, the EGD has drawn up a 'taxonomy' of activities that are considered 'sustainable' and therefore eligible for EU funding (European Commission, 2020). In this way, this sermon-like intervention directly influences the carrots. But sermons can also influence sticks: as part of the EGD's biodiversity strategy, the Soil Strategy for 2030 reiterates the European 'no net land take in 2050' (NNLT) target and announces that binding legislation is imminent. The 2023 legislative proposal for a Soil Monitoring Law (European Commission, 2023) has come short of obliging member states to achieve this objective but it does mandate policy infrastructure to support such an obligation in the future. If NNLT becomes a binding norm, this can have far-reaching consequences for planners, particularly those operating in member states with high urbanization pressure and within systems within the comprehensive-integrated tradition (Evers, 2024). Closer to planning, the EGD resurrected the German Bauhaus tradition, stimulating innovation in architecture and design through competitions, publications and events (European Commission, 2021).

3.6 Success of Interventions and Systems

The interventions discussed in this chapter are heterogeneous: they are drafted and implemented at different levels of scale in different contexts and circumstances. For this reason, any judgments about success should be made with caution. As a starting point, the SUPER intervention database was analysed to see if any statistical regularities could be discovered with respect to the success or sustainability of interventions. This exercise revealed that no significant correlation could be found between success/sustainability and the main attributes of interventions (e.g. location, scale, instrument) included in the database.

Given this lack of quantitative substantiation, a qualitative analysis was performed on the reasons given for the relative success/failure and (un)sustainability of interventions which were provided in the SUPER intervention database (usually done based on expert judgment). This revealed 24 determining factors, which could be grouped into 6 categories (Fig. 3.3).

From this figure, it is clear that coordination and collaboration are associated with interventions that are almost successful or successful. One-dimensionality and market orientation have the opposite orientation. Interestingly, centralization and decentralization have comparable results, suggesting that both approaches can be equally as successful or as sustainable. Although the SUPER project did not discover guaranteed recipes for success, the many individual examples of interventions and their accomplishments included in the database can inspire policymakers. Examples include a national infill development programme in Luxembourg, permission to add extra floors in Malta, urbanization caps in coastal Spain, and fiscal rules in Italy and Estonia. Through the exchange of such information in reports, workshops, and other means, member states are learning from one another. This exchange can have a homogenizing effect in the long run, which can help to explain the gradual convergence of European planning systems (Nadin et al., 2018; Reimer et al., 2014). Finally, it is worth noting that policies are usually implemented as a package, so that it is difficult to untangle the effects of single policies (Bibri et al., 2020; Nelson et al., 2007).

Given that the success of interventions is so context-specific, one can ask whether some planning systems provide more fertile ground for sustainable urbanization than others. Again, it is very difficult to establish a statistically significant causal link between the composition of a planning

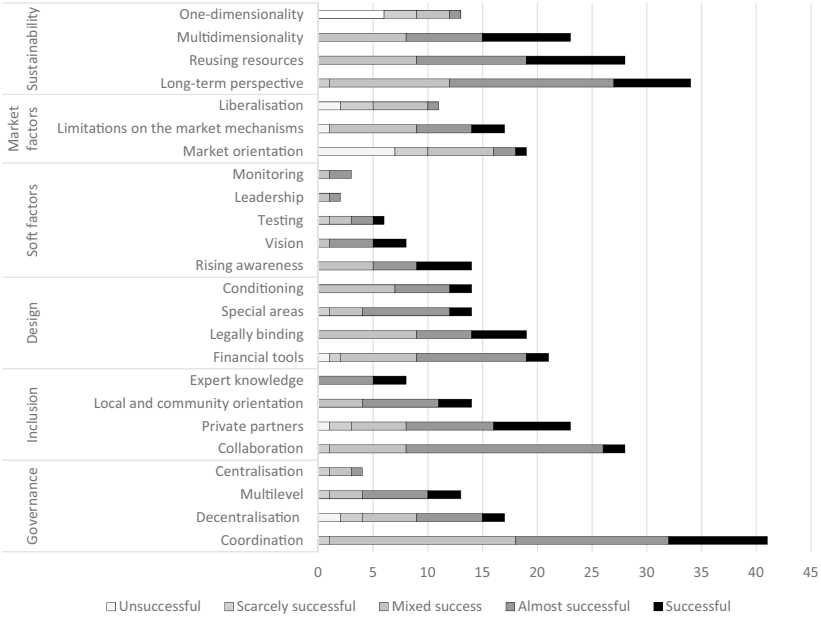

Fig. 3.3 Intervention success factors

system and its ability to control urban development. Nevertheless, the comparative research of Pagliarin (2018) on Barcelona and Milan as well as Terhorst and Van de Ven (1997) on Amsterdam and Brussels both find a relationship between strong planning institutions and more compact forms of urbanization. A broader study using ESPON data found that "the state-led systems and market-led neo-performative systems tend to guarantee a better capacity for public control of spatial developments" (Berisha et al., 2023b, p. 12). Yet another study attempted to rank the effectiveness of planning systems in Europe based on the ESPON COMPASS country reports compiled in 2016 and supplemented with interviews from international planning experts (Crince Le Roy, 2023). The conclusion was that the overall best-functioning systems were (in

descending order), Finland, the Netherlands, Croatia, and Hungary.[2] Concerning the ability of systems to guide future spatial development, Hungary and Croatia emerged as winners. This of course does not imply that urbanization is more sustainable in these countries, only that the planning systems could—if this was set as a political priority—effectively be deployed to this end.

Finally, we can consider the effect of European policies. Based on an expert judgement analysis of the most relevant SUPER factsheets, these were generally seen as having a positive effect on sustainable urban development, but often the impact was indirect and weak (e.g. transport, energy, public procurement, and maritime). Unsurprisingly, environmental and climate policies were seen as having the most impact overall, but generally working indirectly. If only strong impacts are considered, urban and regional development policies are the most prominent (Fig. 3.4).

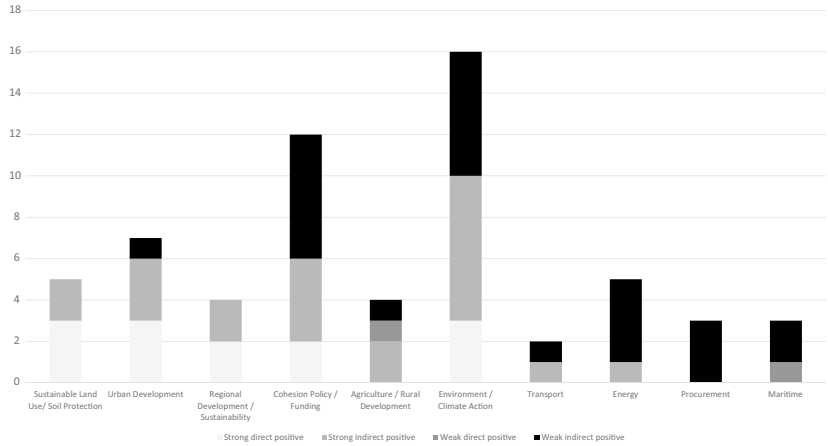

Fig. 3.4 Normative effect of EU policies

[2] This considered four dimensions of planning systems: its *flexibility*, *integration* (between sectors and governmental levels), whether it allowed for a *transparent and participatory* process, and the extent to which it could *guide future spatial development*.

3.7 Conclusions: Spatial Planning Systems and Urbanization

Public interventions to define or guide the growth of human settlements is an age-old activity. Over the centuries, the reasons for doing this have changed as well as the technologies and instruments which are deployed. At present, one of the greatest challenges is to accommodate the demand for urban functions without undermining quality of life now or for the future generations and without destroying valuable ecosystems, cultural heritage, or remaining open space. Many of the examples presented in this chapter seek to do this in part. However, as we have seen, these interventions are always implemented within a specific institutional context: Copenhagen's Finger Plan or London's Green Belt cannot be simply transplanted to another city. Indeed, these cities are evolving and so too are the applicability and desirability of their own policies. Even the lessons distilled in this chapter are relative: what was deemed a recipe for success before (e.g. hard legal status, private-sector collaboration) may be seen as a liability later.

In this sense, our analysis is at most a snapshot in time. As institutions, planning systems evolve, and as these systems are asked to address different challenges, planning doctrines can change too. Still, path dependencies matter: the systems of the Scandinavian countries and the Netherlands and England have a long history, while that of Poland has a relatively short history, with Italy somewhere in the middle. The EU influence is relatively recent and less direct than national and local systems, but it is growing. More specifically, the implications of the EU's 'no net land take in 2050' target have yet to be fully understood.

Given this, the route towards sustainable urbanization is varied. Being aware of the long history of interventions in various geographic, territorial, and institutional contexts in the past will help to draft the interventions necessary for the future. It is important to keep an open mind, even if not politically expedient or viable, because urban development is a long-term activity that spans electoral terms. One very useful method is to imagine different futures resulting from policy alternatives based on a combination of interventions and use this to ground current policy decisions. This is the topic of the next chapter.

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CHAPTER 4

Future Urbanization Pathways: Compact, Polycentric, or Diffuse

Abstract This chapter presents the three future urbanization scenarios created as part of the ESPON SUPER project: compact, polycentric, and diffuse. The research design is explained using a four-step procedure and discusses the distinction between exogenous (environmental) and normative (policy) scenarios. It also explores the qualitative and quantitative approaches for the analysis and communication of scenarios and, specifically, the use of the LUISETTA land-allocation model to simulate urbanization in the three scenarios. After presenting the scenario storylines, the impacts on the physical landscape are discussed as well as changes in urbanization and population density. The chapter concludes by emphasizing the potential of these scenarios to serve as a basis for public debate on preferred policy directions and as a tool for drafting a strategy to achieve sustainable urbanization.

Keywords Scenarios · Future studies · Outlook · Land-use modelling · Storytelling

4.1 Introduction

The future is, by definition, uncertain. At most, science can make reasoned estimations by identifying relevant trends and developments and theorizing about how particular driving forces will change over time.

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Hypotheses can then be made about whether it is more likely that a given trend continues, becomes amplified or diminishes. As more variables are considered, complexity increases, especially when variables interact. At some point, computer models usually take the place of human reasoning, effortlessly compiling astronomically large datasets at lightning speed. Computer models do not build themselves, but are themselves the result of human theorizing, empirical research, and testing and are continuously being calibrated and adapted. Urbanization is a good example of such a complex phenomenon with many driving forces and intervening variables.

Europe, indeed, the whole world, is facing major upheavals that will affect future urbanization. The introductory chapter identified key driving forces, many of which are being affected by current events. Geopolitical conflict, technological advancements, migration, and energy poverty can affect the economy as well as preferences regarding where individuals and businesses wish to locate. On the other hand, the transition to renewable energy adds another competitor for rural land, restricting supply. Housing costs are another uncertain factor: throughout Europe these have risen faster than economic growth, making homes an attractive investment object on the one hand, but on the other, forcing many people to economize on urban space or seek a residence further afield. Finally, the effects of Covid-19 on urbanization are highly disputed. Whereas some urban professionals feel that it will fuel suburban diffusion, others believe that it will increase demand for socially cohesive and green cities (Evers, 2020).

An appropriate method to study future urbanization is by using scenarios. Scenarios describe alternative futures when uncertainty is too high to warrant forecasting but high enough to avoid speculation (Dammers et al., 2019; Scholles, 2008). This method was first used in the context of military planning in the early postwar era as well as for large corporations and public administrations attempting to prepare for the future. Today, it is used in many different fields and has become commonplace in spatial planning (Bradfield et al., 2005; Khakee, 1991; Salewski, 2012).

This chapter discusses three policy scenarios based on the different modes of urbanization described in Chapter 1 and used throughout the book. The first section discusses the scenario method and the key choices that need to be made. The second presents the scenario design chosen for the ESPON SUPER project and outlines how the modelling was performed. The third part presents the storylines, recounting how

policy orientations redirected urbanization towards different developmental pathways, resulting in changes in the magnitude and shape of urban development in 2050. The final section reflects on the differences between the scenarios and how they can be used by policymakers.

4.2 Methodological Considerations

There are many different methods available for scientists to probe the future. The most straightforward way is to extrapolate current trends to produce an estimate of a future situation. This can be done to illustrate challenges that require policy attention; well-known figures showing the exponential growth in population and CO_2 (with dotted lines for future development) fall into this category. More sophisticated analyses pay attention to the interaction between trends and driving forces. They make reasoned estimates about how the driving forces will develop and how other trends will affect the trend under investigation. Population forecasts generally rely on these kinds of methods. For broader policy concerns, a set of analyses can be performed and combined to provide an outlook; this analysis is common in the environmental field, where aspects such as air, soil, and water quality are treated separately. All these examples pertain to the production of an approximation of a *probable* future using the best available means; uncertainty is usually illustrated utilizing a bandwidth. However, in many cases, uncertainty is so high that forecasts become meaningless—everything seems to fall into the bandwidth of possibility, and little can be said in the way of probability.

