

Evaluating Brownfield Redevelopment Potential in the Liverpool City Region: A Composite Indicator Approach Informed by Transit-Oriented Development

Author: Conor O'Brien

MSc Geographic Data Science at University of Liverpool | Liverpool City Region Combined Authority

Background and Motivation

In the Liverpool City Region (LCR), decades of population decline has left a large stock of brownfield sites which can be used for redevelopment to help support new housing demand, however many sites lack the accessibility to transport and services nearby to make redevelopment viable.

Transport-Oriented Development (TOD) provides a framework for linking housing developments with public transport and key amenities. This study develops a composite indicator to systematically evaluate brownfield sites in the LCR, helping identify which sites would be most suited for redevelopment based on TOD principles.

Data and Methods

For the analysis, the Liverpool City Region Brownfield Land Register was the core dataset, which was provided from the LCRCA. Additional datasets were collected to capture accessibility from open sourced sites, data was collected for locations of schools, hospitals, GPs, supermarkets and more to represent services. Open-sourced transport location data was collected for train stations and bus stops, as well as GTFS data for daily bus frequencies, which was processed in Python using the city2graph package.

A composite indicator was developed to evaluate each site. Indicators were standardised using stakeholder and literature input and aggregated into final scores across three dimensions: transport accessibility, service accessibility, and dwelling capacity. Network-based distances were calculated for the distance between each site and different service/transport locations to measure accessibility, this was done with the GPU-accelerated ukroutes package. Results were presented through statistical summaries, ArcGIS maps, and an interactive dashboard for exploration.

Key Findings

The composite indicator revealed that the highest-scoring clusters in the LCR were concentrated at the sites near the River Mersey, and in South Sefton, due to their transport links and nearby services reinforcing each-other to score highly. Many

of these coincided with the LCRCA's Strategic Spatial Planning (SPP) focus areas, highlighting alignment between local priorities and sites with high accessibility. Halton consistently underperformed, reflecting a weaker transport network in the area.

The results suggested that sustainable redevelopment potential is uneven across the LCR, with the greatest opportunities being in well connected and service rich locations, whilst peripheral areas need more transport infrastructure in order to unlock the potential for redevelopment of their brownfield sites. Out of the three main dimensions, services and transport accessibility reinforced each-other sharing a positive correlation, whilst dwelling scores had a slight negative correlation with both and played a secondary role in the overall site suitability composite scores.

Value of the research

This research integrates transport, service, and dwelling capacity into a composite framework for evaluating brownfield sites. By combining GPU-accelerated network measures (ukroutes), the study captures accessibility more realistically than simple distance-based approaches. The composite indicator will provide the LCRCA with a transparent, interactive evidence base to prioritise brownfield redevelopment with TOD principles.

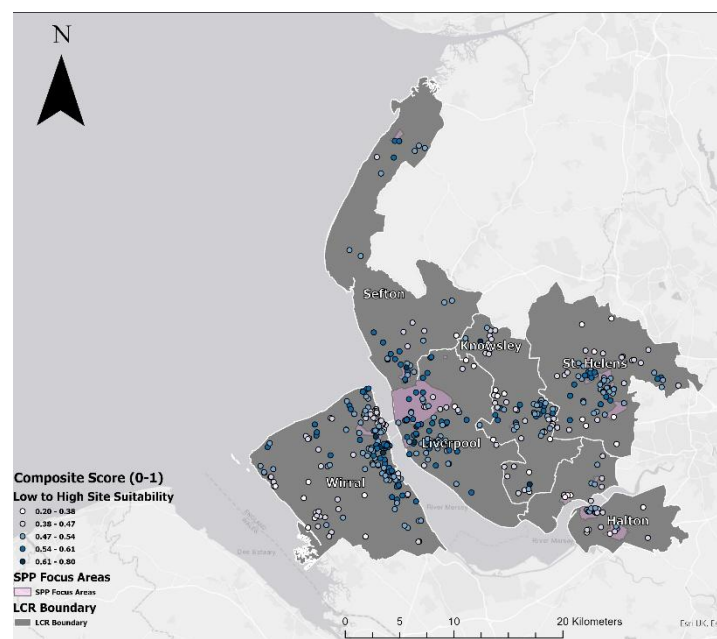


Figure 1: Distribution of brownfield sites in the Liverpool City Region classified by overall composite score (0-1)