

Compact City and Urban Sprawl

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Both in Europe and North America there is a growing concern about the development of urban form, especially deconcentration of urban land use in the form of urban sprawl. This has unintentional consequences such as city centre decline, increased reliance on the use of the private car, and the loss of open space. While governments try to regulate the development of urban form, there are no easy solutions. However, policies such as 'new urbanism' and 'smart growth' in North America, and 'compact city' and 'multifunctional land use' policies in Europe, though difficult to implement, have the potential to curb urban sprawl and the further growth in car use, as the cases of Portland, Oregon and Randstad Holland in The Netherlands illustrates.

1. Introduction

Across states and cities in Europe and North America there is a growing awareness of, and concern about, the development of urban form. Especially urban sprawl, the growth of urban spatial patterns with low densities, large outward expansion, spatially segregated land uses, leapfrog urban development, and widespread commercial strip development, are generally considered not conducive to a good quality of life in urban areas (Burchell *et al.*, 2000).

A whole range of unintentional consequences of this type of urban growth and expansion are brought forward in the literature. Most prominent among these are (i) deinvestment in urban core areas and central city decline; (ii) reliance on the use of private cars and therefore to the growing number of vehicle miles travelled, road congestion and decline of air quality; and (iii) the loss of open space and scenic areas in and close to metropolitan regions (Ewing *et al.*, 2002). Many politicians, planning practitioners and academics believe that governments should try to regulate the development of urban form to avoid the consequences of urban sprawl often perceived as undesirable.

In Northern America the movements promoting government regulation of urban growth are referred to as 'New Urbanism' and 'Smart Growth' (Knaap, 2000; Urban Land Institute, 1999). In some states and counties in the United States smart growth policies have been put into action; well-known examples are the states of Oregon and Maryland and Montgomery county in Virginia. Recently even in the state of Michigan, with Detroit as one of the metropolitan areas in the United States with the largest degree of urban sprawl (Galster *et al.*, 2001), and widespread opposition to regional land use planning, an advisory body for land use planning has been formed by the new governor.

In (Northwest) Europe metropolitan planning at the regional scale has a longer tradition than in the United States (Newman and Thornley, 1996; Salet *et al.*, 2003). The attempt to regulate urban form usually comes under such terms as compact city policy and the promotion of multifunctional land use (Jenks *et al.*, 1996). In The Netherlands the national government has, for decades, tried to regulate the development of urban expansion in a series of national spatial plans, since the 1980s focused on compact urban growth (Dieleman *et al.*, 1999). Its aims are quite comparable to

those brought forward by the smart growth policies in some parts of the United States.

The concept of multifunctional land use is part and parcel of the literature and debate on urban form and its consequences. It can be defined as the combination of different land use functions in the same area. It recognizes that spatial functions need not always be examined as alternative and mutually competing uses of scarce land, but instead a merging of land use functions at a certain location can lead to economies of synergy, save space, and be environmentally benign (Rodenburg *et al.*, 2003). The concept of multifunctional land use is, of course, directly related to the themes of compact city and urban sprawl discussed in this article. Multifunctional (urban) land use can be most commonly observed in high-density urban environments, especially at nodes of high accessibility such as railway stations and metro stops. In the literature mixed land use locations around public transport modes are often referred to as Transit Oriented Developments (TOD). On the other hand urban sprawl can often be associated with spatially segregated land uses and leapfrog urban development, the opposite of multifunctional land use at one location.

In this article we will further explore the various aspects of the debate and research on compact cities, urban sprawl and smart growth, with a focus on two related themes. First, we will explore the two-way interaction between transport and urban form in some depth, because urban land use patterns and transport systems and mobility patterns are so closely intertwined. Secondly we will review empirical research on policies to contain urban sprawl. One of the main aims frequently is to reduce the use of the private car. We will draw mainly on evidence from two prominent cases, Portland, Oregon in the United States and the Randstad Holland in The Netherlands, both of which have long history of urban growth management, that has been evaluated extensively in the literature.

2. Theories of Urban Sprawl

There is general agreement that urban sprawl is the combined effect of growing affluence, changing lifestyles and the vast advance in personal mobility made possible by the private automobile. The car has shaped the dispersed form of the modern metropolis and has caused the metropolis to depend on the car (Newman and Kenworthy, 1998). In order to understand urban sprawl, it is therefore important to review theoretical insights on the interaction between transport and urban form. This will be done in this section using concepts from the EU TRANSLAND project (Wegener and Fürst, 1999).

Theories on the two-way interaction between urban land use and transport address the locational and mobility responses of households, firms and travellers to changes in the urban land use and transport system at the urban-regional level.

It is common knowledge among planners and the public that urban land use and transport are closely inter-linked. That the spatial separation of human activities creates the need for travel and goods transport is the underlying principle of transport analysis and forecasting. Following this principle, it is easily understood that the suburbanization of cities is linked to increasing spatial division of labour, and hence to ever-increasing mobility.