There are various ways to deal with uncertainty in future studies (Evers & Vogelij, 2021). If uncertainty is extreme, such as long-term technological advancements and geopolitics, it can be useful to produce a number of speculations (e.g. a utopic or dystopic situation) and reflect on their origins. This can reveal institutional shortcomings and suggest policy action to stave off or anticipate such extreme situations. Similarly, speculations about unexpected extreme events—called 'wild cards' or 'black swans' in the literature—such as pandemics, war, or revolutionary technology, can provide insight into the robustness of current institutions and practices to improve preparedness (Dammers et al., 2019). Speculations need not be probable, only *possible*.

Scenarios, which are essentially multiple narratives about the future, provide a middle-ground between speculations and forecasts. Like forecasts, they are based on an analysis of the drivers of existing trends and

developments and try to make reasoned statements about the future on this basis. Like speculations, they require imagination and are open to higher levels of uncertainty that can challenge current paradigms. To be useful, do not need to be probable but should always be *plausible*. Plausibility is enhanced if the scenarios are transparent about why and how the different futures emerge: often this is done by varying a crucial variable or logical set of variables.

The scenario method has become increasingly common in architecture (Coleman, 2014), urban planning (Abou Jaoude et al., 2022) and is already a hallmark of modern strategic spatial planning (Vogelij, 2015) because it can address economic, environmental, and social uncertainties (Abou Jaoude et al., 2022; Wiebe et al., 2018). An advantage of the scenario method is that it invites a discussion on the desirability of alternative futures as well as a discussion on what current planning interventions could bring them about. In this way, it contributes directly to planning decision-making (Chakraborty & McMillan, 2015; Khakee, 1991) and is a common element in planning support systems (Abou Jaoude et al., 2022). The Netherlands has pioneered the use of scenarios in planning, producing countless studies over the past half-century on how the territory could and should develop, usually with the aid of urban designers (Salewski, 2012).

Depending on the purpose, stakeholder involvement, scope, orientation, data, and other considerations, different scenario methodologies can be applied (Chakraborty & McMillan, 2015; Radeljak Kaufmann, 2016). While this has resulted in a rich and varied tradition, some authors have described the state of scenario development as methodological chaos (Bradfield et al., 2005). Rather than giving a comprehensive overview or detailed chronology of this method, this section will prove some of the most important defining features of scenario design. This will help to place the SUPER scenarios in context.

Most scenario studies follow a standard process. Scholles (2008) identified four basic phases of scenario design in spatial planning. The initial 'system analysis' phase is about identifying key factors and deciding whether they should be considered stable or variable over the scenario period. The second phase regards the selection of which key factors, and their possible trajectories over time, should define the scenarios. The third phase determines how the key factors should vary, based on a combination of scientific insight and creativity (Kosow & Gaßner, 2007). In the final phase, the scenarios are elaborated and communicated using appropriate

means (e.g. narratives, diagrams, figures) to support societal discussion or decision-making. This four-step scenario-design procedure is usually just part of a wider project. For example, guides exist for researchers on how to produce effective scenarios within ongoing environmental and spatial planning policymaking processes and ensure they impact decision-making (Dammers et al., 2019).

A key distinction in scenario design is between exogenous (environmental) and normative (policy) scenarios. Recalling the discussion on drivers in Chapter 1, environmental scenarios vary exogenous factors that cannot easily be influenced, such as global economic development, geopolitics, and climate change. These kinds of scenarios are useful for identifying robust measures that would be beneficial in all situations or drawing up contingent strategies. Here, it is important to point out that it is impossible to choose between environmental scenarios. Normative scenarios, on the other hand, vary factors that represent (exogenous) policy choices and are very useful for showing the implications of decisions. Sometimes one or more scenarios are constructed as an ideal which can be used as the basis for a later strategy. Either of these two types could be applied to urbanization. An environmental scenario study would explore the difference, for example, between high and low economic growth on the magnitude and form of urban development under stable policy conditions. A policy scenario study would hold constant as many external factors as possible to explore how urban development would occur under different policy conditions.

Another crucial decision regards the number of scenarios to make. A single but fundamental policy choice or extreme uncertainty can sometimes be expressed by two scenarios (best-case versus worst-case), although this often invites criticism of being oversimplistic. In some instances, three scenarios are created, e.g. showing the probable, the possible, and the desired future (Börjeson et al., 2006). A common method is to vary two key variables, chosen based on their significance and level of uncertainty, to create four scenarios along two axes (Kosow & Gaßner, 2007). One can also choose to create embedded scenarios, which can illustrate the implications of different policy orientations within different environmental contexts. This multiplies the number of scenarios and hence the complexity of the design. The desire for simulating a broad range of possible futures (completeness) should therefore be weighed against the time and costs of creating and using these scenarios. Most

authors limit themselves to three to four main scenarios (Alcamo & Henrichs, 2008).

Finally, the method of analysis and communication needs to be established (step 4). This can take the form of qualitative approaches, such as essays about future events using illustrative examples and made-up statistics to pure works of fiction (future newspaper articles) or artistic renderings. More quantitative approaches use computer models to calculate how the main variables will evolve and affect other variables using econometric modelling. In both cases, it is important to establish a plausible storyline that connects drivers to the final state.

4.3 Scenario Design

This section presents the research design of the future urbanization scenarios created as part of the ESPON SUPER project (Evers et al., 2020). Recalling the first phase identified by Scholles (2008), the first task is to understand the 'system' of urbanization. As discussed in Chapter 1, the amount and location of land converted to urban use is considered to be the product of a combination of factors, some exogenous to the planning system and some endogenous. Concerning the second phase (selection of key factors), the SUPER project investigated the extent to which exogenous factors explained urbanization, finding only a weak relationship with population and an even weaker relationship with economic development, the two most commonly cited drivers (Van Schie et al., 2020), suggesting that policy matters. As an illustration, Chapter 3 provided myriad examples of how planning policy and practices have influenced the amount, shape, and direction of urban development.

This insight led to the key scenario-design decision (step 3) to hold exogenous factors constant across scenarios and vary policy orientations according to the three urbanization types. Moreover, given the focus of this book is on how to make urbanization more sustainable, the normative/policy scenario approach is more appropriate than an environmental scenario approach. Table 4.1 summarizes which variables were held constant and which varied.

The last step identified by Scholles (2008) is communication. Here it was decided to use a combination of techniques to illustrate the scenarios, from a storyline narrative to quantitative modelling. This first necessitated the identification of societal attitudes that could help explain the adoption

Table 4.1 Key elements of the scenario design

Elements	*Compact urbanization*	*Polycentric urbanization*	*Diffuse urbanization*
Constants			
Demographic development	Slowdown in EU population growth and ageing with regional differentiation		
Macroeconomic development	Low to medium growth in the EU with regional variation		
Technological advancement	Transport and information innovations		
Climate change	More extreme weather events		
Variables			
Attitudes on mobility	Walkability	Multimodal	Private car
Attitudes on density	Positive	Mixed	Negative
Attitudes on governance	Collectivist	Interdependence	Independence

of relevant policies, resulting in the three urbanization types. The premise and outcome of each scenario are therefore the following.

- **Compact scenario**: strong urban containment policies are enacted in the early 2020s as a collective response to perceived spatial challenges; sustainability and other matters of public interest are prioritized. By 2050, urban development mainly occurs within or at the edges of the largest cities.
- **Polycentric scenario**: to strengthen community and local identity, policies are implemented in the early 2020s to promote the creation of a well-connected network of small and medium-sized towns. This stems from attitudes about the need for social cohesion and recognition of interdependence. By 2050, development will be clustered in urban regions.
- **Diffuse scenario**: policies encouraging urban diffusion were implemented in the early 2020s, allowing people to flee crowded and expensive cities and buy large homes in spacious surroundings. This stems from individualistic attitudes. By 2050, the countryside has absorbed many scattered urban functions and replaced agriculture.

The final task was to translate these notions and decisions into quantitative input for the LUISETTA model; this is explained in the text box

below. Because the LUISETTA model was run up to 2050 according to a single scenario logic, this year comprised the focus of the scenarios. The intervening years are relatively uninteresting for the exercise as urbanization occurred incrementally and cumulatively without adjustment of variables in the interim. In theory, it would be possible to create more sophisticated scenarios with branching at critical junctures, but this would have made them less distinct and more difficult to compare. For the same reason, no hybrid scenarios were considered. This is because the goal within the SUPER project was not to predict, but to illustrate radically different yet plausible futures to support a policy discussion.

The LUISETTA Model

LUISETTA is an open-source version of the Land Use-based Integrated Sustainability Assessment (LUISA) modelling platform developed by the EU Joint Research Centre (Jacobs-Crisioni et al., 2022). Although LUISETTA has fewer functionalities than the full version, it was deemed sufficient to draw up policy-oriented scenarios.

Approximately 40 datasets are incorporated into the model, including information on age, population, accessibility, distance to roads and water, terrain slope, soil contamination, and high-value farmland. A high-resolution (100 m) version of the 2012 Corine land cover (CLC2012) map is used as the base map, which includes the EU member states, the UK, Iceland, Norway, Switzerland, and Liechtenstein.

For each five-year interval, LUISETTA performs three main tasks. First, the demand for different types of land use (e.g. urban development) is determined in hectares using the projections included in the model at the NUTS 2 level. The second task is to distribute these demands geographically. The result is a map of land conversion pressures. Suitability for urban use, for example, is determined by distance to roads, water, existing population, and relative accessibility. The final output of the model is a modified version of the CLC2012 map for each five-year period between 2015 and 2050, with pixels categorized as urban, commercial, agricultural, and natural.

Because LUISETTA only contains information for EU member states (EU28) in 2012, projections for non-EU ESPON countries (Iceland, Norway, Switzerland, Liechtenstein) were calculated based on national demographic projections from Eurostat, which were then distributed over the respective NUTS2 regions in these countries using the same assumptions contained in the LUISETTA model. Specifically, household size converges to 1.8 across Europe in 2050.

The built-in baseline is policy-poor (few spatial policy restrictions are included) and can be run without additional input or adaptation. After examining its output, it was deemed suitable for the 'diffuse' scenario, with a small adjustment to have this occur more intensely in highly populated areas (consistent with the sprawl literature). Two methods were then employed to create the 'polycentric' and 'compact' scenarios. To simulate higher densities, demand for residential and commercial development was lowered so that the model would convert fewer hectares to urban use. Second, to affect the distribution of land-use change, a cartographic layer of 'relative attractiveness' was inserted into the baseline map that added weights to certain locations (e.g. near rail stations) for their suitability for urbanization.

4.4 Future Urbanization Storylines

Given that the LUISETTA model provides an image of 2050 urbanization, it is tempting to concentrate the discussion solely on the endpoint of the scenario. Salewski noted that this often occurs in practice: "In the communication process the final image of an extreme future state is most powerful, while the underlying diachronic analysis is usually lost" (2012, p. 305). We seek to avoid this by paying attention to all parts of the storyline.

Given that it is extremely unlikely that all regions in Europe will follow the same path given the territorial and political diversity, the scenarios should in no way be interpreted as predictions, but instead as thought experiments regarding possible urbanization pathways and their effects. As stated, creating narratives about future development is a common

spatial planning tool, particularly for strategic decision-making (Albrechts et al., 2003; Throgmorton, 1996).

This section presents the three narratives on future urbanization in Europe. Stylistically, they seek to be provocative and bold, while at the same time remaining plausible. Each scenario is presented in three parts: rationale, policy package, and impact. The rationale presents the general logic of urban development based on the prevailing social attitudes within the storyline. The policy package establishes a plausible link between the social attitudes and the tools chosen to influence urbanization that were drawn from the SUPER intervention database. Many of these were already discussed in Chapter 3. The scenarios conclude with a final image, generated by the LUISETTA model, of how several European regions could appear in 2050.

4.4.1 Compact Scenario

In this scenario, social attitudes no longer hold sacred the suburban ideal of single-family houses and private cars. To those born after the introduction of the smartphone and growing up with video conferencing, commuting long distances seemed like a colossal waste of time and resources. A better alternative was to live in a smaller apartment conveniently located near services and activities in a bustling urban environment; this was also preferred by the ageing population. Moreover, given high energy prices, this was also economically prudent. Widespread awareness about the impacts of climate change gave support to policies directed at compact urbanization.

