

# **Sustainable Urban Form and Real Estate Markets**

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**Abstract**

A number of models of sustainable urban form have been promoted but the concept has not been subject to a fundamental review of its theoretical and empirical underpinnings. Sustainable urban form implies an inter-linkage of sound environmental, social and economic foundations. This paper initially focuses on the nature of the economic debate surrounding sustainable urban forms. It then considers the principal elements of urban form - land use patterns, position/ transport infrastructure, density, characteristics of the built environment. From this base it considers the underlying urban economic forces that shape these elements and their impact in turn on the urban economy. The role of transport infrastructure and spatial real estate markets is highlighted in the determination of urban form. The paper suggests an alternative formulation of the approach to urban sustainability that requires as a necessary condition a viable real estate sector with sustainable markets. As a consequence the paper argues the need for policy to understand and shape functional (sub) land use market/ catchment areas.

## **Introduction**

The last decade has seen a considerable interest in urban sustainability and a debate has ensued about the impact of urban form. There is a growing literature on the issues, with sustainability seen as depending on three constructs – environmental (including transport), social and economic dimensions. The physical dimensions of urban form represent an amalgam of land use patterns, the transportation system and urban design features. The conclusions of this debate about the sustainability of urban forms has focused on increasing the density of development, ensuring a mix of uses, containing urban ‘sprawl’ and achieving social and economic diversity and vitality – characterised as the concept of a ‘compact city’ (Jenks *et al*, 1996).

UK Government policy has embraced this view of sustainability, and such principles have become the dominant planning ethos (Urban Task Force, 1999). However, with the literature tending to be normative, this commitment to the compact city as a sustainable urban form has not been subject to a fundamental review of its theoretical and empirical underpinnings. This paper focuses on the economic core of the sustainability arguments and the role of real estate markets. It begins by reviewing the arguments for sustainable urban form. The paper then considers the principal elements of urban form - land use patterns, position/ transport infrastructure, density, characteristics of the built environment, and layout, and the underlying urban economic forces that shape these elements. The next section draws on this section to assess the concept of economic sustainability. From this base it considers the relationship between these economic outcomes with spatial real estate markets. In particular the paper considers the interaction between functional (sub) property markets/ catchment areas and physical form.

## **Sustainable Urban Form**

The Brundtland Report (World Commission on Economic Development, 1987) was the first global attempt to address the sustainability problem that stems primarily from the idea that there are a finite number of resources in the world but an infinite number of human wants. Therefore, in order to achieve sustainable development it is necessary to meet current needs, whilst ensuring the needs of future generations are also catered for. The report warned that significant changes need to be made in order to ensure a sustainable global future. An emphasis on the role of cities in achieving sustainability was made in the Green Paper on the Urban Environment (Commission of European Communities (CEC), 1990).

Some go further and argue that the economic development/ environment relationship at the local level is fundamental to whether or not sustainable development is achievable (Gibbs *et al*, 1996). Given that cities are primary spatial economic units and contribute significantly to environmental impacts, they play a key role in the path

to sustainable development. It is widely suggested that in order to address the issue of sustainable development, achieving sustainability at the urban level is crucial. Since cities are widely acknowledged to be the main sources of pollution and environmental degradation it seems appropriate to address the sustainability issue from this level. Many commentators extend these arguments to specify desirable urban forms.

Lynch (1981) considers five basic dimensions and two meta-criteria for the performance dimensions of the spatial form of a city. These are; how settlement form affects vitality, how settlement form affects human sense, the degree to which the settlement form fits the requirements of people, how able people are to access activities, services etc, and how much control people have over services/ activities/ spaces etc. The two meta-criteria are efficiency (costs etc) and justice (equity etc). Productive efficiency is seen to be affected by the access and fit dimensions of spatial city form. Lynch (1981) pre-empted the Brundtland definition of sustainable development in the context of the urban economy. He sees the sustainability problem being one of enabling the urban economy to exist long into the future, whilst keeping resource use within levels that allow the earth's finite resources to provide indefinitely, alongside social equity.

