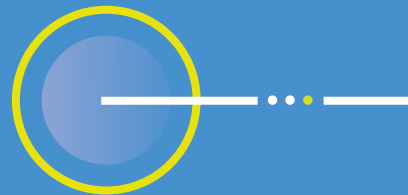


Greater Dublin Area Transport Strategy

2022



2042



Greater Dublin Area Transport Studies
Bray to Arklow

November 2021

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Executive Summary

Introduction

The National Transport Authority (NTA) commissioned Jacobs Engineering Ireland Limited (Jacobs) and SYSTRA Ltd. (SYSTRA) to undertake a series of studies on areas in the Greater Dublin Area (GDA). These studies will inform the NTA's review of the Transport Strategy for the Greater Dublin Area (2016-2035) which will consider the future development of the transport network in the Greater Dublin Area (GDA) for the period up to 2042.

The Bray to Arklow study area is located south of Dublin and lies along the coast, bounded by the Wicklow Mountains to the west, County Wexford to the south, and encompassing the urban area of Greystones at its northern end. It forms a north-south corridor, including three main settlements of Greystones, Wicklow and Arklow, as well as the smaller towns, villages and rural areas across the area.

The methodology for this study is based on the Area Based Transport Assessment (ABTA) process, which has been adapted and comprises the following key steps:

- Policy Context – understand the planning and transport policy context within which this study sits;
- Baseline Assessment – provide a clear understanding of the existing spatial characteristics, land uses, transport conditions and constraints in the study area;
- Establish Context – understand the future growth proposals for the study area as well as future travel patterns which proposed transport options need to serve;
- Options Development and Assessment – identify high-level transport options to serve demand in the study area and assess them via a multi-criteria analysis against the objectives of the study; and
- Final Summary – present the options to be taken forward and investigated further as part of the detailed preparation of the Draft Transport Strategy.

Policy Context

A comprehensive review of existing national, regional and local level legislation, policy and guidance relevant to this study has been undertaken in order to provide context for the identification of interventions which align with wider policy goals. Key documents include:

- Project Ireland 2040 – National Planning Framework;
- Project Ireland 2040 – National Development Plan;
- Draft National Investment Framework for Transport in Ireland (2021);
- Strategic Investment Framework for Land Transport (2014);
- Smarter Travel: A Sustainable Transport Future (2009 to 2020);
- The Climate Action Plan (2019);
- The Regional Spatial and Economic Strategy for the Eastern and Midland Region (2019 to 2031);
- Dublin Metropolitan Area Strategic Plan (2016 to 2040);
- Transport Strategy for the Greater Dublin Area (2016 to 2035); and
- Wicklow County Development Plan 2016-2022.

Baseline Assessment

The study area consists largely of rural areas, although two thirds of the area's population live in the three main towns of Greystones, Wicklow and Arklow. Within these, and the other built-up areas, residential land use predominates, although there are still notable destinations for services, employment and education throughout the study area.

The study area is served along its coastal areas by the Dublin - Rosslare Rail Line, with stations in Greystones, Kilcoole, Wicklow and Arklow. The N11/M11 runs through the middle of the study area, to the west of the large, coastal towns. The rail line and the N11/M11 form the two key transport corridors in the study area.

There are a number of long-distance coach services operating towards Dublin along the N11/M11 departing generally from Wexford and Wicklow. The northern part of the study area, beginning at Newcastle, will be served by a number of local routes in the BusConnects network as well as two peak-only services towards Dublin City. South of Newcastle there are no regular local bus services outside of Local Link routes operated by Ring a Link.

Walking infrastructure is provided on most routes within towns, although there are gaps in the urban network. Segregated cycling infrastructure provision is sparse even within the larger towns. The rural road network generally lacks dedicated cycling and walking infrastructure.

Car ownership is higher in the study area (89%) than the wider GDA (81%), and the proportion of trips to work by car is far higher than the GDA figure (81% vs. 55%). Following this very high car mode share for commute trips, mode shares for bus/coach (4%), walking (7%) and cycling (1%) are very low and fall far short of the respective figures for the GDA as whole. However, access to the train line from the major population centres and DART services from Greystones is evidenced in the use of Train/DART for commute trips at 7% mode share.

The topography of the study area is shaped by the coastline to the east rising towards the Wicklow Mountains to the west of the study area. It is home to a number of watercourses including the Avoca River, Kilcoole Wash and Broad Lough. The Glen of the Downs, through which the N11 runs in the vicinity of Delgany and Greystones, is a narrow, wooded valley that is a nature reserve and under the EU Habitats Directive has been designated a Special Area of Conservation (SAC).

Context

Chapter 4 provides the context of the transport demand and supply in the forecast year, 2042. It considers the proposed growth in the area, transport proposals, travel patterns and forecast demand on key corridors if modal shift is achieved. It demonstrates relatively significant changes in land use in the study area. Employment levels are expected to grow at a level similar to the forecast national average, but both population and education are to grow at a higher level than average. The vast majority of this growth is to be located in the three main towns, as well as notable population growth in Newtownmountkennedy.

The report provides an overview of current proposals for future transport interventions. With respect to road transport there is a proposal to enhance the efficiency of the N11/M11 between Junction 4 and Junction 14. The section under consideration is approximately 22km in length, extending from the existing M11/M50 junction west of Shankill (north of the Bray to Arklow study area), to the N11/M11 junction at Coyne's Cross (north of Ashford), Co. Wicklow. This project is currently at Option Selection stage. In advance of the main scheme, a separate N11/M11 Interim Bus Project to provide bus priority/lanes on the N11/M11 corridor is now also being progressed. In terms of heavy rail, the DART+ programme proposes station modifications to increase capacity in Greystones and civil works to increase service frequency between Bray and Greystones. The risk to the rail line from coastal erosion through the length of the study area is noted in this report.

Regarding light rail, advancement of proposals for Metro South and the subsequent Luas extension to Bray could provide further options for travel from the study area towards Dublin City. The new Dublin Area Bus Network is being rolled out as part of the BusConnects programme from early 2021 and has been taken as the 'base' urban bus network within this study. Routes extending from the Bray to Arklow study area towards the City Centre will benefit significantly from the Bray to City Centre Core Bus Corridor which begins at the Dargle Bridge in Bray. This project will provide enhanced bus priority along the key N11 corridor inside the M50. The GDA Cycle Network Plan proposals would create a comprehensive cycle network in the study area.

2042 demand analysis shows a significant number of internal urban area trips as well as trips between neighbouring towns. A large number of trips leave the study area, with a notable number of trips southbound

towards Arklow, but most external trips are focused northbound towards Bray, the south city and City Centre/Docklands. Most trip patterns have a very high car mode share, with origin trips from some rural zones having a car mode share exceeding 90%. Exceptions to this are:

- the key external destinations of the City Centre and UCD which both attract a very high public transport mode share;
- internal trips in Arklow which have a high walk mode share; and
- origin trips from central Greystones which have a relatively high public transport mode share.

However even the modelled zone with the lowest car mode share in the study area sees 56% of origin trips using car. The high car mode share is despite the N11/M11 (without proposed upgrade) operating at 95%-100% capacity in the northern end of the study area. The average car trip length increases between 2016-2042, which, combined with very high car mode share, likely means that, even in a Do Minimum scenario without the N11/M11 upgrade, the volume of car kilometres from the study area will increase.

A review of AM peak hour forecast public transport capacity in 2042 found very high demand on both PSO and commercially operated long-distance coach services towards the city centre, with almost all services operating above design capacity. The rail line was over capacity from Wicklow to Greystones. However, some spare capacity is modelled on DART services from Greystones before returning to overcrowded conditions north of Dún Laoghaire. Spare capacity was modelled on BusConnects services, though it is noted that this is in the absence of BusConnects bus priority infrastructure and relatively long bus journey times in comparison to other modes.

Public transport trips within the study area generally experience higher journey times in comparison to car for most trips. However, there are significant differences between bus and rail journey times, with OD pairs well served by the rail line benefitting from more competitive rail transport journey times compared to bus and car, and bus journey times suffering from a lack of bus priority in the modelled network along the congested N11/M11 corridor and serving areas off the main route, such as Newtownmountkennedy.

Analysis was also undertaken to estimate the level of public transport demand along key movement corridors if certain levels of mode shift away from car were to occur. This analysis is intended to provide an indicative level of demand to help inform the options development process in terms of level of provision required. Analysis was undertaken on two identified movement corridors passing through the study area:

- The Inland N11 Corridor
- The Coastal Rail Corridor

This analysis determined that, in order to enable a car mode shift of 50% (i.e. 50% of all car trips in 2042 shift to other modes including public transport, with shorter trips proportionally allocated to active modes), capacity for 700 extra public transport trips would be required to cater for northbound demand from the study area along the inland corridor and 500 extra public transport trips along the coastal corridor. This figure includes both modelled public transport demand, and additional demand from shifted car trips.

Options Development

To identify options to serve demand in the study area in 2042, the following steps were completed:

- A review of relevant planning and transport policies and strategies has provided the overall context for options, and identified current thinking in relation to the future transport network;
- A baseline analysis of the existing transport network identified existing network issues and opportunities;
- An analysis of planning and travel data from the 2042 Planning Sheet and a Do Minimum run of the Eastern Regional Model (ERM) for 2042 provided insights into future travel demand and network capacity constraints; and

- A review of the GDA strategy objectives against which all options should be aligned.

The above steps resulted in the preparation of an options long list to serve demand in the study area:

Type of option	Description
PT corridor	Radial public transport option connecting study area with areas to the north along the coast
PT corridor	Radial public transport option connecting study area with areas to the north inland from the coast
Local PT links enhancements	Arklow - Gorey
Local PT links enhancements	Wicklow – Rathnew - Ashford
Local PT links enhancements	Kilcoole, Newtownmountkennedy, Kilpedder, Delgany, Greystones
Rural Transport Service enhancements	From rural areas to towns within Study Area
Bus infrastructure	Provide bus priority on N11/M11
Supporting infrastructure	Park and ride, interchange
Cycle infrastructure	Cycle measures for key settlements within the study area: Greystones-Delgany, Rathnew-Wicklow, Arklow
Cycle infrastructure	Strategic cycleways between key settlements

The long list of options, where relevant, were shortlisted based on their ability to serve modelled demand in the forecast year. Based on forecast demand, the following options for the Inland and Coastal corridors were examined as part of an initial sift, to identify options to be taken forward to the Multi Criteria Analysis (MCA) Stage:

Inland Radial Corridor:

- Enhanced bus spine; and
- Enhanced bus spine with Priority.

Coastal Radial Corridor:

- Do Nothing;
- Additional New Bus Services;
- Feeder Bus services to DART north of study area (Bray or Woodbrook);
- Park and Ride north of study area (Woodbrook); and
- Minor heavy rail enhancements.

The remaining options were considered to be complementary measures and have not been assessed as part of the multi-criteria analysis.

Options Assessment

The shortlisting of core options is carried forward into Chapter 6 for a qualitative and comparative multi-criteria analysis (MCA), providing a high-level assessment based on professional judgement. Building on the key themes of the Common Appraisal Framework, a set of criteria which sit within these overarching themes were developed to enable a more detailed assessment of options to be undertaken. The criteria were based on the objectives for the 2021 review of the GDA Transport Strategy (2016-2035), as provided by the NTA.

The options brought forward to the assessment stage for the inland radial corridor were compared via the comparative analysis which demonstrated that overall, a Bus Spine with Priority performs best. In the case of the coastal rail corridor, minor enhancement to the Dublin - Rosslare Rail Line performed best within the MCA. However, the option of providing feeder bus services to DART stations north of the study area also performed well and is recommended for further consideration.

Alongside the radial corridor options, a potential new local bus service between Arklow and Gorey has been identified in addition to a series of complementary measures such as frequency improvements to BusConnects bus services, bus priority infrastructure on the N11/M11, rural transport services and cycle network improvements.

Summary

This study provides a comprehensive review of the Bray to Arklow study area in relation to proposals for future land use and transport networks and identifies a series of transport options to serve future travel demand. Two core movement corridors have been identified from the modelled data provided, which cater for the majority of movements through the study area; both are radial, with one along the coast and one inland. A demand analysis has been undertaken, incorporating both modelled public transport demand and additional demand from car mode shift to identify the most appropriate options to serve these core corridors.

The following options are recommended for further consideration in the GDA Strategy:

- minor improvements to the Dublin - Rosslare Rail Line and necessary coastal protection;
- feeder bus services from the coastal corridor to the DART north of Bray;
- significant enhancements to the N11/M11 bus corridor including new services, frequency improvement and bus priority;
- new local bus service between Arklow and Gorey;
- enhanced frequencies on local BusConnects routes;
- Park and Ride and public transport interchange facilities at Greystones, Bray and Cherrywood;
- delivery of the GDA Cycle Network Plan; and
- rural transport services sufficient to meet accessibility needs.

