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Growing Compact

edited by Laura Fregolent, Stefania Tonin



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Introduction

by Laura Fregolent *and* Stefania Tonin*

This book is the result of an international conference held on 25 and 26 September 2013 whose purpose was to promote the discussion between several researchers who have covered the issue concerning urban sprawl and the impacts that this sprawl has on the environment, economy and society in general, as well as the costs that this urban form implies.

Sprawl affects the change of land use in the entire Western world, and now also in developing countries. The causes of the urban sprawl are varied but the main ones are attributable to economic growth, to the improvement of the economic conditions of households in particular, to the development and expansion of the transport network and to demographic factors, to the different lifestyles that have occurred over time. The choice to live in a sprawling area involves private benefits, especially in the short term and as a response to new and complex preferences, but also entails negative consequences, especially social and collective ones.

There is a lot of pressure on the environment: soil sealing, pollutant emissions increase due to the transportation systems and domestic heating, destruction or fragmentation of ecosystems. There are also adverse consequences under the social perspective such as social segregation, the lack of services and the loss of centrality of the urban centres, as well as relapses on the economic system, which assume a considerable importance such as the volatility of real estate prices and the high cost of investment and maintenance of urban infrastructures and services needed to ensure the same quality of life for residents of the urban centers, suburbs or sprawled outskirts.

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Many of these issues were covered with success by American researchers, who support their theories with data, measures and values. In Europe, however, research on these issues is still fragmented, mainly due to the difficulty of collecting homogeneous data on land use changes, on the comparability of the dynamics involved and on the actual quantification of soil consumption.

During the conference, there was an attempt to create a clear picture of the issues described above starting from the contribution of Reid Ewing, Shima Hamidi and Arthur Christian Nelson, which, through some research and important publications in the history of the planning, outlines the history of sprawl, its conceptualisation, its features, the measures taken to quantify its effects, impacts and costs.

A central issue in research on sprawl is that concerning its measurement, its quantification and the identification of indicators capable of describing the phenomenon. The research carried out by Stefan Fina also focus on this and on his contribution on analyses of urban land use patterns and development trends of urban land use change. The current state of research is summarized in a graphical overview of a DSPIR model (driving forces, state, pressure, impact, response). Impact dimensions of urban land use change are then identified in terms of the levels of urbanization (surface), the intensity of use (density), and their arrangement in a study area (pattern). Particularly the patterns of urban land use are found to be difficult to measure since they require complex geographic analysis routines to capture spatial variations of urban entities.

Laura Fregolent and Stefania Tonin show the results of an ongoing research on the public costs of sprawl. The authors investigate the relationship between the dynamics of urban growth patterns and the costs necessary to provide public services. The case study considers the central area of the Veneto Region, and they compares the local public expenditures for the main services with the urban growth dynamics over the same time period.

Maria Cristina Gibelli instead focuses on the measures to use in order to limit sprawl taking inspiration from good practice experienced at international level and through the proper use of urban and territorial planning through which promoting urban densification processes.

The work of Paolo Pileri focuses on land use, one of the most direct consequences of sprawl growth of urban centres which produces devastating effects. The soil is considered as a resource and its loss also gives rise to a loss of important ecosystem services. Pileri wonders how we can intervene and what could the role of planner be; while Istvan Bart focuses on the relationship between urban sprawl and climate change, proving that the

«correlation between increases in artificial land area and transport-related CO₂ emissions indicates that policies limiting the increase of artificial land could be effective in limiting the increase of CO₂ emissions in transport. Policies limiting land use will not necessarily restrict economic growth, for growth is not correlated to increasing the quantities of artificial land».

The contribution given by Tadashi Matsumoto has a very wide perspective and outlines major issues around compact city policies and presents key policy practices in the OECD countries. Specific focuses are placed on urban contexts that have drawn attentions to compact city policies; indicators to monitor compact cities, track policy performance and compare them in different metropolitan regions; and key compact city strategies, with illustration of best practices, based on a survey of policy practices in OECD member countries and five in-depth policy case studies.

