Transport and Energy Consumption

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Introduction

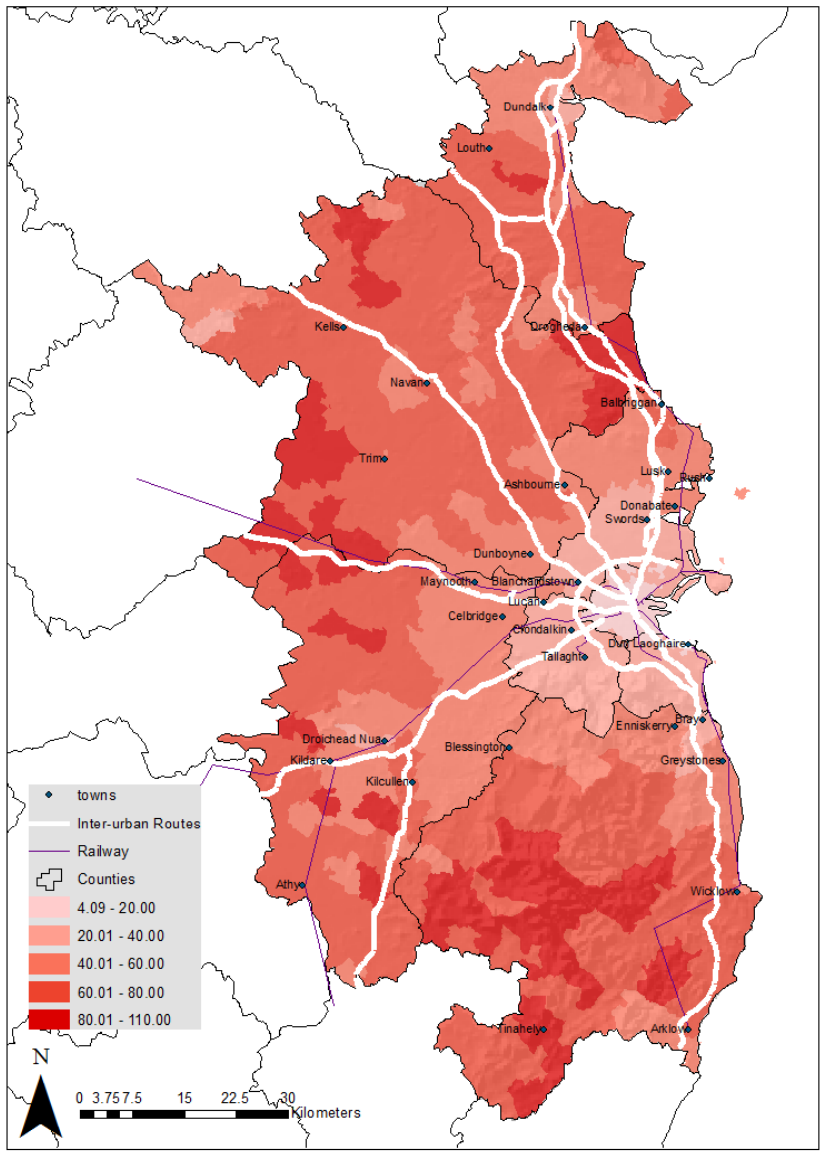
Energy consumption and emissions from the transport sector continue to rise, adding to growing concerns about the environmental impacts caused by transport systems and related land-use patterns. Transportation and land-use are a function of one another, therefore it is often hypothesized that changing urban form will result in changes in transport energy consumption.

This work examines the relationship between urban form and transport energy consumption. It is hypothesised in this research that more compact neighbourhoods result in more sustainable communities, with lower transport energy consumption. The theory is to an extent premised on urban containment, to provide a concentration of socially sustainable mixed uses, that will concentrate development and reduce the need to travel, thus reducing transport energy consumption.

Using the Census 2006 Place of Work - Census of Anonymised Records (POWCAR) Dataset a variety of urban form factors are examined in terms of their influence on journey to work energy consumption. The transport energy consumption (TEC) is a composite made up of journey length, time, mode and occupancy for the commute to work.