1. Introduction

1.1 Background to the study

The National Transport Authority (NTA) commissioned Jacobs Engineering Ireland Limited (Jacobs) in collaboration with SYSTRA Limited to complete an Area Based Study for Bray to Arklow.

This study was commissioned in order to inform the NTA's review of the Transport Strategy for the Greater Dublin Area 2016 – 2035, which will consider the future development of the transport system in the Greater Dublin Area (GDA) for the period up to 2042. In this context, the purpose of this study is to:

- Provide a comprehensive assessment of future travel demand in the Bray to Arklow area;
- Identify realistic potential options to meet future travel demand to and from this area, and in particular to cater for demand into Dublin City Centre and other key destinations;
- Focus in particular on options for public transport and active modes provision, taking account of emerging proposals;
- Assess potential options using a multi-criteria assessment framework; and
- Recommend options which can be taken forward for further assessment as part of the development of the revised Transport Strategy.

1.2 Overview of the study area

The Bray to Arklow study area is located south of Dublin and lies along the coast, bounded by the Wicklow Mountains to the west and County Wexford to the south. The study area is shown in Figure 1-1.

This large area stretches along the coast from the southern edge of Bray down to Arklow. The area is predominantly rural in character whilst also encompassing a number of key settlements in County Wicklow, including Greystones, Kilcoole, Newtownmountkennedy, Wicklow, Rathnew, Ashford and Arklow.

The N11/M11 is the main route through the area, running north to south. The area is also served by trains running on the Dublin – Rosslare railway line. As shown in Figure 1-2, retail, education, and employment is distributed across the settlements in the study area.

1.3 Study methodology

The methodology for this study is based on the Area Based Transport Assessment (ABTA) process, which has been developed by both the NTA and Transport Infrastructure Ireland (TII). This approach ensures that movement and accessibility of all forms, across all modes of travel, is considered in the development of areas at a local level. The ABTA approach has been adapted for the purposes of this study and comprises the following key steps:

- Policy Context – understand the planning and transport policy context within which this study sits;
- Baseline Assessment – provide a clear understanding of the existing spatial characteristics, land uses, transport conditions and constraints in the study area;
- Establish Context – understand the future growth proposals for the study area as well as future travel patterns which proposed transport options need to serve;
- Options Development and Assessment – identify high-level transport options to serve demand in the study area and assess them via a multi-criteria analysis against the objectives of the study; and
- Final Summary – present the options to be taken forward and investigated further.

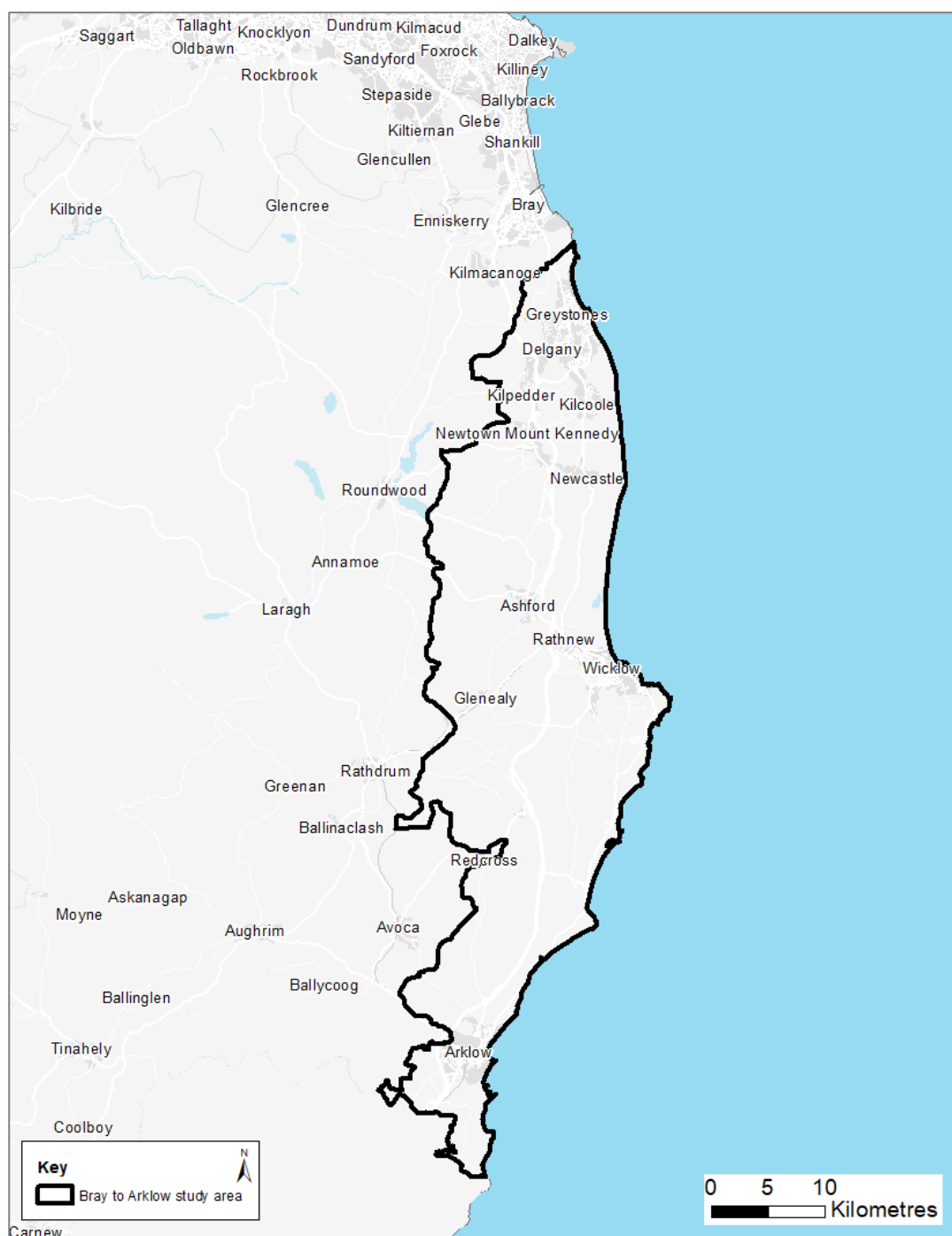


Figure 1-1: Bray to Arklow Study Area (Wider Context)

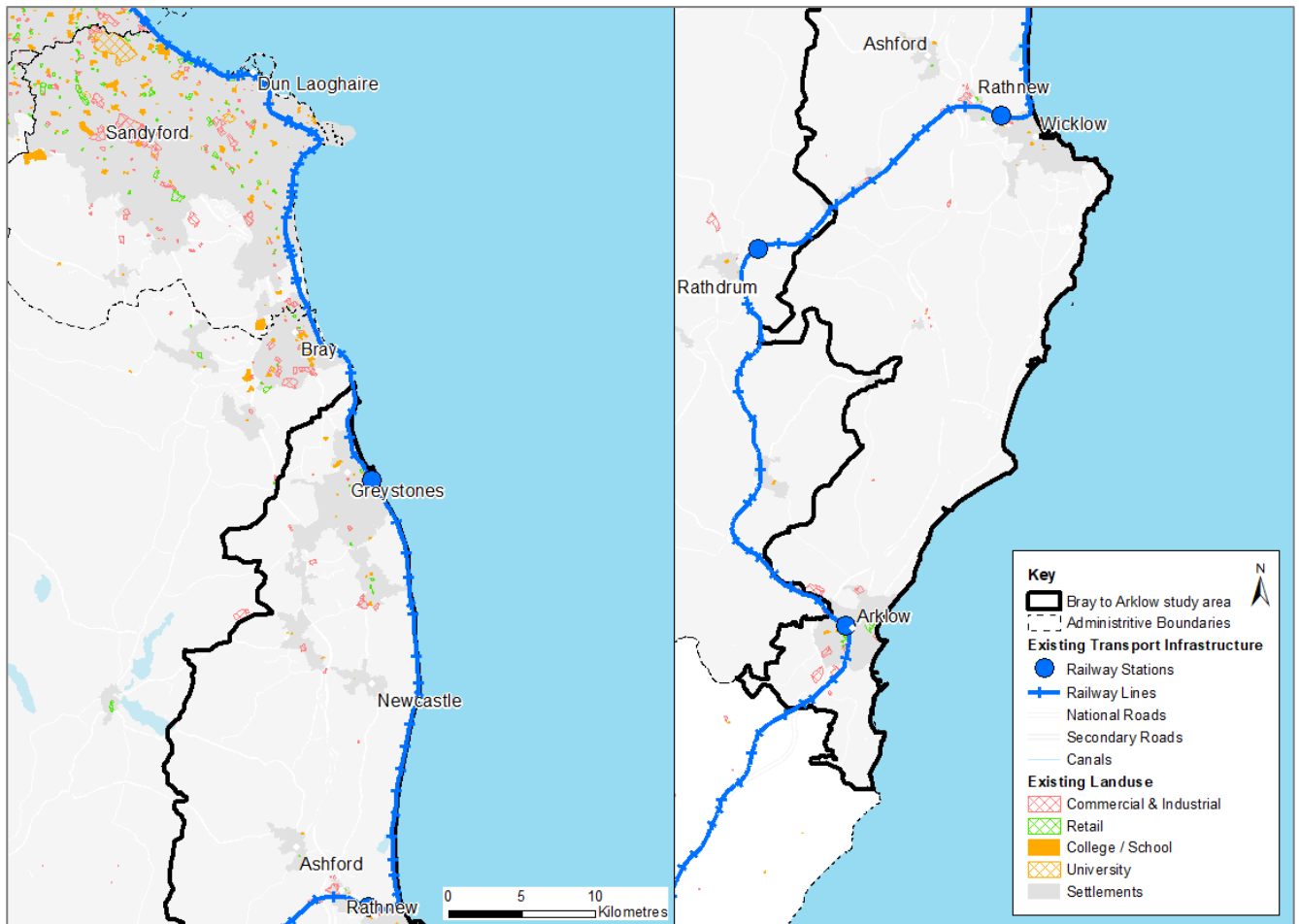


Figure 1-2: Bray to Arklow Study Area (Study Area Context)

1.4 Report structure

This report comprises the following chapters:

- Chapter 2 – Policy context;
- Chapter 3 – Baseline Assessment;
- Chapter 4 – Context;
- Chapter 5 – Options Development;
- Chapter 6 – Option Assessment; and
- Chapter 7 – Summary.

2. Policy context

This Chapter provides a comprehensive review of existing national, regional and local level legislation, policy, and guidance relevant to this study. It examines plans, policies and objectives at all levels in order to provide the broad context for this area study. It therefore frames the development of the study and provides a context for the identification of interventions which align with wider policy goals.

2.1 National policy

2.1.1 Project Ireland 2040 - National Planning Framework (2018 to 2040)

Project Ireland 2040 was adopted by the Government in February 2018 and includes two elements:

- National Planning Framework (NPF) - shaping development in economic, environmental and social terms to 2040; and
- National Development Plan (NDP) - setting out the investment priorities that will underpin the NPF from 2018 to 2027.

Project Ireland 2040 provides the framework for future development and investment in Ireland and is the overall Plan from which other, more detailed plans will take their lead, including city and county development plans and regional strategies. The NPF is a tool to assist the achievement of more effective regional development.

The objectives of the NPF, in brief, are to:

- Guide the future development of Ireland, taking into account a projected 1 million increase in population, and create 660,000 additional jobs and 550,000 more homes by 2040;
- Direct 25% of this growth to Dublin, 25% across Cork, Limerick, Galway and Waterford and the remaining 50% across key regional centres, towns and villages (as set out in the Regional Spatial and Economic Strategy [RSES]); and
- Co-ordinate delivery of infrastructure and services in tandem with growth, helping to tackle congestion and quality of life issues.

The NPF represents the overarching national planning policy document and is underpinned by a series of core principles named National Strategic Outcomes (NSOs) which include:

- NSO 1 Compact Growth;
- NSO 2 Enhanced Regional Accessibility;
- NSO 4 Sustainable Mobility;
- NSO 7 Enhanced Amenity and Heritage; and
- NSO 8 Transition to a Low Carbon and Climate Resilient Society.

These principles are translated by supporting policies and actions at sectoral, regional and local levels.

In relation to Dublin, the NPF requires the preparation of the Dublin Metropolitan Area Strategic Plan (MASP) (part of the RSES), and notes that the identification of infrastructure required to sustain growth is a key priority of this Plan. In relation to Dublin, the NPF itself sets a clear focus on:

- Supporting future growth by better managing growth and ensuring it can be accommodated within and close to the city. This includes a focus on underutilised land within the canals and M50 ring, and a more compact urban form.

- Enabling significant population and jobs growth in the Dublin metropolitan area, together with better management of the trend towards overspill into surrounding counties.
- There will be a requirement for significant greenfield development on sites which have good integration with the city and can be served by high capacity public transport. Some existing sites have already been designated as Strategic Development Zones (SDZs).
- Addressing infrastructural bottlenecks, improving quality of life and increasing housing supply in the right locations.