Finally, Ciro Gardi considers the phenomenon from a European perspective and describes the drivers of this continuous growth area: changes in lifestyles, the increased potential for human mobility (leading to the urban sprawl) and also speculative processes. The European Environment Agency and the Directorate General for the Environment of the European Commission points out that urban expansion is more dependent on changes in lifestyles and consumption patterns rather than on increasing population. These processes have an impact on soil, determining its irreversible degradation and preventing the provision of further ecosystem services. With the approval of Soil Thematic Strategy for soil protection, the European Union initiate a process with the aim of protecting this essential and non-renewable resource. This aim however is still far to be reached and efforts at national level will be required to be successful in the protection of soil.

The perspectives are wide-ranging, the analyses are in-depth featuring results that give rise to many questions and considerations on the measures and tools most appropriate to pursue the issues.

Compactness vs. Sprawl – Areas of agreement

by Reid Ewing^{*}, Shima Hamidi^{**} and Arthur Christian Nelson^{***}

In 1997, the *Journal of the American Planning Association* published a pair of point-counterpoint articles now listed by the American Planning Association as “classics” in the urban planning literature. In the first article, “Are Compact Cities Desirable?,” Peter Gordon and Harry Richardson (G&R) argued in favor of urban sprawl as a benign response to consumer preferences. In the counterpoint article, “Is Los Angeles-Style Sprawl Desirable?,” Reid Ewing (E) argued for compact cities as an alternative to sprawl. G&R and E disagreed about nearly everything: the characteristics, causes, and costs of sprawl, and the cures for any costs associated with sprawl.

In the intervening years, opinions have converged somewhat in response to empirical studies. The co-authors of this piece agree that sprawl and compact development represent two ends of a continuum of development types, characterized not only by density but by other D variables. We agree that a given region’s position along the continuum can be measured and related to public policy outcomes. We agree that market failures of one sort or another have contributed to sprawling development patterns. We agree that compact development is undersupplied relative to current demand, and that this demand will increase due to demographic and lifestyle changes. We agree that sprawl and compact development have both costs and benefits, and that no development pattern is optimal in all respects. We agree that smart growth initiatives have had limited success to date, but that

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government can foster more efficient development patterns by raising the cost of auto use, relaxing local regulations on land use intensity and mix, and entering into partnerships with progressive developers.

It is time to reprise and recast the debate based on new research and writing on these and related topics. This article will summarize the literature since 1997 in each of the four areas contested in the two original articles.

1. Characteristics of Sprawl

Both G&R and E used the term “compact” to describe one end of the development continuum, and “sprawl” to define the other end. Depending on the context, G&R equated compact development to high density or monocentric development, arguing that a city like Los Angeles is in fact compact by virtue of its high average density. In contrast, E defined sprawl in terms of three prototypes: (1) leapfrog or scattered development, (2) commercial strip development, or (3) large expanses of low-density or single-use development. Even this definition has its limitations, and was expanded to include any development pattern characterized by poor accessibility and lack of functional open space. In E’s view, compact development was anything that didn’t fit this definition, meaning a development pattern with contiguity, strong centers, mixed land uses, medium to high densities, good accessibility, and permanent open spaces. By E’s definition, Los Angeles is not so compact.

1.1. Sprawl Conceptualized

Let us first conceptualize sprawl, at least the land-extensive, low-density part of it, illustrated in Figure 1. Figure 2 shows a simplistic urban area with a single center¹. In the absence of externalities, the regional land market values land for urban uses along line U_1 and land for rural uses along line R_1 . The boundary of urban development is where both lines cross, at B_1 . However, the value of land for urban uses at the suburban

¹ We are indebted to Gerrit J. Knaap for this conceptualization which is included in Nelson and Duncan (1995).

fringe internalizes such benefits as under-priced utilities, and mortgage interest and property tax deductions against ordinary income. The value of land for urban uses thus rises to U_2 . Rural land, however, internalizes the impacts of urban development negatively. A large literature shows that urban development near farming operations reduces farmland productivity (see Nelson, 1992). The value of rural land thus falls to R_2 . The boundary of urban development thus extends to B_2 . The difference between B_1 and B_2 is a form of sprawl. In the absence of planning, this outcome might be remedied by eliminating all forms of subsidies for urban development, and having urban development compensate rural land owners for negative externalities (Nelson and Duncan, 1995). Neither is likely, so planning attempts to effect a more outcome albeit crudely.



