

Polycentric Cities and Sustainable Development

Duncan Alexander Smith

duncan.a.smith@ucl.ac.uk



Urban Form: Key to Sustainable Cities?

Cities are the world's economic engines, centres of culture and innovation, and home to billions of people. They are also the world's greatest sources of unsustainable energy consumption. This research investigates how urban form- the structure of the built environment and land use- relates to urban travel, one of the largest and fastest growing sectors of energy use and carbon emissions in cities.



Monocentric City

Density, Diversity and Sustainable Travel

High density mixed-use centres bring activities closer together and are thought to reduce travel distances, and so encourage more efficient walking and public transport trips. But uncertainty remains over the most effective scale and structure of mixed-use centres within cities.

Monocentric and Polycentric Cities

The traditional structure of Western cities is **Monocentric**, with a high density commercial core surrounded by residential suburbs. This structure provides strong support for radial public transport journeys, but it tends to increase travel distances, and exacerbate congestion due to tidal commuting flows.

With the rise of mass car ownership and globalisation, **Polycentric** cities have emerged. Some researchers argue that decentralisation can bring commercial activities closer to residential areas and reduce travel distances. But much decentralisation has taken the form of car dependent sprawl, and the 'jury is still out' on the issue polycentric forms.



Polycentric City

This research analyses urban form in Greater London, identifying commercial centres and the degree of urban polycentricity. Travel data is then used to analyse the commuting efficiency of these centres and how polycentric urban theory relates to London.

Measuring Urban Form and Function

This research uses real estate data to analyse urban form. A spatial database of commercial and government property has been developed, and is classified according to major urban travel purposes, such as commuting and shopping. The data is gathered at address level and aggregated to assess trends across the entire city.

1. Real Estate Data

Data is gathered from the Valuation Office on the function and floor space of commercial and government property. Functions are simplified into general categories such as office, retail and local services.

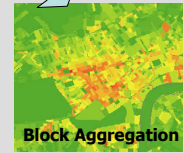
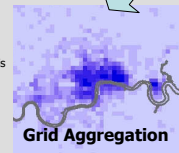


2. Address Matching

The real estate data is matched to spatial address and building data from the Ordnance Survey Mastermap. This provides a highly detailed geography of commercial and government urban functions.

3. Data Aggregation

The data is too detailed to view trends across entire cities. Aggregation into grids is performed in GIS to analyse urban form and function across Greater London, as shown below in the Greater London Density Map.



4. Multiple Scales

Urban form decision making is often at local scales. For the data to be useful to planners it must be available at multiple scales. Block based aggregations highlight urban texture.

Greater London Density Map

Edge Cities
Developments to the west around Heathrow are distinctly mono-functional and dispersed. This is indicative of car dependent urban forms.

City Centre
London is dominated by the central agglomeration, and has a strongly monocentric employment structure. The centre combines both office and retail functions, particularly in the West End. The City world financial centre has historically discouraged mix of uses.

Tertiary Centre
With space in the City Centre limited, a new high density business service centre has emerged and grown rapidly at Canary Wharf.

Inner City
As the central agglomeration expands, it merges into the Inner City. Public transport access is high here, but diversity can fall if residential uses are pushed out.

Metropolitan Centres
Outer centres such as Croydon have good public transport, integrate residential and commercial activities, and can potentially support major office employment. Recently these centres have struggled to compete and are losing jobs.

Local Centres
There are hundreds of small scale local retail centres. Offices do not generally agglomerate at such fine scales.

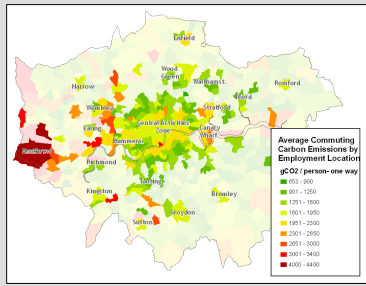
Legend

- Offices (Blue square)
- Retail (Yellow square)

Height represents the density of Rateable Value, which is correlated with employment and commercial floorspace.

Greater London Commuting Patterns

Commuting carbon emissions can be estimated from distance and mode choice data. These are mapped to employment destination zones. Distinct travel patterns are revealed for the centres identified in the above density analysis.



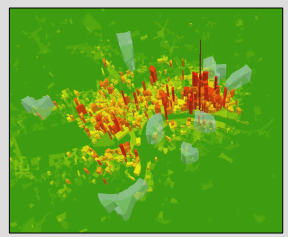
Average Commuting Carbon Emissions Proxy Mapped to Employment Destinations

City centre commutes are overwhelmingly by public transport, but are longer distance. Outer London centres and the Inner City achieve more sustainable commuting patterns due to good live-work integration. Around Heathrow and the western corridor there is by far the most carbon intensive commuting.

More polycentric urban development could reduce commuting distances and improve live-work integration in Greater London. But this must be integrated with metropolitan town centres, rather than the segregated car dependent office parks that have emerged around Heathrow.

Conclusions and Integrating with Policy

The results of the urban form analysis reveal London's employment structure is highly monocentric, with more dispersed patterns for retail activities.



A more polycentric approach to business services could reduce commuting distances with greater live-work integration, provided this development is integrated with metropolitan town centres. This would require policies to redirect the market's preference for the city centre and the highly inefficient car dependent office-parks growing around Heathrow.

Linking to Planning Practice-

There is great potential to link this analysis to planning practice and improve decision making. Analysis would have to be at multiple scales and integrated with government planning databases.

This example shows office density for Central London at block scale combined with 'Opportunity Areas' priority areas for development (shown in transparent blue)-circling the centre. This illustrates the planned expansion into the Inner City.

