DUBLIN CITY CENTRE
TRANSPORT PLAN 2023

Modelling Report

Jacobs

Dublin City Centre Transport Plan 2023: Modelling Report

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1 INTRODUCTION

1.1 Context

The Dublin City Centre Transport Plan 2023 (the Plan) is an update of the 2016 City Centre Transport Study, as provided for in the Dublin City Development Plan (DCDP) 2022-2028[1]. It is intended to frame the implementation of the DCDP and the 2022-2042 National Transport Authority (NTA) Transport Strategy for the Greater Dublin Area (the Transport Strategy) in Dublin City Centre.

The Plan considers ways to optimise and enhance the transport network to meet the transport needs, challenges, and opportunities for the city centre. This is based on prevailing national, regional and local transport policy, most notably the Hierarchy of Road Users model set out in the National Sustainable Mobility Policy (NSMP), which places sustainable modes at the top. The emerging proposals have been developed with the sustainable growth of the city and its economy as a key aim, as well as its social, cultural and environmental wellbeing.

A suite of technical notes has been produced which informed the development of the Plan. This note should be read in conjunction with the other technical notes.

1.2 Purpose of This Technical Note

The goal of this technical note is to provide an overview of the transport modelling undertaken as part of this plan and provide insights into the potential outcomes and benefits of the interventions identified within Technical Note 3: Traffic Management.

This technical note outlines the modelling process carried out and details the schemes included in each of the modelled scenarios. It also provides analysis of results from the modelling.

1.3 Technical Note Structure

Following this introductory section, the next sections of this technical note are organised as follows:

Section 2 describes the scenarios modelled for the purposes of this plan.

Section 3 presents analysis of the baseline scenario.

Section 4 presents a comparison of results with and without the proposed interventions.

Section 5 concludes by summarising the key findings from the modelling.

[1] Published by Dublin City Council (DCC) in 2022

2 MODELLING METHODOLOGY

2.1 Overview

Modelling for this plan was carried out using a multi-modal strategic model. The model used was the NTA's East Regional Model (ERM). This allows travel choices (such as mode and route choice) to be modelled.

The ERM is part of the Regional Modelling System (RMS) which has been developed by the NTA to assist in comparative appraisal of a wide range of potential future transport and land use options. The system includes the National Demand Forecast Model (NDFM), which estimates the travel demand in Ireland on a typical weekday based on forecast land use data. The RMS also comprises five Regional Models, each covering a region of Ireland, which apply the NDFM outputs to a set of travel choice and assignment models. The ERM has been used for this plan. The ERM covers the counties of Dublin, Louth, Meath, Kildare, Wicklow, Monaghan, Cavan, Westmeath, Offaly, Laois, most of Carlow and the north of Wexford.

The modelled day is split into five time periods considered within each of the regional models, detailed in Table 1-1. 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 from survey data for each time period and mode.

Table 1-1 ERM Time Periods

Period	*Demand Model Full Period*
Morning peak (AM)	07:00-10:00
Lunch time (LT)	10:00-13:00
School run (SR)	13:00-16:00
Evening peak (PM)	16:00-19:00
Off-peak (OP)	19:00-07:00

The ERM includes assignment models for Road, Public Transport, and Active Modes (Walking and Cycling) travel. More detail regarding the development of the ERM can be found in the NTA's ERM Model Development Report[2].

In order to understand the potential impact of the measures included within the plan, the following scenarios were modelled:

- 2022 Baseline;
- 2028 Do Minimum; and
- 2028 Do Something.

The forecast model year of 2028 corresponds with the end year of the DCDP.

2.2 Study Area

The study area for the modelling was formed based on the canal cordon, encompassing an area of approximately 14 square kilometres. Analysis was also conducted for an Inner Core Area, which was developed as part of Technical Note 3: Traffic Management by considering where filtered permeability would have the most positive outcomes for active modes and public transport. The development of this area can be seen in that note. Both the study area and Inner Core Area are shown in Figure 2-1.

[2] *ERM Model Development Report:* https://www.nationaltransport.ie/planning-and-investment/transport-modelling/regional-modelling-system/regional-multi-modal-models/east-regional-model/