However, the reverse impact from transport to land use is less well known. We vaguely grasp that the evolution from the dense urban fabric of medieval cities (where almost all daily mobility took place on foot), to the vast expansion of modern metropolitan areas, with their massive volumes of intraregional traffic, would not have been possible without the development of first the railway and in particular the private car. This has made every corner of the metropolitan area almost equally suitable as a place to live or work. However, exactly how the development of the transport system influences the location decisions of landlords, investors, firms and

households is not clear even to many urban planners.

The major theoretical approaches to explain this two-way interaction of land use and transport in metropolitan areas include technical theories (urban mobility systems), economic theories (cities as markets), and social theories (society and urban space).

Technical Theories: Urban Mobility Systems

In the technical paradigm of urban development, technical conditions determine the internal organization of cities. The compactness of the medieval city resulted from the need for fortifications and from the fact that most trips had to be made on foot. When these two constraints disappeared in the nineteenth century, urban development, following this paradigm, largely became a function of transport technology.

In the 1950s, first efforts were made in the USA to study systematically the inter-relationship between transport and the spatial development of cities. Hansen (1959) demonstrated for Washington DC, that locations with good accessibility had a higher chance of being developed, and at a higher density, than remote locations ('How accessibility shapes land use'). The recognition that trip and location decisions co-determine each other and that therefore transport and land-use planning needed to be co-ordinated, quickly spread among American planners, and the 'land-use transport feedback cycle' became a commonplace in the American planning literature. The relationships implied by this term can be briefly summarized:

- ♦ The distribution of *land uses*, such as residential, industrial or commercial, over the urban area determines the locations of human *activities* such as living, working, shopping, education or leisure.
- ♦ The distribution of human *activities* in space requires spatial interactions or trips in the *transport system* to overcome the distance between the locations of activities.

- ♦ The distribution of infrastructure in the *transport system* creates opportunities for spatial interactions and can be measured as *accessibility*.

- ♦ The distribution of *accessibility* in space co-determines location decisions and so results in changes of the *land use* system.

The theories based on this paradigm start from observed regularities of parameters of human mobility, such as trip distance and travel time, and from here try to infer those trip origins and destinations that best reproduce the observed frequency distributions. It had long been observed by Ravenstein (1885) and Zipf (1949) that the frequency of human interactions such as messages, trips or migrations between two locations (cities or regions) is proportional to their size, but inversely proportional to their distance. The analogy to the law of gravitation in physics is obvious. The gravity model was the first *spatial interaction* model. From the spatial interaction model it is only a small step to its application as a location model. If it is possible to make inferences from the distribution of human activities to the spatial interactions between them, it is also possible to identify the location of activities giving rise to a certain trip pattern. Lowry's (1964) *Model of Metropolis* essentially consists of two singly constrained spatial-interaction location models, a residential location model and a service and retail employment location model, nested into each other.

The spatial interaction paradigm has led to a better understanding of important dimensions of individual mobility and location behaviour and their interrelationships. It has made it clear that daily mobility depends on prior more long-term location decisions, and that these are in turn co-determined by the daily need for travel. The spatial interaction model clearly predicts that if travel costs – in monetary costs or in time – decrease (as they have done during the last 40 years) the result will be spatial dispersal of human activities and longer trip distances travelled.

Economic Theories: Cities as Markets

Economic location theory goes beyond technical theories in that location costs are taken into account. In this case firms look for the optimum constellation of size (economies of scale) and location (agglomeration economies) given their specific mix of products, production technology and pattern of suppliers and customers, whereas households try to match their space needs and location preferences with their budget restrictions. Both firms and households trade off accessibility for space or *vice versa*.

A fundamental assumption of all spatial economic theories is that locations with good accessibility are more attractive and have a higher market value than peripheral locations. This fundamental assumption goes back to Von Thünen (1826) and has since been varied and refined in many ways (see the extensive review by Vreeker *et al.* in this issue). In macroanalytic approaches spatial development is the result of spatial production functions incorporating among labour and capital such spatial factors as agglomeration advantages, transport costs and land prices, and it is still disputed under which conditions spatial equilibrium or spatial polarization will occur, or whether there is a cyclical sequence of agglomeration and deglomeration phases (Van den Berg *et al.*, 1982). Microanalytic approaches, on the other hand, start from the locational behaviour of individual players such as firms, landlords or households in the urban land or housing markets. Probably the most influential example of the latter kind is the model of the urban land market by Alonso (1964). The basic assumption of the Alonso model is that firms and households choose that location at which their bid rent, i.e. the land price they are willing to pay, equals the asking rent of the landlord, so that the land market is in equilibrium. The bid rent of firms results from the cost structure of their production function, i.e. sales price minus production and transport costs plus profit

divided by size of land. A firm with higher added value per unit of land is therefore able to pay a higher price than a firm with less intensive land utilization, everything else being equal. So it is not surprising that, say, jewellers are found in the centre, whereas trucking companies have their yards on the periphery.