This philosophy resulted in a coherent policy package based on existing interventions in Europe for achieving compact urbanization. A relatively straightforward and tried approach is to define physical boundaries for urban growth. Examples that were drawn on included London's Green Belt, Turin's Corona Verde Plan, Leipzig's Grüner Ring, the Metropolitan Cork Green Belt, and Stockholm's Urban Containment Strategy. Inspiration was also taken from policies curtailing urbanization, such as the zero-growth plan of Cassineta di Lugagnano in Lombardy, Germany's 30-hectare target, Switzerland's anti-sprawl laws, Dutch 'red for green' schemes, and the land take reduction scheme in Flanders. This was coupled with strategies to encourage densification through the use of vacant urban land (e.g. Royal Seaport eco-district, Stockholm), redevelop brownfields and repurpose existing underutilized urban land (e.g.

Reinventing Paris, Dublin Docklands), or increase the quality of existing urban spaces (e.g. Berlin Programme on Sustainable Development).

By 2050, the impacts of the compact urbanization policy were visible in the physical landscape. Figure 4.1 shows the LUISETTA results of the compact scenario in five European regions in 2050. The darkest shade shows urban development since 2020 whereas the medium shade shows areas that were already built up at the beginning of the scenario period. In large urban regions, there was further coalescence of urban areas (Randstad and Brussels-Antwerp), while in less urbanized areas urbanization was confined to the edges of the largest cities (Bologna-Ravenna, Stockholm, Constanţa).

An analysis of the LUISETTA output revealed that the largest increase in urban area (urbanization/land take) occurred in NUTS2 regions with large cities (which we realize is directly related to the model input). Interestingly, given the scenario storyline, population density not only increased in regions with the biggest capital cities but also in urban regions in southern Germany, Italy, and Spain.

4.4.2 Polycentric Scenario

In this scenario, social attitudes favoured a return to community. Rejecting both American-style individualism associated with sprawling development as well as the forced urbanity of the compact city, life in small and medium-sized towns was held up as an ideal middle ground. Such a community could be largely self-sufficient, containing both jobs and facilities as well as homes (Handy, 2005). Food and energy production could occur in a decentralized manner according to a 'buy and produce local' philosophy. This urban form was especially attractive for the increasingly ageing population, due to its recognizable traditional structure, giving a sense of belonging and inclusion. For this same reason, reliable and accessible public transport both within and between towns was seen as vital.

This philosophy resulted in a coherent policy package that harkens back to the polycentric urbanization policies of yesteryear. The most prominent example is the Garden City promoted by Ebenezer Howard (Howard, 1902), which inspired planned communities in Europe and abroad. There are various historical examples to point to, such as the postwar new towns and growth centres in the UK, Sweden, and the Netherlands. More recently, the city plan of Stara Zagora in Bulgaria

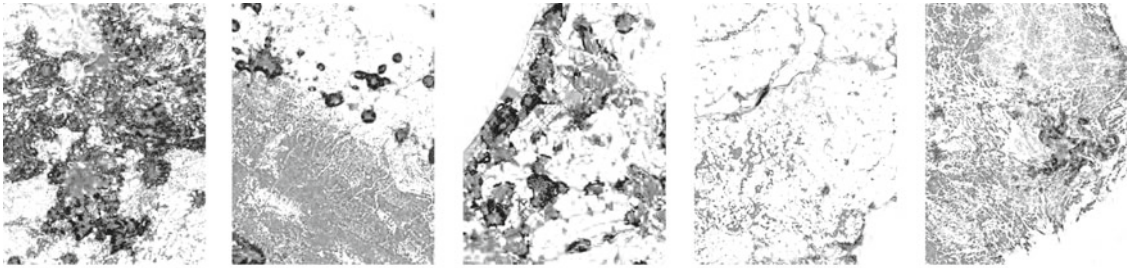

Fig. 4.1 Compact scenario output for five European regions in 2050

established settlements as secondary urban centres, with available public services and quality housing opportunities (Cotella et al., 2020).

The concept of transit-oriented development (TOD) was embraced as a way to create interconnected and walkable communities without big-city densities (Papa & Bertolini, 2015). A well-cited example is Ørestad, a district of Copenhagen built on the backbone of a light-rail system. It contains high-quality urban functions and residential densities near the stops and high-quality nature in the vicinity (Knowles, 2012). Similar developments can be found throughout Europe, such as Paris, Rotterdam, Vienna, and Stockholm (Paulsson, 2020; Pojani & Stead, 2015).

What polycentric urbanization will look like in the physical landscape in 2050 is shown in Fig. 4.2 according to the LUISETTA model results. The dark shades in the picture represent a new development of urban tissue, and light shades built urban areas that existed at the time of the beginning of the scenario period. It is evident that new urban development is not concentrated in the outskirts of major cities, but in smaller towns in their immediate vicinity or in towns located in broader gravitational areas of the major city in a row along main transportation routes.

The statistical output shows that the increase in urban land use occurred mainly in populous regions, leading to significant differences in larger countries (France, Germany, and Italy). Population density increased mainly in urban regions of major cities, but also in other developed regions (e.g. along the Mediterranean coast).

4.4.3 Diffuse Scenario

In this scenario, social attitudes are more individualistic. A contemporary Broadacre City is envisioned, where dispersed services and facilities are accessed by private transport modes, often powered by self-generated electricity. In this scenario, people wish to live in single-family homes on large plots of land. The Covid-19 pandemic was a trigger in this direction, with unpleasant memories of quarantines in small apartments. Especially the elderly population longed for homes with spacious gardens after decades of working in urban centres. The urban heat island effect was also a reason to vacate cities for a greener environment. Digital technologies that enabled work, shopping, education, and other activities at a distance reduced the necessity of proximity: a shift from physical to the virtual.

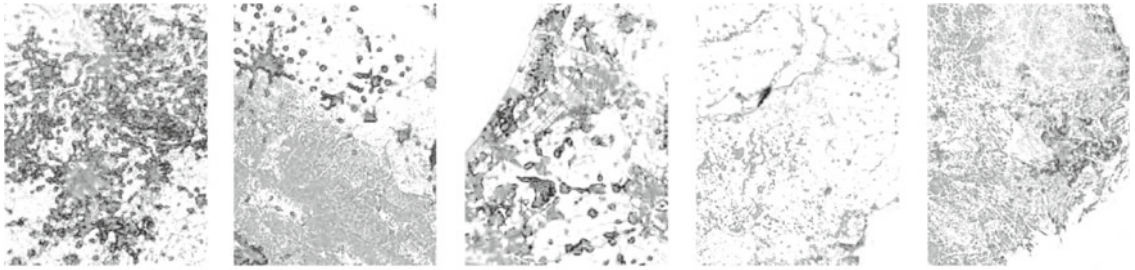

Fig. 4.2 Polycentric scenario output for five European regions in 2050

This philosophy resulted in a coherent policy package to promote diffuse urbanization. The budgets of planning departments, which were often bulwarks of outdated notions of compact development (Pagliarin, 2018), were slashed and restaffed so that existing restrictions could be swiftly abolished. A lean, flexible planning procedure was introduced, making it easier to buy land and build one's own house in green surroundings. Various European policies inspired this paradigm shift. The area of Oosterwold near Amsterdam in the Netherlands had experimented with a very hands-off regime, with no zoning plan or coordination by the government for services and infrastructure—everything is arranged and financed by the landowners themselves (Cozzolino et al., 2017). Flanders' rule allowing 'fill-in' housing construction along existing roads was also a source of inspiration, as was subsidizing suburban and exurban construction (such as in Lithuania to repopulate shrinking regions) as well as the Italian and Croatian policies of providing amnesty to illegally constructed buildings.

The first palpable effect was seen in the immediate vicinity of cities, which spread outwards into rural and natural hinterlands at low densities. This is illustrated by the LUISETTA model output (see Fig. 4.3), which shows that urban development is becoming more amorphous and dispersed (Brussels-Antwerp-Constanţa) and encroaching on natural spaces (Bologna-Ravenna, Stockholm). The Netherlands finally received the ribbon development it had so long sought to prevent (dark shades indicate new urban fabric, light shades existing urban areas).

Finally, the statistical analysis of the diffuse scenario model output revealed a large increase in urban land use (120–140%) in most regions, the highest proportion at the regional level of all scenarios. Although diffuse urbanization occurs at low densities in terms of morphology at the local level, densities still increased in many areas at the regional (NUTS 2) level.

4.4.4 Cross-scenario Comparison

A synthetic interpretation of results derived from the LUISETTA model is a complex and challenging undertaking given the territorial diversity of Europe. One interesting finding is that the changes in demand (used as input in the scenario design) did not produce an equivalent change in supply (model output). This is likely due to intervening variables such as site suitability and inbuilt transaction costs from the previous land use.

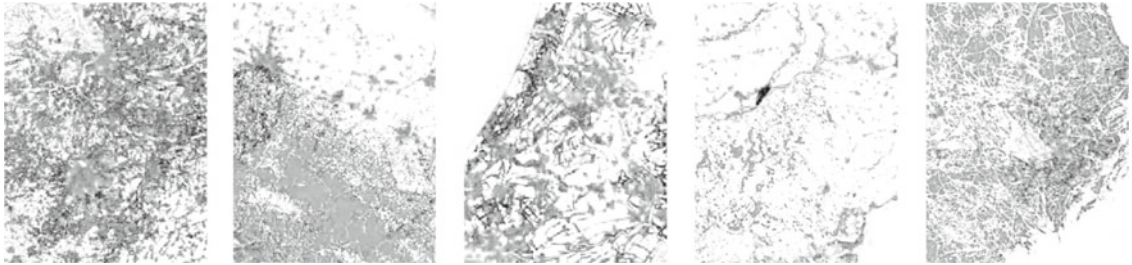

Fig. 4.3 Diffuse scenario output for five European regions in 2050

For this reason, the 50% decrease in demand introduced in the compact scenario did not produce a commensurate 50% reduction in urbanization. Instead, the differences between scenarios were far less than expected. Using the diffuse scenario as a baseline, the model indicates an 4% average reduction in urbanization across Europe for both compact and polycentric scenarios. This finding highlights a shortcoming of the model for realistically simulating urbanization scenarios, unless another method can be found than adjusting the demand module and spatial attractiveness factors. It should also be noted that since this research was carried out, there have been additional advances in land-use modelling, for example, the 2UP model which employs highly detailed datasets on population and soil sealing (although unfortunately little land-use differentiation) at the global level (Koomen et al., 2023).

Bearing these shortcomings in mind, some interesting patterns do emerge when individual countries are compared. For example, there are some cases where urbanization remains relatively constant across all three scenarios, indicating that societal preferences may have a modest effect on outcomes. In Lithuania, the scenarios produced identical urbanization levels, perhaps due to the modest demographic development predicted up to 2050. More surprisingly, in some countries, urbanization was higher in the compact scenario than in the diffuse scenario (Bulgaria, Croatia, Germany, and Latvia), albeit very slightly. In general, the compact scenario produced a reduction in urbanization, the most substantial difference being seen in Iceland (17%), the UK (14%), Malta (12%), Belgium and Luxembourg (11%), and Sweden (11%). In some countries, the polycentric scenario yielded a greater decrease than the compact scenario (Estonia, Latvia, and Denmark). The model also produced results on changes in urban population densities, which were directly derived from the output on urbanization. This usually varied little between scenarios. As expected given the model input, densities (people/ha urban land) tended to be slightly higher in the compact scenario, less so in the polycentric scenario and least in the diffuse scenario. Exceptions include Austria and Estonia. Malta showed the exact opposite tendency, with the diffuse scenario producing significantly higher densities than polycentric and compact.

Given the fact that changing demand in the model had so little effect on the results, and the surprising outcomes of individual countries, it would be premature to reflect on potential policy implications. There are

simply too many unanswered technical questions. More in-depth analysis and a deeper understanding of the working functions and processes of the LUISETTA model would be essential to explain these differences with increased confidence and precision. At present, the model seems more suited to illustrating possible urbanization patterns than producing reliable statistical output.