Transport and Energy Consumption

Map 5.1 represents the TEC of each ED of the study region. It can clearly be seen from the map that transport energy consumption increases with increasing distance from Dublin's city centre, with the exception of the larger towns in the surrounding hinterland. In particular outlying hinterland EDs transport energy consumption is as much as 15 times higher than city centre Electoral Divisions. This would be expected considering the higher accessibility to public transport in the city centre and the more favourable modal split, the central core area within the canals has a car mode share of only 36.5% compared to a mode share of 58% for the overall GDA.



Map 5.1 Transport Energy Consumption and Residential Population Density

Relationship between Transport Energy Consumption and Population Density

An inverse relationship is found between residential population density and TEC, lower residential densities are associated with higher TEC patterns and higher densities with lower energy consumption. Residents located in EDs with densities in excess of 40 persons/ha use 50% less energy in their commute to work than the average for the region. This result is in agreement with results from Newman and Kenworthy (1989) whose findings support the argument for higher density development leading to lower energy consumption.

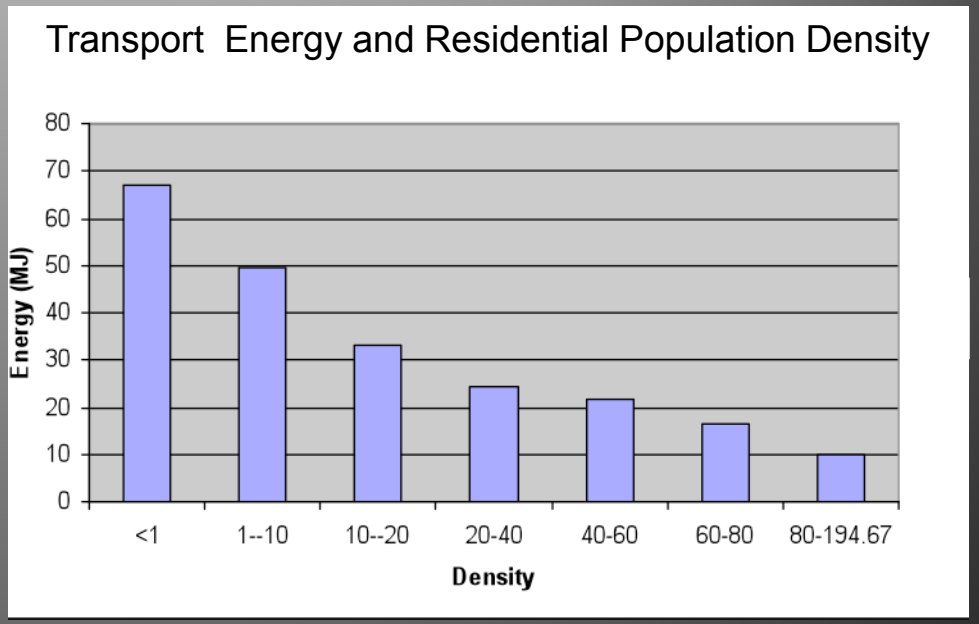
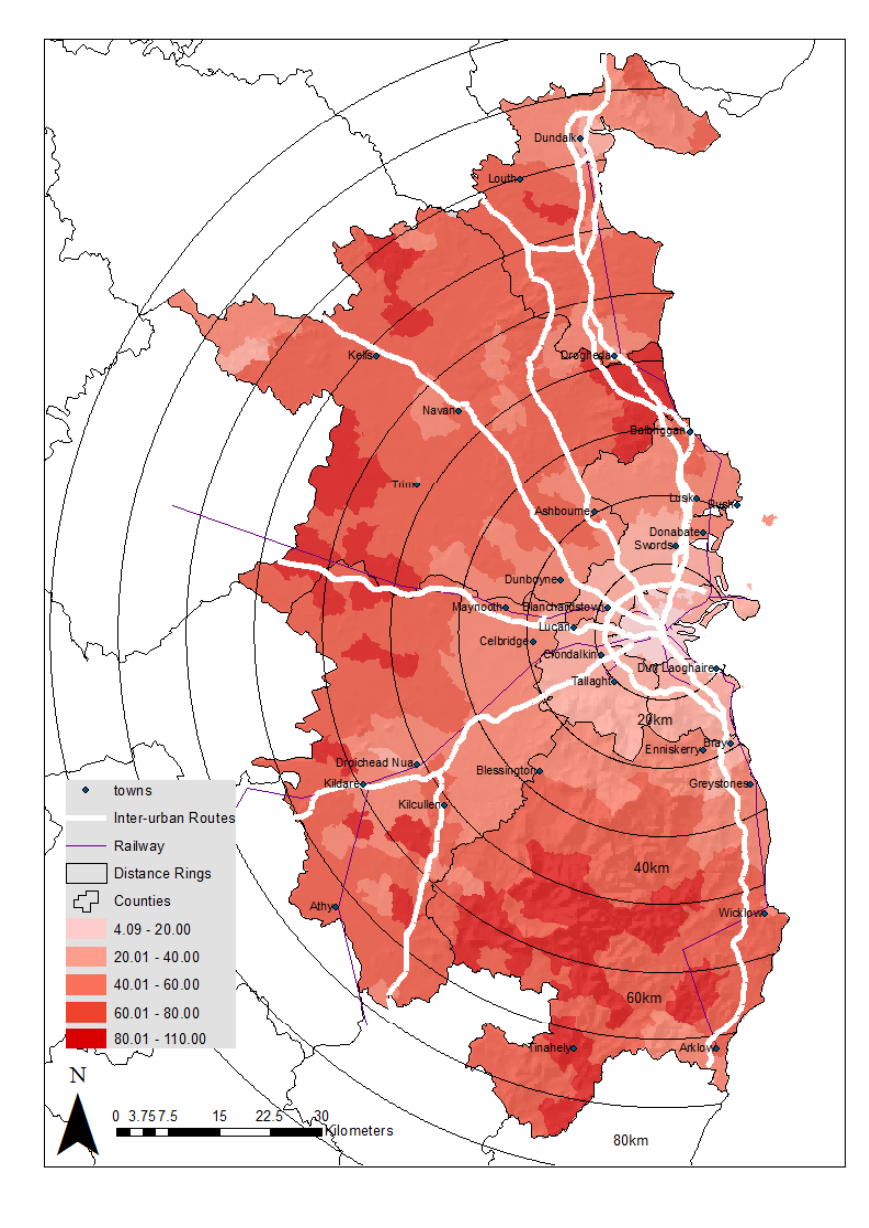


