

# Urban Planning

Open Access Journal | ISSN: 2183-7635

Volume 2, Issue 4 (2017)

## Garden Cities and the Suburban Antidotes

Editors

Markus Hesse and Geoffrey Caruso

Urban Planning, 2017, Volume 2, Issue 4  
Garden Cities and the Suburban Antidotes

Published by Cogitatio Press  
Rua Fialho de Almeida 14, 2º Esq.,  
1070-129 Lisbon  
Portugal

*Academic Editors*

Markus Hesse, University of Luxembourg, Luxembourg  
Geoffrey Caruso, University of Luxembourg, Luxembourg

Available online at: [www.cogitatiopress.com/urbanplanning](http://www.cogitatiopress.com/urbanplanning)

This issue is licensed under a Creative Commons Attribution 4.0 International License (CC BY).  
Articles may be reproduced provided that credit is given to the original and *Urban Planning* is  
acknowledged as the original venue of publication.

---

## Table of Contents

<b>Suburban Innovations</b> Pierre Fillion	137–140
<b>‘A Peaceful Path to’ Healthy Bodies: The Biopolitics of Ebenezer Howard’s Garden City</b> Samuel M. Clevenger and David L. Andrews	141–145
<b>Suburban Infill to Redevelop Suburbia—Retrofitting Post-Suburban Business Locations in the Zürich Metropolitan Area as a Component of Growth Management</b> Hendrik Jansen	146–160
<b>Comparing the Landscape Fragmentation and Accessibility of Green Spaces in Territories-in-Between across Europe</b> Alexander Wandl	161–180
<b>Garden Cities of the 21<sup>st</sup> Century: A Sustainable Path to Suburban Reform</b> Nicolas Vernet and Anne Coste	181–196

---

## Foreword

### by Markus Hesse and Geoffrey Caruso

Urban population is definitely increasing worldwide and what is known as “urban sprawl” in particular has been largely depicted as a problematic and unsustainable form of urban development. Compact city principles have been presented as perfect antidotes and became the flagship of urban policy over the last 15 years in many Western countries. Increasingly, however, it becomes obvious that too simplistic density policies have been trapped in many difficulties, e.g., low level of acceptance, gentrification and segregation, health and pollution exposure impacts, limited impact on the increasingly complex mobility patterns, mismatch of location, buildings and neighbourhood qualities to lifecycles and new family organizations, difficulties to adapt building stocks to innovative energy infrastructure, urban infill with halo effects on biodiversity corridors, etc. Those traps reflect a still limited understanding of the functioning of suburbs and of the complexity of suburbanization processes.

Rather than equating suburbs to sprawl, the selection of papers in this themed issue of *Urban Planning* considers suburbs as an in-between space—between the city and the countryside, between urban and suburban politics—whose sheer existence and broad distribution across the world calls for transformation towards more sustainable forms of development. More particularly the issue proposes complementary approaches that provide analytical insights into suburban problems and developments. They all challenge the practice of planning for and in suburbia in light of its in-betweenness or of some remoteness from central locations, hence question the necessary ingredients for brewing an antidote, needed perhaps, to counteract the bads of suburbs.

In a starting commentary, Pierre Filion stresses the transitory nature of suburbs as they emerged over the last 70 years in order to remind us of their transformative potential rather than as lock-ins. The article by Hendrik Jansens contributes likewise into showing the continuous transformation of a spatial stock by taking the example of the infill and retrofitting of suburban businesses around Zürich. The other three contributions prolong and bridge the suburban dynamics and configurational aspects with the concept of Garden Cities supposedly allying the goods of cities and countryside. Alexander Wandl depicts the spatial connection between the ‘urban’ and the ‘green’ in suburbs, including gardens, and propose an analytical method to measure fragmentation and accessibility in this particular interface. Nicolas Vernet and Anne Coste contrast the Garden City with sprawl. They highlight the configurational benefits of the Garden city concepts when environmental and energy preoccupations are integrated within a systemic and multi scalar approach. In a second commentary, Samuel Clevenger and David Andrews invite cautiousness. They show how deeply Garden Cities models and its early practice were rooted in elite sanitary views, with little, if any, interest for social inclusion. A dangerous trap one cannot fall again in if garden city configurations are revisited to operationalise today’s revived interest for urban nature and health as important parts of urban sustainability agendas.

---

Commentary

## Suburban Innovations

Pierre Filion

School of Planning, University of Waterloo, Waterloo, Ontario, N2L 3G1, Canada; E-Mail: pfilion@uwaterloo.ca

Submitted: 12 November 2017 | Accepted: 13 November 2017 | Published: 11 December 2017

### Abstract

This commentary addresses the evolution of the North American suburb over the last 70 years, a period over which it adopted a development pattern marking a radical break from prior forms of urban settlement. Early in this period, the emerging suburban form constituted perhaps the sharpest transition in the history of urbanism in terms of urban form and transportation. This suburban form rapidly came to dominate North American metropolitan regions and spread to other parts of the world. In this commentary, I propose a brief history of the North American suburb since the late 1940s seen through the lens of the contributions it made to the evolution of urbanism across the continent. I contend that while suburbs are often associated with urban stasis, because perceived as an impediment to the emergence of new environmentally sensitive and socially and functionally integrated urban formulas relying on public transit and walking, they have played a major transformative role in the past and may be the source of further urban transitions in the future. North American suburbs have also undergone deep social changes over the last decades. However, I question the claim, made by some researchers, that we are entering a post-suburban era; but at the same time, I acknowledge the possibility of major future innovations within present suburban configurations.

### Keywords

dispersion; landscape urbanism; New Urbanism; North America; post-suburbanism; recentralization; suburb; suburban innovations

### Issue

This commentary is part of the issue “Garden Cities and the Suburban Antidotes”, edited by Markus Hesse and Geoffrey Caruso (University of Luxembourg, Luxembourg).

© 2017 by the author; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

### 1. The Dispersed Suburb Revolution

The commentary relates to the Garden City themed issue in two ways. First, the Garden City was the first integrated model of a low-density peripheral development with abundant green space. Such a form of development influenced the North American suburb of the last 70 years, even if there are significant differences between the two types of suburban development, such as the contiguity of North American suburbs and their centreless configuration. Second, just as the Garden City represented a radical transformation of the prevailing urban form, so did the dispersed North American suburb some 50 years later.

The historical narrative begins with the North American suburb becoming a foremost urban innovation. It is indeed difficult to overestimate the extent to which

the suburban form that took shape from the late 1940s to the early 1960s revolutionized the morphology, journey patterns and social geography of North American metropolitan regions. Centralized, public transit dependent and relatively high-density agglomerations experienced rapid decentralization, escalating reliance on the automobile and falling density. A new model of development—the dispersed suburb model—took shape over the 15 years that followed World War II. The dispersed suburb is characterized by a near universal reliance on the car and land use patterns that are adapted to this form of transportation: generally low density, zonal specialization, dispersion of structuring activities (employment, retailing, institutions; Filion, Bunting, & Warriner, 1999). The influence of heavy automobile use was also mirrored in other land use innovations shaping the dispersed suburb. These include ex-

pressways, curvilinear streets, super blocks bordered by arterials, and buildings forms, such as shopping malls, adapted to large automobile-based catchment areas.

The rapid expansion of dispersed suburbs was driven by the accelerated growth of a blue- and white-collar middle class propelled by a long period of prosperity from the late-1940s to the mid-1970s. As described by David Harvey (1981), suburbs became the ‘spatial fix’ of Fordism, playing a foremost role in securing the consumption and production needs of this regime of accumulation. Reliance on a wide array of durable goods— notably, single family homes, automobiles, appliances— is indeed at the core of the dispersed suburban life style. The accumulation of consumer goods was supported by the comparatively large amount of space available to households in suburbs. The dispersed suburb thereby played a key macroeconomic role by providing an outlet for the Fordist production of goods. At the same time, vast suburban industrial parks were well suited to the single-floor assembly-line production of standardized goods, many of them consumed by suburbanites.

## 2. Suburban Path Dependences and Social Diversification

Within a few decades, the dispersed suburban model became the dominant North American metropolitan form, with the central city accounting for a decreasing minority of the regional built environment, population and economic activity. Once in place, it is difficult to modify the dynamics of the dispersed suburb, in large part because of the interrelation between automobile transportation and low-density, functionally specialized land-use patterns. Prevailing suburban land use cannot be modified without a simultaneous sizeable transportation modal shift, and such a transportation change requires a transformation of land use. Other path dependences assuring the perpetuation of dispersed suburban development patterns include habits and preferences of residents— shaped by their living environment— as well as interests vested in this form of development and the financial mechanisms supporting suburban dispersion (Atkinson & Oleson, 1996; Blais, 2011). Hence the impression that suburban dispersion has become a factor of inertia preventing the adjustment of metropolitan development to changing societal social and economic circumstances and to rising environmental awareness.

Yet, North American suburbs have experienced ongoing evolution, albeit at a slower pace than over the early years of the dispersion model. This evolution has mostly taken the form of an adaptation of land uses to expanding catchment areas of car users. Examples of new forms of development arising in such contexts include big box stores, multiplex cinemas and ever larger supermarkets. But the main transformation of suburbs has been of a social nature. The makeup of the population of suburban areas has transitioned from being solidly white middle class to becoming increasingly diversified from an

income, racial and ethnic perspective. In a fragmented land use configuration structured by the super block and single-use zoning, social diversification has led to a social segmentation of suburban space. The evolution of the North American suburb thus combines path dependences, which maintain prevailing land use patterns and transportation dynamics in place, with the unfolding of profound social transformations. These path dependences determine the spatial configuration of these social transformations. The outcome is low-income social groups living in an environment that was conceived for middle-class households. These social groups are therefore confronted to living environments that are expensive to negotiate, as in the case of a forced reliance on the car and the high purchasing and maintenance cost of single-family homes relative to other forms of housing. The ‘spatial fix’ of Fordism is not so well adapted to the income polarization induced by automation, globalization and neoliberalism (Hackworth, 2006).

## 3. Post-Suburbanism

Over the last decades, the North American suburb has been the object of planning innovations causing some observers to proclaim the onset of a post-suburban era (e.g., Charmes & Keil, 2015). One such innovation has been the introduction of the New Urbanism model, which attempted to raise the density and pedestrian appeal of new developments, while deemphasizing the presence of the car and adopting traditional vernacular architectural styles. The ‘back to the future’ characteristics of new urbanism also include the adoption of an orthogonal street layout with back lanes for garage access, and in early versions of the model, the presence of a traditional retail main street. The expectation on the part of the promoters of new urbanism that their model would transform suburban development proved to be exaggerated. New Urbanism remained confined to a niche market. Another difficulty with New Urbanism is that it failed to generate functional walking, in large part due to the economic failure of main street retailing in this context, and the removal of this feature from later New Urbanism developments. Finally, despite their distinctive morphological features, New Urbanism subdivisions were inserted within the super-block structure and adopted the high automobile reliance of conventional suburban subdivisions.

Landscape Urbanism constitutes another reaction to conventional North American suburban development. Its principles, however, clash with those of New Urbanism. Landscape Urbanism is not concerned with density and street layout. Its approach concentrates on the greening of suburban development by relying more on natural assets (e.g., existing stream systems and woodlots) and green infrastructures (e.g., green roofs and porous pavements allowing water infiltration) (Benedict & McMahon, 2006). It attempts to abate the environmental impact of the dispersed suburb without challeng-

ing its defining land-use features or its reliance on the car (Waldheim, 2006).

There are also attempts to recentralize suburbs by creating multi-functional walking- and public transit-conducive centres, thus breaking with the car-orientation, low-density and land-use specialization features of the dispersed suburb. Such centres can be developed at different scales, depending on the size of their catchment areas: the neighbourhood, the municipality or a quadrant of the metropolitan region (Filion, Kramer & Sands, 2016).

We can query if a widespread adoption of these alternatives to the dispersed suburb could yield a qualitatively different suburban form. Could it change the transportation-land use dynamics of the dispersed suburb and usher in the post-suburban era? The query cannot be answered at this stage of the evolution of the North American suburb for the scope at which alternative models have been implemented has been too modest to impact significantly the dispersed suburb.

#### 4. Future Suburban Innovations

Future suburban innovations are likely to emerge from two sources: responses to tensions affecting suburbs and technological advancements. Tensions presently felt in suburbs stem to a large extent from falling incomes (e.g. United Way Toronto & York Region, 2017). These conditions call for more public services at the very time when filtering down suburban municipalities are confronted to declining revenues while having to attend to expensive renewal of aging infrastructures (Brown, 2014; Hodson & Marvin, 2015). Another source of tension is traffic congestion on suburban expressways and arterials, the outcome of near universal reliance on the automobile. There is also the environmental degradation associated with dispersed suburban development: the large environmental footprint of suburban areas (much in excess of their already extensive built perimeter) primarily due to voracious energy consumption (Wackernagel & Rees, 1996); the absorption of rural and natural land; impermeable surfaces interfering with water infiltration; air pollution and greenhouse gases emissions. These tensions have prompted the search for new forms of suburban development characterized by intensification, a variety of housing types, improved public transit and growth boundaries containing outward expansion. But to date, these alternatives have been more objects of discussions or planning objectives, than actual transformations.

Innovation technologies most likely to influence the future of the North American suburb include information technology applications to urban areas. Information technology contributions to the operation of suburbs could, for example, make for more efficient energy production and consumption, improve delivery and transportation systems and reduce construction, and thereby housing, cost through more advanced building techniques. But it is noteworthy that to date the im-

pact of information technology on suburban form and dynamics has been held back by the ongoing requirement to commute and the human need for face-to-face contact. Likewise, it has proven difficult to translate big data into planning innovations with practical applications. Presently, there is much discussion about the anticipated impact self-driving cars will have on urban areas. As these vehicles will operate within the existing transportation infrastructures of dispersed suburbs and will further reduce the friction of distance, self-driving cars are likely to further rather than challenge dispersion. The door-to-door availability of self-driving cars and the low cost of this transportation option in its taxi-like applications may wipe out suburban public transit and thus impede the densification and recentralization effects that could ensue from quality public transit.

#### Conflict of Interests

The author declares no conflict of interests.

#### References

- Atkinson, G., & Oleson, T. (1996). Urban sprawl as a path dependent process. *Journal of Economic Issues*, 30(2), 609–615. doi:10.1080/00213624.1996.11505825
- Benedict, M. A., & McMahon, E. T. (2006). *Green infrastructure: Linking landscapes and communities*. Washington, DC: Island Press.
- Blais, P. (2011). *Perverse cities: Hidden subsidies, wonky policy, and urban sprawl*. Vancouver, BC: UBC Press.
- Brown, H. (2014). *Next generation infrastructure*. Washington, DC: Island Press.
- Charmes, E., & Keil, R. (2015). The politics of post-suburban densification in Canada and France. *International Journal of Urban and Regional Research*, 39(3), 581–602. doi:10.1111/1468-2427.12194
- Filion, P., Bunting, T., & Warriner, K. (1999). The entrenchment of urban dispersion: Residential preferences and location patterns in the dispersed city. *Urban Studies*, 36(8), 1317–1347. doi:10.1080/0042098993015
- Filion, P., Kramer, A., & Sands, G. (2016). Recentralization as an alternative to urban dispersion: Transformative planning in a neoliberal societal context. *International Journal of Urban and Regional Research*, 40(3), 658–678. doi:10.1111/1468-2427.12374
- Hackworth, J. (2006). *The neoliberal city: Governance, ideology, and development in American urbanism*. Ithaca, NY: Cornell University Press.
- Harvey, D. (1981). The spatial fix—Hegel, von Thunen, and Marx. *Antipode*, 13(3), 1–12. doi:10.1111/j.1467-8330.1981.tb00312.x
- Hodson, M., & Marvin, S. (Eds.). (2015). *Retrofitting cities: Priorities, governance and experimentation*. Abingdon and New York: Routledge.

United Way Toronto and York Region. (2017). *The opportunity equation in the Greater Toronto Area: An update on neighbourhood income inequality and polarization*. Toronto and Markham, ON: United Way Toronto and York Region.

Wackernagel, M., & Rees, W. E. (1996). *Our ecological footprint: Reducing Human impact on the Earth*. Gabriola Island, BC: New Society Publisher.

Waldheim, C. (Ed.). (2006). *The landscape urbanism reader*. New York: Princeton Architectural Press.

#### About the Author



**Pierre Filion** is a professor of Urban Planning at the University of Waterloo School of Planning in Waterloo, Canada. He has published approximately 150 journal articles and book chapters. His areas of research include the relation between transportation and land use, metropolitan-scale planning and suburban areas. He is currently investigating the transformation of North American suburbs through recentralization strategies.



Commentary

## 'A Peaceful Path to' Healthy Bodies: The Biopolitics of Ebenezer Howard's Garden City

Samuel M. Clevenger \* and David L. Andrews

Physical Cultural Studies Program, Department of Kinesiology, University of Maryland, College Park, MD 20740, USA;  
E-Mails: scleveng@umd.edu (S.M.C.), dla@umd.edu (D.L.A.)

\* Corresponding author

Submitted: 21 November 2017 | Accepted: 22 November 2017 | Published: 12 December 2017

### Abstract

Recent renewed discussions of the garden city as a “developmental model for the present and foreseeable future” (Stern, Fishman, & Tilove, 2013) have prompted us to reflect upon its endurance as an agent of spatial and urban reform. Looking to extend the established garden city literature, we argue the history of Ebenezer Howard's community model should be reexamined as a cultural history of body and environmental politics. In this commentary, we explicate how Howard's garden city model served as a spatial vehicle for installing the biopolitical agendas of Victorian reformers keen to “civilize” working class bodies in the service of British industrial and imperial power. This entails a brief examination of the biopolitical dimensions of garden city history, keying on the prescribed restructuring of urban life and the concomitant “regeneration” of working class bodies within and through garden city designs. Our aim is to challenge scholars, planners, and policymakers of the garden city *present*, to consider the ways the garden city was historically planned to reproduce the cultural, spatial, and biopolitical relations of Western capitalism.

### Keywords

biopolitics; countryside; Ebenezer Howard; embodiment; garden city; nature; working class

### Issue

This article is part of the issue “Garden Cities and the Suburban Antidotes”, edited by Markus Hesse and Geoffrey Caruso (University of Luxembourg, Luxembourg).

© 2017 by the authors; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

### 1. Introduction

Planning is an exercise of power. (White, 1995)

In September 2014 the international politics magazine *Foreign Policy* reported on the revival of Sir Ebenezer Howard's (1898) “garden city” as a fruitful model for sustainable urban planning (Hurley, 2014). The article's central premise keyed on the salience of Howard's model as an ecologically-friendly strategy of urban reform, designed to address the multiplying effects of climate change through the adoption of more preserved green spaces and humane planning schemes. “Some people,” the tagline proclaimed, “think it just might help save the planet” (Hurley, 2014). One such advocate was Yale Uni-

versity Professor Robert A. M. Stern, who conspicuously anointed the garden city a “developmental model for the present and foreseeable future” (Stern, Fishman, & Tilove, 2013). Further corroborating the renewed interest in garden cities, only a few months prior to the *Foreign Policy* piece, U.K. Prime Minister David Cameron announced the building of at least three new garden city-inspired communities as part of his Conservative Government's strategy for addressing the nation's escalating housing shortage (Mason, 2014). Evidently, the garden city is experiencing something of a twenty-first century renaissance.

There is little need to recapitulate the acknowledged significance of Howard's garden city in the history of urban, town and regional planning. Historians (Beevers,

1988; Meacham, 1999; Parsons & Schuyler, 2002) have long examined the important economic, social and cultural contexts surrounding the garden city's emergence in Howard's foundational and influential treatise, *To-morrow: A Peaceful Path to Real Reform* (1898). Others (Buder, 1990; Creese, 1966) have elucidated the international dissemination of the garden city in the twentieth century, and the movement's wide-ranging impact on the global planning of new, preconceived cities. There is also an abundance of scholarship shedding light on the achievements and problems of the international garden city movement, including the planners' links to "techno-cities" (Kargon & Molella, 2008), class paternalism (Meacham, 1999), colonialism (Bigon & Katz, 2014), eugenics (Voigt, 1989), and the values and relations of capitalism (Pinder, 2005). Furthermore, the garden city can now be understood in terms of its impact on the rise of New Urbanism (Stephenson, 2002), the international movement for New Towns (Buder, 1990; Christensen, 1986), and the history of urban public health policies (Corburn, 2009, 2013). Hence, through myriad vehicles and venues—and whether acknowledged or otherwise—the garden city continues to inform the philosophy and practice of modern urban planning as the world enters the "age of the Smart City" (Hügel, 2017).

The enduring influence of the garden city on urban design prompted us to reflect upon what we consider to be a routinely overlooked dimension of this complex phenomenon. Namely, the cultural politics—or what we refer to as the biopolitics—of the garden city movement. In *To-Morrow* (1898), Howard wrote of the community model's amenities in terms of their social, physical, and natural "healthfulness," and its prescribed form looking not just at the reformation of urban environments, but also, and crucially, for the reformation of urban bodies. For some reason, contemporary commentators habitually fail to acknowledge the unapologetically eugenic and biopolitical objectives articulated within, and through, Howard's schematic. For instance, in Hurley's (2014) and Stern, Fishman and Tilove's (2013) contemporary accounts, the garden city is strictly an agent of spatial and urban reform: an influential experiment in potentially sustainable community building, prefigured on the planning and execution of: "well-built homes for people of diverse means," "clean air and ample green space," and a local, ample "employment, education, and culture..." (Hurley, 2014). While each of these elements incorporates an embodied dimension—specifically in their goal of improving the health and well-being of community residents—the patrician pathologizing of urban bodies and cultures so engrained within Howard's philosophy is largely overlooked.

The garden city was fundamentally a biopoliticized community model for repopulating and restoring the health and constitution of urban working class bodies. While expressed in different iterations, each garden city community was designed to prescribe particular, bourgeois forms of embodied living. The planners

imagined that pre-industrial, pastoral living and social arrangements—with their country cottages, perceived architectural modesty and durability, fresh rural air, sunlight, familial and village cooperation, local produce, and open, natural spaces that protected the community from urban encroachment—were "naturally" healthier in relation to the ravages of the Victorian urban maelstrom, and believed they could bring such nostalgic visions of the pre-industrial bucolic to material fruition through modern town planning. In short, they believed the garden city would improve the social, cultural, as well as physical health of the urban working class by providing pre-designed spaces to nurture lives, practices, and social relations that were framed by a closer relationship with a particular rendition of "nature". For us, any examination of garden cities necessarily involves a cultural history of body and environmental politics as much as a history of urban planning and design. Hence, within the remainder of this commentary, we offer insights into how the garden city movement was shaped by Howard's and the planners' biopolitical agenda, as they sought to constitute "naturally healthy" spaces of living designed to ameliorate the deficiencies of urban working class bodies and cultures.

## 2. Garden City Biopolitics

While it may be overlooked in its contemporaneous iterations, from its inception the garden city incorporated a biopolitics prefigured on the liberation of urban working class bodies from the debilitating shackles of urban industrialization, through their prescribed relocation to planned communities balancing "town" and "country" life. When Howard envisioned a community that could unite the cultural amenities of urban life with the "natural healthfulness of the country" (1898, p. 9), he drew from a socially constructed vision of healthy, "civilized" cultural habits and a bourgeois English nostalgia for pastoral spaces, housing, and social arrangements (Meacham, 1999). Evoking Western, Christian mythology of "nature" as a feminized "Garden of Eden" (Merchant, 2003), Howard wrote the countryside was nature's "bosom," a source of "all health, all wealth, all knowledge." In contrast, the industrial city, with its "social opportunities," "places of amusement," and employment, provided inadequate sunlight and fresh air, overcrowded, unsanitary, and expensive housing, and little opportunity for "healthy" interaction with countryside spaces (1898, pp. 7–10). Victorian reformers, fearful that the physical and social "degeneration" of urban workers would undermine British imperial power (Thorsheim, 2006), embraced and promoted Howard's garden city, arguing it was a spatial palliative for returning urban dwellers to the traditional, "healthy" pastoral spaces of British imperial mythology. In this way, the garden city movement emerged during a period in which "the biological manipulation of human bodies" (Shea, 2010, p. 153) became increasingly integral to the political agendas of Western reformers keen to "civilize" and discipline (Foucault, 1995)

the workers of their overcrowded, unsanitary, unhealthy industrial urban centers. The garden city would mitigate these deleterious effects of industrial capitalism and provide urban workers with the essentials for a healthy life, simultaneously defusing the discontentments impelling contemporary radical labor movements.

Early twentieth century advocates of English garden cities exhibited a paternalist and benevolent approach to working class health that was, at least partially, imbued with a racial nationalism preoccupied with the preservation of British imperial strength. This Anglo-Saxon elite (comprising prominent liberal members of Parliament, British nobles, and industrialists) believed the “degenerating”/degeneration of urban working class health to be detrimental to the overall “health” of the British Empire. At the groundbreaking of the first English garden city at Letchworth, the Right Honourable Earl Grey proclaimed garden cities would stymie the “evil” plaguing British national body politic: the “ill regulated and anarchic growth” of Britain’s large cities, and its “sapping” of “the strength and poisoning the character of the Nation.” Workers could now be removed from the “squalid and depressing monotony” of the urban “sunless slums,” and resettled onto garden cities with “civilized” recreation and an “organised influence to mould” young British men “into honest citizenship...” (First Garden City Limited, 1903). Because it provided access to “naturally healthy” traditional English rural and open spaces in conjunction with “civilized” recreational and cultural activities, elite supporters promoted the garden city as an important instrument for physically, culturally, and socially “civilizing” urban dwellers through what amounted to the paternalist regulation of working class bodies and habits. The garden city was part of their overall biopolitical agenda for preserving the racial and moral vitality of the British Empire.

The biopolitics of urban and community design is not a new discussion for urban planners and architects (Aggregate, 2012; Hauptmann, Neidich, & Angelidakis, 2010; Wallenstein, 2009). There is a still-developing canon of theoretically-nuanced scholarship pertaining to the institutional maintenance and regulation of bodies in modern societies (Rose, 2007; Foucault, 2008; Lemke, 2011). Yet, rarely is the history of garden cities framed or studied in terms of the planners’ implicit biopolitical objectives: as “a spatial machine that would render and regulate human sociality” and bodies “towards particular—governmental—ends.” (Osborne & Rose, 1999, p. 748). Historians and scholars place great emphasis on the fact that Howard, and garden city planners such as Sir Raymond Unwin, were social reformers influenced by radical ideas of British and American socialist and anti-capitalist thinkers (such as William Morris, John Ruskin, Edward Carpenter and Edward Bellamy; Buder, 1990). Howard and early inspired planners, however, routinely spoke of the garden city as a strategy for regulating and remaking the everyday activities of residents by resettling them into a prescribed community form that would structure

“healthier” social relations through provisions such as access to “open spaces” and parks. The problematic inferences to eugenics doctrine in Howard’s original depiction of the garden city, and the model’s subsequent incorporation in the racial hygiene programs of Nazi Germany (Voigt, 1989; Fehl, 1992), illustrate the entrenched biopolitical elements of garden city ideals. Only by placing the history of the garden city in conversation with theories of biopolitics and modern biopower can we begin to see how the garden city movement discourse was based on an idealization of “healthy bodies” molded by the planners’ cultural definitions of health, nature, and bourgeois perceptions of urban working class bodies.

Revisiting the biopolitical dimensions of garden city history allows for a more nuanced understanding of the inherent class politics entailed in contemporary garden city boosterism. Recently, the Town and Country Planning Association—originally founded by Ebenezer Howard as the Garden City Association—called for the British Government to guarantee affordable housing at the newly planned garden city at Ebbsfleet. The organization asserted that Ebenezer Howard’s original garden city principles demand “genuinely affordable housing for all budgets” (Booth, 2014). Yet, from the early years of Letchworth Garden City’s development, the planners encountered strong criticism from local laborers who objected to the more expensive, bourgeois aesthetics of the community’s houses. Letchworth planner Raymond Unwin, for example, stipulated the houses be built using materials that could restore what he called an “organic unity” between dwelling and the surrounding environment. A deeply nostalgic believer in the natural healthfulness of pre-industrial architecture, Unwin demanded that building aspects as minute as roofing tiles were necessary for the social and biological health of the community. When he mandated that expensive red clay tiles be the only roofing material used in Letchworth, local laborers protested that they should be able to use grey slates, a cheaper roofing material commonly found on urban tenements at the time. Unwin, however, retorted that the advantages in using red tiles outweighed the difference in cost, for they contributed to a “healthy,” necessary “unity of effect” between house and countryside (“Artistic Problems,” 1906). In his planning of Letchworth Garden City, installing the correct conditions for his vision of healthy living supplanted the initial affordability of community housing. Thus, as renowned British historian Eric Hobsbawm (1989) wrote, garden cities “followed a town planning path well-trodden by the middle and upper class suburbs of the period” (p. 167), resulting in a community whose social opportunities and spatial arrangements exacerbated class conflict.

### 3. Conclusion

In summary, we believe the garden city should be considered less as a reformist model promising sustainable housing and living arrangements, and more an endur-

ing built environment form that emerged as a paternalist strategy for the maintenance of people's bodies and the reproduction of capitalist social and spatial relations. If contemporary planners and architects want to engage with the garden city model in terms of its utility in creating more humane, equitable, and environmentally sustainable living environments in this ecologically turbulent epoch of the "Anthropocene" (Angus, 2016), they must first come to terms with its deep historical links to problematic idealizations of "healthy bodies," and its function as a spatial blueprint for the regulation and maintenance of particular forms of embodied living. Only then can we initiate productive conversations on the garden city's role in the creation of inclusive communities that respect, rather than regulate, a multiplicity of sustainable modes of living and interacting with surrounding environments.

### Conflict of Interests

The authors declare no conflict of interests.