4.5 Conclusion

The future urbanization scenarios presented here attempted to extrapolate the logical result of societal attitudes on urbanization, producing maps that display the amount and location of new development in 2050 at a high level of resolution. The aim of these scenarios is not to show which form of urbanization is the most or least favourable but to give an indication of what could happen if all European countries were to opt for a distinct form of urbanization. As such, it can serve as a basis for public debate on preferred policy directions. If one type of urbanization is deemed desirable, one can then discuss the desirability and feasibility of the interventions aligned with this scenario. Again, this analysis should be seen as a source of inspiration rather than an outlook. The choice to hold many variables constant can be questioned in light of recent events: Covid-19, the European Green Deal, the energy crisis, climate change, and geopolitical turmoil. All these may affect societal attitudes and with it the demand for urban space and locational preferences. Nevertheless, at a time when the European Union is trying to provide a common response to crisis and uncertainty, these scenarios can be of great benefit as they predict the direction of possible spatial changes in an immediately understandable way. As such, this can signify the first steps towards drafting a strategy to achieve sustainable urbanization.

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CHAPTER 5

The Sustainability of European Urbanization

Abstract This chapter critically examines the sustainability of urbanization in Europe. The first analysis appraises the changes in urban land cover and urban form in the 2000–2018 period, revealing a complex picture at the regional level. The second analysis applies an evidence-based sustainability assessment framework to three urban forms: compact, polycentric, and diffuse. This revealed trade-offs within and between dimensions of sustainability. The final analysis, based on case study research, examined how interventions affected development practices. This revealed that there is scope for positive change. The Chapter concludes with a reflection on the tensions between the domains of environment and planning and between academia and practice.

Keywords Sustainability · Environmental impact assessment · Trade-offs · Development practices · Interventions

5.1 Introduction

Given the unprecedented rate of urbanization globally and the arrival of the Anthropocene—the era of irrevocable change of the physical environment by human activity—we can ask how much more the world can endure before it is too late. At this historical juncture, it has become imperative that urbanization and its drivers are not only explained and

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described, but also critically assessed in terms of sustainability. This raises some fundamental questions. What is sustainability and, hence, sustainable urbanization? How can we assess or measure this in a meaningful way? And how can we monitor the effects of our interventions?

The point of departure in this book is to take a broad view towards such questions. In Chapter 1 we identified two complementary notions of sustainability:

- Temporal sustainability: the balance between current needs and those of future generations. The land-use decisions we make today are often irrevocable. This was demonstrated by the scenarios in Chapter 4: in each, different locations were urbanized, and consequently, different rural/natural functions sacrificed. Each scenario also changed the shape of the urban region, which has implications for future growth. Temporal sustainability also pertains to the rate of urbanization: does this outstrip the capacity to provide sufficient public services and/or infrastructure or undermine key ecosystem services? This ties into the everyday work of spatial planners when helping to draw up long-term strategies. Interventions implemented to enhance sustainability that are durable over time can be said to be institutionally sustainable.
- Thematic sustainability: the balance between economic, social, and environmental interests. Sometimes this is conceptualized as a triangle with three separate 'realms' which partially intersect at a point where development is sustainable (Campbell, 2016). Sometimes the dimensions are depicted as concentric circles, with the economy being a subset of society which is itself part of the environment. Given that economic interests are usually sufficiently represented, this usually entails enhancing, retaining or at the very least minimizing damage within the other dimensions (Raworth, 2017). This ties into the everyday work of spatial planners when they strive to reconcile competing land-use claims and promote efficient urban development.

This chapter discusses the sustainability of urbanization by building on research described earlier in this book. The first section relates to temporal sustainability and asks whether current urbanization trends in Europe (see Chapter 2) can be considered sustainable. Section 5.3 is devoted to

thematic sustainability: it asks to what extent the three urban types used throughout the book (and which underpinned the scenarios in Chapter 4) can be considered sustainable. This is done by applying an assessment framework of economic, social, and environmental sustainability to the three urban forms. The third and last analysis examines the role of sustainability in actual planning practice. Based on in-depth case studies, which were also used for Chapter 3, the implementation of interventions was investigated and their relative contribution to sustainability assessed. This provides insights for possible pathways towards a more sustainable future, the topic of Chapter 6.

5.2 Sustainability of Urban Developments

In Chapter 2, we saw how land use in Europe was gradually urbanizing in the 2000–2018 period. Given that urbanization outstripped deurbanization by over eight times and the fact that the construction of buildings and infrastructure can have irreversible impacts on ecosystems and soil quality, this can be considered unsustainable. In other words, carrying capacity is exceeded as the consumption of land is clearly more than the rate of recovery (Neuman & Churchill, 2015). This is the implicit stance taken in the European Union's 'no net land take by 2050' target: every hectare of land 'taken' is implicitly assumed to be unsustainable. In this interpretation, all 1.2 million hectares of new urban use should be lamented. Some countries and regions can be singled out as the main culprits. As we saw in Chapter 2, big member states (Spain, France, Germany, Poland, Italy) are responsible for the most hectares converted to urban use and the Netherlands and Cyprus show the most intensive urbanization (Van Schie et al., 2020). The good news to this rather gloomy outlook is that the rate of urbanization appears to be slowing somewhat. A less austere interpretation would be to ask whether new urban developments are making prudent use of land as a scarce resource. To investigate this, we use the multidimensional conceptualization of sustainability as an organizing principle. This is also the approach taken by the United Nations.[1]

[1] In particular: "The economic value of sustainable urbanization can be understood through the lens of the national economy, property development and prosperity across the urban-rural continuum. Likewise, the environmental value of sustainable urbanization can be understood through the lens of cities and climate change, the built and natural

With respect to *economic sustainability*, we can question whether the expansion in employment areas relates to a commensurate expansion of the economy. At first glance, this appears to be the case: "In general terms, countries that have been characterized by an increase in population and GDP during the reference period display a parallel increase in land consumption" (Berisha et al., 2023, p. 5). A critical but unanswered question is how significant this relationship is. Knowing this will give insight into how efficiently land is being used for socio-economic purposes. For this, a regional (e.g. NUTS 3) rather than a national analysis is more appropriate because this is closer to the level where housing and labour markets manifest themselves. From this angle, a completely different picture emerges: the relationship between urbanization and population development is weak at best and almost non-existent for GDP (see Fig. 5.1).

One reason for this might be that European land-use data is notoriously difficult to link to European economic data.[2] We can temporarily choose to ignore these problems and proceed with an illustrative makeshift analysis. In this case, taking population as a proxy for jobs and industrial/commercial land cover as a proxy for economically driven urbanization, over the 2000–2018 period, efficiency/sustainability was only apparent in a few regions (primarily in Lithuania and Romania) in Europe. This corroborates a similar study finding that "shrinking cities are the only category showing a positive balance between re-use and creation of brownfields" (Cortinovis et al., 2019). Development was particularly unsustainable in parts of the UK, Spain, Germany, Austria, Western Poland, the Western Balkans, Greece, and Turkey. Again, it should be stressed that this is a rough indication of the relationship

environment and ecosystem services. The social value of sustainable urbanization can be understood through a city's quality of life and focus on inclusivity and equity" (UN Habitat, 2020, p. 45).

[2] Industrial/commercial land cover is relatively scarce, covering only 0.6% of Europe's total surface area, but with great regional variation, making it a questionable indicator. The highest share in Europe (18.5%) is found in Seine-Saint-Denis (stretching from the Périphérique of Paris to Charles de Gaulle Airport). Still, even in regions where the proportion of urban land use is relatively high, this land cover is typically lower than 2% of its total surface area (but typically 10–25% of its urban land use). On the other hand, significant economic production and employment takes place in areas designated as urban fabric (these are largely residential but include city and district centres which are dominated by commercial activities).

between economy and urbanization, and agree that "multiple correlation statistical analysis, exploring the incidence of different quantitative variables in influencing land consumption rates (e.g. GDP, population and/or family trends, geographical and geomorphological characteristics etc.)" is still needed (Berisha et al., 2023, p. 12), but also note that European land-use data might be too poor to support such analyses.

With respect to *environmental sustainability*, we should ask how much urbanization damages the ecological carrying capacity. The claim that all land 'taken' from natural or agricultural use is necessarily unsustainable should be questioned. Some urban uses (e.g. parks and gardens) can harbour high levels of biodiversity and deliver more robust ecosystem services than some agricultural uses (e.g. livestock sheds, horticulture) (Calzolari et al., 2020, p. 8). Under the assumption that natural land cover is more ecologically valuable than agricultural land cover, an alternative ranking emerges (see Fig. 5.2). The Netherlands, which in Chapter 2 was identified as having the most intensive land take in Europe (in terms

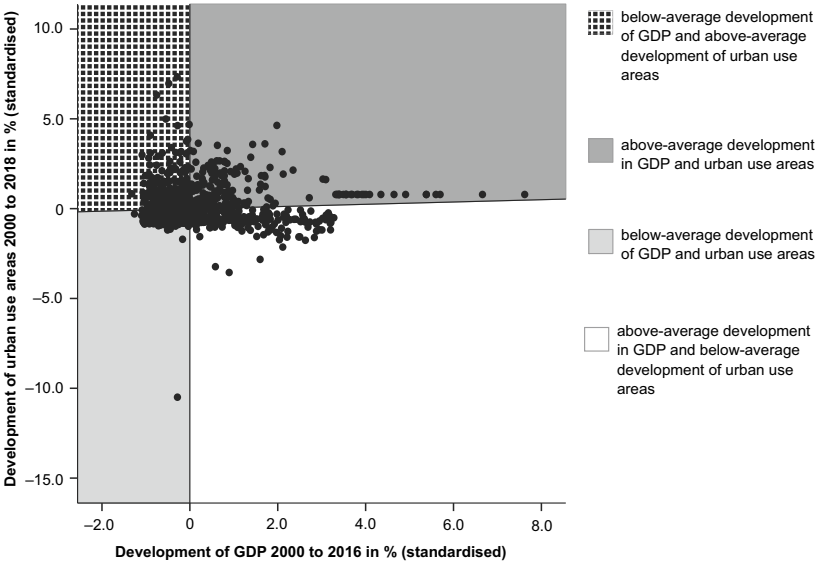

Fig. 5.1 Scatterplot of urban use versus GDP development

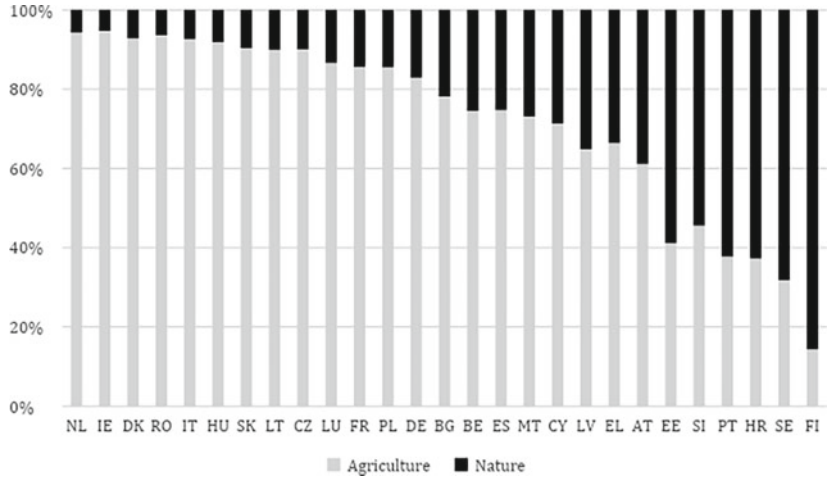

Fig. 5.2 Original function of land urbanized in 2000–2018 by country (EU27)

of ha/total land mass), does this almost exclusively on agricultural rather than natural land (Evers et al., 2023).

If we confine ourselves further to protected natural areas, which have a very high ecological value, we can ask to what extent these are being threatened by urban encroachment. In 2018, the share of urban functions in such areas was relatively low. Urban land cover within protected areas was less than 1% in the Nordic countries, Spain, Ireland, and Romania and highest in Belgium, England, eastern Poland, and the Czech Republic.