The debate over the most sustainable urban form has two principal alternatives. One side advocates a high density, mixed use centralised urban form. The other side advocates a low density, dispersed urban form. Arguments in favour of a compact, centralised city claim that this type of urban form provides environmental, social and economic benefits. The environmental benefits of a compact urban form are seen to include reduced energy usage and greenhouse gas emissions following a lesser demand for polluting modes of travel, reduced pressure on greenfield sites and greater use of more efficient technologies. The promulgated social benefits of a compact urban form include a greater availability of housing that meets peoples' needs in a sustainable way, increased access to services and facilities leading to better quality urban environments. Advocates of this type of urban development include the CEC (1990), Newman & Kenworthy (1989) and the UK Government (Urban Task Force, 1999).

From an economic perspective there are a range of economic arguments in favour of the compact city. Camagni et al (1998) hypothesise that a compact city with high density mixed-use areas could contribute towards profitability and economic growth, lower energy consumption, and greater allocative and distributive efficiency. Economically, it is argued that a compact urban form can lead to new business formation and innovation, which also attracts new residents. Compact city advocates, such as Barton (2000), further argue that mixed land use is the most sustainable type of urban use, in that it increases the viability of services and transport provision supported by high residential density. Mixed land use in this context refers to the intermingling of land uses to ease access and reduce travel. He qualifies this however,

in stating that it is the use of these services and facilities that makes them viable, not their mere existence. Mixed use is linked closely to ideas of ease of access and the provision of a greater choice. A further argument is that by having many types of land use in one development area there is a

*“critical mass and level of activity (created) which is greater than the sum of individual users, thereby making a critical contribution to location and character”* (ODPM 2002a).

Labour markets are also said to function more efficiently in high density areas. Prud'homme & Lee (1999) claim that the closer people are to their place of work, the more effective the labour market is. A larger labour market also provides employers with a wider skills base, leading to an increased likelihood of skills-job matching. They conclude that the effective size of the labour market is negatively related to sprawl. High employment density in urban areas and well-functioning infrastructure are also said to contribute positively to economic performance by Cervero (2001). This is linked to a wider skills base, better job-skills matching, and improved commuting speeds/ distances associated with compact urban forms.

Breheny (1992) comments on the CEC's idea of a compact city (CEC, 1990) and claims it to be contradictory, as a compact city may mean a reduction in environmental quality through the loss of open spaces to development. Another possible drawback of a compact urban structure is the potential for diseconomies to occur when the central structure becomes too big (e.g. congestion externalities) (Knight, 1996). In terms of residential preferences, a compact urban form may be less desirable for some individuals. Households with children may prefer to locate further away from the city centre, where they have a garden. Other households may experience an increase in income and demand more space, which is found in less dense developments, further away from the city centre. The compact city can also fail to adequately consider future changes in population. A high density, compact city is less likely to be able to cope with significant population growth, as there is less potential for expansion if development is already at a high density (Anas et al, 2000).

Proponents of the decentralised view therefore stress either the benefits of a decentralised 'rural' or 'semi-rural' life style with low development costs or the unstoppable market forces that will create dispersed communities with low energy consumption and congestion (Richardson and Gordon, 1993; Gordon and Richardson, 1997). There has been no consensus as yet over this long standing debate, and some argue that a combination of the compact city and dispersed urban form should be adopted (Camagni et al, 2002). This compromise is referred to as a polycentric urban structure; Frey (1999) provides a useful and succinct discussion of this approach, which he calls 'decentralised concentration'. A polycentric structure may become

more attractive where agglomeration benefits can still be gained in each of the sub-centres while avoiding the risk of negative agglomeration effects associated with large urban structures.

Polycentricity is a concept that has been adopted in European policy, which is claimed to promote economic growth and equality across Europe (Commission of European Union, 1999). A polycentric structure is also asserted to promote links between industrial clusters and encourage innovation and thus economic growth; although there are some doubts expressed as to whether or not this occurs in reality (ODPM, 2003). Within a polycentric urban structure competitiveness and cohesion is encouraged through developing connectivity between the various centres within a city by good transport links. However, Parr (2004) has queried the basis for the economic arguments of the polycentric urban region.