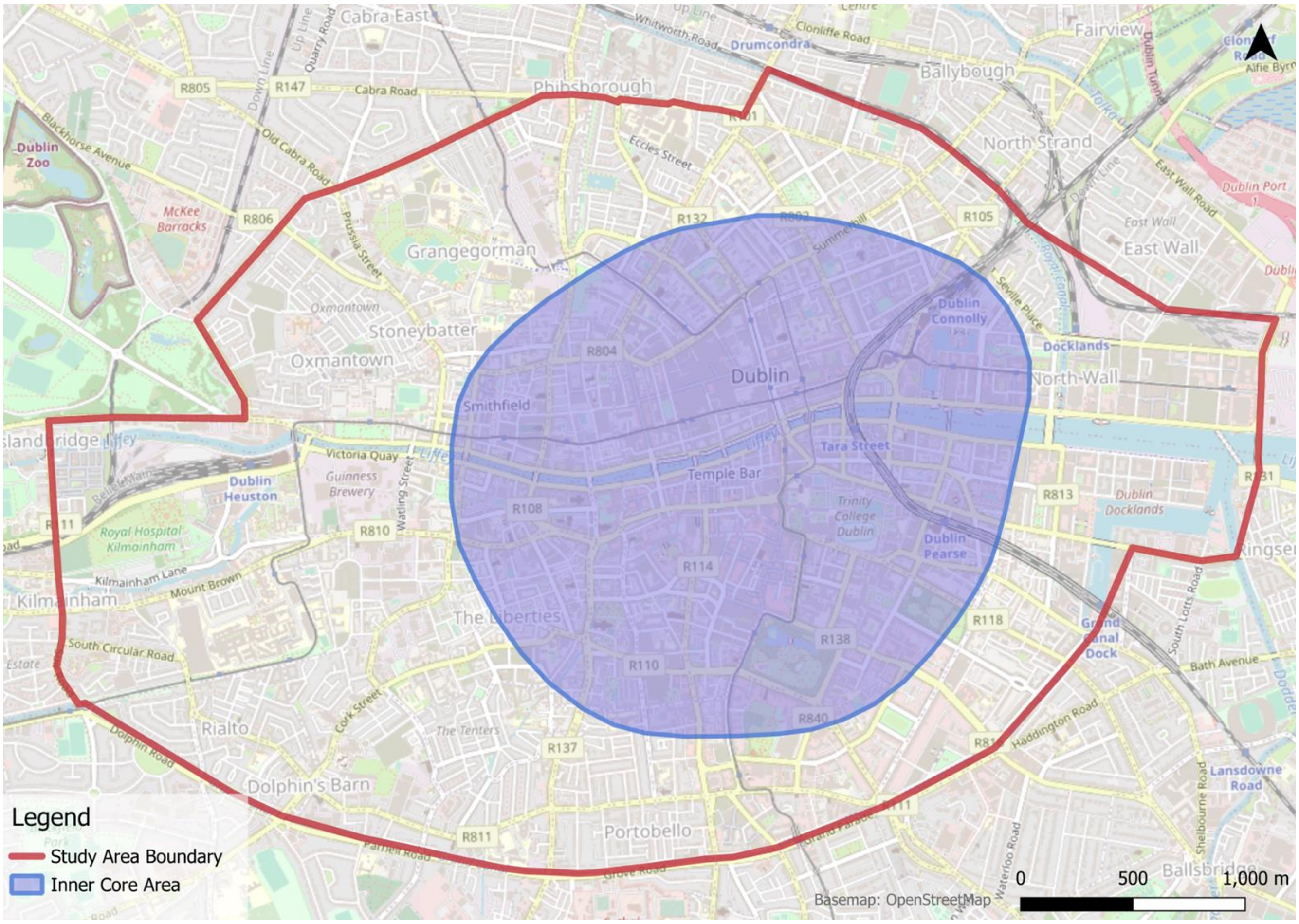

Figure 2-1 Study Area and Inner Core Area

2.3 2022 Baseline Scenario

The baseline scenario is a representation of the current transport network and demand. For this plan, the baseline scenario was created from the 2016 ERM Base Scenario, which is the latest calibrated & validated base model available at the time of this plan. To bring the network more in line with the current situation, the modelled network was updated to a 2020 network. The baseline scenario does not include changes to the network made during or following the Covid-19 pandemic.

The demand scenario for the baseline comprised 2022 Core Demand produced by the NDFM.

2.4 2028 Do Minimum Scenario

The Do Minimum model scenario represents the expected transport network and demand in 2028. This comprises planned and committed schemes expected to be in place by 2028, prior to any interventions proposed by this Plan. The Do Minimum scenario was created from the 2028 ERM Reference Case model (including 2028 Reference Case demand) with several network updates.

The updates added to the 2028 ERM Reference Case to form the Do Minimum comprised these schemes:

- Traffic Management schemes already implemented in Dublin City Centre, including Winetavern Street bus lane, the closure of Capel Street to vehicular traffic, and revised layout at Merrion Row / Hume Street / Ely Place
- Parliament Street made traffic-free;
- College Green made traffic-free (with buses using alternative BusConnects routing);
- Liffey Street Lower made traffic-free;
- Interim DART Expansion Programme (non-tunnel elements);
- Luas Cross City incorporating Luas Green Line Capacity Enhancement – Phase 1;

- BusConnects radial core bus corridors;
- BusConnects fares and ticketing;
- BusConnects routes and services;
- Rail- and bus-based P&R provision (partial implementation by 2028);
- Greater Dublin Area Cycle Network Plan; and
- Updates to national, regional and local roads outside of the study area as per the National Development Plan 2021-2030.

2.5 2028 Do Something Scenario

The Do Something model scenario represents a situation in which the proposals set out in Technical Note 3: Traffic Management have been implemented. This scenario was created starting from the 2028 Do Minimum Scenario, with the following changes:

- City centre traffic management measures outlined in Figure 2-2;
- Bus routes updated to use a contraflow bus lane at Memorial Road (in the scenario modelled, bus routes made use of Custom House Quay rather than Beresford Place. If Custom House Quay is to be dedicated to active modes, these routes would instead take a more direct route via Beresford Place);
- Signals at certain junctions reduced to 90-second cycle or rebalanced to give more pedestrian time; and
- The following parking interventions as laid out in the Climate Action Plan 2023 (CAP23):
    - Free workplace parking capacities reduced by 50%; and
    - Parking charges increased to €2.50 per hour within the canal cordon where they are currently less than €2.50. Free parking remains free.