Figure 5.1 Transport Energy Consumption and Residential Population Density

Transport Energy Consumption and Distance from the Central Business District

Increased distance from Dublin is associated with higher energy consumption in the commute to work, transport energy consumption appears to plateau between 30km to 70km from Dublin's CBD. Residents who are between 30km to 60km away from Dublin consume 50% more energy than those residents located 10km to 20km from Dublin.

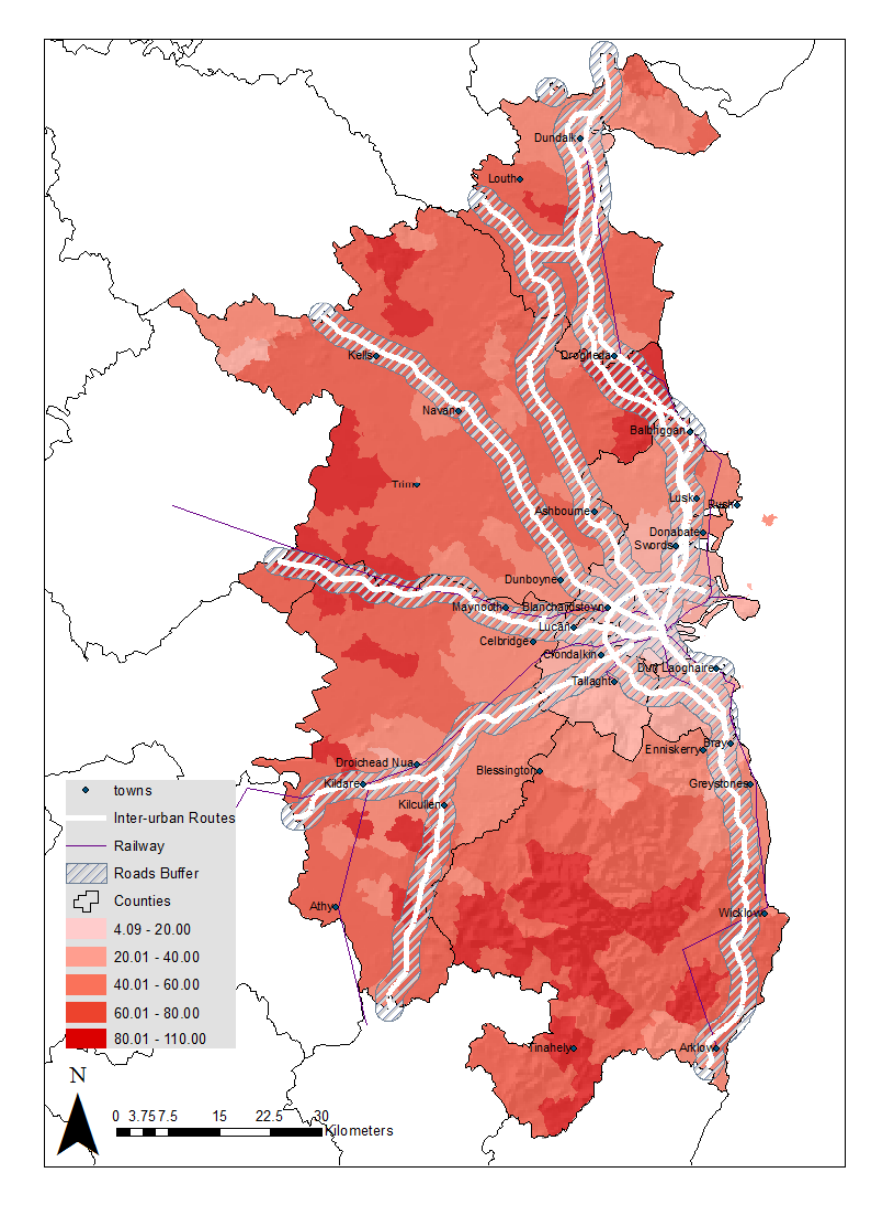


Map 5.2 Transport Energy Consumption and Distance from CBD

Distance from Primary Transportation Routes

Residents located within 2km of the N11 route use the least amount of energy in their journey to work. This reflects the greater amount of public transport options available along this route with commuter rail, DART and LUAS services all in close proximity.