These arguments are characterised by normative theoretical views supported by minimal and disputed evidence (Breheny, 1996). Empirical research on the subject is very limited. Williams (2000) is a notable exception; she found indirect evidence that the overall economic viability and vitality increased in a compact urban form based on a study of three boroughs in London. She found increased investment, employment etc. but concluded that it was impossible to tell whether this was due to intensification alone.

### **Elements of Urban Form**

This section seeks to dissect the arguments linking urban form and economic sustainability or, put more precisely, the relationships between urban form elements and sustainable economic outputs. In doing so the paper shifts from a normative outcome perspective to a positive one that stresses processes to actual/potential outcomes. To undertake this task the paper examines the intervening processes in the different sectors of the urban economy, focusing on the interaction of supply and demand and sectoral or intermediate outcomes. The approach taken is to focus on a city and to view it both in the urban macro context and as a potential combination of urban forms.

There are four main elements that make up urban form. These are land use, density, position/transport infrastructure and characteristics of the built environment. An additional micro-element is layout. The dominant land use is residential but a functional urban area requires industrial, retail, offices etc. and some of these uses will be located together in one building, i.e. mixed land use (as distinct from an area with a mix of uses). Density has a number of sub-elements - gross population, net residential, commercial and industrial employment densities. Position/Transport infrastructure is closely linked to the idea of accessibility and is related to the ease at

which buildings/ spaces/ places can be reached. Characteristics of the built environment, is a concept encompassing various features of an urban area such as building type, building height and intensity of land use. The fifth element of urban form is layout. This is an important social and environmental element, but is of less importance to the economic interest of this paper.

### *Land Use*

Specific spatial distributions of land use are crucial to the arguments about potential 'sustainable' urban forms. There are two underlying substantive land use demand factors. The first of these is the spatial pattern of revenues/ costs (see Alonso, 1964; Dunse and Jones, 2005). The demand for different land uses will depend on the relevant cost of using certain locations, and the revenues it will provide. Land that is deemed to be more productive for one use may not be considered so for another. If a certain area is thought to be desirable because it will generate large revenues, it is likely to have a higher value. What is deemed to be desirable may vary from occupier to occupier. Residential location preferences are different to industrial demands, and these will be different to retail demands etc. Second, there are agglomeration factors. This is the impact of agglomeration economies on the demand for various land uses. The idea behind this is the potential propensity of office/ retail occupiers to choose locations that are close to other office/ retail occupiers undertaking similar or complementary activities (Henderson, 1974; Parr, 2002). Agglomeration economies result in potentially lower input costs and knowledge and skill transfers amongst other benefits (see later).

There are three principal underlying influences linked to the (changing) supply of land use (ignoring the distinction between existing stock versus new supply). Development finance is an essential prerequisite but investment funds can be constrained by attitudes toward the risks associated with particular land uses and potential locations (Jones, 1996). For example investors in the UK have been traditionally reluctant to invest in mixed use development, although in recent years there has been an increase in the interest of developers in undertaking these mixed developments in regeneration schemes. Similarly public-sector investment can play a key role in the development of localities (Jones and Watkins, 1996). The decision to develop is ultimately based on profitability that in turn can be decomposed into a range of revenue and cost variables. These encompass construction costs, such as materials, land and labour. Finally, the scale of land availability offers opportunities/constraints to the adaptation of the land use pattern. This last factor can be seen to have a direct link with urban form but the others are more indirect with the exception of the revenue component of development appraisals. This is determined by prevailing rents and demand discussed above.

In terms of intermediate outcomes the interaction of supply and demand determines simultaneously spatial land use patterns and land prices/ rents (ignoring planning). The pattern of land uses influences travel patterns through for example commuting and shopping. Mixed use areas arguably encourage more travel by foot/ public transport and less travel by private car. Negative externalities (congestion/ health costs) may be caused by transport use over and above the socially optimal level. This is most likely to be caused where there are many single use areas and inadequate infrastructure or public transport provision.