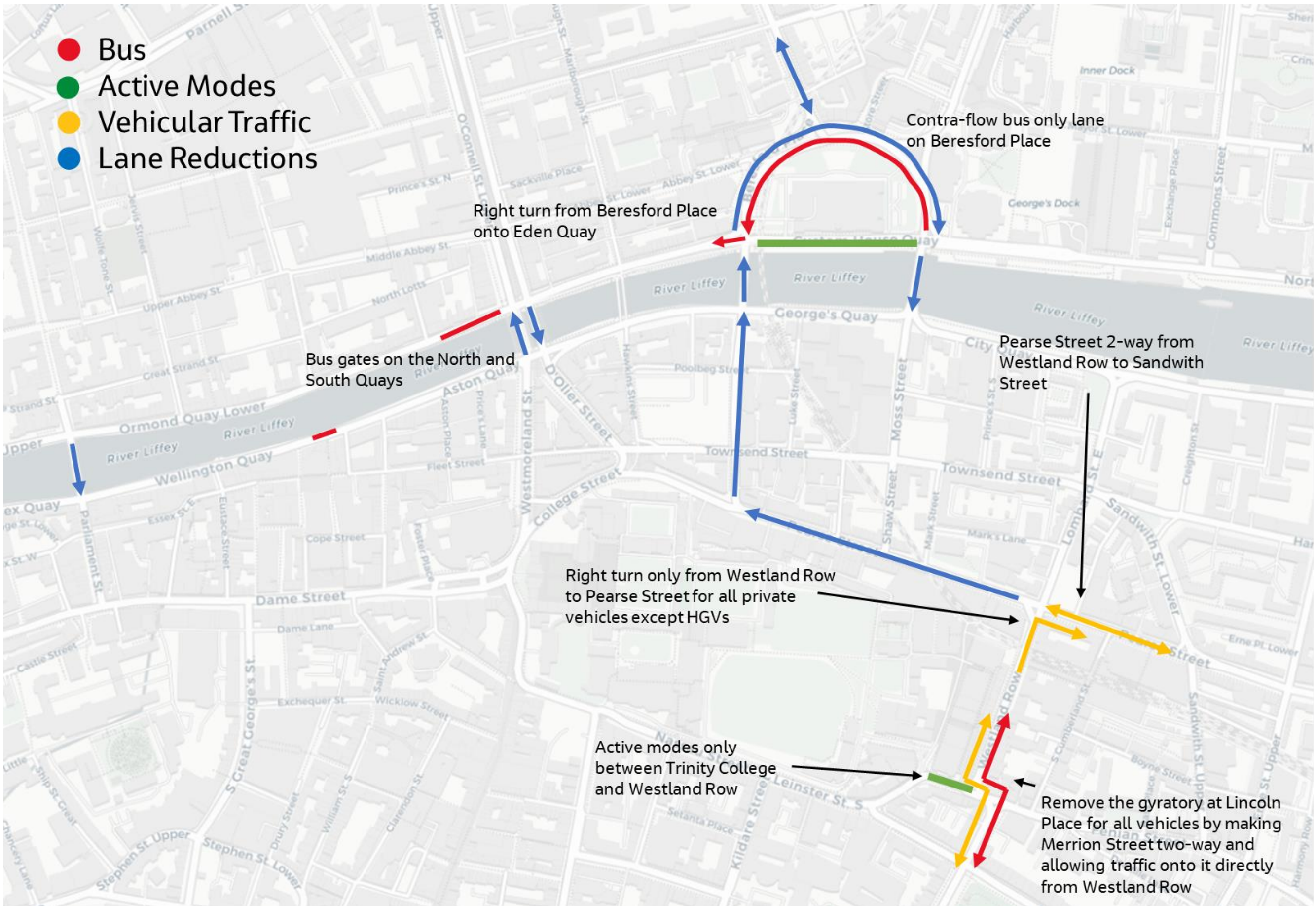

Figure 2-2 Schematic of traffic management changes modelled in Do Something scenario

The Do Something scenario traffic management measures depicted in Figure 2-2 include lane reductions resulting in the following:

- Grattan Bridge: 1 traffic lane (southbound);
- O'Connell Bridge: 1 traffic lane in each direction and 1 bus lane in each direction;
- Butt Bridge: 1 traffic lane and 1 bus lane (northbound);
- Talbot Memorial Bridge: 1 traffic lane and 1 bus lane (southbound);
- Pearse Street: 1 traffic lane and 1 bus lane (westbound);
- Tara Street: 1 traffic lane and 1 bus lane (northbound);
- Beresford place: 1 traffic lane and 1 bus lane (eastbound) and 1 contra-flow bus lane (westbound); and
- Gardiner Street: 1 traffic lane in each direction and 1 bus lane in each direction.

Figure 2-2 represents one of two possible configurations at Custom House Quay / Beresford Place, in which traffic is removed from Custom House Quay. The alternative configuration involves Beresford Place being made traffic-free instead, with traffic allowed on Custom House Quay. While the arrangements for general traffic, taxis and goods in the Do Something scenario were modelled as per Figure 2-2, the modelled bus routing in fact made use of Custom House Quay (a trivial difference which does not affect the attractiveness of either Custom House Quay or Beresford place for active modes in the model).

3 BASELINE MODEL ANALYSIS

3.1 Demand and Mode Share

The baseline model's inbound mode share across the canal cordon in the AM period was compared with the latest available canal cordon counts. Figure 3-1 shows this comparison, alongside the DCDP mode share targets for reference. For this analysis, the car, taxi and goods modelled vehicle numbers have been converted to numbers of people.

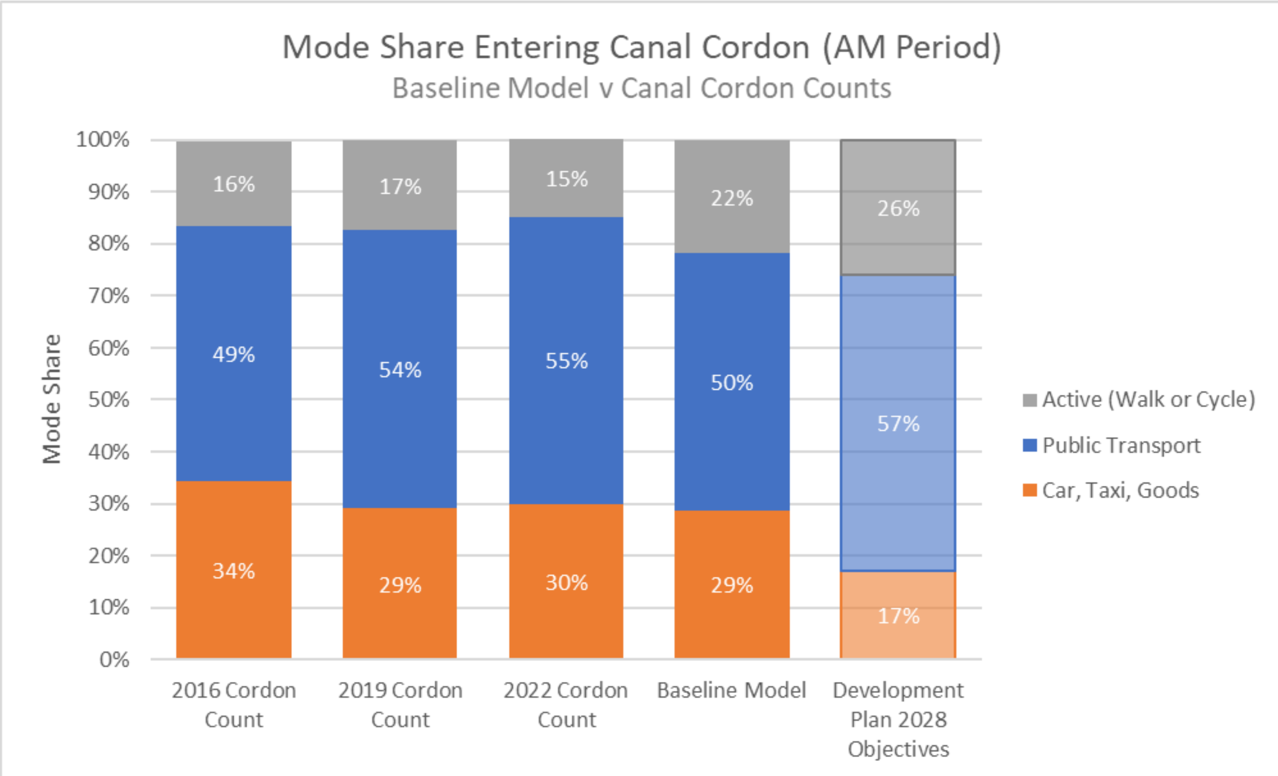

Figure 3-1 Inbound mode share: Baseline model v Canal Cordon counts

The 29% mode share made up of car, taxi and goods in the baseline model aligns well with the corresponding 30% mode share observed in the 2022 cordon count data. While the baseline model shows a higher share of active modes compared to the 2022 cordon counts, the overall sustainable mode share in the baseline model (72%) closely matches the 70% sustainable mode share in the 2022 cordon counts.

The numbers of people entering the canal cordon in the AM period are shown in Table 3-1.