As households have no cost functions like firms, the trade off is between land consumption and distance to the centre. Each household type has to divide its expenditure between land and transport costs. Households therefore maximize their combined utility of land and transport within their budget constraints. This explains why high-income households occupy large sites at the periphery, whereas low-income households frequently live in high-density housing areas near the centre.

Today fundamental changes in the economic environment lead to both spatial polarization and spatial dispersal within urban regions. Flexible production and distribution systems require extensive, low-density sites with good access to the regional and local road network, and this explains why new manufacturing firms prefer suburban locations. Retail facilities tend to follow their customers to the suburbs and similarly prefer large suburban sites with good road access. High-level services, however, continue to rely on face-to-face contacts and, despite e-mail, fax and electronic data interchange, remain in the city centre. Castells (1996) argues that in the present network economy processes of urban deconcentration and concentration operate parallel to each other. The result is the spatial dispersal of many economic activities except high-level services.

Social Theories: Society and Urban Space

In social sciences theories of urban development the spatial development of cities is the result of individual or collective appropriation of space.

Since the work of Durkheim and Simmel in

sociology traditions exist in which the city is a fundamental dimension of human existence. However, only between the wars, the Chicago School of urban sociologists looked more closely into processes of social change at the neighbourhood and urban levels. Based on an adaptation of evolutionist thoughts from philosophy (Spencer) and biology (Darwin), they interpreted the city as a multi-species ecosystem, in which social and economic groups fight for 'ecological positions' (Park *et al.*, 1925; Park, 1936).

In spatial terms the ecological position is a territory such as a neighbourhood or a region. Appropriation of space takes place as invasion of different ethnic or income groups or tertiary activities in a residential neighbourhood and uses concepts of animal and plant ecology such as 'invasion', 'succession' or 'dominance' to describe the phases of such displacement. A number of qualitative theories of urban development were put forward to explain the spatial expansion of American cities, such as the concentric (Burgess, 1925), sector (Hoyt, 1939), or polycentric (Harris and Ullman, 1945) theories of city growth. Concepts from social ecology continue to be useful for understanding the mechanisms of social change in cities beyond the economic processes on the land market.

Social geography theories are related to social ecology concepts, but go beyond their macro perspective by referring to age-, gender- or social-group specific activity patterns which lead to characteristic spatio-temporal behaviour, and hence to permanent location. Hägerstrand (1970) made these ideas operational by the introduction of 'time budgets', in which individuals, according to their social role, income, and level of technology (e.g. car ownership) – subject to various types of constraints – command *action spaces* of different size and duration. Action spaces are limited by three types of constraints: (i) *capacity* constraints: personal, non-spatial restrictions on mobility, such as monetary budget, time budget, availability of transport modes and ability to use them;

(ii) *coupling* constraints: restrictions on the coupling of activities by location and time schedules of facilities and other individuals; and (iii) *institutional* constraints: restrictions of access to facilities by public or private regulations such as property, opening hours, entrance fees or prices. Only locations within these action spaces can be considered. It is an achievement of the 'time geography' of the Hagerstrand school to have drawn attention to the various kinds of restrictions of the land-use and transport system for the mobility of women with children, the elderly and the handicapped.

On the basis of Hägerstrand's action-space theory, Zahavi (1974; 1979; Zahavi *et al.*, 1981) proposed the hypothesis that individuals in their daily mobility decisions do not, as the conventional theory of travel behaviour assumes, *minimize* travel time or travel cost needed to perform a given set of activities but instead *maximize* activities or opportunities that can be reached within their travel time and money budgets. He studied a large number of cities all over the world and found that the time and money budgets devoted to transport vary within urban regions as a function of age, income and residential location, but that they showed a remarkable stability over time when averaged across whole urban regions. The temporal stability of time and money budgets for transport explain why in the past gains in travel speed have not been used for time savings (as is usually assumed in transport cost benefit analysis) but for more and longer trips. Zahavi's theory explains why acceleration and cost reduction together permit more and more people to choose residential locations at the far periphery of urbanized areas, without increasing their time and money budgets for travel.

Summary

Based on technical, economic and social theories, the most likely scenario of urban development is continued spatial dispersal. The trends in socio-economic contexts and

lifestyles currently in force, such as cheap transport, rising incomes, more women going to work, smaller households, more leisure time and the consequential changes in housing preferences, will continue to create demand for more spacious living in attractive neighbourhoods, and this will be easier to realize at the urban periphery, preferably in the vicinity of small towns with attractive town centres and up-market shopping facilities. Retail and service facilities will continue to follow their clients to the suburbs, as will the new 'clean' industries which depend on the highly skilled middle-class labour living in the suburbs. The result will, in the best case, be a park-like rural-urban continuum, and in the worst case, a nondescript urban sprawl (Fishman, 1987; Rowe, 1991; Sieverts, 1997).