Finally, with respect to *social sustainability*, we can consider whether urban development reflects a real societal need. Again, the technical hurdles (unharmonized data, lack of time series and geographical gaps) make it unfeasible to conduct a scientifically sound analysis. Like the other indicators, we use a simple proxy as a first indication: contrasting the development of urban fabric (primarily housing) to population growth. This is also the method used by the United Nations to measure SDG indicator 11.3.1 on sustainable urbanization (Eurostat, 2022). This calculation, mapped out in Fig. 5.3, reveals some clear hotspots where 'excessive' urban fabric was being added without an equivalent increase in population. This is the case in Poland, Latvia, southern France as well as parts of Spain and Greece. Many regions in Poland added over 200 m^2 of urban fabric for each new inhabitant, suggesting that this development

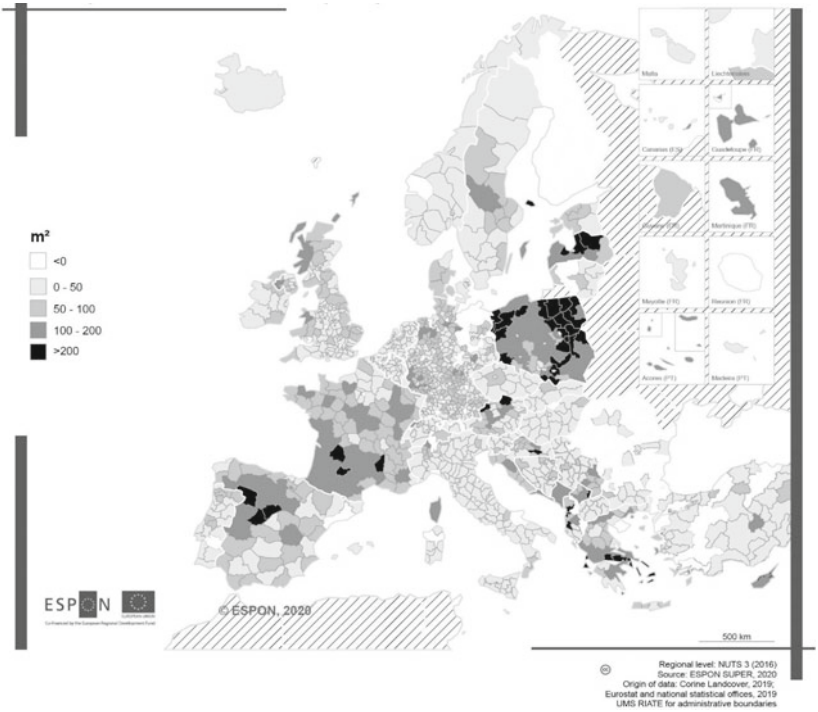

Fig. 5.3 Development of urban fabric per capita (2000–2018)

might be driven by a supply-side logic. Again, the intensively urbanizing Netherlands fares better in this case. Also noteworthy is that Finland, which was the country which urbanized the most on natural land, appears to be meeting a societal need.

One important caveat in this regard is that urbanization per capita fails to account for the original situation. Some regions with high scores in this period may have had insufficient housing in 2000 and are simply catching up.

To conclude, the data shows a mixed picture for the sustainability of developments, unless a rigid 'land take' perspective is adopted which considers all urbanization unsustainable. In all three dimensions of sustainability, we encountered technical issues in coupling land-use data to environmental and socio-economic indicators. Nevertheless, we do

observe some regions where sustainability seems unlikely. For example, the rapid expansion of urban fabric in Poland, which in Chapter 2 was associated with diffuse development in the substructure, can be noted in light of the failure of the planning system to control urbanization (Chapter 3). Similarly, the oversupply of urban space in Spain seems more strongly linked to the dynamics of financial markets than demographics. Both cases warrant further investigation. Finally, it is important to remember the original function of the land 'taken' as this is an important factor in determining sustainability. This factor should also be taken on board in further research.

5.3 Sustainability of (Future) Urban Form

The urban sprawl versus compact city discussion has spanned decades, and a large evidence base has been amassed in the process. The verdict that sprawl is unsustainable is clear (Hamidi & Ewing, 2014), but often too hastily drawn (Schuetze & Chelleri, 2015). The drawbacks of compact development are insufficiently addressed and at the same time, sprawl is one of the most popular forms of urbanization worldwide (Artmann et al., 2019) specifically in southern (Salvati, 2013) and eastern Europe (Halleux, 2008). Indeed, the statistical analysis discussed at the end of Chapter 2 found no significant correlation between urban form and a composite sustainability indicator, with only the most diffuse forms performing slightly worse than the others (Lardinois, 2021). This suggests that the relationship between sustainability and urban form is complex and should be studied in more detail. The purpose of this section is to do just that: assess the three urbanization types used throughout this book (compact, polycentric, diffuse) on a range of sustainability indicators.

5.3.1 Research Design and Methodology

Care must be taken when drawing up sustainability assessment frameworks. In practice, these have often been used to obfuscate sustainability and enable marginal 'techno-managerial solutions' rather than further a discussion about what needs to change to improve sustainability (Kaika, 2017). To avoid this, the guiding principle when evaluating the three urban forms (compact, polycentric, and diffuse) was to be as transparent as possible, even if it runs the risk of appearing simplistic. A foundational

consideration was how to conceptualize sustainability. As elsewhere in this book, we take the three-dimensional model as the point of departure: people/social, planet/environmental, and profit/economic sustainability. The assessment framework itself is then essentially a 3 × 3 matrix crossing the three urbanization types with the three sustainability dimensions. One advantage of this approach is that the dimensions are readily understandable and relatively discrete—although there remain grey areas and interdependencies—allowing for analyses of how the urbanization types score on individual dimensions.

The matrix was elaborated with indicators for each dimension of sustainability. The first batch of indicators was taken from two publications both entitled *Urban Sprawl in Europe* (Couch et al., 2008; EEA & FOEN, 2016) and Jabareen's (2006) assessment of sustainable urban forms (i.e. neo-traditionalist, compact city, urban containment, and ecocity), which had conducted a similar analysis. We then performed our own literature review to update and enlarge that evidence base, adding indicators inductively. Particularly literature on polycentric development had to be sought out, as most studies compared compact development to sprawl. The search was complicated by the fact that polycentricity can have different effects at different levels of scale (e.g. interurban versus intraurban) (Park et al., 2020). A combination of purposive sampling methods was employed to find literature such as searches in Google Scholar and university library databases and snowball techniques such as collecting sources from the bibliographies of journal articles. Given our geographical scope, we preferred European studies, but included some relevant North American sources given the longstanding sprawl/compact debate there (Burchell et al., 1998; Evers et al., 2020, p. 4). About 160 sources were incorporated into the matrix in total.

We would like to stress that this matrix is only a superficial overview indicating how the evidence tends to lean with respect to correlations. One should be very wary about drawing conclusions about causality; it is a simple amalgamation rather than a true meta-analysis controlling for geography, scale, macroeconomic context, and other salient factors. Writing about housing prices, Dawkins and Nelson (2002), found that, "the effects of urban containment appear to be much more dependent on the style of policy implementation, the structure of local housing markets, the pattern of existing land ownership, and the stringency of other local regulations," suggesting that the relationship between urban form and sustainability is indirect at best. Bruegmann (2006) further points out that,

> Because of the complexity of urban systems, however, it is often difficult to draw up such a balance sheet. […] this problem is compounded by the fact that the 'solution' to any given problem depends on the vantage point of the person doing the proposing. (p. 222)

This last problem raises the issue of normativity. We recognize that the selection of indicators is not a neutral process: "Indicators arise from values (we measure what we care about), and they create values (we care about what we measure)" (Meadows, 2021, p. 19). Unlike theoretical works such as that on sustainable city indicators (Egger, 2006) or policy-oriented documents like the World Cities Report (UN Habitat, 2020), our selection of indicators was data-driven: all 26 indicators were obtained by reviewing a scientific study. Still, we can question the sources used in the analysis. Given that sustainability and urban form are most extensively discussed in the environmental and planning literature, our results likely have a disciplinary bias. We attempted to include contrary standpoints (e.g. economic studies), but this represents a relatively small portion of the surveyed literature. Thus, we are aware of the problems of indicators, but feel that the transparency of showing scores on individual indicators is an improvement over the many competing sustainability indexes (Singh et al., 2009) and invites readers to draw their own conclusions.

5.3.2 Sustainability Assessment Results

The completed matrix includes a literature reference in each cell along with a total score. The scoring was an expert-judgement estimation of net impact on a Likert scale. If, for example, three sources found a large positive impact, one found no relationship and one found a small negative impact, it may receive a+ score. A disadvantage to this approach is that a modest score can be obtained either by conflicting studies or by a consensus that the impact is minimal. On the other hand, we chose not to aggregate the scores at either the level of sustainability dimensions or total sustainability. A simplified version of the results is displayed in Table 5.1; the full table including bibliographic information is available in Evers et al. (2020).

Bearing these caveats in mind, our findings generally confirm the critical literature on urban sprawl, namely that compact modes of urbanization are more sustainable than diffuse, with the notable exception of some indicators related to the housing market (housing demand,

Table 5.1 Sustainability assessment framework

	Compact	*Polycentric*	*Diffuse*
Economic sustainability			
GDP, wealth	+/−	++	+
Public finance	+ +	+	−
Jobs	++	++	+/−
Accessibility	+/−	++	+/−
Business areas	++	++	+/−
Housing demand	−	+	+
Transportation costs	+/−	+	−−
Energy consumption	+	+	−−
Ecological sustainability			
Reducing mobility (by car)	++	++	− −
Reducing pollution, including CO_2	++	+	−−
Green urban areas	−	+	−/+
Biodiversity	+/−	+/−	−−
Land consumption	+	+	−−
Natural hazards	−	+	+/−
Climate change	+/−	+	+/−
Consumption of resources	+/−	+	−
Renewable energy	+/−	+/−	+/−
Space for future water retention	+	+	+
Circular economy	+	+	−
Social sustainability			
Health	+/−	+/−	+/−
Affordable housing	+/−	+/−	++
Equity/inclusion	+/−	+	−−
Public and recreational space	+/−	+	+/−
Variety (high-rise, suburban, etc.)	+	+	+
Mixed-use areas	+	++	−
Satisfaction with the home environment	+/−	+	+

affordable housing, satisfaction with the home environment). Diffuse urbanization, by virtue of its scattered form and low density, scores lowest within the realm of ecological sustainability. Polycentric urbanization enrichens the discussion because it sometimes scores better than compact development, and sometimes worse. A fuller comparison of the types, including references, is provided below.

Compact

- Many studies examine the relationship between economic factors and compact urbanization. Densification and revitalization of brownfields were found to significantly increase land values (Nelson et al., 2007). Proximity was seen to lower transportation costs, but also exacerbate traffic congestion and public transport overcrowding (Litman, 2023). Businesses efficiently concentrate in central business districts (Ewing et al., 2016; Glaeser, 2011), which can slow economic development elsewhere (Cheshire et al., 2018).
- Concerning the environmental dimension of sustainability, one of the most frequently cited benefits of compact development is to preserve open areas (Bengston & Youn, 2006; Halleux, 2008; Soga et al., 2014), but others note it can stimulate leapfrog development (Evers & de Vries, 2013). On the other hand, densification can lead to a decrease in green space within the city as was seen in Amsterdam (Giezen et al., 2018) and Helsinki (Hautamäki, 2019). Lack of urban green spaces worsens air pollution and heat island effects as well as vulnerability to other climate hazards (Burby et al., 2001; Glaeser & Kahn, 2010). Some ecosystem services are, however, compatible with compact development such as green roofs, vertical gardens, and small urban parks (Francis & Jensen, 2017).
- In terms of social sustainability, one of the main factors raised for compact development is increased housing costs, which can lead to the displacement of low-income households unless ameliorated by effective affordable housing policies (Nelson et al., 2007). This was seen in the case of Stockholm, where gentrification exacerbated income segregation (Celioska-Janowicz et al., 2020). On the other hand, compact environments fit the '15-minute city' model with excellent access to local services, jobs, and leisure activities and allow for alternative forms of transport like walking and cycling (Moreno et al., 2021). Some authors found lower social segregation (Nelson et al., 2007). A high concentration of people can be problematic for the spread of infectious diseases, but this is also offset by better logistics, technology, and health facilities (Hamidi et al., 2020). Dense compact cities are frequently associated with urbanity and cosmopolitanism, but also misanthropy (Okulicz-Kozaryn & Valente, 2022).