Figure 1 – Low density sprawl in Phoenix (Arthur C. Nelson)

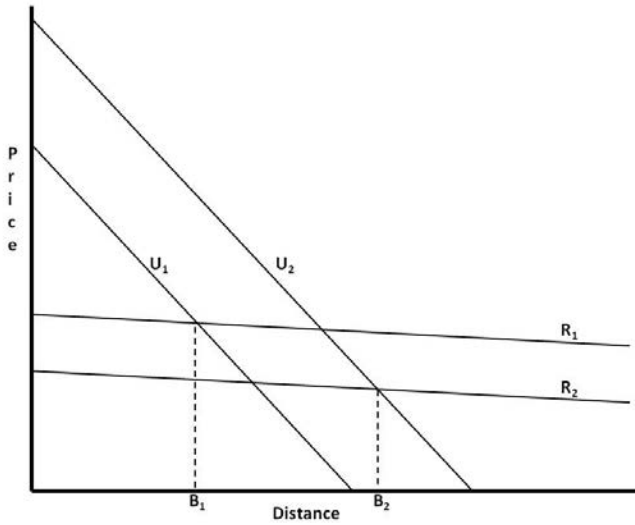


Figure 2 – Sprawl conceptualized. U_1 is the value of urban land without capitalized subsidies and U_2 is the value with capitalized subsidies. R_1 is the value of rural land without negative externalities from urban development and R_2 is the value with negative externalities. B_1 is the boundary between urban and rural land uses without externalities and B_2 is the boundary with them. The difference between B_2 and B_1 is a form of urban sprawl.

1.2. Measuring Sprawl

Since 1997, the broader definition of sprawl has been operationalized in quantitative measures developed by ourselves and others. The first attempts to measure the extent of urban sprawl were crude. Several researchers created measures of urban sprawl that focused on density (Fulton *et al.*, 2001; Malpezzi and Guo, 2001; Nasser and Overberg, 2001; Lopez and Hynes, 2003; Burchfield *et al.*, 2006). Density has the big advantage of being easy to measure with available data. Judged in terms of average population density, Los Angeles looks compact. Another notable feature of these studies was the wildly different sprawl ratings given to different metropolitan areas by different analysts. With the exception of Atlanta, which always ranked as very sprawling, the different variables used to measure sprawl led to very different results. In one study, Portland was ranked as most compact and Los Angeles was way down the list. In

another, their rankings were essentially reversed (Glaeser *et al.*, 2001; Nasser and Overberg, 2001).

Meanwhile, some scholars began developing more complete measures of urban sprawl. Galster *et al.* (2001) disaggregated land use patterns into eight dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed use, and proximity. Sprawl was defined as a pattern of land use that has low levels in one or more of these dimensions. Each dimension was operationally defined, and six of the eight were quantified for 13 urbanized areas. New York and Philadelphia ranked as the least sprawling of the 13, and Atlanta and Miami as the most sprawling.

Since then, Galster and his colleagues have extended their sprawl measures to more than 50 metropolitan areas confirming the multidimensional nature of sprawl. In one study, metropolitan areas were ranked in 14 dimensions, some related to population, others to employment, and still others to both (Cutsinger *et al.*, 2005). The 14 dimensions, which were reduced to seven factors through principal components analysis, tended to cancel out each other. Metropolitan areas ranking near the top on one factor were likely to rank near the bottom on another. Los Angeles, for example, ranked second on both “mixed use” and “housing centrality,” but 48th on “proximity” and 49th on “nuclearity.” Given so many overlapping variables, this type of analysis can get confusing.