### *Position/ transport infrastructure*

This enables the ease by which people can reach buildings, spaces, and places. It provides a set of accessibility relationships within the urban area that can be seen in terms of the distances or travel costs. These relationships can be seen as a hierarchy with at one level travel from residential areas to city centre, major retail locations, work and other services and at the other extreme accessibility at the neighbourhood level – i.e. looking at accessibility from one place to another within a certain area. (eg the accessibility to local schools, medical centres, shops within a neighbourhood). Physical landscape shapes the infrastructure provision and can create physical barriers to accessibility.

Infrastructure in the form of transport networks has a direct impact on the scale of local market areas. For example the spatial extent of retail and other services' catchment areas is partly a function of the costs of travel by customers. In fact a hierarchy of services provision/facilities exists determined by the transport network. This is most evident in retailing, e.g. large retail superstore, local supermarket, small corner shop.

From a demand perspective the transport infrastructure primarily determines travel costs. If costs are high then travel trips may be short and some households could be excluded from access or refrain from using services/facilities. These costs take the form of both financial and time costs. Accessibility cost is a fundamental demand factor underlying the spatial location decisions. The trade off between accessibility to the central business district and space/land costs is the central relationship in seminal works in urban economics (Alonso, 1964; Muth, 1969). While these models are based on very restrictive simplifying assumptions the role of accessibility is an essential influence on the location decisions of firms and households.

Transport infrastructure also impacts on modal choice by households. Where people have a greater modal choice their accessibility options can increase. If people have more available means of transport, they can potentially access more areas. Overall the



range of travel modes and costs available influences the efficiency of the urban economy. Too much private car use can create congestion.

Accessibility costs are therefore the key to the underlying spatial economic forces at work that creates the pattern of land use within urban areas. As a consequence accessibility also impacts on the spatial distribution of employment and residential preferences. In terms of location, there is likely to be a higher demand for land/property that has good accessibility both to it, and to other services/ facilities/ infrastructure etc. In as much as accessibility can influence profitability then this is reflected in land prices / rents.

### *Density*

Density can be seen as an outcome of the competition between land uses within a given urban transport infrastructure and its associated pattern of accessibility. In a competitive land market the higher the price the greater the density of utilisation. As noted earlier there are three main aspects to density; gross population density, net housing density, population density, and commercial and industrial employment density.

The role of density has been at the heart of the sustainable urban form debate. Newman and Kenworthy (1989a, 1989b) found that for a range of cities across the world that population density is inversely related to fuel consumption. In contrast research in the USA finds that commuting distances remain constant despite continuing decentralisation because such trips are no longer necessarily only from suburbs to city centre (Gordon and Richardson, 1993). This effect may not be universal and Spence and Frost (1995) find the reverse in the UK. This issue is also confounded by the link between housing density and income. Access-space models of urban housing markets demonstrate that low income households live at high densities consuming small amounts of housing at a high price/rent per square unit. Similarly high income communities (countries) will tend to live at lower densities. Hence an analysis that focuses on density as a single variable can be misleading.

High land use densities have a number of implications for demand for and cost of services provision. The greater concentration of demand, e.g. consumer spending, associated with high land use density, ceteris paribus, reduces the spatial extent of viable social and private services' catchment areas (including business services). This in turn suggests the potential for more consumer choice and diversity in high density areas. However, this conclusion must be tempered by the potential for concentrations of low income households in high density areas. For example Muth (1969) demonstrates (under a range of simplifying assumptions) that in cities where there is a high income elasticity of demand for housing low incomes households consume small

amounts of housing at high unit costs in inner high density locations and high incomes households consume the converse.