From a social and environmental point of view the results of the deconcentration process are generally considered to be negative: longer journeys to work and shopping trips, more energy consumption, pollution and accidents, excessive land consumption and problems of public transport provision in low-density areas. A dispersed settlement structure relies on access to car travel as a prerequisite for taking advantage of employment and service opportunities, and thus contributes to social segmentation. Inner cities, except for the largest and most successful metropolises with a prosperous, 'international' central area, are victims of the exodus of people and jobs, and will increasingly develop as just one among several regional centres. Inner-city housing areas will continue to become marginalized as the younger and more active segments of the population leave because of the run-down housing stock, traffic noise and lack of parking space, unless the total existing population is displaced by gentrification or tertiarization – though these are themselves signs of economic prosperity and hence occur predominantly in successful cities.

However, one should be careful not to draw a too bleak picture based on one

scenario only. There are other tendencies potentially working in other directions. Teleworking and teleshopping are still in their infancy but may fundamentally change daily mobility patterns and hence location behaviour. There is a growing diversity of lifestyles and housing preferences, which may challenge the dominance of suburban living as the ultimate manifestation of the 'good life'. In some countries there are signs of a re-appreciation of urban life and a trend to return to inner cities 'back from the edge' (Gratz and Mintz, 1998). At the other end of the spectrum, there are new ideas in urban and landscape design towards new forms of integration of housing and nature with an ecological perspective. And in many cities new concentrations of business and financial services have developed both in some parts of the inner city as well as at accessible transport nodes at the periphery of metropolitan areas. It is at these locations that areas of multifunctional urban land use are most likely to develop.

Table 1 summarizes the impacts of land use and transport policies on land use and transport patterns from a theoretical point of view:

- ♦ The impact of high residential density in reducing average trip length is likely to be minimal in the absence of travel cost increases, whereas a high density of employment is positively correlated with average trip length. Attractive neighbourhood facilities can be seen as a 'pull' factor for reducing trip length. With regard to trip frequency little or no impact is to be expected from land use policies according to Zahavi's theory of fixed travel budgets. Residential and employment density as well as large agglomeration size and good public transport accessibility of a location tend to be positively correlated with the modal share of public transport while neighbourhood design and a mixture of workplaces and residences with shorter trips are likely to have a positive impact on the share of cycling and walking.

Table 1. Theoretically expected impacts of land use and transport policies.

<i>Direction</i>	<i>Factor</i>	<i>Impact on</i>	<i>Expected impacts</i>
Land use ↓ Transport	Residential density	Trip length	Higher residential density alone does not lead to shorter trips. A mixture of workplaces and residences leads to shorter trips if at the same time travel costs are increased.
		Trip frequency	Little impact. If destinations are shorter, trips are shorter and more trips are made.
		Mode choice	Minimum residential densities are a prerequisite for efficient public transport. More walking and cycling trips will be made only if trips become shorter.
	Employment density	Trip length	Concentration of workplaces in few employment centres increases average trip lengths. A balance of workplaces and residences in an area leads to shorter work trips only if travel becomes more expensive.
		Trip frequency	Little impact. If destinations are closer, trips are shorter and more trips are made.
		Mode choice	Concentration of workplaces in few employment centres reduces car use if supported by efficient public transport. More walking and cycling trips will be made only if trips become shorter.
	Neighbourhood design	Trip length	Attractive public spaces and a variety of shops and services induce more local trips.
		Trip frequency	Little impact. If destinations are closer, trips are shorter and more trips are made.
		Mode choice	No-detour street layout with pedestrian spaces and cycling lanes lead to more walking and cycling.
Transport ↓ Land use	Accessibility	Residential location	Locations with good accessibility to workplaces, shops, education and leisure facilities are more attractive for residential development. Improving accessibility locally changes the direction of new residential development, improving accessibility in the whole urban area results in more urban sprawl.
		Industrial location	Locations with better accessibility to motorways and railway freight terminals are more attractive for industrial development. Improving accessibility locally changes the direction of new industrial development, improving accessibility in the whole urban area results in more urban sprawl.
		Office location	Locations with better accessibility to airports, high-speed rail railway stations and motorways are more attractive for office development. Improving accessibility locally changes the direction of new office development, improving accessibility in the whole urban area results in more urban sprawl.
		Retail location	Locations with better accessibility to customers and competing retail firms are more attractive for retail development. Improving accessibility locally changes the direction of new retail development, improving accessibility in the whole urban area results in more urban sprawl.

♦ The impact of transport on land use is mediated by a change in the accessibility of a location. Locations with good accessibility to workplaces, shops, education and leisure facilities are more attractive for residential, industrial, office or retail development. Higher accessibility increases the attractiveness of a location for all types of land uses and so can increase the probability of the development of multifunctional land use areas. If, however, accessibility in the entire metropolitan area is increased, it will result in a more dispersed settlement structure.