### References

- Aggregate. (2012). *Governing by design*. Pittsburgh: University of Pittsburgh Press.
- Angus, I. (2016). *Facing the Anthropocene: Fossil capitalism and the crisis of the Earth system*. New York: Monthly Review.
- Artistic problems of garden city. (1906, March 3). *The Hertfordshire Express and General Advertiser*.
- Beevers, R. (1988). *The garden city utopia: A critical biography of Ebenezer Howard*. New York: St. Martin's Press.
- Bigon, L., & Katz, Y. (Eds.). (2014). *Garden cities and colonial planning: Transnationality and urban ideas in Africa and Palestine*. Manchester and New York: Manchester University Press.
- Booth, R. (2014, April 22). New garden cities must offer genuinely affordable homes, says charity. *The Guardian*. Retrieved from <https://www.theguardian.com/politics/2014/apr/22/garden-cities-affordable-homes-tcpa-ebbsfleet-howard-leitchworth>
- Buder, S. (1990). *Visionaries and planners: The garden city movement and the modern community*. New York: Oxford University Press.
- Christensen, C. A. (1986). *The American garden city and the new towns movement*. Ann Arbor, MI: UMI Research Press.
- Corburn, J. (2009). *Toward the healthy city: People, places, and the politics of urban planning*. Cambridge, MA: MIT Press.
- Corburn, J. (2013). *Healthy city planning: From neighbourhood to national health equity*. New York: Routledge.
- Creese, W. L. (1966). *The search for environment: The garden city before and after*. New Haven: Yale University Press.
- Fehl, G. (1992). The Nazi garden city. In S. V. Ward (Ed.), *The garden city: Past, present and future* (pp. 88–106). London and New York: Spon.
- First Garden City Limited. (1903). *The garden city movement; private view of Letchworth Estate, October 9th 1903* (LBM3126). Letchworth: First Garden City Limited.
- Foucault, M. (1995). *Discipline and punish: The birth of the prison*. New York: Vintage Books.
- Foucault, M. (2008). *The birth of biopolitics: Lectures at the Collège de France, 1978–1979*. (G. Burchell, Trans.). New York: Picador.
- Hauptmann, D., Neidich, W., & Angelidakis, A. (Eds.). (2010). *Cognitive architecture: From bio-politics to noo-politics; Architecture & mind in the age of communication and information*. Rotterdam: 010 Publishers.
- Hobsbawm, E. (1989). *The Age of Empire, 1875–1914*. New York: Vintage Books.
- Howard, E. (1898). *To-Morrow: A peaceful path to real reform*. London: Swan Sonnenschein & Co.
- Hügel, S. (2017). From the garden city to the smart city. *Urban Planning*, 2(3), 1–4. doi:10.17645/up.v2i3.1072
- Hurley, A. K. (2014, September). The machine is a garden. *Foreign Policy*. Retrieved from <http://foreignpolicy.com/2014/09/26/the-machine-is-a-garden>
- Kargon, R. H., & Molella, A. P. (2008). *Invented Edens: Techno-cities of the twentieth century*. Cambridge, MA: MIT Press.
- Lemke, T. (2011). *Biopolitics: An advanced introduction*. New York: New York University Press.
- Mason, R. (2014, April 21). New garden cities not required to include low-cost homes, minister says. *The Guardian*. Retrieved from <https://www.theguardian.com/society/2014/apr/21/new-garden-cities-low-cost-homes>
- Meacham, S. (1999). *Regaining paradise: Englishness and the early garden city movement*. New Haven: Yale University Press.
- Merchant, C. (2003). *Reinventing Eden: The fate of nature in western culture*. New York: Routledge.
- Osborne, T., & Rose, N. (1999). Governing cities: Notes on the spatialisation of virtue. *Environment and Planning D: Society and Space*, 17, 737–760. doi:10.1068/d170737
- Parsons, K. C., & Schuyler, D. (Eds.). (2002). *From garden city to green city: The legacy of Ebenezer Howard*. Baltimore: Johns Hopkins University Press.
- Pinder, D. (2005). *Visions of the city: Utopianism, power and politics in twentieth-century urbanism*. New York: Routledge.
- Rose, N. S. (2007). *Politics of life itself: Biomedicine, power, and subjectivity in the twenty-first century*. Princeton: Princeton University Press.
- Shea, D. P. (2010). "Abortions of the market": Production and reproduction in news from nowhere. *Nineteenth-Century Contexts*, 32(2), 153–172.

doi:10.1080/08905495.2010.493447

Stephenson, B. (2002). The roots of the new urbanism: John Nolen's garden city ethic. *Journal of Planning History*, 1(2), 99–123. doi:10.1177/153132001002001

Stern, R. A. M., Fishman, D., & Tilove, J. (2013). *Paradise planned: The garden suburb and the modern city*. New York: The Monacelli Press.

Thorsheim, P. (2006). Green space and class in imperial London. In A. C. Isenberg (Ed.), *The nature of*

*cities* (pp. 24–37). Rochester: University of Rochester Press.

Voigt, W. (1989). The garden city as eugenic utopia. *Planning Perspectives*, 4(3), 295–312. doi:10.1080/02665438908725685

Wallenstein, S. O. (2009). *Biopolitics and the Emergence of Modern Architecture*. New York: Princeton Architectural Press.

White, R. (1995). *The organic machine: The remaking of the Columbia River*. New York: Hill and Wang.

### About the Authors



**Samuel M. Clevenger** is a PhD candidate in Physical Culture Studies in the Department of Kinesiology at the University of Maryland, College Park, MD, USA. His dissertation is a history of the biopolitics of the international garden city movement, with specific attention to the prescription of physical culture in the plans for British and American garden city communities. He has published research in the international journals *Rethinking History*, *Sport*, *Education and Society*, and the *International Journal of the History of Sport*.



**David L. Andrews** is Professor of Physical Cultural Studies in the Department of Kinesiology at the University of Maryland, College Park, MD, USA. His publications include *The Blackwell Companion to Sport* (edited with Ben Carrington, 2013, Blackwell), *Sport and Neoliberalism: Politics, Consumption, and Culture* (edited with Michael Silk, 2012, Temple University Press), and *The Routledge Handbook of Physical Cultural Studies* (edited with Michael Silk and Holly Thorpe, 2017, Routledge).

Article

## Suburban Infill to Redevelop Suburbia—Retrofitting Post-Suburban Business Locations in the Zürich Metropolitan Area as a Component of Growth Management

Hendrik Jansen

Research Group Built Environment, ILS—Research Institute for Regional und Urban Development, 44145 Dortmund, Germany; E-Mail: hendrik.jansen@ils-research.de

Submitted: 4 July 2017 | Accepted: 25 October 2017 | Published: 20 December 2017

### Abstract

Regional growth management has become a significant component of sustainable urban land development in many European metropolitan areas. Particularly in rapidly growing metropolitan regions, increasing population and job numbers require strategic planning management, but there is little knowledge about which planning instruments influence or direct these processes most effectively. Based on an analysis of spatial development in the Zürich metropolitan region, particularly in suburban areas, over the past several decades, this article examines the opportunities for the infill, revitalization and retrofitting of suburban business locations as key elements of growth management. In doing so, this article focuses on one central question: To what extent does (cantonal) regional planning and its specific instruments (cantonal structure plan) influence and control the spatial development and urban design quality in the retrofitting of suburban locations? The Glattal region was chosen as a case study as it experienced a significant change in terms of its urban structure during the last 10–15 years. In this context, suburban service locations were examined and analysed in depth using two case studies. The Hochbord area in Dübendorf and the Glattpark area in Opfikon demonstrate the conversion of formerly mono-functional areas (Hochbord) to mixed-use neighbourhoods and the development of new mixed-use locations (Glattpark). The article demonstrates how the suburban office stock transformed to strategic spots for mixed-use in both locations and explores how the retrofitting process could be directed at the cantonal level. In this context, spatial planning instruments at the regional level, such as the cantonal structure plan, seem to play a significant role in the transformation of the urban periphery.

### Keywords

growth management; retrofitting suburbia; suburban infill; urban revitalization

### Issue

This article is part of the issue “Garden Cities and the Suburban Antidotes”, edited by Markus Hesse and Geoffrey Caruso (University of Luxembourg, Luxembourg).

© 2017 by the author; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

### 1. Introduction

In recent decades, many cities across the world with metropolitan functions and regional expansion have experienced a strong influx of people and companies and a concomitant expansion of settlement structures. Recently, these decentralizing tendencies have been characterized by new qualities of suburbanization such as the formation of new centres with functional foci (Brake, 2005; Burdack, 2006; De Jong, 2014; Feindt, 2003; Phelps

& Wood, 2011). To ensure sustainable spatial development and to prevent urban sprawl, urban and regional planning institutions need to actively control these developments, considering the economic, spatial and design issues in both the densely built areas and the suburban, less densely built areas. From a regional perspective, this results in the increasing importance of entrepreneurial linkages and functional relocations (Hesse & Leick, 2013). In addition to regionalization tendencies and large metropolitan areas transforming into “polycen-

tric urban regions” (Kloosterman & Musterd, 2001; Meijers 2005) or “mega-city regions” (Hall & Pain, 2009), especially in suburban regions, increasingly differentiated locations have emerged.

Worldwide, suburban locations of the *Zwischenstadt* (“in-between city”) (Sieverts, 1997) consist of the same basic elements (supermarkets, shopping centres, highways, infrastructures, low-density housing), but significant differences appear in their local differentiation (Aring & Heffert, 2001; Roost, 2013). They often specialize in one dominant field (for example, offices, shopping, housing, trade or leisure) and can be described as “islands with their own profile in a spacious archipelago” (Kunzmann, 2001, p. 214). In recent years, research on the redevelopment and conversion of these locations has increased. Particularly in US discourse, the topic of retrofitting has become an important aspect in the mixing of uses, the legibility of urban structures, the conversion of existing structures and the assessment of public spaces in terms of walkability and landscaping (De Jong, 2014; Dunham-Jones & Williamson, 2009; Talen, 2011).

Particularly in the past 20 years, many studies have addressed the issue of local and regional growth management in the US (Dempsey & Platinga, 2013; Landis, 2006; Nelson, 1999), Europe (Bizer, Einig, Köck & Siedentop, 2011; Bramley & Watkins, 2014; Kühn, 2003) and Asia (Bengston & Youn, 2006; Wong & Lee, 2007; Yang & Jinxing, 2007). The results go in two directions: while some question the effects of urban growth regulations (land price effects, negative implications on the housing supply, and leapfrogging effects), there is also evidence that urban growth management leads to the spatial concentration of building activity and higher densities in the core areas of cities, thus protecting cultural and natural landscapes (Gennaio, Hersperger, & Bürgi, 2009; Siedentop, Fina, & Krehl, 2016). According to Siedentop et al., most studies show that growth management policies are effective but can have negative impacts when poorly managed.

The regional level is of specific importance in the debate of growth management and sustainable urban development here, since policies against urban sprawl and compact settlement structures can be implemented most effectively at this level. Autonomy and power are however, different in each national context (Pallagst, 2007).

Suburban areas can benefit from growth management, particularly since the inward development capacities of many metropolitan areas have been exhausted (Kraemer, 2006). Thus, building reserves in the urban peripheries have to be developed. In the context of European cities, in general, the model of intensification and densification dominates, as expressed, for example, by the Leipzig Charter on Sustainable European Cities (EU Ministers, 2007), in smart growth strategies in North America (Reeds, 2011; Urban Land Institute, 1998) and the Swiss cultural landscape initiative of 2012 in Switzerland (Canton Zürich, 2014; Scholl, 2015). How-

ever, strong population growth has led to a lack of available construction sites and building land in many European cities, so spatial planning and urban management need to increasingly focus on suburban areas and their capacities for infill. So far there is little knowledge about the capacities of regional planning instruments and their directing effects on the development of suburban office locations.

Based on previous research on the redevelopment of suburban service areas in the Frankfurt Rhine/Main region, this article examines the metropolitan area of Zürich to determine whether growth management in terms of inner development, structural densification and mixed-use of the core areas offer the opportunity to integrate former suburban locations more effectively into the regional spatial structure and to transform them into more integrated areas. The research on the Frankfurt Rhine/Main region analysed the potential for retrofitting suburban service areas in the region by comparing different urban design instruments at a local level (e.g., zoning plans and design guidelines; Jansen, Wünnemann, & Roost, 2017). The Zürich metropolitan region serves as an analogous example of how regional planning instruments influence the redevelopment of suburban city structures. Switzerland and the canton of Zürich use specific instruments in the field of growth management at a cantonal level. The canton represents the area of a county, of which 26 exist in Switzerland. The canton has wide-ranging legislative powers and strong political autonomy. This includes the planning of spatial development within the canton. In particular, the instrument of the cantonal structure plan (“kantonaler Richtplan”) combined with the regional and local structure plans is of importance here. Its main function is to control spatial development with a definition of the settlement areas (Canton Zürich, 2014).

This article focuses on how regional planning and its specific instruments (structure plans) can contribute to the requalification of suburban locations. Methodologically, it is based on different qualitative approaches that include partially standardized qualitative interviews with key actors at different spatial levels (canton, city and specific locations or projects;  $n = 15$ , see Table 1) that were conducted from September to October 2015 and between March and April 2017. Partially structured interviews were chosen, to detect the different views and opinions of stakeholders, especially since the research questions have qualitative foci. The interviews were transcribed, coded and compared in the overlapping areas (e.g., stakeholders from different spatial levels). Furthermore, a variety of planning documents, including the documents to structure planning at the cantonal level and design planning (Figure 3), were analysed and evaluated at the site level. Based on expert interviews, two case studies were identified that were investigated in depth through site visits.

Section 2 describes the growth management of the Zürich metropolitan region and its characteristics as a

polycentric city region. Section 3.1 analyses the specific development of the Glattal region, which is one of the most dynamic regions in terms of urban development and redevelopment of suburban areas. Sections 3.2 and 3.3 present the results of the case study analysis and empirical findings from the stakeholder interviews. The discussion and conclusion in sections 4 and 5 highlight the effects of the cantonal structure plan on the redevelopment of suburban service locations.

## 2. Growth Management of the Polycentric Zürich Metropolitan Region

The city of Zürich is located in the core of the polycentric Zürich metropolitan region. It has extensive functional and morphological connections to the surrounding communities and regions. Some of the most important areas

include the Limmattal, located to the Northwest of the city; the Glattal, located to the North and connected to the Zürich Airport; and the cities of Winterthur and Zug, which are located farther away and serve as financial and service centres (Canton Zürich, 2014). Because of its history as a financial city, the characteristics of the city of Zürich have been shaped by this activity. Since the 1980s, banks such as UBS and Credit Suisse have developed a spatial division of labour and spatial restructuring that were reflected in the site allocation of representative offices and back offices. The consequence of flexibilities such as these caused “fragmented, splintered settlement structures” (Schmid, 2006) with “Business Satellites”, the “outer cities”, “edge cities” (Garreau, 1991) or “Exopolis” (Soja, 1996). Schmid describes the urban landscape of Zürich as “floating centralities” with the “constant emergence of ever new and surprising urban configurations”

**Table 1.** List of interview partners.

No.	Level	Person	Position	Institution	Project	Interview Date
11	Cantonal	Wilhelm Natrup	Head of Department for Spatial Planning	Canton of Zürich	Various	07.10.2015
12	Cantonal	Mathias Loepfe	Employee at the Regional Planning Association Zürich	Raumplanung Zürich and Umgebund	Various	10.10.2015
13	Local	Pascal Hunkeler	Head of Urban Design Department	City of Zürich	Various	08.10.2015
14	Local	Anna Schindler	Head of Urban Development Department	City of Zürich	Various	26.10.2015
15	Local	Marco Forster	Employee in the Planning Department	City of Dübendorf	Hochbord	28.10.2015
16	Local	Nils Epprecht	Employee in a planning office	Office SAW	Hochbord	30.10.2015
17	Local	Roland Stadler	Employee in the Planning Department	City of Opfikon	Glattpark	23.10.2015
18	Science	Michael Koch	Professor for Urban Design	HCU Hamburg	Various	27.10.2015
19	Science	Simon Kretz	Research Associate at Institute of Urban Design	ETH Zürich	Various	12.10.2015
110	Local	Reto Lorenzi	Head of Planning Department	City of Dübendorf	Hochbord	01.04.2017
111	Local	Vinzenz Zedi	Head of Project Development	Mobilier AG	Hochbord	10.04.2017
112	Local	Walter Mosimann	Board of Interest Group	Interest Group Hochbord	Hochbord	26.04.2017
113	Local	Roland Stadler	Employee in the Planning Department	City of Opfikon	Glattpark	26.04.2017
114	Local	Johannes Eisenhut	Head of Project Development	Senn Resources AG	Glattpark/Hochbord	07.04.2017
115	Local	Bernhard Ruhstaller	Managing Director	Development Agency Glattpark	Glattpark	05.04.2017



(2006, p. 163). This development of Zürich settlement structures followed the economic concept of “flexible accumulation” in post-Fordism described by Harvey (1985, 2016). This refers to the division of work processes and their spatial characteristics. In the metropolitan area of Zürich, these developments led to a strong polycentric structure with numerous business locations in peripheral locations. Examples include, among others, the Cherstraße office park in Zürich-Kloten, the Hochbord industrial area in Dübendorf and the Leutschenbach office park. All these sites originated from former industrial areas that were gradually transformed to service facilities during the 1970s and 1980s and comprise areas between 25 ha and 35 ha.

Due to a prosperous economy, high quality of life and political stability, the metropolitan area is currently experiencing a strong growth phase. Between 2005 and 2010, the metropolitan area experienced a population growth of 100,000 inhabitants and, as of 2015, over 400,000 people live in Zürich and approximately 1.7 million people live in the Zürich metropolitan region (Canton Zürich, 2014). The number of inhabitants in the canton of Zürich is expected (mid-range scenarios) to increase by approximately 600,000 by 2030 (Canton Zürich, 2014; I7, 2015). The city of Zürich is expecting an increase of approximately 80,000 inhabitants and as many jobs by 2030. Additionally, the more peripheral or suburban city areas, such as the Glattal and Limmattal regions, are experiencing strong growth.

The development of today’s polycentric structure in the Zürich region with the aforementioned phenomena of suburbanization and job relocation in the suburban area was accelerated by the expansion of S-Bahn train connections at the beginning of the 1990s, particularly in the areas of Limmattal and Glattal (Kretz & Küng, 2016; I4, 2015). The additional permission for service uses in industrial zones was a response to the economic crisis, which resulted in the transformation of areas such as those in Zürich-West and Zürich-Oerlikon (I3, 2015; I7, 2015). Expansion of the railway infrastructure also led to a new functionalization of the linked locations. The network evolved from industrial suppliers (especially freight) to employment suppliers (passengers) for growing use for service jobs. These jobs led to increased demand for residential uses and consequently increased settlement activity in these suburban areas (Kretz & Küng, 2016). Strong economic growth in recent decades resulted in some conflicts in cantonal and municipal spatial planning surrounding subjects such as sprawl, compactness, mixed-use and protection of cultural and natural landscapes:

The cities in the canton of Zürich have to demonstrate strategies for how they increase density and develop the inner-city areas, especially the building zones (“Bauzonen”) that have not been fully developed yet. They also have to prove densification strategies such as built-up storeys of existing buildings. The

city of Zürich has rather low densities compared to cities such as Munich, Frankfurt or Basel, which are much denser. The inner-city areas have a great deal of potential for the future. (I7, 2015)

As a result, the “Kulturlandinitiative” (Cultural Land initiative) was adopted as a result of a referendum with 54.5% of positive votes in 2012. This initiative provides active protection of agricultural and ecologically valuable areas (Canton Zürich, 2014).

Suburban areas are subjects of intense discussion at various Swiss planning levels. The guidelines for action of the cantonal structure plan in the field of “urban landscape” seek higher densities and mixed-use. These guidelines should strengthen the city by shortening distances and ensuring accessibility to public transport. The “Kulturlandinitiative” was a revision of the Spatial Planning Act and thereby further legitimized enhancing control of spatial development of the canton of Zürich. In fact, it accelerated the Spatial Planning Act in 2013. The revision of the cantonal structure plan defines containing 80% of the population growth in already densely built-up areas as the main strategy for the Canton of Zürich. This follows the Leitmotiv “inward development before outward development” which is a central part of the Swiss Spatial Planning Act that came into force in 2013. In Switzerland the cantonal structural plans are the main instruments to lead the spatial development (not national concepts or local zoning plans). This is not a new tendency but a well-accepted basis for spatial development since the 1980s.

With the “Kulturlandinitiative” and the Spatial Planning Act in 2013, the Zürich metropolitan region is following a planning policy that is similar to many other regions in Germany (described in Bundesinstitut für Bau-, Stadt- und Raumforschung [BBSR], 2017) or Austria (described in Österreichische Raumordnungskonferenz, 2011). In order to reduce the consumption of land for new development and to preserve natural resources, future settlement development is supposed to be compact and should focus on inner city areas before outward city ones.

The central planning tool for the management of sustainable spatial development of the canton of Zürich is the cantonal structure plan. This is an instrument for early information and allows for the participation of the population. Therefore, it moderates possible conflicts with the public interest (Canton Zürich, 2014). The structure plan is the leading instrument in combination with regional and local master plans. It addresses the topics of spatial development, settlement, landscape, traffic, supply/disposal and public buildings and facilities and operationalizes them in targets, maps and actions. In relation to urban development, the structure plan defines the so-called central areas of which there are currently twelve in the metropolitan area of Zürich.

Central areas are settlement centres of cantonal importance in the fields of education, culture and economics as well as areas with particular potential for trans-

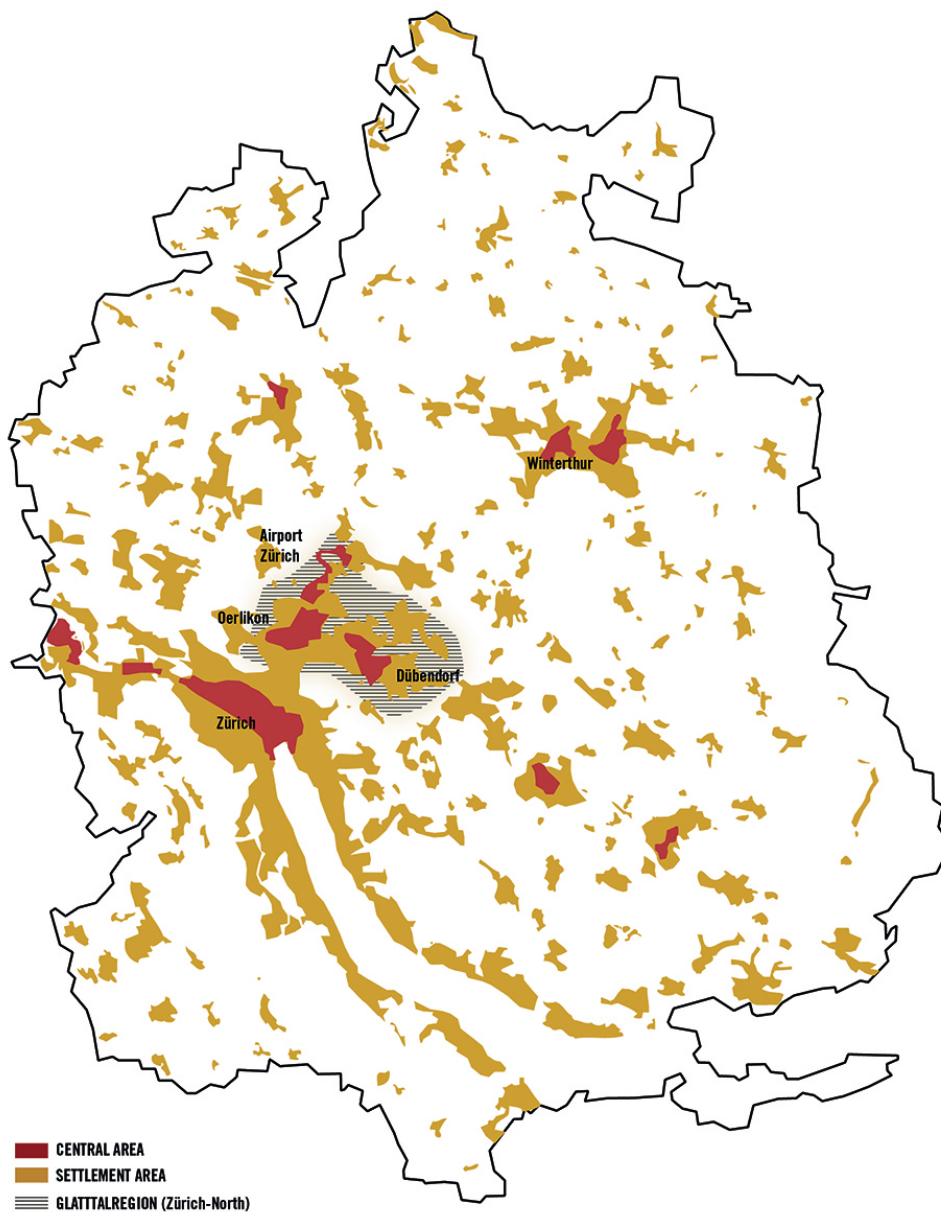
formation. The cantonal structure plan includes mandatory requirements for authorities at all levels (cantonal, regional, local) but does not define restrictions on exact parcels of land or for landowners. The specifications of these requirements of the structure plan are usually developed at the local level through zoning and possibly design guidelines or building regulations (Canton Zürich, 2014; I7, 2015).

### 3. Development of the Glattal Region

The Glattal region in Zürich-North demonstrates growth management in suburban areas, and it serves as a prototype for development outside the core city of Zürich (I5, 2015). The region has received special attention in literature in recent years (among others Architekten-

gruppe Krokodil, 2013 and Schmid, 2006). The Glattal region consists of eight autonomous communities (Rümlang, Kloten, Opfikon-Glattbrugg, Wallisellen, Bassersdorf, Wangen-Brüttisellen, Dietlikon and Dübendorf) and connects to Zürich-Downtown and Zürich-Kloten spatially and functionally (Figure 1).

Because of its strategic location, the region has had a strong influx of people and jobs with increased infrastructure and settlement developments since the 1990s/2000s (Odermatt, 1999). The Glattal region is referred to as “mature suburbia” and has evolved from urban fragments into an urban structure (Campi, Bucher, & Zardini, 2001). This has recently led to major urban densification and restructuring in many places, resulting in municipalities merging into a regional “Glattstadt” (Campi et al., 2001; I3, 2015; I8, 2015). Due to these dynamics,



**Figure 1.** Overview of the settlement structure and central areas in the Zürich metropolitan area and the location of Zürich-Nord/Glattal area. Source: author based on Canton Zürich, 2014.

Zürich-North is also called the “secret capital” (Loderer, 2001), indicating that physical change is much more visible here than in the core city of Zürich itself.

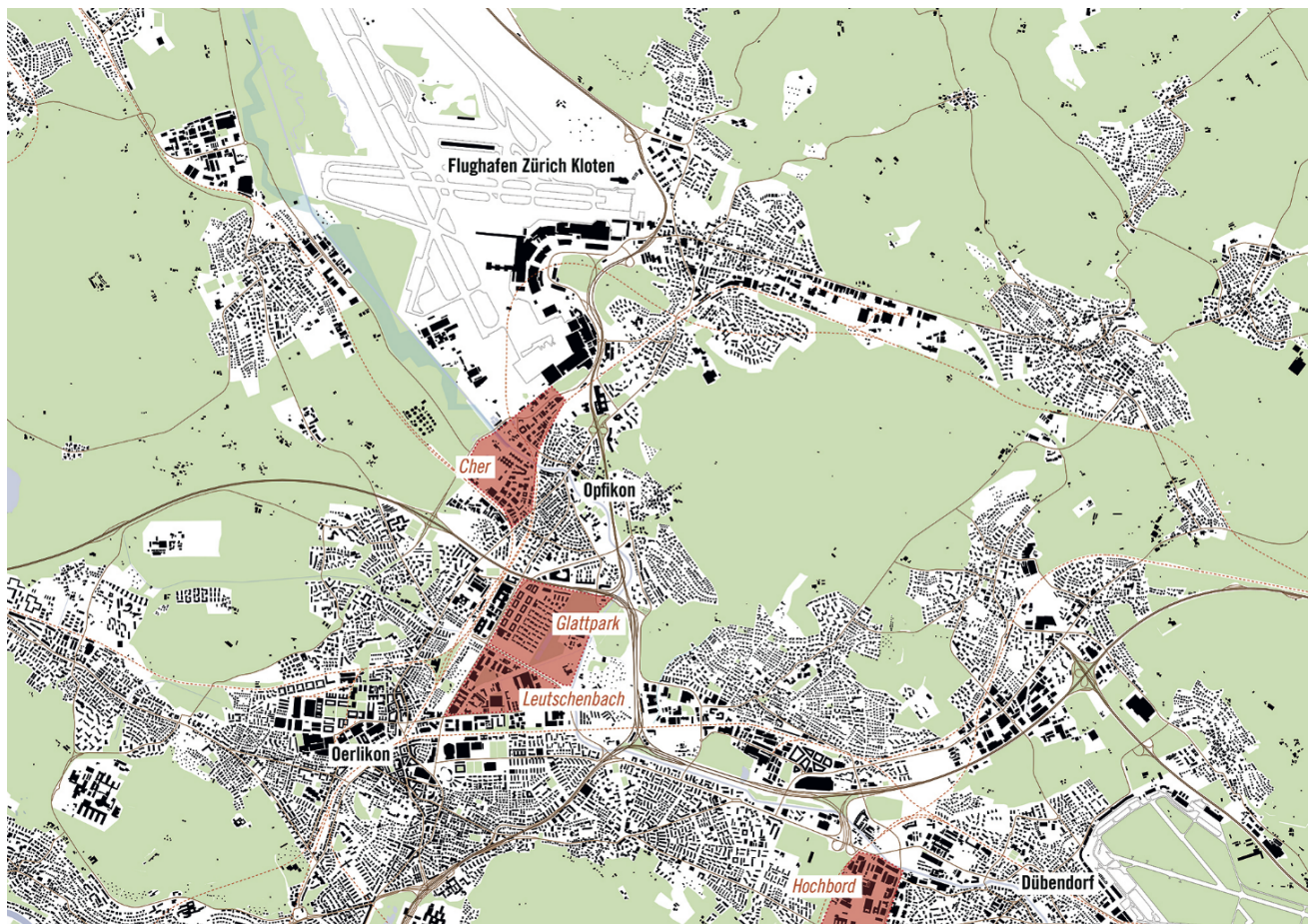
This increasing focus on the transformation of suburban housing developments in the city of Zürich and the Glattal region, however, is not an isolated case in Switzerland. Meili comments, “Essentially, Zürich and Basel no longer have any insoluble problems in their own urban territory. All Swiss cities have a problem of form outside the city core” (Meili, 2013, p. 3).

From 1980 to 2013, population increased by approximately 50,000 inhabitants to a total of approximately 160,000 in the upper Glattal region. The number of employees rose to approximately 65,000. By 2030, another estimated 30,000 residents and 25,000 employees are expected to migrate to the area. In the mid-term, the area will have approximately 190,000 inhabitants (Kretz & Küng, 2016). In particular, the region’s infrastructure (airport and railway) and low business taxes are reasons for this development, which has led to the formation of suburban service centres with numerous back offices of banks and insurance companies (Kurz, 2008; Odermatt, 1999). These suburban service locations in the Glattal region correspond with the definition of what Brandl, Barman-Krämer and Unruh called “super com-

plexes”, which they described as “regions implanted into the urban fabric” and characterized as “collections of large detached buildings of consumption, leisure or service sectors that shape the urban space through symbolic elements” (2007, p. 47). Therefore, these sites have high importance both in functional terms and as design elements of suburbia.

Kretz and Küng remarked that many of these places are the most dynamic in the Glattal region (e.g., Cher in Opfikon, the Glatt/Grindel district in Wallisellen) and described them as “inner peripheries” or “outer centralities” of the region, meaning that these areas are peripherally driven even though they are topographically within the booming region (Kretz & Küng, 2016; 19, 2015). The Glattal region represents the starting point of the metropolitan region of Zürich for a successive suburban redevelopment and thus provides a new approach in the Swiss retrofitting debate (Campi et al., 2001; Pfenninger & Schreggenberger, 2013).