In high density residential and employment areas the spatial focus of travel demand is likely to lead to better public transport facilities although there is a greater propensity for congestion. Where areas are low density, single use, it is more likely that travel costs are higher in terms of both financial and time costs. Costs of public and private infrastructure provision therefore may be reduced where there are high densities. However, high densities are also associated with high land prices, particularly in the most accessible locations, and this in turn may lead to higher unit costs for some services (controlling for quality). Empirical research in the USA finds that low density development has the highest infrastructure costs (Burchell, 2000).

Higher employment densities are traditionally linked to potential agglomeration economies, thereby reducing production costs and promoting product development. In particular knowledge spillovers between firms in an industry, the Marshall-Arrow-Romer externalities promote urban economic growth. This view is supported by Porter (1990) who argues that competitive pressures brought about by the geographical concentration in an industry will stimulate innovation. However, Glaeser et al (1992) find no evidence to support these theories based on empirical research on American cities and instead their evidence supports Jacobs (1969) who argues that high employment densities increase economic growth but through knowledge spillovers between industries. Further, it has recently been argued that such effects are becoming more diffuse (Parr, 2002).

Notwithstanding the precise mechanisms linking employment densities to economic growth a study of 47 cities in the USA finds that high employment density in urban areas (controlling for city size) contributes positively to economic performance as measured by high labour productivity (Cervero, 2001). Arguably the research is limited by its lack of full control for urban industrial structure but its finding is supported by Ciccone and Hall (1996) in a more limited empirical study, also in the USA.

### *Characteristics of the built environment*

This element encompasses building types, heights, and intensity of land use. Intensity is distinguished from density here because it refers just to the footprint of the building (s). For example, high rise flats would be considered high intensity even if they are surrounded by green space. There are three supply factors influencing the characteristics of the built environment. The types of buildings, heights etc may be influenced by the costs and/or the provision of infrastructure. For example, a low rise, low intensity estate of housing will require many separate water connections,

electricity cables etc. making the provision of infrastructure more costly than a high intensity building. Construction costs are influenced by the type, height etc of buildings. A high rise development may provide a greater return to the investor if more housing spaces are created, leading to economies of scale. Higher quality buildings will almost inevitably cost more in materials, but may provide a significant return if they are deemed to be prestigious etc. Building costs are also influenced by the quality of buildings (physical, functional, aesthetics) and maintenance costs, as well as the degree of homogeneity of buildings.

Investment attitudes of financial institutions can influence the characteristics of the built environment (the building itself and its environment). While such investors are market led and will invest their funds where they will receive the greatest return, they tend to be risk averse with regard to new types of building form or the introduction of a building form new to an area. For example, they have been ambivalent to green buildings. Further banks in the UK are reluctant to lend on flats above a certain storey height. Similarly, house builders have taken a cautious approach to innovation for example in energy conservation, because introducing such measures increases the sale price. Demand factors can also influence the built environment through building type preferences, such as the desire of families with young children to occupy housing with gardens. The level of building maintenance may also be important. High maintenance buildings, *ceteris paribus*, may not be desirable in terms of the costs they incur and so demand would be low.

Choice of residential, commercial or industrial building form is likely to be determined simultaneously with location. The type of building people choose to live in may also influence their choice of transport mode, eg fewer people in high rise flats may choose to own a car, as may fewer people living in high density central areas etc. If there is limited parking at the workplace, people may choose or be forced to walk/use public transport etc.

### *Layout*

Layout is an integral element of urban form and includes such phenomena as street type, road layout, degree of sprawl, which are primarily concerned with function and adaptability. ODPM (20002b) split layout into two levels: urban structure and urban grain. Urban structure is more concerned with how routes, developments, areas etc relate to each other. Urban grain is more concerned with the layout of street patterns, housing patterns, and other building layout patterns. The layouts of today's cities are largely artefacts of their historical development and planning and building regulations. However, certain types of layout will make infrastructure provision easier and cheaper. Local layout may influence transport infrastructure provision and modal choice, and vice versa, which affect the urban structure through affecting how areas,

space, places, developments etc relate to one another. Layout can therefore impact on ease of access to services and employment.

