# Limerick and Shannon Metropolitan Area Transport Strategy

## Demand Analysis Report

## July 2020

National Transport Authority,
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| Document Identification Table | |
|---|---|
| **Client / Project Owner** | National Transport Authority |
| **Document Title** | Demand Report |
| **Task Order** | |
| **Task** | Limerick and Shannon Metropolitan Area Transport Strategy |
| **Deliverable Code** | |
| **Version** | V4.0 |
| **Document Status** | Draft |

## Document Status Tables

Version 1

| | Name | Position | Date |
|---|---|---|---|
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| **NTA Review** | | | |

Version 2

| | Name | Position | Date |
|---|---|---|---|
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| **Checked by** | | | |
| **Approved by** | | | |
| **NTA Review** | | | |

Version 3

| | Name | Position | Date |
|---|---|---|---|
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| **NTA Review** | | | |

Version 4

| | Name | Position | Date |
|---|---|---|---|
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# CONTENTS

# 1 Introduction

## 1.1 Background

The National Transport Authority (NTA) is a public body set up under statute and established in December 2009. The role and functions of the NTA are set out in three Acts of the Oireachtas; the Dublin Transport Authority Act 2008, the Public Transport Regulation Act 2009 and the Taxi Regulation Act 2013. In August 2015, the Department of Transport, Tourism and Sport (DTTaS) published its policy document *"Investing in our Transport Future - Strategic Investment Framework for Land Transport"*. Action 4 of that framework states that: *"Regional transport strategies will be prepared by the NTA and provide an input to regional spatial and economic strategies".*

Having regard to its role in relation to transport, and the action placed upon it in the DTTaS policy document, the NTA, in collaboration with Limerick City and County Council and Clare County Council, is developing a Transport Strategy for the Limerick and Shannon Metropolitan Area (L-SMATS henceforth) covering the period up to 2040.

L-SMATS is a Regional Level and is directly informed by National Level (Tier -1) policies; the most important of these being are the National Planning Framework (NPF) 2040 and the National Development Plan 2018-2027, both of which were published in February 2018. The strategy will provide a framework for the planning and delivery of transport infrastructure and services in the L-SMA over the next two decades. It will also provide a planning policy for which other agencies can align their future policies and infrastructure investment.

## 1.2 Purpose of this Report

The methodology for the development of the L-SMA Transport Strategy 2040 is undertaken on a step by step basis, from: reviewing the existing policy and transport baseline, undertaking a detailed future demand analysis, developing transport options, developing the draft Strategy for public consultation and subsequently finalising the Strategy. Figure 1-1 outlines the proposed methodology.


Figure 1-1: Limerick and Shannon Metropolitan Area Transport Strategy Methodology

This Report is concerned with second task in the preparation of the Strategy - an assessment of the travel demand within the L-SMA in 2040. The report outlines the methodology adopted to estimate future land use within the L-SMA. Two initial model runs have been undertaken for this land use scenario using the NTA's Mid-West Regional Model (MWRM) to assess the likely future 2040 travel demand.

The aim of this stage of the Strategy is to establish a thorough understanding of the future travel demand and movement patterns to inform the development of transport options, network and supporting proposals for further testing. The demand and movement patterns have been assessed using individual and combined corridor analysis, the details of which are outlined in this report.

## 1.3 Report Structure

The following provides a description of the contents of each section of the report;

- **Section 2:** Outline of the estimated 2040 modelled land use data;
- **Section 3:** Overview of the NTA modelling system and how travel demand is generated from the 2040 land use data;
- **Section 4:** Comparison of the high-level results from the two scenarios modelled using the 2040 travel demand;
- **Section 5:** Detailed analysis of the future travel demand at a corridor level for the idealised network scenario;
- **Section 6:** Summary of the combined demand from all corridors and the indicative strategic network required to meet this demand.

# 2 Planning Data Section

## 2.1 Overview

In March 2019, the NTA, in association with Limerick City and County Council (LCCC) and Clare County Council (CCC) prepared an initial Planning Datasheet for the 2040 Baseline Land-use Scenario for the application within the L-SMA Transport Strategy. This Planning Datasheet has been used for the purpose of the following analysis.

The Planning Datasheet contains data at a CSO Small Area (SA) level on population, employment and education. This section provides a summary of the 2040 Planning Sheet demographics at a city, county, metropolitan and settlement level and the growth from 2016-2040.

## 2.2 2040 Planning Datasheet Summary

The sections below present population, employment and education numbers for the derived 2040 Baseline Land Use Scenario at a high level for Counties Limerick & Clare, Limerick & Shannon Metropolitan Area (L-SMA) and CSO Limerick City and Suburbs Boundary. Comparison between 2016 and 2040 scenario are also made to present the growth between the two scenarios. The areas within the metropolitan area are shown below in Figure 2-1.

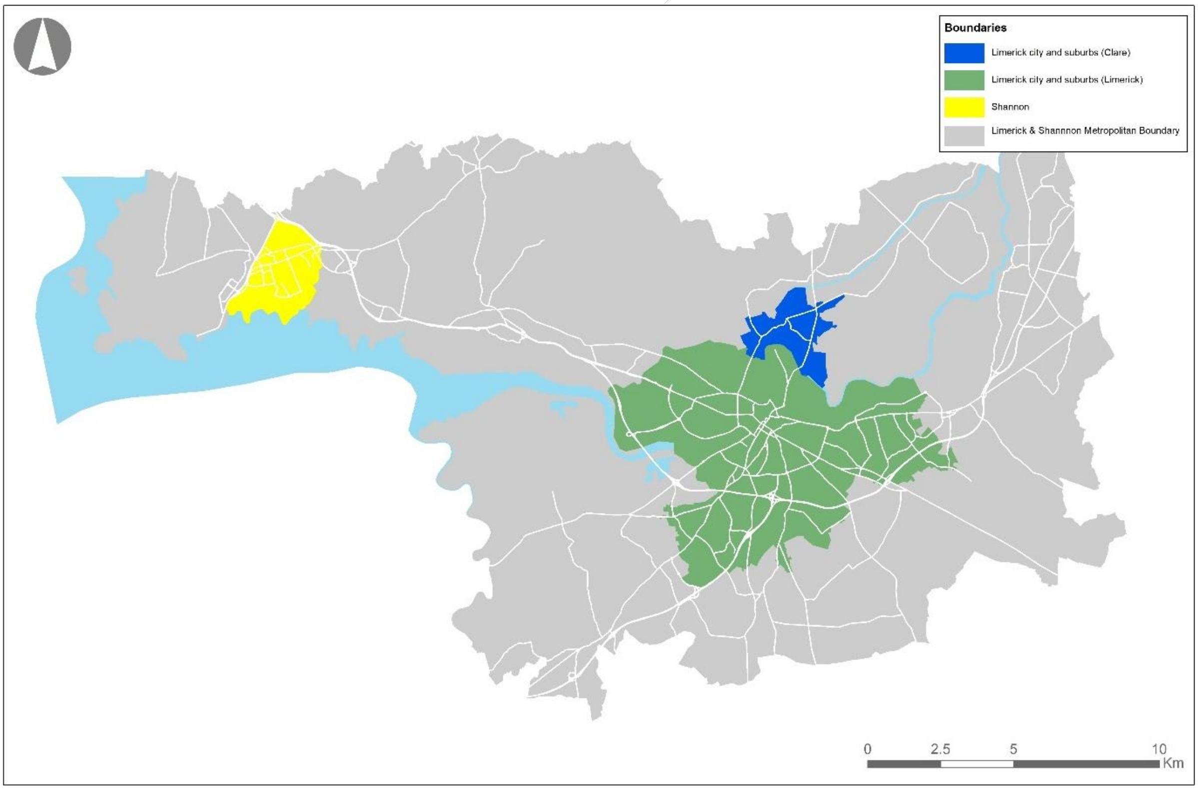


Figure 2-1: Limerick City & Suburbs & Shannon Area Boundaries

It should be noted the initial planning datasheet developed by the NTA to inform the demand analysis was developed prior to the finalisation of the Regional Spatial and Economic Strategy (RSES). An updated planning datasheet was developed in the latter stages of the project to reflect the projections outlined in the RSES. This planning sheet was used in the optioneering and strategy appraisal stages and therefore the demographics presented in this report differ from those presented in Options Development Report and Modelling Report.

### 2.2.1 Population

Table 2-1 provides a comparison between the 2016 and the 2040 Planning Datasheets for the areas defined by the NTA. The table presents a proportional higher growth within the CSO defined Limerick City & Suburbs than in Limerick City & County and County Clare with a significant population increase within urban areas.

Within the remaining Metropolitan Area, there are significant population increases close to the existing City & Suburbs in areas such as Mungret, Annacotty & the proposed South Clare Economic Strategic Development Zone (SDZ) which lie immediately outside the existing CSO city boundaries. Approximately a third of all growth projected for County Clare lies within this proposed SDZ.

Table 2-1: Population Comparison

| County | Population | | Population Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | |
| **Limerick City & County** | 194,899 | 261,475 | 66,576 | 34% |
| **Clare County** | 118,817 | 151,000 | 32,183 | 27% |
| **Metropolitan Areas** | | | | |
| **L-SMATS Area** | 132,420 | 209,198 | 76,778 | 58% |
| **-Limerick City & Suburbs** | 94,177* | 143,723 | 49,546 | 53% |
| -Limerick City & Suburbs (Limerick) | 89,201 | 138,645 | 49,444 | 55% |
| -Limerick City & Suburbs (Clare) | 4,976 | 5,079 | 103 | 2% |
| **-Shannon** | 10,442 | 13,600 | 3,158 | 30% |
| **-Remaining Metropolitan Area** | 27,801 | 51,875 | 24,074 | 87% |

It should be noted that the CSO Limerick City & Suburbs boundary does not align with the boundaries of CSO Small Areas. For the purposes of this comparison the population by SA was needed to compare to 2040. Thus, the population figure given is marginally lower than the official Census population for Limerick City and Suburbs (94,192).

### 2.2.2 Employment

Table 2-2 provides a comparison between the 2016 and the 2040 Planning Datasheets for the areas defined by the NTA. Overall employment grows at a higher rate than population as the age profile and work force size increases. A higher proportion of growth is concentrated within the Limerick City & Suburbs area. As with the population growth, the high level of growth in the remaining metropolitan area is driven primarily by significant levels of employment growth in Mungret & the South Clare Economic SDZ.

Table 2-2: Job Comparison

| County | Employment | | Employment Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | |
| **Limerick City & County** | 63,434 | 93,566 | 30,132 | 48% |
| **Clare County** | 30,914 | 42,372 | 11,458 | 37% |
| **Metropolitan Areas** | | | | |
| **L-SMATS Area** | 60,097 | 94,903 | 34,806 | 58% |
| **-Limerick City & Suburbs** | 43,241 | 64,280 | 21,039 | 49% |
| -Limerick City & Suburbs (Limerick) | 42,892 | 63,907 | 21,015 | 49% |
| -Limerick City & Suburbs (Clare) | 349 | 374 | 25 | 7% |
| **-Shannon** | 10,701 | 13,273 | 2,572 | 24% |
| **-Remaining Metropolitan Area** | 6,155 | 17,350 | 11,195 | 182% |

### 2.2.3 Education

Table 2-3 provides a comparison between the 2016 and the 2040 Planning Datasheets for education places which includes primary, secondary and tertiary education.

Table 2-3: Education Comparison

| County | Education | | Education Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | |
| Limerick City & County | 49,211 | 65,275 | 16,064 | 33% |
| Clare County | 19,936 | 25,247 | 5,311 | 27% |
| Metropolitan Areas | | | | |
| L-SMATS Area | 37,911 | 55,588 | 17,678 | 47% |
| -Limerick City & Suburbs | 31,284 | 44,284 | 13,000 | 42% |
| -Limerick City & Suburbs (Limerick) | 31,013 | 43,976 | 12,963 | 42% |
| -Limerick City & Suburbs (Clare) | 271 | 308 | 37 | 14% |
| -Shannon | 2,583 | 3,184 | 601 | 23% |
| -Remaining Metropolitan Area | 2,936 | 6,257 | 3,321 | 113% |

## 2.3 Settlement Level Comparison

The sections below present population, job and education numbers for the 2040 Baseline Land Use Scenario at a more granular detail, showing the distribution of growth at a settlement level. Comparison between the 2016 base and the 2040 scenario are also made to present the growth between the two scenarios.

### 2.3.1 Limerick City and County and Clare County Settlements

The population, employment and education data at its most disaggregated form consists of 1,566 Census Small Areas (CSAs) for the MWRM. In the interest of simplicity these CSAs were grouped into specific settlements that allowed for sensible analysis of these locations. The settlements do not match Electoral District boundaries but are defined based on a best match between the Mid-West Regional Model Zoning System and the planning data at a CSA level. Additional growth is added at a settlement level in order to test future year scenarios. The settlements are illustrated in Figure 2-2.

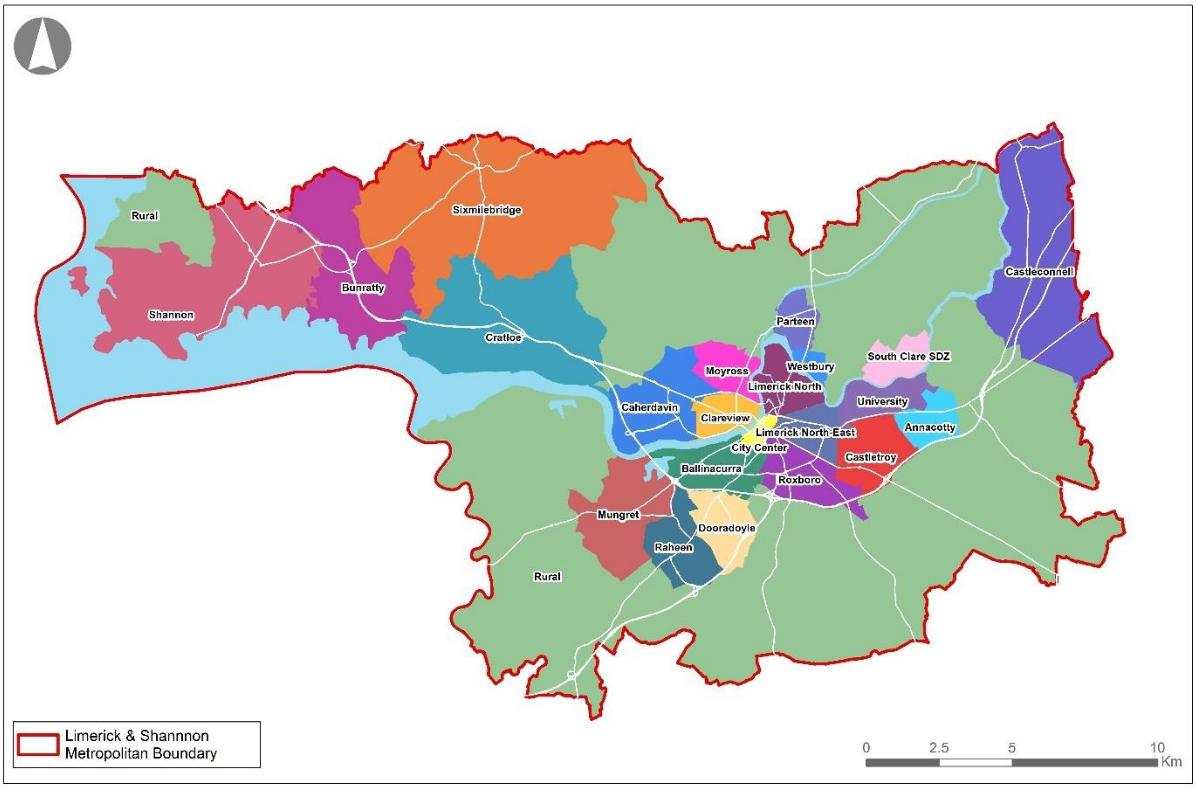


Figure 2-2: Metro Area Settlements

### 2.3.2 Population

Table 2-4 provides a comparison between the 2016 and the 2040 Planning Datasheets at a settlement level for population. As shown, significant levels of population growth are planned for the proposed South Clare Economic SDZ & Mungret with areas adjacent to the City such as Ballinacurra, Caherdavin, Raheen and Annacotty also experiencing high population growth.

**Table 2-4: Population Comparison at a Settlement Level**

| Metro Settlements | Population | | Population Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | 2016 to 2040 % |
| Annacotty | 5,497 | 9,455 | 3,958 | 72% |
| Ballinacurra | 6,956 | 15,187 | 8,231 | 118% |
| Bunratty | 983 | 961 | -22 | -2% |
| Caherdavin | 5,487 | 14,148 | 8,661 | 158% |
| Castleconnell | 3,332 | 5,827 | 2,495 | 75% |
| Castletroy | 5,998 | 9,817 | 3,819 | 64% |
| City Centre | 6,071 | 9,263 | 3,192 | 53% |
| Clareview | 7,035 | 8,941 | 1,906 | 27% |
| Cratloe | 1,514 | 1,511 | -3 | 0% |
| Dooradoyle | 13,350 | 13,963 | 613 | 5% |
| Limerick North | 6,803 | 10,062 | 3,259 | 48% |
| Limerick North-East | 12,344 | 14,694 | 2,350 | 19% |
| Moyross | 6,918 | 9,342 | 2,424 | 35% |
| Mungret | 1,259 | 6,650 | 5,391 | 428% |
| Parteen | 1,061 | 1,089 | 28 | 3% |
| Raheen | 3,446 | 7,449 | 4,003 | 116% |
| Roxboro | 7,774 | 11,279 | 3,505 | 45% |
| Rural | 15,887 | 23,977 | 8,090 | 51% |
| Shannon | 10,028 | 13,220 | 3,192 | 32% |
| Sixmilebridge | 3,962 | 4,022 | 60 | 2% |
| South Clare Economic SDZ | 379 | 11,000 | 10,621 | 2802% |
| University | 2,963 | 3,963 | 1,000 | 34% |
| Westbury | 3,373 | 3,379 | 6 | 0% |
| **Total** | **132,420** | **209,198** | **76,778** | **58%** |

The population growth distribution between 2016 and 2040 is shown for each small area in Figure 2-3 and shows the high levels of growth in areas adjacent to the city centre as population intensifies in suburban areas. There is also considerable population growth within Shannon.

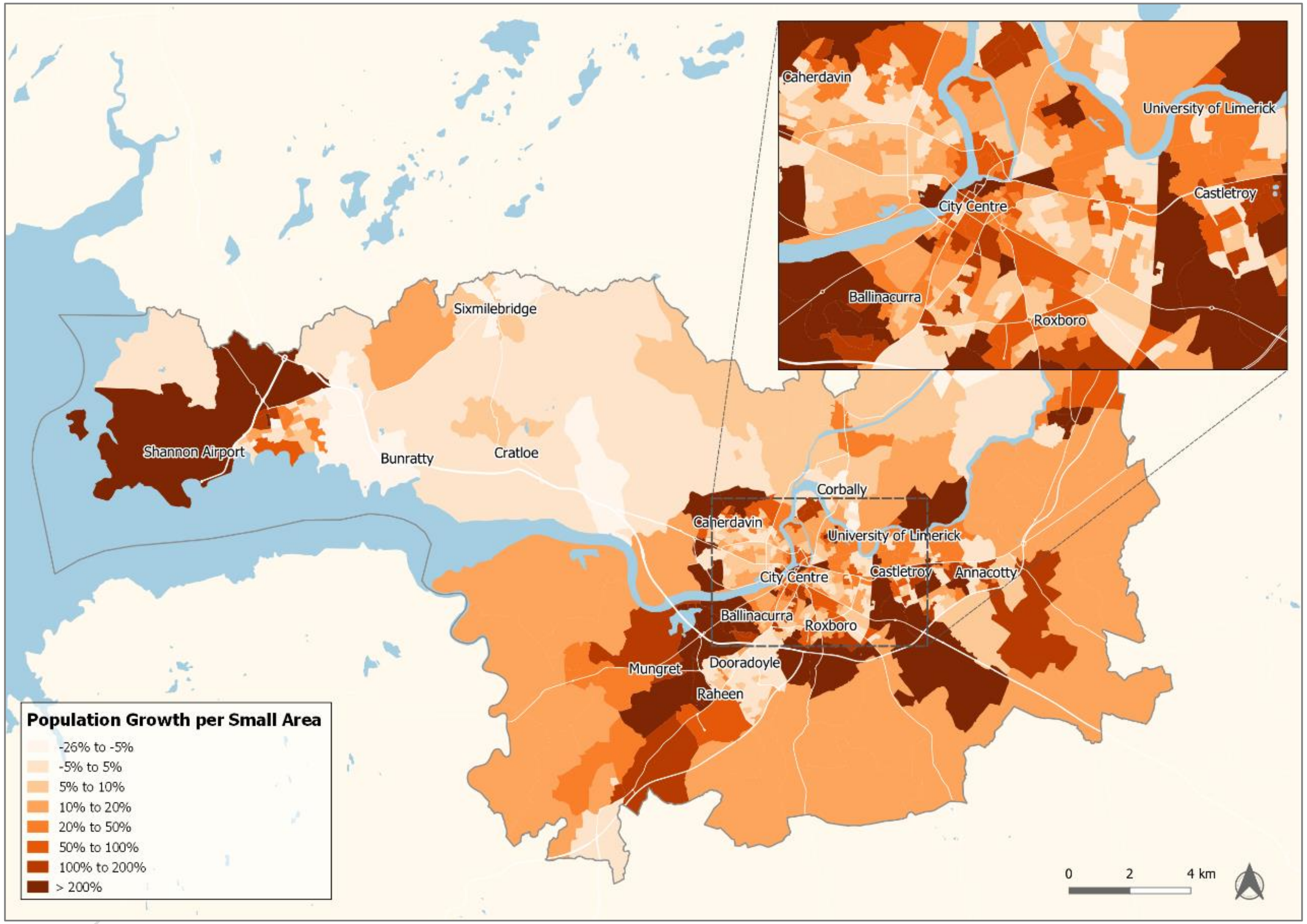


Figure 2-3: Population Growth 2016 to 2040

### 2.3.3 Employment

Table 2-5 provides a comparison between the 2016 and the 2040 Planning Datasheets at a settlement level for employment. The greatest absolute growth is seen in Ballinacurra which includes the Limerick Docklands. There is also significant employment growth within the City Centre, Mungret, Shannon and the proposed South Clare Economic SDZ.

Table 2-5: Job Comparison at a Settlement Level

| Metro Settlements | Population | | Population Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | 2016 to 2040 % |
| Annacotty | 1,783 | 2,174 | 391 | 22% |
| Ballinacurra | 3,140 | 12,135 | 8,995 | 286% |
| Bunratty | 457 | 597 | 140 | 31% |
| Caherdavin | 849 | 2,437 | 1,588 | 187% |
| Castleconnell | 313 | 301 | -12 | -4% |
| Castletroy | 900 | 1,725 | 825 | 92% |
| City Centre | 9,282 | 15,009 | 5,727 | 62% |
| Clareview | 1,556 | 1,568 | 12 | 1% |
| Cratloe | 183 | 268 | 85 | 46% |
| Dooradoyle | 5,508 | 5,883 | 375 | 7% |
| Limerick North | 1,459 | 1,723 | 264 | 18% |
| Limerick North-East | 3,066 | 5,466 | 2,400 | 78% |
| Moyross | 1,477 | 1,536 | 59 | 4% |
| Mungret | 296 | 4,704 | 4,408 | 1489% |
| Parteen | 137 | 169 | 32 | 24% |
| Raheen | 5,421 | 5,674 | 253 | 5% |
| Roxboro | 3,765 | 6,024 | 2,259 | 60% |
| Rural | 3,747 | 4,243 | 496 | 13% |
| Shannon | 10,512 | 13,086 | 2,574 | 24% |
| Sixmilebridge | 247 | 303 | 56 | 23% |
| South Clare Economic SDZ | 73 | 3,535 | 3,462 | 4743% |
| University | 5,774 | 6,244 | 470 | 8% |
| Westbury | 152 | 101 | -51 | -34% |
| **Total** | **60,097** | **94,903** | **34,806** | **58%** |

The job growth distribution between 2016 and 2040 is represented by CSO small area in Figure 2-4.

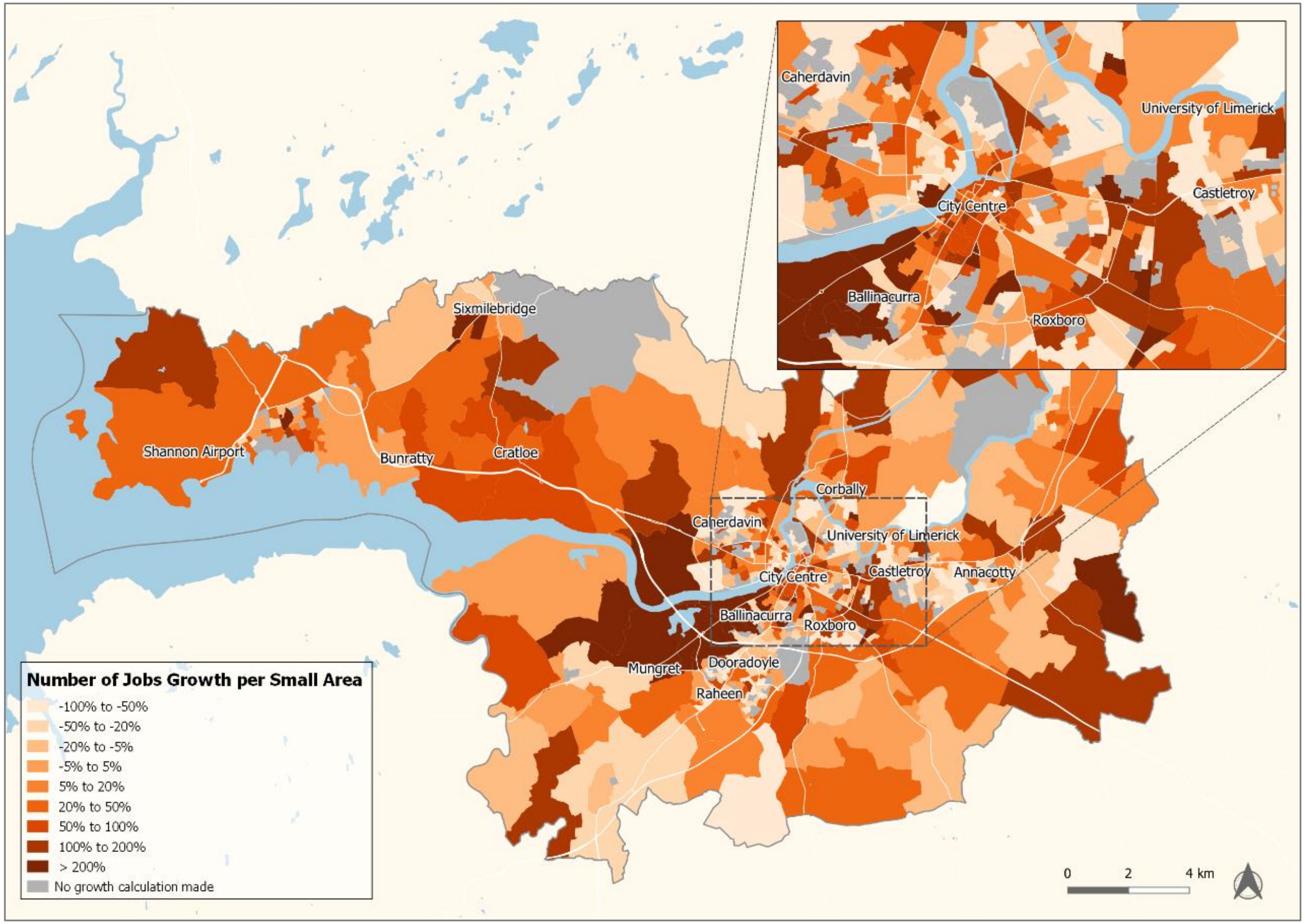


Figure 2-4: Job Growth 2016 to 2040

### 2.3.4 Education

Table 2-6 provides a comparison between the 2016 and the 2040 Planning Datasheets at a settlement level for education. As before, there is significant growth in education places in the Limerick Suburbs and areas with significant population growth forecast such as Mungret and the proposed South Clare SDZ.

