

# POSSIBLE EFFECTS OF LIGHT RAIL TRANSIT ON LAND-USE IN DUBLIN

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**Abstract.** Dublin is Ireland's capital city with a population of over one million. The bus system serving Dublin is not providing the city with an adequate public transport system due to congestion, caused mainly by private cars.

Recently, a large transportation study has been conducted in Dublin. The recommendations of this study include the provision of three Light Rail transit (LRT) routes with several novel "quality bus corridors".

The aim of the research reported in this paper is to examine land-use along the LRT routes, using measurements of land-use composition, together with information from other cities, which have recently introduced LRT.

**Key Words.** Transportation; land-use; urban development, urban systems, light rail.

## 1. INTRODUCTION

Dublin is the capital city of Ireland, and, as such, is the administrative, commercial, cultural and historical centre of the State. Throughout the twentieth century there have been major changes in both the structure and expanse of Dublin city and county. The population has more than doubled, from 505,654 persons in 1926, to 1,025,304 persons in 1991 (Central Statistics Office; 1992), while the region itself has become increasingly more significant within the State (Horner; 1992). Two features common to Western industrialised society have become evident in the dispersal of population within the Dublin region, especially since the 1920's (Clancy; 1986).

- 1) A significant reduction in the population of the Inner city and some Inner suburbs.
- 2) The expansion of urban development into new suburban areas and areas contiguous to Dublin (Clancy; 1986).

The current structure of Dublin is largely the result of a regional planning framework drawn up by Miles Wright in 1967. Wright recommended that population expansion be accommodated in four new towns west of the city centre (Horner; 1992). This recommendation was incorporated into the first Dublin county development plan in 1971. Three major new towns Tallaght, Blanchardstown

and Clondalkin were planned for an area west of the city (See Fig. 1). These towns were to absorb a large proportion of projected population growth. Population targets for the towns were set to reach 100,000 in each town over the twenty year period up to 1991. However, the new towns have failed to develop as planned. In 1994 population levels still fall well below the 1991 targets of 100,000. In addition, amenity and service provision for resident populations have not developed to the level initially planned. It is a primary objective of the Dublin planning authorities that these towns reach their population targets, and the level of service provision necessary to facilitate this population.

Parallel with population dispersal, there have been similar changes in the distribution of land-uses. Space dependant industrial and warehousing activities have relocated from the Inner city to large estates in outer suburbs. The retail industry has responded to the growth of suburbia and increased car ownership through the development of large multi-function shopping sites. Other activities have either stayed in the city centre, or undergone only minor dispersion. The city centre retains a large proportion of the region's clerical, administrative and professional staff.

The dispersal of population and development into outer suburban areas has resulted in the growth of



commuter traffic from an increasingly large geographical area. The development of roads, commuter rail and bus networks within the region, facilitates daily commuting from areas within thirty to thirty-five miles of the city. In addition, daily commuting may occur between the city and most of the main towns within a fifty mile radius (Horner; 1992).

The consequence of these developments has been to create a substantial mismatch between work and residential locations. The expansion of "white collar" employment in the city centre has largely benefited the suburban commuter population. Consequently, problems have arisen both in terms of congestion due to the cross boundary movement of employees, and in terms of inhibiting access to employment for lower income, non-car owning groups in society.

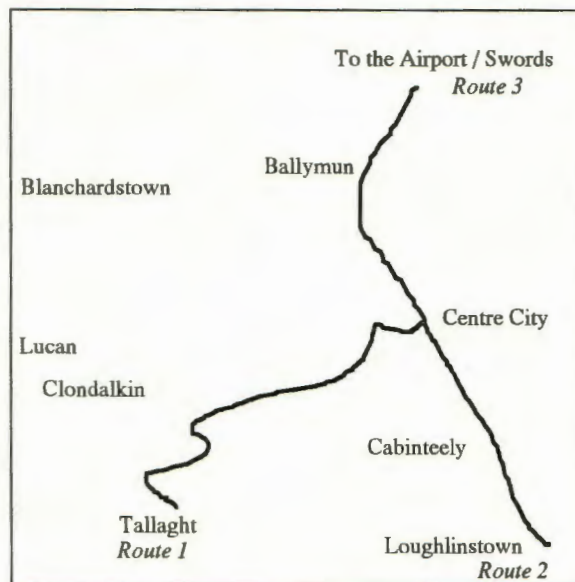


Fig. 1: Proposed Light Rail Transit Routes for Dublin, and the three Western towns.