The canton has reacted to this growth in the structure plan and defined three of the central areas described above in the Glattal region: northern Zürich/Opfikon, Kloten/Opfikon and Wallisellen/Zürich/Dübendorf-Stettbach (Figure 2). All of these regions are classified as “development areas” (Canton Zürich,



**Figure 2.** Building structure and infrastructural connections in the Zürich-Nord/Glattal Region with suburban office locations Cher, Glattpark, Leutschenbach und Hochbord. Source: author based on Kretz & Küng, 2016.

2014). The development objectives for these central areas are supposed to be mixed-use, densification and increased infrastructure development (transport and green spaces):

The city of Zürich tries to keep a 1:1 ratio between jobs and residents, which has proved to be healthy for urban development. However, right now, there is a much higher demand for housing developments. (I6, 2015)

These central areas currently include numerous suburban service locations, which are usually characterized by being low density, structured in a mono-functional manner and having poor urban quality in terms of open space and building structure. They are currently undergoing an intense retrofitting process, which is affecting architectural and urban conversion, additional uses and improvement of public spaces. In particular, opportunities for growth management manifest at the urban level of the district. Here, both structural and social transformation processes can be observed, and their spatial effects can be analysed. This is done in the following two case studies of the Glattal region.

The cantonal level has two main responsibilities that can effectively control and shape the development and retrofitting of these suburban service locations:

1. The definition of central areas

With its main instrument, the cantonal structure plan, the canton is able to define areas of “cantonal importance”. These areas are described as areas with high density, mixed-use, proportional ratio between jobs and residents and very high quality of transport infrastructure. By defining these ar-

reas, the canton commits to public investment in transport infrastructure. Within this category, real estate developers can rely on long-term planning security for their projects and are more likely apt to invest. The definition also influences the image of an area in a long-term perspective (I10, 2017; I11, 2017; I14, 2017).

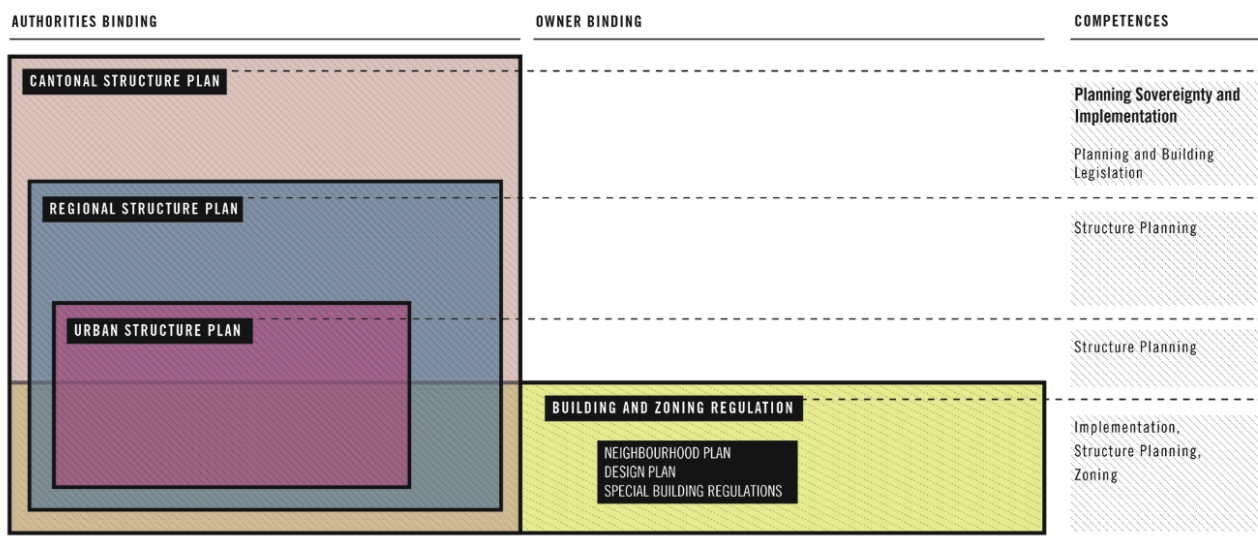
2. The permission of building activity

Within the Zürich metropolitan area, the canton of Zürich with its Department of Spatial Planning is the permission-giving authority for any building activity. This means the planning sovereignty is on a regional level (cf. Figure 3). In this sense it can demand certain quality assuring instruments such as a *Testplanung* (“test planning process”), *Sonderbauvorschriften* (“special building permits”) or *Quartiersplanpflicht* (“neighborhood design plan obligation”). All these instruments affect the development of the built environment. If cities or developers do not cooperate the canton may deny the building permit, which is rarely the case (I10, 2017; I11, 2017; I14, 2017).

However, the cantonal structure plan can “only” create a framework of conditions (i.e., define the central areas, uses and densities, demand detailed studies), as it is binding among all subordinate authorities (I6, 2015; I7, 2015; I10, 2017). The execution of building activities is still in the responsibility of the city.

3.1. The Hochbord District in Dübendorf

The example of the Hochbord district in the municipality of Dübendorf exemplifies opportunities for urban transformation in suburban service locations. This area is lo-



**Figure 3.** Competences and bindings of different planning instruments on cantonal, regional and local level for the Canton of Zürich. Source: author based on Hoelzel, 2014.

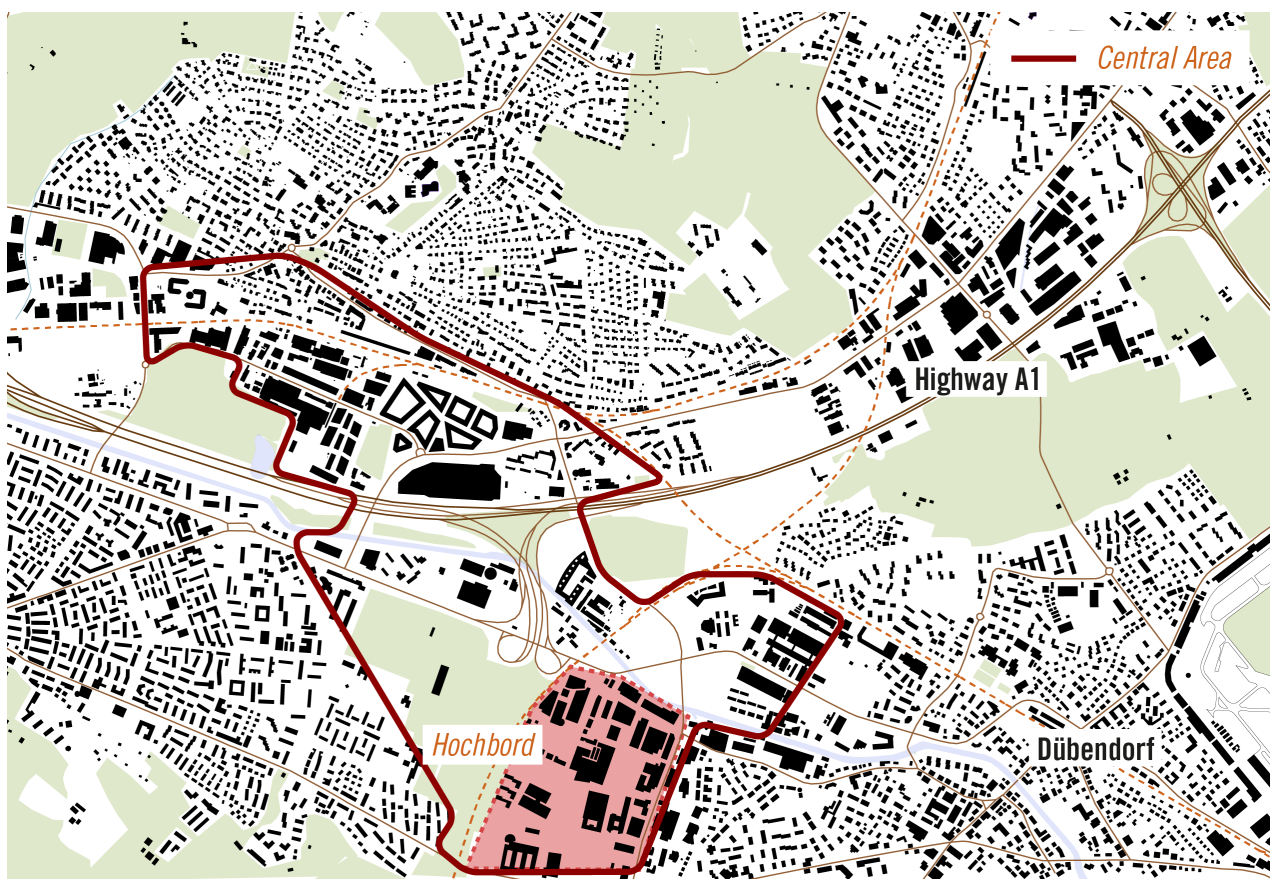
cated Southwest of the centre of Dübendorf (26,000 inhabitants) and has a size of approximately 36 ha with predominantly commercial uses. Via the Stettbach public train station, the area is connected to the Glattalbahn, which reaches the Zürich Airport as well as the city of Zürich and other communities in the Glattal region. There is also a connection to the A1 highway which links to Winterthur and Zürich. The Hochbord region was an industrial zone on the outskirts of Dübendorf in the 1930s and was used for this function for many decades. Due to a decline in demand for industrial and commercial areas in the 1980s, not all areas were completely developed.

With increasing pressure on the housing market in the Zürich region and the convenient access to the public transport system, in the late 1990s, the area was designated as a central area in the cantonal structure plan (Figure 4) and was therefore considered to be a “settlement area of cantonal importance”. This planning target served as a strong restructuring step that provided appropriate density and mixed-use (I7, 2015), highlighting its importance as “residential use as an impulse”. The maximum share of residential use was determined by the Department of Spatial Development to be 60%. Subsequently, the city of Dübendorf and the Suter von Känel Wild (SKW) urban planning office created a neighbourhood concept in 2003 that represented the main architectural structures, open spaces and transport infrastructure. The canton and the municipality agreed on a design

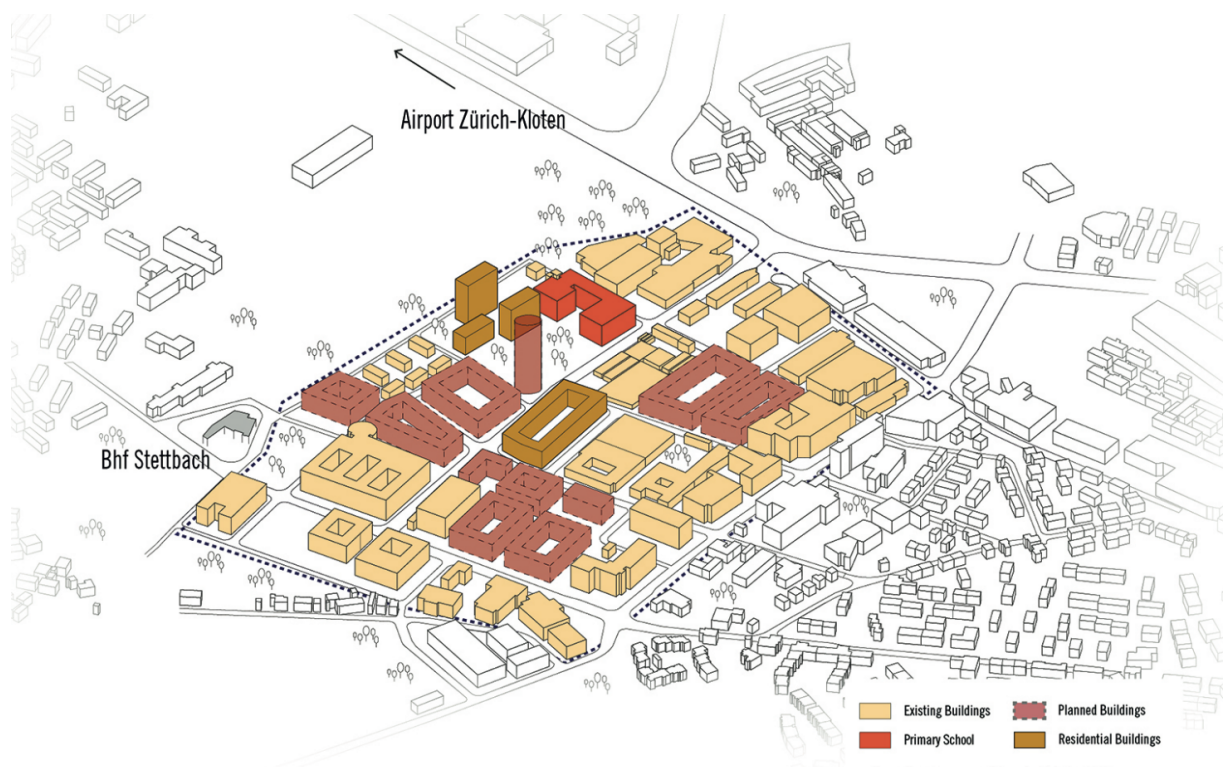
plan obligation for the entire territory of Hochbord to ensure appropriate urban design quality (SKW, 2015; Figures 5 and 6).

The municipality expects approximately 10,000 new jobs and approximately 900 new inhabitants for the area. The proposed designs of the municipal structure plan and the district plan are based on block development and produce high density. The plan also provides a balanced distribution of residential units and generates a higher percentage of living areas in the quieter inner parts (Figures 5 and 6). These plans are binding for all landowners and specify the requirements of the cantonal structure plan at the municipal level (I2, 2015; I7, 2015). A 100-meter high residential tower is one of the remarkable urban development projects: the Jabee Tower, with 212 apartments, serves as both a modern residential building with delightful views of the Glattal region and a landmark for a new centre of the neighbourhood. Critics of this project from the general public noted a lack of scale and focused on the expected traffic congestion in the area (I1, 2015), although it has to be noted that the densities meet existing planning laws with Hochbord as a central area.

As part of the restructuring process, the Hochbord interest group (IG) was established in 2009. It consists of numerous local companies and participates in the development process of the site on an informal basis. Conflicts in the Hochbord area mostly arise because of



**Figure 4.** Definition of central areas in the Glattal including the area of Hochbord in Dübendorf. Source: author.



**Figure 5.** Building structure and distribution of uses for the case study of Hochbord in the city of Dübendorf: the existing commercial and office buildings are complemented by mixed-use typologies and housing. Source: author.



**Figure 6.** First building projects for the restructuring of the Hochbord area are already completed and represent high density housing projects. Source: author.

the fragmented structured ownership. According to I2, some landowners see the potential for the development of their land and encourage rapid development. Others, however, fear a restriction of the expansion potential for commercial use and interference in the development through legal actions (I2, 2015; I12, 2017). Due to a strong private development dynamic the Hochbord interest group has changed its status from a protective organisation of private land owners towards an economic and cultural support organization of the area (I12, 2017), since the Hochbord area has become a significant cultural, residential and business spot even on a regional scale.

Overall, the restructuring of Hochbord has been much slower than that of Glattpark in Opfikon (see case study 2). According to Forster (I5, 2017), this slower development may have advantages, as more organic growth is possible and potential impacts of ongoing construction projects on the whole project can be responded to individually. Because of the strong structural densification, the Hochbord area will serve as a “new” centre of Dübendorf (I2, 2015), which might facilitate functional shifts to today’s Dübendorf downtown. These are, however, not yet achieved, as both the companies and the new residents are more strongly connected to the city of Zürich than the city of Dübendorf.

For private real estate developers, there are different reasons to develop property in the Hochbord area. Quite notably, the definition of Hochbord as a central area in the cantonal structure plan is not experienced as important factor for investment decisions (I11, 2017; I14, 2017). It does have an indirect effect though, since all interviewed real estate companies named as the first and most important reason for investment the high quality of public transport infrastructure (I11, 2017; I14, 2017). In this sense, the cantonal structure plan can create planning security for investors, as they can trust on robust transport infrastructure development by the canton, parallel to their real estate investments.

For the city of Dübendorf the cantonal level has a direct influence on the Hochbord development, since it can deny building permission, if design and concept are not to its full satisfaction. In the case of Hochbord the canton demanded a clear concept of residential-share in each building parcel, asked for a definition of important ground floor areas with activating uses (such as restaurants, shopping or leisure) and stated the necessity of a neighbourhood design plan (one of Zürich’s urban design tools to create a detailed plan on the local level). These aspects demonstrate the strong influence of the cantonal level on the development of the Hochbord area (I11, 2017; I14, 2017).

### 3.2. *The Glattpark Area in Opfikon*

The development of the Glattpark area is an example of transformation that occurred due to suburban densification and development planning in the Glatt region. The first plans for the development of the former agricultural

area were initiated in the 1950s. The first district plan from 1957 provided a designation of approximately 66 ha of land to be developed as dense service areas to create 15,000 jobs. Previously, this area was purchased by the city of Zürich and was supposed to serve as an outsourcing area for public buildings.

The 1961 zoning plan with an outstretched industrial sector was approved but never realized. The second district plan, which was completed by the city of Opfikon in 2000, was designed as a mixed-use area for approximately 6,600 residents and 7,300 jobs. The plans for the realization were set for 3 development zones, which have mostly been completed (Figure 7).

The first zone provides a service area, which is right on the main street (Thurgauerstrasse) and is less sensitive to noise emissions from transport and traffic. Some international companies, such as Mondelez and Takeda, have already settled here. The second zone provides space for a mixed-use and supply area, which can also be seen as the centre of Glattpark connecting a central district street with the “Boulevard” leading from South to East. The third zone is the residential area, which is almost completely realized as block structures. The high-density housing forms have a strong connection to the Glattpark green area in the east by visual connections and structural orientation of the buildings towards this open space. This forms a generous open space and creates amenities for the residents. In conclusion, Glattpark has a very urban textured image, with a focus on classic block development and multi-storey buildings (Figures 8 and 9).

Both zoning and urban design principles are therefore defined by the design regulations of special building regulations (including statements on urban principles, phased development, the distribution of uses and elevated ground floors). In the three development zones, the number of floors in the buildings is regulated as follows: five-storey buildings in the residential section, six-storey buildings in the mixed-use section and up to seven-storey buildings in the service section (Figures 8 and 9). The Glattpark project is an example of a long-term negotiation process with a relevant initiative of the citizenry. The rethinking of urban planning was, however, only manifested by societal protest movements and may be considered (as stated in Schmid, 2006) as a blueprint for the culture of participation in the planning processes in Switzerland (Kretz & Küng, 2016; Schmid, 2006). Despite intense planning, structuring and urban design regulations, the density of buildings and the influx of a large number of new residents in Glattpark led to social conflicts. The inhabitants of the new Glattpark district differ strongly in their milieu and lifestyle from the inhabitants of Opfikon and usually have a much stronger link to Zürich’s city centre than the centre of Opfikon (I5, 2015; I6, 2015). This has led to numerous community workshops and participation formats in which the different groups were urged to reach consensus and to develop greater understanding of the developments in Glattpark

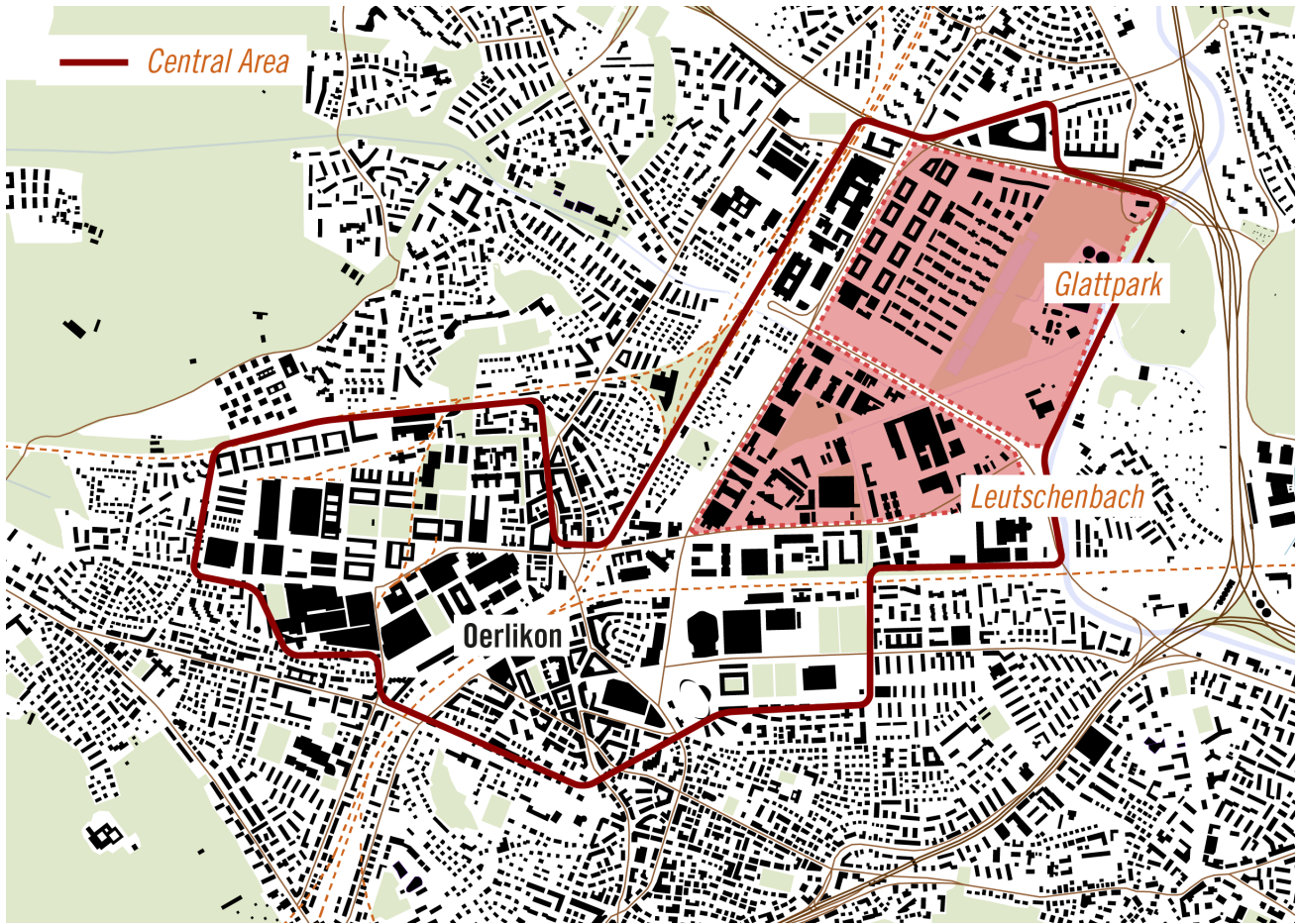


Figure 7. Definition of central areas in the Glattal including the area of Glattpark in Opfikon. Source: author.

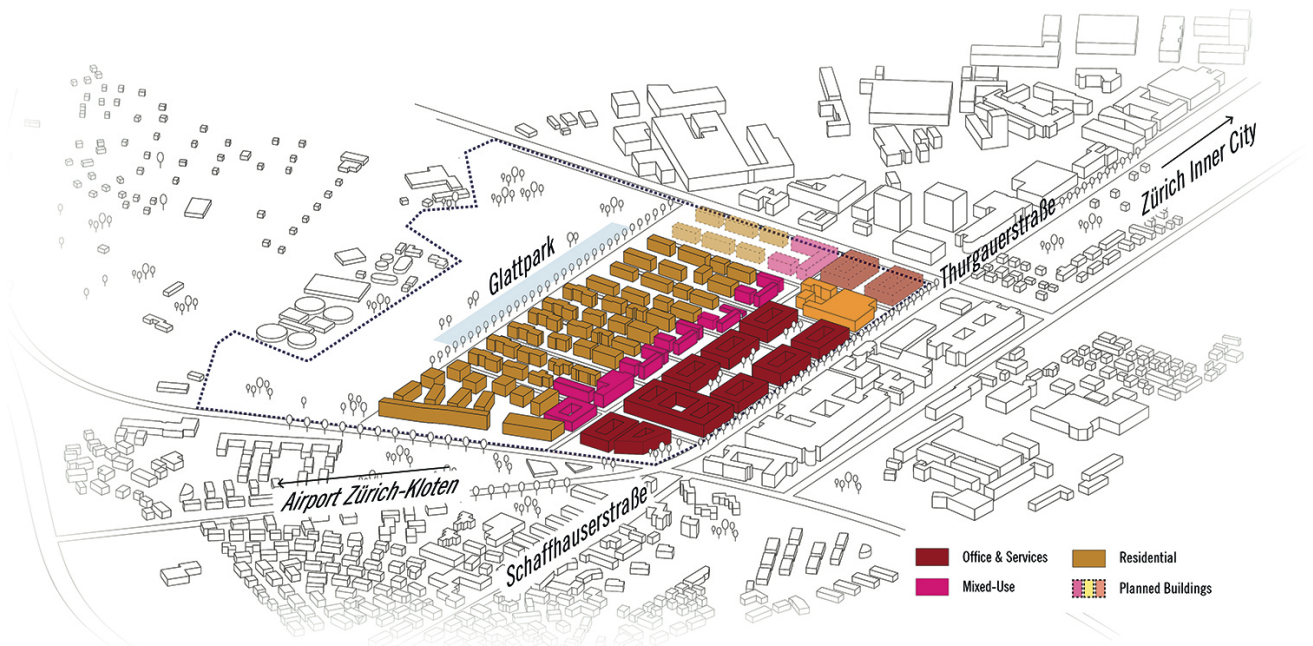


Figure 8. Building structure and distribution of uses for the case study of Glattpark in the city of Opfikon: strong zoning restrictions and high urban densities for office and residential uses. Source: author.





**Figure 9.** The three defined zones show the building design and design of public spaces in the case study of Glattpark. Source: author.

and the adjacent Leutschenbach office park, which was part of the development (I6, 2015).

The Canton of Zürich has defined the Glattpark area, which is a part of the bigger Zürich North area, as a central area of cantonal relevance since 1999. Beside the investment and building in the Glatttal train, that is connecting the area to Zürich's inner city and the airport, the canton has influenced the development of the Glattpark by the definition of "special building permits" and a "neighborhood design plan obligation". Both instruments helped to structure the area and ensure high urban design quality. The neighborhood design plan helped to establish a public park area, the Glattpark. The special building permits controlled the establishment of the central street (Boulevard) and its distribution of uses. This included the heights of ground floor areas and the establishment of an office zone along the Thurgauerstraße (see Figures 8 and 9; I13, 2017; I15, 2017).

Similar to Hochbord area, the Glattpark area benefits from the strong connection to public transport and its outstanding location between the inner city and airport, which are compelling arguments for investment (I13, 2017; I14, 2017; I15, 2017).

#### 4. Discussion

The Glattal development and the case studies presented demonstrate the effects of specific planning instruments on transforming suburban locations in the canton of

Zürich (Figure 8). Infill and strong growth offer an opportunity for the redevelopment of suburbia and can transform suburban service centres. The high pressure in the housing market led to a "forced retrofitting" of these locations, with the infill and integration of mixed-use building structures as well as higher densities. The cantonal structure plan is an aligned consensus instrument that, together with the municipal offices (e.g., Department of Urban Design, Department of Urban Development) of Zürich and surrounding communities, can facilitate the long-term development of the region.

To secure urban design qualities, municipalities can use the instruments of building and zoning regulations, building codes and design plans or design guidelines to control the concrete building form. The canton defines the central zones in a dialogue with the municipalities. While the municipalities have to develop the areas according to the central zone characteristics (e.g., density and mixed-use), the canton has an obligation to establish the road infrastructure and connection to public transport hubs. Being permission-giving authority for the Swiss zoning plan ("Bau- und Zonenordnung"), the canton can force a retrofitting of specific areas within the metropolitan area.

Zürich has only a few mono-functional suburban office locations. That is probably because the planning sovereignty is on the cantonal level, while the implementation sovereignty is on the local level. (I6, 2015)

The structure plan provides the development of densification and mixed-uses, especially in places that have good regional transport infrastructure. Both case studies demonstrate that the Glattalbahn can be seen as a key driver of development for the entire region, which simultaneously promotes and manages growth. However, in the development of the respective locations, the ownership structures played a crucial role. The cantonal structure plan therefore prevents “planning that stops at community borders” and may also play a part in influencing urban design and quality (I2, 2015; I13, 2017). The major development areas found in both Dübendorf and Opfikon occur “on the edge” of the city. From the perspective of the metropolitan region and the canton, these areas are key growth areas (I2, 2015; I7, 2015).

In the case of Glattpark Opfikon, the city owns the whole area, which greatly accelerated development dynamics, marketing and implementation of the provisions of the cantonal structure planning. The fragmented distribution of land owners in the Hochbord area required a longer negotiating process in the land development.

However, the presented case studies also show how the densification and change of use can lead to conflicts in some areas, which can be caused by both the structural form (extreme densities and atypical typologies in a location; Lampugnani, 2015) and the social structure (divergence of local residents and new inhabitants; I5, 2015; I6, 2015; I10, 2017). Interviewees mentioned a decoupling of the connection between new residents and old residents in terms of their social status and lifestyle. Additionally, the interviewees for Hochbord mentioned, how existing companies (e.g., crops producer), might be forced to relocate and leave the area due to emission-conflicts with the upcoming residential uses.

These tendencies can be examined in both case studies. It is an open question whether in the long-term the mixed-use of this location will lead to positive effects on the quality of the area and contribute to stronger integration. The need for strong growth management in Switzerland and Zürich has led to the establishment of appropriate land-use planning tools and a systematic restructuring of suburban locations. In these cases, the regional instrument of the cantonal structure plan is an effective tool in terms of the spatial allocation of densification, mixed-use development and urban integration, particularly for developing suburban areas and thus of suburban service locations.

The limited new land consumption shows positive approaches towards a compact settlement structure, especially for the Glattal region, but can lead also to building-related, creative and social challenges in individual cases. However, the local aspect of this restructuring process is very different and varies based on the characteristics of the area, in terms of both the structural characteristics and the distribution of uses and development processes with specific key actors.

## 5. Conclusions

The development of the Glattal region and the case studies show that a structured and legitimized growth management (and planning law) contributes to an urban and functional redevelopment of suburban service locations and can improve their quality of place, thus creating integrated districts in a suburban settlement structure with appropriate instruments. Growth management prevents city-centred solutions for urban growth and tries to distribute resources, such as construction land and infrastructure, in a sustainable way while protecting cultural and natural resources. The cantonal structure plan sets a framework to address ongoing growth in the. However, the growth in some areas seems to be too fast, and the pressure is too high in the context of small city structures to adapt to the existing urban structure, as shown in the case studies.

The cantonal level, with its two major responsibilities—definition of central areas in the structure plan and building permissions—is able to strategically develop specific areas and control growth in the inner-city areas. With its power to steer public investments in transport infrastructure, the canton is able to promote certain areas strongly and consequently to create an atmosphere or planning security that facilitates private investments. Interviews with local actors have shown that an institutional organization (such as development agency Glattpark, IG Hochbord) also can promote development processes significantly.