Table 2-6: Education Comparison at a Settlement Level

| Metro Settlements | Population | | Population Growth | |
|---|---|---|---|---|
| | 2016 | 2040 | 2016 to 2040 | 2016 to 2040 % |
| Annacotty | 1,036 | 1,748 | 712 | 69% |
| Ballinacurra | 5,286 | 7,209 | 1,923 | 36% |
| Bunratty | 131 | 147 | 15 | 12% |
| Caherdavin | 484 | 2,024 | 1,541 | 318% |
| Castleconnell | 196 | 655 | 459 | 234% |
| Castletroy | 761 | 1,542 | 781 | 103% |
| City Centre | 864 | 1,726 | 861 | 100% |
| Clareview | 2,048 | 2,339 | 291 | 14% |
| Cratloe | 258 | 266 | 7 | 3% |
| Dooradoyle | 1,662 | 1,875 | 213 | 13% |
| Limerick North | 2,469 | 3,102 | 633 | 26% |
| Limerick North-East | 1,919 | 2,627 | 708 | 37% |
| Moyross | 3,793 | 5,047 | 1,253 | 33% |
| Mungret | 142 | 1,105 | 963 | 677% |
| Parteen | 269 | 274 | 5 | 2% |
| Raheen | 706 | 1,414 | 708 | 100% |
| Roxboro | 1,833 | 2,498 | 666 | 36% |
| Rural | 2,171 | 3,514 | 1,343 | 62% |
| Shannon | 2,583 | 3,171 | 588 | 23% |
| Sixmilebridge | 379 | 404 | 25 | 7% |
| South Clare Economic SDZ | 1 | 1,709 | 1,708 | 169323% |
| University | 8,916 | 11,169 | 2,253 | 25% |
| Westbury | 2 | 25 | 23 | 1128% |
| **Total** | **37,911** | **55,588** | **17,678** | **47%** |

As many small areas have no schools the education absolute growth rather than percentage growth in education places between 2016 and 2040 is represented in Figure 2-5.

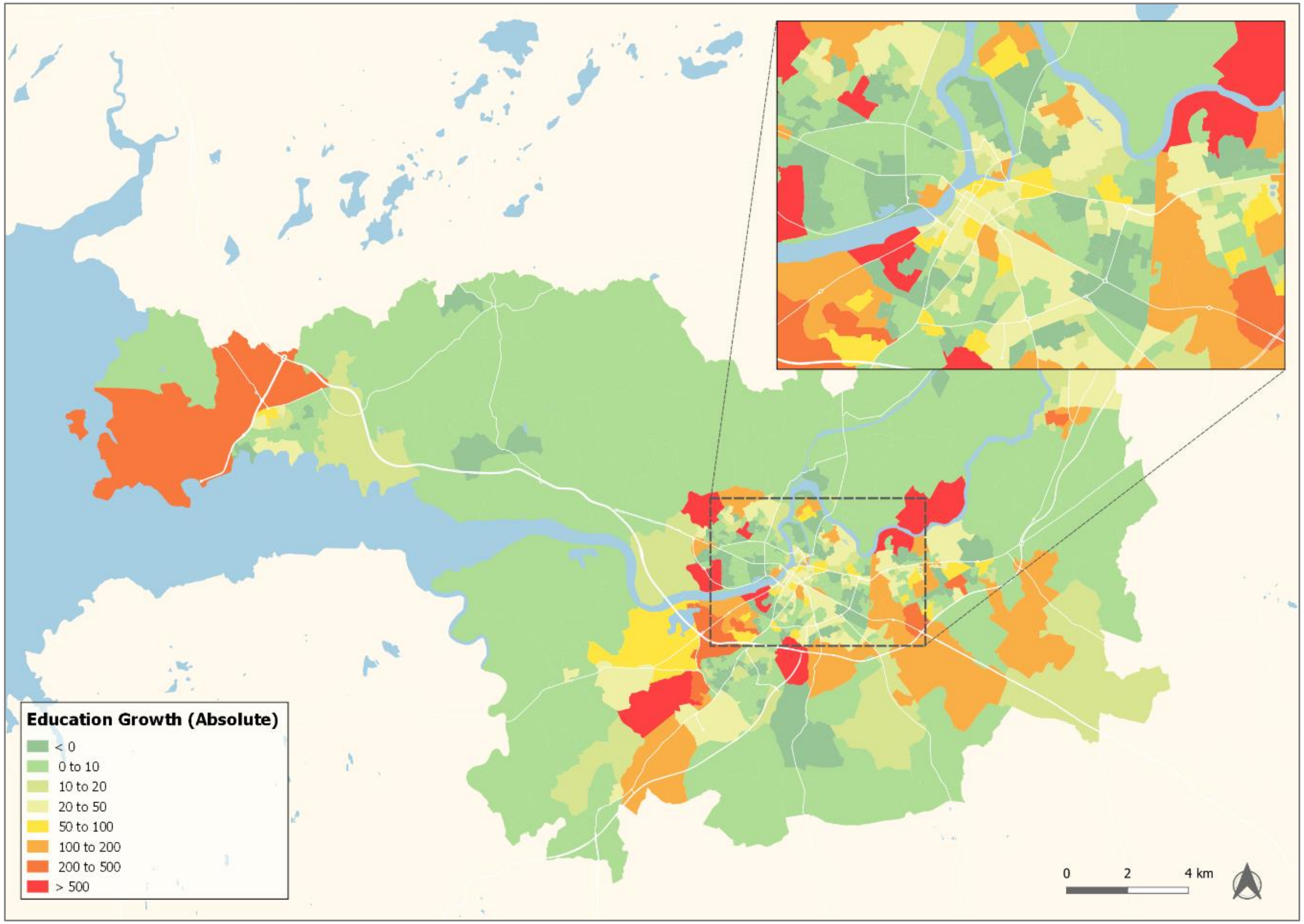


Figure 2-5: Education Growth 2016 to 2040

# 3 NTA Regional Modelling System

## 3.1 Introduction

This section describes the NTA Regional Modelling System, outlining its scope, extent, components, functionality and its suitability for use in developing the L-SMA Transport Strategy. The national remit of the NTA uses a system of regional models to help it deliver on its planning and appraisal needs. The NTA Regional Modelling System comprises five regional transport models covering the Republic of Ireland and centred on the five main cities of Dublin, Cork, Galway, Limerick, and Waterford and are summarised in Table 3-1 below.

**Table 3-1: Regional Modelling System**

| Regional Modelling System | Abbreviation | Counties Covered |
|---|---|---|
| Eastern Regional Model | ERM | Louth, Monaghan, Cavan, Longford, Westmeath, Meath, Offaly, Laois, Kildare, Dublin, Wicklow, Carlow & Northern Wexford |
| South East Regional Model | SERM | Wexford, Kilkenny, Waterford & Tipperary South |
| South West Regional Model | SWRM | Cork & Kerry |
| Mid-West Regional Model | MWRM | Limerick, Clare & North Tipperary |
| Western Regional Model | WRM | Galway, Mayo, Roscommon, Sligo, Donegal & Leitrim |

Each regional model has the following key attributes:

- Full geographic coverage of the relevant region;
- A detailed representation of the road network, particularly the impact of congestion on on-street public transport services and include modelling of residents' car trips by time period from origin to destination;
- A detailed representation of the public transport network & services, and can predict demand on the different public transport services within the regions;
- A representation of all major transport modes including active modes (walking and cycling) and includes accurate mode-choice modelling of residents;
- A detailed representation of travel demand, e.g. by journey purpose, car ownership/availability, mode of travel, person types, user classes & socio-economic classes, and representation of four-time periods (AM, Inter-Peak, PM and Off-Peak); and
- A prediction of changes in trip destination in response to changing traffic conditions, transport provision and/or policy.

The Mid-West Regional Model (MWRM), which covers Limerick City & County and Clare County, has been used to support the development of the L-SMA Transport Strategy. Figure 3-1 on the following page illustrates the geographical extent of each of the Regional Models.

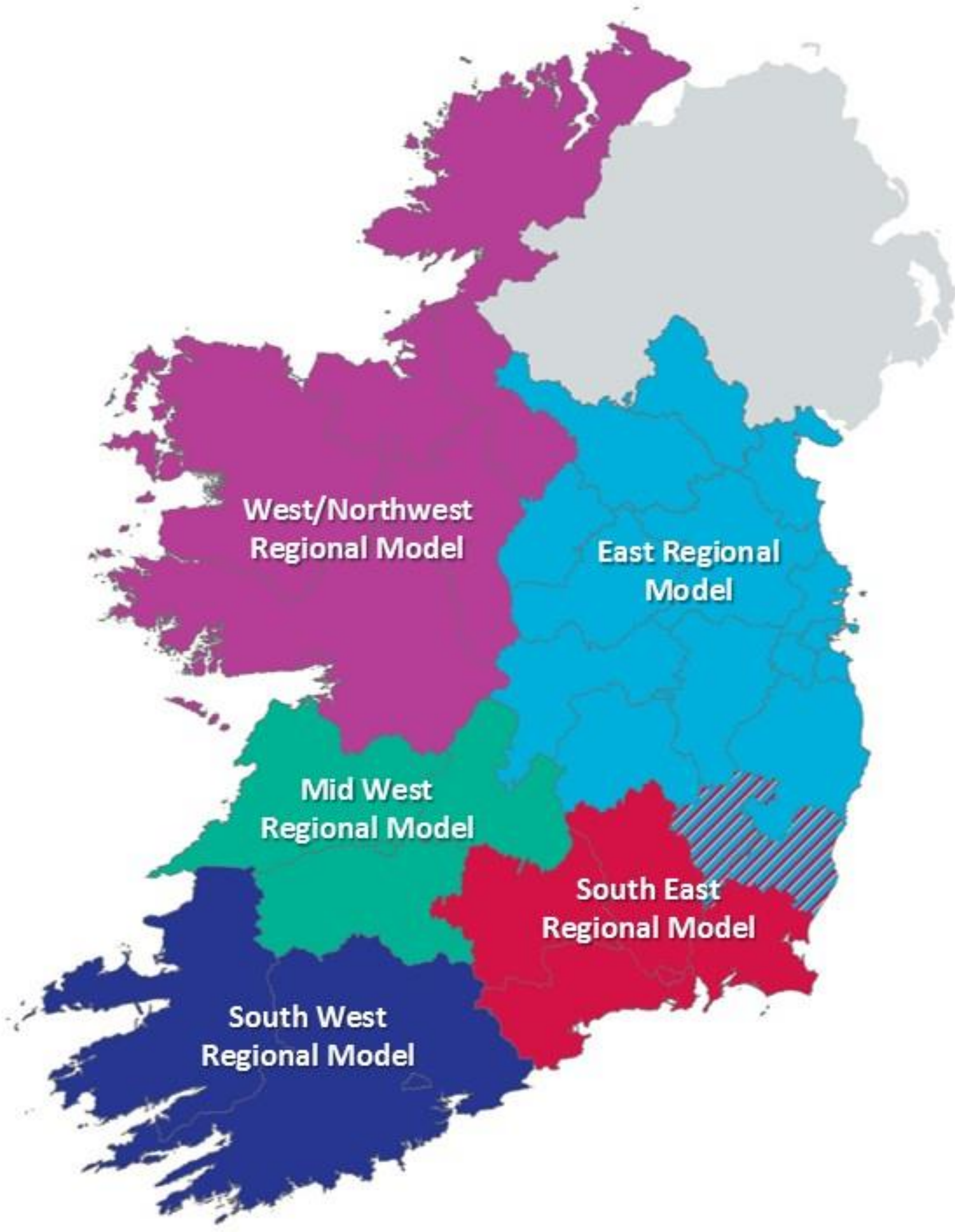


**Figure 3-1: Modelling System Regional Model Areas**

## 3.2 Regional Modelling System Dimensions

The regional modelling system features or dimensions are defined in terms of:

- Zone system;
- Modes of travel represented;
- Base year;
- Time-periods; and
- Demand segmentation;

### 3.2.1 Zone System

The zone system definitions for each of the regional models were based on Census Small Area (CSA) boundaries and Electoral Districts (EDs). The 2016 CSAs are the core base layer for each zoning system. CSAs are the smallest geographic unit of data available with which to define the model zone system. Each CSA is a defined geographic area associated with demographic data (e.g. population, age distribution, employment status), and the work / school travel characteristics of the population (via *Place of Work, School or College - Census of Anonymised Records* (POWSCAR)).

CSAs are subsets of EDs. ED boundaries are commonly used as the unit of geographic information in Ireland and as such it was desirable to maintain a transparent relationship between EDs and the model zone system. Regional Model zones can be smaller or larger than either of these units where required.

The criteria used for developing zone boundaries for the MWRM and other regional models included:

- Population, Employment and Education – maximum values were specified for zone population, number of jobs and persons in education;
- Activity Levels – limits were applied to zone activity levels ensuring that zones with either very low, or very high, levels of trips were not created;
- Intra-zonal Trips – threshold values were applied to the proportion of intra-zonal trips, within each zone, to avoid an underestimation of flow, congestion and delay on the network;
- Land Use – zones were created with homogeneous land use and socio-economic characteristics where possible;
- Zone Size/Shape – thresholds were applied to zone size, and irregularity of shape, to avoid issues with inaccurate representation of route choice;
- Political Geography – as mentioned above, it is possible to aggregate all zones to ED level i.e. zone boundaries do not intersect ED boundaries;
- Special Generators/Attractors – large generators/attractors of traffic such as Airports, Hospitals, shopping centres etc. were allocated to separate zones.

The MWRM zone system includes a total of 456 zones with a geographical breakdown as follows:

- Limerick City zones: 94;
- Limerick County zones: 126;
- Clare County zones: 131;
- North Tipperary County: 77;
- External zones: 26; and.
- Special zones: 2.

Figure 3-2 shows the MWRM Zone System. External zones represent national demand from areas across the country to/ from the Mid-West (area shown in blue). The two special zones in the model are Foynes Port & Shannon Airport. Further information on the MWRM Zone System can be found in the MWRM zone system development report[1]

[1] MWRM Zone System Development Report: https://www.nationaltransport.ie/wp-content/uploads/2018/06/MWRM_Zone_System_Development_Report-1.pdf

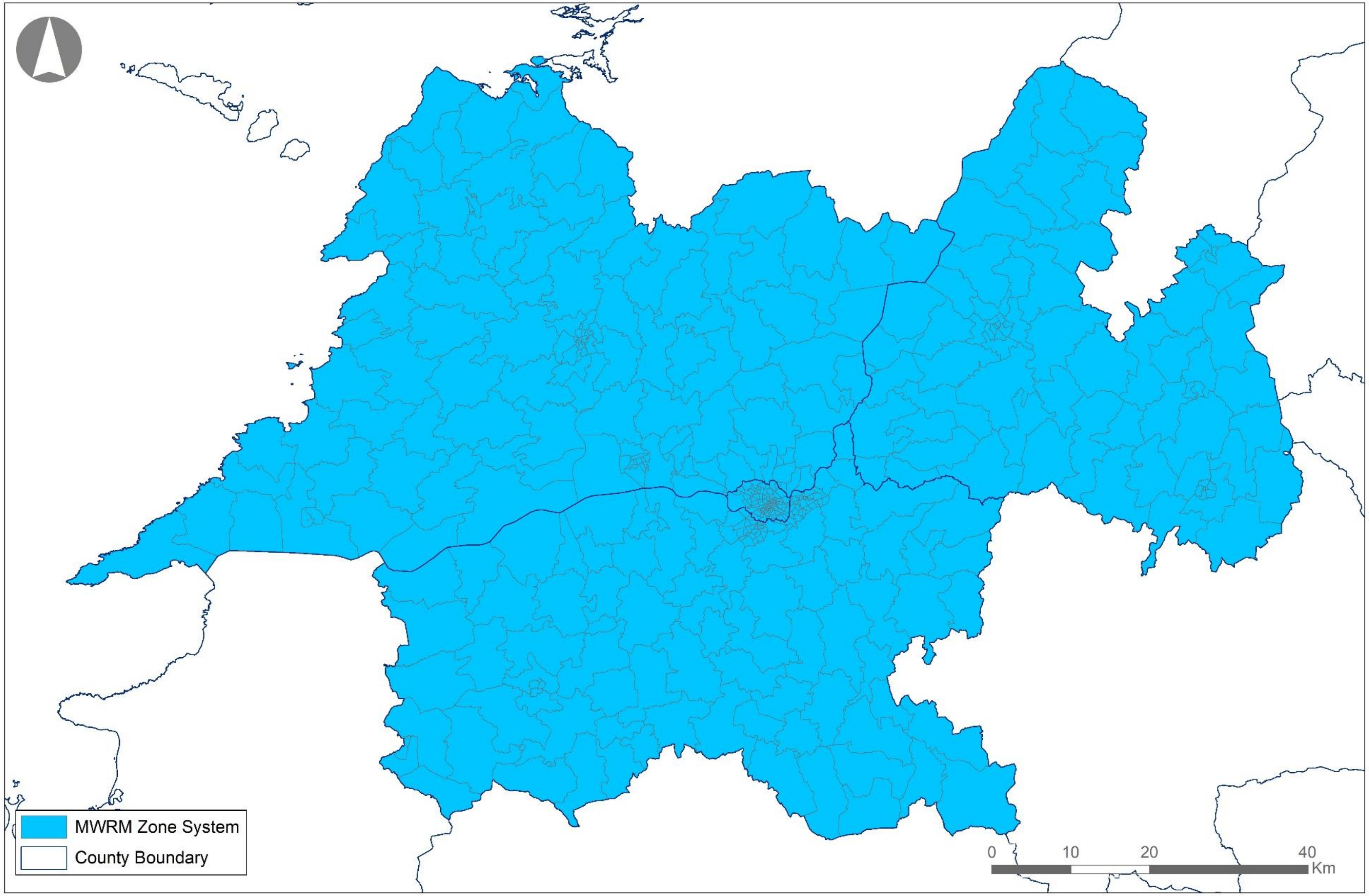


**Figure 3-2: MWRM Zone System**

### 3.2.2 Modes of Travel

The regional model system covers all surface access modes for personal travel and goods vehicles:

- Private vehicles – taxis and cars;
- Public transport – bus, rail, Luas, BRT, Metro;
- Active modes – walking and cycling; and
- Goods vehicles – light goods vehicles and heavy goods vehicles.

### 3.2.3 Base Year

The current release version of the MWRM is calibrated to the 2012 Census Data. An update of the model to a 2016 base is currently underway at the time of writing. All data presented in this section of the report has been extracted from the 2012 base year model which has been calibrated to data from the 2012 NHTS and 2012 Census as well as traffic counts and public transport count data. For the purpose of this assessment, the road and public transport networks have been updated to 2016. In addition, the demand used in the assessment utilises the latest available 2016 census data on population and social demographics at a CSO Small Area level.

### 3.2.4 Time Periods

The model represents an average weekday. The day is split into five-time periods considered within each of the regional models, detailed in Table 3-2 below. The periods allow the relative difference in travel cost between time periods to be represented. Representative peak hours are used in the assignment models, which are based on period to peak hour factors derived for each time period and mode. The peak hour factors are derived from survey count data for each time period to represent the 'busiest' hour within the full demand period.

Table 3-2: Time Periods

| Period | DEMAND MODEL FULL PERIOD | ASSIGNMENT PERIOD |
|---|---|---|
| **AM Peak** | 07:00-10:00 | Peak hour – based on a Peak Hour factor of 0.393 for cars, 0.393 for active modes and 0.47 for public transport |
| **Morning Inter Peak (IP1)** | 10:00-13:00 | Average hour from full period - based on a Peak Hour factor of 0.33 for cars, 0.33 for active modes and 0.33 for public transport |
| **Afternoon Inter Peak (IP2)** | 13:00-16:00 | Average hour from full period (not assigned) |
| **PM Peak** | 16:00-19:00 | Peak hour - based on a Peak Hour factor of 0.358 for cars, 0.358 for active modes and 0.4 for public transport |
| **Off Peak** | 19:00-07:00 | Free flow assignment |

## 3.3 MWRM Structure

### 3.3.1 Overarching Structure

As mentioned above, the MWRM is the model used to support the development of the L-SMA Transport Strategy. All the regional models, including the MWRM, include 3 core modelling processes (i.e. Demand Model, Road Assignment Model and Public Transport Assignment Model) which receive inputs from the National Demand Forecast Model (NDFM) and provide outputs for transport appraisal and secondary analysis. This process is shown in Figure 3-3 below.

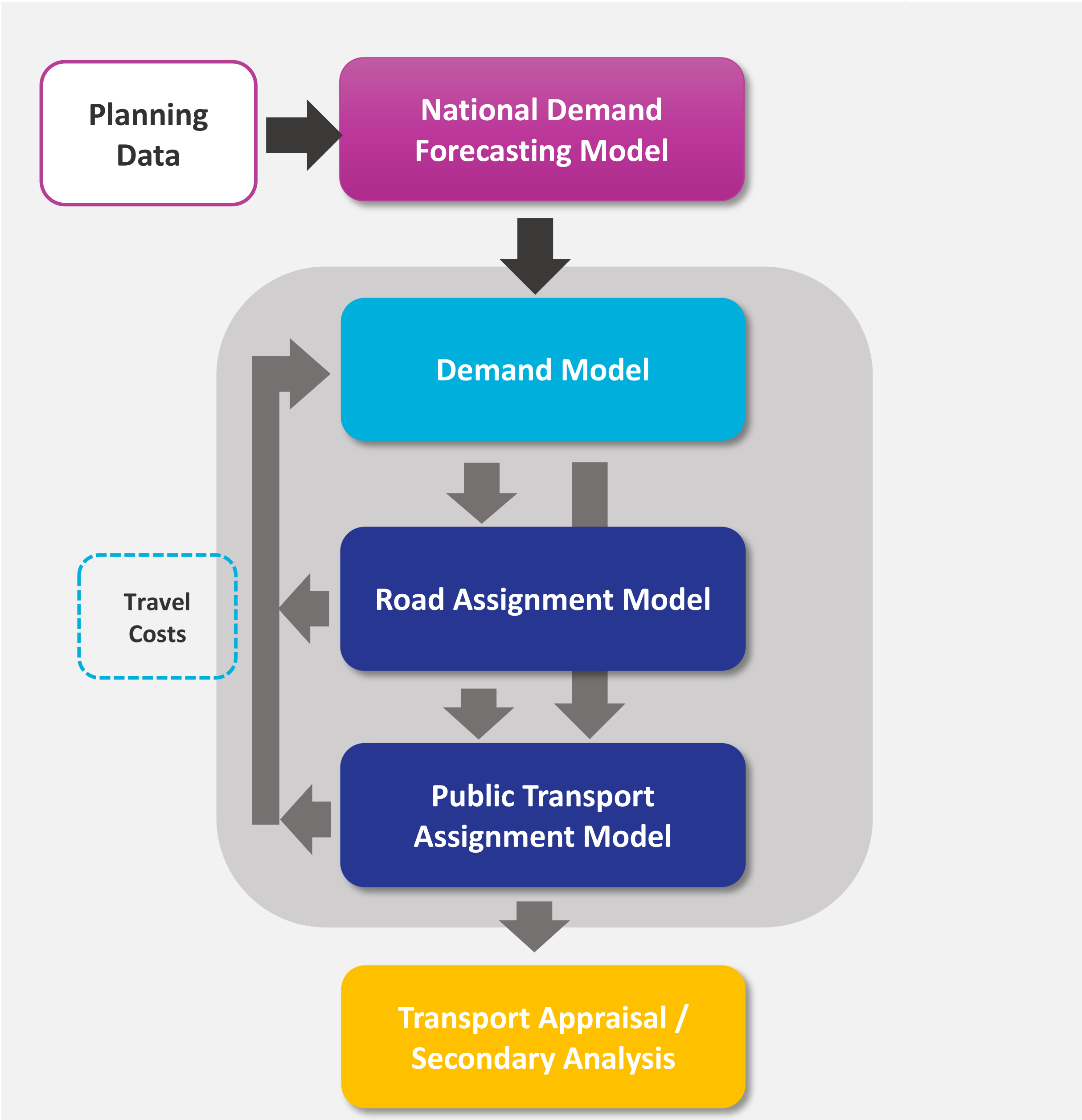


Figure 3-3: Model Structure

### 3.3.2 Planning Data

The Planning Data referred to above is a national database of 99 demographic and spatial variables for each of the 18,488 CSAs in the state. The main categories of planning data are:

- References and spatial definitions;
- Origin-based person types; e.g. age bands, gender, principal economic status (PES), employment type, and various combinations of categories;
- Destination-based person types; e.g. employment type or education type; and
- Households.

### 3.3.3 National Demand and Forecasting Model (NDFM)

The ***NDFM*** is a separate modelling system that estimates the total quantity of travel demand generated by and attracted to every Census Small Area (CSA) daily. The level of demand from, and to, each zone (referred to as 'trip ends') is related to characteristics such as population, number of employees and land-use data as outlined in Section 2.

The NDFM comprises the set of models and tools that are used to derive national levels of trip making, for input to each of the regional models. The NDFM outputs the levels of trip making at the smallest available spatial aggregation (CSA).

The key components of the NDFM are as follows:

- The **Planning Data Adjustment Tool** (PDAT) controls the planning data inputs to the core NDFM system. It is used to amend planning data to represent the combination of general changes over time and the relevant land-use planning scenarios;
- The **Car Ownership/Car Competition Model** estimates the level of car ownership in a CSA, (sub-dividing the number of households in each CSA between 'No Car', 'Cars < Adults' and 'Cars >= Adults' households) i.e. the car competition bands;
- The **Car Availability Model** classifies the set of individual person trips as either 'Car Available' or 'Car-not-available' using calibrated relationships between the three car competition bands and the trip purpose;
- The **National Trip-End Model (NTEM)** converts the planning data into person trips, using calibrated trip rates; and
- The **Regional Modelling System Integration Tool (RMSIT)** estimates the level of trip-making by main mode (car, bus, rail and goods vehicles) between 38 of the main urban settlements in Ireland.

Figure 3-4 shows the system of NDFM models and the key regional model components that the NDFM interacts with.