### **Economic Sustainability of Cities**

The paper so far has reviewed normative models of sustainable urban form, and discussed the elements of urban form, their determinants and their interaction with urban economies. The latter section emphasises the role of real estate markets and transport infrastructure in the determination of urban form but the proven links with urban economic performance and sustainability are limited. Not only is more research required but it is not clear that the present formulation of the sustainable urban form debate is progressing policy. In this section the starting point is a macro view of the economic sustainability of cities and size. The issue of sustainability is then examined by reference to sub sectors of the economy.

The very existence of cities depends on the existence of agglomeration economies that can be subdivided into economies of scale, scope and complexity (Parr, 2002). A further distinction can be made between internal and external economies to the firm. Only external economies result in concentrations of urban economic activity. These include localisation economies such as the access to a pool of labour, availability of a range of auxiliary trades and specialised services plus knowledge spillovers noted earlier. Urbanisation economies, i.e. economies of scope, result from the common location of firms belonging to different and unrelated industries. They include the availability of a range of municipal services, public utilities, transportation and communication facilities, the existence of a wide variety of business and commercial services and a complementary of labour supply. Households can also benefit from agglomeration economies in the form of a range of shops, amenities and cultural facilities and firms and households from public services/infrastructure (Henderson, 1974).

These external agglomerations are a function of urban size. However, beyond a certain urban size further increases there may also bring negative agglomeration economies such as congestion and pollution. Some also argue agglomeration economies can be too big to be sustainable (Fujita & Thisse 2002). Such arguments suggest there may be an 'optimal' urban size and the concept spawned a number of papers in the early 1970s including Alonso (1971), Evans (1972) and Richardson (1973). These theories suggest there may be an 'optimal' urban size where the total benefits of size equate with the total costs (McCann, 2001, Capello and Camagni, 2000).

The theory of optimal city size can be criticised on a number of counts. No distinction is drawn between cities with different economic structures as it uses only one production function for all cities. The theory therefore fails to account for that fact

that since all cities are different their optimal sizes may be different as well. Spatial dimensions of an urban economy are ignored in what is an essentially macro urban perspective. Beneath this macro-urban view there are a range of sectoral perspectives from public administration, households and industries with different size optima (Button, 1976). In the context of sustainable urban size, it is necessary to identify a set of sustainable criteria that establishes an appropriate optimum city size, or more precisely urban settlement size distributions.

Capello & Camagni (2000) for example argue that it is optimal efficient size that achieves economic sustainability. The efficient size depends on what is produced, how, and how the area in question operates within the urban economy. Although size influences location costs and benefits through creating greater potential for more mixed and higher level urban functions, specialisation and integration within the system also have an effect.

A purely ecological approach to urban sustainability would suggest that that the goal of sustainability is not possible, since cities depend upon imports and exports of resources and waste. The nature of the urban environment is such that it has very little assimilative capacity. Most resources are imported into cities and waste exported, so cities what ever their size not only impact on their own environment, but on surrounding environments too.

Beyond this narrow definition of sustainability in environmental terms as noted above it can also be seen to have social and economic dimensions. Camagni et al (1998) for example propose three types of 'environment' in the city - physical, economic and the social. The sustainability outcome from the social environment is equity and welfare. From the physical environment the outcome is pure ecological and aesthetic principles while from the economic environment comes profitability and economic growth.

The authors identify three overlapping areas between the three environments contributing to sustainability. Between the social and economic environments arises distributive efficiency. Between the physical environment and the economic environment exists long-term allocative efficiency. Between the physical environment and social environment there is intra- and inter-generational equity. The economic environment is linked in particular to the existence of agglomerations and Camagni et al (1998) define a sustainable city as

*“a city where the three environments characterising an urban agglomeration interact in such a way that the sum of all positive externalities stemming from the interaction of the three environments is larger than the sum of the negative external effects caused by the interaction” (p.108).*

This sustainability condition has a strong parallel with the original formulation of the original optimal size solution. Just like the original it does not appear to aid a practical solution.