However, it should be pointed out that the cantonal planning level, even with its strong planning instruments, cannot fully control the growth management in the Zürich metropolitan areas. Especially the exceptional market conditions with very low interest rates, lack of investment alternatives to real estate and strong demand on the housing market are allowing a fast and fundamental retrofitting process. After thorough saturation of the office real estate market, many investors (both private and institutional) focused on the housing market, which could also increase the conversion of service locations. There also are some limitations for the cantonal planning when property owner structures are fragmented and a common vision for the future of an area is not shared.

To sum up, the cantonal level in Zürich, with its specific planning instruments, effectively helps to strategically identify areas for retrofitting, create a framework for public and private investments and support the development of these areas over a long period of time. With its authority to give or deny building permission, the canton has strong power to control development up to the detailed urban design level. It is therefore able to develop the metropolitan area—and suburban areas in particular—within a compact mixed-used structure and protect natural and cultural land against an on-going urban sprawl.

## Conflict of Interests

The author declares no conflict of interests.

## References

- Architektengruppe Krokodil. (2013). *Glatt! From suburb to city*. Zürich: Park Books.
- Aring, J., & Herfert, G. (2001). Neue Muster der Wohnsuburbanisierung. In K. Brake, J. S. Dangschat & G. Herfert (Eds.), *Suburbanisierung in Deutschland* (pp. 43–56). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.
- Bengston, D., & Youn, Y. C. (2006). Urban containment policies and the protection of natural areas: The case of Seoul's greenbelt. *Ecology and Society*, *11*(1).
- Bizer, K., Einig, K., Köck, W., & Siedentop, S. (Eds.). (2011). *Raumordnungsinstrumente zur Flächenverbrauchsreduktion. Handelbare Flächenausweisungsrechte in der räumlichen Planung*. Baden-Baden: Nomos.
- Brake, K. (2005). Der suburbane Raum als Standorttyp. In K. Brake, I. Einacker & H. Mäding (Eds.), *Kräfte, Prozesse, Akteure: Zur Empirie der Zwischenstadt* (pp. 8–44). Wuppertal: Müller + Busmann.
- Bramley, G., & Watkins, D. (2014). 'Measure twice, cut once'—Revisiting the strength and impact of local planning regulation of housing development in England. *Environment and Planning B: Planning and Design*, *41*(5), 863–884. doi:10.1068/b39131
- Brandl, A., Barman-Krämer, G., & Unruh, P. (2007). Gestaltungsstrategien für den suburbanen Raum: Wissenschaftliche Annäherung an seine stadträumlichen Qualitäten und Potenziale. *disP-The Planning Review*, *43*(168), 44–55.
- Bundesinstitut für Bau-, Stadt- und Raumforschung. (2017). *Raumordnungsbericht 2017*. Bonn: Bundesamt für Bauwesen und Raumordnung. Retrieved from [http://www.bbr.bund.de/BBSR/DE/Veroeffentlichungen/Sonderveroeffentlichungen/2017/rob-2017-dl.pdf?\\_\\_blob=publicationFile&v=3](http://www.bbr.bund.de/BBSR/DE/Veroeffentlichungen/Sonderveroeffentlichungen/2017/rob-2017-dl.pdf?__blob=publicationFile&v=3)
- Burdack, J. (2006). New economic poles in European metropolitan peripheries: Introductory remarks on theory and empirical evidence. *European Spatial Research and Policy*, *13*(2), 139–150.
- Campi, M., Bucher, F., & Zardini, M. (2001). *Annähernd perfekte Peripherie: Glattalstadt/Greater Zürich Area*. Basel: Birkhäuser.
- De Jong, J. (2014). *New suburbanisms*. London: Routledge.
- Dempsey, J. A., & Plantinga, A. J. (2013). How well do urban growth boundaries contain development? Results for Oregon using a difference-in-difference estimator. *Regional Science and Urban Economics*, *43*(6), 996–1007. doi:10.1016/j.regsciurbeco.2013.10.002
- Dunham-Jones, E., & Williamson, J. (2008). *Retrofitting suburbia: Urban design solutions for redesigning suburbs*. Hoboken, NJ: John Wiley & Sons.
- EU Ministers. (2007). *Leipzig charter on sustainable European Cities*. Leipzig: European Union.
- Feindt, P. H. (2003). Metropolregion Hamburg—Anmerkungen zu einer politischen Konstruktion von Raum. In E. M. Döring et al. (Eds.), *Stadt—Raum—Natur—Die Metropolregion als politisch konstruierter Raum* (pp. 39–51). Hamburg: Hamburg University Press.
- Garreau, J. (1991). *Edge city: Life on the new frontier*. New York: Anchor Books.
- Gennaio, M. P., Hersperger, A. M., & Bürgi, M. (2009). Containing urban sprawl—Evaluating effectiveness of urban growth boundaries set by the Swiss Land Use Plan. *Land Use Policy*, *26*(2), 224–232. doi:10.1016/j.landusepol.2008.02.010
- Hall, P. G., & Pain, K. (Eds.). (2006). *The polycentric metropolis: Learning from mega-city regions in Europe*. Abingdon: Earthscan.
- Harvey, D. (1987). *The urbanization of capital: Studies in the history and theory of capitalist urbanization*. Baltimore, MD: Johns Hopkins University Press.
- Harvey, D. (2016). *The ways of the World*. London: Profile Books.
- Hesse, M., & Leick, A. (2013). Wachstum, Innovation, Metropolregionen. Zur Rekonstruktion des jüngeren Leitbildwandels in der deutschen Raumentwicklungspolitik. *Raumforschung und Raumordnung*, *71*(4), 343–359.
- Hoelzel, F. (2014). Eine Frage, Zwei Antworten. In *Stadtregionen Planen* (Themenheft von Hochparterre, Mai 2014). Zürich: Hochparterre.
- Jansen, H., Wünnemann, M., & Roost, F. (2017). Post-suburban revitalization? Redevelopment of suburban business centres in the Frankfurt/Rhine-Main region. *Journal of Urban Design*, *22*(2), 249–272. doi:10.1080/13574809.2016.1261627
- Kanton Zürich. (2014). *Raumplanungsbericht 2013*. Zürich: kdmz.
- Kloosterman, R. C., & Musterd, S. (2001). The polycentric urban region: Towards a research agenda. *Urban Studies*, *38*(4), 623–633. doi:10.1080/00420980120035259
- Kraemer, C. (2006). Germany—Urban growth regulation with strong local autonomy. In N. Bertrand & V. Kreibich (Eds.), *Europe's city-regions competitiveness: Growth regulation and peri-urban land management* (pp. 153–175). Assen: Royal Van Gorcum.
- Kretz, S., & Küng, L. (Eds.). (2016). *Urbane Qualitäten—Ein Handbuch am Beispiel der Metropolitanregion Zürich*. Zürich: Hochparterre.
- Kühn, M. (2003). Greenbelt and Green Heart: Separating and integrating landscapes in European city regions. *Landscape and Urban Planning*, *64*(1), 19–27. doi:10.1016/S0169-2046(02)00198-6
- Kunzmann, K. (2001). Welche Zukünfte für Suburbia? Acht Inseln im Archipel der Stadtregion. In K. Brake, J. S. Dangschat, & G. Herfert (Eds.), *Suburbanisierung in Deutschland* (pp. 213–222). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.
- Kurz, D. (2008). *Disziplinierung der Stadt. Moderner Städtebau in Zürich 1900–1940*. Zürich: gta Verlag.

- Lampugnani, V. M. (2015). *Bauen in der Peripherie: Stadt oder Suburbia*. Tagungsbericht ETH Forum Wohnungsbau 2015. Retrieved from [http://www.wohnforum.arch.ethz.ch/sites/default/files/tagungen/tagungsbericht\\_lampugnani\\_def.pdf](http://www.wohnforum.arch.ethz.ch/sites/default/files/tagungen/tagungsbericht_lampugnani_def.pdf)
- Landis, J. D. (2006). Growth management revisited: Efficacy, price effects, and displacement. *Journal of the American Planning Association*, 72(4), 411–430. doi:10.1080/01944360608976763
- Loderer, B. (2001). Die heimliche Hauptstadt. *Hochparterre—Zeitschrift für Architektur und Design*, 10/2001, 14–21.
- Meijers, E. (2005). Polycentric urban regions and the quest for synergy: Is a network of cities more than the sum of the parts? *Urban Studies*, 42(4), S. 765–81. doi:10.1080/00420980500060384
- Meili, M. (2013). Preface. In Architektengruppe Krokodil (Ed.), *Glatt! From suburb to city*. Zürich: Park Books.
- Nelson, A. C. (1999). Comparing states with and without growth management analysis based on indicators with policy implications. *Land Use Policy*, 16(2), 121–127. doi:10.1016/S0264-8377(99)00009-5
- Odermatt, A. (1999). Räumlich-soziale Entmischung und die Finanzkrise der Kernstädte: das Beispiel Zürich. *Geographica Helvetica*, 54(1), 18–28.
- Österreichische Raumordnungskonferenz. (2011). *Österreichisches Raumentwicklungskonzept "ÖREK 2011"*. Wien: Geschäftsstelle der Österreichischen Raumordnungskonferenz. Retrieved from [http://www.oerok.gv.at/fileadmin/Bilder/2.Reiter-Raum\\_u\\_Region/1.OEROK/OEROK\\_2011/Dokumente\\_OEROK\\_2011/OEROK\\_2011\\_DE\\_Downloadversion.pdf](http://www.oerok.gv.at/fileadmin/Bilder/2.Reiter-Raum_u_Region/1.OEROK/OEROK_2011/Dokumente_OEROK_2011/OEROK_2011_DE_Downloadversion.pdf)
- Pallagst, K. (2007). *Growth management in the US: Between theory and practice*. Farnham: Ashgate.
- Pfenninger, R., & Schregenberger, T. (2013). *Glatt. Projekte für eine Stadt im Werden*. Zürich: Park Books.
- Phelps, N. A., & Wood, M. (2011). The new post-suburban politics? *Urban Studies*, 48(12), S. 2591–2610. doi:10.1177/0042098011411944
- Reeds, J. (2011). *Smart growth: From sprawl to sustainability*. Cambridge: Green Books.
- Roost, F. (2013). Stadträumliche Qualifizierung von suburbanen Dienstleistungszentren. Anregungen aus Japan und den USA [Urban spatial qualification of suburban service centers. Suggestions from Japan and the USA]. In Wüstenrotstiftung (Ed.), *Nachdenken über Städtebau – Bausteine für eine Interpretation im 21. Jahrhundert* (pp. 169–185). Berlin: DOM.
- Schmid, C. (2006). Global city Zürich: Paradigms of urban development. In R. Keil & N. Brenner (Eds.), *The global cities reader* (pp. 161–169). Abingdon: Routledge.
- Scholl, B. (2015). Bernd Scholl—Switzerland. *disP—The Planning Review*, 51(1), 76–77. doi:10.1080/02513625.2015.1038076
- Siedentop, S., Fina, S., & Krehl, A. (2016). Greenbelts in Germany's regional plans—An effective growth management policy? *Landscape and Urban Planning*, 145, 71–82. doi:10.1016/j.landurbplan.2015.09.002
- Sieverts, T. (1997). *Zwischenstadt—Zwischen Ort und Welt, Raum und Zeit, Stadt und Land*. Basel: Birkhäuser.
- Soja, E. W. (1996). *Thirdspace: Expanding the geographical imagination*. Cambridge, MA and Oxford: Blackwell.
- Suter von Känel Wild. (2015). *Teilrevision Richt- und Nutzungsplanung. Entwicklungskonzept Hochbord*. Dübendorf: Stadt Dübendorf. Retrieved from [http://www.duebendorf.ch/dl.php/de/5501589eefdfd/20150210-DO-Entwicklungskonzept\\_Hochbord.pdf](http://www.duebendorf.ch/dl.php/de/5501589eefdfd/20150210-DO-Entwicklungskonzept_Hochbord.pdf)
- Talen, E. (2011). Sprawl retrofit: Sustainable urban form in unsustainable places. *Environment and Planning B: Planning and Design*, 38(6), 952–978. doi:10.1068/b37048
- Tang, B. S., Wong, S. W., & Lee, A. K. W. (2007). Green belt in a compact city: A zone for conservation or transition? *Landscape and Urban planning*, 79(3), 358–373.
- Urban Land Institute. (1998). *ULI on the future: Smart growth-economy, community, environment*. Washington, DC: Urban Land Institute.
- Yang, J., & Jinxiang, Z. (2007). The failure and success of greenbelt program in Beijing. *Urban Forestry & Urban Greening*, 6(4), 287–296. doi:10.1016/j.ufug.2007.02.001

## About the Author



**Hendrik Jansen** is a doctoral candidate at TU Dortmund University's Department of Urban and Regional Planning and a research associate at ILS—Research Institute for Regional and Urban Development, both located in Dortmund, Germany. He is founder and partner of the urban design office BJP | Bläser Jansen Partner in Dortmund. His research interest focuses on retrofitting post-suburbia, urban design & policy, and transnational comparison.

Article

## Comparing the Landscape Fragmentation and Accessibility of Green Spaces in Territories-in-Between across Europe

Alexander Wandl

Department of Urbanism, Delft University of Technology, 2600 AA Delft, The Netherlands; E-Mail: a.wandl@tudelft.nl

Submitted: 5 August 2017 | Accepted: 20 December 2017 | Published: 29 December 2017

### Abstract

To improve the positive effects provided by green spaces on human well-being in dispersed urban areas is a key challenge for sustainable spatial development in Europe. This article presents a methodology that allows for the comparison of the potential of green spaces in Territories-in-Between across Europe, in a way that crosses the fields of urban ecology and urbanism. The article adds to the existing knowledge and understanding of the relation between the spatial organisation of systems of green spaces and their accessibility to biodiversity and human well-being. Firstly, it adapts the fragmentation index in a way that it can be applied to the specific spatial characteristics of Territories-in-Between. Secondly, it combines the fragmentation index with an indicator for accessibility of green spaces, in order to integrate aspects of ecology, human well-being and the spatial heterogeneity of the relation between them. The methodology is applied to ten areas across western Europe in order to inform decision and policy makers including urban planners, designers and environmental agencies to be able to assess the potential of system of green spaces for biological diversity and human well-being in an integrated manner.

### Keywords

accessibility of green spaces; dispersed urban development; ecosystem services; landscape fragmentation

### Issue

This article is part of the issue “Garden Cities and the Suburban Antidotes”, edited by Markus Hesse and Geoffrey Caruso (University of Luxembourg, Luxembourg).

© 2017 by the author; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

### 1. Introduction

The quality of urbanisation and related urban growth of cities are key challenges in securing and improving human well-being, as well as protecting and establishing ecosystems and their biodiversity. The reasons that cities play a crucial role in the relationship between well-being and biodiversity are, according to Pickett et al. (2008), (i) most of the planet’s population lives in cities and therefore, human contact with nature is predominantly urban; and (ii) cities have impacts on regional and global ecosystems such as ‘climate, atmospheric chemistry and hydrological systems’ (p. 140), which go beyond the borders of urbanised areas. An increasing amount of literature within the field of biodiversity studies acknowledges that urban ecosystem structures such as green belts, parks of all sizes, rivers and creeks, private gardens, some

derelict areas and brownfields, play a crucial role in preserving the planet’s biodiversity (Eigenbrod et al., 2011; Parker, 2015). But the biodiversity benefits are unevenly distributed spatially, which raises questions concerning environmental justice. The ‘increase in urbanization will result in spatial shifts in both supplies of ecosystem services and the beneficiaries of those services’ (Eigenbrod et al., 2011). Who has access to which green spaces is a question that will challenge urban planning and design in the coming decades.

As much of the urbanisation of the last decades took place outside of the dense city cores (Kasanko et al., 2006), and it can be expected that the process of development of the ‘horizontal metropolis’ (Viganò, Arnsperger, Barceloni Corte, Cogato Lanza & Cavalieri, 2017) will go on in the near future, it is crucial to look at this new form of ‘diffused city’ (Secchi in Viganò et al., 2017) to

answer the above question of environmental and human well-being. Wandl, Nadin, Zonneveld and Rooij (2014) used the term Territories-in-Between (TiB) as an umbrella term to characterise and map dispersed urban development across Europe, in order to compare them without favouring the cultural notions that come with some of the concepts. They include *Zwischenstadt* (D) (Sieverts, 2003), *città diffusa* (I) (Indovina, 1990), *annähernd perfekte peripherie* (CH) (Campi, Bucher, & Zardini, 2000), *peri-urbanité* (F) (Le Jeannic & Vidalenc, 1997).

Urban areas are not homogeneous territories but have significant spatial differences in their demographic, physical and ecological structures. Metropolitan areas could be described in the words of Neutelings (1994) as a *Patchwork Metropolis*. Or as Huhlmann & Promski (2007, p. 7) put it, 'the sharp distinction between city and countryside has dissolved into an ecological and cultural continuum of a built structure between city and landscape'. Therefore, it is not a surprise that this new spatial structure 'where we live now' (Sieverts, 2008) as well as the societal challenges and transformations that are related to the ongoing revolution towards the 'Industry 4.0' (Hermann, Pentek, & Otto, 2016), made scholars revisit (Wahler-Žak, 2017) a concept that was developed as an answer to the challenges of the first industrial revolution: Howard's Garden City.

Already Howard stated that there are not only the two poles of urban and countryside, but that there is or could be a third pole, illustrated in his Town-Country magnet, that combines the beauty of the nature with the possibilities provided by economic and societal activities (Wahler-Žak, 2017, p. 19). Could it be that, in contrary to the many attempts of implementing the Garden City, which resulted in often green but mono-functional housing areas (Wahler-Žak, 2017), the 'diffuse city', which according to Secchi was not born out of the expansion of the city but 'had its roots in the territory, its inhabitants, and their history' (Secchi in Viganò et al., 2017), has the qualities listed under the Town-Country magnet?

The above description of diffused areas is very similar to the idea of the 'landscape mosaic', commonly used in landscape ecology (Dramstad, Olson, & Forman, 1996), and is therefore a valid starting point for an integrated understanding of urbanised territories.

In order to inform decision and policy makers, including urban planners, designers and environmental agencies, it is crucial to be able to assess existing and proposed systems of green spaces in a way that integrates aspects of biological diversity and human well-being. Three aspects of TiB make them specifically relevant for the provision of ecosystem services: their sheer spatial size, the theoretical challenges in relation to the urban-rural dichotomy and the ongoing discussion of densification versus decentralisation.

We first describe the effects that are provided by ecological structures for both aspects: human well-being and preservation of biodiversity in TiB. Afterwards, we introduce two indicators, landscape fragmentation and

accessibility of green spaces and adapt their calculation to fit the assessment of TiB. We use these indicators to compare the landscape fragmentation of TiB and the accessibility of green spaces in ten areas across Europe. We finish with a discussion of the advantages and limitations of the methods presented in this article.

The article adds to the existing knowledge and understanding of the relation between biodiversity and human well-being in two aspects. First, it adapts the fragmentation index (Jaeger, 2002) in a way that can be applied to the specific spatial characteristics of TiB. Second it combines the fragmentation index with an indicator for accessibility of green spaces, in order to integrate aspects of ecology, human well-being and the spatial heterogeneity of the relation between them. With these adapted methods we then test whether the hypothesis that less fragmented green space systems provide better accessibility to green spaces can be supported or not. Furthermore, it allows to identify which settlement patterns, and therefore spatial planning approaches, combine both biodiversity and accessibility.

## 2. Green Structures in TiB and Their Relation to Human Well-Being and Biodiversity

The integration of urban ecology and urbanism into a comprehensive regional planning approach is still a challenge in daily practice. Scott et al. (2013) even describe the disintegration (Shucksmith, 2010) of planning as a key characteristic of Territories-in-Between. Green spaces in TiB will be in the focus of both problems and potential solutions for environmental and social issues in the coming decades. According to Lovell and Taylor, urban green spaces are the key spatial structure of urban ecosystem services and 'will have a critical role to play in conserving biodiversity, protecting water resources, improving microclimate, sequestering carbon, and even supplying a portion of the fresh food consumed by urban dwellers' (2013, p. 1447). Moreover, green spaces, in the sense of public and private open spaces with a permeable and at least partly vegetation covered surface, continue to have to meet simultaneously cultural and esthetical needs of residents, encouraging leisure activities, and educating people about nature.

Large un-fragmented areas are crucial for biodiversity and health of plant and animal populations. Fragmentation decreases biodiversity (Beninde, Veith, & Hochkirch, 2015; Dramstad et al., 1996; Faeth & Kane, 1978; Jaeger et al., 2008; Jaeger, Soukup, Madriñán, Schwick, & Kienast, 2011; Kane, Connors, & Galletti, 2014). Levels of fragmentation vary significantly in TiB, depending on the elements that fragment landscape, and thereby block species dispersion and human mobility. These fragmentation elements can be of human nature (e.g., highways or other infrastructures, buildings and densely build up areas), or natural elements (e.g., high mountains, seas and rivers). How fragmenting these elements are is of course species-dependent. The result-

ing spatial structure—of the web of infrastructure, as well as other human and natural fragmentation elements in TiB—is a patchwork of patches with a variety of size.

Eco-corridors are particularly focused for species dispersion and genetic exchange. They are very often considered more crucial than stepping stones (Angold et al., 2006; Beninde et al., 2015; Dramstad et al., 1996; Marulli & Mallarach, 2005). In TiB, eco-corridors are often established along infrastructures (train lines, highways) and rivers, the same infrastructures that are also acting as barriers. Another key indicator for biodiversity is the percentage of vegetation cover and vegetation diversity: less than 10% seems a critical value (Aronson et al., 2014; Beninde et al., 2015; Clauset et al., 2009). TiB are mosaics of grey and green open spaces with different percentage of vegetation cover. Significant parts of green spaces are private areas such as gardens and agricultural land. Furthermore, derelict areas and brown-fields are also usual on TiB.

Having defined three key characteristics of the structure of green spaces (patch size, corridors and vegetation cover), we can now relate them to the contributions to human well-being. The provision of healthy and affordable food and the possibility to grow food for yourself is the first to consider. There is high potential in TiB for urban agriculture (subsistence) as well as local (organic) food production, because of the large amount of garden area and small public green spaces (Andersson et al., 2007; Gómez-Baggethun & Barton, 2013; Lerner & Eakin, 2011; Thompson, 2012). Whether this potential is used depends both on the accessibility of these areas and the possibility to facilitate local producer-customer contact. However, the risk of pollution because of specific functions (highways, heavy industry and similar), and therefore a negative influence on the quality of food, is high in TiB.

Micro climate regulation, another relevant positive effect of green spaces, is related to the capacity of evapotranspiration of vegetation. The amount of sealed surface is crucial to mitigate the urban heat island effect (van der Hoeven & Wandl, 2013). TiB usually have a rather high amount of impervious areas, but are also often the location of industrial areas or large infrastructure, which contribute to the urban heat island. Shopping malls and their large parking lots are also hotspots. This aspect is crucial when discussing future densification of TiB.

Air quality regulation is also directly related to the intensity of vegetation cover. Leaves reduce particulate matter, ozone, sulphur dioxide, carbon monoxide, and many more pollutants, but pollen can also cause allergies. These effects are very often local and need to take place close to the source of pollution. The intermingling of infrastructure, green spaces and housing areas in TiB is predestinated for that.

Green spaces are important for the development of educational, aesthetic and cultural values as well as im-

proving recreation and physical and mental health. Experiencing (urban) biodiversity is a key to halting the loss of global biodiversity because people are most likely to take action for biodiversity if they have direct contact with nature (Beumer & Martens, 2014; Müller & Werner, 2010). Urban green spaces can contribute to human interaction by providing the possibility for both social interaction as well as privacy needs. Natural landscape features contribute to the development of aesthetic preferences and thereby contribute to a sense of community. Private gardens are one of the key attractors for people to move towards the edges of the cities and into TiB. On the other hand, TiB lack traditional urban landmarks, whilst landscape features are often contributing to a sense of place and community (Campi et al., 2000).

Green spaces in TiB provide possibilities for physical exercise: staying in or close to green spaces reduces stress as well as the heart rate; trees contribute to the purification of water and air as well as to balancing temperature; all these aspects are related to health issues such as respiratory diseases, obesity, sedentary lifestyles, cardiac diseases as well as loneliness. As most green spaces in TiB are either private gardens or privately owned agricultural areas, the relevance for this aspect is accessibility. Who has access with what means to which green spaces is crucial. Unclear ownership and responsibility for spaces provide both difficulties and potentials for accessibility.

Having discussed the relationship between the spatial structure of green spaces in TiB and their positive effects on human well-being and biodiversity we are able to identify indicators to empirically determine their relationship in reality. To summarize the content of the above, patch size, together with landscape fragmentation by infrastructure leads to a specific mosaic of patches in an area, which is very often brought into relation with the quality of ecosystems and their richness of habitats and species (Jaeger, 2002; Jaeger et al., 2011; Park, 2015). It is also increasingly recognised that the mosaic of patches is related to human well-being (Di Giulio, Holderegger, & Tobias, 2009; Girvetz, Thorne, Berry, & Jaeger, 2008) particularly to cultural and recreational aspects (Matsuoka & Kaplan, 2008) as well as physical and mental health (Pretty, Peacock, Sellens, & Griffin, 2005). Who has access to which green space is not covered by the description of the green space structure alone. It is relevant to know who can reach and profit from the relevant green spaces, that is, who lives within the service area of the different green spaces.

Therefore, we describe two indicators: landscape fragmentation and accessibility of green spaces, and how they have to be adapted to be used for the comparison of TiB. We also present the used data for calculating the indicators in the following paragraphs. Beforehand, the ten cases of the comparison of TiB across Europe are introduced.

**3. Cases, Methods and Data**

*3.1. Selecting Ten TiB Across Europe*

This article is part of a PhD project, which compares Territories-in-Between across Europe in order to understand how planning approaches and spatial performance are interrelated. The method to identify TiB and the selection of case studies was published earlier in Wandl et al. (2014). The following is a brief summary:

(1) The cases should be located in countries that are characterised by different planning traditions, and therefore represent different approach towards sustainable development of TiB.

(2) The areas should be big enough that they contain urban areas and TiB as well as rural areas as defined by Wandl et al. (2014).

(3) The key regional planning documents had to be available in a language spoken by the PhD candidate. This is the reason why only cases in Western, Central and South Europe are included.

(4) For the first aspect, we have used the traditions (or ideal types) of spatial planning introduced by the *European Compendium of Spatial Planning* (European Commission, 1997) and further developed by Nadin and Stead (2013). These ideal types can be assigned to individual countries within the EU, although in reality the different countries blend aspects of more than one ideal type. For the second aspect, we needed to decide on an ideal territorial sample size that would allow us to carry the analysis soundly. When located at the edges of big metropolitan areas, such as Île-de-France or the Randstad, squares with a side length of 50 km proved to be big enough to cover areas classified as urban, rural and TiB. For other spatial analyses, an additional 25 km buffer around the 50 × 50 km square was included, in order to avoid flawed results at the edges of the squares.

Figure 1 shows the location and name of the ten cases across Europe. Table 1 presents the cases with their ideal type of planning as well as the area that is classified as TiB and the number and percentage of population living within TiB.



**Figure 1.** Name and location of the ten case studies.



**Table 1.** Key features of the ten selected TiB across Europe for the year 2013.

Case study name	Ideal type of spatial planning	Population			Area classified as TiB	
		Total	in TiB	%	square km	%
Île-de-France	Regional economic	3,893,228	1,006,492	25.85	1,096	54.16
South-Holland	Integrated comprehensive	2,849,336	1,267,325	44.48	1,089	53.82
The Tyrol	Integrated comprehensive federal <sup>1</sup>	281,199	203,066	72.21	379	18.73
North Somerset	Land use management	736,265	562,595	76.41	790	39.03
Vienna-Bratislava	Integrated comprehensive federal	338,470	266,489	78.73	735	36.34
Gelderland	Integrated comprehensive	1,031,570	832,782	80.73	1,083	53.51
Bergamo-Brescia	Urbanism	1,094,195	913,480	83.48	1,051	51.91
Veneto	Urbanism	1,052,495	888,305	84.40	1,299	64.16
South Wales	Land use management	987,624	888,662	89.98	966	47.72
Pas-de-Calais	Regional economic	970,905	913,379	94.08	1,205	59.53

<sup>1</sup> Note that the for the Integrated Comprehensive Model 4, case studies were selected in order to be also able to compare the cases with strong national planning (NL) and the ones with strong federal planning (AT).

3.2. Adapting Jaeger’s Landscape Fragmentation Index for TiB

The European Environment Agency (EEA) report *Landscape Fragmentation in Europe* (2011) provided the first assessment of landscape fragmentation for all EU countries using the following two indicators:

- effective mesh size ( $m_{eff}$ );
- effective mesh density ( $s_{eff}$ ).

Both were introduced by Jaeger (2002) and further developed by Girvetz et al. (2008) and are an expression of the patch size of unfragmented areas. According to the EEA (2011, p. 17), ‘the effective mesh size ( $m_{eff}$ ) serves to measure landscape connectivity, i.e. the degree to which movement between different parts of the landscape is possible. It expresses the probability that any two points chosen randomly in a region are connected; that is, not separated by barriers such as transport routes or built-up areas. The more barriers fragmenting the landscape, the lower the probability that the two points are connected, and the lower the effective mesh size.  $m_{eff}$  can

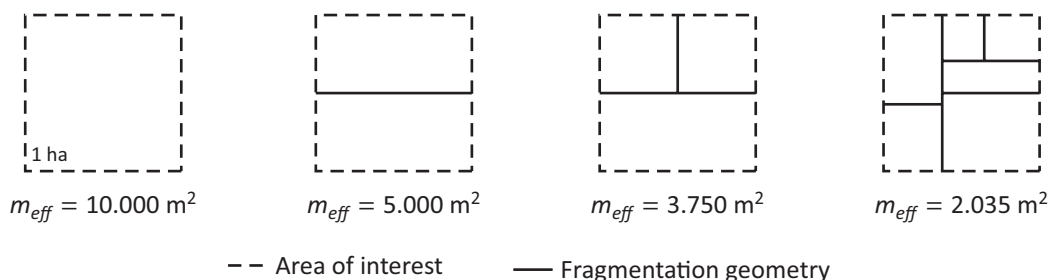
be expressed in the following formula:

$$m_{eff} = \frac{1}{A_t} \sum_{i=1}^n A_i^2$$

Where  $n$  is the number of patches,  $A_i$  to  $A_n$  represent the patch sizes from patch 1 to patch  $n$ , and  $A_t$  is the total area of the region investigated. The effective mesh density ( $s_{eff}$ ) gives the effective number of meshes per  $km^2$ , in other words the density of the meshes. This number is very easy to calculate from the effective mesh size. It is simply a question of how many times the effective mesh size fits into an area (EEA, 2011, p. 24):

$$s_{eff} = \frac{1}{m_{eff}}$$

To calculate the landscape fragmentation a fragmentation geometry, which is formed by the built and natural elements that are impassable borders in a specific area, has to be defined. In Figure 2 we show a simple example how  $m_{eff}$  changes with different fragmentation geometries.