Table 3-1 Inbound demand by mode: Baseline model v Canal Cordon counts

Scenario	Public Transport	Car/Taxi/Goods/Motorcycle	Walk/Cycle	Total
2016 Cordon Count	100,135	70,166	33,562	**203,863**
2019 Cordon Count	116,287	63,114	37,822	**217,223**
2022 Cordon Count	97,658	53,148	26,437	**177,243**
2022 Baseline Model	95,841	55,630	42,081	**193,552**

The baseline model's numbers of people entering by public transport and by road modes (95,841 and 55,630 respectively) are similar to those observed in the 2022 cordon count (97,658 people by public transport and 53,148 by car/taxi/goods/motorcycle). The active modes total in the baseline model (42,081) is noticeably higher than the 2022 cordon active modes count (26,437). However, the higher active modes total in the baseline model is consistent with the trend exhibited prior to the Covid-19 pandemic; the 2016 and 2019 cordon counts observed active modes totals of 33,562 and 37,822 respectively.

Overall, the demand entering the canal cordon in the baseline model scenario aligns well with observed cordon count data. While it does not fully reflect the impacts of the Covid-19 pandemic on the 2022 travel network and demand due to limited availability of data at the time of this plan, the baseline model has been deemed suitable for high-level analysis of travel patterns.

3.2 Through Traffic Analysis

Analysis was carried out to understand the travel patterns of vehicles entering the Inner Core Area (shown in Figure 2-1). The process involved:

1. Defining the Inner Core Area as a cordon in the baseline model;
2. Extracting a demand matrix of all road trips entering this Inner Core Area cordon; then
3. Categorising trips in the matrix as having either an internal (within the Inner Core Area) or external (outside of the Inner Core Area) destination.

In the baseline model, 29,757 cars enter the Inner Core Area in the AM period. These are from a combination of:

- Cars which have entered the Canal Cordon, many of which continue on to enter the Inner Core Area; and
- Cars originating between the Canal Cordon and Inner Core Area.

Regardless of origin, "through traffic" refers to those trips that enter the Inner Core Area but have an external destination, i.e. their destination is not inside the Inner Core Area.

Figure 3-2 shows the proportions of destination traffic and through traffic by time period, while Figure 3-3 presents the proportions for the 12-hour period from 7am to 7pm. The data in both figures is from the 2022 baseline model scenario.

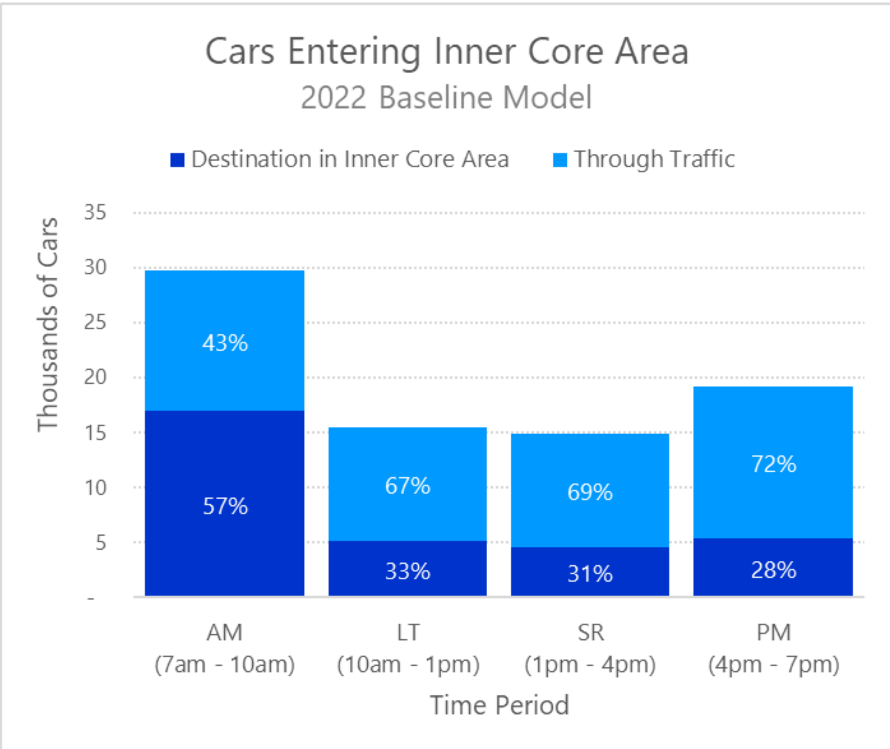

Figure 3-2 Inner Core Area through traffic analysis (by time period)

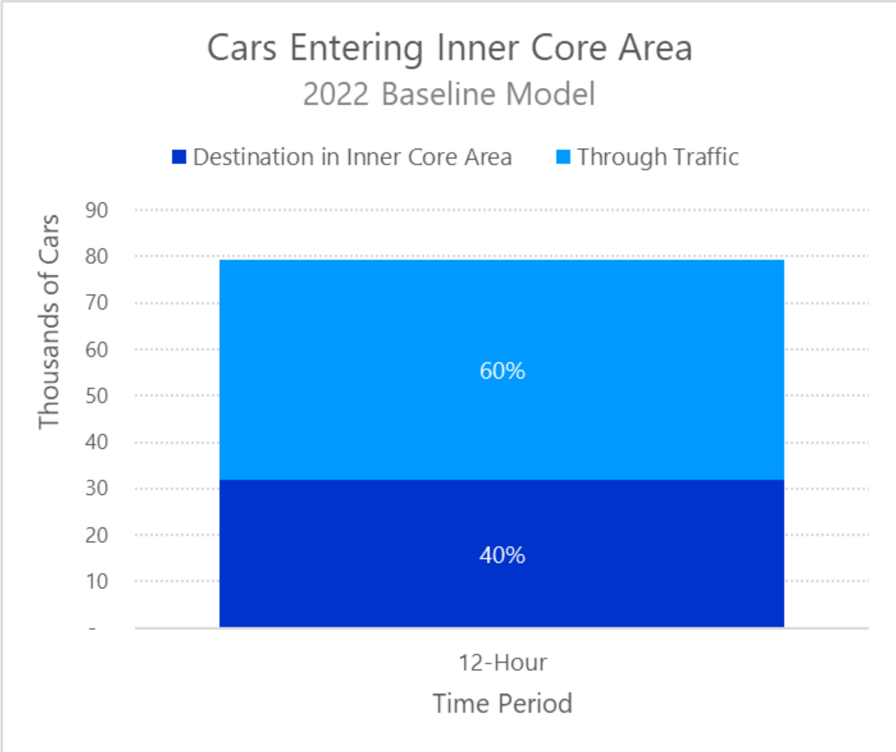

Figure 3-3 Inner Core Area through traffic analysis (7am to 7pm)

As shown in Figure 3-3, approximately eighty thousand cars enter the Inner Core Area from 7am to 7pm in the baseline model. Of these, only 31,986 have a destination within the Inner Core Area, while the other 47,250 have destinations outside the Inner Core Area. This constitutes 60% of traffic entering the Inner Core Area which is through traffic.