Ewing *et al.* (2002) also developed sprawl indices that like Galster’s are multidimensional, but are more focused and demonstrate wider degrees of variability among metropolitan areas. They defined sprawl as any environment with 1) a population widely dispersed in low-density residential development; 2) a rigid separation of homes, shops, and workplaces; 3) a lack of major employment and population concentrations downtown and in suburban town centers and other activity centers; and 4) a network of roads marked by very large block sizes and poor access from one place to another. These indices were used to measure sprawl for 83 of the nation’s largest metropolitan areas. All sprawl indices were standardized, with mean values of 100 and standard deviations of 25. The indices were constructed so that the more compact a metropolitan area was, the larger its index value. More sprawling metropolitan areas had smaller index values. Thus, in the year 2000, the relatively compact Portland, Oregon, metropolitan area had an index value of 126, while the slightly smaller Raleigh-Durham metropolitan area had an index value of 54 (Figure 3). Los Angeles ended up near the middle of the pack, with an index of 102.



Figure 3 – Satellite Images of Portland and Raleigh at the Same Scale. www.maps.google.com

These indices, and a similar sprawl index for counties, have been widely used to study the costs of sprawl (Ewing *et al.*, 2003a; Ewing *et al.*, 2003b; Kelly-Schwartz *et al.*, 2004; Sturm and Cohen, 2004; Cho *et al.*, 2006; Doyle *et al.*, 2006; Ewing *et al.*, 2006; Kahn, 2007; Plantinga and Bernell, 2007; Stone, 2008; Ewing and Rong, 2008; Joshu *et al.*, 2008; Trowbridge *et al.*, 2009; Schweitzer and Zhou, 2010).

Using 2010 data, Ewing and Hamidi (2014) recently updated and refined their sprawl indices for metropolitan areas and counties, and created new sprawl indices for urbanized areas and census tracts. Indices are posted on a National Institutes of Health website (<http://gis.cancer.gov/tools/urban-sprawl/>). The new indices have already been applied to travel outcomes, public health and obesity, and traffic safety, establishing costs of sprawl in all three areas (Hamidi and Ewing, 2014; Hamidi *et al.*, 2015; Ewing *et al.* 2014a; Ewing *et al.*, 2014b).

2. Causes of Sprawl

Conceiving sprawl differently, the two earlier articles cited different reasons for its proliferation. To G&R, sprawl was a reflection of market forces. Consumers and businesses prefer outlying locations where land is inexpensive and congestion moderate. Modern telecommunications make clustering of businesses unnecessary. The low cost of automobile travel allows people to live far from their places of work and shopping. The resulting decentralized settlement patterns are economically efficient, and the only sources of market failure – that might render settlement patterns inefficient – are subsidies for the automobile (encouraging long-distance driving) and local land use regulations (discouraging higher densities and mixed uses).

In contrast, E viewed land markets as fraught with imperfections that induce sprawl. Perfectly functioning markets require many buyers and sellers, good information about prices and quality, homogeneous products in each market, no external costs or benefits, and so forth. Land markets meet none of these requirements. The rate of land appreciation is uncertain, causing land speculation and (where speculators guess wrong or land becomes legally encumbered) scattered development. Owner-occupied housing is subsidized through the tax code, a public policy that particularly benefits suburban residents who are primarily homeowners. Outlying development is subsidized through utility rate structures that are independent of distance from central facilities. The land market is rife with externalities, and government regulation may introduce additional market distortions by holding down densities and segregating land uses.

2.1. Consumer Preferences

The American Dream is often said to include a large lot home in the suburbs. A 1999 survey by the National Association of Homebuilders found that 83% of respondents preferred a detached single-family home “in an outlying suburban area” over a similarly priced urban townhouse accessible to public transit, work and amenities.

But the abiding preference for single-family detached housing does not imply a preference for large lots at whatever cost. Nor does it imply a preference for other hallmarks of sprawl, such as segregated housing, shopping, and work places. Compact alternatives to sprawl come in many forms, and these forms collectively have more than “boutique appeal” (G&R’s term in the earlier article). Studies show that with a more complete set of housing choices compact development can hold its own in the marketplace.

Also consumer preferences can change over time. Perhaps the best national assessments of stated preferences for compact development are the more recent National Surveys on Communities, conducted for Smart Growth America and the National Association of Realtors (Belden *et al.*, 2004; Belden *et al.*, 2011). In these surveys, respondents were given a choice between communities labeled “A” and “B.” Community A was described as having single-family homes on large lots, no sidewalks, shopping and schools located a few miles away, no public transportation, and (only in 2004), commutes of more than 45 minutes. In contrast, community B was described as having a mix of single-family and other housing, sidewalks, shopping and schools within walking distance, nearby public transportation,

and (in 2004 only), commutes of less than 45 minutes. The operative distinction is between all single-family dwellings on large lots without pedestrian amenities vs. a mix of housing types with pedestrian amenities.