As a result, a consultancy body, the Dublin Transportation Initiative (DTI), was set up to review the transport system in the Dublin region. It was to make recommendations for the implementation of new policies regarding the city and its hinterland. The resulting transportation proposals include the development of a Light Rail Transit (LRT) network, consisting of three routes. The aim of this paper is to examine the land-use composition of particular sites along these proposed LRT routes. The three proposed LRT routes are: (See Fig. 1)

- 1) Tallaght to the city centre.
- 2) Loughlinstown to the city centre (Along an old disused railway line).
- 3) Swords and the Airport to the city centre.

## 2. BACKGROUND

The DTI Transportation strategy includes not only development of a Light Rail Transit network. It also covers improvements in all aspects of surface transport (that is in road, rail, bus, cycling and walking) as well as issues relating to traffic management, the implementation of services and other related factors (Dublin Transportation Initiative; 1992).

The introduction of an LRT network is therefore not an isolated project. Rather, it is part of a comprehensive set of measures to improve transportation as a means of achieving other social and economic objectives. A foremost aim of the DTI is to examine the impact of transport improvements on land-use, economic development, urban renewal, employment and the environment. An important feature of the DTI transportation program is that improvements are to be co-ordinated with land-use policies. The introduction of LRT in particular is part of a wider scheme of urban development and renewal, especially in the city centre.

Land-use planning priorities for the Dublin region include strengthening the city centre and maintaining its prominent position within the region and the State. It is recognised that transport improvements alone will be insufficient to achieve these aims. Therefore, policies on urban renewal, development and crime control are being devised to reinforce the impact of these improvements.

Outside the city centre land-use priorities focus on the ability of the three Western towns to attract some of the residential, commercial and industrial development expected over the next twenty years (Dublin Transportation Initiative; 1992). There are fears that development may drift outwards along new national arterial roads, which are being developed in these areas. Therefore, here, also, transportation improvements will need to be supplemented, mostly by zoning restrictions.

## 3. ANALYSIS

Differences in land-use within a single route may be revealed by an analysis of the "Location Quotients" of land-use types at specific "activity sites" along routes. (For details on "activity sites" see Appendix 1.) The location quotient is a statistic which was developed to describe industrial concentration (Bennison; 1982). It may, however, be used as a comparative measure of any land-use concentration. This feature has previously been used by the Transport and Road Research Laboratory, in an analysis of the impact of a Metro



system on retailing in the central area of Lyne and Wear (Bennison; 1982).

In this study the quotient has been used to compare the proportion of different land-use types at specific points along a route, with the proportion of those land-use types within the route as a whole.

The location quotient is calculated from the formula:

$$\frac{n1/n2}{t1/t2} \quad (1)$$

Where

n1 = The number of establishments of a particular land-use type at each "activity site" along a route.

n2 = The total number of establishments of all land-use types at each "activity site" along the route.

t1 = The total number of establishments of the land-use type along the route.

t2 = The total number of establishments (that is all land-use types) along the route.

A quotient of 1.0 and over indicates that an area has more of a particular establishment type than average. A quotient of under 1.0 indicates that the area has a less than the average proportion of that particular land-use type.

This formula can be used as a measure of the relative concentration of different land usage and, consequently a measure of the attractiveness of travel to specific areas.