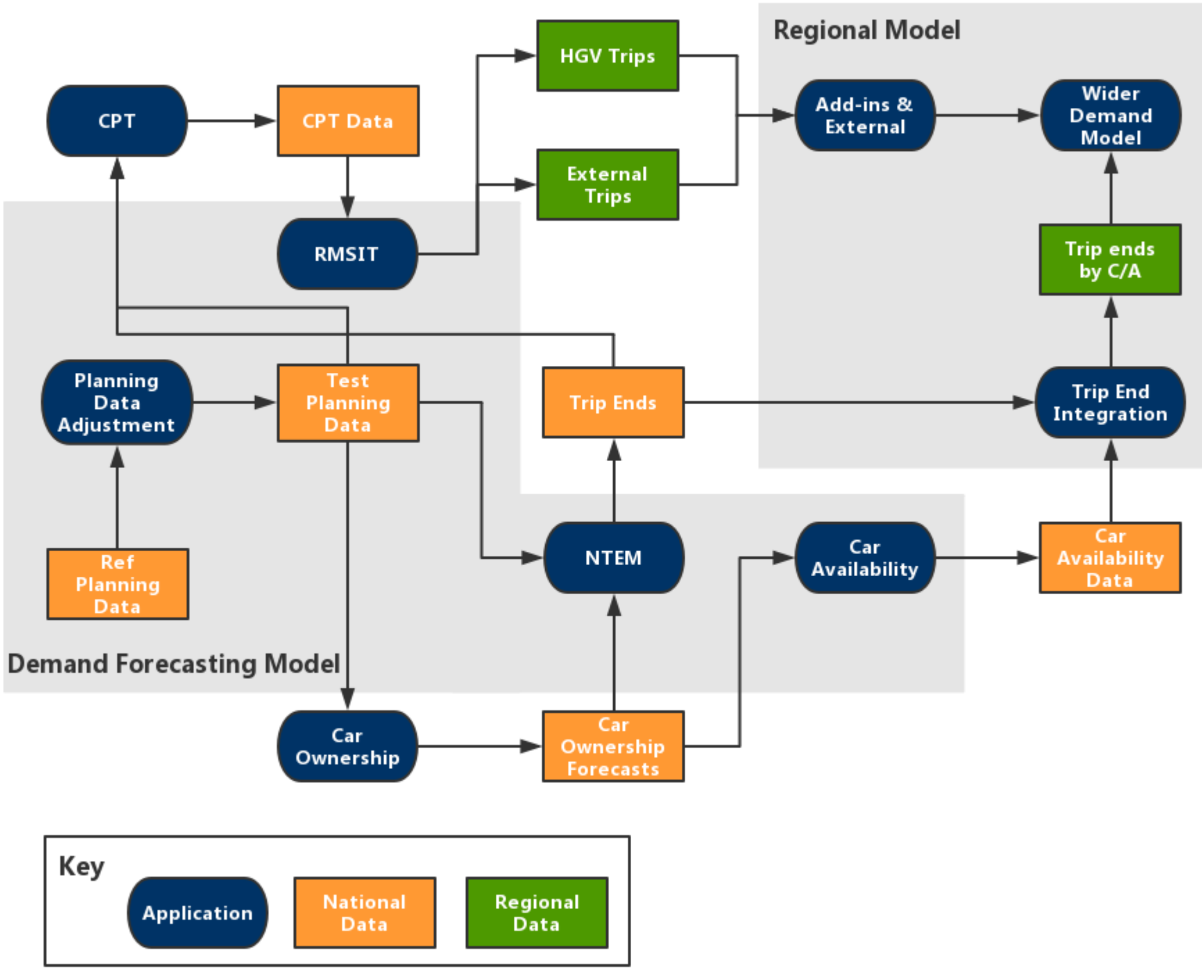


Figure 3-4: NDFM Structure

### 3.3.4 Demand Segments

Groups of people with similar travel behaviours (for example, commuters who own a car) are represented by distinct demand segments in the regional modelling system. This allows those groups to be treated differently in the regional demand model according to their behaviour.

The NDFM demand segments were derived from the National Household Travel Survey (NHTS) data and *Place of Work, School or College - Census of Anonymised Records* (POWSCAR) data sets. They have been segmenting into 33 distinct classifications as noted below in Table 3-3.

**Table 3-3: Demand Segments**

| No. | Purpose | Car Availability | Third Level of Segmentation |
|---|---|---|---|
| 1 | Commute | Available | Blue collar |
| 2 | Commute | Available | White collar |
| 3 | Commute | Not available | Blue collar |
| 4 | Commute | Not available | White collar |
| 5 | Education | Available | Primary |
| 6 | Education | Available | Secondary |
| 7 | Education | Available | Tertiary |
| 8 | Education | Not available | Primary |
| 9 | Education | Not available | Secondary |
| 10 | Education | Not available | Tertiary |
| 11 | Escort to education | Available | Primary |
| 12 | Escort to education | Available | Secondary |
| 13 | Escort to education | Available | Tertiary |
| 14 | Escort to education | Not available | Primary |
| 15 | Escort to education | Not available | Secondary |
| 16 | Escort to education | Not available | Tertiary |
| 17 | Other | Available | Employed |
| 18 | Other | Available | Non-working |
| 19 | Other | Not available | Employed |
| 20 | Other | Not available | Non-working |
| 21 | Shopping - food | Available | Employed |
| 22 | Shopping - food | Available | Non-working |
| 23 | Shopping - food | Not available | All |
| 24 | Visit friends / relatives | Available | Employed |
| 25 | Visit friends / relatives | Available | Non-working |
| 26 | Visit friends / relatives | Not available | All |
| 27 | Employers Business | All | All |
| 28 | All | Available | Retired |
| 29 | All | Not Available | Retired |

| No. | Purpose | Car Availability | Third Level of Segmentation |
|---|---|---|---|
| **30** | One-way business | Available | All |
| **31** | One-way business | Not available | All |
| **32** | One-way other | Available | All |
| **33** | One-way other | Not available | All |

### 3.3.5 Tours

Tours are an important aspect of how Trip Ends are modelled. The main concept is that every person is expected to make a distinct series of trips beginning from their house and ultimately returning home (signalling the end of a tour). The five distinct trip types which may comprise a tour are shown graphically below in Figure 3-5 and include:

- Simple from Home;
- Simple to Home;
- One-way from Home;
- One-way to Home; and
- Non-Home-Based (NHB) trips.

All tours are defined relative to a home or a destination. This corresponds to the concept of productions and attractions where productions are associated with homes and attractions are associated with destinations. The terms productions and attractions are not used when discussing one-way or NHB trips. These are dependent on direction, are not defined to return to a home or a particular attraction, and therefore in these cases the labels origin and destination are used as referring to the start and finish location of such trips.

It is worth noting that trip chains (a tour comprising more than two trips) are modelled as multiple single trips. These consist of an outbound (one way From Home) and an inbound (one-way To Home) as well as any number of intermediate NHB trips. An example of this is shown in Figure 3-5.

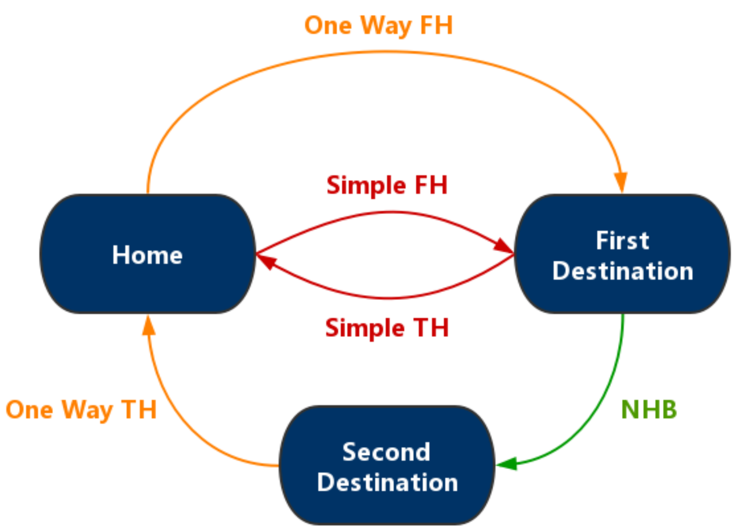


Figure 3-5 Trip Chains

Figure 3-6 shows the most basic relation of origins and destinations with respect to directional trips, comparable to simple tours.

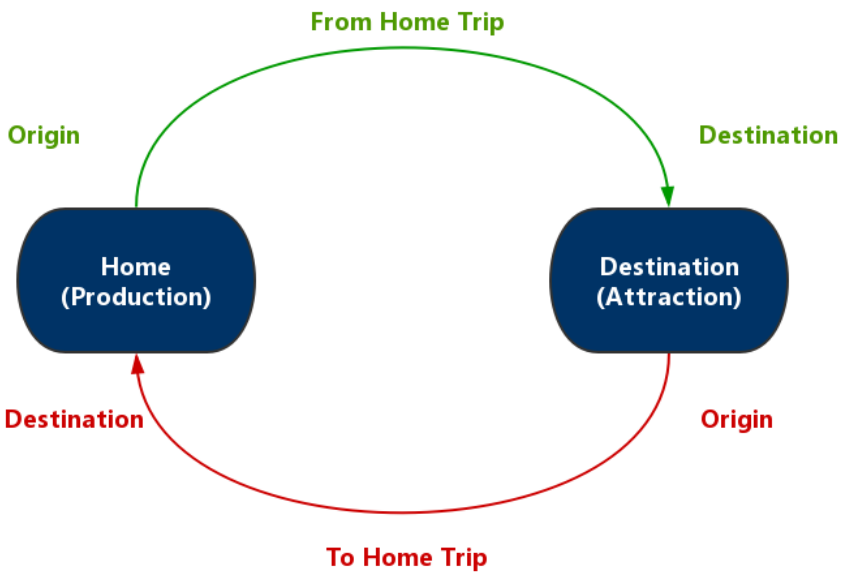


Figure 3-6 PA V OD for Simple Tours

Figure 3-7 (below)shows the same relationship for trip chains, where it is particularly noted that both ends of a non-home-based tour correspond to attractions.

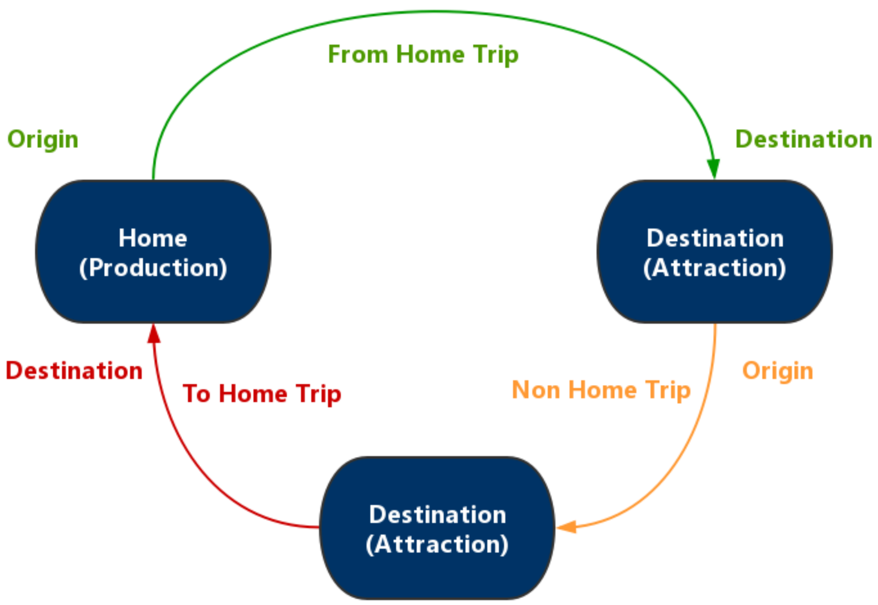


Figure 3-7 PA V OD for Extended Tours

Tours are considered as movements within or from time period to time period as shown in the Tour Grid in Table 3-4. The tours under the diagonal for the IP1, IP2 and PM time periods (marked in green) are those which are not considered in any calculations while the off-peak tours (marked in red) are considered only in commute demand segments. Time period demand is derived either by summing the rows (From Home) or the columns (To Home).

Table 3-4: Tour Grid

| TP Out\ TP In | AM | IP1 | IP2 | PM | OP |
|---|---|---|---|---|---|
| AM | 1 | 2 | 3 | 4 | 5 |
| IP1 | 6 | 7 | 8 | 9 | 10 |
| IP2 | 11 | 12 | 13 | 14 | 15 |
| PM | 16 | 17 | 18 | 19 | 20 |
| OP | 21 | 22 | 23 | 24 | 25 |

### 3.3.6 MWRM Demand Model

The **Demand Model** models travel behaviour and is implemented in Cube Voyager. The demand model processes all-day travel demand from the NDFM through a series of choice models to represent combined mode, time of day, destination and parking decision making. The outputs of the demand model are a set of trip matrices which are assigned to the Road and Public Transport models to determine the route-choice and generalised costs.

The demand model consists of several components that interact in a sequential manner between the trip end model and the assignment models. It includes the following distinct components:

- Macro Time of Day;
- Mode Choice;
- Destination Choice;
- Parking; and
- Tours and One-Way.

A simple representation of the model structure is shown in Figure 3-8.

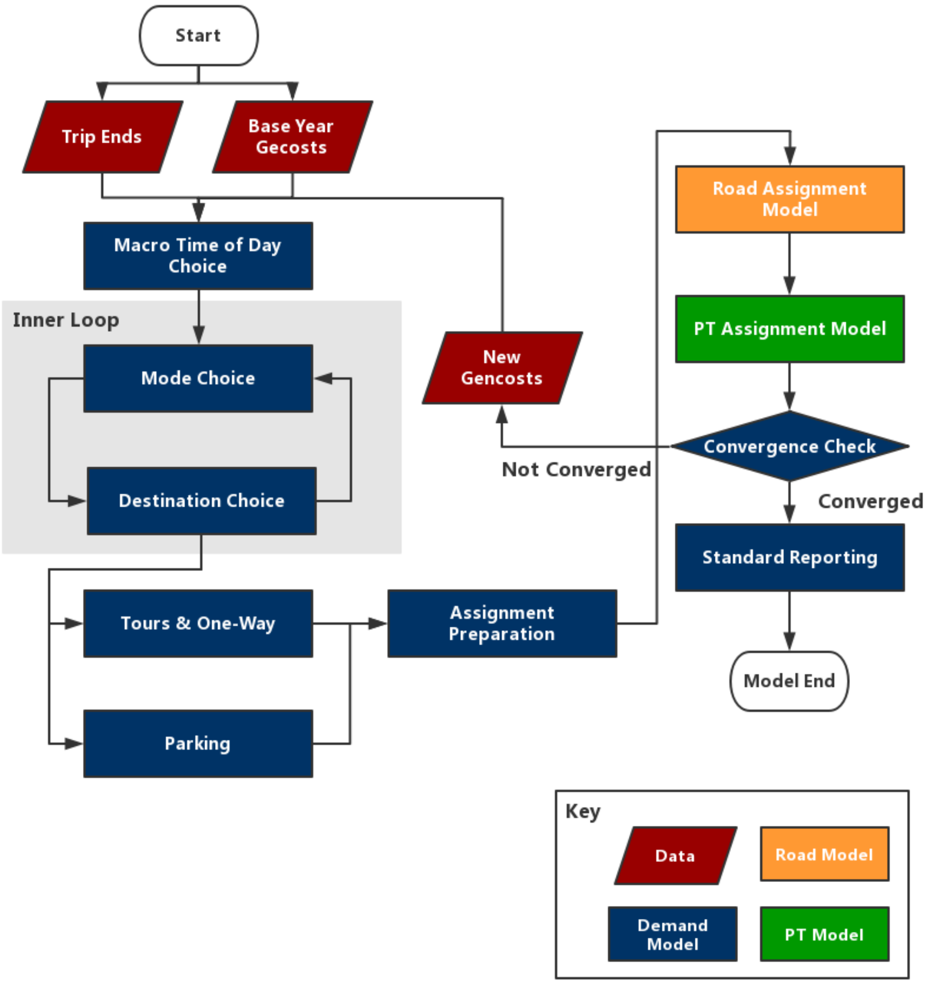


Figure 3-8: Demand Model Structure

### 3.3.7 MWRM Road Assignment Model

The **Road Assignment Model** (RDAM) is implemented in SATURN and includes capacity restraint whereby travel times are recalculated in response to changes in assigned flows. The main purpose of the RDAM is to assign road users to routes between their origin and destination zones. The cost of travel is then calculated by the RDAM for input to the demand model and economic appraisal.

It should be noted that SATURN is a macroscopic model and considers the aggregate behaviour of traffic flows. It does provide detail on junction delay and queueing along links it is a strategic model used to look at impacts across a wider area. Whilst suitable for the purposes of this strategic assessment it is not suitable for detailed junction modelling which consider the interaction of individual vehicles which should be undertaken using a microscopic model such as VISSIM or PARAMICs.

The inputs to the Road Assignment model from the demand model are the road assignment matrices from the assignment preparation stage. The outputs from the Road Assignment model for the demand model processes consist of generalised costs skims by time period and assigned road networks in CUBE Voyager format which are passed on to the PT model.

In addition to these requirements for demand model processes, there are a series of standard SATURN outputs that are produced for use in the specific interrogation of the road networks for scheme and/or scenario assessment.

### 3.3.8 MWRM Public Transport Assignment Model

To generate costs to update the choice model processes, a PT assignment must be undertaken to establish new generalised costs. The **Public Transport Assignment Model** (PTAM) is implemented in Voyager and is used to allocate PT users to services between their origin and destination zones. The model includes a representation of the public transport network and services for existing and planned modes within the modelled area. The model includes:

- Rail;
- DART;
- Luas;
- Metro.
- Urban Bus;
- Inter-Urban Bus; and
- Bus Rapid Transit (BRT).

The outputs of the PT assignment model fall into two categories, those required by the demand model, and those produced for reporting and analysis purposes.

The outputs from the Public Transport Assignment model for the demand model processes consist of the assigned networks which are passed on to active mode assignment as the starting point for their network build procedure, and generalised cost skim matrices by user class for each of the assigned time periods that feed back into the main Mode and Destination choice demand model loop. An overview of the PT model process is shown below in Figure 3-9.

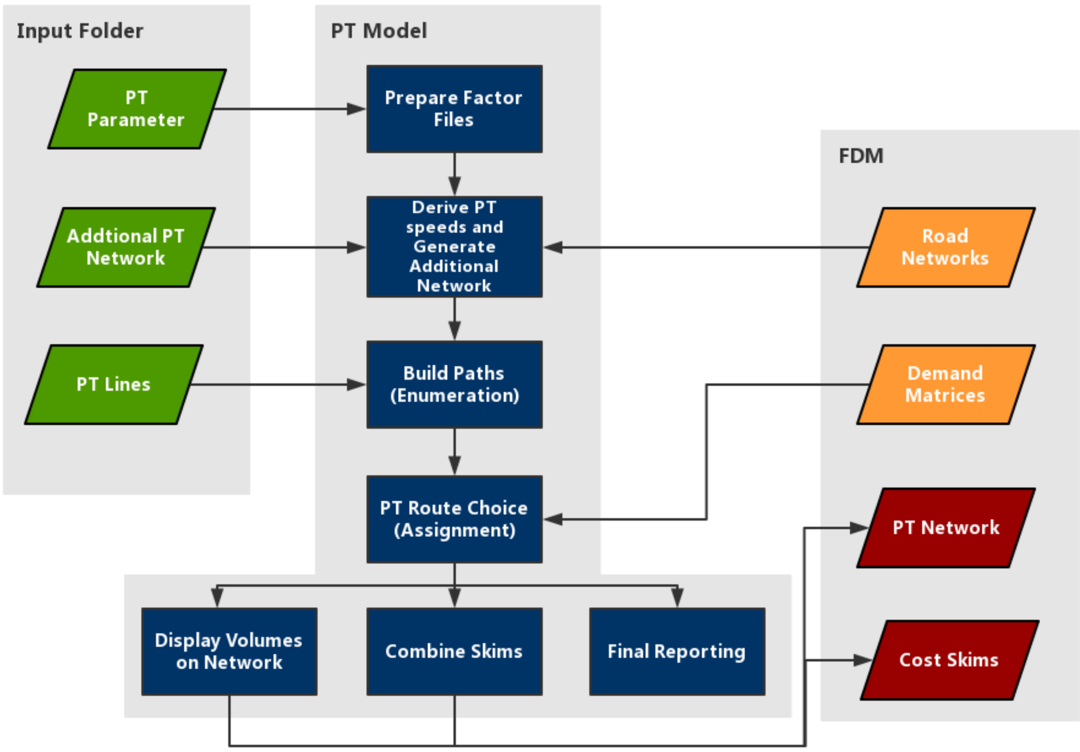


Figure 3-9: PT Model Process

### 3.3.9 MWRM Active Modes Model

The Regional Modelling System represents active modes (i.e. walking and cycling) within the demand model to improve the realism of travel choices. To generate costs to update the choice model processes, an **active modes assignment** must take place to establish new generalised costs. This active mode assignment assumes no crowding or delays.

The inputs for the active assignment model are the output CUBE format PT networks, the demand model produced assignment matrices and separate input pedestrian only links and cycle lanes. The outputs of this process include an assigned network with walk and cycle flows by user class, and a set of generalised cost skims. The active assignment is a CUBE-based lowest cost path assignment model with no junction modelling based purely on distance and a constant speed by mode.

Walk speeds are taken as 4.8 kph for all user classes while cycle speeds are set to 12 kph as default except in specified cases as indicated by the cycle data network input. Improvements to cycling mode provision are included through associating improvements to cycling Quality of Service to increases in service user speeds.

## 3.4 Suitability of Mid-West Regional Model in Developing the Strategy

### 3.4.1 Model Calibration and Validation

It is important that a strategic transport model is appropriately calibrated and validated in line with best practice guidelines. The MWRM has been subject to a comprehensive calibration and validation process whereby a substantial amount of observed data has been incorporated into both the demand model and the assignment models as presented in Table 3-5.

Table 3-5: Observed data used for model calibration and validation

| Demand Model | Assignment Models |
|---|---|
| **Tour proportions** | Road traffic volumes |
| **Generalised cost distributions** | Road journey times |
| **Travel distance distributions** | Road trip length distribution |
| **Modal share** | Public transport in-vehicle time factors |
| **Journey time distribution** | Public transport fares and ticket types |
| | Public transport passenger flows |
| | Public transport boardings and alightings |
| | Public transport journey times |
| | Public transport interchange/transfers |

The calibration and validation process ensure that the MWRM accurately reflects existing conditions and 'costs' associated with travel. This allows changes in the forecasting of transport demand and strategic transport infrastructure schemes and appropriate transport policies to be modelled and tested using the MWRM. Further details on the model calibration can be found in the MWRM Demand, Road, PT and Active Mode development reports, available on the NTA's website[2]

[2] https://www.nationaltransport.ie/regional-transport-model/regional-model-overview/regional-model-structure/mwr/

### 3.4.2 Use of MWRM for Strategic Transport Planning

The model has many strengths and features that make it the ideal tool to aid the strategic planning process. The MWRM has been developed from first principles making best use of the most recently available data (POWSCAR and NHTS) to replicate travel choices and transport network conditions as accurately as possible.

Several distinct journey purposes and characteristics including car availability, employment status, and education level are considered within the model to evaluate travel choices more accurately. This carries through to forecasting whereby specific person type demand can be forecast to derive appropriate trip distributions and future year travel conditions.

The model utilises a tour-based approach which allows for more accurate mode choice modelling and consideration of travel costs, particularly with respect to the inclusion of parking charges.

Four main modes of travel: private car, public transport, walking, and cycling are included in the model. Each mode has been calibrated individually, for each journey purpose, to replicate observed trip cost distributions.

The use of SATURN software in the road model allows for junction modelling to be included in the model which improves typical network representation in congested areas over an entirely link-based approach. Link speeds and delays are transferred to the public transport model which allows journey times of on-street modes (Bus, BRT) to reflect perceived traffic conditions rather than a strict timetable.

The model covers the L-SMA region plus surrounding counties, and takes full account of travel within, into and out of the L-SMA area. As the model is also used as the basis for scheme evaluation, the transport networks represented contain a level of detail beyond that which would be normally required for its use as a strategic transport planning tool.

To account for the availability of parking facilities in Limerick and Shannon City Centre, both a free workplace parking model and a parking constraint model have been implemented to re-evaluate mode choice based on whether parking was available at the travellers' ultimate destination.

There are however, as with all transport models, limitations to what the model can be used to assess. There are a number of potential measures which cannot be assessed using the MWRM. These include, amongst others;

- Intelligent Transport measures which improve wayfinding, management of parking and route choices;
- Behavioural Change Initiatives which influence choice of mode and time of travel;
- Public Transport measures such as Real Time Information and integrated ticketing;
- Public Ream enhancements – which improve the quality of the environment and likelihood for walking/cycling trips.

With respect to the performance of individual junctions SATURN does provide information on the performance of individual junction but operational assessments of junctions should be undertaken at a more localised level using microscopic modelling. However, for the purposes of this strategy this level of detail is not required. Any measures identified in the strategy will need to undergo further assessment as part of their future appraisal which may include further modelling.

### 3.4.3 Summary

The Mid-West Regional Model (MWRM) provides a comprehensive representation of travel patterns across the Limerick and Shannon Metropolitan Area and is a suitable tool for the testing and appraisal of the Strategy. The limitations of strategic transport models are recognised and fully understood. The MWRM is considered the appropriate tool for fulfilling the NTA's requirements in terms of its planning and appraisal needs.

# 4 Modelled Scenario Comparison

## 4.1 Introduction

This section of the report outlines a comparison of the characteristics of the demand between the two 2040 modelled scenarios, the Do-Minimum Scenario and the Idealised Network Scenario. An overview of each scenario is provided below.

### 4.1.1 Do-Minimum Scenario

This scenario represented the committed future transport network, i.e. the base transport network with committed road improvements in place. This included Phase 1 of the Northern Distributor Road.

### 4.1.2 Idealised Network Scenario

The Idealised Network scenario facilitates an unconstrained analysis of potential public transport demand on key corridors in the L-SMA. In modelling the idealised network, it has been assumed that each corridor on the network will operate with optimal characteristics in terms of frequency, capacity, coverage, interchange opportunity, directness & speed. This will ensure that public transport represents a highly attractive mode for those travelling along the corridor.

In adopting this approach, it ensures that the maximum potential for public transport use on each corridor can be ascertained, although in reality; this may never be achieved. In addition, the full northern distributor road was modelled with PT priority to allow orbital bus movements. The Foynes to Limerick Road Scheme incorporating Adare Bypass was also included for this assessment though it is recognised that this scheme is not yet committed.

## 4.2 2040 Transport Demand Characteristics

### 4.2.1 Profile of Demand throughout the Day

In total, there are approximately 600,000 trips originating within the L-SMA over the 24-hour period in both the 2040 Do Min and Idealised Scenarios which represents a 21% increase compared to the 2012 base year model. The percentage breakdown of demand between the five modelled periods is approximately equal in both scenarios and is presented below in Figure 4-1. The busiest periods in terms of total demand are the AM morning peak and the Afternoon Inter peak.