In the next section, we will review recent literature on empirical evidence about urban sprawl, its major causes and anti-sprawl policies applied in practice.

3. Empirical Evidence

The debate on compact cities, smart growth and urban sprawl has recently generated a whole series of empirical studies and publications which try to define and measure urban form, identify its major causes and discuss policies aimed to reduce urban sprawl and promote smart growth.

Measuring Sprawl

It is easier to talk in general about urban form and sprawl than to 'wrestle sprawl to the ground', to define and measure these concepts as Galster *et al.*, (2001) argue. They distinguish and measure eight dimensions of sprawl, density, continuity, concentration, clustering, centrality, 'nuclearity', mixed uses and proximity. For thirteen large metropolitan areas in the US they develop indicators for these dimensions for the pattern of residential land use. Housing sprawl is relatively mild in cities such as New York, Chicago, Boston and also Los Angeles but large in Detroit, Miami and Atlanta. Ewing *et al.* (2002) review similar studies that try to measure sprawl and also develop their own methodology applied to eighty-three large metropolitan areas in the US. They define four (composite) dimensions of sprawl: low development density; segre-

gated land used; lack of significant centres; and poor street accessibility and also develop an overall sprawl index. New York, San Francisco, Boston and Portland are relatively compact metro areas according to this index, while Atlanta, Raleigh-Durham, and Riverside-San Bernardino are sprawled. Studies like these try to characterize urban form for whole metropolitan areas (see also Bunting *et al.*, 2002) while others focus on neighbourhood characteristics (for instance Srinivasan, 2002; Song and Knaap, 2003). Some studies are limited to the exercise of defining and measuring urban form, while others also try to relate urban form characteristics quantitatively to outcomes in terms of quality of life and sustainability of metropolitan development; the most frequent outcome studied relates to travel and travel behaviour (for instance Ewing *et al.*, 2002; Srinivasan, 2002; Schwanen, 2002; Dieleman *et al.*, 2002; these studies also review the extensive literature on this topic). The measurement of urban form is certainly a field of intense interest now, while comparison of urban form across Europe is hampered by the lack of a standard definition of metropolitan region and data for such units on this continent.

Galster *et al.* (2001) and Ewing *et al.* (2002) point out correctly that it is important in the debate on urban form and sprawl to distinguish the measurement of the characteristics of sprawl from the causes of this phenomenon including land use policies, and from the impacts of the development of urban form and sprawl such as transportation outcomes, decline of central cities, the loss of open space etc. This distinction is not always present in the literature and this omission therefore confuses the argument. Nor is the distinction between cause and consequence always easy to make, as we have argued in the previous section for land use patterns and transport and travel. Yet in this discussion we will try to focus first on possible causes then on possible consequences of the development of urban form.

Causes of Sprawl

The factors that lead to deconcentrated urban land use, sometimes in the form of sprawl – low density, single use, strip and leapfrog developments – can be grouped into two categories (*i*) general causes relating to the general drift of change in developed societies, and (*ii*) government policy, spatial planning related. Naturally changes in urban form are mostly the result of general changes in Western societies such as the growth of affluence, economic and demographic change, technological innovation in transport systems, and also the history of urban development. In the US, households spend on average 19 cents of every dollar on shelter and 18 cents on transportation, the largest items in their household budget (Surface Transportation Policy Project, 2000). So, of course, rising affluence is a dominant driver in the demand for spacious living and growing automobile ownership, and in their turn dominant causes of the development of urban deconcentration (Carruthers, 2002). In the Detroit metropolitan area, for example, the growth of developed urban land of 17 per cent between 1990 and 2000, was due mainly (43 per cent) to lower density residential development (SEMCOG, 2003).

European countries face similar effects in the rise of affluence in the demand for urban space. In The Netherlands, for instance, average incomes nearly doubled between 1960 and the present (constant €), and certainly were instrumental in generating a lifestyle in which ownership and use of the private car and more luxurious and spacious housing play an important role.

Historical factors also play a role in differences in urban form and density. Of course, European cities are on average much more compact than those in the US and Australia, because they are much older and partly developed in an era when the streetcar and private car were not yet invented (see also section on theories of urban sprawl). Kenworthy *et al.* (1998) show that urban

densities for housing and employment are on average three times as high in Europe than the US, and Stretton (1996) argues that Australian cities average about a quarter of the population density of European cities. Naturally, European cities are therefore easier to travel by foot and bike and are better served by public transport (Kenworthy *et al.*, 1999). Similar arguments about general causes of changes in urban form and the growth of urban sprawl can be developed for demographic, economic and technological change, but that is not the main focus of this article. It is more relevant to review briefly the literature on the influence of political and spatial planning as a factor in the development of urban form and sprawl, because that is more at the heart of the present debate by both practitioners and academics.