Polycentric

- One economic advantage cited with polycentric development is its ability to allow businesses to cluster and gain critical mass (borrowed size) without the agglomeration diseconomies of compact development (Balz & Schrijnen, 2016; Davoudi, 2003; Meijers, 2007). It can contribute to regional growth by its rapid communication and transport between multiple urban centres, allowing an easier flow of labour, goods, and knowledge (Knowles, 2012; Rosenthal & Strange, 2008). Areas near TOD sites result in higher median incomes (Delmelle & Nilsson, 2019), jobs (Lierop et al., 2017), and land values (Bartholomew & Ewing, 2011), which can be used to finance public services (Cervero & Murakami, 2009).
- Studies on environmental sustainability find that the creation of small walkable urban cores and their connection to other centres by public transport will reduce car traffic (Papa & Bertolini, 2015) and, consequently, noise and air pollution (Sider et al., 2013). Some studies find increased travel times vis-à-vis other urban forms, whereas others find the opposite (Park et al., 2020). Polycentric structures are also seen as conducive to finding space for urban green areas (Knowles, 2012; Lierop et al., 2017), circular economy principles (Fusco Girard, 2013), water retention, and renewable energy production (Westerink et al., 2013). There are also signs that compact polycentric structures are efficient in terms of energy and heating costs.
- Some argue that polycentric urban forms enable a more diversified housing stock, allowing lower incomes to find sufficient housing (Guthrie & Fan, 2016). This form is conducive to mixed-use development (Lehmann, 2016; Pojani & Stead, 2015). The polycentric urban form also means that green spaces, recreational areas as well as high-quality pedestrian and bicycle infrastructure are easier to realize (Schwanen et al., 2004), which can have health benefits (Pojani & Stead, 2015; Ratner & Goetz, 2013). Polycentric planned towns and districts in the Netherlands are generally highly valued by residents (de Klerk & Van der Wouden, 2024). Many transit-oriented neighbourhoods have remained stable in terms of population (i.e. little displacement effect) (Delmelle & Nilsson, 2019).

Diffuse

- One of the main arguments for diffuse urban development is that it has economic advantages. Land acquisition is less expensive, which should translate into lower costs for purchasing or renting space (Bruegmann, 2006; Oueslati et al., 2015). A disadvantage is that the fragmented low-density urban structure makes it difficult to serve by public transportation, which can raise individual transportation costs, create congestion on certain roadways, and result in much higher individual travel costs (Cinyabuguma & McConnell, 2013; Longley et al., 2002), energy costs (Newman & Kenworthy, 1999), and other public services (Gielen et al., 2019; Hortas-Rico & Solé-Ollé, 2010). On the other hand, the diffusion of jobs (sometimes stimulated by containment policies) to suburban areas can reduce commuting distances (Anas & Rhee, 2007).
- The literature is less divided in its verdict on the environmental effects. Diffuse development is said to cause high air and noise pollution volumes (Glaeser & Kahn, 2010; Norman et al., 2006), although the fact that this is spread out across a large area reduces its intensity. The low-density aspect results in less efficient land use and loss of land (Couch et al., 2008; EEA & FOEN, 2016; Leontidou et al., 2008) that could have served as ecological services (Hamin & Gurran, 2009) or renewable energy (Bruegmann, 2006; Norman et al., 2006). On the other hand, low densities reduce heat island intensity (Zhou et al., 2017) and can make it easier to find space to adapt to climate change (Pizarro, 2009; Westerink et al., 2013). The spatial fragmentation is not conducive to biodiversity (EEA & FOEN, 2011).
- In terms of social sustainability, an important advantage of diffuse urban form is the provision of low-cost and high-quality housing with private yards and ample privacy (Antoniucci & Marella, 2018; Ewing et al., 2016; Oueslati et al., 2015), and enjoy closer contact with nature (Robertson, 1990). Many citizens living in diffuse urban areas enjoy living in homes they built themselves at sites at locations of their choosing, including minorities (Kahn, 2007). Other authors have pointed to higher social segregation (Xie et al., 2018), as well as transport justice issues (Kenyon, 2011) and transport-related stress (Costal et al., 1988). Diffuse development can encourage less-active

lifestyles, leading to obesity and other health problems (Ewing et al., 2003).

From this overview, the results are clearly mixed. Each urban form type contains both positive and negative aspects, indicating trade-offs between and within sustainability dimensions (Anderson et al., 1996). Consequently, we should be wary about claims that some forms are necessarily (un)sustainable, but critically examine in which ways and under what conditions they are so. The findings confirm that compact development is also fraught with dilemmas (Neuman, 2005; Roo & Miller, 2019).

This aligns with Campbell's (2016) advice to planners that they should abandon the holy grail of achieving a perfect balance and try to find a workable compromise and manage trade-offs. In practice, planners understandably have a clear preference for compact urban form but should also be aware of how this goal interfaces with related goals such as affordable housing and local environmental factors. The transparency of the assessment framework not only facilitates making choices between indicators (e.g. one might be more urgent than the other within a particular context) but also reasoned long-term strategies (e.g. a transition to electrified vehicles will reduce the problem of emissions but not congestion and loss of street space to parking). Finally, the assessment framework results must be seen in the light of the prevailing territorial context. For example, we can ask how the structure of southern European systems defined by social institutions such as patrimonial tradition in land ownership and the importance of kinship ties would react to the imposition of a compact city model. As we have seen in the past (see Chapter 3), when planners operating in the 'urbanist tradition' attempted to steer urbanization using detailed plans, this resulted in informal diffuse development. In other words, for sustainability, it is arguably less important to promote a particular urban form but to reform everyday development practices.

5.4 Sustainability of Land Development Practices

In the conceptual framework presented in Chapter 1, the step between urbanization drivers and their outcomes consists of development practices. This is the crucial point at which decisions are made about whether, where and how to convert land to urban use. It is described as a 'black box' because it cannot be studied at the macro-level: these decisions are taken in a very localized context according to specific (in)formal rules

of the game and interactions by a particular constellation of stakeholders (Lord, 2012; Peters, 1999; Scharpf, 1997). For example, a fiscally decentralized planning system characterized by a 'comprehensive integrated' approach where local officials have an 'entrepreneurial planning' orientation may react to a development proposal by setting up a public-private partnership and using the profits to fund related public services, whereas a fiscally centralized system of 'passive' land-use planners may be much more reticent. To investigate this, the ESPON SUPER project took a comparative case study approach, researching development practices in 11 very different contexts. To capture the heterogeneity of Europe, the selection attempted to vary the geographic spread, level of scale and type of planning system, and intervention as much as possible. To enable a modicum of comparability, data was collected and registered using a strict regime of templates that could then be synthesized in spreadsheets to detect regularities (Farinós Dasí et al., 2020a).

The main research question was how new public-sector interventions impact land-use decisions and developments. The analysis is akin to performance-oriented studies, which are often employed to gauge the effects of strategic planning (Faludi, 2000) by looking at if and how the plan was followed up in future decision-making. In other words, rather than investigating whether developments conform to notions of sustainability (Sect. 5.2), or how the impacts of alternatives score on indicators of sustainability (Sect. 5.3), this section looks at the extent to which interventions to promote sustainability resonate in planning and development practices. If this results in a durable change, we can also say that these interventions are institutionally sustainable.

5.4.1 Unsustainable Urbanization Practices

Before talking about what sustainable urbanization is, we should first look at current European development practices which are, with few exceptions, considered unsustainable. There are many reasons for this, but deep-rooted ideas about the dominion over and subjugation of nature as a God-given right are certainly a factor. Under capitalism, this ideology becomes translated into institutions where private property is held sacred, and land is a commodity to be traded on the free market. When such economic valuation predominates,

> It can then come as no surprise to us that the most scabrous slum is more highly valued than the most beautiful landscape, that the most loathsome roadside stand is more highly valued than the richest farmland. (McHarg, 2006 [1968])

Because urban land is worth vastly more than rural land, this provides a significant financial impetus for landowners to urbanize (or developers to buy land to this end). Of course, there are also costs, impediments and risks involved in land development, so care needs to be taken to ensure a positive business case. As argued in Chapter 3, a major consideration in land development is the structure and function of the land-use planning system, as it is responsible for granting development rights as well as informal practices, such as how planners perceive their role in the development process (e.g. passive, entrepreneurial, or facilitative).

The case study research made an initial assessment of the sustainability of the prevailing development practices using a multicriteria analysis. Factors include whether the development was viewed as meeting a real demand, or whether it was deemed more supply-driven. An indicator of this is whether municipalities are financially dependent on urban development. The assessment also ascertained whether public authorities adopted a proactive or reactive stance in the process, whether planning practice was seen as improving or not, and the extent to which it corresponded with EU policies and SDGs. From this, the Austrian, Swiss, and Swedish cases were seen as relatively fertile ground for sustainable urbanization, whereas this was seen as most challenging in Germany, the Netherlands, and Poland. These scores should be treated with a healthy dose of scepticism, as the case study reports were prepared by national experts, and some were more critical than others about the current situation (most likely related to comparisons with past performance).

The analysis moreover revealed that some traditional institutional groupings were unimportant for explaining the functioning of the planning system, such as whether the administrative structure was centralized or federal, geographic location, the degree of EU influence, and planning culture. Despite the large differences in context, the comparison revealed some important similarities and debunked stereotypes about dysfunctional Mediterranean and Eastern planning systems versus well-organized ones in Northwest Europe. It also discovered discrepancies between formal systems and informal practices:

> It is evident that, in some cases, the situation on the ground has shifted from these long-held and pervasive imaginaries. It has been found that most actors, even in the most permissive environments, demand a stricter basic and restrictive regulation approach. Decision makers at the top echelons of the administration tend to choose solutions that are close to de-regulatory, linked to ideology and political capitalization, but local stakeholders which are in closer contact with everyday practice, lean towards solutions that tend to increase the level of control or implement binding interventions. (Farinós Dasí et al., 2020b)

However, this does not necessarily translate into sustainable development practices. Indeed, a majority of the investigated countries exhibited local supply-side rationality, where land development was found to outstrip need. In three cases (Spain, Croatia, and Romania), this seemed to be linked to boosting business opportunities in an insufficiently diversified economy, while in others (Germany and the Netherlands) urban development was perceived as a vehicle to recover from the economic crisis. In all cases, it was linked to an overarching system where local authorities rely on land development for revenue and where intermunicipal competition undermines the willingness to introduce restrictive planning measures.

5.4.2 Ex-ante Sustainability Assessment

Each case study focused on an intervention to improve the sustainability of development practices. Some of the interventions were drawn up in a proactive way to strengthen planning (Austria, Italy, and Romania) whereas others sought to redress perceived unsustainable development (Germany, Switzerland, and the Netherlands). Of the eleven cases, only two initially failed to mention the three dimensions of sustainable development explicitly (Belgium and Romania), primarily because they predate the time when this conceptualization became dominant (they did so implicitly however). In addition, many of the interventions incorporated the temporal dimension as well. For example, some express concern for future generations (Switzerland, Croatia, Italy, and Romania), while others explicitly seek to achieve long-term effects (Austria, Switzerland, Spain, Poland, and Romania), or set long-term urbanization targets (Belgium, Germany).

A qualitative analysis of the official text of the interventions discovered that the case studies differed on which dimension of sustainability seemed to enjoy priority (Farinós Dasí et al., 2020b). While no intervention exclusively focused on one dimension, most leaned towards the environmental dimension, while two (Romania and the Netherlands), were more economically motivated. Social considerations were the least frequently mentioned, with only three interventions (Austria, Spain and Sweden) devoting a third or more of their attention to this. Further analysis discovered that interventions falling into the instrument category 'strategy' were much more holistic than legal devices. Finally, interventions set at higher levels of scale tended to be narrower in their aims.

The textual analysis was supplemented by over 100 stakeholder interviews, which included questions about what problems the interventions should address. This revealed differences between the opinions of stakeholders and the actual articulation of the intervention. From Fig. 5.4, one can gauge the relative distance between needs (interviews) and the means (intervention text). The discrepancy was substantial in Spain, Switzerland, Croatia, and the Netherlands, where respondents placed much more emphasis on environmental matters than the intervention had done. Expectations were more aligned in Italy, Romania, and Germany. Interestingly, Swedish respondents raised more social concerns than the intervention had addressed. In two cases (Italy and Austria), the main need was to improve institutions rather than make progress on one or more dimensions of sustainability whereas in Romania the stakeholders could not agree on priorities.

The main conclusion is that even though the interventions were drafted in a way that slightly prioritized environmental sustainability, this was much less than what the stakeholders felt was necessary. In some instances (Spain) the draft intervention was adapted to gain a broader base of political support, while in others (Netherlands) an ecological perspective ran counter to the prevailing political ideology.