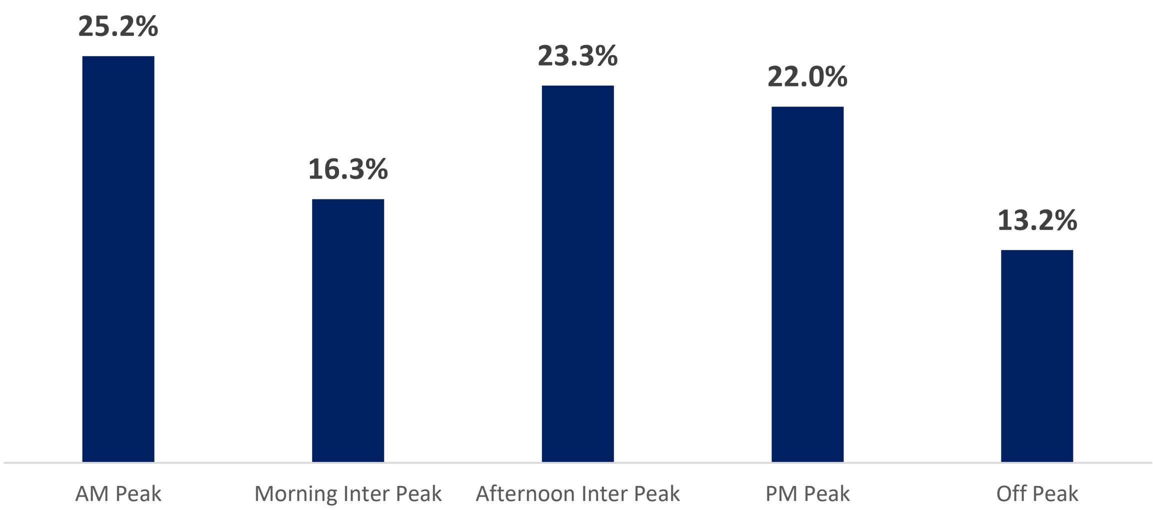


Figure 4-1: Percentage of 2040 Demand by Time Period

### 4.2.2 Breakdown of Trip Purposes

The breakdown of 2040 demand between trip purposes is shown in Figure 4-2 by time period and in Figure 4-3 for the 24-hour period. As expected, there is a higher level of commute in the morning and evening peak and more education trips in the morning and afternoon peaks. The 'Other' trip purpose is the largest trips purpose in each time period. This includes trips made by those in retirement, visiting friends and relatives, food shopping, leisure trips and non-food related shopping trips.

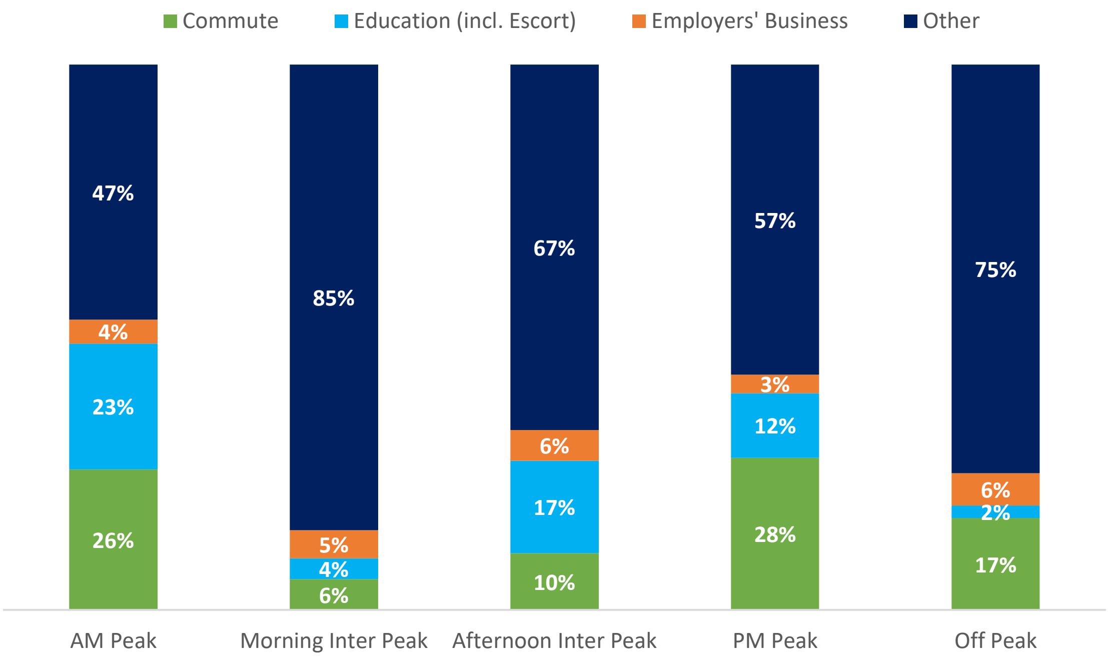


Figure 4-2: Percentage of 2040 Demand by Trip Purpose per Time Period

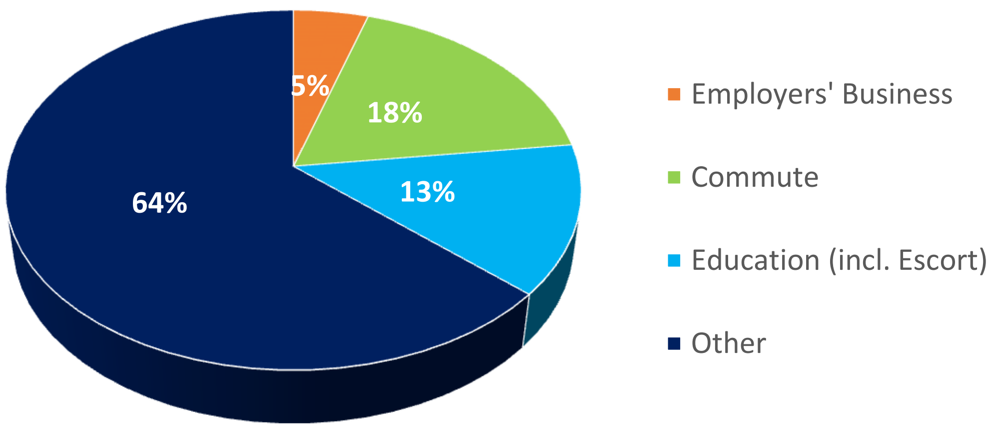


Figure 4-3: Percentage of 2040 24-Hour Demand by Trip Purpose

### 4.2.3 Overall Mode Share Comparison

The mode shares for the 24-hour period for the scenarios are shown below in Figure 4-4. The graph shows a reduced car mode share in the 2040 Idealised Network scenario, reducing from 67% to 61% respectively, with uplifts in the public transport mode shares. The chart below also shows a drop in the walking and cycling mode share in the Idealised scenario due to the high frequency and coverage of the unconstrained public transport network attraction.

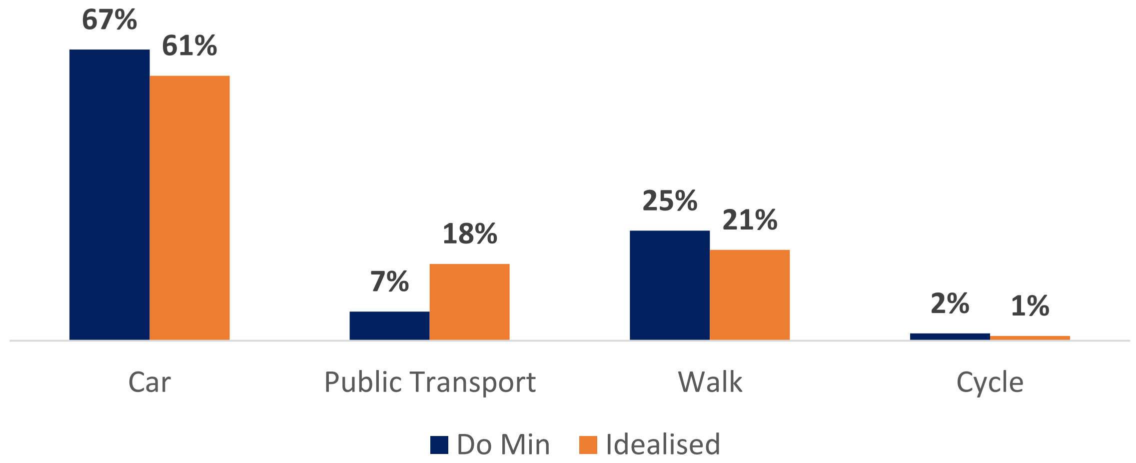


Figure 4-4: Limerick and Shannon Metropolitan 2040 24-Hour Mode Share Split Comparison

It should be noted that whilst the Idealised Scenario does include significant public transport provision it does not contain any significant demand management measures and thus the shift from private car to public transport is limited.

### 4.2.4 Mode Share by Trip Purpose Comparison

The mode share by trip purpose is outlined in Table 4.1 and Table 4.2 for the 2040 Do Minimum & Idealised Network Scenario. The results show that commuting and education car mode share are only slightly reduced in the idealised scenario with a more significant reduction in other road trips.

Table 4.1: Limerick and Shannon Metropolitan Area 2040 Do Min Mode Share by Trip Purpose

| Purpose | Road | PT | Walk | Cycle |
|---|---|---|---|---|
| Commute | 71.3% | 1.7% | 24.7% | 2.2% |
| Education | 51.4% | 8.3% | 39.1% | 1.3% |
| All Other Purposes | 71.6% | 7.8% | 19.2% | 1.4% |

Table 4.2: Limerick and Shannon Metropolitan Area 2040 Idealised Mode Share by Trip Purpose

| Purpose | Road | PT | Walk | Cycle |
|---|---|---|---|---|
| Commute | 70.9% | 4.3% | 23.2% | 1.6% |
| Education | 50.1% | 15.9% | 33.3% | 0.7% |
| All Other Purposes | 60.9% | 23.8% | 14.4% | 0.9% |

### 4.2.5 Mode Share by Area

The 24-hour mode share comparison for the Limerick City and Suburbs, Shannon, Other Metropolitan Areas and are presented in Figure 4-2 for both scenarios. As shown there is a significant uplift in the level of public transport across all areas in the 2040 Idealised scenario, with reduction in car mode share as well as walking and cycling due to the enhanced PT offering.

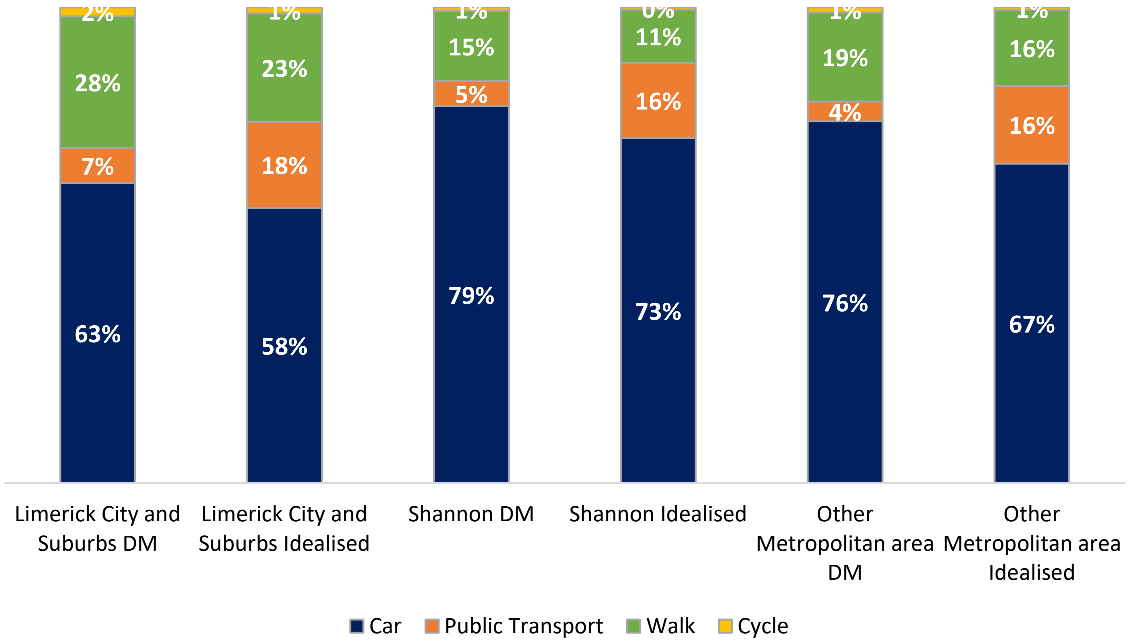


Figure 4-5: Limerick and Shannon Metropolitan 2040 24-Hour Mode Share Split by Area

A more detailed breakdown of the car mode share by MWRM zone is shown in Figure 4-6 & Figure 4-7 which illustrate the car more share in the 2040 Do-Minimum and Idealised Network Scenarios respectively. As shown there, notable decreases in car mode share throughout the metropolitan area particularly in the wider suburbs, university and proposed SDZ lands.

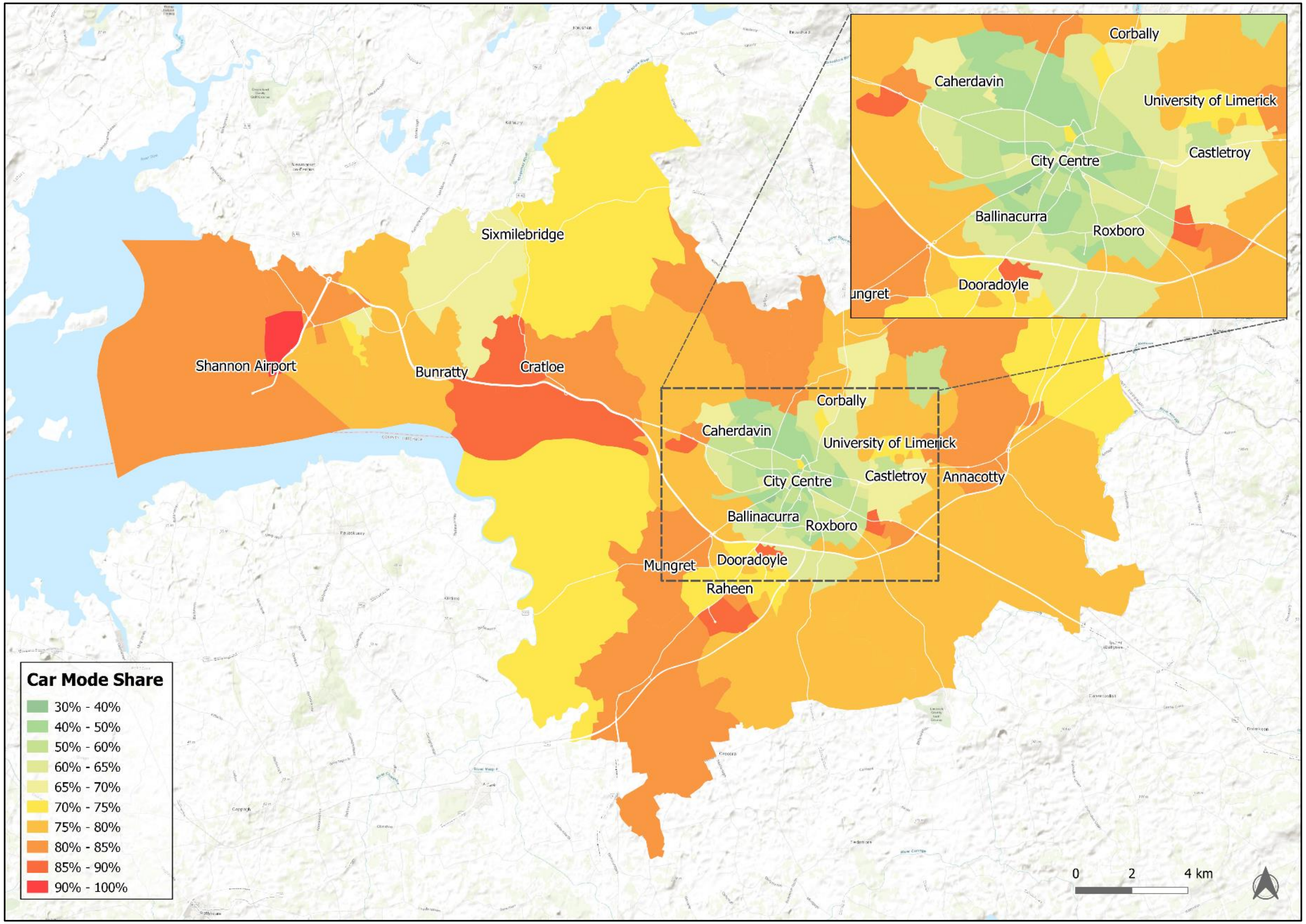


Figure 4-6: Limerick and Shannon Metropolitan 24-Hour 2040 DM Car Mode Share by MWRM Zone

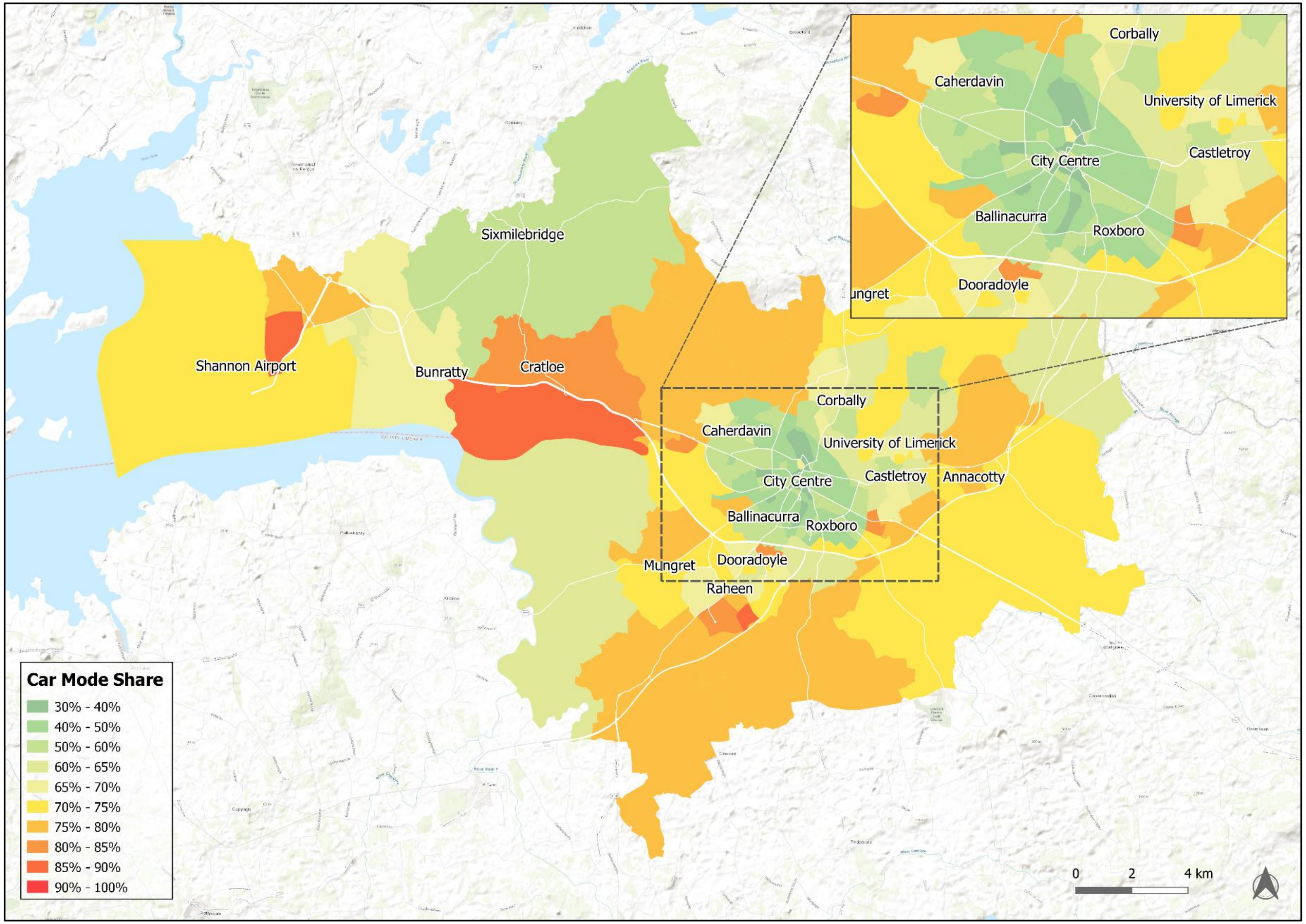


Figure 4-7: Limerick and Shannon Metropolitan 24-Hour 2040 Idealised Car Mode Share by MWRM Zone

### 4.2.6 Mode Share by Time Period

Figure 4-8 and Figure 4-9 show the mode shares for the Limerick and Shannon Metropolitan Area by time period for the 2040 Do-Minimum and Idealised Network Scenario. The figures show the most significant increases in public transport mode share with increments of approximately 10% in most of the peak time periods. This is due to both reductions in the car mode share and walk trips replaced by public transport.

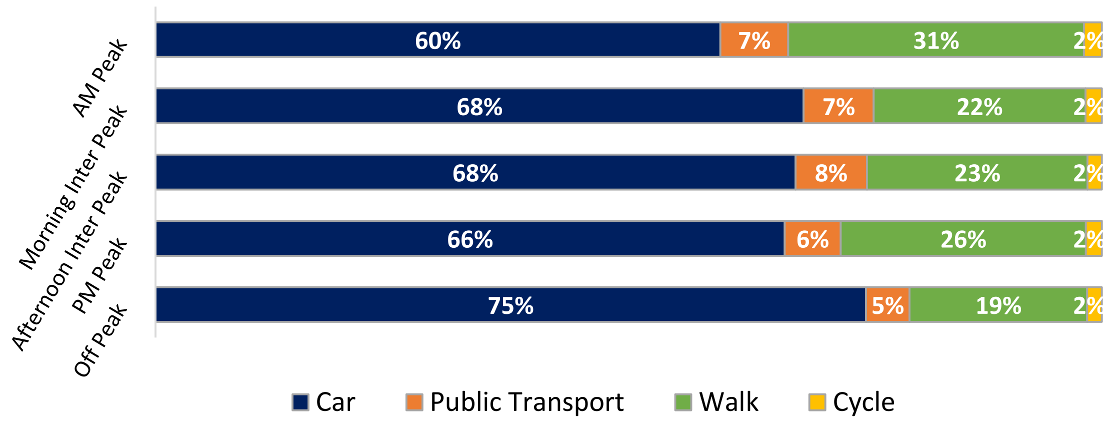


Figure 4-8: 2040 Do-Minimum Scenario Mode Shares by Time Period

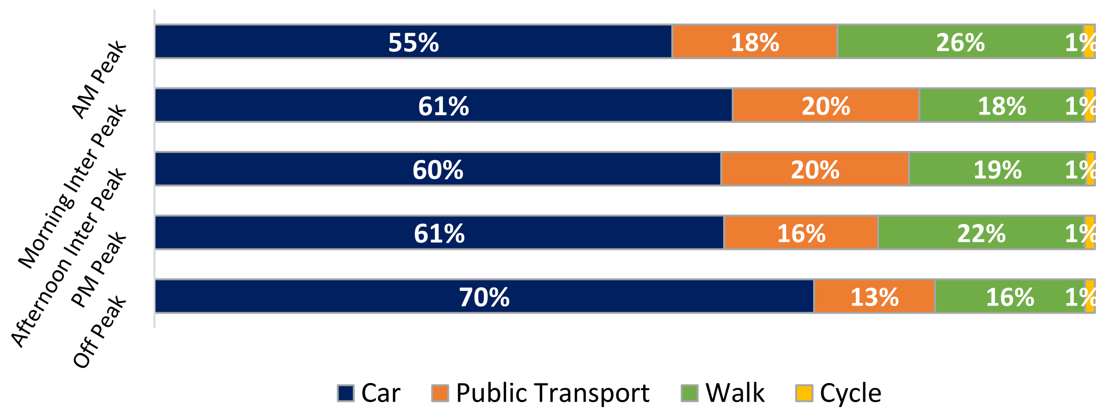


Figure 4-9: 2040 Idealised Network Scenario Mode Shares by Time Period

## 4.3 Transport Demand Movement Patterns

### 4.3.1 Sector to Sector Comparison Analysis

The movements between defined sectors were also extracted from the MWRM for the 24-Hour Period. Table 4.3 and Table 4.4 summarise this information at a high level between wider aggregated areas if the metropolitan area and outside the study area by proportion and absolute trip numbers.

Table 4.3: Limerick and Shannon Metropolitan 24-hour 2040 Idealised Destination Demand by Sector

| Origin/ Destination | Wider City | Metro Towns | Metro Rural | Outside Metro |
|---|---|---|---|---|
| Wider City | 79.3% | 3.1% | 5.9% | 11.7% |
| Metro Towns | 20.1% | 52.7% | 5.0% | 22.2% |
| Metro Rural | 53.6% | 8.4% | 20.6% | 17.4% |
| Outside Metro | 7.0% | 2.0% | 1.1% | 89.8% |

Table 4.4: County Level Total 24 Hour 2040 Idealised Demand

| 24-hour Demand | Wider City | Metro Towns | Metro Rural | Outside Metro | Total Origin Demand |
|---|---|---|---|---|---|
| Wider City | 372,115 | 14,586 | 27,914 | 54,713 | 469,328 |
| Metro Towns | 13,728 | 36,096 | 3,418 | 15,216 | 68,458 |
| Metro Rural | 28,942 | 4,548 | 11,129 | 9,426 | 54,045 |
| Outside Metro | 51,033 | 14,557 | 8,283 | 652,744 | 726,618 |
| Total Destination Demand | 465,818 | 69,788 | 50,744 | 732,099 | 1,318,450 |

The origin destination patterns were also analysed between the settlements presented in Section 2 and shown in Figure 2-2 and again in Figure 4-10 for clarity. The settlement to settlement movements are presented in Table 4.5 & Table 4.6 for the 2040 24 hour and AM time period respectively. As shown, there is strong demand between the city centre and surrounding settlement areas. There is also strong demand between the university and proposed SDZ, and between settlement south of the M20.