**Figure 2.** Different fragmentation geometries and their effective mesh size.

Jaeger et al. (2011, p. 28) use a combination of CORINE land use data, data of the street network, elevation data expressing high non-passable mountains, as well as temperature and river catchment areas to define their fragmentation geometry (see Table 2). They also state that it is important to reconsider and adapt the fragmenting elements for studies with different scope. The following paragraphs present such an adaptation for studying TiB on a regional scale.

For the comparison of TiB, the inclusion of discontinuous urban fabric into the fragmentation geometry seems problematic, as this area often includes low density built up areas with a lot of green spaces, mostly private gardens, which have a high percentage of vegetation cover and are crucial for certain benefits as mentioned earlier. Another problematic aspect is the complete exclusion of industrial areas, commercial units, roads and railroads, because the vegetated areas along these areas are very often ecological corridors, and also create buffer zones which provide benefits for human well-being such as purifying air and water and adding to aesthetical aspects of the landscape.

Therefore, the fragmentation geometry that was used to compare TiB across Europe was adapted. As Jaeger et al., we use the continuous urban land cover and the street network as a basis. But instead of using the other types of CORINE land cover, we used areas without vegetation cover as fragmentation elements.

To do so, the normalized difference vegetation index (*NDVI*), which is an indicator for photosynthetic activity, was calculated. This was done using Landsat 5 images with 30 m resolution. This allows for the identification of landscape elements such as gardens or small areas of fallow land, which are often not blocking the dispersal of species, but are on the contrary, often important parts of an urban green network structure and exclude it from the fragmentation geometry.

The *NDVI* was acquired using the following equation:

$$NDVI = \frac{IR - R}{IR + R} \times 100 + 100$$

Where *R* and *IR* are the spectral reflectance in the TM red and near-infrared bands. The *NDVI* equation produces values in the range from 0–200, where values bigger than hundred indicate vegetated areas and values smaller than 100 signify non-vegetated surface features. These values vary of course, reflecting different states of the vegetation process over the year. Therefore, cloudless images at the beginning of the Summer of 2009 were selected for the analyses and the final selection of the pixel values that were used as fragmentation geometry.

The year 2009 was used as it was the last period where for all cases cloud free image could be obtained during the vegetation period. Table 2 presents all datasets that were used to construct the fragmentation geometry.

### 3.3. Accessibility of Green Spaces

The key spatial elements that provide benefits for human well-being are green spaces, therefore the accessibility of green spaces can be seen as key indicator for human well-being in TiB. There are several standards that describe how much green space should be accessible to inhabitants of the area. Natural England, for example, defines the following (Comber, Brundson, & Green, 2008, p. 104):

- No person should live more than 300 m from their nearest area of natural greenspace of at least 2 ha in size;
- There should be at least one accessible 20 ha site within 2 km from home;
- There should be one accessible 100 ha site within 5 km;
- There should be one accessible 500 ha site within 10 km.

Van Herzele and Wiedemann (2003), for example, propose a typology of green spaces and related sizes and distances of their service areas (see Table 3).

These approaches already demonstrate that there are quite some differences in the distances of service areas as well as sizes of green spaces. It is interesting also that none of the standards known to the author define precisely how to calculate these distances. Are those Euclidian, Manhattan or network distances? And from where to where is the distance measured, from access points of the green spaces or the centre of park?

According to Higgs, Fry and Langford (2012, p. 328) the identification of the following three elements has to be defined clearly in order to make a precise assessment:

1. an origin point, representing the geographical location of the population potentially seeking to access green space;
2. a destination point, representing the geographical location of the green space;
3. a distance measurement taken between these two points.

While we agree completely with points two and three, we would like to reconsider the first one. Defining an origin and destination matrix is a common approach for accessibility studies, but two aspects are critical. First, where should the point of origin within an analytical areal unit (municipality, census area or similar) be located? Second, the proposed method of point to point analysis does not allow drawing conclusions about which uninhabited areas have higher potential for future development, and therefore it has only limited value for planning. Therefore, we choose to use service areas, as these areas are within a specific network distance of a point of origin, instead of an origin to destination matrix.

**Table 2.** Fragmentation elements according to Jaeger et al. (2011) in comparison to the adapted method.

Jaeger et al. (2011)		Proposed in this article		Comments
Data set	Fragmentation elements	Data set	Fragmentation elements	
<b>Landcover</b>				
Corine Land Cover (CLC)	1.1. Continuous and discontinuous urban fabric	Landsat 4-5 TM. <a href="http://glovis.usgs.gov/">http://glovis.usgs.gov/</a>	NDVI: >100 and Area >200m <sup>2</sup>	Re-cultivated parts have a NDVI >100 and are therefore not considered as fragmenting
	1.2. Industrial, commercial and transport units			
	1.3. Mine, dump and construction sites			
	1.4. Artificial, non-agricultural vegetated areas			
	4.2.2. Salines			
	5.1.2. Water bodies			NDVI <100
<b>Transport Infrastructure</b>				
Tele Atlas MultiNet©	00. Motorways ; (Buffer 30 m)	Open Street Map <a href="http://www.openstreetmap.org/">http://www.openstreetmap.org/</a>	Motorway; Motorway Link (Buffer 50 m)	Buffers are wider, because line features were used
	01. Main Roads (Buffer 20 m)			
	02. Other Major Roads (Buffer 15 m)			
	03. Secondary Roads (Buffer 10 m)			
	04. Local Connecting Road (Buffer 5 m)			
	Railroads (Buffer 4 m)		Tertiary; Tertiary Link (Buffer 10 m)	
			Light rail/Mono rail (Buffer 10 m)	
			Tram (Buffer 5 m)	
<b>Altitude, Slope and Temperature</b>				
WorldClim	Mean temperature July <9.5 Celsius			Not within TiB
Nordregio	Elevation higher 2,500m Elevation higher 1,500m and slope >2 degree			Covered by NDVI <100
CCM2: Catchment characterisation and modelling Version 2.1	Catchment areas greater than 3,000km <sup>2</sup>			Not relevant for TiB

**Table 3.** Minimum standards for urban green spaces. Source: Van Herzele & Wiedemann (2003, p. 113).

Functional level	Maximum distance from home	Minimum surface (ha)
Residential green	150	
Neighbourhood green	400	1
Quarter green	800	10 (park 5)
District green	1,600	30 (park 10)
City green	3,200	60
Urban forest	5,000	300

In order to assess the accessibility of green spaces three groups of sizes of green spaces were chosen:

- Green spaces between 1 and 10 ha, which are key for the provision of benefits for human well-being in the direct living surrounding, should be accessible in very short time and distance, and therefore also accessible for less mobile population groups like elderly and children;
- Green spaces between 10 and 30 ha, which serve bigger areas like districts in an urban environment, but also whole settlements in a more dispersed environment, with a bigger service area, but still used on a daily basis and should therefore be in a walking distance under 15 minutes (Matsuoka & Kaplan, 2008);
- Green spaces larger than 30 ha, which have a regional effect.

In order to assess how many people have access to green spaces we assigned service areas to each of the classes of green spaces. A service area is the area from which any access point of a specific green space is reachable within a certain distance along the network of streets. As Table 4 shows, bigger green spaces have multiple service areas, as they provide in their closer vicinity the same services as smaller ones.

The calculation and mapping of the service areas requires the following steps.

- Selecting relevant green spaces—those un-fragmented areas (patches) that are bigger than 1 ha;
- Using the intersection points of the street network with the green spaces as access points to these green spaces. We applied a 25 m threshold for passing bystreets and paths to also consider that

it's not necessary to actually enter the green space to profit from it;

- Calculation of the service areas along the street network, using the ARCGIS network analyst for the radii in Table 4, from each of the access points.

The service areas of the different green spaces may overlap and thereby create an intensity map of access to green spaces. This intensity map is then overlaid with a 1km grid which contains the size of population. The resulting map and dataset shows then where and how many people have which intensity of access to green spaces.

#### 3.4. Combining the Two Indicators

The aim of the article is to draw conclusions on both ecological qualities of the system of green spaces—as well as on the benefits for humans the system of green spaces provides—in a way that regional planners and designers can assess future plans and projects. Therefore, two methods of combining the indicators were chosen. The first one combines both indicators on a systems level. It is a simple juxtaposition of the effective mesh size of a case and the intensity of access to green spaces. Intensity stands for the amount of green spaces a specific part of the population has access to: the more green spaces, the higher the intensity. This allows to consider if less fragmented green networks also provide a higher intensity of accessibility to green spaces.

The second method presents the amount of green space according to the three categories of size in Table 4 and relates them to the percentage of population for whom they are accessible. This provides a better understanding about the relation of accessibility and the size distribution of the green spaces in a system and allows

**Table 4.** The different sizes of green spaces and their service areas.

Size of green space in ha	Service area distance in m		
1 to 10	400		
10 to 30	400	800	
>30	400	800	3,500

us to reflect whether a green space system with a few large green spaces performs better than one that has a variety of sizes.

**4. Results**

This section presents firstly the advantages of the above described method of defining the fragmentation geometry based on NDVI, using the case of South-Holland as an example. Second, the resulting landscape fragmentation is presented for all cases, as well as the distribution of the different patch sizes of green spaces in the ten TiB. Thereafter, the results of the accessibility of green spaces study, following the early described method, are presented. Finally, two ways of combining both indicators are presented: the first compares both on the level of the system of green spaces, the second investigates how the different distribution of patch sizes is related to the accessibility.

*4.1. Refined Fragmentation Geometry Based on NDVI*

In the following we use the case South-Holland as a demonstration case to show the advantages of the methodology described above in representing the complex green structures in TiB. The following Figures 3 and 4 present the two steps of building the fragmentation geometry for the case of South-Holland.

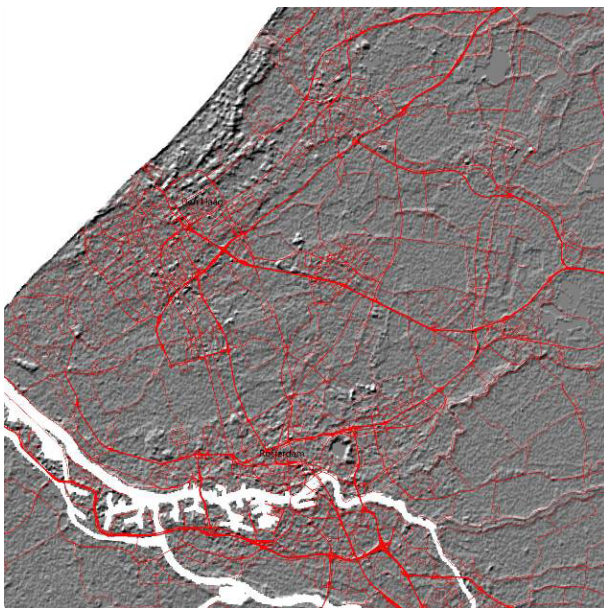
Figure 5, which presents the comparison between fragmentation geometry using the datasets proposed by Jaeger et al. and our adapted method shows clearly the advantage of the latter. The large glasshouse areas south-

west of The Hague for example, which fall in the CLC class non-irrigated arable land and do not, in the method of Jaeger et al., contribute to the fragmentation geometry, although they are completely built up areas and thus should be included in our fragmentation geometry. The green spaces at the edge of The Hague, which belong to the CLC discontinuous urban areas, are considered to be part of the fragmentation geometry according to Jaeger et al., although they play a crucial role as green corridor system of the The Hague-Rotterdam Metropolitan region. Our method identifies them as such and excludes them from the fragmentation geometry.

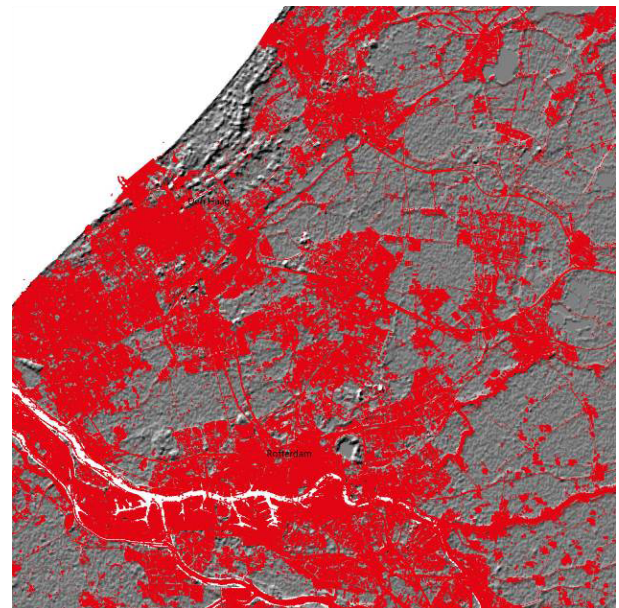
*4.2. Comparing Landscape Fragmentation in TiB across Europe*

Table 5 presents the effective mesh size as well as the mesh size density for the entire (urban, rural and TiB) case study areas as well as only for the TiB within the square of 50 by 50 km. As expected, Table 5 and Figure 7 show that the two cases with the smallest population figures are the least fragmented and the one with the largest population density is the most fragmented. The ranking of the other cases does not show a relation to population density, which is an interesting outcome.

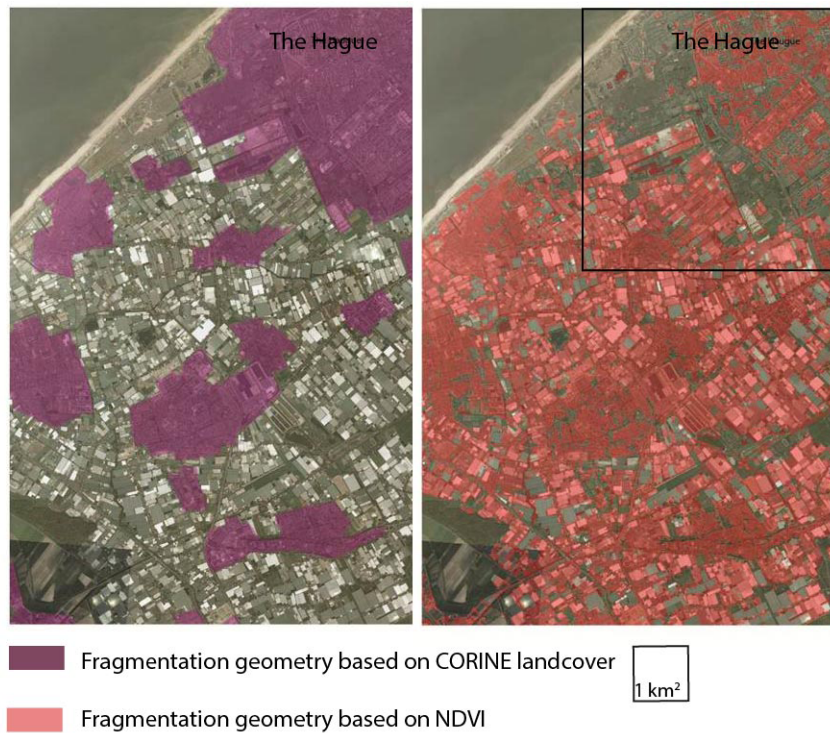
Before comparing the fragmentation only within TiB, it is important to mention, that the cases are much less diverse considering the density of inhabitants, than for the whole case study area. Also, the ranking among the cases considering the population density changed. TiB in South-Holland are the most densely populated, followed by South Wales and Île-de-France (see Table 1). On



**Figure 3.** The first step of the fragmentation geometry (in red) based on street and railway network obtained from open street map data for the 50 x 50 km square in the case of South-Holland. Source: author.



**Figure 4.** The complete fragmentation geometry (in red), including the areas which were selected through adding the results from the NDVI analyses. Source: author.



**Figure 5.** The comparison of different ways of building the fragmentation geometry. On the right hand side using a NDVI based analyses and on the left hand side using CORINE land cover classes according to Jaeger et al. (2011). The black square shows the location of the bird’s eye view of Figure 6.



**Figure 6.** Bird’s eye view over the TiB around The Hague showing the glass house areas on the left and the green buffer zone surrounding the suburban settlements. Source: Google Earth.

the less dense end of the list the Tyrol overtakes Vienna-Bratislava. The Veneto, which has the smallest difference between the overall population density and the population density in TiB, has the third least dense TiB.

The landscape fragmentation across the cases is much less diverse. The effective mesh size in the Tyrol is 220 times bigger than the one in Île-de-France. This

factor shrinks to four, when only comparing the effective mesh sizes of the TiB in those two cases. Considering only TiB, no relation between the population density and landscape fragmentation can be observed. The case with the lowest population density, Vienna-Bratislava, still performs best but the three most densely populated TiB are in the middle of the ranking. Therefore, it can be

**Table 5.** Comparison of effective mesh size and mesh size density in the ten cases.

Case study name	Total case study area			TiB within case study area		
	$m_{eff}$	$S_{eff}$	Rank	$m_{eff}$	$S_{eff}$	Rank
Bergamo-Brescia	21.912	0.046	3	0.405	2.468	10
Gelderland	9.191	0.109	8	0.956	1.046	7
Île-de-France	0.875	1.142	10	1.485	0.673	4
North Somerset	20.162	0.050	4	1.721	0.581	3
Pas-de-Calais	9.694	0.103	7	2.303	0.434	2
South-Holland	10.668	0.094	6	0.477	2.098	9
South Wales	13.553	0.074	5	1.224	0.817	6
The Tyrol	199.320	0.005	1	1.459	0.685	5
Veneto	1.672	0.598	9	0.865	1.156	8
Vienna-Bratislava	22.917	0.044	2	2.782	0.359	1

concluded that natural topography, as well as elements like technical and green-blue infrastructures and the resulting settlement patterns and metropolitan structures, which are influenced by planning and design, have an influence on this indicator.

The overview of number and total size of green spaces per category, in Table 6, shows that in all cases but South-Holland, a few large (>30ha) green spaces count in total for more area of green spaces than all small and medium sized green spaces together. The accessibility of these large green spaces is therefore crucial when combining both indicators to understand the relation between the spatial structure of the system of green spaces and effects on human well-being.

Small green spaces account for more hectare than medium size green spaces in all cases. For the majority of cases, the smallest class of green spaces accounts for more than 97% of the number of green spaces. Exceptions are Pas-de-Calais and Gelderland, which count relatively more medium sized green spaces as well as large green spaces, namely around 3%, compared to the mean of all cases, which is 1.9%. Moreover, The Tyrol's share of medium (6%) and large (10%) green spaces is significantly different to all other cases.

Both Dutch cases have a significantly higher area of mid-sized green space. In contrast, the two Austrian cases have significantly less area that falls into this category. Within the TiB of Pas-de-Calais, The Tyrol and

**Table 6.** Comparison of the number and area of green spaces according to small, medium and large size, as well as the share of each in relation to the total number and area.

Case	Green space < 10ha				10ha < Green spaces < 30ha				Green spaces > 30 ha			
	Nr.	% of total	Area in ha	% of total area	Nr.	% of total	Area in ha	% of total area	Nr.	% of total	Area in ha	% of total area
Bergamo-Brescia	8,015	97.8	3,657	29.2	93	1.14	1,653	13.2	85	1.0	7,217	57.6
Pas-de-Calais	5,260	93.7	3,101	11.9	158	2.81	2,746	10.5	198	3.5	20,213	77.6
Île-de-France	7,113	96.7	3,577	20.7	121	1.65	2,048	11.9	119	1.6	11,632	67.4
The Tyrol	374	83.3	557	9.0	27	6.01	527	8.5	48	10.7	5,112	82.5
Gelderland	4,169	94.0	2,135	13.6	127	2.86	2,372	15.1	140	3.2	11,199	71.3
North Somerset	2,531	96.5	1,122	15.2	41	1.56	701	9.5	50	1.9	5,537	75.2
South-Holland	9,789	97.9	4,598	36.0	134	1.34	2,300	18.0	81	0.8	5,883	46.0
South Wales	6,296	96.6	2,737	19.7	117	1.80	1,947	14.0	102	1.6	9,213	66.3
Veneto	7,210	96.0	3,719	19.3	145	1.93	2,700	14.0	154	2.1	12,826	66.6
Vienna-Bratislava	2,921	97.1	1,295	12.8	28	0.93	455	4.5	58	1.9	8,406	82.8

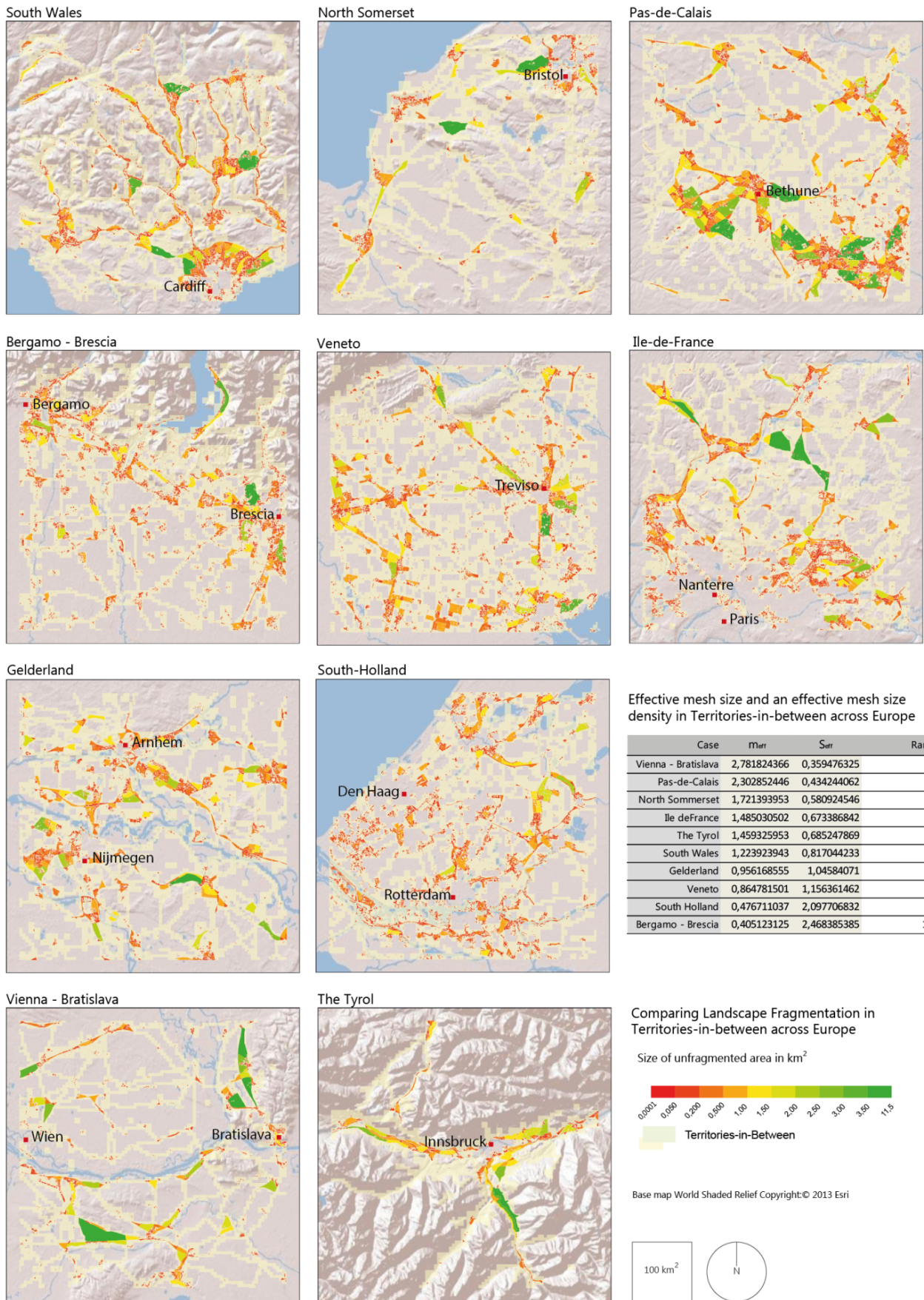


Figure 7. The landscape fragmentation of TiB in the ten case study areas. Source: author's own.



Vienna-Bratislava are significantly more hectare of green spaces, which are classified as large green spaces compared to all other cases.

To summarize, if the hypothesis is correct that the amount of large green spaces is not only crucial for the landscape connectivity, but also for the accessibility of green spaces, then Vienna-Bratislava, The Tyrol and Pas-de-Calais should perform best, and South-Holland should perform worst for the indicator accessibility of green spaces. If we follow the above argument that the effective mesh size is a better measure, also for the accessibility of green spaces, then Vienna-Bratislava, Pas-de-Calais and North Somerset should perform best, whereas Bergamo-Brescia and South-Holland are expected to perform worst concerning the accessibility of green spaces.

#### 4.3. The Comparison of Accessibility of Green Spaces in the Territories-in-Between

Before interpreting the data below, it is important to keep in mind that a minimum size of 200m<sup>2</sup> was chosen as lowest threshold to include a green space into the study. This means that isolated small green spaces, such as courtyards and small private gardens, are not considered. A general observation is that in all cases, except the Île-de-France, in both dense urban areas and TiB more than 50% of the population has access to at least one type of green space. For TiB this is true for all cases. Across all cases the percentage of population that has access to more than one type of green space is at least double the amount for TiB than for dense urban areas. The population within TiB that has access to at least one type of green space ranges from around 50% (Bergamo-Brescia and Pas de Calais) to close to 90% in Gelderland. In the majority of cases (7 of 10) more than half the population of TiB has access to more than one type of green space. A comparison of the two metropolitan cases, the Île-de-France and South-

Holland, shows that the latter performs nearly twice as well. Cases from the same country perform rather similarly, again with the exception of France. The following Table 7 and Figure 8 present the number of people living in different zones of intensity of accessibility to green space in the different case study areas.

#### 4.4. Combining the Two Indicators and Interpreting Results

In the following the two indicators are combined and interpreted in two different ways. The first combination, investigates, which category of size of green spaces serves the highest percentage of population. If the biggest green spaces serve the highest share of population, then the least fragmented TiB should be those with the highest accessibility of green space as well.

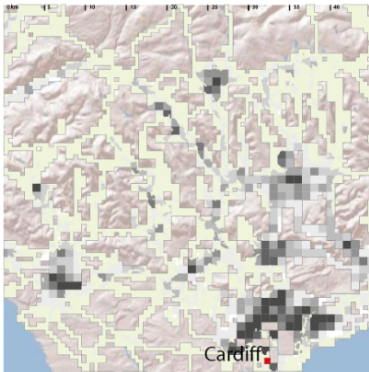
Figure 9 presents the percentages of population in TiB within the service areas of a specific size category of green spaces. Mind that percentages add up over 100%, because certain parts of the population are served by more than one type of green space, which was expressed in the above described intensity of accessibility.

In all cases the largest category of green spaces serves the highest amount of population. In three cases The Tyrol, Gelderland and Pad-de-Calais, more than 80% of the population are served by large green spaces. In the Ile-de-France, as well as in Bergamo-Brescia, relatively few, below 50% of people are served by large green spaces. In the two Dutch cases relatively many people are served by medium sized green spaces. In the case of Vienna-Bratislava, the mid-sized green spaces only serve around 6% of the population and both Italian cases with around 11% also score rather low. South-Holland stands out with 27% of population served by small green spaces. The Veneto and the Ile-de-France perform the weakest in this category.

**Table 7.** Intensity of accessibility to green spaces in urban areas and TiB in ten cases.

Case study name	Urban areas in case study areas			TiB within case study areas		
	Access to at least one type (%)	Access to more than one type (%)	Rank	Access to at least one type (%)	Access to more than one type (%)	Rank
Bergamo-Brescia	47	7	9	53	24	10
Gelderland	92	20	2	89	58	1
Île-de-France	11	1	10	52	28	9
North Somerset	53	9	8	68	40	4
Pas-de-Calais	96	35	1	83	52	3
South-Holland	57	8	7	68	40	4
South Wales	66	6	4	63	43	7
The Tyrol	95	18	3	83	53	2
Veneto	62	6	5	62	29	8
Vienna-Bratislava	65	3	6	66	29	6

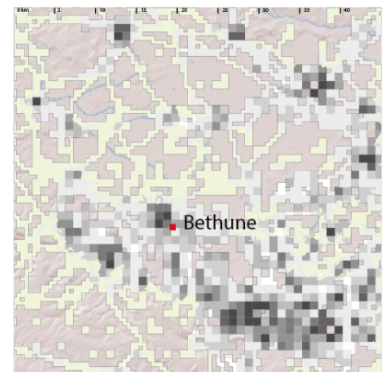
South Wales



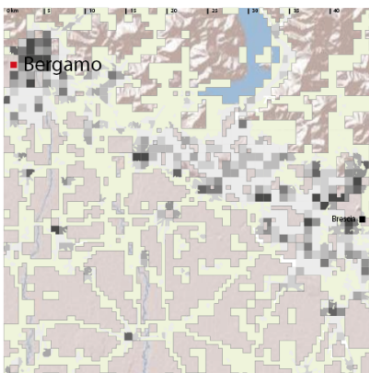
North Somerset



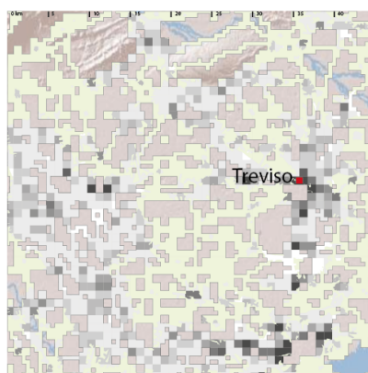
Pas-de-Calais



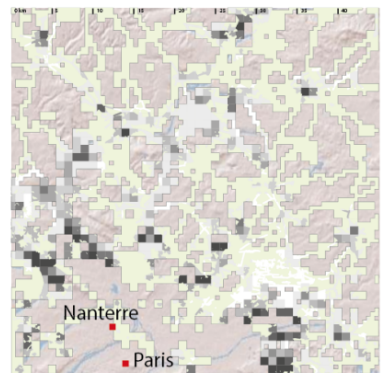
Bergamo - Brescia



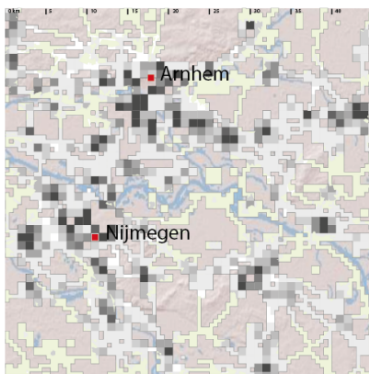
Veneto



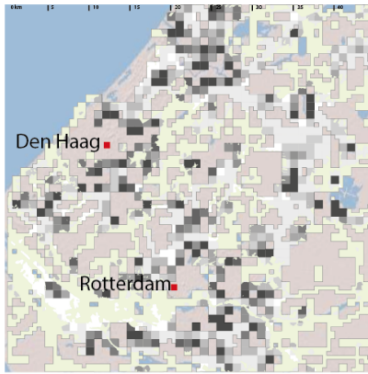
Ile-de-France



Gelderland



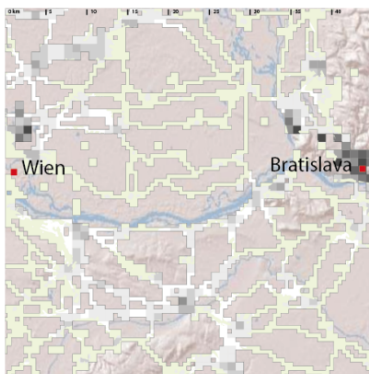
South-Holland



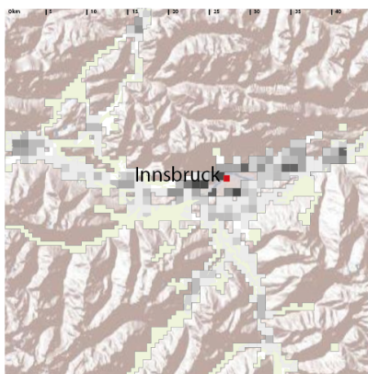
Comparing the accessibility of green spaces in Territories-in-between across Europe

Case study name	Percentage of population with		Rank
	access to at least one type	access to more than one type	
Bergamo-Brescia	53	24	10
Gelderland	89	58	1
Ile-de-France	52	28	9
North Somerset	68	40	4
Pas-de-Calais	83	52	3
South-Holland	68	40	4
South Wales	63	43	7
The Tyrol	83	53	2
Veneto	62	29	8
Vienna-Bratislava	66	29	6

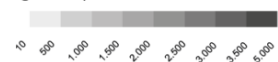
Vienna - Bratislava



The Tyrol



Number of inhabitants per sq. km with access to green spaces within TiB



Territories-in-Between

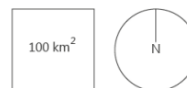


Figure 8. Comparison of accessibility across cases.