Key transport-related growth enablers for Dublin include:

- Delivering key rail projects set out in the Transport Strategy for the GDA including Metro Link, DART expansion and the upgrade of the Luas green line link to Metro Link;
- The development of an improved bus-based system, with better orbital connectivity and integration with other transport networks;
- Delivering the metropolitan cycle network set out in the GDA Cycle Network Plan, including key commuter routes and urban greenways; and
- Improving access to Dublin Airport, including public transport.

This policy sets the context for the development of transport interventions, including those considered through this study. It highlights that there will be significant growth to 2040 and that improvements to public transport and active mode provision are key to supporting the levels of planned development.

2.1.2 Project Ireland 2040 - National Development Plan (2018 to 2027)

The NDP sets out the enabling investment to implement the strategy set out in the NPF, for the period 2018 to 2027. Under the NDP, investment in public transport infrastructure will be accelerated to support the development of an integrated and sustainable national public transport system consistent with the NPF's NSOs of Sustainable Mobility and Compact Growth. Projects with allocated funding within the NDP include:

- Continued investment in bus and train fleets and infrastructure;
- The delivery of the Dublin BusConnects programme;
- The complete construction of Metro Link;
- Delivery of the priority elements of the DART Expansion Programme;
- A Park & Ride programme; and
- Cycling and walking networks in key urban areas.

These projects will deliver significant improvements. This study, and other work the NTA is doing to review the Transport Strategy for the Greater Dublin Area, will consider other longer-term interventions required to support the NPF to 2040 and beyond.

2.1.3 Project Ireland 2040 - Draft National Investment Framework for Transport in Ireland (NIFTI) (2021)

NIFTI is the Department of Transport's new high-level strategic framework for prioritising future investment in the land transport network. At the time of writing, the public consultation for NIFTI is currently underway and expected to conclude in May 2021. Once published, NIFTI will replace SIFLT as the framework for future land transport investment. NIFTI is intended to ensure that transport investment is aligned with and supports the NPF and its NSOs. NIFTI outlines key investment priorities that future transport projects must align with to be considered for funding.

Priorities include:

- Decarbonisation – Recognises the fact that transport accounts for approximately one-fifth of Irish greenhouse gas emissions, so decarbonisation is an urgent priority in the context of climate change targets;
- Protection and renewal – many of the challenges faced by the network can be addressed, at least partially, through protection and renewal. Adequate maintenance is necessary to ensure safety, make sustainable modes an attractive option, deliver connectivity and accessibility and ensure the resilience of key pieces of infrastructure;
- Mobility of people and goods in urban areas – requires prioritisation in order to facilitate compact and sustainable growth in towns and cities. Support will be given to projects that reduce urban congestion, especially through the use of sustainable mobility measures; and
- Enhanced regional and rural connectivity – through addressing critical bottlenecks and network constraints as well as ensuring all parts of the country are well-served with access to major ports and airports.

This framework highlights the need for this study to identify measures to address issues such as climate change and urban congestion through modal shift and improved provision for sustainable modes.

2.1.4 Investing in Our Transport Future: Strategic Investment Framework for Land Transport (2014)

The Strategic Investment Framework for Land Transport (SIFLT) sets out the strategic framework to consider the role of transport in the future development of the Irish economy and estimates the appropriate level of investment required in the land transport system. The framework establishes:

- High-level priorities for future investment in land transport; and
- Key principles, reflective of those priorities, to which transport investment proposals will be required to adhere.

Priorities include:

- Achieve steady state maintenance – emphasising the importance of efficient maintenance and management;
- Addressing urban congestion – recognising that improvements to the efficiency and sustainability of urban transport systems are a key priority. The document specifically notes that this “must be guided by demand/capacity assessments and recognise the role of urban centres as key drivers of economic activity, nationally and regionally.” It goes on to say that measures should include improved and expanded public transport capacity, walking and cycling infrastructure as well as Intelligent Transport Systems to improve efficiency and capacity; and
- Maximising the contribution of land transport networks to national development.

This framework highlights the need for this study to identify measures that address urban congestion and improve the provision of sustainable transport modes.

2.1.5 Smarter Travel: A Sustainable Transport Future (2009 to 2020)

Smarter Travel: A Sustainable Transport Future presents an overall policy framework for sustainable transport in Ireland. The policy sets out a vision, goals and targets to be achieved and outlines 49 actions that form the basis of achieving a more sustainable transport future.

Smarter Travel acknowledges that continued growth and dependency on the private car is not sustainable and therefore sets an objective to promote a significant mode shift in favour of public transport, walking and cycling. A key target in this regard was to reduce the proportion of travel to work by car from 65% to 45%.

Key goals of Smarter Travel include:

- Improving quality of life and accessibility to transport for all;
- Improving economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks;
- Minimising the negative impacts of transport on the environment through reducing air pollution;
- Reducing overall travel demand and commuting distances in the private car; and
- Reducing reliance on fossil-fuel-based transport modes.

Please note, this policy is currently under review as part of the Sustainability Mobility Policy Review. Consultation on the review closed in early 2020. The consultation documents emphasised that the purpose of the review was to put in place a new policy which supports:

- A shift away from the private car to greater use of active travel and public transport;
- Travel by cleaner and greener transport; and
- Comfortable and affordable journeys to and from work, home, school, college, shops and leisure.

The new policy will align with the NPF and will replace the Smarter Travel policy, plus the National Cycle Policy Framework.

This policy highlights the need for this study to place key emphasis on identifying the interventions required to support mode shift.

2.1.6 National Cycle Policy Framework (2009 to 2020)

Ireland's first *National Cycle Policy Framework 2009-2020*'s vision is that all cities, towns, villages and rural areas will be bicycle friendly. The overarching mission of the Framework is to create a strong national cycling culture to align with *Smarter Travel*'s objective that 10% of all trips will be by bike by 2020.

The Framework sets out a comprehensive package of interventions – both 'hard' (planning and infrastructure) and 'soft' (communication and education) – to make cycling a convenient and safe option for everyone. The approach recommended is a hierarchy of measures, including:

- Reducing volumes of through-traffic, especially HGVs, in urban centres and in the vicinity of schools and colleges;
- Calming traffic/ enforcing low traffic speeds in urban areas; and
- Making junctions safe for cyclists and removing multi-lane one-way street systems.

A number of objectives relevant to this study include:

- Support the planning and design of urban centres to support cyclists and pedestrians;
- Improve integration between cycling and public transport to enable multi-modal travel;
- Provide secure parking for bikes; and
- Evaluate and monitor the implementation of measures.

Please note, this policy is currently under review as part of the Sustainability Mobility Policy Review (as detailed above). This policy highlights the need for this study to identify the cycle infrastructure required to support future growth.

2.1.7 Building on Recovery: Infrastructure and Capital Investment (2016 to 2021)

Building on Recovery: Infrastructure and Capital Investment 2016-2021, published by the Department of Public Expenditure and Reform in 2016, presents the Government's new €42 billion framework for infrastructure investment in Ireland over the period 2016 to 2021.

The Exchequer transport capital allocation is largely framed by the recommendations and priorities set out in the *Strategic Investment Framework for Land Transport* (superseded by the *Planning Land Use and Transport Outlook 2040* in 2018). These priorities are threefold:

- Maintain and renew the strategically important elements of existing land transport system;
- Address urban congestion; and
- Improve the efficiency and safety of existing transport networks.

Under the Plan, €100 million is being committed to sustainable transport and carbon reduction measures, including Greenways, to ensure that the transport sector makes a major contribution to climate change mitigation targets.

This policy highlights the need for this study to identify measures that contribute to climate change mitigation targets, whilst addressing the priorities outlined above.

2.1.8 Climate Action Plan (2019)

The *Climate Action Plan: To Tackle Climate Breakdown* was published by the Government in June 2019. The Plan identifies how Ireland will achieve its 2030 targets for reduction in carbon emissions and a pathway towards achieving a net zero emissions by 2050.

A central pillar of this plan is the role that transport can play in reducing our carbon footprint and improving air quality in our towns and cities. The plan acknowledges that the delivery of improved public transport will lead to a modal shift away from unsustainable transport choices and contribute significantly to the decarbonisation challenge that lies ahead.

The *Climate Action Plan* sets a target reduction of 45-50% in Ireland's transport emissions by 2030. The projected increase in population and economic activity and the resulting increased travel demand from the movement of people and goods will further intensify Dublin's current decarbonisation challenge. In 2017, transport accounted for a significant proportion of Ireland's greenhouse gas emissions – approximately 20%.

Other targets in relation to transport include:

- Increasing the number of electric vehicles;
- Building the electric vehicle charging network at the rate required to meet demand;
- Require at least one recharging point in new non-residential buildings with more than 10 parking spaces; and
- Raise the blend proportion of biofuels in road transport.

The plan highlights the need for this study to identify measures that contribute to reductions in transport related carbon emissions.

2.1.9 Road Safety Strategy (2013 to 2020)

The Road Safety Strategy set out targets to be achieved in terms of road safety in Ireland, with the primary target defined as follows:

'A reduction of road collision fatalities on Irish roads to 25 per million population or less by 2020 is required to close the gap between Ireland and the safest countries. This means reducing deaths from 162 in 2012 to 124 or fewer by 2020. A provisional target for the reduction of serious injuries by 30% from 472 (2011) to 330 or fewer by 2020 or 61 per million population has also been set.'

The Strategy goes on to state that 'the attractiveness of walking depends strongly on the safety of the infrastructure provided. Collisions involving pedestrians account for 1 in 5 fatalities annually.' It also notes that 'collisions involving cyclists account for 1 in 25 road deaths annually.'

The Road Safety Authority (RSA) undertook a consultation on their new strategy 2021-2030, which closed in November 2020. The new strategy is proposed to have an end date of 2030 to align with the EU Road Safety Policy. The review document notes that while the long-term trend shows that roads in Ireland have become safer for road users overall, this has not been the case for all road user groups. It notes that the biggest decrease in fatalities was among pedestrians and that pedestrian casualties were 68% lower in 2019 compared to 2000, but that pedestrians are still the second largest fatality group, behind car occupants. The new strategy will look at how to further reduce fatalities and serious injuries and how to deal with new issues in road safety.

2.1.10 UN Convention for the Rights of People with Disabilities (2019)

In March 2019, Ireland ratified the *UN Convention on the Rights of People with Disabilities*. Article 9 of the 'UNCRPD' includes the right to transport and creating an accessible end to end journey, with the user focus central to this approach. Its focus is:

"To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to, inter alia:

- Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces.
- Information, communications and other services, including electronic services and emergency services."

Article 9 for the first time enshrines the right to transport within Irish legislation. The focus on Usability and Accessibility has implications and opportunities across transport planning and provision, including the National Planning Framework and the way that schemes are appraised to capture wider benefits associated with ensuring this Right.

2.1.11 Other national guidance

The following national guidance has also been considered:

- Area Based Transport Assessment Guidance (ABTA), NTA/TII, 2018;
- Design Manual for Urban Roads and Streets (DMURS), Department of Transport, Tourism and Sport, 2013 (updated 2019);
- National Physical Activity Plan, Healthy Ireland, 2019 (updated 2021);

- National Cycle Manual, National Transport Authority, 2011;
- Permeability: A Best Practice Guide, National Transport Authority, 2015;
- Achieving Effective Workplace Travel Plans; Guidance for Local Authorities, National Transport Authority¹.

2.2 Regional policy

2.2.1 Regional Spatial and Economic Strategy for the Eastern and Midland Region (2019 to 2031)

The *Regional Spatial and Economic Strategy for the Eastern and Midland Region* (RSES) translates the objectives of the NPF at a regional level and provides a link between the NPF and local plans. Overall, it provides a framework for investment to better manage spatial planning and economic development throughout the Region to 2031, and beyond to 2040.

The RSES identifies 16 regional strategic outcomes (RSOs). Integrated transport and land use is one of these, aiming to promote best use of transport infrastructure and promote sustainable and active modes of travel. The key challenge facing the region is identified as the transition to a low carbon society. The RSES therefore identified a number of primary areas of transition, with sustainable transport systems being one of these.

Dublin Metropolitan Area Strategic Plan

The Metropolitan Area Strategic Plan (MASP) for Dublin sets out a strategic planning and investment framework for the Dublin metropolitan area covering the short term (to 2026), medium term (to 2031) and longer term (to 2040). It includes a vision for future growth to 2031 including large scale development opportunities and a sequence of infrastructure priorities. It envisages a 250,000 increase in population of the metropolitan area between 2016 and 2031.

The vision is underpinned by a spatial framework in line with the overall settlement strategy focused on:

- Consolidation of Dublin City and suburbs;
- Key towns of Swords, Maynooth and Bray; and
- Planned development in strategic development areas in Donabate, Dunboyne, Leixlip and Greystones.