4 DO SOMETHING MODEL ANALYSIS

4.1 Demand and Mode Share

The modelled number of people entering the canal cordon by mode in the AM period is shown in Table 4-1 for each scenario. For the Do Minimum and Do Something, this table also provides differences against the Baseline scenario.

Table 4-1 Inbound demand by mode: Do Something and Do Minimum v Baseline

Scenario	Public Transport	Car/Taxi/Goods	Walk/Cycle	Total
2022 Baseline	95,841	55,630	42,081	**193,552**
2028 Do Minimum	117,168 (+22%)	42,706 (-23%)	59,750 (+42%)	**219,624 (+13%)**
2028 Do Something	122,484 (+28%)	37,231 (-33%)	61,319 (+46%)	**221,035 (+14%)**

From the baseline scenario to the 2028 Do Something, the total trips into the canal cordon increase by 14%. This constitutes a 28% increase in public transport trips, a 46% increase in walk or cycle trips, and 33% decrease in car, taxi or goods trips in the 2028 Do Something compared to the baseline.

Figure 4-1 shows the AM period mode shares of each mode inbound across the canal cordon in each scenario. The inclusion of the interventions in the Do Something model run shows a clear shift away from private vehicles and towards more sustainable modes, matching the target for reduction in car mode share to 17% as laid out in the DCDP. The overall sustainable mode share shown by the Do Something scenario matches the DCDP target, with a shift towards active modes exceeding the active mode target.

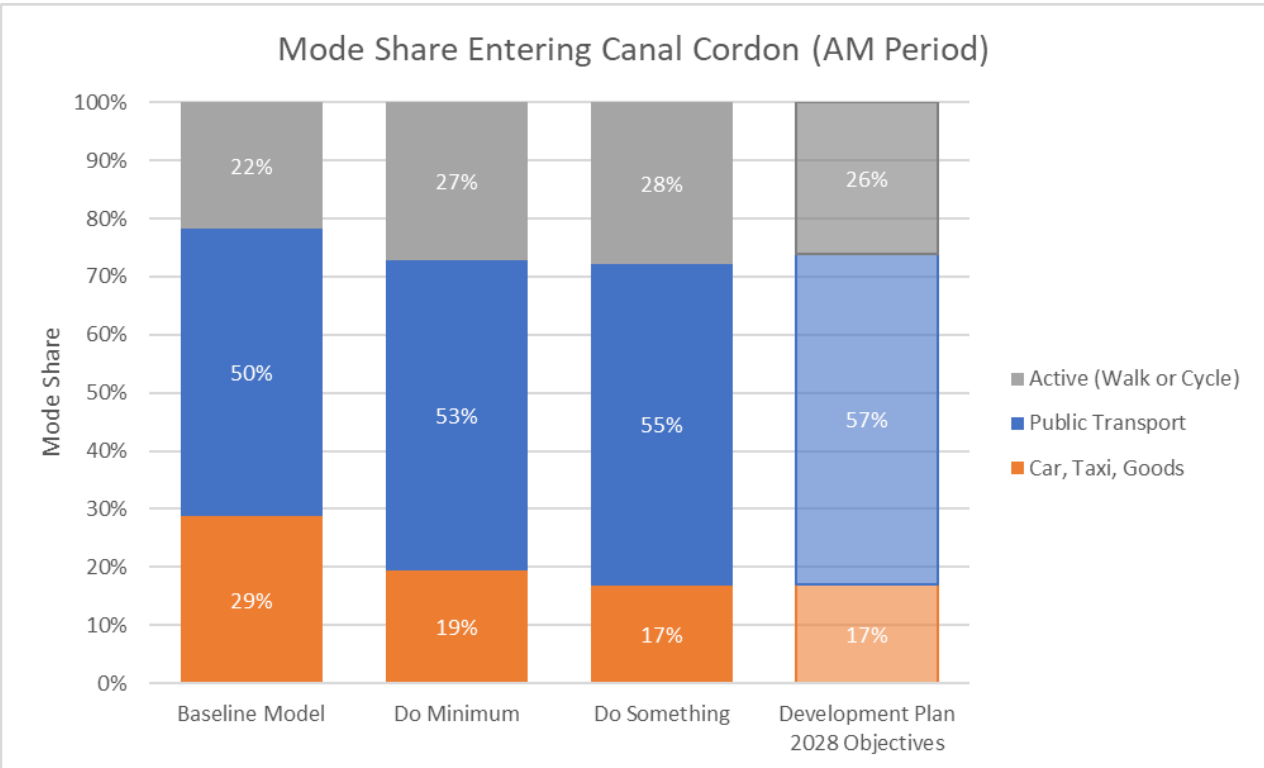

Figure 4-1 Mode share differences between the model scenarios and DCDP objectives

4.2 Changes in Private Cars

The differences in car flow inside the study area between the Do Minimum and Do Something model runs can be seen in Figure 4-2, where increases are represented by green lines and decreases are represented by blue lines. Bus gates on Aston Quay and Bachelors Walk, which close these quays to private vehicle traffic, cause a decrease in flow at these locations. Other links that show decreases in flow are those where sustainable modes have been prioritised, such as Pearse Street, Beresford Place and Gardiner Street.

While there are some increases in flow, these are much more modest than the decreases. The increases in flow are close to the periphery of where the traffic management interventions are located. One such example is along the roads Ossory Road, West Road, St. Mary's Road, and East Road.