### 3.1 Commercial Land-Use Data.

Published data on commercial establishments in the Dublin Area was used to produce an inventory of 1,821 establishments adjoining the three proposed LRT routes (Parker, 1991; Thom's Commercial Directory, 1993). This data was used to produce a detailed inventory of commercial land-use, categorised into seven separate land-use categories. (For details of land-use categories see Appendix 1.) The data was then used as a means of identifying specific "activity sites" along the three corridors. Activity sites are defined as areas containing concentrations of any of the seven land-use categories outlined in Appendix 1. Location Quotients were then calculated for each commercial category in the most significant activity sites along the three routes. The quotients show the distribution of land-use for a number of activity sites along each route.

The central proposition of this paper is that levels of activity at particular locations may be altered due to changes in local access. Transportation is a

derived demand, that is an individual travels in order to avail of certain facilities. Thus if improved levels of access allow individuals to travel more easily to certain sites then activity levels may rise at these sites. Increased activity may then encourage further development, at the expense of competing locations. The overall effect may then be to produce long term changes in land-use patterns.

Many areas are developed with a single land-use function in mind. The disadvantage of this in terms of public transport is that it encourages car usage. An individual may need to reach a number of different activities in any given day. If these activities are spread over a number of locations more travel will be required. The nature of the current public transport system makes such movement costly and time consuming. It is expected that the sites which provide the most varied range of activities will benefit most from increased access due to LRT.

## 4. RESULTS

A sample of results for the Tallaght/ city centre route are outlined in Table 1. The Table lists areas in order of location along the route, starting with the area furthest from the city centre.

The following land-use categories are represented in the Table:

I/M= Industry and manufacturing uses.

W= Warehousing.

RG= Retail-Grocery.

RNF= Retail-Non-Food.

SG= Specialist Goods

OS= Other Services.

OFF= Office uses.

(For a more detailed explanation of these categories please refer to Appendix 1)

A preliminary analysis of the results reveals a tendency towards the concentration of similar activities in specific areas. Few areas are characterised by a wide range of land-use. Industry/ manufacturing, warehousing and office uses tend to be located together. Service activities (that is retail and other services) also tend to cluster together. This pattern illustrates a tendency towards the spatial separation of land-use types in suburban Dublin.



#### 4.1. Route 1: Tallaght to the city centre.

Table 1 illustrates the location quotients for a sample of the activity sites along the Tallaght/ city centre route. Looking at Table 1 a striking separation of land-use functions becomes apparent. Two sites, Tallaght and The Square, contain high levels of service activities. It is evident that these areas contain little or no warehouse, industrial or office activity.

Table 1: Location Quotients; Tallaght to the city centre.

| Area       | I/M | W   | RG  | RNF | SG  | OS  | OFF |
|------------|-----|-----|-----|-----|-----|-----|-----|
| Tallaght   | 0.6 | 0   | 8.5 | 1.9 | 0.7 | 1.7 | 0   |
| The Square | 0   | 0   | 4   | 6   | 0.6 | 2.4 | 0   |
| Greenhills | 1.3 | 2.2 | 0   | 0   | 1   | 0.4 | 1.3 |
| Kylemore   | 1.0 | 3.4 | 0   | 0   | 1.4 | 1.1 | 1.2 |
| Naas Rd.   | 1.1 | 8.1 | 0   | 0   | 0.3 | 1.2 | 2.9 |
| Inchicore  | 1.1 | 0   | 0   | 0   | 1.6 | 0.8 | 0   |

In contrast, industrial, warehousing and office activities tend to cluster together. Three areas, Kylemore, the Naas Road and Greenhills, show high proportions of these activities. Here the absence of any retail activity is extremely marked.

Kylemore emerges as the most significant centre in terms of mixed land usage, although the lack of any retail function is striking. Greenhills, and the Naas Road also show relatively high levels of mixed usage. Greenhills contains high proportions of industry, warehousing, specialist goods and office uses. The Naas Road shows high levels of industry, warehousing, other services and office uses. Inchicore shows the lowest levels of mixed use, containing a high proportion of only two land-use functions.

Table 1 indicates that there are significant levels of industry and other service functions along the route. These are the most significant functions within the route, with four of the six sites containing above average proportions of these land-use types.