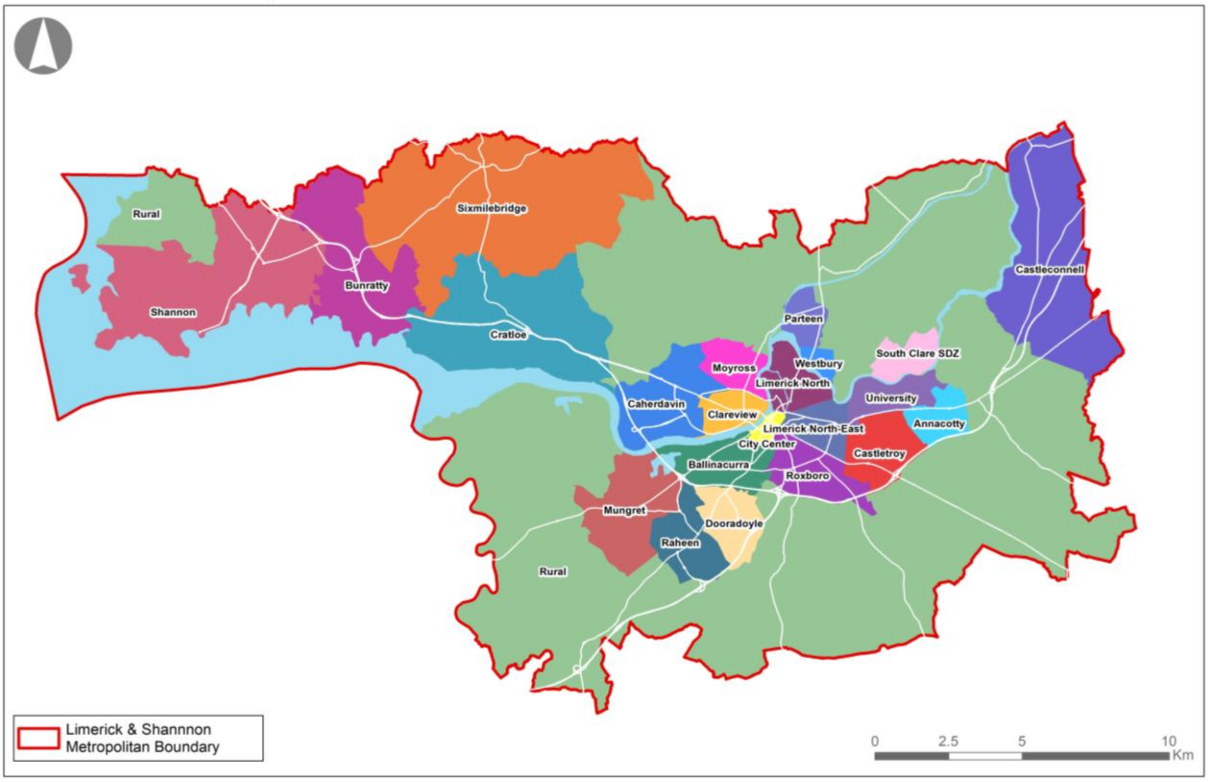


Figure 4-10: Sector System used for Origin-Destination Analysis

**Table 4.5 Settlement to Settlement Idealised 24 Hour 2040 Demand**

| Settlement | City Center | Annacotty | Ballinacurra | Caherdavin | Castletroy | Clareview | Dooradoyle | Limerick North | Limerick NE | Moyross | Mungret | Parteen | Raheen | Roxboro | SDZ | University | Westbury | Bunratty | Castleconnell | Cratloe | Shannon | Sixmilebridge | Rural |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **City Center** | 10840 | 865 | 5447 | 3164 | 1321 | 3580 | 2813 | 3225 | 4978 | 2683 | 586 | 190 | 1326 | 3969 | 742 | 952 | 732 | 58 | 416 | 187 | 729 | 426 | 2846 |
| **Annacotty** | 917 | 3778 | 615 | 272 | 1444 | 213 | 557 | 402 | 1429 | 243 | 231 | 70 | 330 | 820 | 617 | 1866 | 120 | 10 | 521 | 28 | 151 | 70 | 1856 |
| **Ballinacurra** | 5640 | 581 | 10496 | 1679 | 946 | 1669 | 4720 | 1294 | 2442 | 1223 | 1287 | 89 | 2902 | 2642 | 459 | 643 | 290 | 40 | 336 | 124 | 424 | 237 | 2545 |
| **Caherdavin** | 3321 | 284 | 1821 | 5743 | 296 | 2454 | 805 | 802 | 1100 | 2305 | 279 | 166 | 384 | 800 | 442 | 464 | 199 | 89 | 135 | 347 | 1225 | 420 | 1424 |
| **Castletroy** | 1384 | 1502 | 991 | 291 | 3187 | 334 | 845 | 580 | 2420 | 324 | 309 | 51 | 487 | 1659 | 613 | 1911 | 102 | 10 | 309 | 25 | 136 | 55 | 1582 |
| **Clareview** | 3590 | 207 | 1681 | 2333 | 327 | 3606 | 774 | 1046 | 1401 | 1843 | 182 | 91 | 311 | 1051 | 243 | 309 | 172 | 37 | 97 | 122 | 475 | 205 | 850 |
| **Dooradoyle** | 2868 | 518 | 4754 | 756 | 816 | 773 | 9792 | 650 | 1485 | 571 | 1710 | 45 | 4629 | 1729 | 307 | 486 | 134 | 24 | 299 | 71 | 305 | 122 | 3231 |
| **Limerick North** | 3333 | 417 | 1320 | 792 | 577 | 1087 | 674 | 3752 | 2533 | 1064 | 146 | 144 | 278 | 1224 | 555 | 707 | 587 | 18 | 159 | 56 | 242 | 137 | 1059 |
| **Limerick NE** | 5098 | 1429 | 2460 | 1071 | 2393 | 1417 | 1541 | 2509 | 8589 | 1186 | 362 | 125 | 708 | 3852 | 1249 | 1849 | 435 | 24 | 452 | 64 | 316 | 170 | 2371 |
| **Moyross** | 2738 | 247 | 1257 | 2339 | 321 | 1918 | 580 | 1066 | 1188 | 3826 | 126 | 135 | 235 | 822 | 699 | 505 | 170 | 49 | 110 | 131 | 448 | 228 | 935 |
| **Mungret** | 720 | 232 | 1574 | 285 | 319 | 208 | 2035 | 157 | 386 | 140 | 2531 | 15 | 2001 | 424 | 74 | 145 | 37 | 12 | 141 | 39 | 164 | 55 | 1503 |
| **Parteen** | 197 | 73 | 94 | 167 | 50 | 100 | 47 | 140 | 124 | 140 | 15 | 147 | 21 | 64 | 139 | 105 | 87 | 3 | 35 | 12 | 50 | 30 | 242 |
| **Raheen** | 1719 | 346 | 3589 | 414 | 526 | 382 | 5669 | 328 | 799 | 278 | 2081 | 24 | 6485 | 891 | 156 | 304 | 67 | 20 | 189 | 54 | 283 | 84 | 2096 |
| **Roxboro** | 4089 | 795 | 2686 | 778 | 1597 | 1062 | 1806 | 1193 | 3731 | 816 | 390 | 63 | 780 | 4918 | 541 | 846 | 222 | 20 | 261 | 52 | 265 | 130 | 2086 |
| **SDZ** | 911 | 631 | 537 | 477 | 616 | 290 | 325 | 534 | 1318 | 704 | 69 | 146 | 140 | 602 | 4977 | 5855 | 217 | 11 | 309 | 36 | 152 | 107 | 1117 |
| **University** | 1153 | 2042 | 715 | 489 | 1938 | 350 | 537 | 724 | 1981 | 532 | 142 | 112 | 278 | 949 | 5962 | 4362 | 263 | 23 | 629 | 46 | 179 | 135 | 1881 |
| **Westbury** | 741 | 116 | 290 | 186 | 96 | 174 | 135 | 568 | 424 | 161 | 35 | 84 | 60 | 221 | 207 | 237 | 321 | 6 | 44 | 18 | 88 | 37 | 288 |
| **Bunratty** | 62 | 10 | 44 | 89 | 10 | 40 | 25 | 18 | 26 | 49 | 11 | 3 | 17 | 21 | 11 | 23 | 6 | 345 | 10 | 42 | 877 | 192 | 96 |
| **Castleconnell** | 403 | 502 | 341 | 129 | 296 | 97 | 305 | 149 | 439 | 106 | 138 | 33 | 176 | 257 | 280 | 569 | 45 | 10 | 2178 | 15 | 114 | 69 | 743 |
| **Cratloe** | 174 | 27 | 125 | 333 | 24 | 119 | 72 | 52 | 58 | 119 | 35 | 11 | 45 | 47 | 37 | 42 | 18 | 43 | 15 | 539 | 578 | 200 | 191 |
| **Shannon** | 716 | 143 | 436 | 1122 | 136 | 467 | 292 | 225 | 319 | 399 | 138 | 47 | 230 | 261 | 141 | 157 | 85 | 795 | 114 | 506 | 23239 | 1494 | 2009 |
| **Sixmilebridge** | 377 | 63 | 225 | 376 | 48 | 189 | 108 | 121 | 149 | 195 | 46 | 27 | 63 | 113 | 95 | 114 | 35 | 179 | 62 | 178 | 1454 | 2848 | 379 |
| **Rural** | 3082 | 1910 | 2798 | 1435 | 1633 | 912 | 3543 | 1057 | 2433 | 941 | 1459 | 236 | 1998 | 2259 | 1129 | 1817 | 300 | 117 | 758 | 207 | 3005 | 461 | 11129 |

**Table 4.6 Settlement to Settlement Idealised 2040 AM Demand**

| Settlement | City Center | Annacotty | Ballinacurra | Caherdavin | Castletroy | Clareview | Dooradoyle | Limerick North | Limerick NE | Moyross | Mungret | Parteen | Raheen | Roxboro | SDZ | University | Westbury | Bunratty | Castleconnell | Cratloe | Shannon | Sixmilebridge | Rural |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **City Center** | 2237 | 101 | 1183 | 295 | 156 | 473 | 396 | 435 | 761 | 406 | 76 | 21 | 151 | 696 | 89 | 233 | 54 | 8 | 40 | 22 | 113 | 46 | 305 |
| **Annacotty** | 269 | 1307 | 234 | 64 | 375 | 53 | 150 | 117 | 384 | 72 | 95 | 21 | 121 | 259 | 186 | 844 | 16 | 4 | 74 | 7 | 62 | 10 | 470 |
| **Ballinacurra** | 1467 | 71 | 3548 | 181 | 133 | 301 | 910 | 243 | 540 | 277 | 186 | 12 | 381 | 652 | 65 | 207 | 27 | 6 | 26 | 15 | 84 | 26 | 300 |
| **Caherdavin** | 1086 | 83 | 781 | 1793 | 87 | 900 | 227 | 271 | 343 | 857 | 91 | 55 | 118 | 275 | 130 | 194 | 33 | 33 | 19 | 107 | 447 | 73 | 376 |
| **Castletroy** | 422 | 505 | 367 | 60 | 980 | 85 | 217 | 176 | 743 | 111 | 115 | 15 | 166 | 552 | 190 | 961 | 14 | 3 | 39 | 6 | 51 | 8 | 356 |
| **Clareview** | 1177 | 46 | 622 | 395 | 75 | 1153 | 186 | 270 | 387 | 498 | 44 | 21 | 67 | 321 | 51 | 110 | 24 | 10 | 14 | 27 | 130 | 36 | 162 |
| **Dooradoyle** | 776 | 93 | 1584 | 101 | 143 | 147 | 2508 | 132 | 323 | 114 | 422 | 8 | 1264 | 401 | 62 | 177 | 13 | 6 | 27 | 11 | 90 | 15 | 587 |
| **Limerick North** | 1042 | 106 | 500 | 155 | 138 | 326 | 166 | 1347 | 741 | 284 | 42 | 41 | 70 | 401 | 121 | 269 | 92 | 5 | 24 | 13 | 72 | 23 | 211 |
| **Limerick NE** | 1442 | 270 | 751 | 154 | 428 | 336 | 312 | 624 | 2330 | 258 | 80 | 24 | 144 | 1106 | 211 | 621 | 48 | 5 | 53 | 11 | 72 | 24 | 381 |
| **Moyross** | 747 | 60 | 413 | 598 | 63 | 620 | 132 | 335 | 313 | 1281 | 25 | 43 | 51 | 255 | 119 | 162 | 26 | 9 | 17 | 34 | 115 | 39 | 192 |
| **Mungret** | 191 | 31 | 558 | 47 | 44 | 40 | 520 | 31 | 75 | 36 | 730 | 2 | 553 | 85 | 17 | 53 | 3 | 4 | 8 | 6 | 54 | 6 | 262 |
| **Parteen** | 57 | 22 | 39 | 42 | 13 | 27 | 13 | 46 | 33 | 37 | 6 | 55 | 7 | 20 | 41 | 43 | 14 | 1 | 6 | 3 | 20 | 5 | 53 |
| **Raheen** | 492 | 65 | 1448 | 83 | 98 | 92 | 1479 | 88 | 192 | 80 | 670 | 5 | 2277 | 234 | 40 | 120 | 9 | 6 | 18 | 10 | 97 | 12 | 396 |
| **Roxboro** | 1105 | 146 | 872 | 113 | 281 | 245 | 409 | 260 | 858 | 164 | 87 | 12 | 174 | 1435 | 94 | 273 | 24 | 4 | 31 | 9 | 62 | 20 | 356 |
| **SDZ** | 207 | 126 | 206 | 93 | 98 | 62 | 57 | 160 | 304 | 299 | 12 | 42 | 33 | 150 | 1604 | 3466 | 25 | 2 | 33 | 6 | 31 | 10 | 204 |
| **University** | 242 | 298 | 162 | 59 | 223 | 55 | 75 | 118 | 361 | 125 | 19 | 15 | 35 | 176 | 521 | 1383 | 24 | 2 | 60 | 4 | 25 | 12 | 219 |
| **Westbury** | 261 | 46 | 142 | 58 | 32 | 64 | 43 | 299 | 146 | 55 | 14 | 40 | 24 | 91 | 79 | 112 | 86 | 3 | 9 | 6 | 37 | 7 | 88 |
| **Bunratty** | 19 | 2 | 18 | 17 | 2 | 10 | 6 | 5 | 8 | 20 | 3 | 1 | 4 | 6 | 3 | 13 | 1 | 92 | 1 | 9 | 263 | 32 | 32 |
| **Castleconnell** | 137 | 213 | 157 | 49 | 105 | 34 | 114 | 64 | 129 | 39 | 73 | 15 | 89 | 92 | 123 | 265 | 10 | 5 | 671 | 6 | 56 | 16 | 298 |
| **Cratloe** | 43 | 9 | 54 | 97 | 8 | 32 | 21 | 17 | 15 | 37 | 12 | 3 | 15 | 14 | 14 | 22 | 3 | 16 | 2 | 196 | 227 | 41 | 59 |
| **Shannon** | 193 | 19 | 144 | 140 | 22 | 93 | 56 | 45 | 76 | 89 | 26 | 6 | 37 | 68 | 31 | 68 | 6 | 197 | 9 | 76 | 6386 | 189 | 619 |
| **Sixmilebridge** | 113 | 25 | 109 | 122 | 16 | 58 | 36 | 49 | 47 | 65 | 20 | 11 | 25 | 42 | 42 | 62 | 6 | 66 | 12 | 69 | 580 | 748 | 144 |
| **Rural** | 973 | 622 | 1155 | 427 | 507 | 277 | 1127 | 403 | 715 | 307 | 573 | 99 | 768 | 780 | 388 | 811 | 51 | 33 | 134 | 65 | 793 | 77 | 3592 |

# 5 Corridor Analysis

## 5.1 Overview

To facilitate analysis of 2040 travel demand within the L-SMA, the area was divided into several corridors based on the national and regional transport networks around a central city centre core. This section of the report provides a comparison of overall demand from each corridor and an analysis of the demand characteristics and distribution for each corridor using outputs from the MWRM 2040 idealised network model run.

These corridors are primarily used to describe radially-based trips, which represents the most dominant trip pattern within the L-SMA.

The corridors and the settlements within each corridor are as follows:

- Corridor A: King's Island, Westbury and Parteen;
- Corridor B: The University, South Clare SDZ, Annacotty, Castletroy, Garryowen and Castleconnell;
- Corridor C: Roxboro;
- Corridor D: Dooradoyle, Raheen and Ballinacurra;
- Corridor E: Mungret, and Ballinacurra;
- Corridor F: Moyross, Clareview, Caherdavin, Shannon, Bunratty, Sixmilebridge and Cratloe.

The corridors have been subdivided into smaller segments based on inner and outer sectors which allow for the greater understanding of movements along the corridor and orbital trips between corridors. The city core, sectors, corridors and segments are shown in Figure 5-1. The segments are named based on their corridor letter and sector number (i.e. Segment B1 lies with corridor B and sector 1).

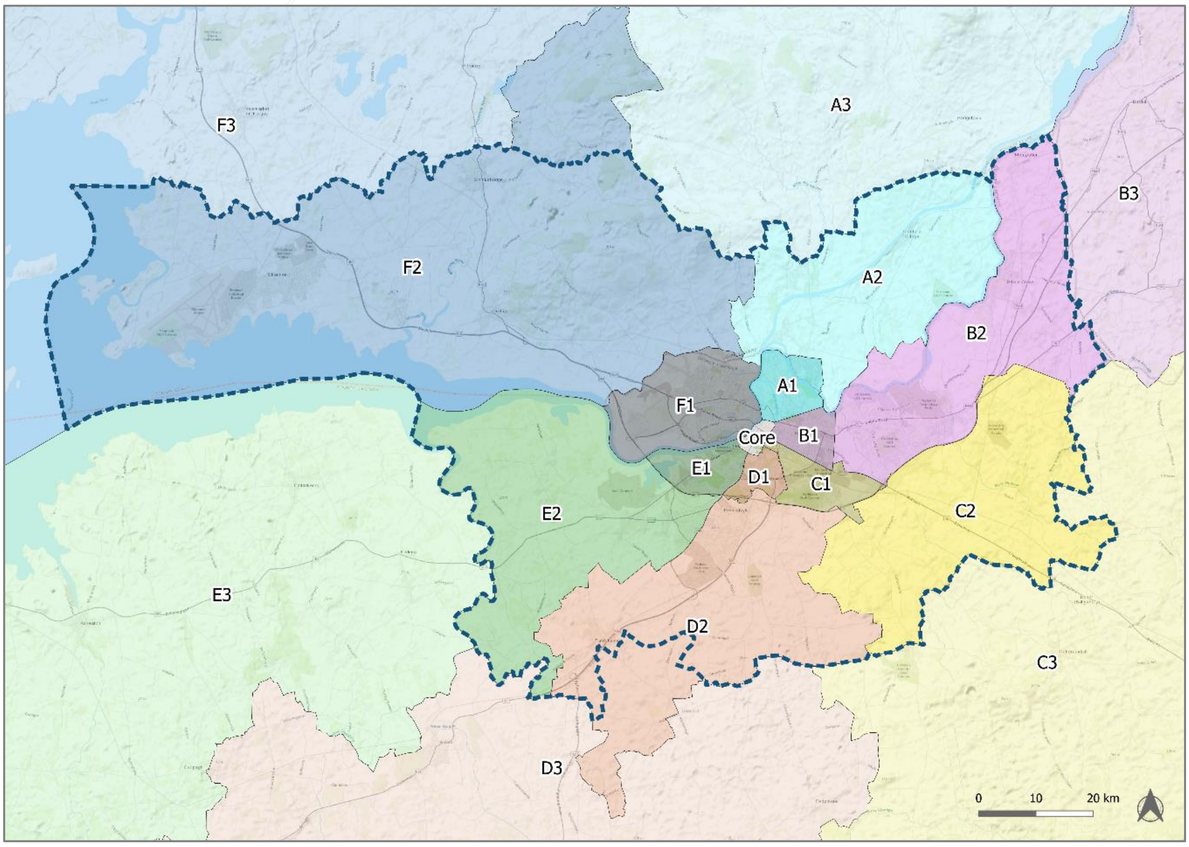

Figure 5-1 L-SMA Corridor & Segments

## 5.2 Corridor Comparison

### 5.2.1 Population & Employment

The total 2040 population, employment and education figures by corridor is shown in Figure 5-2 as modelled in the 2040 planning sheet. The Figure shows Corridor B has the highest population followed by Corridor F. Corridor D & E also have a significant residential population. Employment is highest within the Corridor B followed by Corridor F, E & City Core.

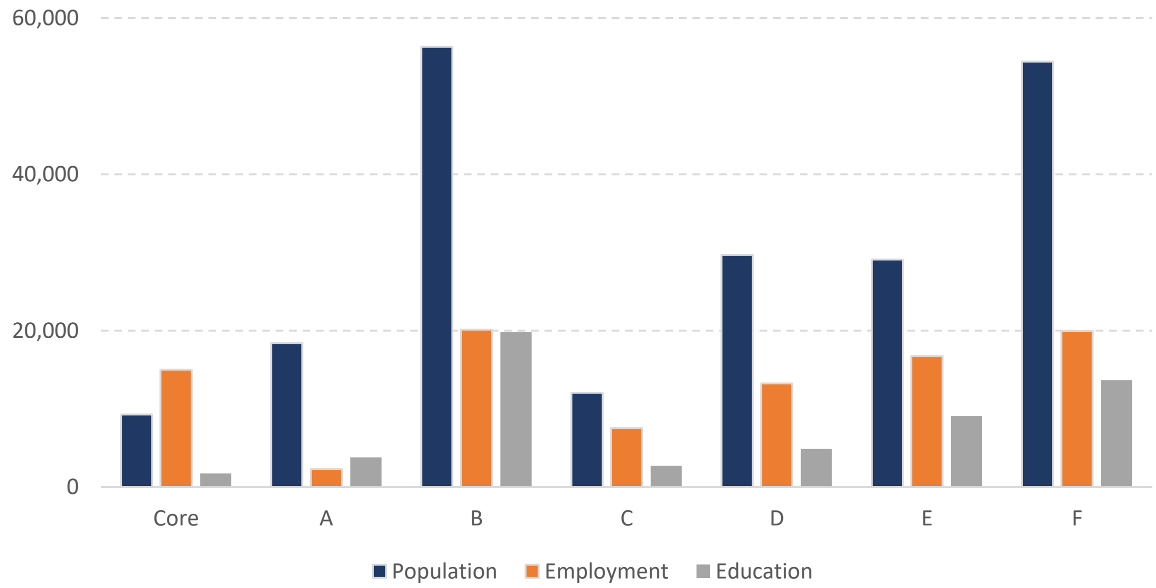


Figure 5-2 2040 Employment & Population by Corridor (2040 Planning Sheet)

### 5.2.2 Total Demand

The total all day 2040 demand originating within each corridor has been extracted from the idealised MWRM model run and is shown in the graph in Figure 5-3, which also provides a breakdown of corridor demand by segment. The all-day demand by segment is also illustrated in Figure 5-4.

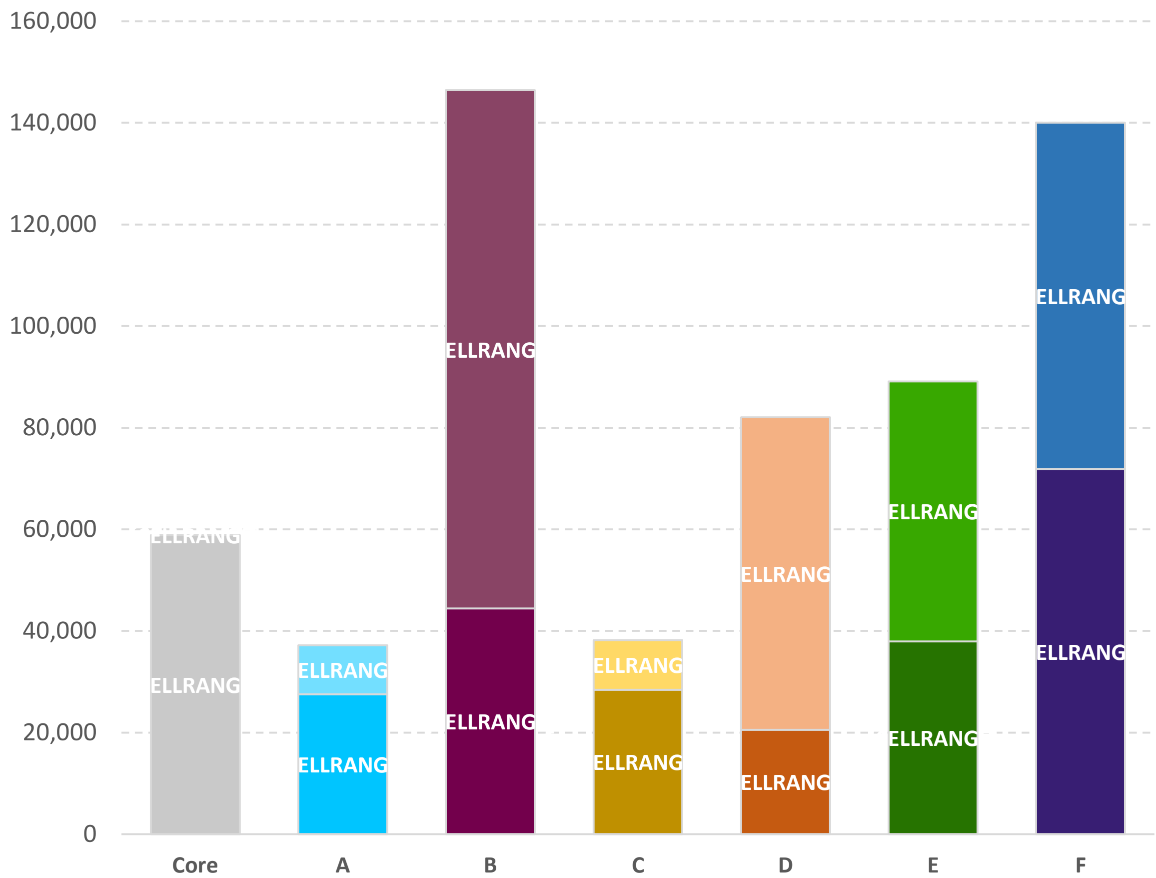


Figure 5-3 2040 All Day Demand Originating within each Corridor

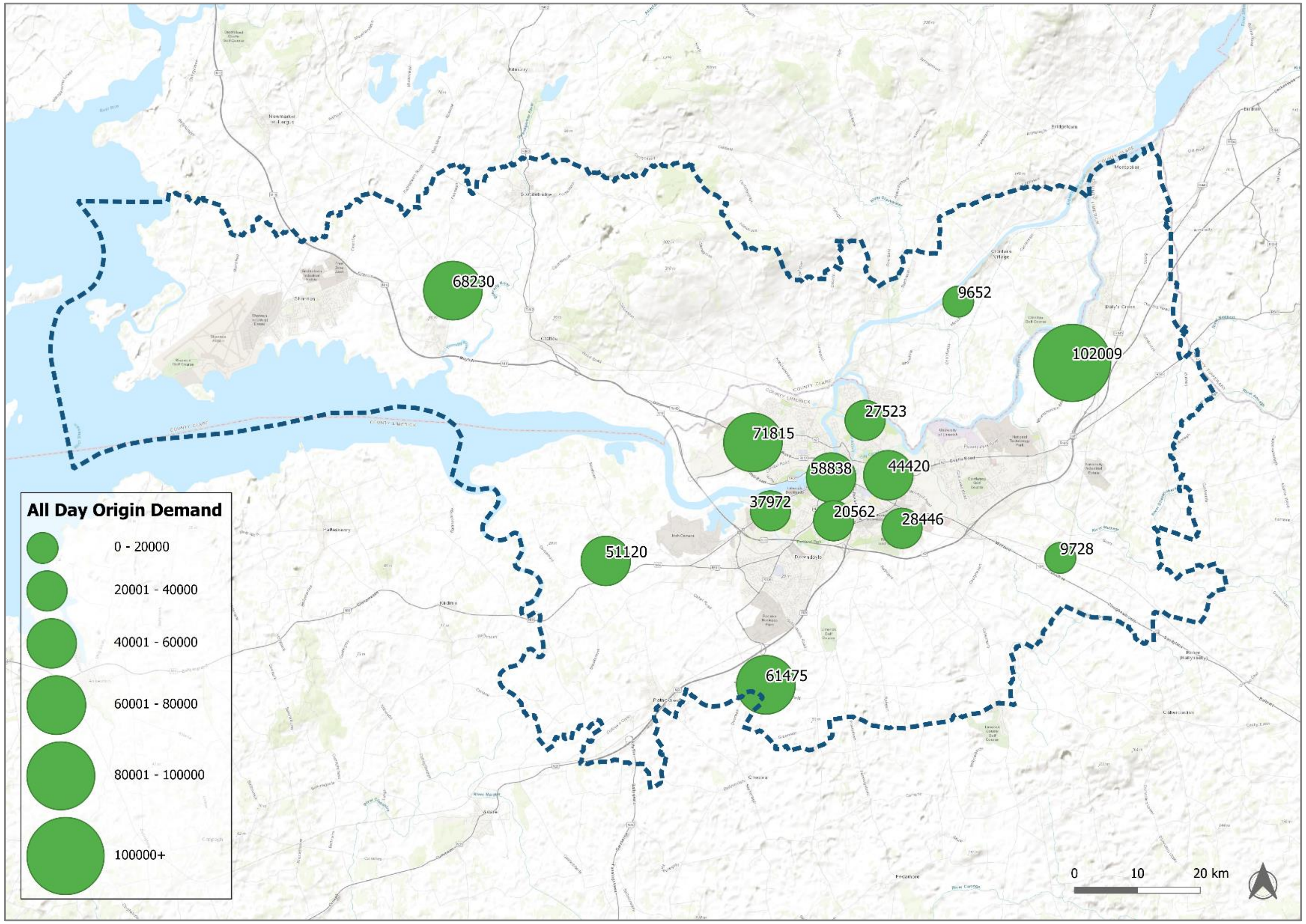


Figure 5-4 2040 All Day Demand Originating within each Segment

### 5.2.3 Mode Share

The mode share for each corridor and the core centre segment have been extracted from the 2040 idealised scenario and are presented in Figure 5-5. The figure shows a lower car mode share within the core city centre segment followed by Corridors A, F, B & C. The highest walking mode shares are also observed in the core city centre, segments A and C. The car mode share within the other corridors are comparable ranging between 61.8%-65.6%.