Anti-Sprawl Policies

Many scholars argue that the structure of the political and fiscal system has an important impact on the way metropolitan regions develop (see, for instance, Faludi and Van der Valk, 1994; Williams *et al.*, 2000; Dieleman *et al.*, 1999; Salet *et al.*, 2003; Abbott, 1997; Carruthers, 2002; Jacobs, 2003 for reviews of some of this literature and the main arguments). Jacobs (2003), in an interesting comparison of the Detroit and Nagoya automobile regions, argues that the strong local autonomy, the dominance of elected local residents in the land use and zoning decisions, and the financial autonomy of local communities are important factors in the development of urban sprawl in Detroit. Local communities compete with each other in attracting businesses, for instance, via tax abatements of up to 50 per cent and affluent suburban areas are frequently the winners in this game. In contrast spatial planning and tax regulations in Japan promote much more interlocal co-operation and service equity, a situation that also seems to apply to many European countries (Dieleman *et al.*, 1999; Salet *et al.*, 2003).

The consistent and long term involvement in metropolitan planning by an agency at a higher geographical scale than local communities and municipalities has also been shown to have a noticeable impact on the development of either urban sprawl or more compact urban structure. Carruthers (2002) has recently demonstrated that the involvement of the state in spatial planning, which varies widely across the US, may strongly curtail urban sprawl. Or if programmes are inconsistent or weakly enforced, they may inadvertently contribute to it. In Europe regional and national governments are often strongly and decisively involved in urban growth management; in The Netherlands for instance the binding national spatial plans certainly exert a strong influence on how metropolitan areas develop spatially (Schwanen *et al.*, 2004).

But, of course, ultimately the merits of spatial planning policies like compact city planning and most growth measures are in the first place not dependent on whether or how they can or should be pursued, but should be evaluated more in terms of their beneficial consequences or the lack thereof.

Ewings *et al.* (2002) argue that a notable feature of the present debate on sprawl is the lack of attention paid to the avoidance of the negative consequences of urban sprawl. Some authors strongly doubt whether there are any benefits at all in terms of quality of urban life from compact city and smart growth planning (Breheny, 1996; Gordon and Richardson, 1997; O'Toole, 2000; Schwanen *et al.*, 2004).

Proponents of such policies usually compile long lists of positive consequences that a certain compact or other 'smart' urban form might have (for reviews, see for instance, Knaap, 2002; Williams, 1999; Counsell, 2001; Ewings *et al.*, 2002; Urban Land Institute, 1999). Curtailing sprawl and promoting compact cities would lead to revitalized urban communities, repopulation of central cities, redevelopment of brownfield areas, housing affordability, more social equity and

less racial and socio-economic segregation, reduced travel demand and shorter travel distances, more biking and walking, cost savings on infrastructure such as road, water and sewer infrastructure, preservation of farm land and open space, environmental protection and improved health. Just a selection of all the benefits mentioned. The Minister of Housing, Spatial Planning and the Environment in The Netherlands mentioned all these items as arguments for compact city policy and added a few (De Boer, 1997); the cultural climate of cities would be improved, recreational opportunities would be enhanced, etc.

Of course it is doubtful that all such benefits would accrue from land use planning only. In the next section we will look at the experience with growth management, central city development, transport policy and the preservation of open space in two prominent examples of anti-sprawl policy, Portland, Oregon and the Randstad.

4. Two Case Studies

There have been many attempts to fight urban sprawl by land use or transport policies or a combination of both. The methodological problem in reviewing these policies lies in the fact that only in few cases have systematic before-and-after studies monitoring the effects of these policies been conducted. But even where before-and-after studies have been attempted, they inevitably suffer from the fact that urban systems are continuously subject to a multitude of concurrent trends and influences, and that it is almost never possible to relate observed effects to their specific causes or to the policies of interest. Nevertheless it is possible to review outstanding examples in which particular efforts have been undertaken.

North America: Portland

Seen through European eyes, urban development in North America is generally con-

sidered to be an example to be avoided. A transport system exclusively dependent on cars, declining inner cities, sprawling suburbs and mushrooming edge cities (Garreau, 1991) is seen as a consistent expression of the lack of planning intervention under the auspices of neo-liberal deregulation of economy and society.

However, that image is too simple. Despite its traditionally weak position of spatial planning, North America has produced a number of innovative approaches to transforming the metropolis into a more sustainable, more compact and more mixed-use urban form. The most prominent of these examples is briefly reviewed here: Portland, Oregon.

Portland (population 510,000) is the largest city in the US State of Oregon. Already in 1973 the State of Oregon introduced an urban growth boundary for Portland. The urban growth boundary defines the area inside of which new urban development is permitted. Outside the urban growth boundary, only agricultural structures are permitted. The urban growth boundary has to be reviewed periodically and it should always include land for 20 years of development.