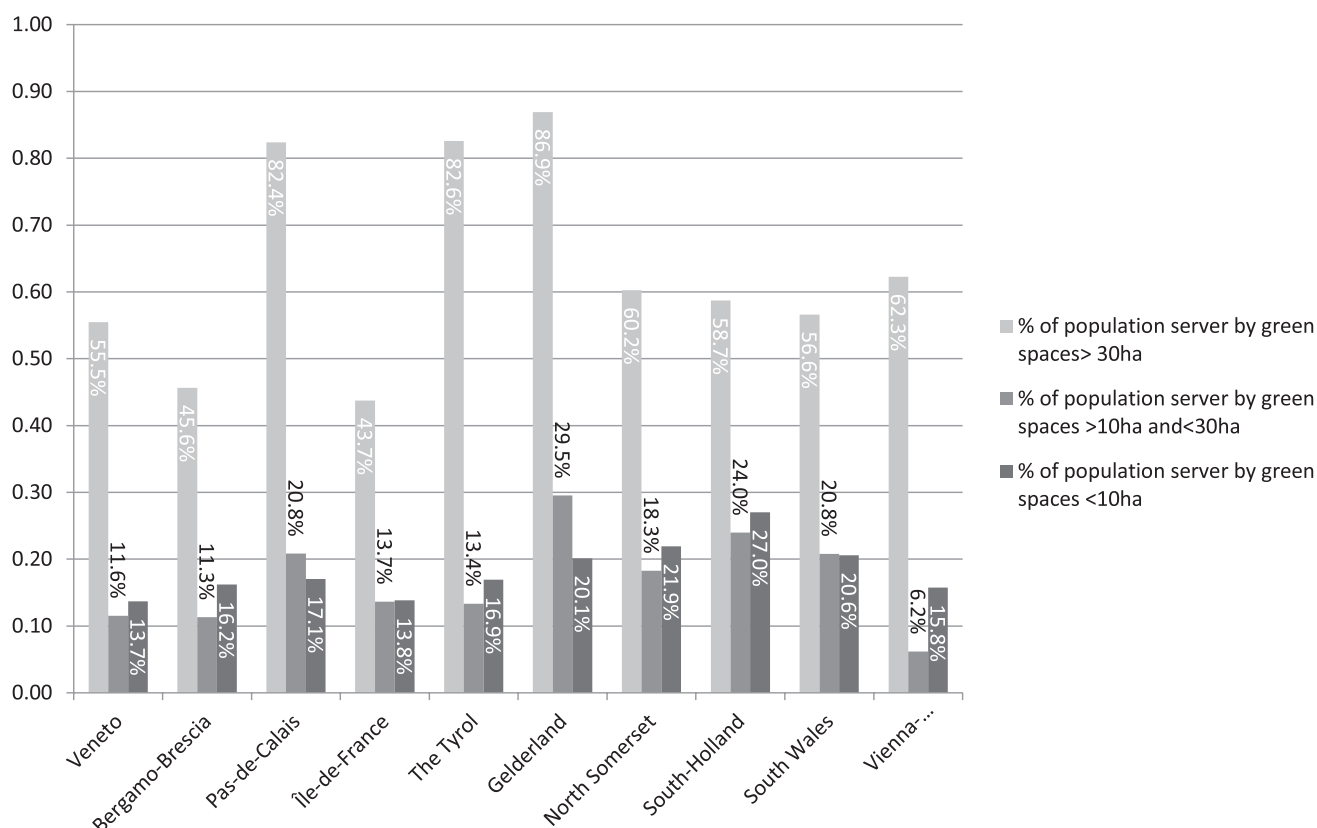


Figure 9. Population within the service area of specific sizes of green spaces.

Table 8 and Figure 10 present both indicators combined and show that there is not a clear relation between the performance of one indicator and the other. There are cases that perform relatively poorly (Bergamo-Brescia) or well (Pas-de-Calais) for both indicators, but there are also cases that perform relatively well for one and relatively poorly for the other (Gelderland). Therefore, an interpretation of the results needs always at least the combination of landscape morphological as-

pects, economic development performance, as well as an understanding of the varying regional planning and design approaches.

Pas-De-Calais is the overall strongest performing case. This is the result of a settlement pattern that is characterised by rather compact towns and villages that are embedded in and separated from each other by an agricultural platform, which has rather small grainsize and a dense accessible network of agricultural paths. The

Table 8. Accessibility of green spaces as well as landscape fragmentation in TiB across Europe.

Case study name	Percentage of population with			Landscape fragmentation	
	Access to at least one type	Access to more than one type	Rank	$m_{eff}$	Rank
Bergamo-Brescia	53	24	10	0.405	10
Gelderland	89	58	1	0.956	7
Île-de-France	52	28	9	1.485	4
North Somerset	68	40	4	1.721	3
Pas-de-Calais	83	52	3	2.303	2
South-Holland	68	40	4	0.477	9
South Wales	63	43	7	1.224	6
The Tyrol	83	53	2	1.459	5
Veneto	62	29	8	0.865	8
Vienna-Bratislava	66	29	6	2.782	1

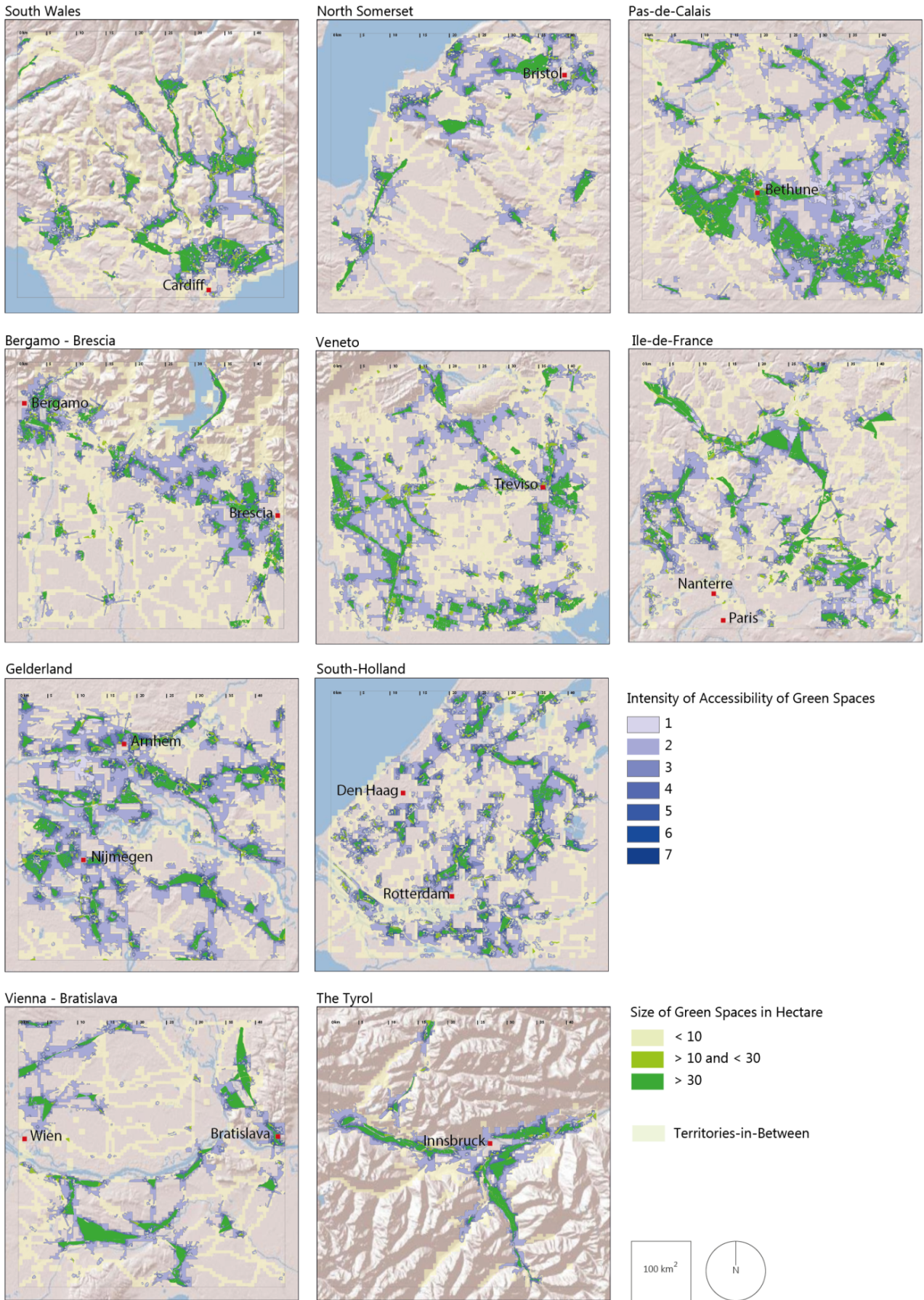


Figure 10. Overlay map of the combined indicators.

compactness of the settlements is partly also the result of the economic decline of this former mining area during the last decades of the twentieth century. A network of green spaces that follows the rivers through towns and countryside functions as eco-corridors and increases the accessibility of green spaces. Finally, the ongoing transformation of mining brownfields into parks and leisure areas since the 1990s has contributed to the high performance of system of green spaces in the case of Pas-de-Calais.

Gelderland, which performs best for accessibility of green space but rather weak concerning landscape fragmentation, has also a compact settlement pattern with agricultural areas, which are highly accessible, specifically by bike, between each city or village. But the road network is much denser than in Pas-de-Calais and therefore, Gelderland shows a higher landscape fragmentation.

The second French case, which is situated at the northern border of the Île-de-France, performs relatively well concerning the landscape fragmentation but relatively poor concerning the accessibility of green spaces. This result can be explained by the fact that most of the big green areas are large forests, mostly former feudal estates, which form large patches of un-fragmented areas and are also accessible by the public, but have rather few entrances, reducing their service areas. The enormous continuous settlement pattern of single family houses at the outskirts of Paris lacks a developed network of small and mid-sized green spaces. Here also rather large forests or parks are the dominant green spaces, which are again not accessible by many people within a short distance. Furthermore, business parks and infrastructure facilities are very often located at the edges of the settlements which may have curbing effects on future settlement development, whilst also blocking access to the agricultural platform and its ecosystem services.

A further interesting case is South-Holland. As one of the most densely populated cases it performs as expected, that is relatively poorly, concerning landscape fragmentation, and surprisingly relatively well concerning the accessibility of green spaces. The latter is the result of the ongoing protection of buffer zones between the cities, which are slowly developing into leisure areas, and the very dense network of regional bike paths that make this and other agriculturally used areas highly accessible. The extensive zone of dunes along the coast that are protected for their natural value and for flood defence reasons have only limited accessibility, but provide still benefits to big parts of the population. This coastal zone is, specifically in the post war areas of The Hague, connected to a well-developed network of green corridors and parks with many small and mid-sized green spaces.

The green belt around Cardiff and Newport, which forms the biggest part of the green space structure in the case of South-Wales, performs relatively and to a certain extent surprisingly weak, considering the idea of the green belt is one the originated from the garden city

and should provide accessible countryside. The reason for the rather bad performances, is that the settlement pattern next to the green belt is a suburban cul-de-sac pattern, which means, low density and little possibility to walk through. Moreover, highways are fragmenting the green belt heavily.

The relative poor performance of the two Italian cases can be explained on the one hand by the dense infrastructure network in the areas, which leads to high landscape fragmentation, and on the other hand, the few large green areas. The green areas are often under natural protection and rather distant from larger settlements and not very well connected to them.

The Tyrol is a case where the influence of topography is very apparent. The fact that the TiB are all located within the valleys where also the infrastructure is concentrated, leads to a highly fragmented territory. However, the ribbon structure of the settlement pattern, has the consequence that big green spaces are very close to the settlements. This spatial configuration combined with a dense network of agricultural and touristic paths and streets—the result of a flourishing tourism industry of the last 50 years—provides a very high accessibility of green spaces.

## 5. Conclusions

We come back to the simple hypothesis set out: Do less fragmented greenspace systems in TiB provide also better accessibility to green spaces? And can we identify, which settlement patterns and therefore spatial planning approaches, combine both biodiversity and accessibility the best? The answer is, for the ten tested cases, that there is not a clear relationship between landscape fragmentation and accessibility of green spaces. There is the same amount of cases that perform equally weak/strong for both indicators, as there are cases that perform contrasting for both indicators.

Clear conclusions can be drawn for the settlement patterns that perform best. A large and un-fragmented regional network of greenspaces as backbone is crucial. Whether this is in the form of green belts, green fingers, buffer zones or landscape parks, does not make a big difference. Crucial is that these large green spaces are easily accessible, preferably by foot, bike or public transport. Furthermore, it is important that traffic and other infrastructures are located and designed in a way that they fragment the big green spaces as little as possible and do not block access to these large green spaces. It is also important to avoid cul-de-sac settlement patterns and gated communities, as well as impermeable industrial or business parks at the edge of the settlements.

Cases that have a more compact settlement pattern—where individual cities, towns and villages are separated by medium sized greenspaces—tend to perform better on both indicators. Crucial here is to make sure that the medium sized green spaces are easily accessible. In contrary to large green spaces, the midsized

green spaces are often not part of national planning or environmental protection, therefore regional and cross municipal cooperating is essential to establish this part of a regional green system.

Finally, a large amount of fair distributed small green spaces is crucial as well. This is specifically relevant for TiB, as ongoing densification is often related with a change of housing typology from single family housing with private gardens to flat buildings without private gardens. Moreover, densification transforms green spaces, which are often considered as underused, but are nevertheless essential for biodiversity and human well-being.

The presented results and maps have the potential to facilitate and inform discussion across the many fields of expertise and actors involved in protecting and assist in developing system of green spaces in TiB. This is specifically important for TiB, where the expected future densification of urban uses and the protection of (urban) biodiversity are causing and will continue to cause conflict among different groups of interest.

The above examples of the interpretation of the two indicators, with admittedly limited knowledge about the local specificities, provides an idea about their usefulness and limitations. The indicators, landscape fragmentation and accessibility to green spaces as well as their combination can be used to compare the potential benefits of green spaces on a regional or metropolitan scale, and thereby compare the performance of different settlement structures. The presented methodology allows for comparison of historic, present and proposed alternative future settlement patterns, and can inform regional planning and design as well as other policy fields.

The key advantage of the method described is the use of NDVI to identify green spaces instead of using CORINE land cover data, because remote sensing allows a more fine-grained identification of green spaces. Satellite data is readily available across the globe and allows, therefore, the methods to be applied worldwide. But there are also limitations as it is difficult to find satellite images, which have no cloud cover. Also, the time of the year the satellite image has been taken has an influence on the indicators. Only images during the vegetation period should be used and harvesting times of agricultural crops have to be considered otherwise barren land is not identified as green space.

A further limitation is that indicators express the potential effects of green spaces. As fieldwork shows, the actual access to specifically agriculturally used areas is often forbidden—this is specially true for the Italian cases. A similar aspect is that the method does not distinguish between private and public spaces, which means that private gardens are included in the assessment, not considering if they or the streets next to them are actually accessible or not. This is critical for gated communities with limited access and therefore, for aspects of spatial justice.

The last limitation leads to a crucial field of further research, which is to combine the indicators with addi-

tional demographic data, (e.g., income, ethnicity or level of education), relating the accessibility of greenspaces and their positive human impacts more clearly to aspects of spatial justice. This kind of studies have been done for urban areas but not for TiB yet. The article also considers only the service areas of green spaces in relation to resident population, but it would be equally interesting and important to extend the assessment to the working population, as a large part of the population is not home throughout much of the day.

Finally, we can conclude that several of the qualities Howard formulated for his Town-Country magnet are present in TiB: beauty of nature and societal opportunity; fields and parks of easy access, pure air and water and good drainage. Those qualities are also related to the key benefits of green structures described in this article and shows how timeless Howard's vision is. It also shows that it is worth using both indicators in combination and look at TiB as distinct and separated from urban areas and understanding them as places in their own right, as this helps to leave behind a discussion: whether further densification or dispersion is the key to solving challenges related to sustainable development, and that they are different within urban and dispersed areas.

### Conflict of Interests

The author declares no conflict of interests.

### References

- Andersson, E., Barthel, S., & Ahrné, K. (2007). Measuring social-ecological dynamics behind the generation of ecosystem services. *Ecological Applications*, 17(5), 1267–1278. doi:10.1890/06-1116.1
- Angold, P. G., Sadler, J. P., Hill, M. O., Pullin, A., Rushton, S., Austin, K., . . . Thompson, K. (2006). Biodiversity in urban habitat patches. *Science of the Total Environment*, 360(1), 196–204. doi:10.1016/j.scitotenv.2005.08.035
- Beninde, J., Veith, M., & Hochkirch, A. (2015). Biodiversity in cities needs space: A meta-analysis of factors determining intra-urban biodiversity variation. *Ecology Letters*, 18(6), 581–592. doi:10.1111/ele.12427
- Aronson, M. F., La Sorte, F. A., Nilon, C. H., Katti, M., Goddard, M. A., Lepczyk, C. A., . . . Dobbs, C. (2014). A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B: Biological Sciences*, 281(1780).
- Beumer, C., & Martens, P. (2014). Biodiversity in my (back)yard: Towards a framework for citizen engagement in exploring biodiversity and ecosystem services in residential gardens. *Sustainability Science*, 10(1), 87–100. doi:10.1007/s11625-014-0270-8
- Campi, M., Bucher, F., & Zardini, M. (2000). *Annähernd perfekte Peripherie: Glattalstadt/Greater Zurich Area*. Basel: Birkhäuser.

- Clauset, A., Shalizi, C. R., & Newman, M. E. J. (2009). Power-law distributions in empirical data. *SIAM Review*, 51(4), 661–703. doi:10.1137/070710111
- Comber, A., Brunsdon, C., & Green, E. (2008). Using a GIS-based network analysis to determine urban greenspace accessibility for different ethnic and religious groups. *Landscape and Urban Planning*, 86(1), 103–114. doi:10.1016/j.landurbplan.2008.01.002
- Di Giulio, M., Holderegger, R., & Tobias, S. (2009). Effects of habitat and landscape fragmentation on humans and biodiversity in densely populated landscapes. *Journal of Environmental Management*, 90(10), 2959–2968. doi:10.1016/j.jenvman.2009.05.002
- Dramstad, W. E., Olson, J. D., & Forman, R. T. T. (1996). *Landscape ecology principles in landscape architecture and land-use planning*. Washington, DC: Island Press.
- Eigenbrod, F., Bell, V. A., Davies, H. N., Heinemeyer, A., Armsworth, P. R., & Gaston, K. J. (2011). The impact of projected increases in urbanization on ecosystem services. *Proceedings of The Royal Society B: Biological Sciences*, 278(1722), 3201–3208. doi:10.1098/rspb.2010.2754
- European Commission. (1997). *The EU compendium of spatial planning systems and policies* (Regional Development Studies 28). Luxembourg: Office for Official Publications of the European Communities.
- European Environment Agency. (2011). *Landscape fragmentation in Europe*. Copenhagen: EEA.
- Faeth, S. H., & Kane, T. C. (1978). Urban biogeography: City parks as islands for diptera and coleoptera. *Oecologia*, 32, 1217–133. doi:10.1007/BF00344697
- Girvetz, E. H., Thorne, J. H., Berry, A. M., & Jaeger, J. A. (2008). Integration of landscape fragmentation analysis into regional planning: A statewide multi-scale case study from California, USA. *Landscape and Urban Planning*, 86(3), 205–218. doi:10.1016/j.landurbplan.2008.02.007
- Gómez-Baggethun, E., & Barton, D. N. (2013). Classifying and valuing ecosystem services for urban planning. *Ecological Economics*, 86, 235–245. doi:10.1016/j.ecolecon.2012.08.019
- Hermann, M., Pentek, T., & Otto, B. (2016). Design principles for industrie 4.0 scenarios. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 2016–March, 3928–3937. IEEE. doi:10.1109/HICSS.2016.488
- Higgs, G., Fry, R., & Langford, M. (2012). Investigating the implications of using alternative GIS-based techniques to measure accessibility to green space. *Environment and Planning B: Planning and Design*, 39(2), 326–343. doi:10.1068/b37130
- Huhlmann, F., & Promski, M. (2007). *Assessing contemporary cultural landscapes*. Paper presented at the European Council of Landscape Architecture Schools Conference, Belgrade, Serbia.
- Indovina, F. (1990). *La città diffusa (The diffuse city)*. Venice: Istituto Universitario di Architettura.
- Jaeger, J. A. G. (2002). *Landschaftszerschneidungeine transdisziplinäre Studie gemäß dem Konzept der Umweltgefährdung; mit 50 Tab.* Stuttgart: Ulmer.
- Jaeger, J. A. G., Bertiller, R., Schwick, C., Müller, K., Steinmeier, C., Ewald, K. C., & Ghazoul, J. (2008). Implementing landscape fragmentation as an indicator in the Swiss Monitoring System of Sustainable Development (Monet). *Journal of Environmental Management*, 88(4), 737–751. doi:10.1016/j.jenvman.2007.03.043
- Jaeger, J. A., Soukup, T., Madriñán, L. F., Schwick, C., & Kienast, F. (2011). *Landscape fragmentation in Europe* (EEA Report No 2/2011). Copenhagen: European Environmental Agency.
- Kane, K., Connors, J. P., & Galletti, C. S. (2014). Beyond fragmentation at the fringe: A path-dependent, high-resolution analysis of urban land cover in Phoenix, Arizona. *Applied Geography*, 52, 123–134. doi:10.1016/j.apgeog.2014.05.002
- Kasanko, M., Barredo, J. I., Lavallo, C., McCormick, N., Demicheli, L., Sagris, V., & Brezger, A. (2006). Are European cities becoming dispersed?: A comparative analysis of 15 European urban areas. *Landscape and Urban Planning*, 77(1), 111–130. doi:10.1016/j.landurbplan.2005.02.003
- Le Jeannic, T., & Vidalenc, J. (1997). Pôles urbains et périurbanisation. Le zonage en aires urbaines. *INSEE première*, 516, 1–2.
- Lerner, A. M., & Eakin, H. (2011). An obsolete dichotomy? Rethinking the rural–urban interface in terms of food security and production in the Global South. *The Geographical Journal*, 177(4), 311–320. doi:10.1111/j.1475-4959.2010.00394.x
- Lovell, S. T., & Taylor, J. R. (2013). Supplying urban ecosystem services through multifunctional green infrastructure in the United States. *Landscape Ecology*, 28(8), 1447–1463. doi:10.1007/s10980-013-9912-y
- Marulli, J., & Mallarach, J. M. (2005). A GIS methodology for assessing ecological connectivity: Application to the Barcelona Metropolitan Area. *Landscape and Urban Planning*, 71(2/4), 243–262. doi:10.1016/j.landurbplan.2004.03.007
- Matsuoka, R. H., & Kaplan, R. (2008). People needs in the urban landscape: Analysis of Landscape And Urban Planning contributions. *Landscape and Urban Planning*, 84(1), 7–19. doi:10.1016/j.landurbplan.2007.09.009
- Müller, N., & Werner, P. (2010). Urban biodiversity and the case for implementing the convention on biological diversity in towns and cities. In N. Müller, P. Werner, & J. G. Kelcey (Eds.), *Urban biodiversity and design* (pp. 3–33). Oxford: John Wiley & Sons.
- Nadin, V., & Stead, D. (2013). Opening up the compendium: An evaluation of international comparative planning research methodologies. *European Planning Studies*, 21(10), 1542–1561. doi:10.1080/09654313.2012.722958
- Neutelings, W. J. (1994). Explorations into wonderland:

- Riding the periphery of Low Countries, The Patchwork Metropolis. *Architectural Design*, 64, 58–63.
- Park, S. (2015). Spatial assessment of landscape ecological connectivity in different urban gradient. *Environmental Monitoring and Assessment*, 187(7), 425. doi:10.1007/s10661-015-4645-9
- Parker, S. S. (2015). Incorporating critical elements of city distinctiveness into urban biodiversity conservation. *Biodiversity and Conservation*, 24(3), 683–700. doi:10.1007/s10531-014-0832-1
- Pickett, S., Cadenasso, M. L., Grove, J. M., Groffman, P. M., Band, L. E., Boone, C. G., . . . Wilson, M. A. (2008). Beyond urban legends: An emerging framework of urban ecology, as illustrated by the Baltimore Ecosystem Study. *BioScience*, 58(2), 139. doi:10.1641/B580208
- Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*, 15(5), 319–37. doi:10.1080/09603120500155963
- Scott, A. J., Carter, C., Reed, M. R., Larkham, P., Adams, D., Morton, N., . . . Coles, R. (2013). Disintegrated development at the rural–urban fringe: Re-connecting spatial planning theory and practice. *Progress in Planning*, 83, 1–52. doi:10.1016/j.progress.2012.09.001
- Shucksmith, M. (2010). Disintegrated rural development? Neo-endogenous rural development, planning and place-shaping in diffused power contexts. *Sociologia Ruralis*, 50(1), 1–14. doi:10.1111/j.1467-9523.2009.00497.x
- Sieverts, T. (2003). *Cities without cities: An interpretation of the Zwischenstadt*. London: Routledge.
- Sieverts, T. (2008). Where we live now. In M. Stadler (Ed.), *Where we live now: An annotated reader*.
- Thompson, I. H. (2012). Ten tenets and six questions for landscape urbanism. *Landscape Research*, 37(1), 7–26. doi:10.1080/01426397.2011.632081
- van der Hoeven, F., & Wandl, A. (2013). *Amsterwarm: Gebiedstypologie warmte-eiland Amsterdam*. Retrieved from <https://books.bk.tudelft.nl/index.php/press/catalog/book/17>
- Van Herzele, A., & Wiedemann, T. (2003). A monitoring tool for the provision of accessible and attractive urban green spaces. *Landscape and Urban Planning*, 63(2), 109–126. doi:10.1016/S0169-2046(02)00192-5
- Viganò, P., Arnsperger, C., Lanza, E. C., Corte, M. B., & Cavalieri, C. (2017). Rethinking urban form: Switzerland as a “Horizontal Metropolis”. *Urban Planning*, 2(1), 88–99. doi:10.17645/up.v2i1.871
- Wahler-Žak, B. (2017). *Gartenstadt21 Ein neues Leitbild für die Stadtentwicklung in verdichteten Ballungsräumen – Vision oder Utopie?* Bonn: BBSR.
- Wandl, A., Nadin, V., Zonneveld, W., & Rooij, R. (2014). Beyond urban–rural classifications: Characterising and mapping territories-in-between across Europe. *Landscape and Urban Planning*, 130, 50–63. doi:10.1016/j.landurbplan.2014.06.010

### About the Author



**Alexander Wandl** is a researcher at the Department of Urbanism at the Faculty of Architecture and the Built Environment at TU Delft. He has a rich experience in national (BAR, NWO) and international research projects (FP7: RUFUS, NODES; ESPON: TANGO; H2020: REPAIR). His research specifically focuses on the understanding of urban form, its performance and related spatial policies through the concept of urban metabolism with a spatial focus on dispersed urban areas. His expertise lies in the integration of spatial decision and design support via geographic information systems.



Article

## Garden Cities of the 21<sup>st</sup> Century: A Sustainable Path to Suburban Reform

Nicolas Vernet <sup>1,2,\*</sup> and Anne Coste <sup>1</sup>

<sup>1</sup> École Nationale Supérieure d'Architecture de Grenoble (ENSAG), Université Grenoble Alpes, 38000 Grenoble, France;  
E-Mails: vernet.n@grenoble.archi.fr (N.V.), coste.a@grenoble.archi.fr (A.C.)

<sup>2</sup> French Environment and Energy Management Agency, 49004 Angers, France

\* Corresponding author

Submitted: 15 July 2017 | Accepted: 18 December 2017 | Published: 29 December 2017

### Abstract

The garden city is often presented as a low-density, unsustainable and space-consuming archetype of suburbanization (Duany, Roberts, & Tallen, 2014; Hall, 2014; Safdie & Kohn, 1997). It has been deliberately also misused by property developers for gated communities (Le Goix, 2003; Webster, 2001). But these projects have little in common with the original concept of garden cities. We argue that the original garden city, as a theory (Howard, 1898) and as experiments (Letchworth and Welwyn Garden Cities), is a precedent that can be used in a sustainable approach that addresses a range of issues and concerns, such as housing, governance, the economy, mobility, the community, agriculture, energy and health. The recent Wolfson Economics Prize (2014) and the many new garden cities and suburbs projects currently planned in the UK have demonstrated the resurgence of this model in the planning world, both in terms of theory and practice. In this paper, we explore its potential in the light of environmental challenges. We therefore suggest that as a model, it can in particular underpin the evolution of suburbs in an era of energy transition, since these areas require an ecosystemic rather than sectoral approach to design.

### Keywords

density; eco-systemic approach; energy transition; garden cities; model; suburbs; Wolfson Economics Prize

### Issue

This article is part of the issue “Garden Cities and the Suburban Antidotes”, edited by Markus Hesse and Geoffrey Caruso (University of Luxembourg, Luxembourg).