In 2004, 55% of Americans expressed a preference for community B, the smart growth community with a shorter commute. This community appealed to 61% of those who were thinking of buying a house within the next three years. Commuting time had a significant influence on respondents' preferences. About a third of the respondents said they would choose the smart growth design if commutes were comparable, while another quarter preferred such a design if it also meant being closer to work. By 2011, the percentage of American preferring the smart growth community had risen to 56%, even without a commuting advantage.

Bolstering these results, a national consumer survey by the global public relations company Porter Novelli found that 59% of U.S. adults now «support the development» of compact communities (defined in detail in the survey itself). Half would now be interested in living in a compact community (Handy *et al.*, 2008). Levels of support were high among all groups except rural residents. More impressive than the absolute levels of support was the increase in support between survey years 2003 and 2005 by a statistically significant 15%. The authors attributed the increase to the media's attention to sprawl and its costs.

Shifts in the real estate market are evident already. Downtown and in-town housing tops the list of hot markets each year in the Urban Land Institute's *Emerging Trends in Real Estate* (PricewaterhouseCoopers and ULI, 2013). In 2003, for the first time in the country's history, the sales price per square foot for attached housing – that is, condominiums and townhouses – was higher than that of detached housing. Because the demand is greater than the current supply, the price-per-square foot values of houses in mixed-use neighborhoods show price premiums ranging from 40 to 100%, compared to houses in nearby single-use subdivisions (Leinberger, 2008).

When it comes to housing demand, demographics are destiny. As baby boomers become empty nesters and retirees, they are exhibiting a preference for compact, walkable neighborhoods. These trends likely will accelerate, because the baby boom generation represents America's largest generational cohort. By 2020, the number of individuals turning 65 years of age will skyrocket to more than 4 million per year. Between 2007 and 2050, the share of the U.S. population older than 65 years of age will grow from 12.8 to 20.7%.

Growth in households without children (including one-person

households) also will impact living patterns. From 2000 to 2025, households without children will account for 88% of total growth in households. Thirty-four percent will be one-person households. By 2025, only 28% of households will have children (Nelson, 2006). Households without children are a natural market for urban living.

In light of changing demographics and resulting residential preferences, Nelson (2006) projects that in 2025, the demand for attached and small-lot housing will exceed the current supply by 35 million units (71%), while the demand for large-lot housing will fall short of the current supply. We have updated those figures showing on the difference between market demand (as reported in 2006) and market supply (in 2009), illustrated in Table 1. Clearly, what people may want is not exactly what they are getting; there may be 37 million more residential units on large lots than surveys indicate the market prefers. One reason may be exclusionary local zoning practices (Pendall, 1999).

Table 1 – Housing Supply versus Housing Demand in the U.S. (2009)

Housing type	Supply 2009	Demand 2009	Difference
Attached	25,914	25,715	199
Townhome	5,973	16,771	(10,798)
Small Lot	14,717	41,368	(26,651)
Large Lot	65,201	27,951	37,250
<i>Total</i>	<i>111,805</i>	<i>111,805</i>	

Figures in thousands of occupied residential units. Demand based on Nelson (2006). “Supply” based on American Housing Survey (2010). “Small lot” means lots under one-sixth acre.

2.2. Public Subsidies

Consumer preferences help explain suburbanization and decentralization of activities within metropolitan areas, but they cannot explain the extent of dispersal, the absence of mixed land uses, and the loss of valuable natural areas. We must look to market failures to explain these phenomena.

The Office of Technology Assessment (1995) lists all manner of subsidies that result in urban sprawl. The biggest are subsidies for the highway system. If motorists had to cover the full social costs of automobile use – including vehicle emissions, free parking, uncompensated accident costs, military presence in the Persian Gulf, and other external costs – they would likely opt