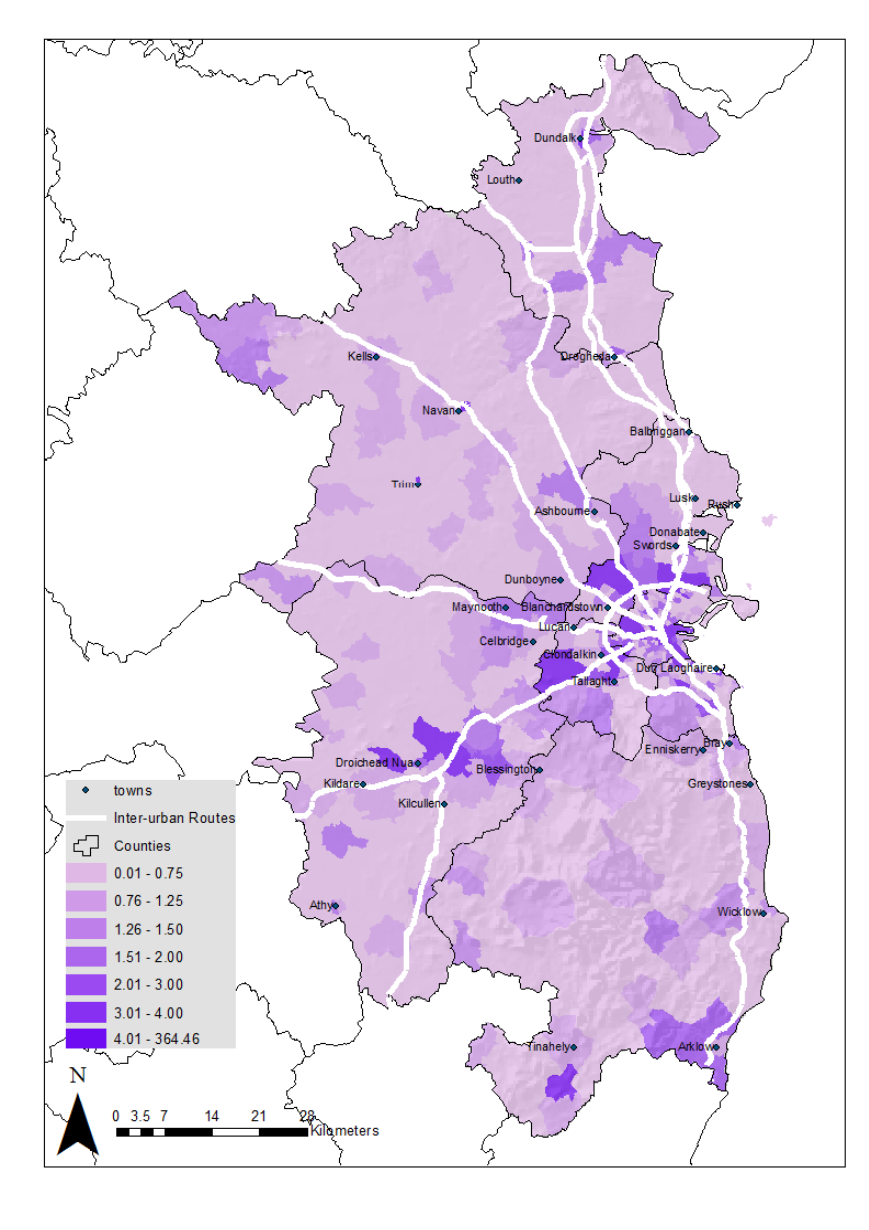
In fact the four better performing routes all have rail corridors in close proximity to them whereas the three worst performing routes don't have any access to rail.



Map 5.3 Distance from Primary Routes

Transport Energy Consumption and the Jobs Housing Balance

There is a clear inverse relationship between jobs-housing balance and transport energy consumption. This result would suggest that at aggregate scale at least, a higher jobs-housing balance is associated with lower transport energy consumption.



Map 5.4 Jobs Housing -Balance

Transport Energy Consumption and Proximity to Rail Stations

Residents located in electoral divisions which intersect with the 2km rail buffer around railway stations consume on average 55% less energy than those who are located outside the buffer zone.