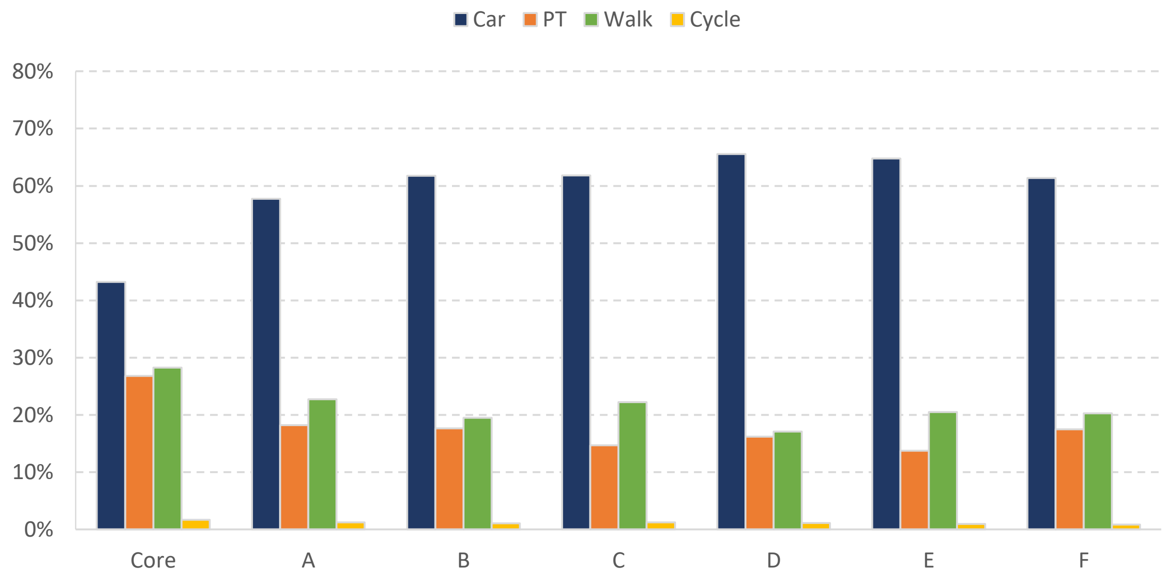


Figure 5-5 2040 Corridor Mode Share-24 hour

The mode share for each corridor has also been disaggregated to each segment as shown below in Figure 5-6.

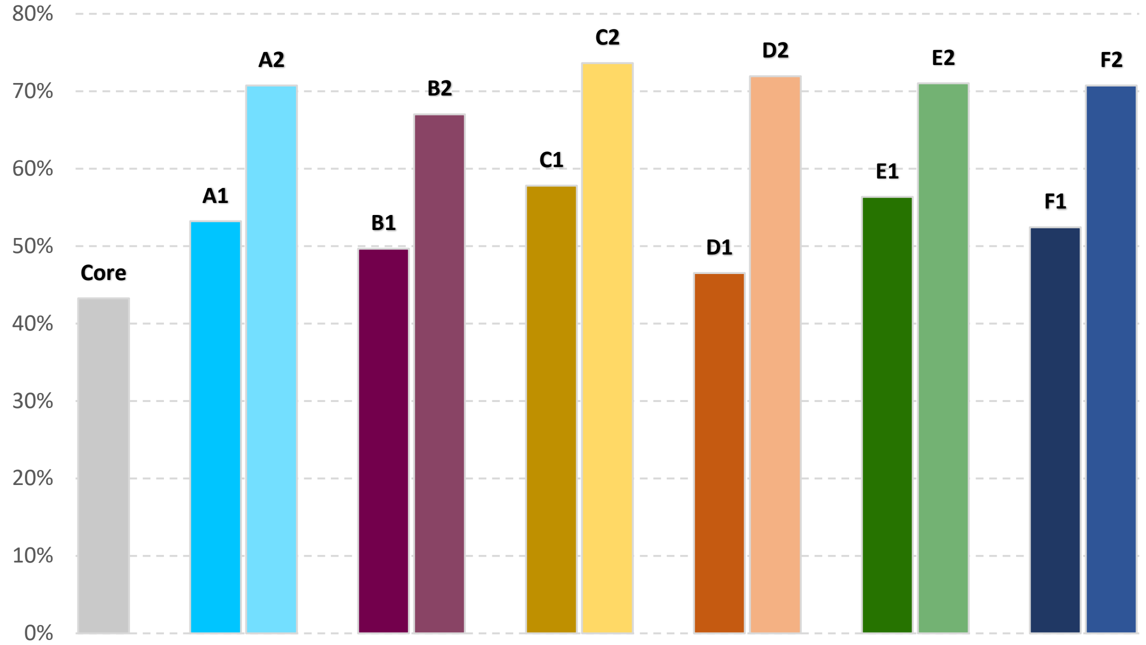


Figure 5-6 2040 Segment Car Mode Share-24 hour

### 5.2.4 Limerick and Shannon Metropolitan Origin & Destination Patterns

2040 Origin-Destination (OD) matrices were developed for all trips between each segment for all time periods, modes and trip purposes for the idealised scenario. The matrices for the 24 hour and AM peak for both the total demand, PT demand and Road demand are presented in Table 5.1 to Table 5.6.

The 24-hour total demand OD matrices show strong demand from most areas to the city core particularly from corridors B & F by public transport. In terms of orbital movements, there is significant demand between E2 & D2 by road. In terms of cross city demand, there is strong demand between Corridors B & F mainly F1.

Table 5.1 Segment to Segment 24-hour Total 2040 Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 10840 | 3958 | 724 | 4978 | 4173 | 2743 | 346 | 3201 | 3818 | 3754 | 2377 | 9428 | 1736 |
| A1 | 4074 | 5227 | 723 | 2957 | 3014 | 1362 | 180 | 716 | 1077 | 1240 | 562 | 3464 | 800 |
| A2 | 717 | 705 | 1508 | 483 | 1756 | 295 | 89 | 111 | 265 | 297 | 156 | 1249 | 576 |
| B1 | 5098 | 2943 | 495 | 8589 | 6998 | 3464 | 511 | 1797 | 2492 | 1678 | 1218 | 3674 | 716 |
| B2 | 4785 | 3077 | 1799 | 7376 | 46774 | 5275 | 2054 | 1396 | 3917 | 2533 | 2145 | 4771 | 1822 |
| C1 | 2580 | 1265 | 278 | 3129 | 4454 | 3078 | 562 | 1565 | 2292 | 1084 | 1129 | 2193 | 468 |
| C2 | 397 | 193 | 95 | 546 | 2179 | 689 | 2059 | 145 | 675 | 303 | 337 | 295 | 126 |
| D1 | 3429 | 735 | 117 | 1840 | 1365 | 1693 | 134 | 2278 | 2199 | 1978 | 972 | 1687 | 361 |
| D2 | 4018 | 1068 | 269 | 2472 | 3740 | 2489 | 603 | 2112 | 17141 | 4600 | 9131 | 2723 | 879 |
| E1 | 3850 | 1210 | 292 | 1642 | 2255 | 1122 | 254 | 1890 | 4377 | 7394 | 4509 | 3647 | 826 |
| E2 | 2900 | 629 | 174 | 1337 | 2203 | 1350 | 320 | 1049 | 10575 | 5439 | 15401 | 1859 | 881 |
| F1 | 9649 | 3456 | 1251 | 3689 | 4547 | 2330 | 277 | 1629 | 2738 | 3852 | 1668 | 26366 | 4874 |
| F2 | 1735 | 770 | 556 | 715 | 1720 | 504 | 115 | 333 | 857 | 886 | 751 | 4649 | 39903 |

Table 5.2 Segment to Segment 24-hour 2040 Public Transport Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 1643 | 804 | 254 | 1168 | 1353 | 688 | 63 | 744 | 883 | 589 | 685 | 1922 | 766 |
| A1 | 858 | 407 | 88 | 425 | 436 | 238 | 20 | 195 | 285 | 207 | 196 | 536 | 199 |
| A2 | 243 | 75 | 94 | 109 | 210 | 70 | 6 | 47 | 60 | 66 | 38 | 197 | 74 |
| B1 | 1202 | 406 | 112 | 932 | 1156 | 481 | 44 | 345 | 465 | 345 | 281 | 805 | 327 |
| B2 | 1818 | 515 | 272 | 1466 | 4015 | 808 | 122 | 356 | 526 | 560 | 293 | 1315 | 535 |
| C1 | 626 | 210 | 65 | 431 | 566 | 267 | 26 | 239 | 274 | 164 | 174 | 518 | 213 |
| C2 | 75 | 21 | 7 | 50 | 102 | 34 | 20 | 15 | 21 | 26 | 13 | 50 | 24 |
| D1 | 803 | 197 | 49 | 367 | 318 | 268 | 14 | 223 | 332 | 202 | 197 | 484 | 184 |
| D2 | 1072 | 302 | 69 | 547 | 479 | 345 | 20 | 346 | 1006 | 529 | 709 | 610 | 251 |
| E1 | 629 | 200 | 66 | 368 | 420 | 189 | 22 | 189 | 451 | 252 | 393 | 508 | 203 |
| E2 | 941 | 233 | 53 | 364 | 314 | 244 | 17 | 226 | 811 | 530 | 683 | 466 | 200 |
| F1 | 1914 | 520 | 190 | 824 | 1043 | 559 | 46 | 464 | 538 | 557 | 367 | 2479 | 944 |
| F2 | 811 | 197 | 76 | 355 | 467 | 249 | 22 | 175 | 234 | 254 | 149 | 986 | 4062 |

Table 5.3 Segment to Segment 24-hour 2040 Road Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 4225 | 1580 | 378 | 1858 | 2172 | 1132 | 229 | 1181 | 2065 | 1791 | 1208 | 4201 | 907 |
| A1 | 1627 | 2587 | 562 | 1353 | 2292 | 674 | 142 | 264 | 645 | 640 | 304 | 1842 | 581 |
| A2 | 382 | 558 | 841 | 317 | 1440 | 201 | 80 | 52 | 195 | 206 | 114 | 952 | 490 |
| B1 | 1947 | 1370 | 327 | 3310 | 4468 | 1678 | 384 | 752 | 1584 | 813 | 780 | 1604 | 361 |
| B2 | 2238 | 2249 | 1411 | 4436 | 30752 | 3615 | 1710 | 858 | 3269 | 1782 | 1816 | 3113 | 1276 |
| C1 | 1060 | 616 | 190 | 1426 | 3113 | 1465 | 455 | 710 | 1615 | 597 | 823 | 1013 | 242 |
| C2 | 263 | 154 | 85 | 410 | 1865 | 568 | 652 | 113 | 639 | 260 | 319 | 219 | 102 |
| D1 | 1309 | 276 | 55 | 760 | 879 | 789 | 105 | 779 | 1440 | 865 | 627 | 691 | 169 |
| D2 | 2027 | 613 | 190 | 1463 | 3147 | 1714 | 568 | 1329 | 12467 | 3061 | 7484 | 1768 | 620 |
| E1 | 1838 | 622 | 200 | 754 | 1664 | 603 | 215 | 800 | 2968 | 2982 | 2853 | 2090 | 603 |
| E2 | 1425 | 327 | 116 | 800 | 1854 | 959 | 298 | 662 | 8770 | 3547 | 10476 | 1215 | 677 |
| F1 | 4431 | 1861 | 962 | 1600 | 3199 | 1097 | 207 | 667 | 1875 | 2238 | 1143 | 11585 | 3760 |
| F2 | 861 | 553 | 468 | 333 | 1243 | 241 | 92 | 150 | 615 | 613 | 599 | 3496 | 27942 |

Table 5.4 Segment to Segment 2040 AM Peak Total Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 2237 | 489 | 76 | 761 | 578 | 592 | 41 | 440 | 518 | 916 | 250 | 1174 | 225 |
| A1 | 1303 | 1825 | 185 | 887 | 888 | 511 | 39 | 194 | 278 | 526 | 140 | 942 | 211 |
| A2 | 216 | 248 | 530 | 133 | 659 | 112 | 25 | 32 | 94 | 145 | 60 | 393 | 209 |
| B1 | 1442 | 672 | 77 | 2330 | 1438 | 1125 | 82 | 373 | 480 | 564 | 217 | 748 | 136 |
| B2 | 1298 | 736 | 364 | 1919 | 14767 | 1755 | 405 | 304 | 1057 | 991 | 620 | 1280 | 430 |
| C1 | 595 | 191 | 31 | 587 | 590 | 856 | 67 | 278 | 376 | 281 | 165 | 327 | 71 |
| C2 | 124 | 58 | 23 | 160 | 761 | 265 | 576 | 38 | 238 | 117 | 118 | 86 | 44 |
| D1 | 1070 | 208 | 26 | 543 | 377 | 622 | 28 | 751 | 582 | 883 | 231 | 454 | 89 |
| D2 | 1151 | 228 | 39 | 623 | 859 | 808 | 97 | 484 | 4822 | 1621 | 1996 | 538 | 216 |
| E1 | 924 | 170 | 28 | 313 | 294 | 296 | 22 | 334 | 763 | 2525 | 491 | 521 | 111 |
| E2 | 856 | 158 | 29 | 333 | 516 | 416 | 54 | 257 | 3269 | 2307 | 4904 | 468 | 274 |
| F1 | 3010 | 960 | 291 | 1043 | 1158 | 837 | 58 | 421 | 698 | 1554 | 370 | 8093 | 1362 |
| F2 | 472 | 201 | 111 | 188 | 524 | 173 | 21 | 78 | 218 | 368 | 145 | 1111 | 11062 |

Table 5.5 Segment to Segment 2040 AM Peak Public Transport Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 338 | 115 | 31 | 199 | 194 | 142 | 8 | 102 | 142 | 143 | 87 | 292 | 112 |
| A1 | 284 | 134 | 22 | 137 | 116 | 87 | 3 | 54 | 79 | 87 | 50 | 157 | 49 |
| A2 | 88 | 28 | 34 | 41 | 67 | 31 | 1 | 16 | 20 | 34 | 12 | 70 | 21 |
| B1 | 334 | 93 | 19 | 238 | 233 | 141 | 6 | 70 | 101 | 116 | 52 | 176 | 63 |
| B2 | 537 | 159 | 72 | 444 | 1180 | 272 | 23 | 99 | 139 | 239 | 74 | 414 | 128 |
| C1 | 165 | 43 | 11 | 97 | 92 | 76 | 3 | 46 | 52 | 49 | 28 | 102 | 38 |
| C2 | 33 | 11 | 3 | 24 | 47 | 18 | 8 | 7 | 10 | 16 | 6 | 25 | 10 |
| D1 | 267 | 62 | 12 | 122 | 91 | 95 | 3 | 66 | 91 | 82 | 49 | 148 | 47 |
| D2 | 339 | 89 | 16 | 165 | 129 | 128 | 4 | 94 | 288 | 211 | 154 | 186 | 64 |
| E1 | 170 | 43 | 10 | 92 | 77 | 55 | 3 | 40 | 99 | 84 | 74 | 116 | 35 |
| E2 | 326 | 86 | 15 | 129 | 103 | 100 | 4 | 79 | 263 | 255 | 218 | 169 | 57 |
| F1 | 631 | 157 | 50 | 268 | 257 | 204 | 8 | 127 | 142 | 225 | 88 | 718 | 229 |
| F2 | 259 | 61 | 19 | 112 | 124 | 93 | 4 | 50 | 66 | 109 | 37 | 284 | 1028 |

Table 5.6 Segment to Segment 2040 AM Peak Road Demand

| Segment | Core | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Core | 791 | 198 | 39 | 273 | 337 | 205 | 29 | 165 | 307 | 341 | 135 | 516 | 110 |
| A1 | 330 | 819 | 140 | 292 | 717 | 192 | 33 | 54 | 172 | 227 | 80 | 413 | 159 |
| A2 | 89 | 199 | 297 | 72 | 564 | 70 | 23 | 12 | 72 | 97 | 47 | 288 | 186 |
| B1 | 396 | 277 | 51 | 735 | 1071 | 421 | 68 | 134 | 331 | 224 | 152 | 280 | 70 |
| B2 | 475 | 470 | 258 | 866 | 9555 | 1074 | 331 | 147 | 895 | 659 | 540 | 756 | 301 |
| C1 | 192 | 84 | 18 | 232 | 448 | 356 | 57 | 109 | 285 | 126 | 127 | 128 | 32 |
| C2 | 65 | 41 | 19 | 98 | 656 | 204 | 179 | 26 | 225 | 92 | 111 | 54 | 35 |
| D1 | 284 | 62 | 11 | 168 | 254 | 215 | 23 | 213 | 406 | 270 | 160 | 144 | 41 |
| D2 | 378 | 87 | 20 | 259 | 703 | 450 | 90 | 208 | 3318 | 839 | 1632 | 243 | 151 |
| E1 | 338 | 73 | 16 | 113 | 202 | 127 | 18 | 127 | 548 | 823 | 327 | 255 | 74 |
| E2 | 259 | 46 | 13 | 131 | 405 | 238 | 49 | 107 | 2636 | 1165 | 3248 | 234 | 216 |
| F1 | 927 | 433 | 223 | 332 | 851 | 305 | 46 | 132 | 494 | 759 | 258 | 2762 | 1094 |
| F2 | 189 | 133 | 88 | 67 | 399 | 74 | 16 | 25 | 151 | 250 | 107 | 770 | 7815 |

## 5.3 Activity Density

### 5.3.1 Overview

The gross Activity Density (combined population, education and employment density) has significant implications for the economic viability of transport infrastructure, service provision and potential for sustainable mode share. To assess the viability of serving demand along each corridor by public transport, the Activity Density has been mapped for the 2040 land-use scenario.

The approximate 2040 Activity Density within the Core Segment is presented in Figure 5-7 and highlights significant density within the city core as would be expected.

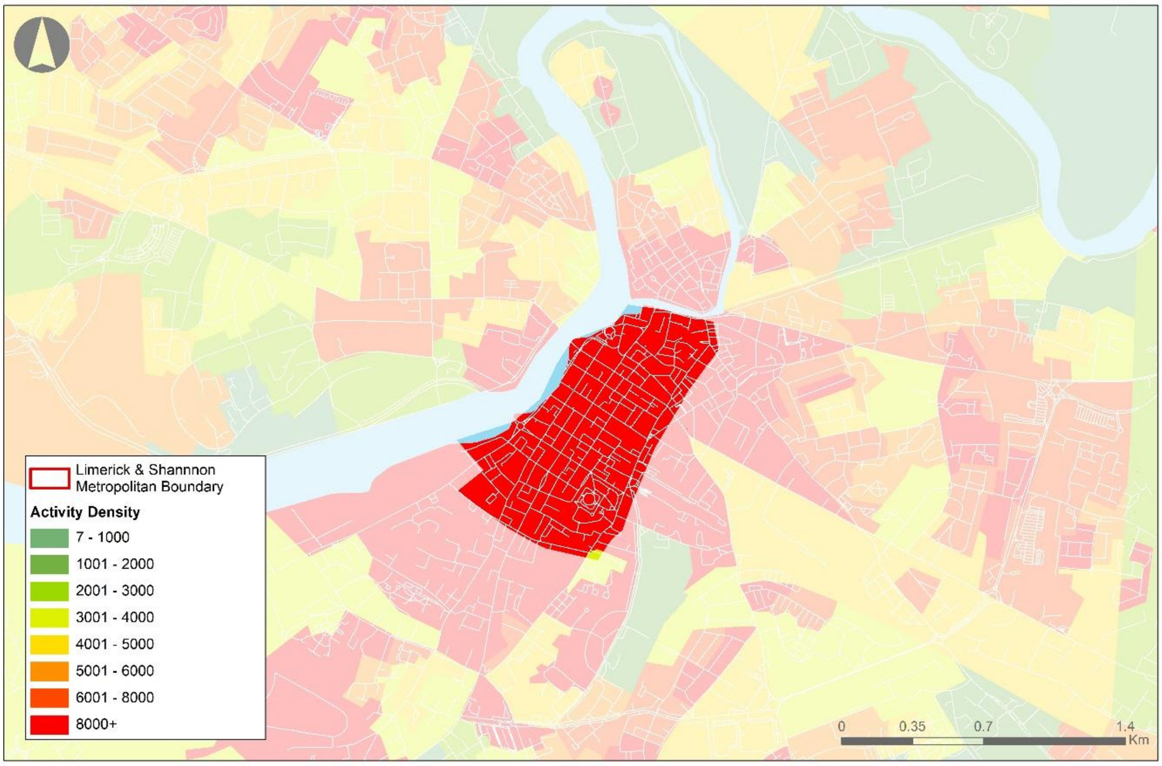


Figure 5-7 City Core 2040 Activity Density

Within Corridor A (below), there are relatively low Activity Density with some higher density areas on King's Island and the residential areas off Corbally Road, as shown in Figure 5-8. There are also some further areas of Activity Density at Corbally Road to the north of the Shannon in Westbury.

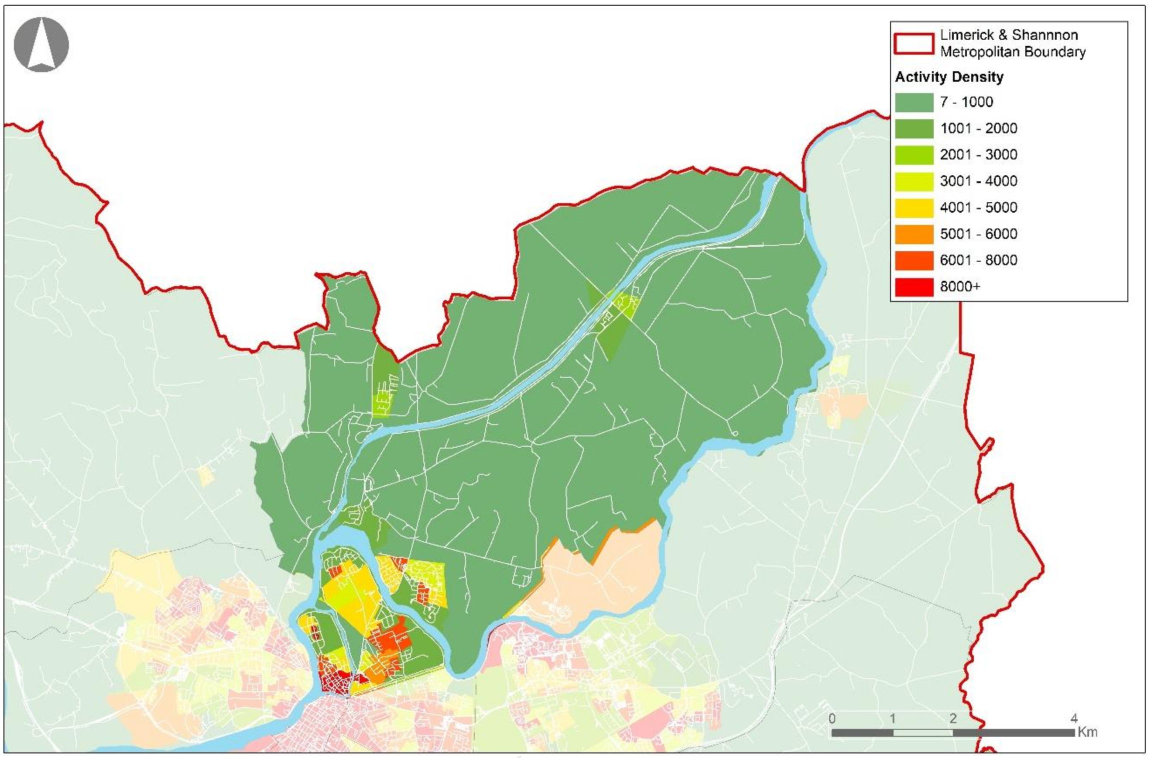


Figure 5-8 Corridor A 2040 Activity Density

As shown in Figure 5-9, Corridor B indicates areas of higher Activity Density on the approach to the City Centre, the University, and to the north of the Shannon within the proposed South Clare Economic SDZ.