The MASP includes a number of guiding principles for development, with a key focus on integrated transport and land use, focusing growth on public transport corridors and nodes. It aims to see 50% of all new homes within or adjoining the existing built up area in Dublin and 50% in other settlements. To unlock development capacity in strategic development areas, the MASP identifies sequencing of enabling infrastructure and directs the cross sectoral investment required to deliver development.



¹ <https://www.nationaltransport.ie/wp-content/uploads/2012/03/Achieving-Effective-Workplace-Travel-Plans-Guidance-for-Local-Authorities11.pdf>

The MASP identifies five strategic development corridors and areas and, for each, highlights the:

- Population capacity (as opposed to targets) in the short, medium and longer term;
- Strategic residential development opportunities;
- Strategic employment opportunities; and
- Infrastructure required to enable this development in the short to medium and medium to longer term.

The MASP recognises that “Facilitating modal shift to more sustainable transport options, including walking and cycling, is a key element in promoting better traffic management and climate change strategies in the metropolitan area.”

2.2.2 Transport Strategy for the Greater Dublin Area (2016 to 2035)

The *Transport Strategy for the Greater Dublin Area 2016-2035* provides a framework for the planning and delivery of transport infrastructure and services in the GDA up to 2035. It provides a transport planning policy around which other agencies involved in land use planning, environmental protection, and delivery of other infrastructure such as housing, water and power, can align their investment priorities.

The GDA’s transport infrastructure must be planned for and invested in on the basis of the following:

- Assumed sustained economic growth;
- Substantial population growth;
- Full employment;
- That no one is excluded from society, by virtue of the design and layout of transport infrastructure and services or by the cost of public transport use; and
- That the environment in the GDA is protected and enhanced.

The Strategy sets out high-level proposals for the walking, cycling, public transport and road networks, as well as parking management measures and other supporting measures for the entire GDA. This study looks to update work done as part of this strategy with a new forecast year of 2042.

2.2.3 Transport Strategy for the Greater Dublin Area Review (2021)

The NTA is required by legislation to review the Transport Strategy for the Greater Dublin Area every six years. The ongoing review will assess the implementation of the current plan and look to produce an updated strategy which will set out the framework for investment in transport infrastructure and services, through to 2042. The NTA aims to complete the review by the end of 2021, so that the new strategy can be approved by the Minister for Transport in early 2022. The review process recognises that the following are particular challenges and considerations for the new strategy:

- Climate change and the environment – recognising the need for transport to lead the way towards a net zero emissions future;
- Growth and change – ensuring the public transport investment aligns with changes in the location of population, jobs and schools;
- Health and quality – recognising that transport can open up opportunities and have a positive impact on health and wellbeing; and
- The economy – with effective public transport being a major driver of economic activity.

This transport study will feed into the review process currently being undertaken by the NTA.

2.2.4 Greater Dublin Area Cycle Network Plan

The Greater Dublin Area Cycle Network Plan was adopted by the NTA in early 2014 and is identified as a key future growth enabler for Dublin in the NPF.

The plan forms the strategy for the implementation of a high quality, integrated cycle network for the GDA. This involves the expansion of the urban cycle network from 500km to 2,480km, comprising a mix of cycle tracks and lanes, cycle ways and infrastructure-free cycle routes in low traffic environments. Within the urban network this will consist of a series of routes categorised as follows:

- **Primary** – main cycle arteries that cross the urban area and carry most cycle traffic – target quality of service (QoS) of two abreast plus overtaking width = 2.5m;
- **Secondary** – link between principal cycle routes and local zones – target QoS of single file plus overtaking width = 1.75m; and
- **Feeder** – cycle routes within local zones and/or connection from zones to the network levels above.

Specific proposals relevant to the Bray to Arklow study area are detailed in Section 4.2.6.

2.3 Local policy

A number of local policy documents are relevant to the Bray to Arklow study area. Local policy documents have been reviewed to inform growth locations and future transport developments. The following documents have informed the future context set out in Chapter 4:

- Wicklow County Climate Adaptation Strategy (2019)
- Wicklow County Development Plan (2016 – 2022);
- Greystones / Delgany & Kilcoole Local Area Plan (2013 – 2019);
- Newtownmountkennedy Local Area Plan (2008 – 2018);
- Newcastle Settlement Plan (2016 – 2022);
- Ashford Town Plan (2016 – 2022);
- Wicklow Town and Rathnew Development Plan (2013 – 2019); and
- Arklow and Environs Local Area Plan (2018 - 2024).

3. Baseline assessment

3.1 Description of the study area

3.1.1 General

The Bray to Arklow study area is largely rural, with neighbouring towns clustered in the north, centre and south of the area. In built up areas, residential land use predominates, although there are still notable destinations for services, employment and education throughout the study area.

3.1.2 Transport network and services

Road network

The Bray to Arklow study area is served by the M11 / N11, as well as regional and local roads (see Figure 3-1). It is evident that the N11/M11, a two-lane dual carriageway road, is the main route through the centre of the study area. From south of the study area, beyond Gorey, the route is the M11 northwards, around Arklow, past the junction for Wicklow, Rathnew and Ashford, and then at junction 14 is downgraded to the N11. From here the N11 passes east of Newtownmountkennedy, connects with the R774 and R762 to provide access to Greystones, and then passes through the Glen of the Downs, a topographically narrow wooded valley. Upon exiting the study area, the route remains as the N11 until junction 5 immediately north of Bray where it returns to motorway standard until just beyond junction 17 with the M50 where it enters Dublin.

There are currently proposals for improvements along the N11/M11 between junctions 4 and 14, which with respect to this study area covers a stretch from an area north of Ashford, passing Newtownmountkennedy and points northwards and beyond to the study area boundary. The improvements that are being developed are designed to reduce congestion and improve safety on this key route.

Regional roads connect the towns, such as the R761 linking Bray, Greystones, Kilcoole and Wicklow, the R750 providing a coastal route between Wicklow and Arklow, and the R772 connecting Ashford and Newtownmountkennedy to junctions with the M11 and N11, respectively.

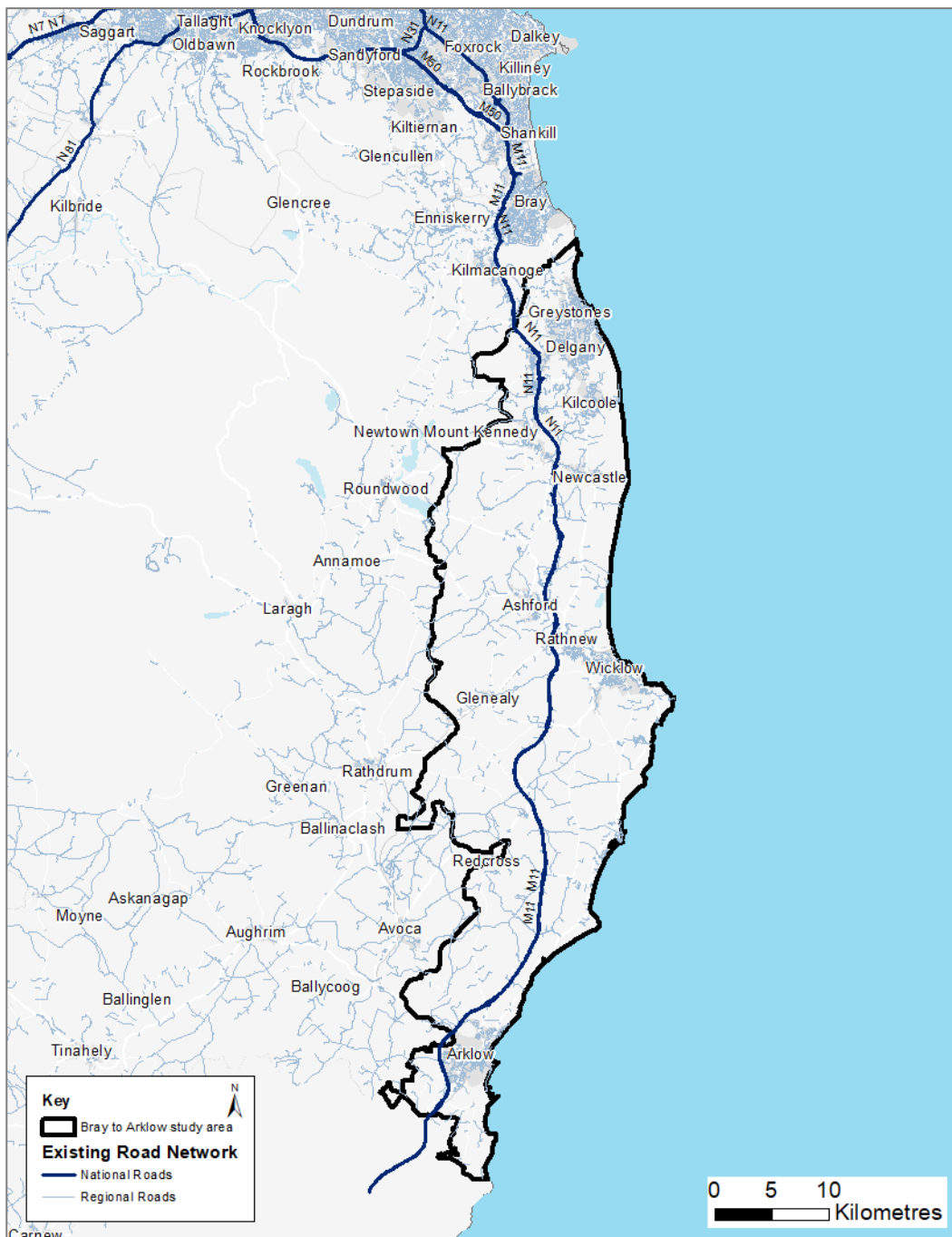


Figure 3-1: Road network in study area

Heavy and light rail network

The heavy rail network in the GDA consists of several individual lines, running a combination of electrified DART services, and diesel Commuter and Intercity services. In this study area provision is on the South East Rail Line (Dublin to Rosslare Europort) (Figure 3-2), carrying InterCity services along its length, Commuter Services from Dublin to Gorey, and DART services as far south as Greystones. The line is double track from Dublin city centre south as far as Bray, where it becomes single track southbound to Greystones and beyond to the rest of the stations within the study area.



Figure 3-2: Heavy and light rail network

The heavy rail trains serve stations at Gorey (outside of this study area), Arklow, Rathdrum (outside of this study area), Wicklow, Kilcoole and Greystones. The DART serves Greystones providing heavy rail connections to areas north of the study area and beyond through network integration and interchange.

Within and close to the study area, car parking is available at each of the stations (Table 3-1). The closest light rail station is outside of the study area at Brides Glen, the southern terminus of the Luas Green line, with the closest park and ride being found at Carrickmines, just off M50 junction 15 and c.15km from Greystones, with capacity for 352 vehicles.

Table 3-1: Train station parking provision

Station	Car Parking Spaces	Daily Car Parking Charges	Bicycle Parking Spaces
Bray	100	€3.50	100
Greystones	400	Free (Mill Road Park & Ride)	40
Kilcoole	15	Free	10
Wicklow	67	€3.50	Available. Number not stated.
Rathdrum	20	€3.50	0
Arklow	125	€3.50	Available. Number not stated.

Parking provision

Parking at train stations in the study area is low priced or free (see Table 3-1).

In the Greystones area parking Monday to Saturday is chargeable at a rate of €1 per hour, or €3 in all day parking zones. Additionally, as stated in Table 3-1, free parking is provided at the Mill Road Park and Ride, which serves the train station. Within the Wicklow area a range of parking permits are available, including €50 residents permits, and seven day permits for visitors at €10. In Arklow, all day parking is provided at Castle Park and River Walk.

Bus network

As stated in the 'Transport Strategy for the Greater Dublin Area (GDA) 2016 – 2035²' the Greater Dublin Area is "heavily reliant" on the bus network. Therefore, this sub-section sets out the existing situation with regards to bus services within the Bray to Arklow area.

The national road network provides key corridors for bus operations, with the local road network providing connectivity to settlements and shorter distance inter-settlement links. Within the study area, the M11/N11 is the principal bus spine catering for Dublin Area Bus Services and longer distance coach routes. The Dublin Area Bus Services are included within the BusConnects programme described below. The coach services include both commercially operated routes provided by Bus Éireann and Wexford Bus, and PSO routes operated by Bus Éireann under contract to the NTA. The PSO services within the study area are part of the Dublin Commuter Services group.