© 2017 by the authors; licensee Cogitatio (Lisbon, Portugal). This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

### 1. Introduction

The term “suburb”—and its French equivalent “périurbain”—is used in the Anglosphere to describe the peripheral urbanization that came about in the main English and American cities since the late 19<sup>th</sup> century. Suburbs are characterized by the development of low-density housing where a wide range of social groups lives. Boosted by the democratization of cars and by consecutive housing crises, considered to be the cause of monotonous urbanization, suburbs have received renewed interest from public authorities (George & Fernandez, 2013, p. 419), and from professionals seeking to limit or to “repair” them (Tachieva, 2010).

Beyond mere urban form, suburbs are related to many of the urban and environmental issues of 21<sup>st</sup> cen-

ture’s urbanization. Furthermore, they are sometimes associated with the garden cities model (Hall, 2014, p. 8), which finds its origins in the England of the late 19<sup>th</sup> century. However, this connection is often based on a misinterpretation of the original project of Ebenezer Howard (1850–1928), or on only a few characteristics of the first garden cities, which were materializations imagined by some architects based on the original theoretical model.

Before going further in our considerations, it seems important here to define the word “model” as we use it, in order to understand clearly the following and to explain why it seems interesting to mobilize this term when we evoke the garden cities. In a previous article, Anne Coste explains that, in the realm of architecture—and by extension that of urbanism—a model can serve many purposes: it can be used to design, to represent

or to understand. Subsequently, she specifies that it can also be of many types: “the archetype, which will be imitated or interpreted through the work of creation; the model or the small scale or otherwise representation or of an object...and, lastly the simplified representation of a process or system” (Coste, 2010, pp. 76–77). Therefore, the models studied can be written, drawn or built.

Based on this point of view, the garden cities model can be considered comprehensive as it combines all these characteristics (Figure 1). Howard’s book *Tomorrow: A Peaceful Path to Real Reform* (1898)<sup>1</sup>, consists of a written manifesto (theoretical archetype) and various synthetic diagrams (simplified representations). It aims at helping to capture the complexity of the ideas expressed by the author (understanding), and at formalizing a project (representation) using the tools of the architect to create (design) new human settlements (examples that may be considered as new physical archetypes). We may also add that the garden cities model is comprehensive in terms of its complexity and variety of scales, but also in relation to the extent of its diffusion (Sadoux & Novarina, 2017), the number of projects that it generated around the world and its longevity (see Stern, Fishman, & Tilove, 2013).

The aim of this article is therefore to evaluate the way the garden cities model sets a precedent which, through its historical evolution and the projects it has inspired, can be used to see beyond the usual issues attributed to suburban areas, in order to imagine a more sustainable path for the suburbs in the 21<sup>st</sup> century. In a first diagnosis, we will put into perspective the common history of these two urbanization models so as to better understand the aspects they effectively share, while attempting to deconstruct some of the misunderstandings commonly attributed to the garden cities model. Here, we will concentrate on the British context, and more particularly on London and its surroundings, where the long story of the garden cities begun with the publication of the original theory and the construction of the first gar-

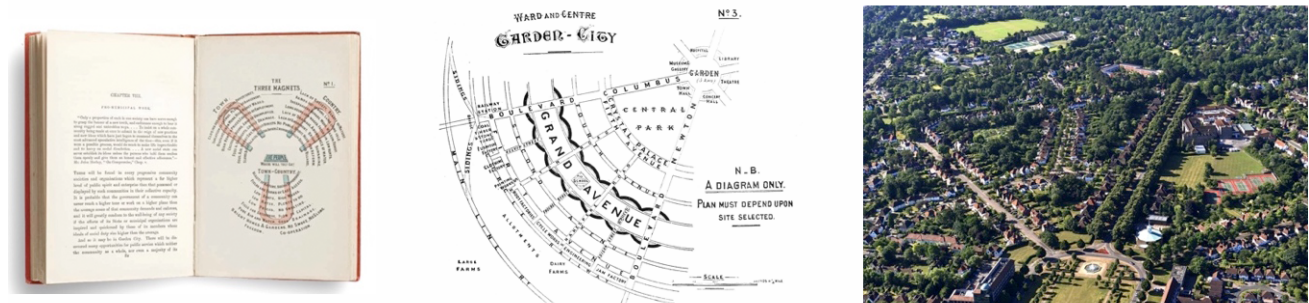
den cities. We will then evoke, along a second part, the usage of the model as a precedent. To do so, we will describe the work of two planning agencies that used the garden cities model to develop new theories and to question the urban form of suburbs. In a third part, more forward-looking, we will explain the theoretical foundations on which our researches are based, and we will present some keys to understand the potential of the garden cities model for conceiving sustainable alternatives for the contemporary suburbs.

## 2. Historical and Social Reasons for Suburbs

### 2.1. The Emergence of Suburbs in Great Britain

In Great Britain, the first nation to undergo the transformations related to the industrial revolution, the culture of suburbs is built upon a number of administrative and technical developments. As is the case with the garden cities, the origin of suburbs was established in Victorian England in the late 19<sup>th</sup> century, stemming from a vision of the city that came to light in the 18<sup>th</sup> century, at the crossroads of hygienist and social concerns. The portrait of London by Andrew Saint gives us some historical insight into the emergence of British suburbs (Saint, 1991).

By 1840, London’s immensity, with a population approaching two million, started facing organization, health and transportation problems. And so, the Metropolitan Board of Works is created in 1855 to handle various public responsibilities (roads, sewerage, slum clearance, housing regulations). In 1889, the London County Council (LCC), responsible for defining the urban prospects of London and its surroundings, came to existence (although its ambitions would be diminished by the State around 1900 as more power was given to local governments). Through the creation of a polycentric urban organization, the growing mass of London absorbed certain communities such as Kensington and Hampstead<sup>2</sup>. This urban phenomenon was gradually am-



**Figure 1.** The garden cities model: as a theoretical archetype (left), as a model of intelligibility (centre) and as an example (right). Sources: Howard (1898); Letchworth Garden City Heritage Foundation, 2016.

<sup>1</sup> Reedited three years later, with the title *Garden Cities of To-morrow* (1902).

<sup>2</sup> That’s the principle of conurbation defined by the biologist and sociologist Sir Patrick Geddes (1854–1932) when he proposes to name “these city-regions, these town aggregates...this new form of population-grouping, which is already, as it were subconsciously, developing new forms of social grouping and of definite government and administration by and by also” (Geddes, 1915, p. 34).

plified by the strong development of transport systems from the second half of the 19<sup>th</sup> century<sup>3</sup>. At that time, London faced correlated health, housing and density challenges. As the Metropolitan Board of Works did not have the power to implement the construction of new housing, it was necessary to wait for the responsibilities of the LCC to be extended in 1893 for the city to begin taking hold of the situation.

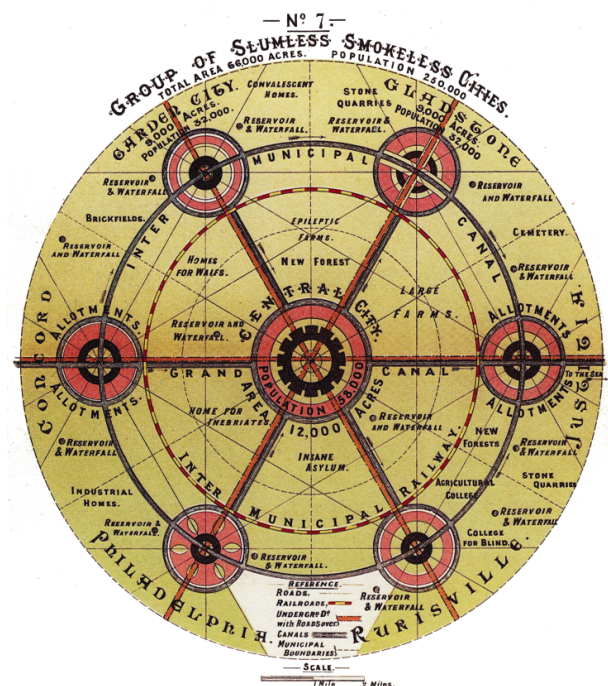
Despite being attracted to the apartment building, the British middle class still preferred long commutes between home and work in order to maintain a quality of life materialized as an individual home and garden, along with a bucolic fondness for the English countryside. The daily journeys achieved by foot, by bus and later by tramway, rail or automobile were ultimately limited only by the evolution of technology and by transport related costs. During the development of the first train lines serving the suburbs, Londoners increased their average daily commuting distance by 15 to 25 km. Around 1900, many would make the journey from downtown London to smaller cities, up to 50 km away. Little by little, this way of life is extended to popular classes and facilitated by the reduced fees offered by railway companies in exchange for the inconveniences caused by the construction of train stations and rail networks. These recurrent home-to-work commutes are particularly characteristic of the interactions between economic centres and their suburban areas, which often serve a mainly residential purpose.

### 2.2. A Dispersion Strategy for Greater London Inspired by the Garden Cities Model

It is in this context that politicians take hold of this dispersion phenomenon, relying in particular on the Garden City Movement, inspired by the reformist ideals of Ebenezer Howard and more specifically his book *Tomorrow*, in which he describes the “Social Cities” principle, that can be defined synthetically as a network of new and interconnected cities (Figure 2). And so, the LCC adopts a new strategy and commits to the creation of low-cost houses on the outskirts of London, inspired by the urban planning methods and the so-called “picturesque” urban forms developed by Richard Barry Parker (1867–1947) and Raymond Unwin (1863–1940), and implemented in the Hampstead Garden Suburb district, from 1907. These two architects are none other than the town planners of the first English garden city, the construction of which had started a few years earlier, in 1903<sup>4</sup>. These urban forms, defined by series of cottages, become more popular, supporting urban sprawl, which at the time was regarded as beneficial from the hygienist ideology standpoint and fit London’s demographic decongestion needs. The LCC, however, had no influence on the establishment of industries, and the dispersion of factories and manufacturing facilities did not

follow the migration of population as quickly as hoped. Between 1919 and 1939, London saw its population increase by 30% and its surface area multiplied by three (Sadoux, 2007) and, correspondingly, in 1931 the population density of the County of London remained almost as problematic as in 1901.

The garden cities model serves the evolution of suburbs once again, although this time urban planners of the interwar period intend to contain urban sprawl and encourage the dispersion of industries toward the economically weaker peripheral regions. After Howard’s death in 1928, his former associates (Raymond Unwin and Frederic J. Osborn, in particular) pursued his work, but let go of the strategy of voluntary action originally meant to support a government-led urban planning project at the regional scale. Inspired by a report co-written by Raymond Unwin in 1933, the Greater London Regional Planning Committee set up a large metropolitan “greenbelt” around London. Its main function was to control the development of suburbs, thus enabling the implementation of a new urbanization strategy. The latter takes shape as the Greater London Plan devised by urban planner and architect Sir Patrick Abercrombie (1879–1957), applying the greenbelt concept over an area of more than six miles in width. Beyond this limit, he implemented an alternative urban development strategy, echoing a tradition of deconcentration, humanist in inspiration, based on the idea of a return to small-scale communities and traditional urban forms (Sadoux, 2007).



**Figure 2.** Diagramme no. 7: “Social Cities”. Source: Howard (1898).

<sup>3</sup> More specifically the rail network around 1840 and the underground networks from 1900 onward.

<sup>4</sup> The two partners apply the urban and architectural principles developed by Unwin for the industrial city of New Earswick, in 1902.

### 2.3. *New Towns Planned as Alternatives to Suburbs*

The limitation of London's periurbanization through the adoption of the greenbelt principle would symbolically represent the state's awareness of suburban issues. Yet, the principle of deconcentration through dispersion requires a strategy of relocation of the population to avoid the reproduction of past errors. In his Greater London Plan, in addition to suggesting the relocation of migrant populations from London in existing towns, Abercrombie designates ten peripheral sites to build new towns capable of accommodating part of the latter (Alexander, 2009, p. 28).

Inspiration for this project is found explicitly on the satellite cities proposed by Howard. The original master plan of the Greater London Plan distinctly shows their perfectly circular shape, contrasting with the organic growth of London. It mobilizes several principles of urban organization defining the garden cities. New towns are accessible by a train and are surrounded by their own greenbelt as a means to limit urban sprawl. They feature an industrial area located on the outskirts, with direct access to the railway system. Finally, residential density is set at a maximum of 30 to 50 inhabitants per acre, in tune with the Tudor Walters report published in 1918. This report, produced by a parliamentary committee of which Unwin was a member, is based on some of his previous theoretical and practical works as an urban planner (Sadoux, 2015a), and draws on his experiences on the design of New Earswick, Letchworth Garden City and Hampstead Garden Suburb. A basis on these enterprises and reflections led to the publication of the first New Town Act in 1946 (Fishman, 1979), formalizing government action for a planned suburbanization in the form of new human settlements.

Between 1946 and 1970, some of the core principles behind the garden cities model served as reference for the creation of thirty-two new towns. These principles would be gradually put to test and invalidated as they confront regulations and urban developments of the 20<sup>th</sup> century. As urban planning projects are handled by Development Corporations, private property and land speculation are favoured, in contrast with the collective land ownership principles advocated by Howard. The diversity of traditional architectures in the Arts and Crafts style is gradually replaced, in parallel to the emergence of theories of modernist urbanism, sacrificing urban quality and leading to the monotonous uniformity of housing structures. Also, the spatial segregation of activities combined with the democratization of cars leads to divisions of functional but also economic and social natures.

Consequently, urban dispersion strategies moved away from the principles behind the traditional city and the values borne by the original garden cities model, and gradually moved closer to the most problematic suburb characteristics mentioned above (privatization, monotony, monofunctional zoning, automobile dependency), and so, to this day, public opinion and profession-

als continue to associate garden cities with the problems posed by new towns and suburbs (Barkham, 2016; Holliss, 2017).

### 2.4. *The Social and Environmental Downsides of Affinity Urbanism*

More generally, negative perception of suburbs was built upon the gradual standardization of a way of life influenced by individualism and a quest for social ascension that tainted the urban evolution of industrialized countries during the last century. Contemporary suburban development, considered as unsustainable in principle, is mainly the result of a thought process that legitimizes individual responses to the collective organization of the inhabited space. In the 19<sup>th</sup> century, the peripheral city appears as a solution to the social problems caused by industrialized cities, affected by both population density and pollution. It emerges as a response to the serious challenges affecting the health and finances of the working classes, as denounced by several physicians and economists of the time, ingraining this era with hygienist and socialist values (Ragon, 2010, pp. 35–56). The following century is then marked by the rise of the middle classes and the consumer society.

New urbanization strategies are thus designed in opposition to the characteristics of the traditional city, which is rejected. This translates into a shift of morphological characteristics: built structures become discontinuous and scattered on their territory. The urban fabric loses its density. The private road impedes free circulation in the public space. Facades no longer determine the position of roads, as they back away behind barriers and gardens. A functional mix gives way to a fragmented urbanism, conditioned by automobile dependency, and organized according to different social functions: production, business, leisure, rest (Donzelot & Epstein, 2009, p. 7).

Economically, the suburb is the consequence of the rise of a society advocating the principle of freedom through property. The suburban ideal stems from the financial possibility granted to people of the middle class to satisfy its desires to dwell—or rather what they are offered to desire—within the limits of what they can afford. Individual houses are thus longed for in order to avoid the hassle of social interaction imposed by collective housing, completed with a garden that will grant access to a tamed sample of the natural world, surrounded by barriers for protection and peace of mind, and last but not least, a car as the symbol of a newly-acquired privilege.

The social consequences of these material considerations are even more insidious. The idea of a possible upgrade from social to residential housing is increasingly precarious. The consequence of this tendency is materialized in the form of an opposition between the different social classes, rejecting cohabitation for fear of relegation. An “affinity urbanism” (Donzelot & Epstein, 2009,

pp. 42–45) is then created, sustained by a quest to live surrounded by peers, and legitimized by an idealized image of the village. But this communitarian vision is illusory and in complete contradiction to a lifestyle based on individualism, which is responsible for the isolation and dependence of the most vulnerable members of society (the elderly, single individuals, single parent families), while the main challenge of urban planning is precisely to achieve a social mix by creating gathering places in order for inhabitants to reconcile with the city.

### 2.5. Garden Cities, Suburbs or Gated Communities?

Due to its evolution over the course of the 20<sup>th</sup> century, the garden cities model has often been partially interpreted or reduced to its morphological drifts, even by planning professionals (Hall, 2014, p. 8). In order to better understand the ways garden cities and suburbs are confused, it is necessary to deconstruct the idea that the theoretical model developed by Howard is at the origin of the evils usually attributed to suburbs; more generally speaking, it is necessary to point out the gaps, in the sense defined by François Jullien (2012), between the initial concept and the various projects that claim a connection with it, in order to compare the initial model with its evolution (temporal, spatial, ideological). Professor Dennis Hardy summarized the reasons for this misinterpretation: “Paradoxically, it was the Garden City movement that fanned the flames of suburban idealism. For, although Garden City purists could not accept anything less than self-standing settlements beyond the metropolitan boundaries, others were happy to adopt terms such as ‘garden suburb’ and ‘garden village’ and even, in cases, ‘garden city’, for their own ends... Gillian Darley has noted, ‘soon the misused term Garden Suburb, Village or City began to be synonymous with suburbia’” (Hardy, 2005, p. 43).

Let us take a second example of affinity urbanism as referred to above: one that tends to assimilate garden cities to gated communities. According to Evan McKenzie, the influence of Howard’s theory on urban planners and American architects in a culture centred on the importance of private property is at the origin of this confusion. In his book *Privatopia*, however, he points out that “the dominant ideology of privatism worked against important aspects of Howard’s plan” (McKenzie, 1994, pp. 7–9). For his part, Renaud Le Goix considers that “garden cities may have inspired the development of gated communities, based on two major points: the self-contention intended as part of the ideal city project, and the conception of local politics” (2003, p. 71). However, if the spatial confinement materialized by the greenbelt gives the impression of creating an isolated urban entity (Le Goix, 2003, p. 72), the initial purpose seems, according to the initial theory, as a means to maintain social cohesion within the community, encouraged by an incentive to develop cooperative initiatives. Also, the Social Cities principle (if the addition of a semantic proof of

this desire to provoke interaction was needed) ensures, according to the author, “the planning and building of town clusters” (Howard, 1902, p. 128), in other words, urban settlements both connected and open to the outside world. Chris Webster’s analysis sheds new light on Howard’s work. It suggests that there is some incoherence between the socialist and humanistic ideals sustaining his project and the fact that garden cities are “new settlements, privately built” on a private site, bought by private investors, and, moreover, “privately governed”. Webster also points out that the model was brought to proportions that Howard could not have imagined, also noting that “in one sense, modern gated communities might seem to have little to do with Howard’s vision” (Webster, 2001, p. 150). This example of gated communities encourages us to differentiate between the initial theoretical intentions and the appropriation of these ideas by other actors in history whose intentions may be opposite.

## 3. The Legacy of the Garden Cities Model Confronted with the Culture and Challenges of the 20<sup>th</sup> Century

### 3.1. Learn from the Past to Build the Future

Our research method is based on the analysis of a model and its history, considered as a precedent, in order to draw inspiration from it to tackle contemporary issues. This approach does not aim at copying its principles, which would obviously be inappropriate in a radically different historical and cultural context, but rather at analyzing its characteristics and its evolution in a prospective will. That is what Hall and Ward call “the wisdom of the past” (2014, p. 170), considering that method as valuable to seek innovation as exploring academic research or analyzing good contemporary working examples. This methodology also fits Howard’s thinking logic as he also had his own models: in an approach that could be considered as scientific, he clearly describes the works that were used to compose his project, which he defines himself as a “a unique combination of proposals” (1902, pp. 101–113). Many leading thinkers of urban planning had the same methodology, which is at the core of many architectural and planning practices. Camillo Sitte, for example, whose work was a reference for both Howard and Unwin, questioned the planning model of the European historic city in order to understand its underlying rules of urban composition (Sitte, 1889/2015). In a similar approach, the study of pre-existing models is fundamental to Unwin’s theoretical and practical work (Neal, 2004, p. 124), more specifically in his well-known book *Town Planning in Practice: An Introduction to the Art of Designing Cities and Suburbs* (Unwin, 1909), which is “a true architectural and urban design manual, incorporating all the canons of the traditional and picturesque city implemented in Letchworth” (Sadoux, 2015b, p. 32).

It must be realized that, while this is not always clearly expressed, the garden cities model served as ref-

erence in a great number of urban reflections carried out throughout the 20<sup>th</sup> century, specifically dealing with urban planning and the design of new human settlements. The post-Howardian heritage thus impacts Anglo-Saxon thought in particular, giving rise to a number of founding theories on contemporary urbanism, mainly in the United States. One example is the Neighbourhood Unit principle, formalized by the American planner Clarence Perry in 1929, who considered at the time that the residential unit best adapted to the automobile age is composed of a concentration of 750 to 1500 families in residences distributed around an elementary school, located within a five-minute walking distance (a quarter of a mile), surrounded by businesses and main roads, complete with community services and a set proportion of public spaces (Neal, 2004, pp. 129–130)—which brings to mind the spatialization of elements in Howard’s garden city, but at the scale of a neighbourhood. On a different scale, Regional Planning conceptualizes a vision of urban planning beyond the limits of the city, considering the territory as an integral part of a global economic and ecological entity (Calthorpe, Fulton, & Fishman, 2001, pp. 16–22). Lastly, from a more functionalist standpoint, Transport Oriented Development (TOD) principles, codified in the late 1980s by Peter Calthorpe, founder of the Congress of New Urbanism, shape the design of walkable urban communities grouped around transportation infrastructures so as to foster proximity and reduce car dependency (Calthorpe, 1995).

In parallel to these theoretical conceptualizations inspired by garden cities across the Atlantic, the model is no longer referred to in Britain since the implementation of the last new towns in the 1970s. It was not until 2014 that the coalition government of David Cameron tried to face the housing crisis by expressing his support toward the creation of a new wave of garden cities and garden suburbs, thus reinvesting the socialist garden cities model. It is also in 2014 that the Policy Exchange think-tank organized the prestigious Wolfson Economics Prize competition, with the objective to rethink Howard’s model and design a “visionary, viable and popular” garden city project. Let us now focus on the work of URBED (United Kingdom) and Duany Plater-Zyberk (USA), two urban planning agencies that participated in the competition, and whose reflections propose innovative updates of the garden cities model regarding suburban issues, and more generally urban crises of nowadays.

### 3.2. URBED’s Interpretation: Rupture and Action

Based on the assumption that modern urban planning principles do not lead to urbanization results of sufficient quality, the Wolfson Prize-winning team formed by the urbanism agency URBED<sup>5</sup>, led by David Rudlin and Nicholas Falk, stand against the ex nihilo creation of new towns and propose an urbanization based on the natural growth of ancient cities, relying on their adapt-

ability, their historical identity and their already present economic attractiveness. This way, the Uxcester project (Rudlin & Falk, 2014) addresses the shortage of housing in England by creating a new type of urban configuration able to double the size of forty major cities across the country.

Rudlin and Falk also challenge “the idea of the garden city as an autonomous human settlement” (Rudlin in Novarina, Artis, Parham, Ames, & Sadoux, 2016), which is the core of much of the theory behind garden cities. Instead, their project is inspired by the territorial system as imagined by Howard when he evokes the polycentricity principle with the Social Cities scheme. This reference is clearly used in the “Snowflake plan” diagram (Figure 3), which identifies urban units as neighbourhoods rather than cities. Their proposal is based on an urban development composed of both urban densification of under-exploited sites (brownfields) and addition of localized greenbelt extensions (greenfields).

Regarding this last point, the reactions to their proposal are strong. Architect and planner Richard Rogers criticized the project (Booth, 2014) as it contradicted his own investigations carried out in the context of the Urban Task Force (1999), for whom this project deflects the attention from the big challenge of urban renewal (Sadoux & Novarina, 2017, p. 11) and infringes upon rural and natural areas that have to be protected from urbanization (Rogers, 2014). Even the British government rejects the results of the Wolfson award on the grounds that the winning proposal could not be validated by English housing policies due to non-compliance with the green belt principle, intended to contain urban sprawl (Department for Communities and Local Government, 2014).

In fact, their strategy is meant to be comprehensive, and is firstly based on the same densification logic as Rogers. Following the British government’s recommendations (Department of the Environment & Welsh Office, 1995), Rudlin and Falk support a brownfield-first approach to serve housing needs by up to 60% (2014, p. 12)—a strategy already proved valuable and necessary in their book *Tomorrow: A Peaceful Path to Urban Reform*, subtitled “The feasibility of accommodating 75% of new homes in urban areas” (Rudlin & URBED, 1998), on which they already based their reflections for the reinterpretation of the garden cities model.

For the remaining part, they propose to take “a good confident bite out of the green belt”. But their goal is not to create dormitory suburbs disconnected from their environment, but rather to design “sustainable urban extensions that can support a tram service and a range of facilities”, surrounded by protected natural areas, rehabilitated and made accessible to inhabitants (Rudlin & Falk, 2014, p. 12). Their solution to reduce the need for housing is based on principles similar to those supporting Howard’s garden cities, but operates a change of scale. The network of new towns becomes a set of neighbour-

<sup>5</sup> Urbanism Environment and Design ([www.urbed.coop](http://www.urbed.coop)).







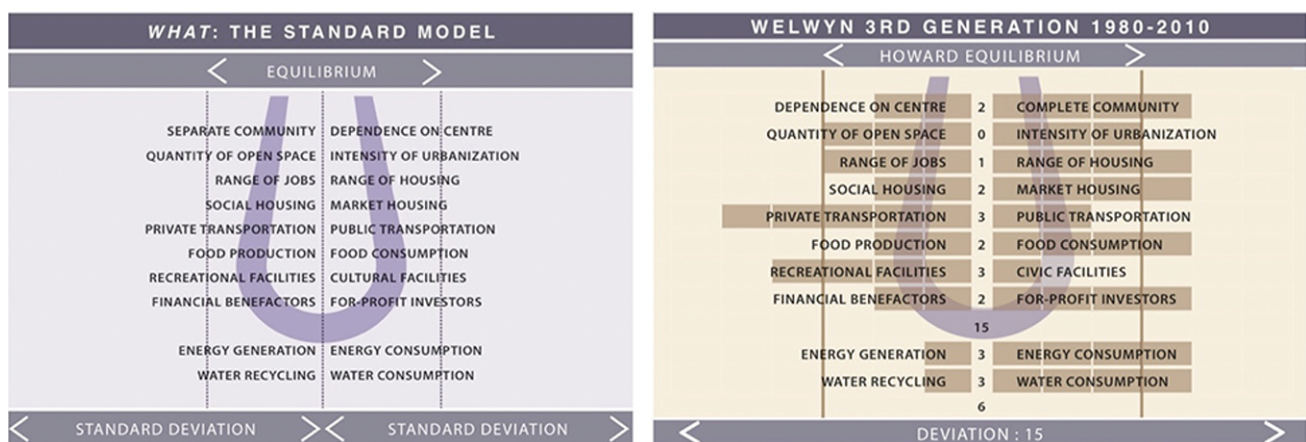
tion when he received from British professors at the Planning and Architecture School of Princeton during the new towns movement in Britain the late 60s (Hetherington, 2006). But DPZ do not only refer to the past of garden cities, they are equally invested in their future. In 2008, with the University of Hertfordshire, they explored the idea of new garden villages and garden cities for the *Hertfordshire Guide to Growth 2021* (DPZ, 2009). More recently, in addition to the many garden cities, garden towns and garden villages announced by the British government since 2014, other initiatives are equally being undertaken by private landowners, some of whom have requested the involvement of DPZ to design new neighbourhood-based garden towns in Scotland<sup>6</sup> (Doughty, 2017).

Another important concept links the two movements: that of equilibrium (social, political, economic), a core notion in Howard’s reference book, symbolized by the Town-Country magnet of the famous Three-Magnet diagram. With Paul Roberts and Emily Talen, Duany responds to the call for proposals of the Wolfson Economic Prize on the base of this main theoretical principle. The team proposes to redefine the theoretical principles that characterize the garden cities model in order to adapt to contemporary urban issues. Through their contribution titled *A General Theory of Urbanism* (Duany et al., 2014), they construct a method of analysis based on the balance of ideal urban characteristics, which are later tested on the towns of the county of Hertfordshire, in Southern England. This method grants them the possibility to carry out a quantitative evaluation of the “deviations” that affect the balance of studied urban spaces. An analysis at different chronological periods makes it possible to understand and interpret urban evolutions according to historical events (crises, technical evolutions, national policies, etc.), but also to imagine future scenarios and direct city policies leading to the restoration of an ideally balanced situation.

In the field of architecture, the same notion of equilibrium is used when evoking “net zero energy” buildings, not defined by a total lack of energy consumption but instead by a rather low consumption which is compensated by a controlled quantity of production. This example, therefore, seems to be particularly relevant for developing a sustainable planning method capable of supporting the energy transition at the urban and territorial scales. Moreover, as suggested by Duany’s team concerning energy and water, other aspects could be taken into account to achieve a balance between urbanization and the natural environment, beyond mere urban characteristics.

This method of evaluation, applied to zones of the regional transect, allowed them to highlight the need for action in the most problematic areas: the suburban territories. It is in this perspective that planner and urban designer Galina Tachieva proposes, in her *Sprawl Repair Manual* (2010) to confront the suburbs in a more direct fashion. Through a more operational approach, she devises a strategy for the “repair” of urban sprawl by completing the already established sprawl areas to re-compose whole and dynamic communities based on the urban elements already present. She relies on an incremental approach and targeted interventions aimed at rehabilitating, intensifying and improving existing infrastructures.

Lastly, if garden cities and new towns implemented during the 20<sup>th</sup> century are associated with the suburbs, this is due to their shared characteristics, resulting from their simultaneous emergence during a historical period that has profoundly changed the urban landscape of our cities. In addition, it can be noted that thanks to the reinterpretations made the URBED or the New Urbanists described above, among others, the theoretical model is more widely used for its ability to conceptualize innovative solutions and adapt to contemporary challenges. It is this approach that we wish to explore through the last section of this article.



**Figure 5.** The DPZ assessment model inspired by garden cities: the standard model and its application on the 3<sup>rd</sup> generation of Welwyn Garden City. Source: Duany et al. (2014, pp. 15, 39).

<sup>6</sup> Chapelton (Aberdeenshire), Tornagrain (Inverness-shire) and Grandhome (Aberdeenshire).

