Limiting urban sprawl into green spaces and agricultural land

In a nutshell

SUMMARY
It is best practice to limit and control urban sprawl by regulatory measures (e.g. spatial land use planning, restriction on specific land use), economic intervention (e.g. trading in building permits) and institutional change and management (e.g. special agencies for urban revitalisation). Examples of measures to limit urban sprawl are encouraging building on brownfield land, minimising sealed space between buildings, renovating unused buildings, and promoting vertical development.
Target group
Local authorities responsible for land use planning
Applicability
This best practice is applicable to all local authorities responsible for land use planning.
Environmental performance indicators
• Percentage of manmade impermeable surfaces (i.e. any kind of impermeable built area: buildings, roads, any part with no vegetation or water) in the territory of the municipality (km^2 manmade impermeable surface/km2 total surface) • Percentage of new built area in a specific time span (e.g. 1, 5, 10 years) out of the total built area in the territory of the municipality at the beginning of the period considered (%)
Benchmarks of excellence
N/A

Description

As urban populations increase, the tendency is for the land area devoted to urbanisation to increase as well (rather than for the city to become denser). Although this process has been strongest in the United States, because of the predominance of single-household detached housing and the ubiquity of the automobile, the spread of urban areas into adjacent green spaces has also been a feature in Europe, where cities have become less compact than they used to be (Figures 1 and 2).

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sprawl

Figure 1: Types of urban areas in Europe: urban growth vis-à-vis urban sprawl from 1991 to 2001 (EEA, 2006; Pichler-Milanovi?, 2007)

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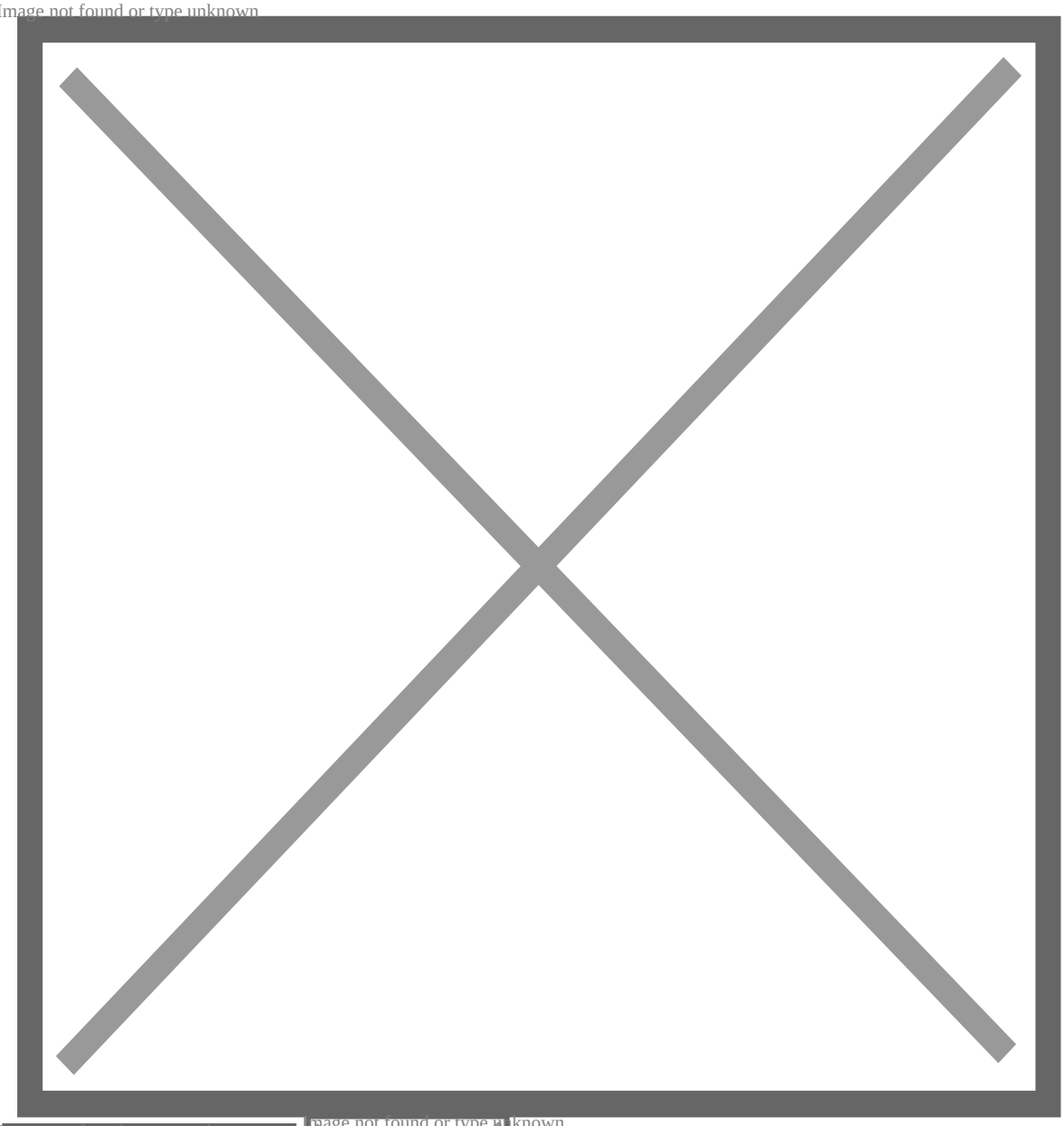