An alternative approach is to express the problem as maximising potential urban output or productivity subject to a series of sustainability constraints. These would encompass social, environmental and economic factors. From an economic perspective these constraints would include the viability of sectors of the local economy. These sectors are manufacturing, services, the labour market, transport, public administration and land use property markets (including viable catchment areas for public and private services). Linked social constraints are an adequate supply of housing for the workforce and their families and full employment. All constraints would need to be met to satisfy sustainability. Exogenous variables include industrial mix, incomes and national government taxation/ policies.

The exact meaning of viability will vary with sector. Transport and public administration will at least be partially determined by social criteria. In the property market sustainable markets will be a necessary condition. Drawing on Jones and Watkins (1996) sustainable markets can be defined as a combination of prices being achieved without public subsidy and the ability of the market to sustain itself through downturns in the property cycle. The adequate housing supply constraint implies also that there is sufficient choice and availability to meet demand. The sustainability of property markets has implications for the nature of urban form and its elements, and this in turn causes interaction with other sectors of the urban economy as noted above. But before this issue is addressed the paper now considers in more detail the operation of local markets.

### **Role of Spatial Real Estate Markets**

The operation of local real estate markets, as noted above, is set within a framework of transport costs (that determines accessibility relationships) which in turn is dependent on the transport infrastructure (Alonso, 1964). Given that transport infrastructure is a key element of urban form then real estate markets can be shaped by transport policies. Thus for example Dunse and Jones (2005) show how the pattern of industrial rents in the Strathclyde sub-region of Scotland rise with closeness to the major road network (see Figure 1). On the other hand the operation of the property market in the absence of planning determines the spatial pattern of land use, the density of development, the characteristics of the built environment and layout. The real estate market is therefore a key determinant of urban form including its spatial dimension.

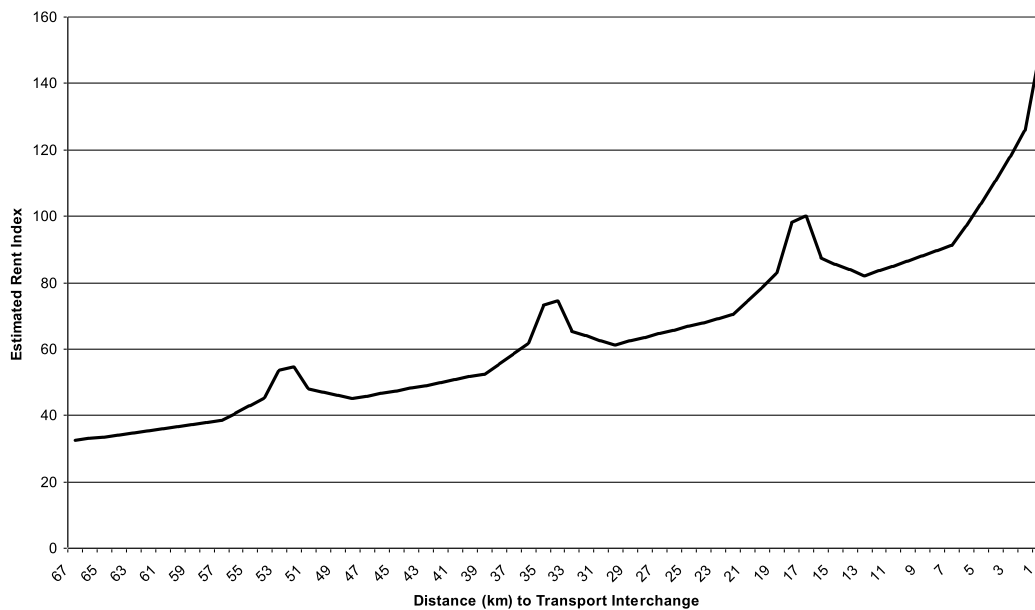


Figure 1: Simulated Industrial Rent Gradient

Source: Dunse and Jones (2005)

Positive planning to achieve a specific/sustainable urban form therefore must centre on transport infrastructure and shaping the property market. Policies seeking to modify property market processes can attempt to determine land use patterns through zoning but sustainable land use markets remain a condition of viability. Given that planning controls can bring costs (Cheshire and Sheppard, 1989) in terms of higher prices and consequent equity issues to succeed in this task it is essential to understand the operation of these markets, not only within urban areas but also at the inter-urban level.