As part of the BusConnects programme, a redesign of the bus network in the GDA is proposed to provide greater capacity, enhance priority and a more coherently planned network. The implementation of the New Dublin Area Bus Network will be completed in phases commencing in 2021. The proposed network is set out here as part of the baseline. The new network features:

- **Spines** – frequent routes made up of bus services timetabled to work together along a radial corridor;
- **Orbitals** – providing connections between the suburbs, town centres and key transport interchanges without requiring travel into the city centre;
- **Other city-bound routes** – other routes which operate on their own timetables outside of spine routes;
- **Local routes** – routes providing connections within local areas;
- **Peak only** – services operating during peak periods to provide additional capacity on key corridors; and
- **Express** – direct services from outer suburbs to city centre at peak times.

The BusConnects routes proposed to run through the Bray to Arklow study area are detailed in Table 3-2.

² National Transport Authority 'Transport Strategy for the Greater Dublin Area 2016-2035' (National Transport Authority, 2016, p.89)

Table 3-2: Dublin BusConnects New Network routes in the study area

Route Type	Service	Route	Weekday Frequency
Spine Routes	none		
Local Routes	L1 / L2	Greystones - Newcastle Loop (L1 Clockwise - L2 Anticlockwise) - Bray	6am to 7pm: 40 minutes 7pm to 12am: 60 minutes
	L3	Greystones Circulator (1-way loop)	6am to 11pm: 30 minutes 11pm to 12am: 60 minutes
	L11	Kilmacanogue – Bray - Dún Laoghaire	6am to 7pm: 20 minutes 7pm to 12am: 30 minutes
Peak-only/express route	X1	Kilcoole - Southern Cross - City Centre	6am to 7am: 2 services 7am to 8am: 4 services 4pm to 5pm: 1 service 5pm to 6pm: 5 services
	X2	Newcastle - Kilcoole - Southern Cross - City Centre	6am to 7am: 1 service 7am to 8am: 2 services 4pm to 5pm: 1 service 5pm to 6pm: 2 services

A map of these proposed routes and others in the vicinity of the study area can be seen in Figure 3-3. The Dublin Area Bus Network as proposed under BusConnects provides a significant number of services in the north of the Bray to Arklow study area. Key locations served include Greystones town centre and rail station, Charlesland, Delgany, Kilcoole, Kilpedder and Newtownmountkennedy. The routes provide local connectivity through an integrated bus network, interchange opportunities with rail, and direct bus links to Bray, Dún Laoghaire and, during the peak hours, Dublin City Centre along the N11 corridor.

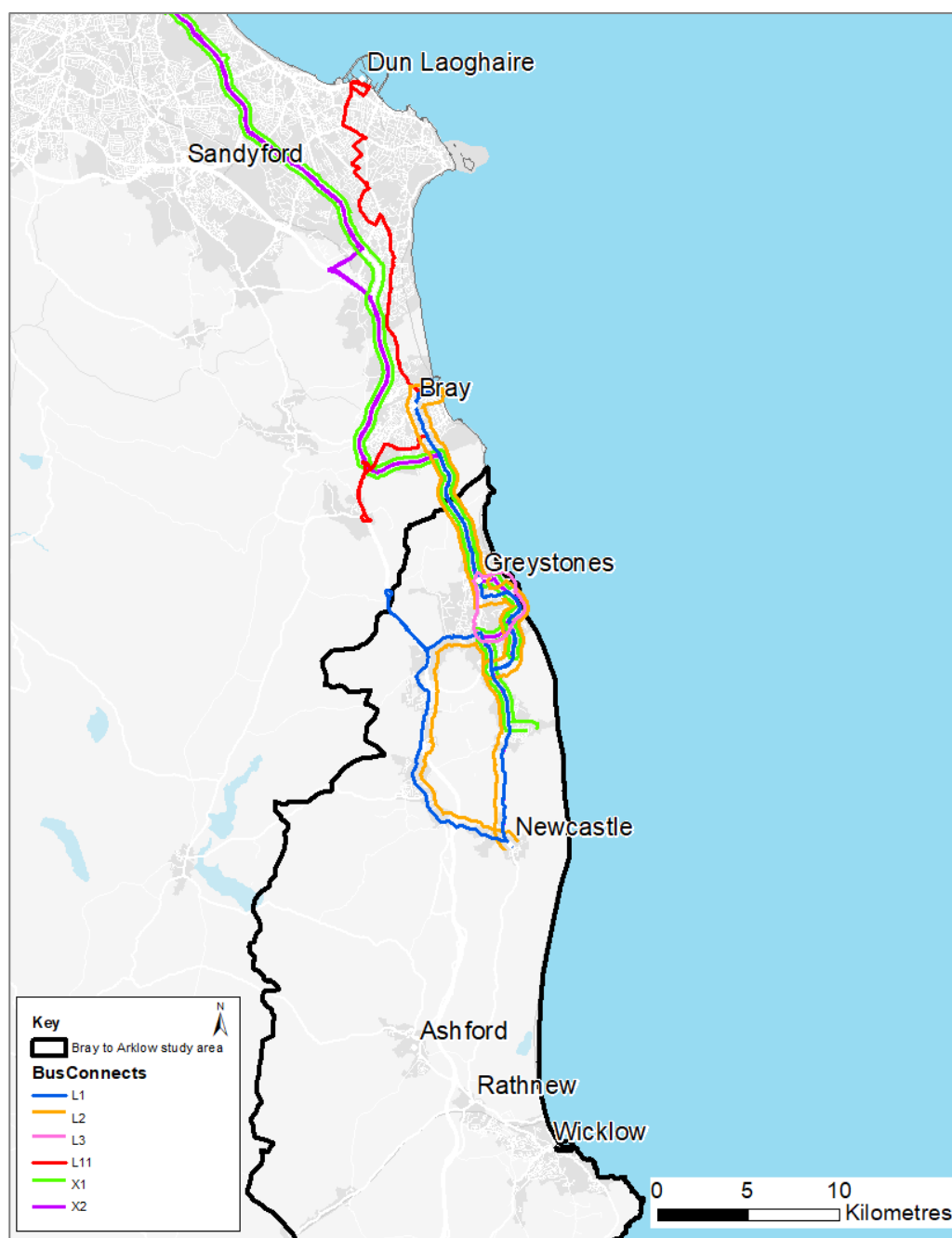


Figure 3-3: New Dublin Bus Network in the Bray to Arklow study area

Local Link (Ring a Link) Service

The Ring a Link service is an affordable bus service serving the rural communities of Carlow, Kilkenny, Tipperary, and Wicklow. The majority of Ring a Link services operate within areas surrounding large towns. The services have a schedule, but often have no fixed route and respond to registered demand.

The Ring a Link service allows travel to or from local villages or towns for business, shopping, socialising, healthcare, or to connect with national bus or train services. The Ring a Link services differ from conventional buses as most of the services are demand responsive and door-to-door. The buses can collect anyone registered within the service area from their homes, alongside other passengers. The frequency of services differs depending on demand, with the buses serving the study area operating sporadically, from once a day to once a week.

Cycle network

The Dublin cycle network in the Bray to Arklow study area is presented in Figure 3-4. In the north of the study area there are segregated lanes adjacent to the R774 from the vicinity of the N11 junction running eastbound and then northbound up towards Greystones. There is a mix of shared use and on-road cycle lanes on other approaches to Greystones, although there are gaps and provision peters out as the facilities approach the centre of Greystones.

In Wicklow and Rathnew, dedicated cycling facilities are provided on the Town Relief Road, Port Access Road, R750 Dublin Road, Dunbur Road, Hawkstown Road, Broomhall Court and Seaview Heights. These routes are either cycle tracks that are separated from and immediately adjacent to the road or are dedicated on road cycle lanes. The cycle tracks along the R750 and Hawkstown Road are of high quality.

Within Arklow there is little cycle provision, with cycle lanes along a short section of the R772 Wexford Road and a short stretch of dedicated cycle path along the eastbound side of the road providing access to Kilbride Industrial Estate.

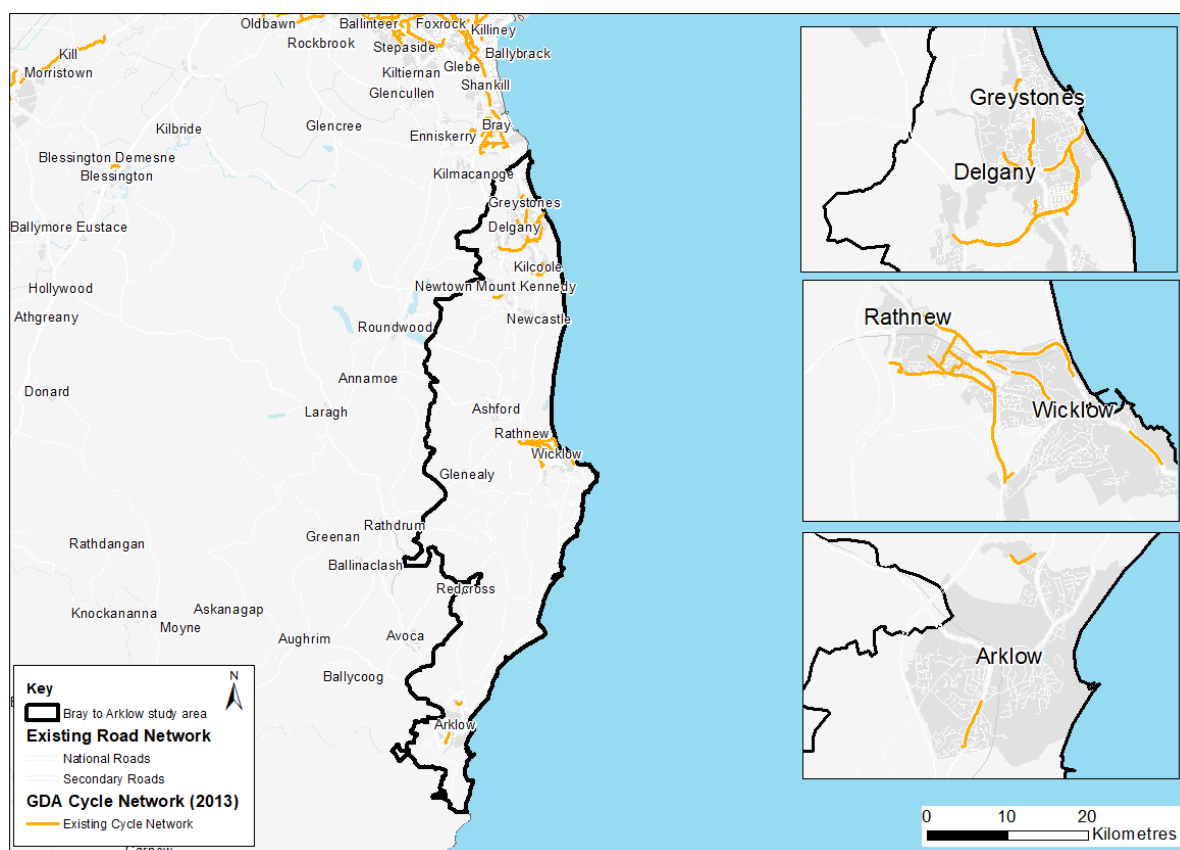


Figure 3-4: Bray to Arklow existing cycle network

Walking network

As noted above the Bray to Arklow study area is mostly rural and includes a group of towns, some of which are adjacent to each other, such as Wicklow and Rathnew, Greystones and Delgany. Most towns, however, are their own entity, linked by rural routes and at distances not suited to walking. Within the towns, the walking infrastructure is generally satisfactory, although the footways can be a little narrow in places. A noticeable gap in the walking infrastructure, however, is the link between Kilcoole town and its train station that lies 1km from the edge of the built up area but is connected by a rural road with no footway. Beyond the built up areas of the towns, footway provision is often non-existent, meaning that in some cases accessibility between nearby towns on foot or by cycle is significantly compromised.

Road safety

In the whole of County Wicklow, between the 1st January and 31st December 2020 there were two fatalities as a result of road collisions³. Data on road fatalities or serious injuries is not available for the study area.

3.2 Existing travel patterns

This section sets out the existing travel patterns across the study area, and between the study area and Dublin City Centre.

3.2.1 Key trip attractors

Whilst there are a number of key trip attractors within the study area, as the study area predominately comprises existing residential land uses, many of the key trip attractors lie outside of the study area.

The key trip attractors within the Bray to Arklow study area include the following:

Leisure & Tourism:

- Wicklow Gaol
- Mount Usher Gardens
- Brittas Bay
- Arklow South Beach
- Greystones Harbour
- Wicklow Harbour

Local Amenities / Services

- Greystones Town Centre & Meridian Shopping Centre
- Wicklow Town Centre
- Wicklow Port
- Rathnew Business Park
- Arklow Town Centre
- Arklow Port
- Arklow Bridgewater Shopping Centre
- Numerous schools
- Numerous sporting facilities

Key trip attractors for travel from the study area to external locations include:

- Bray
- Dublin City Centre
- Cherrywood Business Park
- Sandyford Business Park
- Dún Laoghaire
- University College Dublin (UCD)
- Blackrock

³https://www.rsa.ie/Documents/Fatal%20Collision%20Stats/Provisional_Reviews_of_Fatal_Collisions/RSA%20Road%20Fatalities%201200X600px%20DECEMBER%202020%20v3.pdf

3.2.2 Car Ownership

Car ownership data has been obtained from the Census 2016 Small Area Population Statistics (SAPS). Table 3-3 presents the car ownership data for the GDA and the Bray to Arklow study area. The proportion of households who own at least one car, excluding those who did not provide a response, is higher in the Bray to Arklow area (90%) than the GDA (79%). There is also a higher proportion of 2+ car households (49% versus 39%).