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Figure 2: Typologies of urban development over the period 1990-2000 (ESPON, 2009)

According to Couch et al., (2007), urban sprawl in Europe is *"to be considered as a process of extending the reach of urbanised areas and not merely a pattern of land use in urbanised areas that exhibits low levels of density, continuity, concentration, clustering, centrality, nuclearity, mixed use and proximity"*. Likewise, EEA (2006) defined urban sprawl as *"unplanned incremental urban development, characterised by a low density mix of land uses on the urban fringe"* and incorporated elements regarding: environmental changes such as sealing of surfaces, emissions by transport as well as ecosystem fragmentation; changes in the social structure of an area, such as segregation, changes in lifestyle and the neglect of town centres; and economic changes, relating to distributed production, changes in land prices and issues of scale. As such, urban sprawl has profound implications for all aspects of sustainable development, not just for the environment (URBS PANDENS project, as cited in Arnstberg, 2003). Figure 3 illustrates the difference between the urban growth and urban sprawl (Couch et al., 2007; Pichler-Milanovic, 2008).

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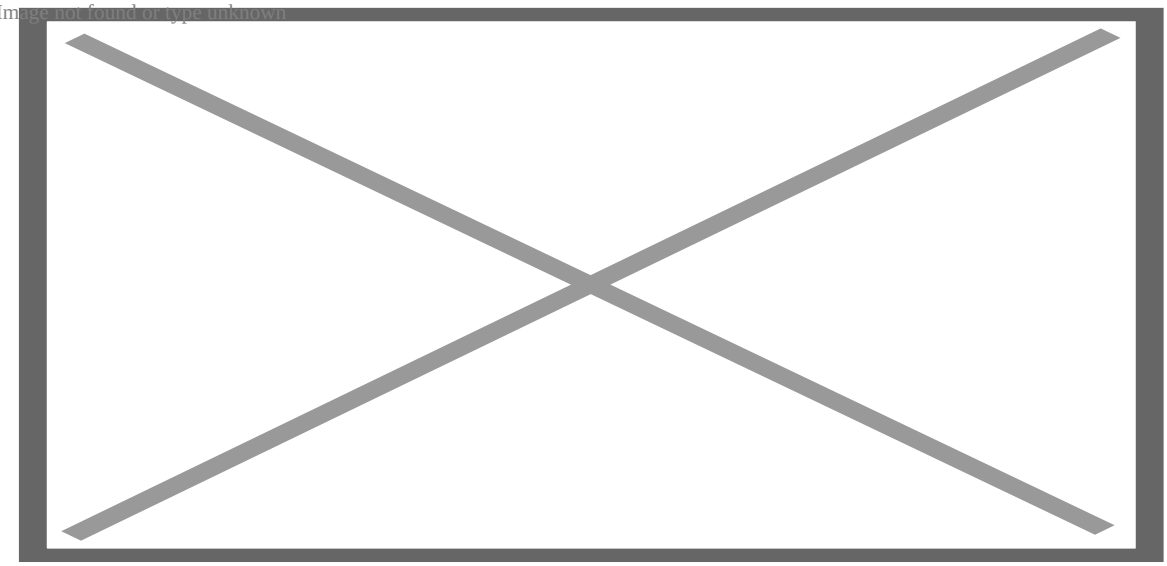

Figure 3: Distinguish between urban growth and urban sprawl (Couch et al., 2007; Pichler-Milanovic, 2008)

Urban sprawl is an increasing trend, not driven by population growth but rather made possible by changes in transportation systems and in lifestyle aspirations, with other driving forces including both micro and macro socio-economic trends such as the means of transportation, the price of land, individual housing preferences, demographic trends, cultural traditions and constraints, the attractiveness of existing urban areas, and, not least, the application of land use planning policies at both local and regional scales. Urban sprawl has been in Europe associated with high population density and economic activity, and/or rapid economic growth, and can be seen particularly in areas where EU regional policies have been implemented. According to EEA (2006) new development patterns can also be observed, for instance around smaller towns or in the countryside, along transportation corridors, and along many parts of the coast usually connected to river valleys. Table 1 presents the different growth patterns for European urban areas. Overall, Scandinavia is demonstrating a more sustainable pattern of growth, with increasing populations without associated geographical sprawl (Pichler-Milanovi?, 2007).