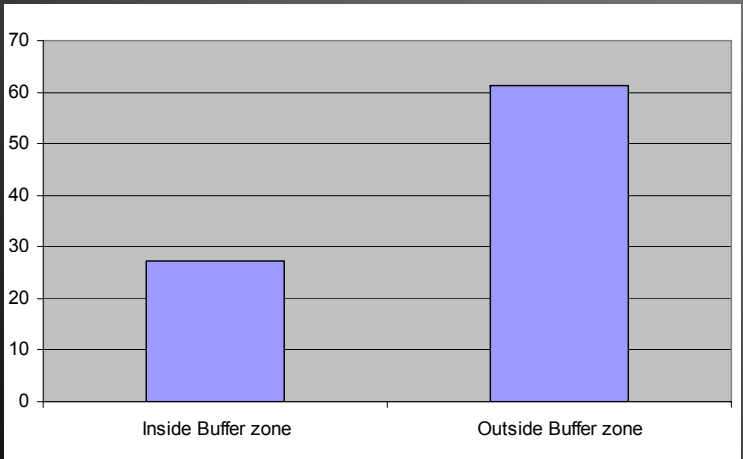
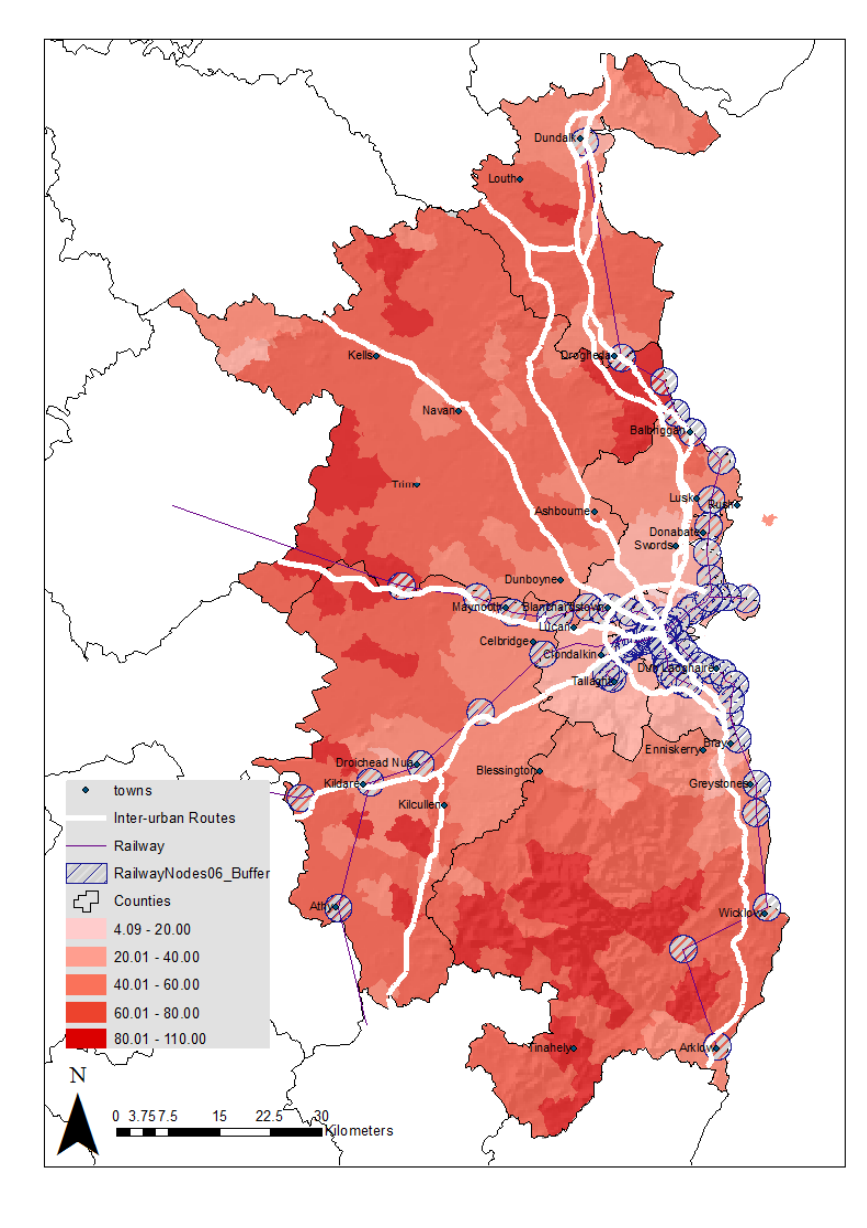


Figure 5.2 TEC and proximity to rail stations



Map 5.5 Proximity to rail stations