Table 3-3: Car ownership data (Census 2016 SAPS)

Area	Total Households	Cars per household				
		0	1	2	3	4+
Greater Dublin Area	666,724	19%	43%	32%	5%	2%
Bray to Arklow	23,311	11%	41%	40%	7%	2%

3.2.3 Travel data

Travel to work/school/college by mode

Statistical analysis has been undertaken on the Census 2016 SAPS to identify the mode split for those travelling to work, school or college. Table 3-4 presents the travel to work data for the GDA and Bray to Arklow. The proportion of people who travel to work by active modes (on foot or by bicycle) is lower in the study area (8%) than for the GDA (15%). The proportion of people who travel by bus, minibus or coach is also lower in the study area (4%) than the GDA (10%). The proportion of people using train, DART or Luas is the same in the study area (7%) as the GDA (7%). The proportion of people driving a car or van is significantly higher in the study area (77%) than the GDA (55%), whilst the proportion of car passengers is also higher (4%) compared to the GDA of 3%.

Table 3-4: Travel to work data (Census 2016 SAPS)

Area	Total work	On foot	Bicycle	Bus, minibus or coach	Train, DART or Luas	Motorcycle or scooter	Car / van driver	Car passenger
Greater Dublin Area	835,694	11%	6%	11%	7%	1%	61%	3%
Bray to Arklow	25,193	7%	1%	4%	7%	1%	77%	4%

Table 3-5 details the travel to school or college data for the GDA and Bray to Arklow study area. The proportion of people travelling by active modes (on foot or by bicycle) is lower in the study area (21%) than the GDA (35%). The proportion of people travelling by public transport (road- or rail-based) is lower in the study area (20%) than the GDA (22%).

Table 3-5: Travel to school or college data (Census 2016 SAPS)

Area	Total School/ College	On foot	Bicycle	Bus, minibus or coach	Train, DART or Luas	Motorcycle or scooter	Car / van driver	Car passenger
Greater Dublin Area	427,946	32%	4%	18%	4%	0%	4%	37%
Bray to Arklow	16,158	20%	1%	15%	5%	0%	5%	54%

Journey time to Work / School / College

Table 3-6 presents the journey time data for travelling to work, school or college. In line with the average for the GDA, the majority of trips to work, school or college in the study area have a journey time under 30 minutes.

Table 3-6: Journey time to work, school or college data (Census 2016 SAPS)

Area	Total	Under 15 mins	1/4 hour - under 1/2 hour	1/2 hour - under 3/4 hour	3/4 hour - under 1 hour	1 hour - under 1 1/2 hours	1 1/2 hours and over
Greater Dublin Area	1,237,858	26%	31%	22%	9%	9%	2%
Bray to Arklow	40,489	35%	22%	16%	9%	13%	5%

Table 3-7 presents the time leaving home to travel to work, school or college data. In line with the GDA, the highest proportion of trips in the study area take place between 8:00 and 9:00 when 41% leave home to travel to work, school or college.

Table 3-7: Time leaving home to travel to work, school or college (Census 2016 SAPS)

Area	Total	Before 06:30	06:30 - 07:00	07:01 - 07:30	07:31 - 08:00	08:01 - 08:30	08:31 - 09:00	09:01 - 09:30	After 09:30
Greater Dublin Area	1,237,858	7%	9%	11%	17%	23%	20%	6%	8%
Bray to Arklow	41,265	7%	11%	12%	14%	18%	23%	8%	7%

3.3 Environmental conditions

The following environmental conditions are of note for the Bray to Arklow study area:

- The Glen of the Downs, through which the N11 runs in the vicinity of Delgany and Greystones, is a narrow wooded valley that is a nature reserve and under the EU Habitats Directive has been designated a Special Area of Conservation (SAC);
- A number of watercourses and water bodies traverse the study area. These include:
 - Avoca River in Arklow, over which there are two bridges, the M11 road bridge and the R772 19 Arches pedestrian and road bridge;
 - Broad Lough, north of Wicklow;
 - Kilcoole Wash, adjacent to the sea; and
 - Just outside of the study area is the River Dargle that runs through Bray and over which are four bridges: the M11 road bridge, R761 Main Street road and pedestrian bridge, and the rail bridge and road and pedestrian bridge at the harbour.
- With respect to air quality, there are no monitoring stations within the study area. The closest is located in Bray, a National Air Monitoring Site, with a local air monitoring site situated in Gorey. In the Environmental Protection Agency's Air Quality in Ireland (2019) report, air quality across the nation was said to be 'generally good', with some localised issues noted;
- The topography of the study area is shaped by the coastline to the east, along which many of the towns are located, rising towards the Wicklow Mountains to the west of the study area.

3.4 Summary of baseline assessment

Following the examination of the existing transport infrastructure and services, and travel demand patterns the Bray to Arklow study area, a number of key conclusions have been identified:

- **Roads** – The Bray to Arklow study area is served by a series of regional and local roads. However, it is the N11/M11 that is the backbone of the network for trips between towns and on to Dublin. Car ownership is at 89% of households, higher than the GDA average of 81%, with 81% of workers and 59% of those in education commuting by this mode;
- **Urban Bus/Coach** – The proposed BusConnects network will provide the northern end of the Bray to Arklow study area with a good level of bus coverage, operating a number of radial and local services at variety of frequencies. Nonetheless a number of gaps in the provision still exist south of the area covered by BusConnects with relatively infrequent coach services and a lack of local services. Bus use in the study area is much lower than the GDA average for commute trips, at 4% (Census 2016 SAPS);
- **Rail** – The Dublin - Rosslare Rail Line travels through the area with a high level of service northbound from Greystones, although the service is fairly infrequent between Arklow and Greystones. Rail use in the study area is in line with the GDA average for commute trips, and nearly double that of bus trips, at 7% (Census 2016 SAPS);
- **Walking** – Walking facilities are provided alongside the majority of roads within the main towns in the study area, although the standard of provision can often be inadequate. Footpaths are lacking on a number of routes in the smaller towns. Walking trips within the study area are much lower than the GDA average for travelling to school or college, accounting for 20% of trips, whilst walking trips for work are much lower within the study area than the GDA average, accounting for 7% of trips; and
- **Cycling** – Provision of cycling infrastructure is sparse throughout the study area, although there are examples of very high-quality infrastructure between Wicklow town and Rathnew. The cycling mode share of trips to both school/college and to work is very low in the study area, at 1%.

4. Context

This Chapter sets out the context of the transport demand and transport supply in the forecast year of 2040. It builds on the baseline (2016) assessment to consider proposed growth, predicted future travel patterns and anticipated travel demand across the study area. This data forms the basis of the assessment of the future year issues and opportunities, and the basis for identifying potential options for intervention.

4.1 Future land use

4.1.1 Overview

The future land use scenario presented here is based on a Planning Sheet for 2040 developed by the NTA in discussion with relevant local authorities. It reflects the 2016 and 2040 population, employment, and education places across the study area in line with regional and local planning. As such, it is aligned with the overall objectives of the NPF and RSES.

Table 4-1 presents the population, employment and education statistics for the Bray to Arklow study area and the national total.

As Table 4-1 demonstrates, growth in the Bray to Arklow study area is higher than the average growth across the nation, with particularly strong growth in a number of the main towns in Wicklow. The table presents growth for the three main urban areas in the study area, as well as Newtownmountkennedy, the rest of the study area and the grand total for the entire area. The figures for the urban areas include the core urban area and surrounding development. Given the relatively large size of some census small areas at the edge of these towns, some of these figures include development in the surrounding rural areas outside of the urban area.

Table 4-1: NTA Planning Sheet population, employment and education Statistics

Area	2016	2040	Growth	
			Absolute	Percentage
Population				
Greystones-Delgany	18,876	22,962	4,086	21.6%
Arklow	11,580	17,545	5,965	51.5%
Wicklow-Rathnew	13,568	17,730	4,343	24.5%
Newtownmountkennedy	3,350	4,948	1,598	47.7%
Remaining Areas	17,863	19,716	1,853	10.4%
Total Bray to Arklow Study Area	65,951	83,829	17,878	27.1%
National Total	4,761,865	5,790,237	1,028,372	22%
Employment				
Greystones-Delgany	2,133	2,767	634	29.7%
Wicklow-Rathnew	3,346	4,905	1,559	46.6%
Arklow	3,437	5,157	1,720	50.0%
Newtownmountkennedy	745	1,073	328	44.0%
Remaining Areas	3,253	3,679	426	13.1%
Total Bray to Arklow Study Area	12,914	17,581	4,667	36.1%
National Total	1,468,093	1,996,002	527,909	36%
Education				
Greystones-Delgany	3,479	4,038	559	16.1%
Wicklow-Rathnew	3,169	4,474	1,305	41.2%
Arklow	2,562	3,511	949	37.0%
Newtownmountkennedy	273	439	166	60.8%
Remaining Areas	2,749	2,893	144	5.2%
Total Bray to Arklow Study Area	12,232	15,355	3,123	25.5%
National Total	982,185	1,186,472	204,287	21%

4.1.2 Population

Figure 4-1 presents population growth for Bray to Arklow between 2016 and 2040. The majority of growth in the study area is expected to be in the three main urban centres, Greystones-Delgany, Wicklow-Rathnew and Arklow and their immediate surrounds. Additionally, there is strong growth expected within Newtownmountkennedy over and above growth levels in the main urban areas and overall study area. A comparatively lower rate of growth, around 10%, has been allocated to the hinterlands and rural areas in the study area.

For Greystones-Delgany, the Wicklow County Development Plan (2016-2022) categorises it as a Large Growth Town II and states a population target in the order of 24,000 in 2028, up from 17,208 in 2011. Wicklow town is categorised as a Large Growth Town I with a population target of 18,000. Arklow is designated a Large Growth Town II, with a population target of 23,000 by 2028. Over the same time period, a doubling of the population is targeted in the Moderate Growth Town of Newtownmountkennedy, from around 3,073 in 2011 to 6,000 in 2028.

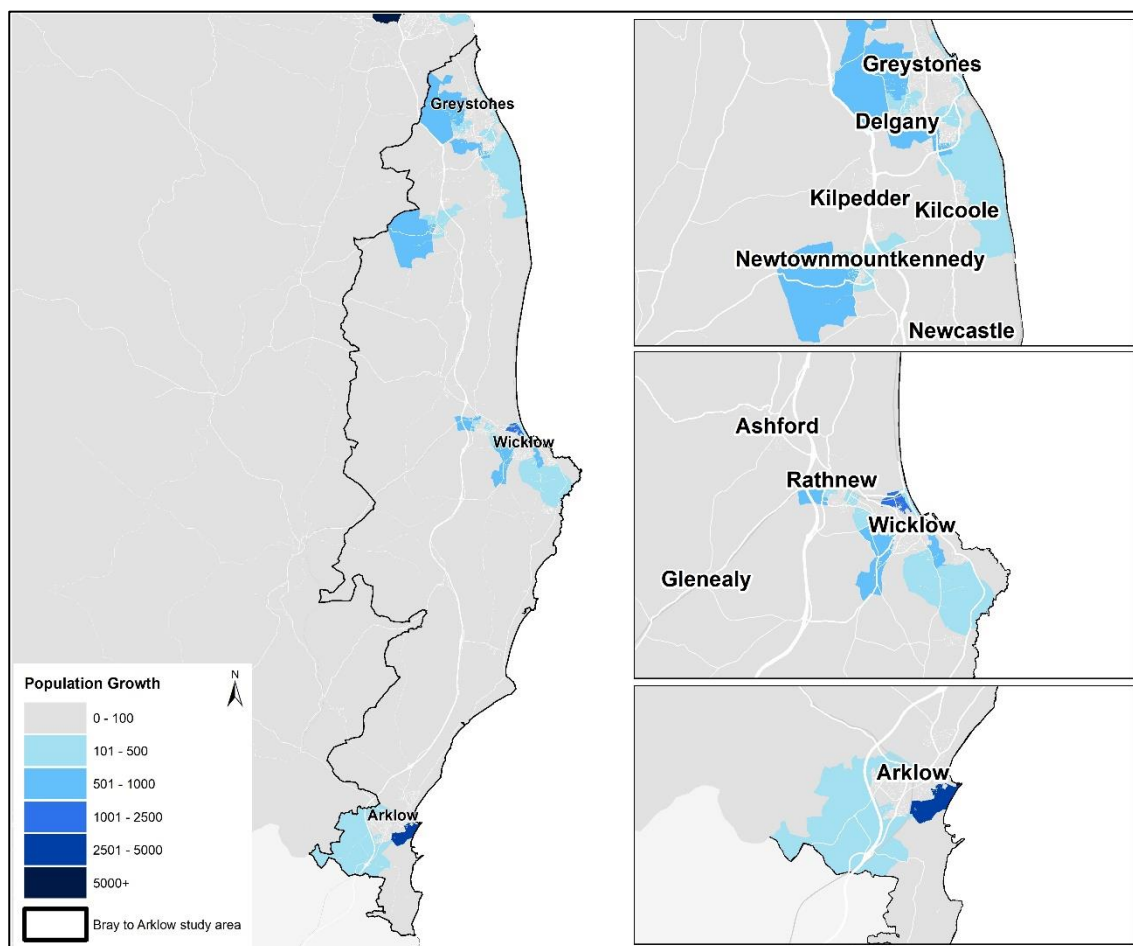


Figure 4-1: 2016 - 2040 Population growth Bray to Arklow study area

4.1.3 Employment

Figure 4-2 presents employment growth for Bray to Arklow between 2016 and 2040. Across the study area there is employment growth of 36% forecast between 2016 and 2040. A higher rate of growth is predicted for Arklow, Wicklow-Rathnew and Newtownmountkennedy with a slightly lower rate in Greystones-Delgany. Similarly to population growth, most is targeted in the main urban areas with a growth rate of 13% across the remaining towns, villages and rural areas in the study area.