In 1979 the regional planning organization Portland Metro was introduced by popular referendum. Metro comprises parts of three counties with 24 municipalities and a population of 1.3 million, and approximately covers the area of the urban growth boundary. To date Metro is the only directly elected regional authority in the United States. Its responsibilities include among others regional land use and transport planning. Stimulated by a powerful environmentalist lobby organization, the 1000 Friends of Oregon, and strongly influenced by the emerging ideas of the New Urbanism movement (Calthorpe, 1993; Calthorpe and Fulton, 2001), Portland developed after Sacramento and San Diego – a new type of urban development, which is not oriented to the car as the main means of transport but on efficient public transport. *Transit-Oriented Development* (TOD) consists

of the following elements (i) a light-rail transit (LRT) network as the backbone of regional public transport; (ii) a dense bus network serving as feeder to the LRT stops; and (iii) concentrations of jobs, services and residences at the LRT stops. There are three types of centre: *Mixed-use centres* are large new centres with high density and many workplaces at the main hubs of the LRT network; *Urban TODs* are smaller centres with medium density and a medium share of workplaces at intermediate LRT stops; and *Neighborhood TODs* are neighbourhood centres with predominantly housing in up to two miles distance from a LRT stop with bus feeder transport.

With this concept Portland is a model example of what is called *smart growth* in the US today. Smart growth is not undisputed. For its proponents smart growth includes urban growth boundaries, park and open space programmes, transit-oriented development, redirection of 'highway dollars' to pedestrian and bike lanes, change of taxation schemes favouring urban sprawl, user fees for new public facilities, urban renewal projects and ecological and disaster protection areas (Sierra Club, 2001). Its critics see smart growth rather as an excuse by affluent communities to prevent immigration of low-income households.

The first line of the Portland LRT, the *Metropolitan Area Express* (MAX), was opened in 1999. At the main completed and planned MAX stops multifunctional land use centres with medium density and a high proportion of office jobs have been developed. Today the regional transport authority Tri-Met maintains an extended LRT and bus network in the three counties.

Although urban development is a slow process, the first positive effects can be seen. Portland grows in a more compact form than other cities in the United States. The use of public transport has increased by 60 per cent. Traffic jams are less frequent than in other American cities. In the MAX corridors, residences and workplaces to the value of

2.4 billion dollars have been built or are in the planning stage. More than a quarter of all new construction occurs on infill sites in already developed areas.

Nevertheless, there is a lively discussion whether land use constraints imposed by urban growth boundaries have negative impacts on the competitiveness and social balance of cities (Song and Knaap, 2003). One opinion is that urban growth boundaries lead to a scarcity of land and higher land prices, and favour land owners inside and disadvantage land owners outside the urban growth boundary (Anas, 1999). It is true that inner-city urban renewal projects in Portland are mostly directed at medium- and high-income households. House prices and rents in Portland almost doubled in the 1990s, and Portland was rated the 'least affordable' city in the United States in 1997 (Harmon, 1998). Other analysts come to different conclusions. Porter (1997) showed that land price increases in cities with growth management were largely caused by increases in attractiveness. Nelson and Peterman (2000) showed that cities with growth management on average are more successful than cities without, and Downs (2002) demonstrated that house prices in Portland have not grown faster than in other comparable metropolitan areas in the United States.

Can Portland be a model for European cities? The preconditions for sustainable urban development are much more favourable in European cities. Population density in Europe is about three times as high than in the United States. Europeans travel 60 per cent less per annum than Americans, own 40 per cent less cars per capita and make more than half of all trips in cities on foot or by public transport – conditions Portland planners can only dream of.

There is one feature, however, in which Portland certainly can serve as a model: the way it has overcome the competition between cities and suburban communities for people and jobs. The Portland example demonstrates that, under conditions of in-

creasing competition between cities and regions caused by globalization, this cannot be achieved by voluntary co-operation only but requires an efficient regional authority based on majority rule, such as Metro (Abbott, 1997).

Europe: The Randstad

As Portland often serves as the example of spatial planning efforts towards growth management in the United States, the same is true for the Randstad Holland in Europe (Faludi and Van der Valk, 1994). The Randstad is the densely populated western part of The Netherlands. This is where all the large cities of the country, Amsterdam, Rotterdam, The Hague and Utrecht are located, along with a substantial number of smaller cities in range of 50,000–100,000 inhabitants (Dieleman, *et al.* 1999). The urban region covers an area of roughly 80 km by 80 km and has some 6.5 million inhabitants. The urban centres are located in a distinctive pattern, a horseshoe form known as Randstad ('Ring City') encircling a more open agricultural area the 'Green Heart'.

In 1966, the first concrete formulation of national spatial planning occurred in the Second Report on Physical Planning for The Netherlands (Van der Burg and Dieleman, 2004). It was partly a reaction to the wave of suburbanization that occurred between the mid-1960s and the end of the 1970s in The Netherlands. There was a real threat that urban sprawl would engulf the Green Heart. The policy was mainly designed to channel urban growth into a number of designated growth centres ('concentrated deconcentration') and to prohibit the growth of small rural settlements. These planning ideas were put into practice successfully in the 1970s and early 1980s. Half a million people moved into the designated growth centres and urban sprawl was stopped (Dieleman *et al.*, 1999).