## 4. Garden Cities, a Complete Model: Transcalar, Holistic and Systemic Approaches

### 4.1. *Toward a Sustainable Path for Suburbs*

As we previously explained, we consider that the garden cities model, while primarily advocating the development of a network of interconnected cities, has also served as an inspiration for the creation of a great number of suburbs throughout the world (Schuyler, 2002). But while its core principles may have only been interpreted partially, or used to sustain other ideological purposes, we stand that this model was originally ground in a pragmatic legacy, defined by a certain theoretical coherence. We therefore assume that both its theoretical evolution and its historical longevity are sources of potentialities capable of challenging urban planning through contemporary aims of sustainability and more specifically of energy transition. As with neighbourhood planning, recent projects that claim the heritage of the garden city tradition in order to conceive new towns and suburbs have evolved their preoccupations in order to integrate environmental and energy issues, and “Howard’s visionary principles of efficient, self-reliant, and equitable communities are still among the major challenges in the way of achieving neighborhood sustainability” (Sharifi, 2016, p. 12).

Let us now see how the garden cities model provides a path for the sustainable renewal of suburbs. In order to do so, we rely on the global coherence of its original vision, which we consider to be complete as we explained in the main introduction, but at the same time chronologically distant from contemporary urban issues, which led us to keep a critical distance from possible transpositions or adaptations to our times. Based on the negative characteristics of suburbs identified at the beginning of the article, and applying some of the remedies described in the previous chapter, how can we build a new urbanization strategy to contribute to the energy transition?

As suggested by the URBED agency through its theoretical model Uxcester, we assume that the development of suburban areas is potentially virtuous if properly planned, but above all that it is not in contradiction with other forms of urbanization, such as the urban renewal or the development of new towns, all of which are cumulative scenarios that must be analyzed according to context (DPZ, 2009). We further assume that, ultimately, and in spite of the implementation of intensification policies on already urbanized areas, the construction of new human settlements will remain necessary. Thus, suburban planning should not be forgotten at the risk of remaining in its anti-urban position, but rather thought—and rethought—in combination with other forms of urbanization, in order to respond more efficiently to a seemingly endless housing crisis.

In addition, in previous works (Coste et al., 2015), we have highlighted the need for a territorialized approach for planning, both systemic and transcalar, to overcome

technical macro-systems. This approach led us to work on the concept of territorial energy ecosystem, which enlarges the possibilities of sustainability considerations regarding human settlements—no matter their type—taking in account both their environmental and social resources. Thus, in the last part of this article, we will come back to the origin of this concept, which will allow us to question the notion of density that is considered today by many urban planners as a key for sustainable cities. We will then evaluate the extent to which a number of levers for action based on the original model, that is to say on its theorized and constructed heritage, can constitute paths for reflection (theory) or action (practice). In doing so, we will try to demonstrate how the garden cities model set a precedent that could be used today, with a sustainable approach, to design human settlements in the 21<sup>st</sup> century.

### 4.2. *From Territorial Metabolism to the Territorial Energy Ecosystem*

Metabolism, a concept often used in territorial ecology, is characterized by fluxes of matter and energy within a given territory and by the concept of environmental footprint (Barles, Buclet, & Billen, 2011). Sabine Barles demonstrates that natural—but also social—processes determine the metabolism of territories, and identifies three main material fluxes: the flux linked to building materials “whose consumption appears to be correlated with urban sprawl”, the flux of agricultural and food products, and the flux of fuels (Barles, 2014).

Consubstantial to the concept of metabolism, the concept of the ecosystem is essential to the emergence of ecology in the 1970s. The concept of the (territorial) energy ecosystem is largely applied in connection to territorial ecology. This was put into practice in our previous study on the spatialization of the energy transition in a rural mid-mountain region of France (the territory of the Massif Central), in a pragmatic perspective (Coste et al., 2015). The concept of territorial energy ecosystem allows us to integrate the dimension of space design, that is to say, to add a qualitative dimension to the analysis of fluxes (already very complex) and a reflection on practices, bringing us closer to the socio-ecological approach of Marina Fischer-Kowalski and Helmut Haberl (2007). In the realm of living matter, within an ecosystem, interactions are what enriches the model. The same goes for the notion of energy ecosystem: it is this dimension of interactions that gains importance in terms of spatialization. Behind the notion of territorial energy ecosystem is therefore a holistic and systemic approach, embedded locally, which was proposed, trying to integrate the technical, human and social dimensions of energy through a spatial project.

Finally, when one considers sustainable development of human settlements through the concept of the territorial energy ecosystem, considering the notions of energy balance (consumption/production ratio), food, access to

water and health, the notion of density—mentioned previously regarding suburbs and garden cities—needs to be re-examined. Rather than a quantitative approach, we propose a qualitative and spatial approach by the use of a precedent.

#### 4.3. Density as a Tool to Analyze the Equilibrium of the Urbanized Territory

Density is used as an index of human occupation based on land use: usually, population density (inhabitants/area) refers to territory, when urban density (dwellings/area) is related to the city. But density is also a design tool at the service of urbanization. The density of the urban block informs us about its form, the density of the neighbourhood integrates public space areas and associated services and finally the density of the city includes the large infrastructures required for its habitability. There are also densities that relate to uses or functions, such as those that indicate the economic activity of a territory, (for example jobs/area).

In 1912, Unwin published *Nothing Gained by Overcrowding* for the Garden Cities and Town Planning association. He explained, through calculus and urban form analysis, how the traditional by-law housing layout of English cities between 1870 and 1910 was inefficient because of excessive street length, and how it could be optimized in order to reduce surface use, cost and daily commute to work (Town and Country Planning Association, Hall, & Clarke, 2012). So as Unwin did in his time, the concept of a territorial energy ecosystem leads us to question the notions of scale and density, and at the same time, the good practices related to energy and resources usage. The dense city, for example, is supposedly virtuous because it consumes less space, but also because collective housing is less energy-consuming and travel distances are shorter or more easily achieved through soft modes of transport. But the paradox of the dense city has long been highlighted: while it consumes less space and energy, thanks to the compactness of built structures, it produces very small quantities of resources (renewable energy, food and water) and the amount of sunlight received per person is lower than in less dense environments. Not to mention low summer comfort due to heat islands, and pollution problems caused by the concentration of people and activities.

It is therefore necessary to consider other indicators to understand our territories, other ratios allowing us to analyze in a systemic way, and to determine the proper use of resources in order to better understand urban quality influential factors. These indicators, comparable to the concept of the ecological footprint (Wackernagel et al., 2002), could help us to recognize and fix some unsustainable aspects of urban operations: the influence of territorialized employment on commuting, the optimization of land capture value reinvested in community services, the improvement of transport networks and flows, or the balance between production of ter-

ritorial resources (material or intangible) according to its needs.

#### 4.4. From the Unexploited Potential of Rurality to the Sharing of Territorial Resources

If Howard considered rural territory as the ideal place for the establishment of his garden cities, it is not by negation of this space, but on the contrary by desire to reconcile the urban space with it. This approach, symbolized by the diagram featuring the three magnets, is present in his project at all the levels. The well-balanced management of territorial resources generated by the garden city through the synergy between the urban and the rural is one of the key points behind the original theory. The viability of the model thus lies in the exchanges between these potential resources and the opportunity for the local populations to benefit from it, in order to achieve greater autonomy, but also to enhance health and the quality of social life.

These resources, both economic and social, respond to the different needs that Howard had theoretically identified for the future inhabitants of the garden city, sustaining all aspects of his project. Matters related to population numbers and surface amount were no more than the tip of the iceberg, and this could justify the absence of density requirements, an indicator that was not so relevant for the strategy he tried to implement. He focused on the necessary inputs for the equilibrium of his urban model, and he searched to find the right balance between the spatial assets that he could take advantage of, and what they may potentially generate. Thus, Howard aimed to combine numerous factors that compose city and, beyond the city, the territory: the rural and the urban, the consumption and the production, work and leisure, built spaces and natural spaces, polluting industries and health.

We also believe that the possibility of an urbanization of the rural space—in other words, the development of “rurbanization” (Bauer & Roux, 1976)—should be considered as an opportunity to develop new and sustainable solutions for today and tomorrow, to incorporate and defend a natural and productive space, respectful of what makes a territory fruitful, and to integrate rather than destroy. For the 21<sup>st</sup> century, the garden cities model could also become more productive in terms of renewable energies, thus contributing to the self-sustainability of cities and their surrounding territories. Planning projects could become something else: no longer the irrevocable consequence of demographic and urban growth, but a place of experimentation and progress, used to explore new possibilities.

#### 4.5. From Spatial Expansion to Social Planning

While today’s urban context is not directly comparable to that of the industrial revolution of the 19<sup>th</sup> century in Great Britain, similar challenges must be faced: the land is

scarce, prices rise dramatically, social inequalities widen, and the urban sprawl ever increases (Sadoux, 2015a). The reflections of town planners are then seen as ways of improving social organization through spatial organization.

It is with this in mind that Howard, as a journalist and stenographer, draws on the expertise of urban planning professionals to turn his ideas into reality. The design work of the associated architects Unwin and Parker for the Letchworth Garden City marks a first spatial interpretation of the garden cities model. As early as 1906, by continuing their investigations on the Hampstead Garden Suburb project, they operate a first break with the theoretical model in the form of a suburb, thus setting aside the principle of an autonomous city. This is followed by a gradual abandonment of several structuring characteristics of the original urban model, particularly on economic and social aspects. These successive deviations from the original model will thus deprive garden city-inspired urbanization of major principles that are perfectly compatible with current energy transition scenarios (Henderson & Lock, 2012), which we should reintegrate in nowadays planning practices.

In planning, architectural diversity, for example, not only avoids the monotony of repeated urban forms and aesthetics, but also ensures social diversity. By guaranteeing the proximity between homes, services and a significant number of local jobs, the functional mix recommended by the garden cities model avoids an important part of the individual traffic flows imposed by daily life in residential areas. The concept of greenbelt, on the other hand, materializes a boundary that avoids the nibbling of the rural by suburbs, but above all keeps residential space within a walkable distance from the activities located in the city centre. In addition, municipal parks, individual and collective gardens provide residents a direct access to leisure, public spaces and socializing areas that are beneficial to their physical—but also mental—health. Last, the territorial division into wards makes it possible to ensure the proper operation and management of all services associated with the neighbourhood community, as proposed by the neighbourhood unit and the TODs mentioned previously, ensuring respectively the presence of schools and public transportation.

Finally, beyond the suburban area, the importance of urban renewal must also be taken into account in Howard's vision. The dispersal strategy aimed at relieving London's congestion intended to act as a lever for the refurbishment of the capital, but also more generally to reduce land pressure on poor households in the city (Howard, 1902, pp. 146–151). This strategy once again brings the theoretical model closer to today's ecological and social approaches.

#### *4.6. From the Individual Carbon Footprint to the Collective Production of Energy*

At the global level, an increasing need for resources and energy is driven by constant population growth

and multiplication of personal energy needs. In 2012, a WWF report alerted on the overconsumption of resources and the degradation of global natural capital (biodiversity, ecosystems and ecosystem services), pointing to strong economic and social disparities regarding the ecological footprint (Grooten, Almond, & McLellan, 2012). The suburbs of countries with the highest incomes tend to accumulate a large number of individual behaviours that are problematic for the environment, particularly with regard to energy consumption. The construction of scattered residential habitats, particularly voracious in space, requires large networks to supply them with flow resources coming from delocalized production areas (for electricity, gas, water, sewers, etc.). Long distances, combined with the absence of public transportation systems and soft mobility infrastructures to facilitate walking and cycling, force inhabitants to own one or more automobiles that they use daily, and which are symbols of their dependence on fossil fuels.

At the time of the emergence of the first garden city, the main energy resource was coal and some of Howard's contemporaries, like Stanley Jevons, already predicted its end (Jevons, 1866), just as the end of oil that is evoked today. Rail transportation technologies like trains and tramways are already well developed, while the democratization of the automobile has not yet taken place. It can also be noticed that the early urban theories developed by Unwin in his book already address bioclimatic issues linked to housing (Unwin, 1909, pp. 310–314). Still, the sustainable aspects that could be attributed today to the garden cities model seem more conjunctural than visionary, but the values advocated by Howard for social and hygienist purposes remind us the ecological issues of our time, which explains why we can find comparable strategies such as circular economy, mutualisation of services, frugality, optimization of resources or local self-production.

According to Howard's theoretical model, and as advocated by the New Urbanists' response to the Wolfson competition presented above, consumption and production should be balanced within the garden city. The local production of energy is therefore one of the requirements to achieve a reinterpretation of a new garden cities model ready to tackle housing crisis in the energy transition context. In targeted urban areas, a process of replacing imported and centralized energy resources (oil, gas and nuclear power), responsible for among other things pollution and climate change, must therefore be initiated in order to replace these by a territorialized production of renewable energies that should be varied and adapted to the natural characteristics of the site. Ultimately, the objective is to define the modalities of a new territorialized energy ecosystem model, promoting interactions between the latent territorial resources and the capacities of local actors to generate individual and collective projects for the benefit of a common autonomy, and thus a shared habitability.

#### 4.7. From a Delegation of Powers to a Complementarity of Actors

In France, as in England, the time has come to transfer political power to metropolises and municipalities, especially in regard to urban planning, through laws such as the adoption of the Localism Act<sup>7</sup> by the British Parliament in 2011. The government's devolution initiatives are generally seen as a disinvestment of the state in the future of rural and suburban areas. On the contrary, for a human settlement based on garden cities principles, such an initiative represents an opportunity, due to the fact that the economic and political system inspired by this model is local-based. Municipal and participative governance as devised by Howard allows residents to develop a collective identity through their personal involvement, but also to maintain attractiveness (economy, services) within the garden city itself.

This inclusive model also works through the complementarity of different stakeholders: it proposes to mobilize all political players (private, public or associative), as well as the rules and strategies that enable the city to function properly. It relies mainly on optimized management at the local level, in accordance with the principle of subsidiarity, of the participation of local populations in the governance of the city, and on the functional diversity of stakeholders within the garden city. Cooperation is also strongly encouraged: it plays a main role in the formulation and implementation of collective actions, and therefore potentially projects to meet the transition challenges (social and solidarity-based economy, housing and energy cooperatives, etc.).

To ensure the responsiveness of local authorities and a more efficient use of allocated means, it is important to define the role of businesses and the civil society. As the scenarios of the actors imagined by Gille Debizet's team show, the initiatives of positive energy territories will necessarily be led by all the actors capable of acting in a more global and mutually supportive way. (Debizet & Dupuy, 2015).

#### 4.8. From Economic Dependence to Energy Autonomy

Conscious of the strong social disparities of his time, Howard designed his urban model on innovative economic grounds, initially imagined to support social and community initiatives, but that unfortunately got lost in the twists and turns of the 20<sup>th</sup> century urban sprawl. But contrary to dormitory suburbs, where local economic dynamics are barely existent, the presence of jobs and services within the garden city itself is meant to guarantee, in part, the attractiveness of this urban entity.

Howard was also aware of the large disparity in agricultural land prices compared to the value of land in urban London. It is on this basis that he defined a strategy of acquiring the space necessary for the foundation of the first two garden cities (Letchworth Garden City in 1903 and Welwyn Garden City in 1920). Faced with widespread privatization of land and properties, he proposed on this financial aspect of the model, a new compromise aimed at reconciling individual aspirations and cooperation principles. Based on the proposals of Thomas Spence and Herbert Spencer, he imagined and set up an equitable land-use system capable of limiting and controlling speculation on land value, the land being considered as a collective property and a common good for the inhabitants of the city, who in return pay a rent used to finance facilities for the community<sup>8</sup>.

For us as well, economic flow principles used by territorial stakeholders, but too often absent from urban reflections, must become part of the equation in a successful energy transition. A territorialized economy allows greater attractiveness and resilience of the cities in the face of economic crisis on a larger scale. More interestingly, value capture systems, such as the one described as part of the theoretical garden cities model regarding real estate management, could be an interesting tool to guarantee a windfall able to contribute to the financing of some necessary infrastructures during the energy transition process (housing renovation, establishment of production sites, etc.). In that way, it could contribute to the financial independence of the city as well as to its energetic autonomy.

## 5. Conclusion

Since the publication of *To-morrow*, considered as a key moment in the history of contemporary town planning (Choay, 1965), and up until its recent resurgence through both national and private initiatives, the garden cities model has consistently inspired urban theories and practices. Howard's particularly comprehensive approach to urban complexity beyond spatialization, as well as the influence of theory and artifacts constructed through the history of urban planning, explains the continuous interest about the precedent of garden cities for more than a century. For their part, sprawling territories and the suburbs crystallize the major stakes of the social and ecological crisis currently experimented by our societies.

This article aims at giving a brief overview of the links between both histories of garden cities and suburbs, two urbanization models that have shaped the urban landscape of the 20<sup>th</sup> century on a global scale. We have tried here to understand their relationship in order to better

<sup>7</sup> The Localism Act is a law that changes the power of local governments in England, facilitating a transfer of powers from the central government to local communities and individuals.

<sup>8</sup> The Land Capture Value system, still in place in Letchworth Garden City, provides funding for recreation and transportation services for the elderly, as well as hospital services. It was also implemented at Welwyn Garden City until 1948, when it became a New Town, together with the City of Hatfield, and its property assets were transferred to the Welwyn Garden City Development Corporation. This system has never been implemented again, not even in the new Garden Cities supported by the British government since 2014.

evaluate the strengths and weaknesses of the first, and to devise solutions for fixing the second's defects. In the previous section, we have tried to extract the aspects of the garden cities model that we consider most relevant to the challenges of energy transition. Thus, notions such as the territorial energy ecosystem, density, cooperation, or financing through land capture value are all points to be explored in order to strengthen our future urbanization models and trace a more sustainable path to a (sub)urban reform.

The garden cities model has been diverted throughout the 20<sup>th</sup> century for ideological reasons, but above all because of historical and societal changes (politics, technology, living standards). For us, the remobilization of a precedent that has withstood other major periods of transition in the past seems relevant to support reflections about the future of our industrialized cities and territories, whose reflections need to be projected over a particularly long period of time, specifically in this time of energy transition. Not to mention that the potential of this research is also important for developing countries to avoid making the same mistakes regarding energy choices. Although it is difficult to anticipate the next big changes, especially when dealing with the urban question over time, our future investigations will try to strengthen the adaptive capacities of a new model of urbanization inspired by garden cities to face the changes—and more precisely the energy transitions—that will radically transform the 21<sup>st</sup> century.

Finally, the garden cities model is a way for us to question history through the lens of our present preoccupations, to take a new look at contemporary practices in order to bring out original potentialities and to imagine the future by relying on experiments implemented over a long period of time, at the scale of human realities.

### Acknowledgments

This work was supported by the French Environment and Energy Management Agency (ADEME), by the research unit "Architecture, Environment & Constructive Cultures" (Labex AE&CC), and by a grant from the SHPT Doctoral School of the Grenoble Alpes University.

### Conflict of Interests

The authors declare no conflict of interests.

### References

- Alexander, A. (2009). *Britain's new towns: Garden cities to sustainable communities*. Abingdon and New York: Routledge.
- Barkham, P. (2016, January 19). Britain's first garden town: Housing crisis solution or 'dog's breakfast'?. *The Guardian*. Retrieved from <https://www.theguardian.com/cities/2016/jan/19/bicester-britains-only-garden-town>
- Barles, S. (2014). L'écologie territoriale et les enjeux de la dématérialisation des sociétés: l'apport de l'analyse des flux de matières. *Développement durable et territoires*, 5(1).
- Barles, S., Buclet, N., & Billen, G. (2011). L'écologie territoriale: Du métabolisme des sociétés à la gouvernance des flux d'énergie et de matières. In *Fonder les sciences du territoire. Proceedings du 1er colloque international du CIST* (pp. 16–22). Paris: CIST.
- Bauer, G., & Roux, J. M. (1976). *La rurbanisation, ou la ville éparpillée*. Paris: Éditions du Seuil.
- Booth, R. (2014, September 8). Labour architect peer says building on greenbelt 'a ridiculous idea'. *The Guardian*. Retrieved from <https://www.theguardian.com/society/2014/sep/08/labour-richard-rogers-green-belt>
- Calthorpe, P. (1995). *The next American metropolis: Ecology, community, and the American Dream*. New York, NY: Princeton Architectural Press.
- Calthorpe, P., Fulton, W. B., & Fishman, R. (2001). *The regional city: Planning for the end of sprawl*. Washington DC: Island Press.
- Choay, F. (1965). *L'urbanisme, utopies et réalités, une anthologie*. Paris: Éditions du Seuil.
- Congress for the New Urbanism. (2000). Charter of the new urbanism. *Bulletin of Science, Technology & Society*, 20(4), 339–341.
- Coste, A. (2010). Quel sens en architecture pour le polysémique terme de modèle? In *Espace Matière Société* (pp. 72–86). Grenoble: ENSA Grenoble.
- Coste, A., Guillot, X., Dubus, N., Pernet, A., Ruchon, M., & Chamodot, M. (2015). *Spatialiser la transition énergétique*. Rapport final. Grenoble: ENSAG.
- Debizet, G., & Dupuy, G. (2015). *Scénarios de transition énergétique en ville: Acteurs, régulations, technologies*. Paris: La Documentation Française.
- Department for Communities and Local Government. (2014). Housing Minister Brandon Lewis' response to Wolfson Prize.
- Department of the Environment & Welsh Office. (1995). *Our future homes: Opportunity, choice, responsibility*. London: HMSO.
- Dodd, N. (2008). *Community energy: Urban planning for a low carbon future*. London and Washington, DC: TCPA and CHPA.
- Donzelot, J., Epstein, R. (2009). *La ville à trois vitesses et autres essais*. Paris: Editions de la Villette.
- Doughty, E. (2017, January 14). Meet the Y.I.M.B.Y. estate owners building new towns on their land—at their own expense. *The Telegraph*. Retrieved from <http://www.telegraph.co.uk/property/buy/meet-yim-by-estate-owners-building-new-towns-land-expense/>
- Duany Plater-Zyberk. (2009). *Hertfordshire guide to growth—2021*. Hatfield: University of Hertfordshire Press.
- Duany, A., Roberts, P., & Tallen, E. (2014). *A General theory of urbanism—Towards a system of assessment based on garden city principles* (Draft version). Miami: Duany Plater-Zyberk & Company.

- Falk, N. (2008). Cambridgeshire quality charter for growth. *Cambridgeshire Horizons*.
- Falk, N. (2017). Garden cities for the twenty-first century. *Urban Design International*, 22(1), 91–110.
- Fischer-Kowalski, M., & Haberl, H. (Eds.). (2007). *Socioecological transitions and global change: Trajectories of social metabolism and land use*. Cheltenham, UK: Edward Elgar.
- Fishman, R. (1979). *L'utopie urbaine au XXe siècle: Ebenezer Howard, Frank Lloyd Wright, Le Corbusier*. (P. Guillitte, Trans.). Bruxelles: Pierre Mardaga.
- Fishman, R. (1998). Howard and the Garden. *Journal of the American Planning Association*, 64(2), 127–128.
- Geddes, P. (1915). *Cities in evolution: An introduction to the town planning movement and to the study of civics*. London: Williams.
- George, P., & Fernand, V. (2013). *Dictionnaire de la géographie*. Paris: Presses Universitaires de France.
- Ghorra-Gobin, C. (2011). Le New Urbanism, marqueur de fragmentation urbaine? Réflexions sur l'intentionnalité de nouvelles pratiques professionnelles et sur les représentations des résidents à l'heure du débat en faveur de la durabilité urbaine. *Cahiers de Géographie du Québec*, 55(154), 75–88.
- Ghorra-Gobin, C. (2014). Le 'New Urbanism' et la soutenabilité. *Métropolitiques*.
- Grooten, M., Almond, R., & McLellan, R. (Eds.). (2012). *Living planet report 2012: Biodiversity, biocapacity and better choices*. Gland, Switzerland: World Wide Fund for Nature.
- Hall, P. (2014). *Cities of tomorrow: An intellectual history of urban planning and design since 1880* (4th ed.). Chichester: Wiley Blackwell.
- Hall, P., & Ward, C. (2014). *Sociable Cities: The 21st-century reinvention of the garden city* (2nd ed.). Abingdon and New York: Routledge.
- Hardy, D. (2005). Utopian ideas and the planning of London. *Planning Perspectives*, 20(1), 35–49.
- Henderson, K., & Lock, K. (2012). The return of the garden city. *Town and Country Planning*, 81, 372–375.
- Hetherington, P. (2006). Urban legend. *The Guardian*. Retrieved from <https://www.theguardian.com/society/2006/sep/20/communities.guardiansocietysupplement1>
- Holliss, F. (2017, February 9). To solve the housing crisis we need new ideas, not garden cities. *The Guardian*. Retrieved from <https://www.theguardian.com/housing-network/2017/feb/09/housing-crisis-worklife-garden-cities>
- Howard, E. (1898). *To-morrow: A peaceful path to real reform*. London: Swan Sonnenschein & Co.
- Howard, E. (1902). *Garden cities of to-morrow* (2nd ed. of *To-morrow: A peaceful path to real reform*). London: Swan Sonnenschein & Co.
- Jevons, W. S. (1866). *The coal question: An inquiry concerning the progress of the nation, and the probable exhaustion of our coal-mines*. London: Macmillan and Co.
- Jullien, F. (2012). *L'écart et l'entre. Ou comment penser l'altérité* (Working Papers Series). Paris: Fondation Maison des sciences de l'homme.
- Le Goix, R. (2003). *Les 'gated communities' aux Etats-Unis. Morceaux de villes ou territoires à part entière?* (Doctoral Dissertation). Panthéon-Sorbonne, Paris, France.
- MacKenzie, E. (1994). *Privatopia: Homeowner associations and the rise of residential private government*. New Haven: Yale University Press.
- Neal, P. (2004). *Urban villages and the making of communities*. London and New York: Spon.
- Novarina, G., Artis, A., Parham, S., Ames, D., & Sadoux, S. (2016). *La garden city: Une référence pour la requalification de la ville diffuse*. Paper presented at the Journée d'étude Bernardo Secchi: La ville des riches et la ville des pauvres, Geneve, Switzerland.
- Ragon, M. (2010). *Histoire de l'architecture et de l'urbanisme modernes: Tome 1, idéologies et pionniers 1800–1910*. Paris: Points.
- Rogers, R. G. (2014, July 15). Forget about greenfield sites, build in the cities. *The Guardian*. Retrieved from <https://www.theguardian.com/commentisfree/2014/jul/15/greenfield-sites-cities-commuter-central-brown-field-sites>
- Rudlin, D., & Falk, N. (1999). *Building the 21st century home: The sustainable urban neighbourhood*. Oxford: Architectural Press.
- Rudlin, D., & Falk, N. (2014). *Uxcester garden city—Second stage submission for the 2014 Wolfson Economics Prize* (p. 88). Manchester: URBED.
- Rudlin, D., & URBED. (1998). *Tomorrow: A peaceful path to urban reform. The feasibility of accommodating 75% of new homes in urban areas*. London: Friends of the Earth.
- Rutheiser, C. (1997). Beyond the radiant garden city beautiful: Notes on the New Urbanism. *City & Society*, 9(1), 117–133.
- Sadoux, S. (2007). Sir Patrick Abercrombie. *Urbanisme*, 355, 93–96.
- Sadoux, S. (2015a). Ni ville, ni suburb: Le retour des garden cities en Grande Bretagne. *Socio-anthropologie — Revue interdisciplinaire de sciences humaines et sociales*, 32, 123–138.
- Sadoux, S. (2015b). Concevoir et représenter l'utopie: La diffusion du modèle des garden-cities en Grande-Bretagne, 1898-2015. *Communication & Organisation*, 48(2), 25–38.
- Sadoux, S., & Novarina, G. (2017). La garden city, un réservoir de références à réinventer. *Les Annales de La Recherche Urbaine*, 113.
- Safdie, M., & Kohn, W. (1997). *The city after the automobile: An architect's vision*. Toronto: Stoddart Publishing Co. Limited.
- Saint, A. (1991). Londres, croissance d'une ville. In *Portrait de ville: Londres* (pp. 4–21). Paris: Datar.
- Schuyler, D. (2002). Introduction. In K. C. Parsons & D. Schuyler (Eds.), *From the garden city to green cities*:

- The legacy of Ebenezer Howard* (pp. 1–13). Baltimore: Johns Hopkins University Press.
- Sharifi, A. (2016). From garden city to eco-urbanism: The quest for sustainable neighborhood development. *Sustainable Cities and Society*, 20, 1–16.
- Sitte, C. (2015). *L'Art de bâtir les villes. L'urbanisme selon ses fondements artistiques*. Paris: Éditions du Seuil. (Original work published 1889).
- Stephenson, B. (2002). The roots of the new urbanism: John Nolen's garden city ethic. *Journal of Planning History*, 1(2), 99–123.
- Stern, R. A. M., Fishman, D., & Tilove, J. (2013). *Paradise planned: The garden suburb and the modern city*. New York: Monacelli Press.
- Tachieva, G. (2010). *Sprawl repair manual*. Washington, DC: Island Press.
- Talen, E. (2006). Connecting new urbanism and American planning: An historical interpretation. *Urban Design International*, 11(2), 83–98.
- Town and Country Planning Association, Hall, P., & Clarke, P. (2012). *Nothing gained by overcrowding! A centenary celebration and re-exploration of Raymond Unwin's pamphlet "How the garden city type of development may benefit both owner and occupier"*. London: TCPA.
- Unwin, R. (1909). *Town planning in practice. An introduction to the art of designing cities and suburbs*. London: Adelphi.
- Urban Task Force. (1999). *Towards an urban renaissance: Final report of the Urban Task Force*. London: Spon.
- Wackernagel, M., Schulz, N. B., Deumling, D., Linares, A. C., Jenkins, M., Kapos, V., . . . Randers, J. (2002). Tracking the ecological overshoot of the human economy. *Proceedings of the National Academy of Sciences*, 99(14), 9266–9271.
- Webster, C. (2001). Gated cities of tomorrow. *The Town Planning Review*, 72(2), 149–170.

### About the Authors



**Nicolas Vernet** is an architect and PhD student at the Centre for Research in Building Cultures of the Grenoble School of Architecture, Univ. Grenoble Alpes (France). He studied at Grenoble School of Architecture and McGill University (Montreal, Canada). Then, he worked as an architect in Grenoble and Paris for two years, before returning to academic work and research. His work focuses on the English model of garden cities in order to understand the way that it could contribute to energy transition in France. His thesis project seeks to propose new schemes of spatial organizations allowing to set an approach of positive energy territories. He also follows graduation projects of Master degree students based on English locations.



**Anne Coste** is an architect and an historian, she is Professor at the Grenoble School of Architecture, Univ. Grenoble Alpes (France). The research she conducts in Lab AE&CC is focused on the notion of “model” in architecture and town planning. Anne Coste managed the project *Spatialize the Energy Transition* (research program Ignis Mutat Res, 2015) and she continues her work on the precedents for socio-ecologic transition in the program *GC21, Garden Cities for the 21<sup>st</sup> Century*. She is the co-author of *Postcarbon Ruralities Milieu, scales and stakeholders of the energy transition*, a book to be published on February 2018.



## **Urban Planning (ISSN: 2183-7635)**

Urban Planning is an international peer-reviewed open access journal of urban studies aimed at advancing understandings and ideas of humankind's habitats.

[www.cogitatiopress.com/urbanplanning](http://www.cogitatiopress.com/urbanplanning)