Table 1: Growth patterns for several European cities; urban growth vis-à-vis urban sprawl from 1991 to 2001 (Pichler-Milanovi?, 2007)

Growth with containment	Growth with sprawl
Copenhagen, Stockholm	Amsterdam, Athens, Berlin, Brussels, Dublin, Lisbon, Ljubljana, Luxembourg, Vienna, Warsaw
Decline with containment	Decline with sprawl
	Birmingham, Bratislava, Budapest, Leipzig, Liverpool, Prague, Rome

The main reasons that can cause the urban sprawl are listed below:

- Lower land price compared to developed areas of the main core of the city
- Availability of un-built agricultural land
- High rate of urbanization and rapid development activities
- Availability of some municipal services in mixed development without paying for it
- Less control on urban development being located outside the urban limit

- Lower taxes on industries
- Influence of speculators on the agricultural land owners for selling land to developers
- High rate of urbanisation
- Results of failure to match demand of urban infrastructure and services

Urban sprawl can be controlled/limited by regulatory measures (e.g. spatial land use planning, restriction on specific land use), economic intervention (e.g. trading in building permits) and institutional change and management (e.g. special agencies for urban revitalisation). Examples of measures to limit urban sprawl are encouraging building on brownfield land, minimising sealed space between buildings, renovating unused buildings, and promoting vertical development.

A further description of the above listed measures (in the sense of how they can be applied) is presented in the next paragraphs.

An efficient advanced technique that can be used for the land use planning is the use of Geographical Information Systems (GIS) tools. Through the GIS tools, the collection of spatial and timely information on land use and growth pattern (of the cities) is feasible. Therefore it is possible to monitor, manage and plan properly the urban space. Also, a provision of infrastructure about transport etc. can be undertaken. In particular, the monitoring provides the necessary information to the planners and the decision makers about the current situation of the urban area and in parallel provides important feedback and input about the nature of the changes that are planned to take place. Summarising, the GIS tools provide all the necessary detailed land use information, which may assist planners and decision makers to regulate and/or guide the development throughout the urban management process (Nigam, 2008; Rahman et al., 2008).

Another practical technique that can support the control of the urban sprawl is to properly regulate the growing difference between the demand and the supply of the urban services. A key economic element might be to use tax incentives (e.g. tax revenue) to increase demand from households and economic activities (Christiansen and Loftsgarden, 2011). Another key element might be to encourage a higher density of urban areas and to reduce negative impacts as much as possible, e.g. by choosing areas for developing zones with low soil fertility and low ecologic value. This action enables the reduction of land use and does not require investment in building additional infrastructures, e.g. streets, sewerage system etc. for new residential projects. This approach involves making use of fallow land and spaces between buildings, reconstructing or converting unused buildings or structures, in order to obtain denser urban areas. Especially for the buildings some practical measures can be applied like:

- revitalisation of brownfields[1] (this may also lead to the remediation of polluted abandoned areas and reduce land consumption; brownfield areas are often in central locations making them potentially valuable),
- closing of spaces between buildings,
- refurbishment of obsolete buildings, e.g. old farm houses, garages etc.
- dividing large building plots to allow the construction of new buildings on the plot,
- adding floors to existing buildings[2] and
- improving the quality of land use, e.g. converting unused street areas into building plots.

Summarising, a number of practical measures that can be applied by the public administration and can control/limit the urban sprawl are listed below (Rahman et al., 2008):

1. identification of spaces for densification in urban areas, e.g. using aerial photographs([3])
2. discussion with building owners about their willingness to sell parts of their building plot
3. use of marketing tools to foster a market for spaces between buildings etc.
4. awareness raising of both building owners and parties interested in constructing a building about advantages of densification
5. protection of prime agricultural land
6. control of urban growth and sub-urban sprawl

7. maintenance of life style in the face of growth
8. maintenance of the environmental quality
9. establishment of legal and financial limitations
10. maintenance of the existing greenbelts (or green zones) and plan new ones
11. especially for new building zones:
    - reduction of the size of new building plots as far as reasonable
    - preparation of plans aiming to minimise areas for streets

[1] Definition made by ISO 21929-1:2011

[2] Wherever it is possible and feasible and does not result in other structural problems of the existing buildings

[3] For more information please visit the link below: http://www.raum-plus.info/

Environmental benefits

Reducing urban sprawl has obvious environmental benefits (European Environment Agency, 2006):

