



Urban planning must account for its effects on ecosystem services

Tightly compacted cities can increase flooding risk for local residents, but sprawling, suburban development can lead to major losses in carbon stored by the land and agricultural production. These are the conclusions of a study which explored the effects of different urbanisation patterns on vital ecosystem services.

Should towns and cities become denser to accommodate growing populations, or should they spread out into the surrounding countryside? This is a conundrum central to the sustainable management of urbanisation, a major cause of land use change in Europe. In turn, land use change is a major driver of changes in ecosystem services – benefits to society delivered by the natural world.

The study explored the potential impacts of changes in urban land cover on three ecosystem services: flood mitigation, carbon storage and agricultural production. These were investigated for the period 2006-2031 in Britain, which has a projected population increase of 16% by 2031. Britain was selected as a case study owing to large amounts of land use data available for the country, but the findings are globally relevant.

Two scenarios of land use were considered to reflect different responses to growing urban populations. The first considers a strategy that minimises sprawl by increasing the density of housing within existing urban boundaries, and which is estimated to convert 948km² of land to new urbanisation overall for the 25-year period. The second uses a strategy that favours development in suburban areas, increasing the urban area and converting approximately 3302km² of land, over three times more than for the densification scenario. Ecosystem service provision under these two scenarios was mapped for the country, using data from previous studies.

The results suggest that densification will lead to a loss of flood mitigation ecosystem services, with an estimated 1.7 million people living within 1km of rivers that are likely to have higher peak flows by 2031. Natural land cover (soil and plants) provides a valuable ecosystem service by absorbing rainfall. However, this is lost with the construction of 'impervious surfaces', such as roads, pavements and buildings, that do not soak up water. Instead, water runs off these artificial surfaces and increases river flow. Additionally, more people will be affected by flooding through densification simply because populations are more concentrated.

Suburban development tends to have more gardens and green areas with more dispersed populations, so loss of flood mitigation is not likely to be a significant issue for urban sprawl strategies. However, suburban development reduces land available for farming, which may increase the need to import more food from other countries. It also turns over more land, disturbing the soil and removing stored carbon. The study estimated that losses of stored carbon could be 3.5 times greater under the sprawl scenario than for the densification scenario, and over the 25 year time period, equate to 17% of total carbon emitted by Britain in 2008.

The researchers suggest that this study highlights opportunities for 'clever planning' to reduce risks and increase benefits of either planning strategy. For example, innovative drainage systems and green roofs could help reduce flood risk in dense cities.

Source: Eigenbrod, V.F., Bell, A., Davies, H.N. *et al.* (2011). The impact of projected increases in urbanization on ecosystem services. *Proceedings of the Royal Society B*. 278:3201-3208.

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