Functional property (and labour markets) markets do not respect administrative boundaries or planning forms. Residential location theory implicitly defines a housing market area (HMA) as the surrounding travel to work area (TTWA) which may also be regarded as the urban labour market area. Jones (2002) argues that HMAs are created jointly by internal spatial arbitrage and by the lack of spatial arbitrage/substitutability between them but are embedded in local labour market areas. They are hence estimated from a combination of self-containment and lack of interconnectedness measured by migration patterns. The results of his empirical research for west central Scotland show quite large differences in the sizes of HMAs but that they are dominated by one that embraces most of the Clydeside conurbation. There is, however, no clear link with urban form. Jones et al (2005) following a similar research approach also find that local industrial property markets (LIPMAs) are quite narrowly spatially defined and located within TTWAs. The local shopping

pitches of retail centres are very closely defined albeit their size is determined by their function or position within a retail hierarchy. This hierarchy reflects the nature of retail catchment areas that are a function of transport costs (see earlier). Similarly LIPMAs and HMAs are linked to transport costs via their relationship with TTWAs.

The existence of housing submarkets has gained general acceptance in the academic literature even though there are considerable differences of views of the underlying causes (Watkins, 2001), and Jones et al (2003) demonstrates that submarkets are stable over time. Jones et al (2004) show that spatial submarkets in Glasgow are relatively self-contained in the sense that a majority of the households that move are likely to settle within the same submarket. This effect occurs partly as a consequence of households' self-imposed limits on search patterns. These limits are a logical outcome of the fact that the property market is associated with limited information and relatively high transaction costs. The limitation of household moves between submarkets reduces the effect of spatial arbitrage, or the process through which households trade constant-quality housing services between submarkets in order to gain from the price differentials. If these processes occur freely then logically submarket price differences will be arbitrated away and equilibrium restored across the urban housing market. The long term existence of submarkets implies that these processes do not occur and the housing characteristics in these submarkets tend to be stationary. Developers tend to build similar housing to that that already exists nearby and the planning system operates as an enabling mechanism. The consequence is that the existing urban form and submarket residential density tend to persist. Similar submarkets have been found in the office market (Dunse and Jones, 2002).

## **Conclusions**

There is much debate about the nature of sustainable urban form although most of the arguments are in normative terms. This paper has focused on the economic dimension of urban sustainability and addressed this issue from two perspectives. First, it examines the elements of urban form and this review shows that there are links with the economic performance of cities although there remain substantial imponderables. It is not clear that the framework of the current sustainable urban form debate is fruitful. However, the essential elements of urban form are shown to be outcomes of real estate markets. Transport infrastructure is also a key element of urban form because it creates the framework for real estate markets and their links to other sectors of the urban economy.

The paper then starts from first principles to examine the economic sustainability of cities and considers its determinants. This leads to an approach that express the problem as maximising potential urban output or productivity subject to a series of sustainability constraints. These would encompass social, environmental and economic factors. From an economic perspective these constraints would include the



viability of sectors of the local economy. Within the real estate sector this would require an adequate supply of housing for the workforce and their families and sustainable markets defined in terms of prices being achieved without public subsidy and the ability of the market to sustain itself through downturns in the property cycle. .

Given the centrality of real estate markets to urban form it is essential not only to understand the operation of real estate markets and their interaction with transport but also to develop policies to change existing urban forms. Understanding real estate markets necessitates developing a policy analysis within a system of functional markets and submarkets and this in turn requires appropriate information systems. Research on submarkets suggests that the current planning system in the UK, at least, reinforces the existing spatial structure of property markets and hence urban form. To modify urban form planning systems will have to find an accommodation with the real estate market but first there needs to be a clearer understanding of a sustainable urban system .

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