- Densification reduces the non-renewable land and soil consumption associated with urban sprawl. It also reduces (but does not eliminate) the consumption of raw materials such as gravel and those needed for example for the production of concrete or asphalt. Reducing urban sprawl allows soil to perform its water and carbon absorption functions, and helps reduce degradation of water quality associated with stormwater runoff from sealed surfaces. Reduced urban sprawl also helps preserve the groundwater recharge capacity of soil, hence reducing water scarcity.
- The changes in lifestyle associated with urban sprawl, which see increases in single-person households, also increase the consumption of resources because multiple-person households consume fewer resources such as water, energy and consumables. Increased energy consumption is also associated with low population density areas whose sprawl reduces the energy efficiency of distribution systems.
- Densification typically allows increased public transport usage in contrast with the prevalence of cars in sprawling urban areas. Therefore, densification leads to reduced fossil fuel consumption and the associated greenhouse gas emissions.
- Reducing urban sprawl allows for the preservation of natural areas, intrinsically important but also vital because of the importance of ecosystems. Negative impacts of sprawl are particularly evident in ecologically-sensitive areas such as coastal zones, for example in the Mediterranean which is considered to be a biodiversity hotspot.
- Limiting urban sprawl into agricultural land helps not only preserve the soil and biodiversity values of these, but also avoids the transfer of agricultural activities to less productive areas, requiring the use of more fertilisers.

Side effects

Densification is often understood as developing abandoned land such as brownfields, which, although they might not count as usable green space for humans, can be an excellent habitat for some species. However, some trade-offs have been identified, in particular the densification by definition will consume open space, leading eventually to a possible conflict between densification on the one hand, and maintaining and valuing green spaces in cities on the other. There are ways to

overcome this apparent contradiction, for example by integrating green and blue design elements into the city and thereby making better use of the space available. Indeed, some areas of what is technically open space might not be useful space if it is at the interface of public and private space, as it is the case in modern suburbs (Ståhle and Marcus, 2009). Finally, the densification that uses non-useful open spaces creates additional useful open spaces or integrates design features such as green roofs or sustainable storm-water management measures, which can actually increase more the green space and eventually improve its environmental value.

Applicability

Measures to limit the urban sprawl can be implemented by all cities. The applicability of the described techniques is increased by involving the public in the decision making process and maintaining the existing urban green areas. The public involvement can be achieved by the so called 'Open green policies' where for instance public can participate in discussions about the establishment of stepping stones between green spaces (Mabelis and Maksymiuk, 2010).

It is important to highlight that cities may have a vested interest in promoting urban sprawl, for instance some municipalities may promote the urban sprawl in order to attract new inhabitants and increase thus the taxpaying population. On the other hand, it can also be the case that there is no single authority at the metropolitan area which can coordinate the policy for land use planning for both a town centre and its surrounding suburbs (if they are managed by different town governments); in this case, the application of this best practice requires an additional layer of concertation between the relevant layers of public administration.

Economics

From an economic perspective, it has been reported that urban sprawl is more costly from the urban development because of the following reasons (EEA, 2006):

- increased household spending on commuting from home to work over longer and longer distances;
- the cost to business of the congestion in sprawled urban areas with inefficient transportation systems;
- the additional costs of the extension of urban infrastructures including utilities and related services, across the urban region.

Driving forces for implementation

In addition to the environmental benefits linked to reducing urban sprawl, which have been explored previously, there are also a series of socio-economic benefits which can act as driving forces for its implementation (EEA, 2006):

- Limiting urban sprawl along river valleys and in lowlands can reduce the economic and infrastructural impacts of flooding, which becomes far more costly as floodplains are built over due to the high value of land prices within them. Limiting sprawl in coastal zones will also reduce the impacts of predicted flooding from climate change driven sea-level rise.
- Urban sprawl generates greater segregation of residential development according to income. Consequently, it can exacerbate urban social and economic divisions. Social polarisation associated with urban sprawl is in some cities so apparent that the concept of the 'divided' or 'dual' city has been applied to describe the divisions between the inner city core and the suburban outskirts.
- Denser urban environments can reduce the costs associated with urban sprawl, which is more expensive because of commuting costs, the business costs due to congestion and the additional cost of extending transport, electricity, waste collection and other infrastructure and services to outlying areas.

- High-density cities which maximise high-quality open spaces while integrating water features offer a higher quality of life since the green spaces are actually used and since they are often associated with sustainable transport options that have positive implications for air quality, noise, etc.

Reference organisations

Some indicative reference public administrations are listed below:

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- Greater London Authority - GLA (2010), The draft climate change adaptation strategy for London – Public Consultation Draft, London: GLA.
- Malmö city has created several world leading examples of sustainable construction and regeneration which have actively incorporated innovative greening strategies, including green roofs; green fences (green walls), open storm water management and aquatic rich ponds as well as tree planting strategies. Western Harbour (WH) is a new city quarter, built on former industrial land, integrating green spaces are in the development to promote biodiversity and ecosystem services. Before developers can buy land in WH, they have to agree to compensate their development by incorporating green points, by which approximately 50% of the area can be considered 'green'.

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