5.4.3 Ex-post Sustainability Assessment

Arguably the most important question in the case studies was: did the interventions make land development practices more sustainable? This was the central research question of the ex-post assessment. The first method was to ascertain if urbanization (land take) declined after the introduction of the intervention. Given the many intervening variables, not much

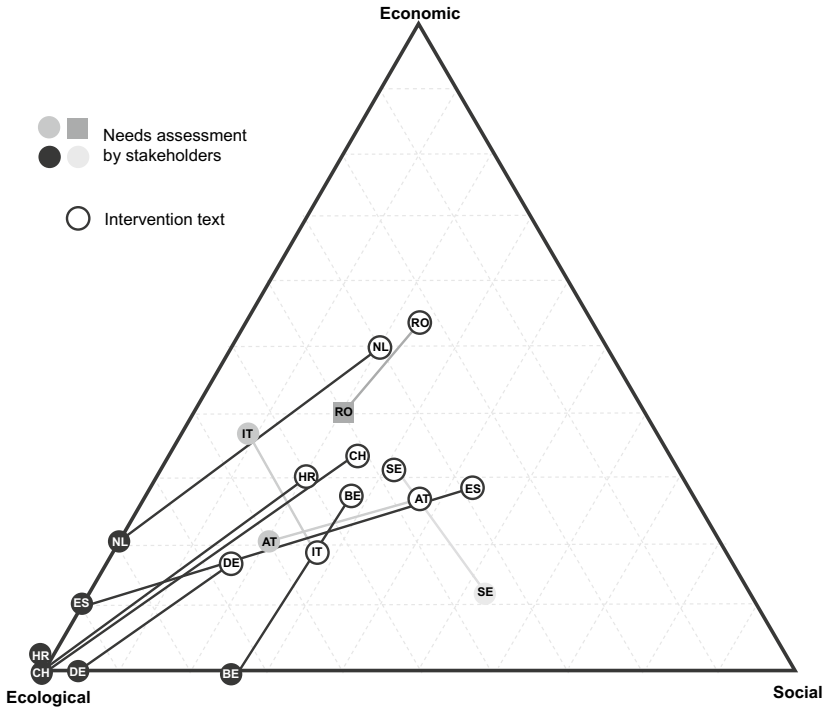

Fig. 5.4 Ternary plot of ex-post sustainability analysis

credence was given to this analysis. The second and more important method was to ask the stakeholders about the effects of the intervention, often using questions worded in a contrapositive manner: all things being equal, would greenfield development (or gentrification, economic development, etc.) have been greater without the intervention? This was then used to reflect on the urbanization trends in the first analysis.

Like the previous sustainability analysis in Sect. 5.3, the interventions were scored on a Likert scale for a range of indicators falling into the three sustainability dimensions. The indicators are not identical because the data was collected from interviews rather than scientific literature. Consequently, the indicators are generally more subjective and less measurable. Given the heterogeneity and limited number of case studies, it would be inappropriate to draw conclusions on the basis of regularity. Nevertheless,

there were clear indications that the studied interventions had a palpable positive impact on sustainable urbanization. The observed transformations in planning and development culture can be broadly categorized into two groups: a shift in mentality and the introduction of innovative instruments and practices. Even if the explicit goal was not to change the planning and development culture, many stakeholders acknowledged it as an unintentional outcome. This included a shift from competitive individualistic decision-making to cooperative strategies in land development, a transition from a top-down tradition to a more open decision-making process, and enhanced public awareness and involvement in land-use planning. In addition, the interventions were seen to innovate developmental practices via the introduction of new instruments, routines, and interactions. Examples include an obligation to justify plans in terms of sustainable urbanization, enhancing legitimacy through compliance, financial compensation schemes that support sustainability, and EU standards for public participation, environmental protection, and institutional accountability.

Finally, the study made two general but noteworthy observations:

- The socio-political contexts changed over the studied timeframe (approximately 2000–2020), and with it, the status and character of the planning system. The various rankings and typologies of planning systems (see Chapter 3) often fail to take this dynamism into account. In particular, planning seems to be weakening in Germany and the Netherlands, both seen as strong systems, but also in Croatia and Romania. Conversely, planning seems to be gaining ground in Austria and Switzerland, but also in Italy and Spain.
- In contrast to spatial planning and territorial governance scholarship, which emphasizes the need for 'soft spaces' and flexible arrangements (Allmendinger & Haughton, 2009), we see an increasing use of norms imposed via regulatory instruments, sometimes inspired by or aligned with European policies. This has created coordination problems between governmental tiers (Spain, Germany, Croatia, and Romania). In some cases, such as the Netherlands and Germany, planning implementation and enforcement is increasingly delegated to consultants and courts.

5.5 Conclusions

This chapter investigated the sustainability of urbanization in three ways: (1) a conformance-oriented analysis of developments, (2) an impact-oriented analysis of urban form, and (3) a performance-oriented analysis of urbanization practices. In this last section, we will briefly reflect on each of these analyses and conclude with some critical comments.

Recalling the conceptual framework in Chapter 1, the first two analyses can be understood as assessing the *outcome* of the urbanization process. The first is primarily focused on the sustainability of the amount of urban space being added and directly informs the policy debate surrounding the 'no net land take in 2050' target. While we recognize that urbanization is far from zero, we argue against taking a one-dimensional conceptualization of every hectare of land 'taken' being unsustainable. The data reveals a complex mosaic of more or less efficient urbanization patterns, both geographically and over time. The second analysis acknowledges that not only the amount of urban space but also its configuration, is important for sustainability. This is related to the longstanding policy debate on urban sprawl. Again, our analysis does not reject the general verdict that compact development is preferable, but nuances this by showing that there are trade-offs between and within dimensions of sustainability. The final analysis is oriented to the *process* of urbanization: it analyses how urban development practices were affected by various interventions. Here, again, the results show mixed results, which can nuance both the fatalistic standpoint that market forces are too powerful to withstand and the naïve beliefs that planners can singlehandedly control spatial development. Given all this equivocal evidence on developments, impacts of urban form and the scope for reform, the next step is to address what can and should be done to improve the sustainability of urbanization in Europe.

A good starting point would be to improve communication between those studying and writing on sustainability (e.g. environmental activists and scholars) and those who are on the front lines of urbanization (e.g. civil servants in municipal planning departments). This gap is typified by the European 'no net land take' target, which originated among a small circle of soil experts and operationalized by scientists working at the European Environment Agency. The urban and regional planners who will be ultimately obliged to implement this target played no part in formulating this initiative and are only now becoming aware of its existence (Evers, 2024). Planning theory is clear about insufficient participation

potentially leading to alienation and even resistance among stakeholders (Arnstein, 1969; Forester, 1989; Healey, 2010; Innes, 1996). Another example is degrowth, an increasingly fashionable concept in academia but largely unknown (or if known, misunderstood or mistrusted) by practitioners. Degrowth views itself as a movement, yet scant attention is given by academics to those who might be responsible for implementing it. This deficiency has only very recently been acknowledged:

> We highlight the significant yet neglected role that urban professionals (architects, designers, planners, medical and social care professionals, IT and technology experts, teachers) can play in linking degrowth agendas with interlocal everyday spatial urban and regional practices. These actors are often overlooked – or even looked down upon – by degrowth scholars and activists, as they are considered not sufficiently 'progressive'. (Kaika et al., 2023, p. 1200)

Local politicians, and the planners who work for them, generally view growth positively (Logan & Molotch, 1987; Savini, 2021) and local finances often rely directly on urban development. At the same time, planners *are* trained to think in terms of long-term processes, interrelations between policy fields and territories and strategic objectives that extend far beyond electoral terms. Furthermore, as street-level bureaucrats, planners usually view themselves as defenders of the local public interest and see it as their duty that weaker voices in society—the downtrodden, and the natural environment—are sufficiently represented (Kaufman & Escuin, 2000). In this sense, there is significant common ground to cultivate practices that serve the degrowth agenda, even if not explicitly embracing the term. Indeed, "Planners have an important role to play in […] helping elected officials and citizens understand why the vision of a sustainable future is a desirable and compelling one and how they can lead society toward that future" (Beatley, 1995).

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CHAPTER 6

Final Thoughts on Sustainable Urbanization

Abstract This chapter contributes to the scholarly and policy debate on sustainable urbanization by discussing the substantive, conceptual, and methodological innovations our pan-European research. Recommendations are provided for policymakers committed to making urbanization more sustainable in the form of inspiration rather than instruction. Recommendations are also provided for future research by noting loose ends and untested hypotheses. We conclude with a call for more attention for sustainability among spatial planners and more attention for spatial planning among environmentalists.

Keywords Sustainability · Policy transfer · Best practices · Urbanization

6.1 Introduction

The main message of the ESPON SUPER project, which informed an important part of this book, is that policy makes a difference for urbanization, implying that policymakers are partly responsible for steering this in more sustainable directions (Cotella et al., 2020; Evers et al., 2020). In other words, the way that urbanization is taking shape in Europe, described at length in Chapter 2, is partly determined by the many public-sector interventions as described in Chapter 3. Inaction, sometimes in combination with claims of powerlessness in the face of exogenous

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or institutional constraints, can therefore also be considered a political choice. Chapter 4 illustrated the effects of alternative courses of action by way of scenarios that offered three plausible storylines towards divergent modes of urbanization (compact, polycentric and diffuse). As such, they can be deployed to facilitate public debate on long-term trends and raise support for short-term measures promoting sustainable urban development. Still, sustainability in the broadest sense cannot deliver the (technocratic) win/win so coveted by politicians; hard choices need to be made that require sustained commitment, risk-taking, and conciliatory measures to mitigate clashes between interests. In its analysis of the sustainability of urban form, Chapter 5 revealed inherent trade-offs within sustainability as well as providing an account of how governments wrestle with these dilemmas in practice when introducing interventions to make development practices more sustainable.

The purpose of this chapter is to bring together the different threads of this book outlined above and formulate synthetic conclusions and recommendations. We do this with two different types of readers in mind. The first are policymakers, officials, and other socially engaged individuals who wish to be agents of change towards a more sustainable Europe (Sect. 6.2). The second types of readers are scholars, students, and researchers (Sect. 6.3) interested in gaining or exchanging knowledge about sustainable urbanization.

For the first type of reader, Sect. 6.2 supplies conclusions and recommendations that fit the current policy context in Europe in all its complexity. Despite a consensus on the goal of sustainable urbanization, there is substantial disagreement about what this entails and the means to achieve it. Between the unlikely extremes of no-regret and certain-regret lie hard choices that demand local policy attention. The conclusions and recommendations are therefore rooted in a view of urbanization as a wickedly complex place-based activity fraught with dilemmas, where few technically correct solutions exist—only better or worse decisions.

Section 6.3 positions this work in the broader scholarly debate and identifies future directions of inquiry for researchers. First, it recounts our conceptual contribution to the urban sprawl/sustainable urbanization discussion, notably the choice for a less normative/pejorative terminology. This is supplemented by recalling the methodological innovations such as morphological analysis and the sustainability assessment methodologies. Second, we argue that the pan-European approach presented

here can and should be followed up by more detailed analyses and testing of hypotheses.

6.2 Implications for Policy and Practice

The edited volume *The Future of Sustainable Cities* (Flint, 2012) was written at a time when the hegemony of neoliberal logic was being questioned: the 2008 financial crisis had demonstrated that the global marketplace could not deliver the promised win-wins of sustainable development and, moreover, was itself acutely unstable. The further retrenchment of welfare states and draconian austerity measures to jumpstart the economy further dispelled the illusion that a harmonious balance between the three dimensions of sustainability was attainable. With remarkable prescience, the book asked how to move the agenda forward in "a new epoch in which … crisis is becoming a way of life" (Flint, 2012, p. 3). Ten years on, Europe is dealing with the aftermath of the Covid-19 crisis and grappling with the climate and looming biodiversity crises. This has been given additional urgency by the war in Ukraine and related humanitarian, energy, food, and immigration crises. At the same time, we see a rise in nationalism and populism. One could surmise that crisis-oriented thinking is unconducive to the sustainable urbanization agenda, which is inherently long-term and often not perceived as urgent. Just as convincingly, one could also argue that sustainable urbanization is needed now more than ever. Unsurprisingly, we take the second view.

The decisions we make about urban development and land use today will impact our physical environment for decades or even centuries to come. And given that land-use conversion is socially determined—it is, after all, the outcome of conscious decisions made by human beings—it is also something that can be affected by conscious human interventions. Policies and practices matter. As the SUPER project argued, now is the time to act (Evers et al., 2020, p. 1).

Looking forward, we note that the playing field has changed considerably. Urbanization was for decades, if not centuries, the exclusive domain of the local and regional level, with the national level playing a more distant, coordinating role and defining the powers, mechanisms, and instruments of the planning system. However, the European Union is becoming a major factor to be reckoned with. The EU is increasingly implementing policies that, if not in name, at least in substance, promote sustainable urbanization (as well as policies which run counter to it). The

'no net land take in 2050' target, nature restoration standards, the Urban Agenda, and the European Green Deal taxonomy are noteworthy examples of policies that will impact planning decisions on urban development. Europeanization is visible in the ambition to enhance harmonization and standardization of targets and goals, which can run a risk of oversimplification and the belief that 'best practices' can be readily transferred from one territorial context to the other. Reality has shown itself to be more complex: the cumulative effect of EU policies on urbanization is not necessarily coherent or necessarily sustainable. At the same time, sustainable urbanization interventions take on different guises in different national contexts, producing different effects. For this reason, one should be cautious when formulating pan-European conclusions and recommendations.