It is hoped to conduct a more detailed analysis of the route in the near future. This analysis would allow for the investigation of six more activity sites along the route, including

- 1) Whitestown
- 2) Belgard Road.
- 3) Ballymount Road.
- 4) Ballymount Roads Upper and Lower.
- 5) Longmile Road.
- 6) Fox & Geese.

#### 4.2. Routes 2 and 3: Loughlinstown and Swords to the city centre.

A similar analysis is currently being undertaken for the Loughlinstown/ city centre, and Swords/ city centre routes. Results for these routes are not yet available, and will be presented at the conference.

## 5. DISCUSSION AND CONCLUSIONS

The location quotient provides a useful analysis of the relative proportion of various land-uses in specific areas. However, there was a notable shortcoming involved in this study.

Due to incomplete data regarding floorspace and the workforce, it was not possible to weight the analysis. Therefore, each unit of land-use is given equal importance, and the significance of larger premises cannot be taken into account. Here, for example, a small corner shop is given the same rating as a large suburban shopping centre.

All routes terminate in the city centre. This is likely to further increase the relative accessibility of this area. As a result it is expected that, at least in the short-term, this area will benefit most from the introduction of LRT. In conjunction with the urban renewal programs of the Dublin planning authorities it is likely that LRT will facilitate the maintenance and intensification of current activities in the city centre area.

The outcome in suburban areas is less certain. This uncertainty is based both on the experiences of other cities, and the spatial separation of land-use categories, which was observed within the Tallaght/ city centre route. An examination of preliminary results for the two remaining routes indicates a similar separation of activities.

Overall, it is expected that sites providing the widest variety of land-use will benefit from the introduction of LRT. Research in other cities has shown that mixed land-use is more conducive to mass transit than single function areas (Cervero, 1989; Whalmsley and Perrett, 1992). Furthermore there is evidence to suggest that the introduction of Rapid Rail Transit (RRT) systems tends to enhance current trends (Whalmsley and Perrett, 1992). Areas that were already developed were found to experience increased development after the introduction of RRT. Hence it is possible that areas currently showing high levels of development may experience further development after the introduction of LRT.

Within the Tallaght route, for example, a number of areas containing high levels of mixed land-use



were identified. It is expected that these areas will be most likely to experience a positive impact due to the introduction of LRT. However, it is not expected that there will be any increase in the level of development due to LRT. Rather LRT may influence the spatial location of development within the city.

Analysis of the two remaining routes will provide a more definite basis for assessing the likely impacts of the LRT system. For each route a number of activity sites have been identified. It is proposed to investigate each of these areas using the location quotient, as outlined in this study. By extending the analysis, a more comprehensive examination of existing land-use can be obtained.

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## APPENDIX 1

Activity sites are defined as areas containing concentrations of any of the following seven land-use categories.

1) I/M: Industrial estates or other large industrial or manufacturing units.

2) W: Warehouse units. Defined as premises given over specifically to the storage of goods

3) RG: Retail-Grocery. Including Supermarkets, Butchers, Confectioners, Greengrocers, Delicatessens and Healthfood Outlets.

4) RNF: Retail-Non-Food. Include Newsagents/TSN, Chemist Off-licence, Clothes and Shoes Outlets.

5) SG: Specialist Goods. Include Wholesale Outlets, Household Goods (for example DIY, Hardware, Furnishers and Electrical goods), Jewellers, Stationers, Florists, Garden Sites, Music stores, and Fancy goods.

6) OS: Other Services. Include  
A) Entertainment Services: Cafe/Restaurant, Take Away, Public House, TV/Video Rental Outlets and Leisure sites.

B) Personal Services: Hair Salons, Dry Cleaners, Optician, Shoe Repairs, and Betting Offices.

C) Educational Sites: Schools, Third Level Colleges and Training Sites.

D) Miscellaneous Services: Banks, Building Societies, Post Office, Garage/Petrol Station, Contractors

7) OFF: Office Units:  
Include Professional Advisory Services; Accountants, Solicitors, Travel Agents, Recruitment Offices, Estate Agents.