Yet, in the course of the 1980s, spatial planning changed track and the policy of

concentrated deconcentration was traded in for the 'compact city' policy. This was mainly because of concern about the decay of the old urban centres, which was partly blamed on the development of the satel-lite towns. Under this new policy of the compact city, formulated by the national government in the Fourth Physical Planning Memorandum Extra in 1991, urban growth was guided into (re)development locations within existing cities (brownfield sites) and towards new greenfield sites directly adjacent to the built-up areas of larger cities in the Randstad Holland. This policy is now being implemented and urban growth both in terms of residences and employment is largely occurring on the urban ring of the Randstad where it was supposed to occur under the compact city policy.

Thus the implementation of both the concentrated deconcentration and compact city policies seem to have been successful to a large extent in the Randstad Holland, although this is more true for the location of residences than for employment (Van der Burg and Dieleman, 2004). This is remarkable because administrative fragmentation of urban regions has often been a major stumbling block for the implementation of growth management. And this fragmentation is also true for the Randstad, with the national government, four provinces and more than 150 municipalities having a say in the spatial planning process. Probably three specific circumstances facilitated the implementation of spatial planning policies in The Netherlands. The first is that the national government has acted as the strategic planning authority in close consultation with the lower tiers of government (Faludi and Van der Valk, 1994). The second is the peculiar tax system in the country where only 17 per cent of the revenue of municipalities comes from local taxation and 83 per cent is channelled through the national state (Van der Burg and Dieleman, 2003). This reduces competition between municipalities for urban growth and gives the national government an

instrument to influence local spatial planning policies. And, thirdly, The Netherlands has a very strong regulation by government of the residential development process. Housing policy has consistently been used to support spatial planning objectives. It is doubtful whether these particular circumstances can be easily replicated elsewhere.

Even with the successful implementation of urban growth objectives in terms of where growth should go geographically, the spatial planning practices of the present are now hotly debated in The Netherlands (Hajer and Zonneveld, 2000; Van der Burg and Dieleman, 2004; Schwanen *et al.*, 2004). This is mainly because the supposed merits of compact city planning, like creating strong and vibrant central cities, stimulating walking, biking and use of public transit, preserving open agricultural and environment space and guaranteeing decent housing for all households, are only partly forthcoming even with the successful implementation of the spatial growth management objectives. The main merit of the compact city policy seems to be the renewed population growth of the central cities, albeit that it is mainly due to the arrival of international immigrants. The main failure seems to be the permanent housing shortage, which is at least partly caused by spatial planning regulations.

5. Conclusions

The analysis in this article has shown that in the absence of strong planning intervention at the regional and local level like in Portland, Oregon and Randstad Holland, the prospects point in the direction of further urban deconcentration. There are presently more tendencies towards spatial separation of urban functions than spontaneous tendencies for new forms of multifunctional, mixed-use urban settlements, although such developments sometimes do occur as illustrated for the *Transit Oriented Developments* around the stations of the Portland Metro. The tendencies of urban deconcentration are

not transient phenomena but the consistent outcome of long-range and fundamental changes in economic conditions, modes of production and distribution, household patterns and lifestyles, and transport and communication technology. However, there is also agreement that even if urban sprawl is the result of thousands of voluntary decisions by firms and households, its consequences in terms of declining inner cities, loss of open space, increasing travel distances, energy consumption and greenhouse gas emissions are largely negative seen from economic, social and environmental points of view. Therefore policies which potentially lead to higher urban densities than now, often observed in the urban periphery and related to multifunctional land use patterns in particular around transport nodes, certainly merit attention and experimentation.

The review of available theory and empirical evidence have made it clear that there are no easy solutions. Land use policies to increase urban density or multifunctional land use without accompanying measures to make car travel more expensive or slower have only little effect as people will continue to make long trips to maximize opportunities within their travel cost and travel time budgets. However, these policies are important in the long run as they provide the preconditions for a less car-dependent urban way of life in the future. Both in Portland and Randstad Holland, where urban growth management policies have been pursued for some decades, there are signs that public transit is fairly vibrant and multifunctional land use areas develop scattered across the metropolitan landscape. Transport policies making car travel less attractive (more expensive or slower) are very effective in achieving the goals of reduction of travel distance and share of car travel. However, they depend on a spatial organization that is not too dispersed. Policies such as the 'new urbanism' and 'smart growth' policies in North America and 'compact city' and 'multifunctional urban land use' policies

in Europe, though difficult to implement, have the potential to stem urban sprawl and further growth in car use, as the cases of Portland, Oregon and the Randstad illustrate.

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