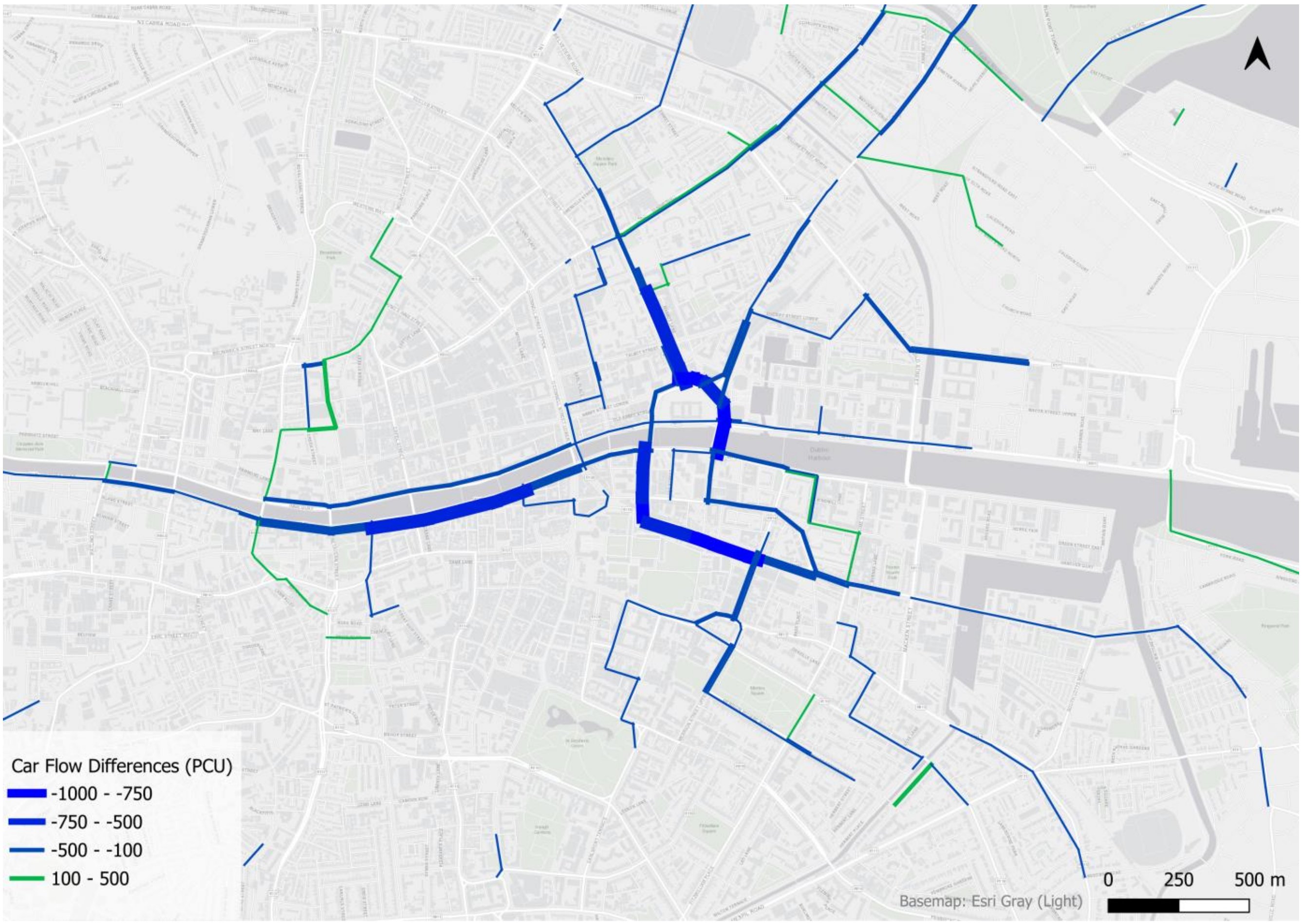

Figure 4-2 Difference in Car Flows Between the Do Minimum and Do Something model runs (AM peak hour)

Outside of this area, flow increases are seen at the Balally and Red Cow Luas stops. Given that the models were performed for the AM time period, this is likely due to increased vehicles accessing the park and rides at these locations to transfer to the Luas. Other significant flow changes are decreases at the M3 Parkway Car Park and Malahide Rail Station. This, again, is likely due to a mode shift to public transport.

In total the Do Something model has 18% fewer vehicle kilometres travelled by car in the study area than the Do Minimum in the AM period, and 15% fewer than the Do Minimum over the full 24-hour day. Compared to the baseline, the Do Something has 34% fewer vehicle kilometres travelled by car in the study area over the 24-hour day.

4.3 Changes for Public Transport

The differences in public transport passenger flow for the AM peak period between the Do Minimum and Do Something models can be seen in Figure 4-3, where increases are represented by green lines and decreases are represented by blue lines. As expected, the increase in public transport passengers significantly outweighs the decrease.

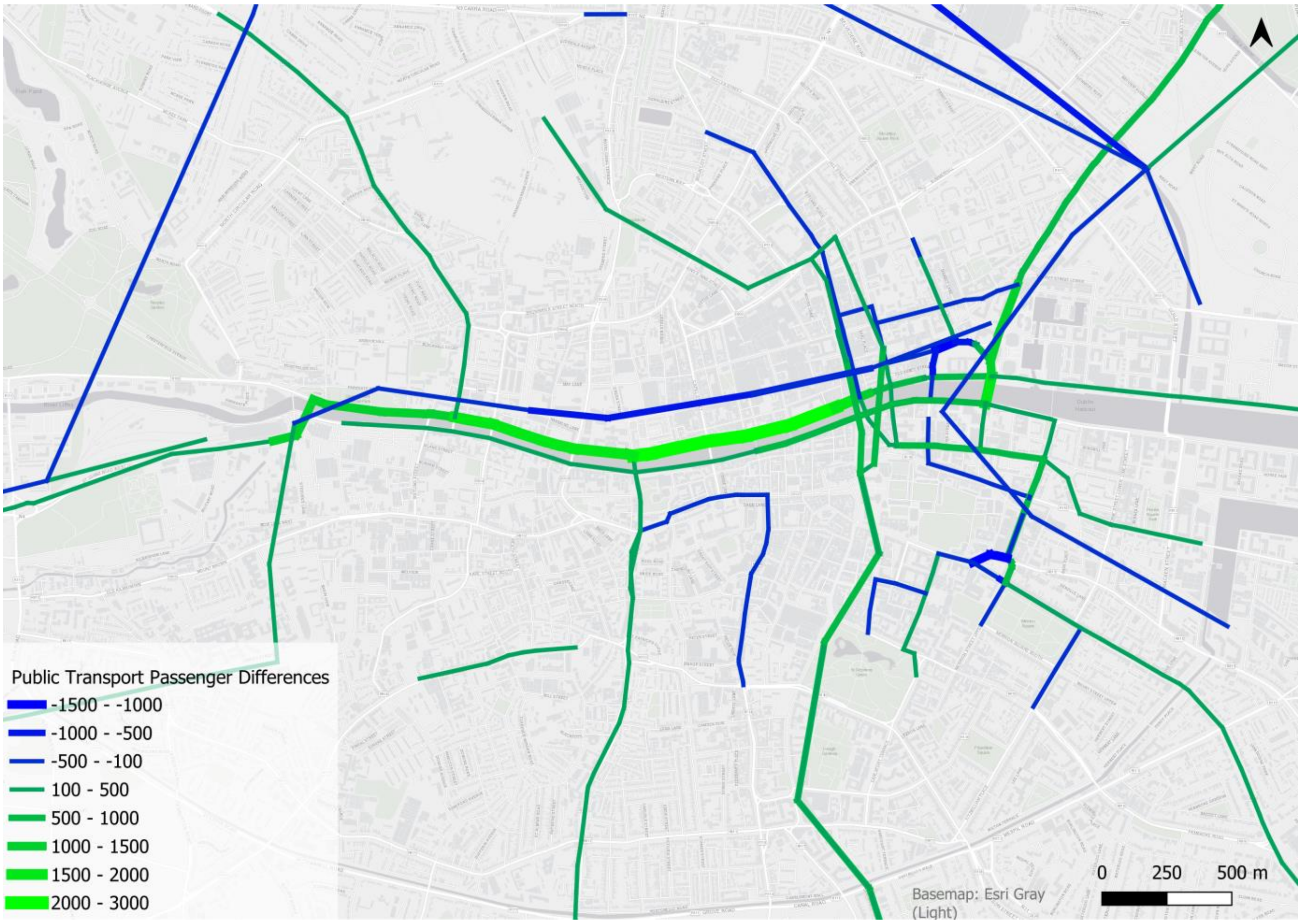

Figure 4-3 Areas with Public Transport Usage Differences of Greater Than 50 or Less Than -50 Passengers Between the Do Minimum and Do Something Models for AM Period (AM peak hour)