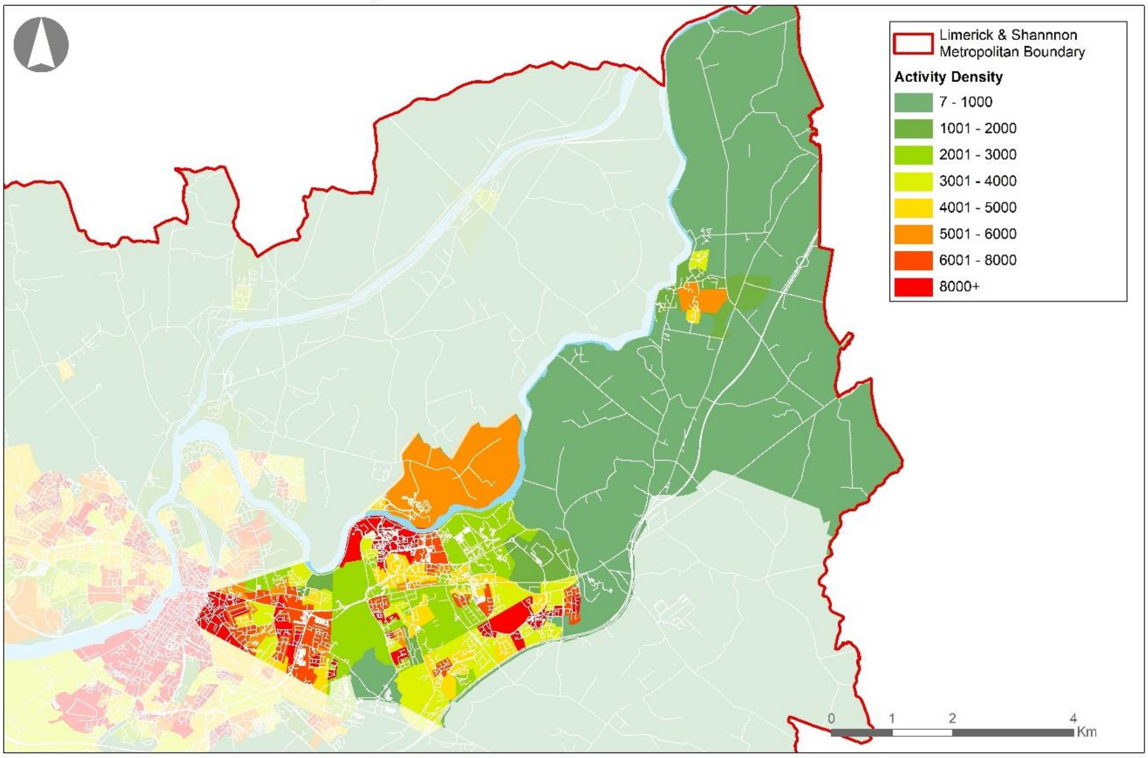


Figure 5-9 Corridor B 2040 Activity Density

Within Corridor C (below) there is lower levels of Activity Density along much of the corridor with some increases evident on the approach to the city.

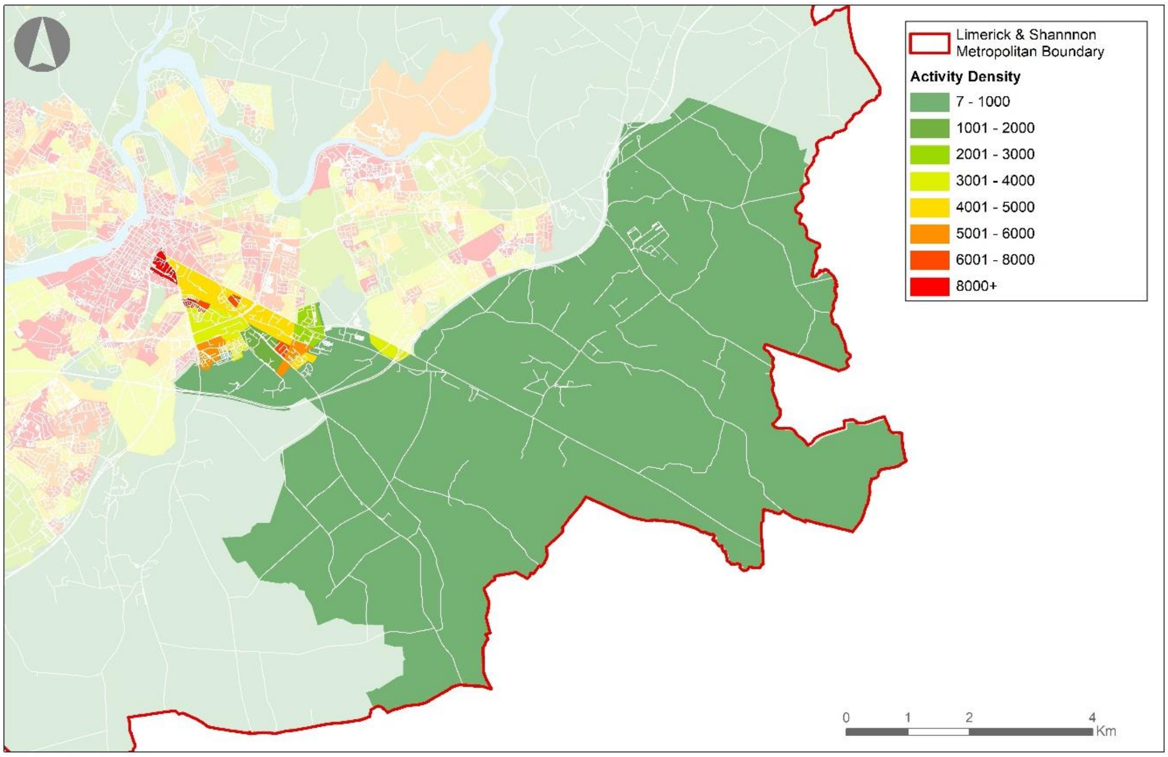


**Figure 5-10 Corridor C 2040 Activity Density**

Within Corridor D (below) there is higher level of Activity Density within the Dooradoyle area including the Hospital, the Crescent Shopping Centre and the approach to the city via O'Connell Avenue.

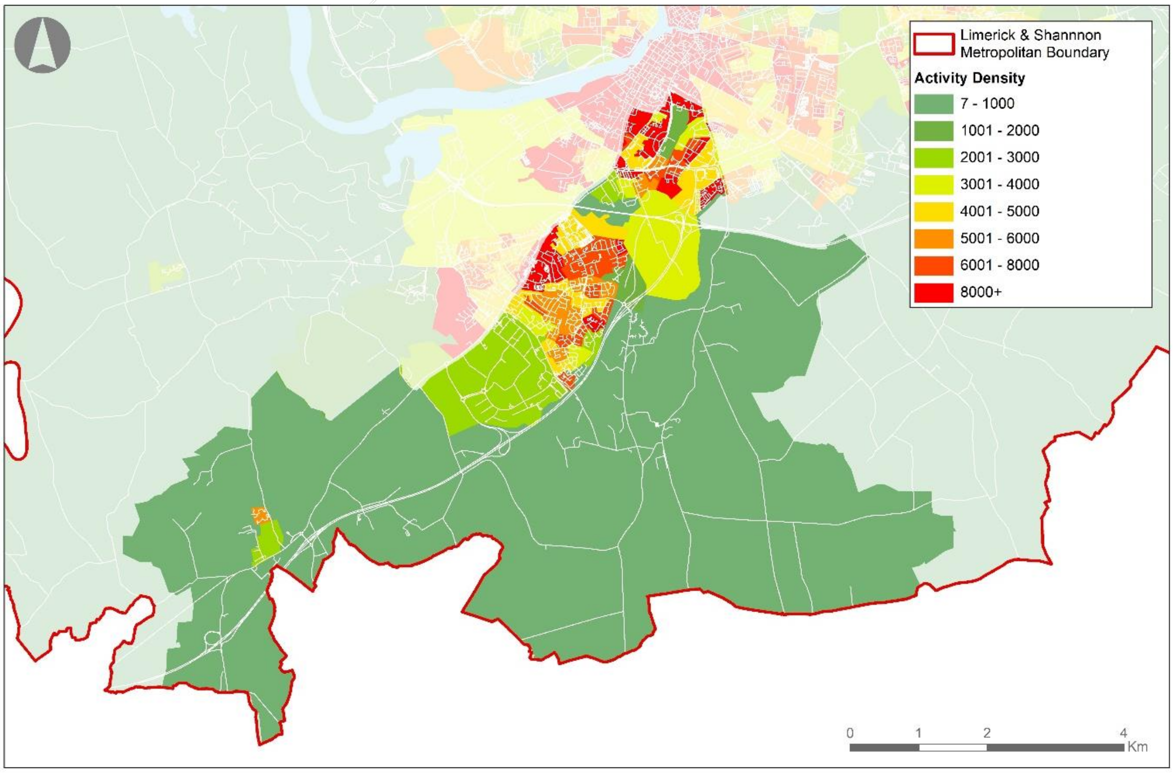


**Figure 5-11 Corridor D 2040 Activity Density**

Within Corridor E, there are higher levels of Activity Density adjacent to Corridor D along the R526, St.Nessan's Road and into the city via the Docklands area.

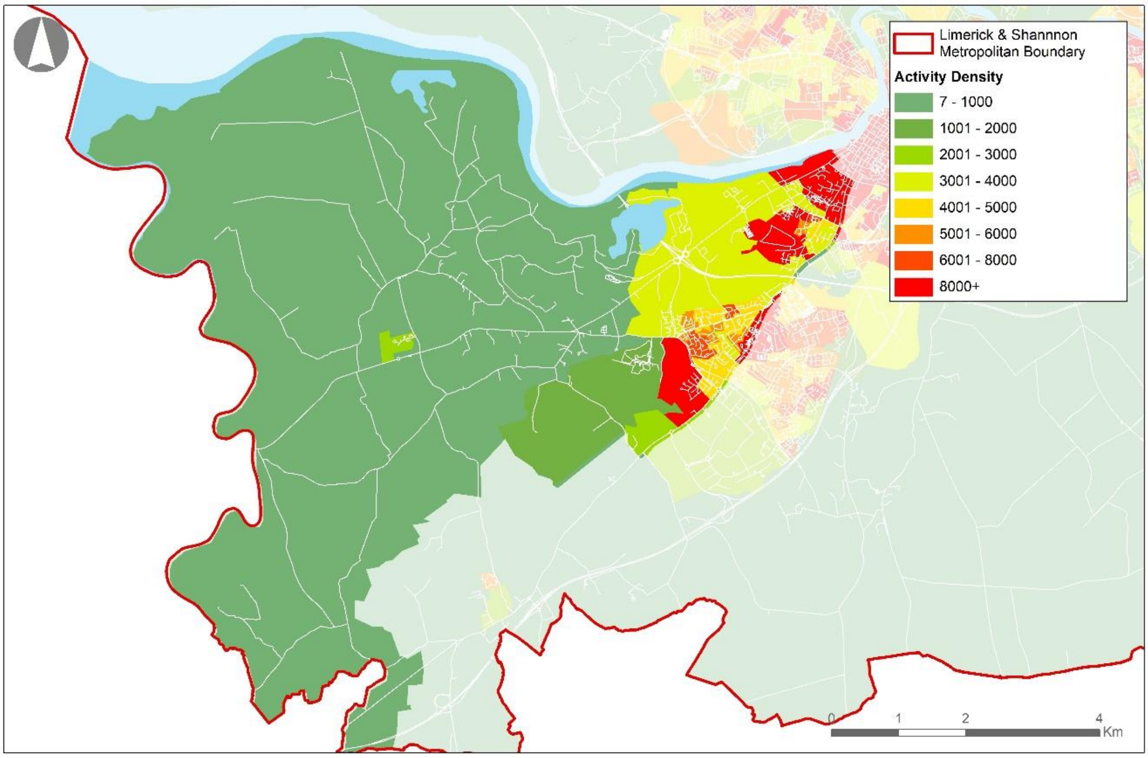


Figure 5-12 Corridor E 2040 Activity Density

Within Corridor F, there are higher levels of Activity Density in Moyross, Thomondgate and along the Ennis Road close to the City. There are also levels of higher Activity Density in the vicinity of Shannon town centre and Airport.

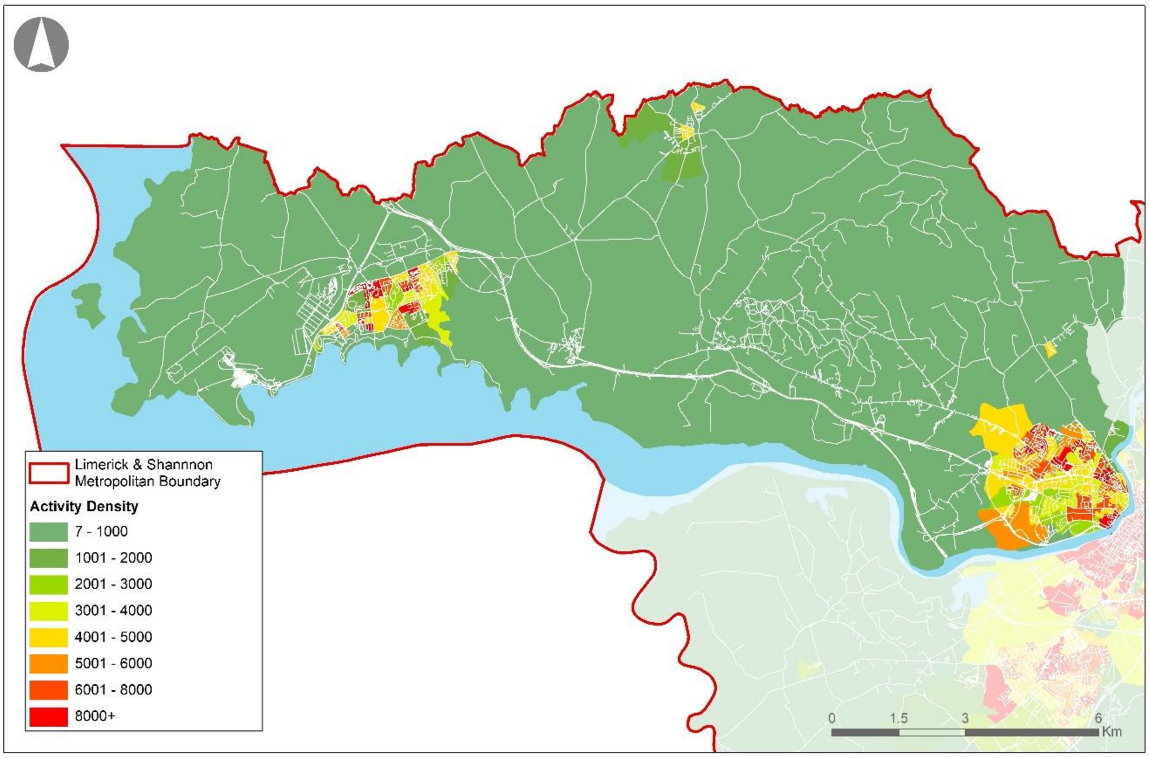


Figure 5-13 Corridor F 2040 Activity Density

# 6 Combined Demand Analysis

## 6.1 Desire Line Analysis

To assess the cumulative impact of the 2040 corridor demand outlined in Section 5 and to identify key desire lines to be served by all modes, desire line maps were produced based on the OD matrices presented in Table 5.1 to Table 5.4. The desire lines for total 24-hour demand are shown below in Figure 6-1 (Note demand below 1,500 trips has been excluded). As shown, there is significant demand between the core and F1, B1 & B2 and D2 and E2.

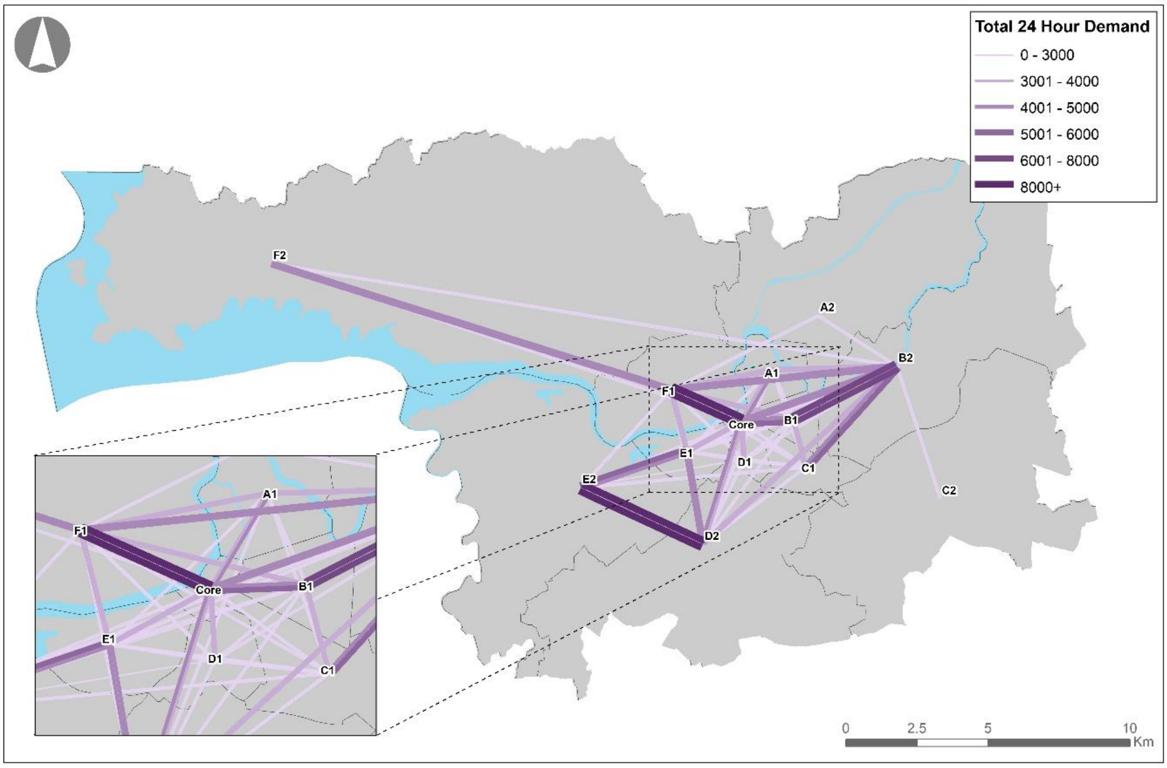


**Figure 6-1 24-Hour 2040 Total Demand Desire Lines**

To understand the potential demand for an improved public transport network and potential road improvements, the AM public transport and road demand desire lines have also been mapped and are shown in Figure 6-2 and Figure 6-3. The 2040 public transport demand shows a strong demand along Corridor B to the Core and F1. There is also strong public transport demand between D2 and the city core.

The AM road demand shows strong demand between D2 & E2, F1 & F2, from B2 to B1 and C1 and between B2 & F1.

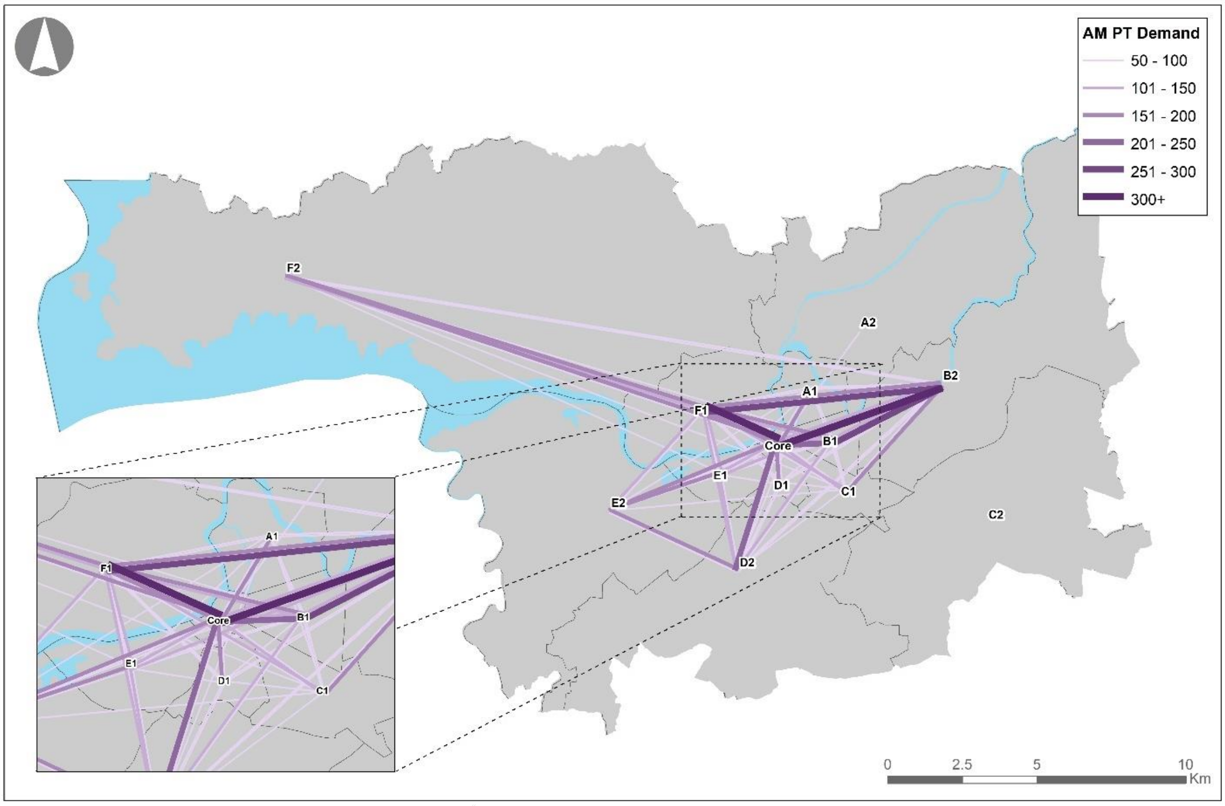


Figure 6-2 2040 AM PT Demand Desire Lines

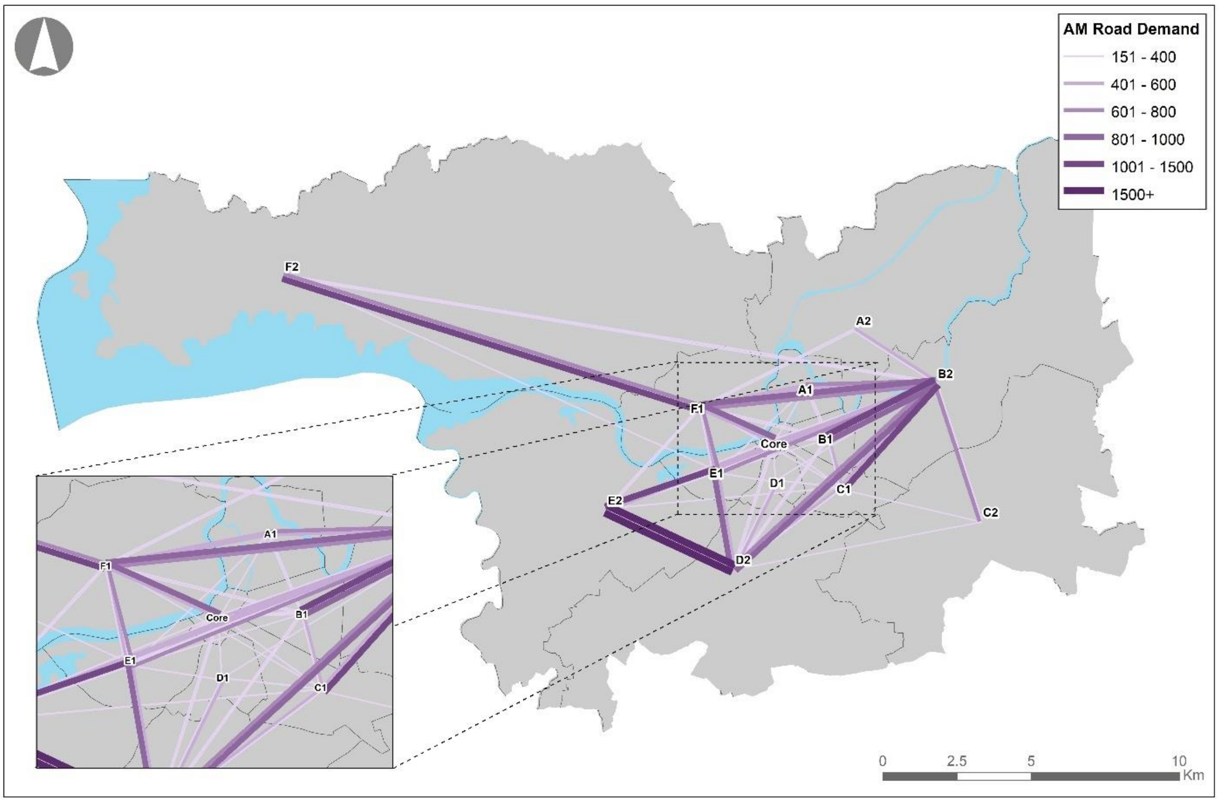


Figure 6-3 2040 AM Road Demand Desire Lines

## 6.2 Spider Web Analysis

To further refine the 2040 corridor demand shown in the desire line maps into a more understandable and coherent framework the demand was assigned onto a simplified 'Spider's Web Network'. Demand by each mode was assigned onto the 'Network' using different assumptions, as follows:

- For Car demand is was assumed that demand would use the quickest path based on journey time. Generally, demand was routed orbitally around the city unless travelling to destination on the direct opposite side of the City Core, in which case it was assigned through the City Core. For example, demand from B2 to D1 would travel via B1-C1 to D1 and demand from F2 to C1 would travel via F1-Core to C1;
- For public transport demand, it was assumed that demand from each corridor could travel orbitally to adjacent corridors within the inner core. All other demand was routed radially through the city core. For example, PT demand from Corridor D would travel orbitally to Corridor E. For example, public transport demand from Raheen would travel to Ballinacurra and across to a destination along Dock Road without going into the city centre. But demand from Raheen to University of limerick would travel through the City Core to Corridor B as B is not an adjacent corridor to D. One exception to this was PT demand between E & F which was assumed to be routed through the Core as no road link exist between the corridors bar the Shannon tunnel;
- Active mode demand, i.e. walking and cycling, were assumed to take the most direct route in terms of distance to their destination segment.

The 'Spider's Web Network' created using this approach for the AM peak hour for all demand, public transport demand and road demand, including and excluding demand from outside the L-SMA, is shown in Figure 6-4 to Figure 6-6.

Figure 6.4 shows the highest total demand is from B2 to B1 and from F1 into the city core with high demand inbound from E2 & D2 also. In terms of public transport demand there is an obvious emerging corridor from B2 to F1 via the city centre. There is also strong demand from D2, E2 and F2. Figure 6-6 and in particular Figure 6-7 show a strong southern orbital road demand corresponding to the M7 corridor with strong inbound and outbound demand from/to D2 and B2.