This was also the position taken in the SUPER project. It formulated rather cautious messages for planners and policymakers. Three will be elaborated in light of recent policy developments with references to chapters of this book.

- Learn from the past and the future.
- Learn from other contexts.
- Take a long-term holistic approach.

6.2.1 Learn from the Past and the Future

The evolution of European land use occurs gradually and incrementally. In the 2000–2018 period, only 0.6% of the surface area under investigation changed its function. Much of this regarded an exchange between agricultural and natural land or shifts within use categories. Urbanization, which accounted for almost half of this land-use change, is significant because it is so unidirectional: over eight times of land is converted to urban use than back. This aspect of irreversibility justifies policy attention.

A major finding of the analysis of land-use developments in the 2000–2018 period (Chapter 2) was that the distribution of developments is highly heterogeneous and that the myriad indicators produced vastly different results. This makes it very difficult to make blanket claims about sustainability at the pan-European level. For example, we see strong urban growth in some parts of Europe, slower development in others and even deurbanization in some instances. This is only partly related to

demographic and economic developments. We see sharp rises in infrastructural land use in some areas (also per capita), whereas similar types of regions remain stable. We see some monocentric cities expanding by contiguous or clustered development while others display profound diffusion. Furthermore, the sustainability of these developments is anything but clear-cut. Urban development often entails a trade-off between different sustainability dimensions. For example, more urban fabric per capita suggests more living space and affordability (social sustainability) but lower land consumption efficiency (environmental sustainability).

Despite this, some general correlations cannot be denied. Urbanization can be partly explained by drivers such as population and socio-economic development, particularly the 2008 crisis (Berisha et al., 2023b). Given this, the multiple crises of today could affect location preferences in the future, shifting urbanization pressure to different types of locations. How is still largely a matter of debate. This underpins the importance of making and using policy scenarios such as those drawn up in the SUPER project for 2050 to explore the advantages and disadvantages of alternative developmental trajectories as a basis for political discussion and strategy formulation.

6.2.2 Learn from Other Contexts

Factors such as demographic and economic development never sufficiently explain urbanization—the relationship is weak at best. The SUPER project compiled over 200 examples of public-sector interventions that affected urbanization in Europe into a database. The examples vary in terms of goals, scales, instruments, and success. This evidence base strongly suggests that institutional and policy factors can adjust the payoffs or orientation of stakeholders involved in the development process through a combination of carrots, sticks, and sermons. Given there is no possibility for a rigorous causal analysis (there is no control group to tell us what would have happened otherwise), the case studies revealed that the interviewed stakeholders widely believed that interventions do impact development practices. This should encourage policymakers that sustainability can be promoted.

There is however no failsafe intervention: little regularity was found in terms of what works and why—interventions fail in some regions and succeed in others. The analysis moreover suggests that it is difficult to be successful in all aspects of sustainability simultaneously; sustainability

includes divergent forces and mechanisms that are hard to reconcile. Synergies are present, but territorially differentiated: several case studies demonstrated how, for instance, the conservation of a particular open area (environmental sustainability) offered an opportunity for public uses (social sustainability) and profit (economic sustainability). For this reason, the intervention database should be used to inspire policymakers about what is possible, rather than suggesting a particular course of action. This was the approach taken in the SUPER spinoffs, where the researchers worked together with policymakers to first put their urbanization objectives into a European perspective and then described relevant interventions in other countries (Berisha et al., 2023a).

6.2.3 Take a Long-Term Holistic Approach

The case studies revealed widespread agreement that urbanization practices had become unsustainable, which provides a mandate for action. This does not imply that change will be immediate. It can take years, if not decades, to implement reforms towards sustainable urbanization and even longer to feel their effects. For this reason, it is important to consider other long-term trends and developments such as demography and climate change when drawing up strategies. This requires leadership in crafting long-term holistic strategies or visions to embed operational interventions and it requires courage to defend these values against pressing short-term issues.

The case studies underlined the value of making a clear, inclusive, and comprehensive spatial strategy. Many interviewed stakeholders speculated that if their intervention had been supported by a strategy, it would have been easier to implement. In this, a higher level of scale is often needed to transcend parochial interests and strike a balance between the three dimensions of sustainability; unidimensional interventions at the local level were comparably less successful. This finding lends credence to the claim that "Planning as an academic discipline and as an applied field has a great deal to contribute to the envisioning of, and working toward, creating more sustainable human settlements: more sustainable towns, counties, metropolitan areas, or multijurisdictional regions-or what I call collectively sustainable communities" (Beatley, 1995). Given the multiple crises Europe is facing, this should be interpreted as a call to action for spatial planners.

6.3 Implications for the Academic Debate

6.3.1 Conceptualization of Sustainable Urbanization

Our decision to emphatically reject normative terminology (i.e. sprawl, land take) in favour of neutral terminology (i.e. urban form, urbanization) could be criticized for downplaying the need to thoroughly rethink current land development practices and reform institutions. We do not accept this argument for two reasons. First, a normative tone in research carries the risk of becoming pigeonholed, and subsequently dismissed, as activist science. This would be unfortunate, as much ESPON-funded work, including the SUPER project, is oriented towards providing overviews of relevant information to ground policy decisions as an 'honest broker' (Pielke, 2007). Second, there is conceptual confusion about both land take as well as urban sprawl. Referring to the phenomenon as urbanization, urban development, and urban form is preferable.

This last point has become increasingly urgent given the nascent legislation on land take. This term is first and foremost problematic due to its inherent pejorative connotations: it is easily confused with illegal appropriation or settlement, tactical acquisition (land grab), compulsory purchases, or downzoning (takings). Instead, it refers to a shift from one type of land use to another. Chapter 2 explained the drawbacks of using Corine Land Cover data to calculate land take, due to problematic classifications and insufficient resolution. Moreover, land take as it is used in the Soil Monitoring Law proposal (European Commission, 2023) is conceptually muddled. Its point of departure is binary: a given land-use change is land take if it concerns the transformation from natural or semi-natural land to 'artificial' (usually urban) land, implying it can be measured in surface area (e.g. hectares). However, the proposal also links artificialization to the reduced ability of the land to deliver ecosystem services, which implies a sliding scale. Academics should not uncritically adopt policy concepts in vogue but instead actively interrogate their implications and, if needed, offer alternatives (Decoville, 2018).

For a similar reason we decided to employ the common three-dimensional interpretation of sustainability used in policy, rather than taking a deep-ecology or degrowth approach. We are aware that this approach can obfuscate conflict and of its blatant (mis)use in politics to suggest the existence of a technically optimal solution, something which could ultimately undermine the creation of a truly sustainable agenda (Whitehead, 2012). We try to retain a critical distance by employing the

three dimensions not to reconcile, but to investigate the (in)compatibility of the three dimensions. We furthermore argue that a multidimensional approach is more amenable to spatial planning, which strives to balance competing land-use claims. As spatial planners are crucial actors in redirecting urbanization in Europe, it makes sense to use terminology that aligns with their ontology and activity; the notion of land take falls short on this notion as well (Evers, 2024). Moreover, if one rejects the utopia of optimal technocratic solutions (Campbell, 2016), the three-dimensional conceptualization of sustainability provides an adequate framework for discussing alternatives and their potential impacts.

6.3.2 Research on Land-Use Developments

The work carried out in the ESPON SUPER project and reported in this book can be seen as preliminary work towards understanding the urbanization of Europe. Our analyses have just scratched the surface of the technical potentials of the enhanced data availability. To this end, the SUPER statistical database could be enhanced. The addition of more environmental indicators, for example, would allow for more sophisticated analyses of European regions than was feasible within the SUPER project. Additional sources that could be incorporated include the Regional Human Development Index (Hardeman & Dijkstra, 2014), Ecosystem Wellbeing Index (Shaker, 2015), public service levels (Kompil et al., 2019), Quality of Life Index (ESPON, 2021), and (if available) their underlying data. At the same time, we must remain vigilant about the limitations of the land-use data, particularly for small-scale urban development. More in-depth research is needed to account for the bias of the low resolution of Corine and whether there is a practical workaround. A comparison with data sources such as the high-resolution 2019 World Settlement Footprint and the WSF Evolution (ESA, 2022) might be useful in this regard.

The preliminary statistical analysis of the sustainability of urban form at the NUTS 3 level was largely inconclusive except for the most extreme form of diffuse development. A more thorough investigation using multiple regressions on individual sustainability indicators rather than the composite index value could uncover more significant relationships. As stated in Chapter 2, the results of the manual morphological analysis could also be compared to automated methods (e.g. based on

entropy or centricity). Finally, it would be interesting to see how a shift to grid cells rather than NUTS 3 areas changes the results.

The SUPER project demonstrated that the LUISETTA model could be used to create divergent urbanization scenarios. However, many problems were also encountered in this application. For example, the changes made to the input module determining the demand for urban land use were not well reflected in the output. This makes it more difficult to simulate increased densities, which is an important parameter in the discussion. Moreover, in its current form, it lacks information about policies at the (sub)national level and cannot simulate large-scale urban development.

6.3.3 On Interventions and Practices

The SUPER project provided evidence that policy and interventions matter (see Sect. 6.2.2), but more research efforts are needed to substantiate this claim. The SUPER intervention database is an excellent starting point, but it can and should be expanded. Existing information based on survey data and best judgment should be supplemented with academic research if available. Particularly the assessment of success and sustainability requires attention. Seen in this way, many entries in the intervention database could serve as a basis (or as a hypothesis) for more in-depth comparative research. In addition, due to data constraints, some topics such as fiscal policies and the interface between property rights and spatial planning were insufficiently addressed. It would be helpful to combine the insights regarding the sustainability of interventions with this more institutional strand of inquiry.

Applied policy research should not seek to impact by promoting 'best practices' to be replicated in other contexts, but by inspiring decision-makers to think outside their box of local practices (Shami, 2003, p. 80). It also provides them with a narrative of what could work. This was also the approach taken by two ESPON SUPER spin-off activities which applied insights to the project to support policymaking in Lithuania and Croatia (Berisha et al., 2023a).

6.4 A Final Note to Planning Practitioners and Scholars

First, we would like to make a case for the concept of sustainability. It is easy to become cynical about sustainable urbanization. Since its inception, the notion of sustainable development has been continually reinterpreted, and sometimes willingly distorted and manipulated, to the point that it often rings hollow. Recalling Wildavsky's (1973) famous statement about planning, if sustainability is everything, maybe it's nothing. Stretching its definition to fit new contexts and applications can undermine its integrity and its force as an agent of much-needed change. In fact, it can arguably become an agent of, or at least complicit to, greenwashing. Nevertheless, we would like to advance that precisely these two attributes of sustainability—its flexibility and breadth—are very useful for those in the planning profession.

- Flexibility: planners are acutely aware that the level at which a planning issue manifests itself as a problem is not necessarily that at which planning instruments are set—there is always a need for local interpretation and ad hoc rescaling. Ideally, sustainability should not be understood as an absolute measure but as a highly context-dependent orientation. A glocalized orientation can act as a bridge.
- Breadth: planners, especially in systems adhering to the comprehensive integrated approach, are keenly aware that their activity entails a balancing act between competing interests. Broad sustainability helps to search for win/win solutions while making trade-offs explicit. In negotiation theory, complexity is advantageous because it increases the chances of shifting zero-sum distributive bargaining into integrative joint problem-solving (Susskind & Cruikshank, 1987).

Second, we would like to call for more attention to urbanization processes because this is potentially where planners can make the most difference; the tools planners wield are primarily linked to regulating land use, especially urban development. However, current planning scholarship has other things on its mind, much of it related to social justice. It is telling that at major European planning conferences such as AESOP, there is rarely a separate track on urbanization or land-use planning (only a single track on law at the 2023 congress mentions planning

instruments). Given that spatial strategies, zoning plans and planning permission continue to comprise the bulk of what planners do on an everyday basis, this may signal a rift between academia and practice.

The much-maligned concept of sustainability can perhaps help pull these disparate worlds together. Bearing in mind its relevance for planning with respect to flexibility and breadth as argued above, sustainability can also be viewed as a form of justice. Its temporal interpretation demands that future generations be given a say in present decision-making and its thematic interpretation does the same for ecological and social aspects (under the assumption that economic interests represent themselves sufficiently). So sustainable urbanization is something that could unite those in and around the planning profession. As we rapidly urbanize the planet, this is not a trivial consideration.

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