Areas with public transport flow increases in the Do Something scenario include:

- Along the Quays on either side of the River Liffey:
  - Maximum increase of over 2,700 bus passengers eastbound on the North Quays; and
  - Maximum increase of over 600 bus passengers westbound on the South Quays;
- The Luas Green Line, with an increase of over 800 northbound and over 500 southbound passengers.

The increases along the quays can be attributed to improved bus speeds along the quays due to the decreases in private vehicles flow.

Areas with public transport flow decreases include:

- The Luas Red Line (decrease of over 600 eastbound and over 100 westbound passengers); and
- Phoenix Park Corridor to Connolly Station (decrease of close to 600 passengers).

The Luas Red Line is seeing less users from Heuston Station towards the city centre with the decreases getting higher as the Luas approaches Busáras. However, taking buses into account, there is an overall increase in public passengers inbound from the west of the city. The increase gets larger as these public transport services get closer to the city. Journey times along this corridor are lower in the Do Something due to the reduction in traffic. The results in Figure 4-4 (which maps bus-carrying links which display speed increases of over 15%) support this, showing bus speed increases of over 15% on the approach to Heuston Station and along the Quays. These more attractive eastbound bus journey times are due to less congestion on the Quays and result in a transfer of patronage from the Red Line Luas to the bus services. The improvements to bus journey times also result in transfers from rail services using the Phoenix Park Tunnel to bus services in the Do Something. At locations where bus lanes have been introduced, buses will travel at a free-flow speed in the model, reducing journey time on the link.

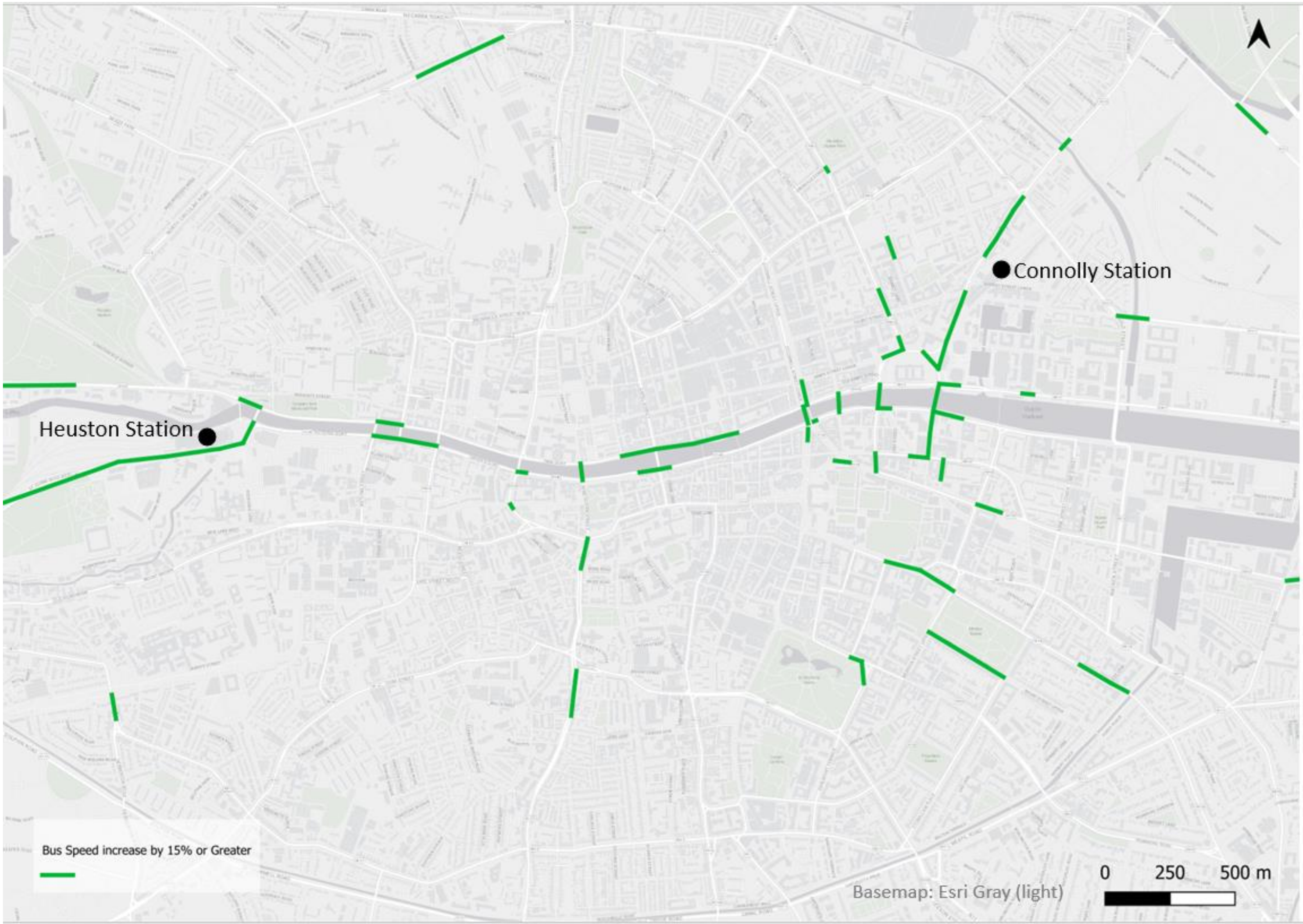

Figure 4-4 Bus-carrying links seeing speed increases of 15% or more from Do Minimum to Do Something (AM peak hour)

Links which carry buses and see a 15% or higher decrease in speed in the Do Something model are shown in Figure 4-5. These speed decreases generally occur at locations where there is no bus priority. For example, Westmoreland Street and D'Olier Street experience lower speeds in the Do Something, as do the north end of Macken Street and on Samuel Beckett Bridge in the northbound direction. Bus priority could be considered at these locations as a means of mitigating the potential reduction in bus speed. At locations where signal times have been rebalanced in favour of pedestrians, this in some instances may lead to small increases in bus travel times.