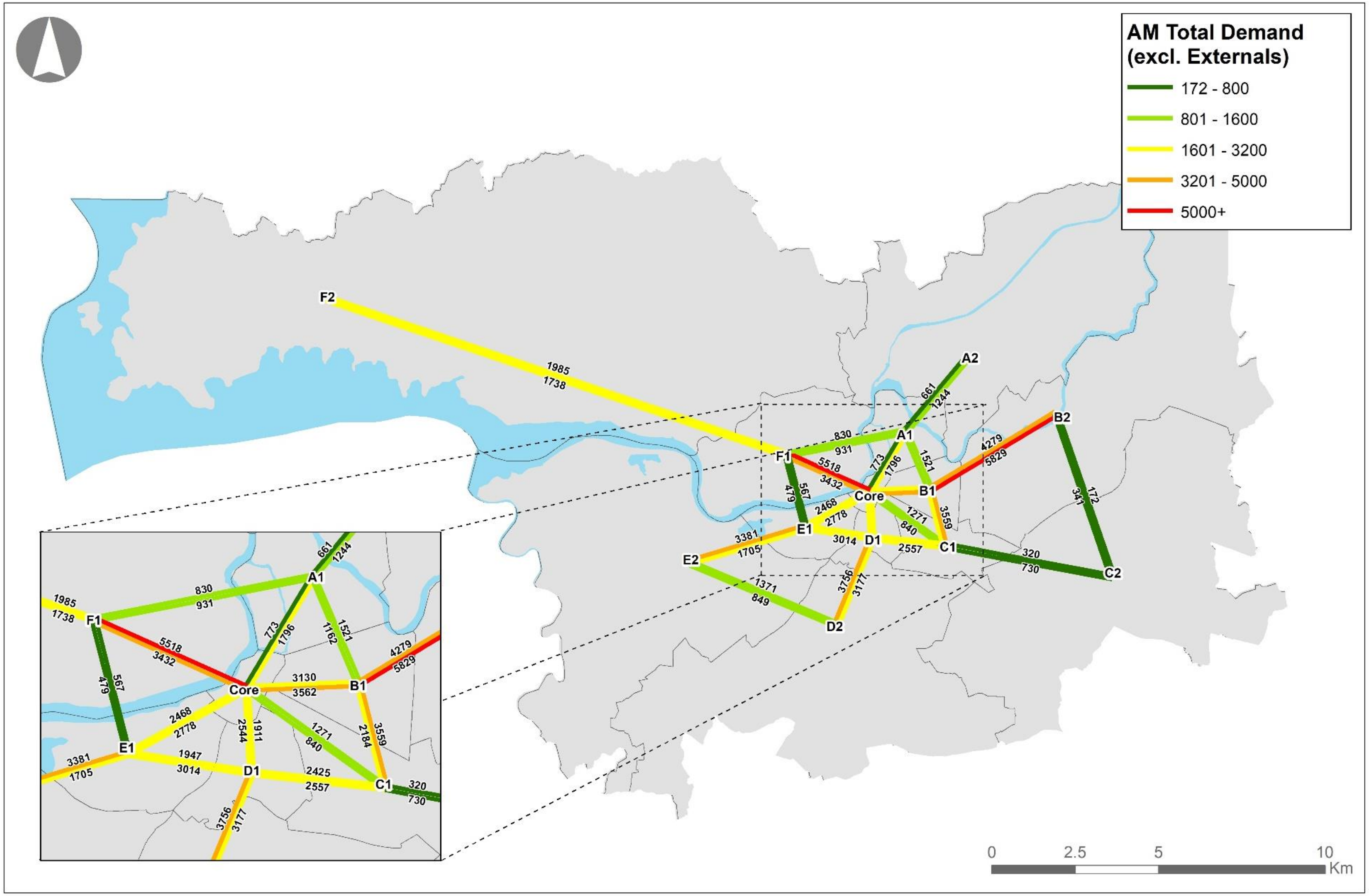


Figure 6-4 2040 Total Demand 'Spider's Web Network'

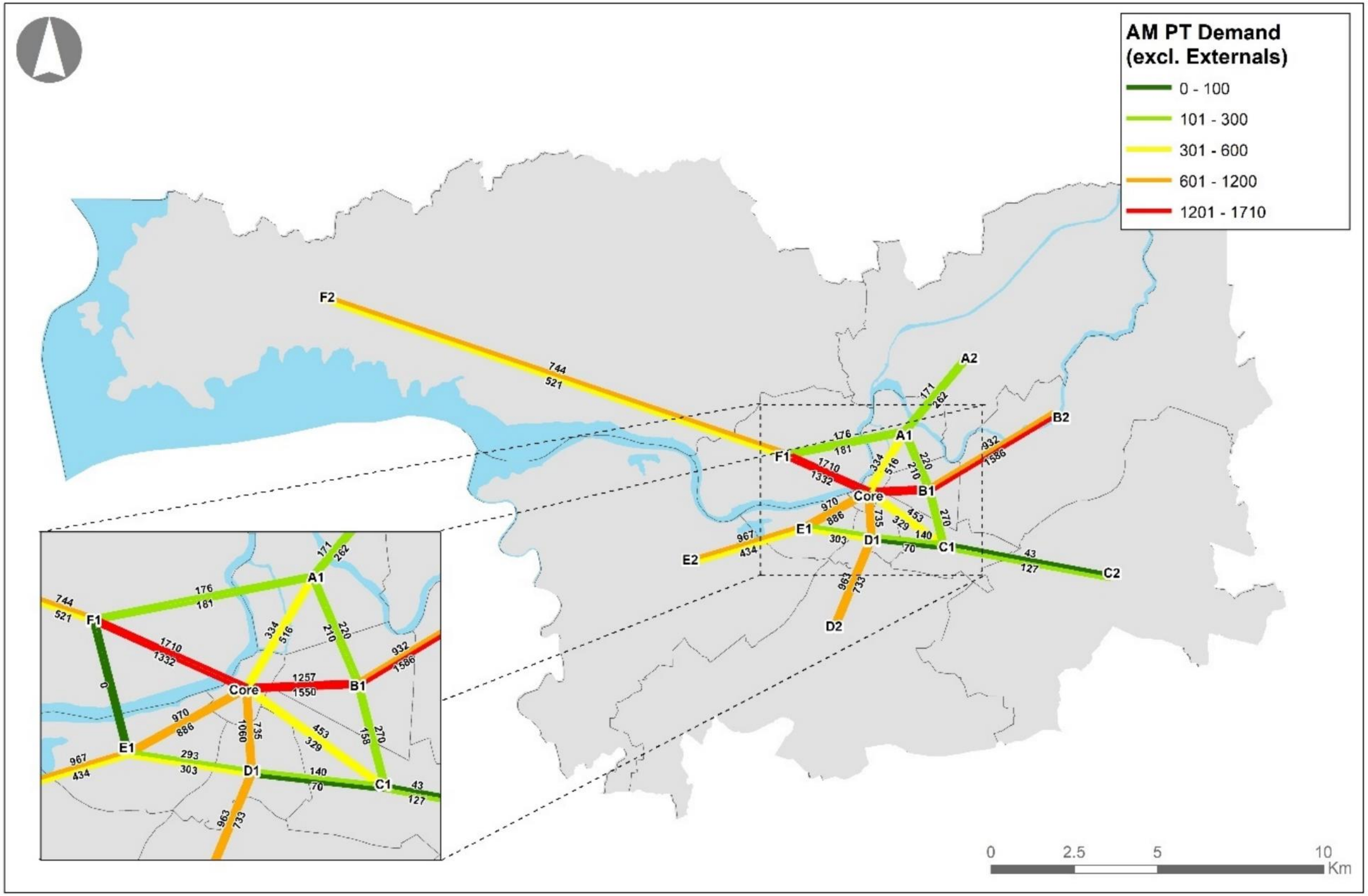


Figure 6-5 2040 AM Public Transport Demand 'Spider's Web Network'

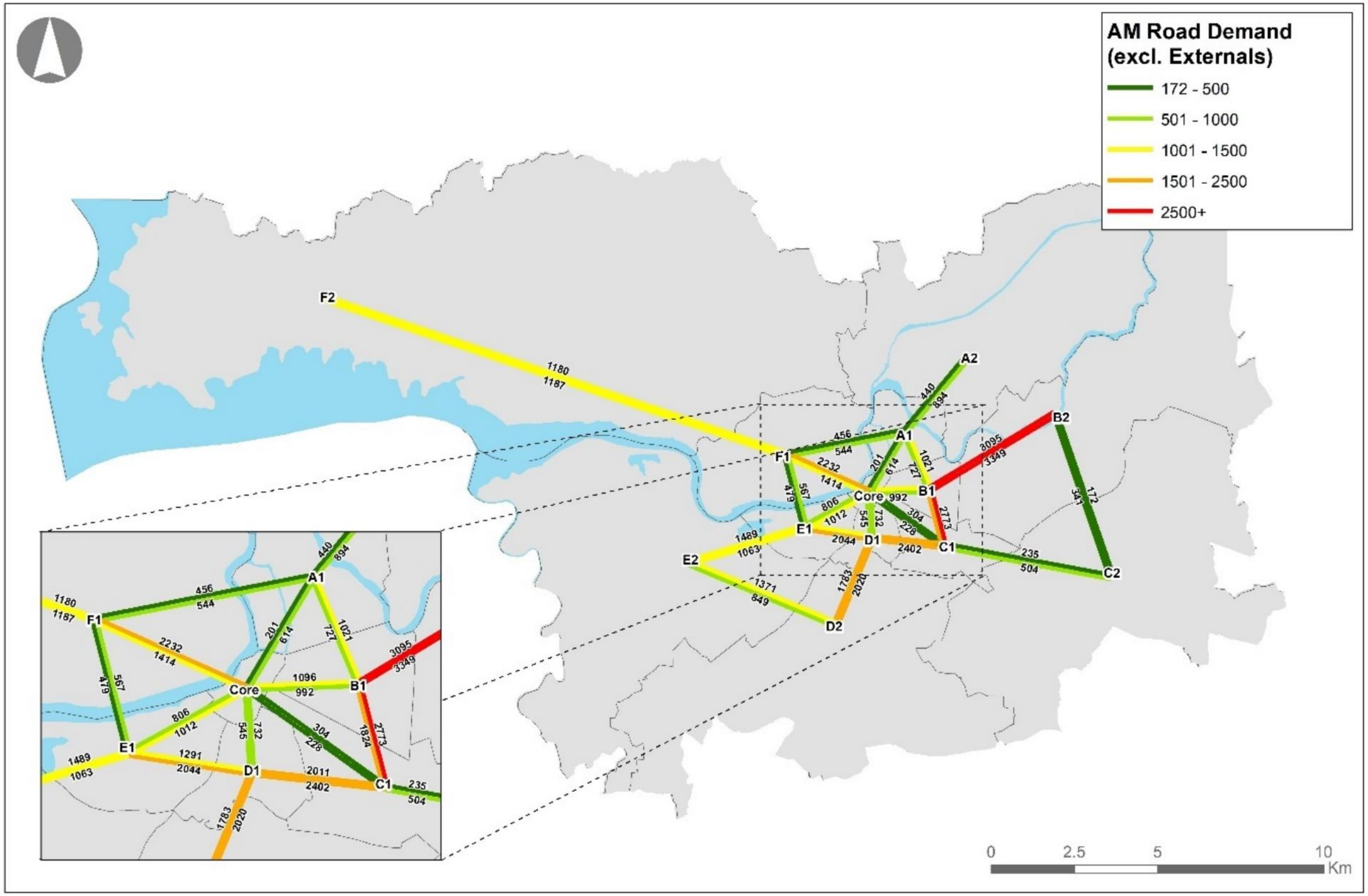


Figure 6-6 2040 AM Road Demand excluding External Demand 'Spider's Web Network'

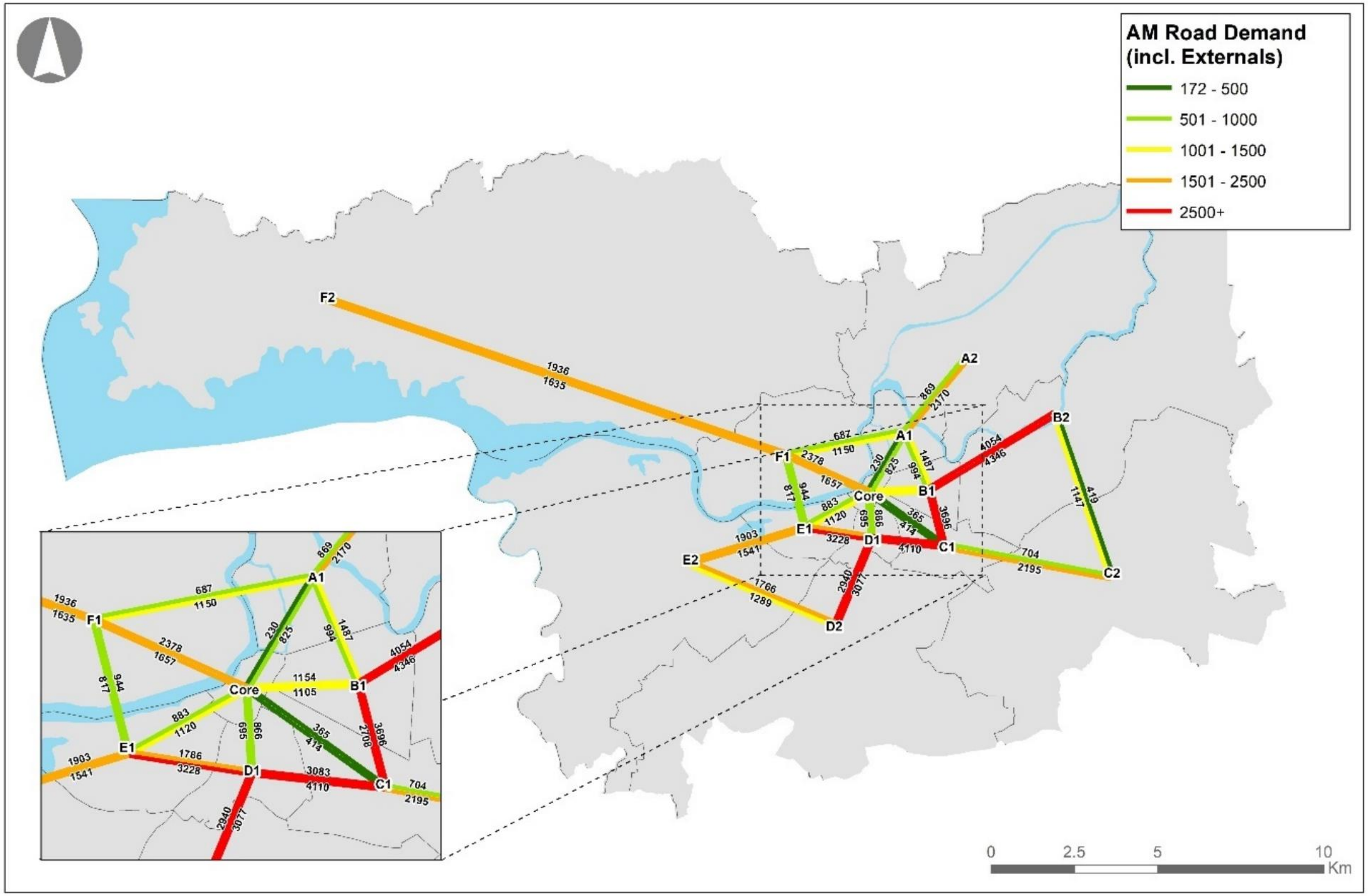


Figure 6-7 2040 AM Road Demand including External Demand 'Spider's Web Network'

## 6.3 Indicative Public Transport Network

### 6.3.1 Strategic Cross City Demand

To identify potential high capacity strategic public transport corridors, the two-way cross-city AM peak demand was extracted from the OD matrices presented previously and is shown below in Table 6.1. Note that travel by public transport to the adjacent corridor is considered an orbital movement and not included in Table 6.1.

Table 6.1 Two-Cross City 2040 AM Peak Demand

| Corridor | B | C | D | E | F |
|---|---|---|---|---|---|
| A | Orbital | 116 | 212 | 206 | Orbital |
| B | | Orbital | 558 | 537 | 941 |
| C | | | Orbital | 159 | 295 |
| D | | | | Orbital | 506 |
| E | | | | | 510 |

As shown the highest cross city demand is between Corridors B & F. This includes demand to/from F2 however F2 is approximately 23km from the city centre with no population centres in between and may be suited to a frequent shuttle service to the city than a higher capacity cross city service. Table 6.2 shows the cross-city demand with demand to/from F2 excluded.

Table 6.2 Two-Cross City 2040 AM Peak Demand (excl. F2)

| Corridor | B | C | D | E | F |
|---|---|---|---|---|---|
| A | Orbital | 116 | 212 | 206 | Orbital |
| B | | Orbital | 558 | 537 | 681 |
| C | | | Orbital | 159 | 207 |
| D | | | | Orbital | 367 |
| E | | | | | 364 |

Based on the above table, there are 3 emerging cross city routes from Corridor B to D, E & F1 that could be served by a higher frequency and/or capacity service and additional priority. Corridors D & E could potentially be served by one service utilising the R526/O'Connell Avenue which would serve areas of higher densities along both corridors. The remaining demand to/from Corridors A & C could be served by reasonable frequency bus services with orbital services running north and south of the city catering for remaining orbital demand. Figure 6-8 shows the emerging indicative public transport network.

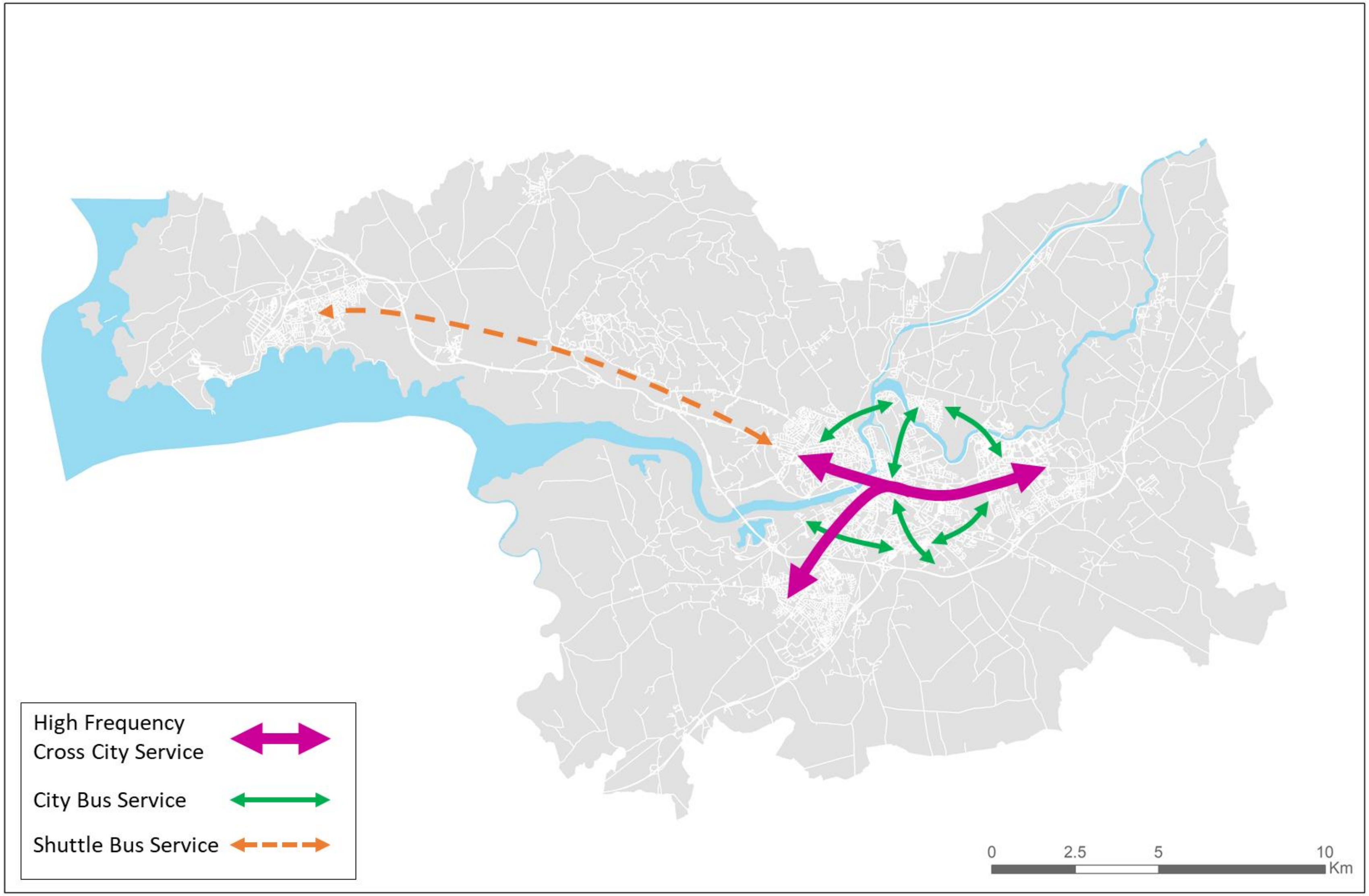


Figure 6-8 Indicative Overall Public Transport Network

## 6.4 HGV Demand Analysis

Transport Infrastructure Ireland (TII) undertook a Limerick HGV Study in 2015 to assess the possibility of an HGV ban in Limerick City like that operating in Dublin. The Findings Report indicated that HGV's typically account for fewer than 3% of vehicles in Limerick on an average weekday. The analysis in the Report supported a position however that banning HGV's from the City Centre or a combination of banning HGVs and lifting Tunnel tolls for HGV would have a significant impact on the number of HGVs and Light Goods Vehicles through and around the city resulting in a more pedestrian and cyclist friendly city. However, further analysis was required to determine the impact upon hauliers, retailers and the level of additional funding obligation on the Department of Tourism, Transport and Sport (DTTAS) as a result in drop of tolling revenue.

To assess the level of HGV demand in the 2040 scenario the HGV links, flows were extracted from the Idealised Network Scenario for the AM peak hour and are shown below in Figure 6-9. The figure shows high levels of demand across the National Network and in particular the M20 & M7 corridors.

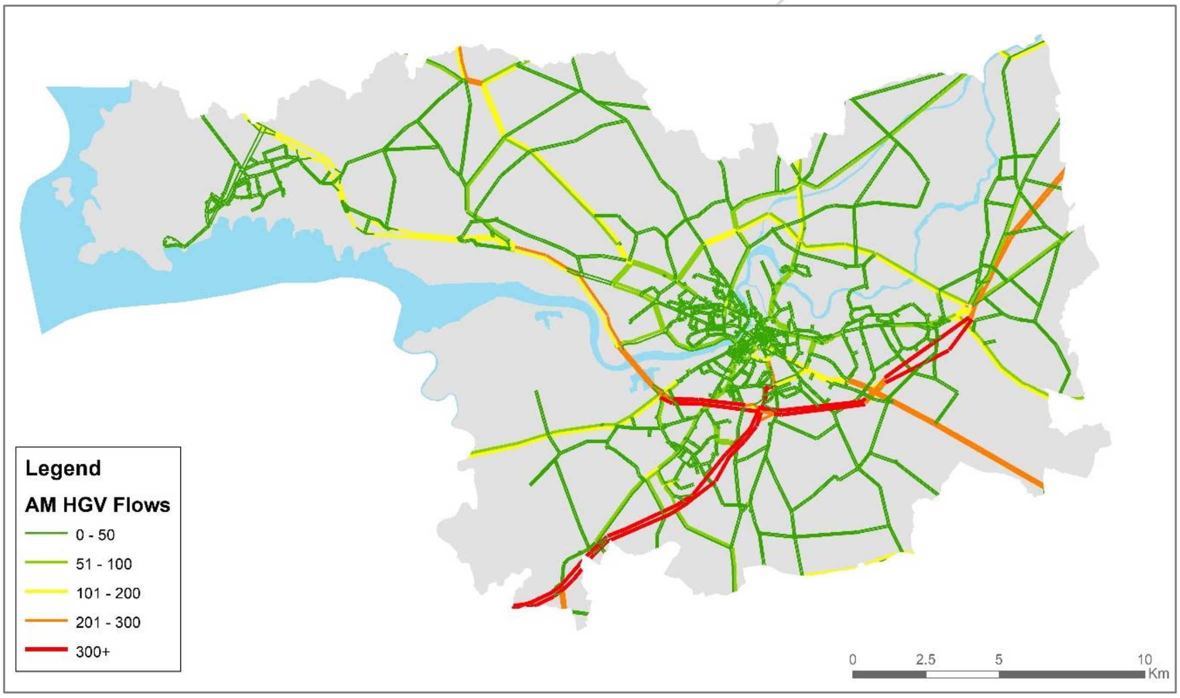


Figure 6-9 2040 AM Peak Hour HGV Link Flows (PCUS)

In addition to the above, the HGV demand has been assigned onto the 'Spider's Web Network' as shown in Figure 6-10. Overall, it shows a similar pattern to the above figure with strong demand Orbitally and on corridors aligned with the national road network. There is higher demand along Corridor E likely to/from Foynes Port however in reality this demand may use the N20/M20 corridor than the N69 and travel through corridor D.

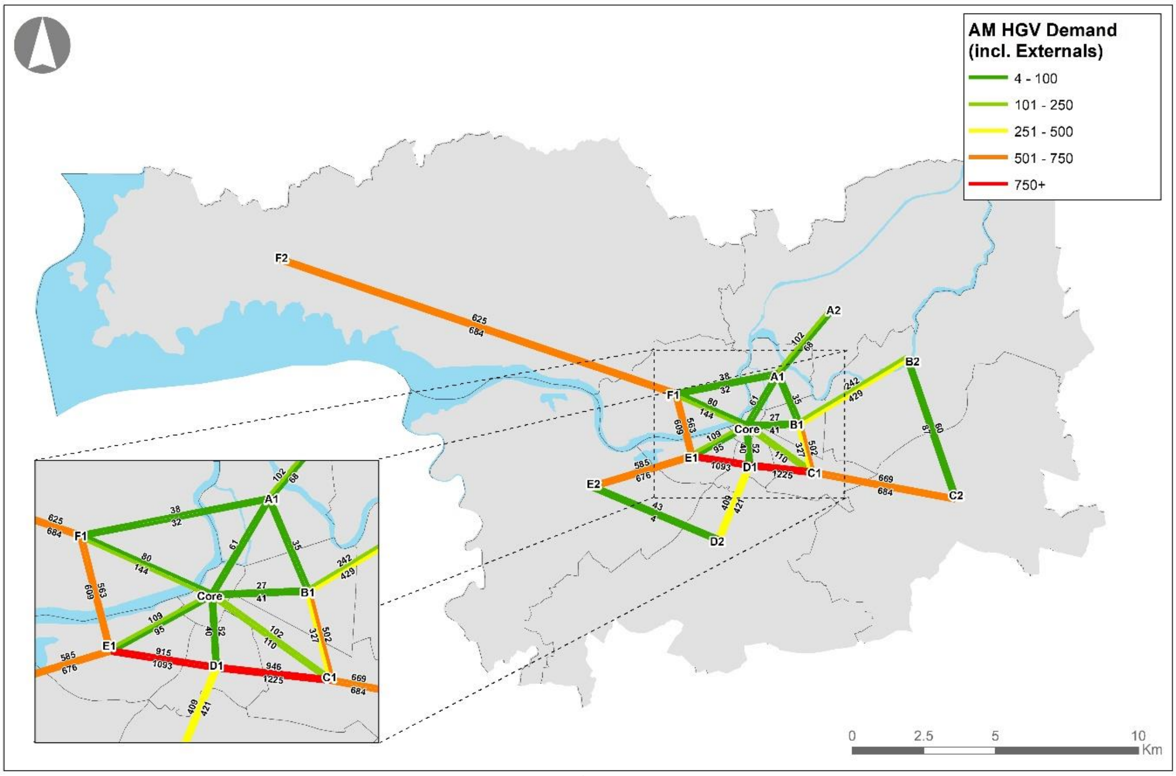


Figure 6-10 2040 AM Peak Hour HGV Demand 'Spider's Web Network