Employment growth of 36% from (12,914 to 19,581) is projected for the Bray to Arklow study area, almost all of which is expected to be located in the four main towns. In the Wicklow County Development Plan (2016-2022), it is outlined that there are aspirations to increase employment in Greystones, which aligns with its position as part of the Bray/Cherrywood/Greystones Core Economic Area.

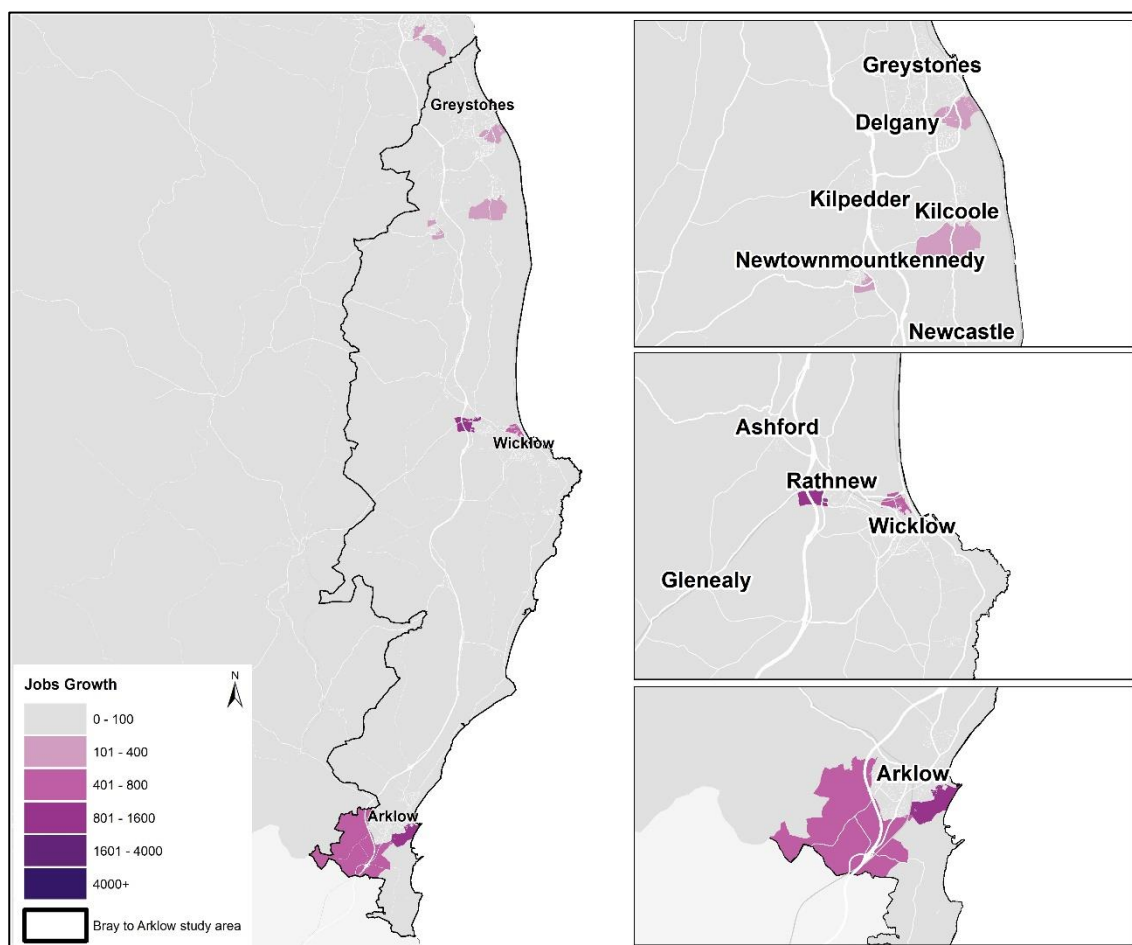


Figure 4-2: 2016 - 2040 Employment growth Bray to Arklow study area

4.1.4 Education

Figure 4-3 presents the education growth for Bray to Arklow between 2016 and 2040. The study area has been allocated growth of just over 25% in its number of education places. This growth is expected to be concentrated heavily in the three main urban areas of Greystones-Delgany, Wicklow-Rathnew and Arklow, with a small number of new and expanded schools planned for in these towns during the 2016-2040 period.

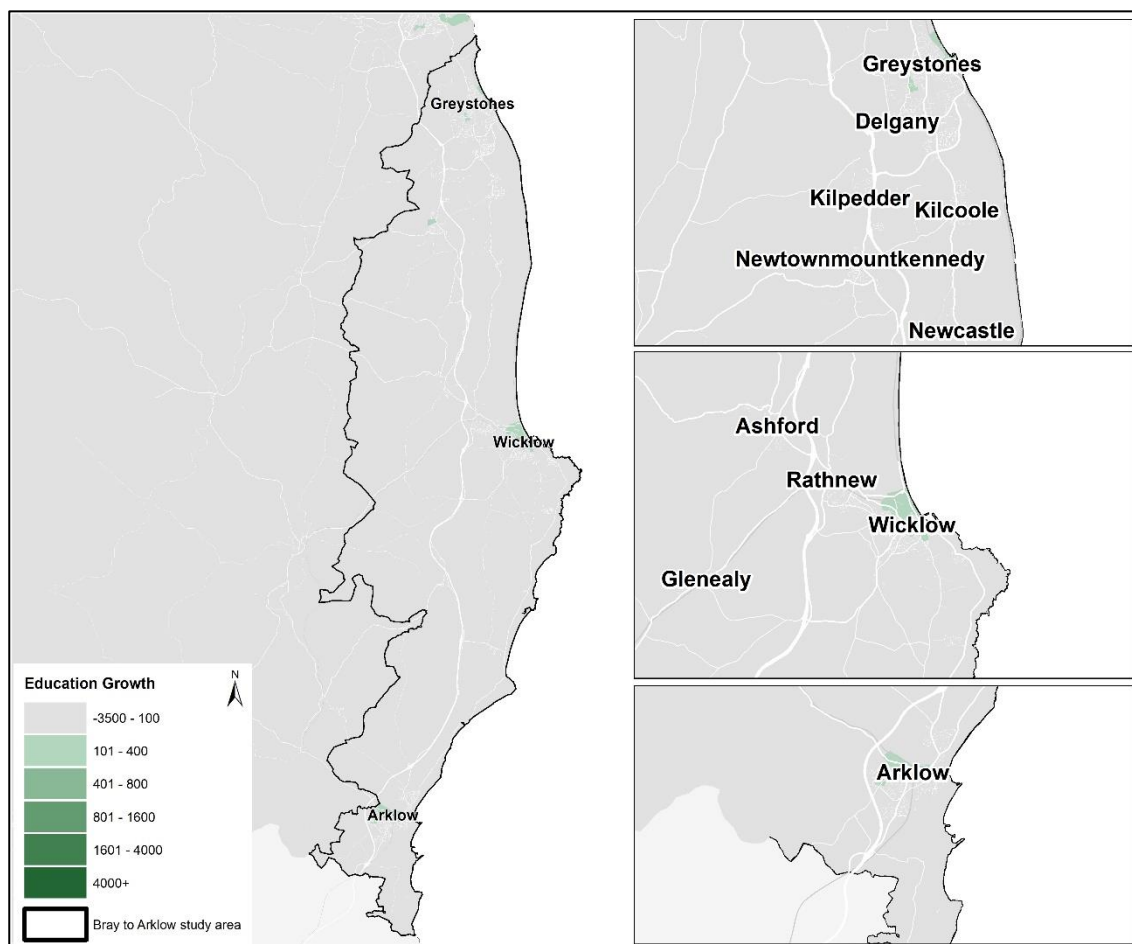


Figure 4-3: 2016 - 2040 Education growth Bray to Arklow Study Area

4.2 Proposals for future transport interventions

4.2.1 Overview

A range of proposals for future transport interventions have been highlighted in previous policies, strategies and plans. Of particular note is the Transport Strategy for the Greater Dublin Area 2016-2035 which has been reviewed in the preparation of this Chapter. The Bray to Arklow study area is located within 'Corridor F' of the GDA Transport Strategy which extends between Dublin City Centre and south Wicklow.

This Chapter provides a brief summary of those schemes which will be considered when identifying options to serve demand in 2042.

4.2.2 Heavy Rail

DART+ Programme will provide frequent, modern, electrified services to Drogheda on the Northern Line, Hazelhatch/Celbridge on the Kildare Line, and Maynooth and M3 Parkway on the Maynooth/Sligo Line, while

improving DART services on the South-East Line as far south as Greystones. The DART+ Programme comprises five main projects: DART+ West, DART+ South West, DART+ Coastal North, DART+ Coastal South, and DART+ Fleet. In addition to the DART+ Programme, DART+ Tunnel, linking the northern and Kildare rail lines via the city centre, is envisaged under Project Ireland 2040. Route options for DART+ Tunnel are currently being investigated to inform the 2021 review of the GDA Transport Strategy.

DART+ Coastal South covers the Dublin - Rosslare Rail Line from Connolly to Greystones. DART+ Coastal Projects are currently at an early stage in the project's timeline with an assessment of options currently being undertaken. At present, subject to modelling and assessment, it is expected that DART+ Coastal will include for:

- "station modifications at Dún Laoghaire, Bray and Greystones to enhance train service capacity"
- "Upgrading of Tara Station to facilitate enhanced interchange with MetroLink"
- "All civil and bridge works as necessary to accommodate an increased service frequency between Bray and Greystones"

Additionally, the Transport Strategy for the Greater Dublin Area 2016-2035 includes a proposal for enhanced Park and Ride facilities at Greystones rail station. North of the study area a new station is proposed at Woodbrook which will also provide for Park and Ride.

Within the study area, the rail line is routed in close proximity to the coast between Bray and Wicklow. A number of studies had identified a risk of future damage to the rail infrastructure as a result of coastal erosion which is likely to be exacerbated by climate change. The 2019 Department of Transport Climate Change Sectoral Adaptation Plan, prepared under the National Adaptation Framework, sets out a national policy objective to address the effects of coastal erosion and support the implementation of adaptation responses in vulnerable areas. The Dublin - Rosslare Rail Line is included as a case study within the adaptation plan.

4.2.3 Road improvement schemes

National Policy

The Transport Strategy for the Greater Dublin Area 2016-2035, identified a need for the upgrading of the N11 between the M50 and Newtownmountkennedy as well as upgrading the M50 between the N11 and Sandyford:

- "Capacity enhancement and reconfiguration of the M11/N11 from Junction 4 (M50) to Junction 14 (Ashford) inclusive of ancillary and associated road schemes, to provide additional lanes and upgraded junctions, plus service roads and linkages to cater for local traffic movements;"
 - a. The N11/M11 Junction 4 to Junction 14 Improvement Scheme is currently at Phase 2 (Option Selection) stage
 - b. Resulting from the severity of congestion issues on the N11/M11 and public feedback, a separate N11/M11 Interim Bus Project to assess the feasibility of bus lanes/priority along the N11/M11 corridor is being progressed and is at feasibility stage. The project is focused on identifying solutions that could offer a practicable interim public transport solution along the corridor in advance of the main N11/M11 Scheme (Shankill to Coyne's Cross).
- "Widening of the M50 to three lanes in each direction between Junction 14 (Sandyford) and Junction 17 (M11) plus related junction and other changes."