Figure 4-5 Bus-carrying links seeing speed decreases of 15% or more from Do Minimum to Do Something (AM peak hour)

4.4 Improvements for Pedestrians and Cyclists

The reduction in traffic in the city centre leads to a number of improvements for pedestrians and cyclists. Figure 4-6 shows how the volume changes in car flow correspond with the walking and cycling networks, underlining the interconnected nature of these modes and the role that limiting the amount of traffic on the streets used by active modes plays. Levels of car traffic have a significant influence on the principles laid out in the walking and cycling technical notes, namely, the creation of a safer, more connected, and more attractive cycling and walking experience by improving road safety, avoiding conflicts, and decreasing noise and air pollution. Expected improvements are detailed in the rest of this section.

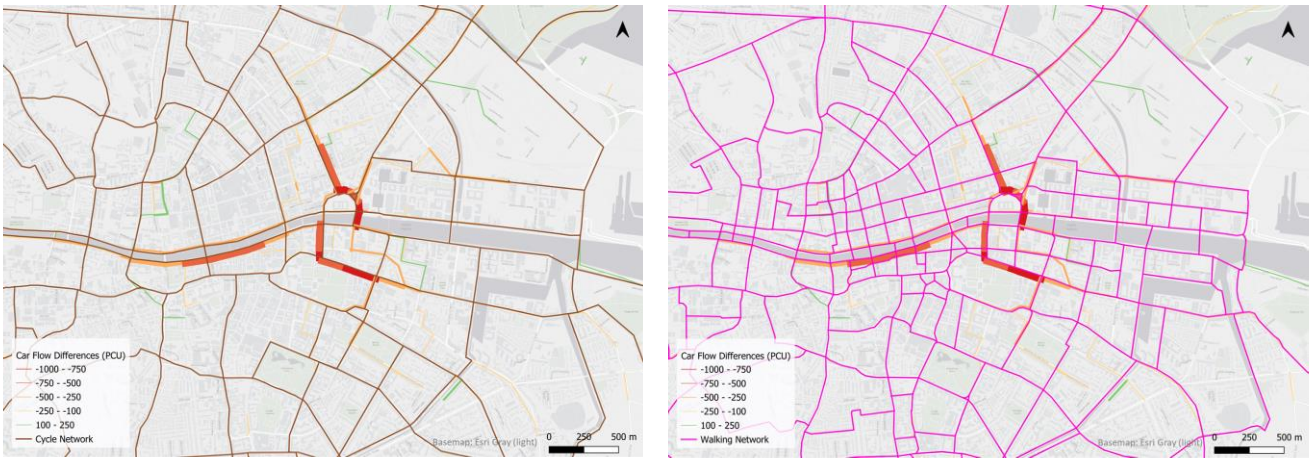

Figure 4-6 Primary Cycling (Left) and Primary Walking (Right) Networks Mapped Over the Difference in Car Flows Between the Do Minimum and Do Something Model Runs (AM peak hour)

Extra Space for Active Modes

Within the canal cordon, there are approximately 8 kilometres of roads that display a decrease in car flow greater than 250 vehicles, as taken from Figure 4-6. No roads in the study area display an increase in car flow greater than 250 vehicles. Roads with a decrease in vehicle flow that are on the cycling or walking networks are detailed in Table 4-2. The total distance of roads on the cycling or walking networks with a decrease in car flow of greater than 250 vehicles is around 7 kilometres.

Table 4-2 Areas that see Improvements for Pedestrians and Cyclists

Street	Network that the Street is in
The Quays between Heuston Station and North Wall/Sir John Rogerson's Quay	Primary Cycling and Primary Walking
Pearse Street	Primary Cycling and Primary Walking
O'Connell Street	Primary Cycling and Primary Walking
Fishamble Street	Primary Walking
Nassau Street	Primary Cycling and Primary Walking
Lincoln Place	Primary Cycling and Primary Walking
Westland Row	Primary Cycling and Primary Walking
Townsend Street	Primary Walking
Tara Street	Primary Cycling and Primary Walking
Beresford Place	Primary Cycling and Primary Walking
Amiens Street	Primary Cycling and Primary Walking
Gardiner Street	Primary Cycling and Primary Walking

Junction improvements

Signal timings at selected junctions have been altered in the Do Something to reflect the proposed change in nature of the city centre. In total, six junctions along the busiest section of the Quays had their cycle time reduced to 90 seconds and eight other junctions in the Inner Core Area had their signal timings rebalanced in favour of pedestrians. Such changes have the potential to greatly improve the speed and efficiency with which people can walk and cycle within the city centre. Furthermore, the expected decrease in road traffic within the Inner Core Area will provide the possibility for adjustments to additional signalised junctions in this area.

Improvements for a Pedestrian Journey

Taking a common pedestrian journey from the main entrance of Saint Stephens Green to The Spire on O'Connell Street, the improvements over the existing situation that this route would experience following implementation of the Do Something scenario are the following:

- The removal of traffic at College Green would remove the need to cross a minimum of two signalised junctions, saving over a minute of journey time; and
- Decreases in private vehicles on O'Connell Bridge would result in significant journey time savings for pedestrians on each side of the river.

Overall, this journey from Saint Stephens Green to The Spire would save pedestrians over 2 minutes in a 17-minute walk, and reduce the time spent waiting at traffic lights on this walk by 30%.

4.5 Area for Further Review/Mitigation

While the study area (and in particular the Inner Core Area) would see a significant reduction in traffic as a result of the proposed interventions, there are some areas that would require mitigation to improve the experience of residents and transport users. In particular, consideration will need to be given to streets around the boundary of the Inner Core Area. While analysis of the Do Something model results shows that much of the traffic reduction in this scenario results from trips switching to public transport or active modes rather than car, the modelling also shows some traffic rerouting around the Inner Core Area, resulting in increased traffic on certain streets. Additional traffic management measures could be considered to ensure that increased private vehicle traffic is directed to streets with a suitable capacity to support the increase, rather than causing undesirable increases on small laneways or residential streets.

5 CONCLUSION

The modelling indicates that in 2028, a transport network including the key public transport network improvements of BusConnects and the DART+ combined with the measures identified within the plan can accommodate increased trip demand and a strong shift towards sustainable travel modes of active travel and public transport. The following key points are noted:

- The increased sustainable mode share target set out in the DCDP can be met;
- The Inner Core Area will see a significant reduction in private vehicle traffic, freeing up the space required for Dublin to become a more sustainable city;
- There will be 8 kilometres of roads with less vehicles in the city centre, 7 kilometres of which is part of the primary cycling or walking networks;
- While some public transport services would see a slight decrease in patronage, overall the passenger numbers would rise significantly due to more efficient services with greatly reduced congestion; and
- Mitigation or alternative routing could be considered where bus speeds fall or where car flows increase in unsuitable environments.

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