The GDA Transport Strategy also proposes to implement demand management measures on the M50 and radial national routes approaching the M50, in order to ensure they retain sufficient capacity to fulfil their strategic functions, including freight movement.

Local Policy

The Wicklow County Development Plan (2016–2022) outlines a number of proposals for the short and medium to long term development of the regional road network including:

- The provision of a 'northern access road' from north Greystones to the Glen Of The Downs N11 interchange;
- To improve the R747 (Arklow – Aughrim – Tinahely – Baltinglass), including re-alignment or by-passing of existing sections where necessary; and
- To provide other more localised road improvement schemes required during the plan lifetime, as funding allows.

There are a number of additional regional and local road proposals in the relevant Local Area Plans for the main towns in the study area. These include a Western Distributor Road in Newtownmountkennedy that will facilitate new development, a Western Distributor Road in Kilcoole to provide a bypass of the town, an inner relief road in Rathnew and a Southern Port Access Road and Western Distributor Route in Arklow. These Local Area Plans also include smaller schemes and upgrades to improve vehicular circulation and service proposed development lands.

4.2.4 Light Rail

Figure 4-4 presents the Greater Dublin Area Transport Strategy Light Rail plan. The Transport Strategy for the Greater Dublin Area 2016–2035 does not include for any planned Light Rail within the Bray to Arklow study area. However, there are proposals for future enhancements to the light rail network that are of relevance. These include projects that are currently underway such as the Luas Green Line Capacity Enhancement Project, as well as planned projects such as Metro South and an extension of the Luas Green Line/Metro South to Bray.

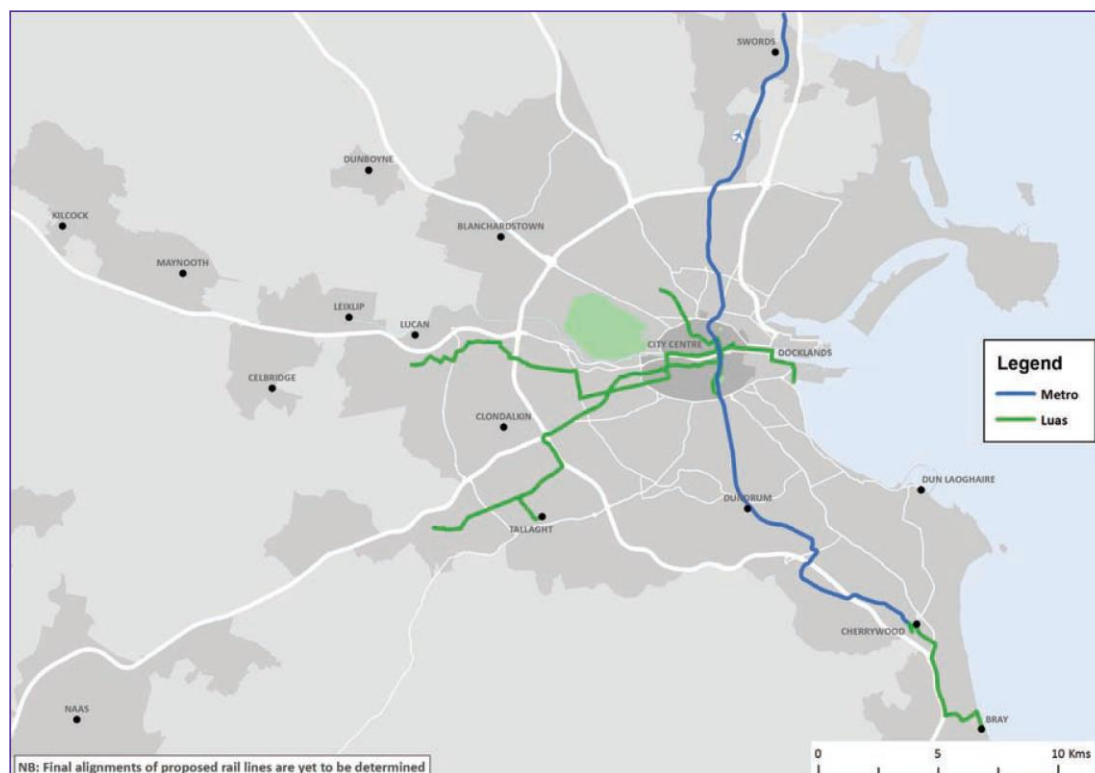


Figure 4-4: GDA Transport Strategy 2035 Light Rail Map

4.2.4.1 Luas Green Line (Light Rail Infrastructure)

The Dublin Light Rail system (Luas) consists of two lines. The Luas Green Line currently provides services between Broombridge and Brides Glen via Dublin City Centre (all north of the study area). The Red Line provides services from Tallaght to The Point, with a spur from the north of Tallaght to City West at the western end, and from Busáras to Connolly in the city centre. These two lines provide high frequency, high-capacity services along these corridors, with trams operating at a frequency of up to every 3 minutes at peak hours.

4.2.4.2 Luas Green Line Capacity Enhancement

The Luas Green Line Capacity Enhancement project was completed in April 2021 providing extra capacity on the Luas Green Line. It will cater for the growing demand on the line in the short term. It included lengthening the existing green line trams to 55m length, plus the purchase of 8 additional 55m long trams. Longer trams operating more frequently, 24 trains per hour instead of 21, will increase passenger capacity by 30%. A major expansion of Sandyford Depot was completed to facilitate the growth in the Green Line fleet.

4.2.4.3 Metro South

While the Luas Green Line Capacity Enhancement project will provide an additional level of passenger capacity, a significant further uplift will be required to cater for the longer term usage forecasts. Metro South was proposed in the GDA Transport Strategy 2016 as an upgrading of the line to metro standard and the extension of new Metro North southwards, via tunnel, to join the upgraded Green line south of Charlemont. This would enable the through running of Metro trams from Swords to either Bride's Glen or Sandyford. The MetroLink will be initially progressed from Swords to Charlemont with provision for a tie-in to facilitate future extension to the south.

4.2.4.4 Luas Extension to Bray

After the Green Luas Line is upgraded to Metro in order to provide the necessary passenger capacity, it is proposed in the GDA Transport Strategy 2016 that the Luas line will be extended from Cherrywood to Bray Town Centre. While a decision on the final alignment has yet to be made, it is likely to run to Bray DART station via Shankill and the former golf club lands, although a possible spur to the development lands at Old Connacht and Fassaroe could be implemented. It will provide a high frequency, high-capacity link between Bray and the key employment areas of Sandyford, Dundrum and Cherrywood, in addition to connecting further north to the City Centre and wider transport network.

4.2.5 Bus

As noted in Section 3.1.2, the new Dublin Area Bus Network is being rolled out as part of the BusConnects programme from early 2021 and has been taken as the 'base' urban bus network within this study.

The BusConnects programme also includes for 16 Core Bus Corridors to provide enhanced walking, cycling and bus priority infrastructure. Routes extending from the Bray to Arklow study area towards the City Centre will benefit significantly from the Bray to City Centre Core Bus Corridor which begins at the Dargle Bridge in Bray. This project will provide enhanced bus priority along the key N11 corridor inside the M50.

The 16 Core Bus Corridors have been combined into 12 schemes for progression through to the planning application and construction phases. It is expected that construction of supporting infrastructure will commence on a phased basis for the 12 schemes from 2022, each scheme taking approximately 2 years to construct, with all schemes completed by 2027.

4.2.6 Cycling

The GDA Cycle Network Plan 2013 forms the overall blueprint for the implementation of a high quality, integrated cycle network for the GDA. For the Bray to Arklow study area, the plan sets out a relatively comprehensive network of urban and inter-urban cycle routes for the study area (Figure 4-5).

There is a lower level of detail for the urban networks with “primary/secondary” routes identified for the main demand corridors in the towns rather than primary or secondary status being identified explicitly in the plan. A network of feeder routes has also been identified. A mix of inter-urban and greenway routes linking the urban settlements provides inter-urban cycle connectivity throughout the study area if implemented. The W11 coastal greenway/inter-urban route in the plan links the three main urban areas in the study area, i.e. Greystones, Wicklow and Arklow.

While delivery of this network will take time, implementation of the cycle network plan would provide a comprehensive network of cycling routes across the study area.

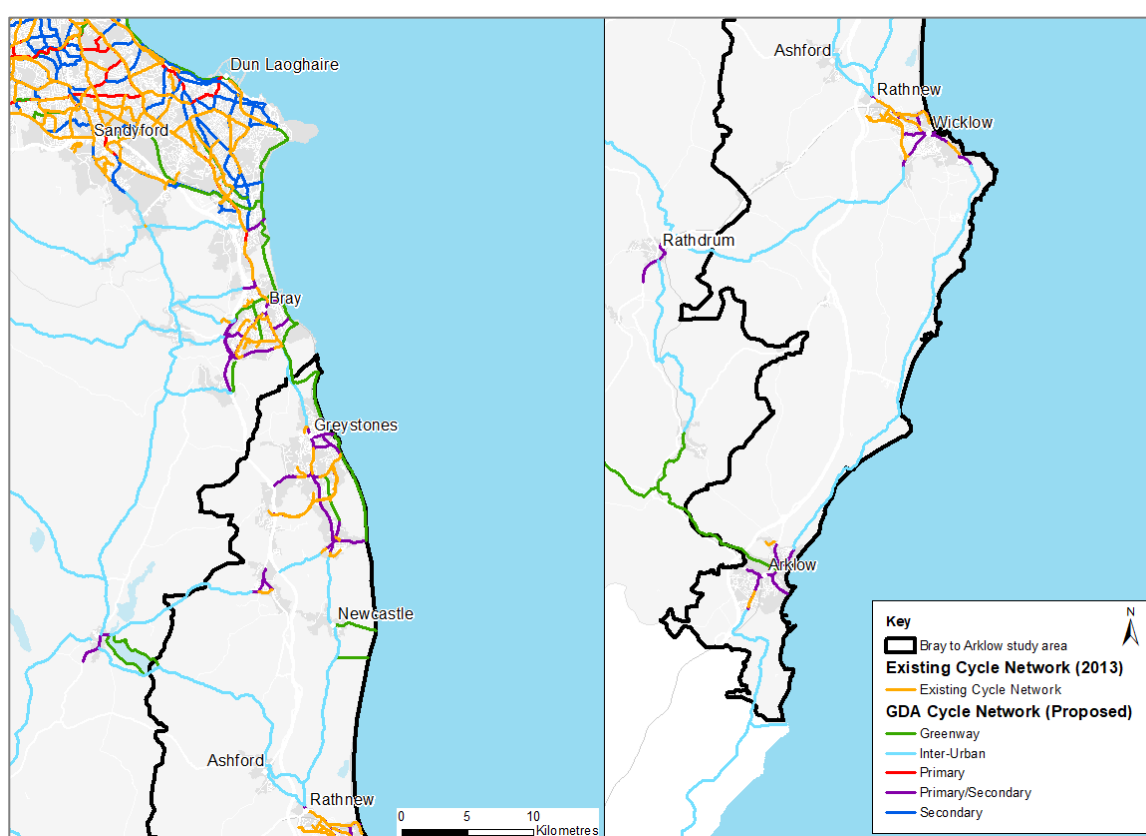


Figure 4-5: Proposed cycle network

4.3 Future travel patterns

4.3.1 Model assumptions

The assessment of future travel demand is based on the outputs from the NTA Eastern Regional Model (ERM). The ERM represents a 2042 scenario including:

Five time periods:

- AM 07:00 to 10:00
- Lunch time 10:00 to 13:00
- School run 13:00 to 16:00
- PM 16:00 to 19:00; and
- Off peak 19:00 to 07:00.

Three mode classes;

- Public transport (bus, heavy rail and light rail);
- Road (cars, LGV, HGV and taxi); and
- Active modes (walk and cycle).

Five trip purposes:

- Employers Business;
- Education;
- Commute;
- Other; and
- Retired.

Do Minimum

The model run represents a 'Do Minimum' scenario which includes proposed development, all existing transport provision, plus a number of changes to the transport network. Details of the transport schemes included are provided in Section 4.2.

The model trips are assigned to a constrained network, meaning route choice of each trip is affected by capacities and journey times (e.g. impacts from queuing) in the model in relation to all the other trips. This means there is a likelihood that due to the volume of trips in the model, some journeys use routes through local roads, instead of using the key strategic routes which are the focus of this study.

The ERM has been used to understand some of the key transport patterns in 2042 such as mode share, trip lengths, origins and destinations, route capacity, and volume to capacity. These are described in the subsequent paragraphs in this Chapter, and this information will be used to support the option development process.

4.3.2 Origins and destinations

Spatial analysis, using GIS, has been undertaken on trips that have an origin and/or destination within the study area, using the demand outputs from the model.

Trips from the Bray to Arklow study area

Figure 4-6 presents the origins and destination of trips which originate within the study area in the AM peak.

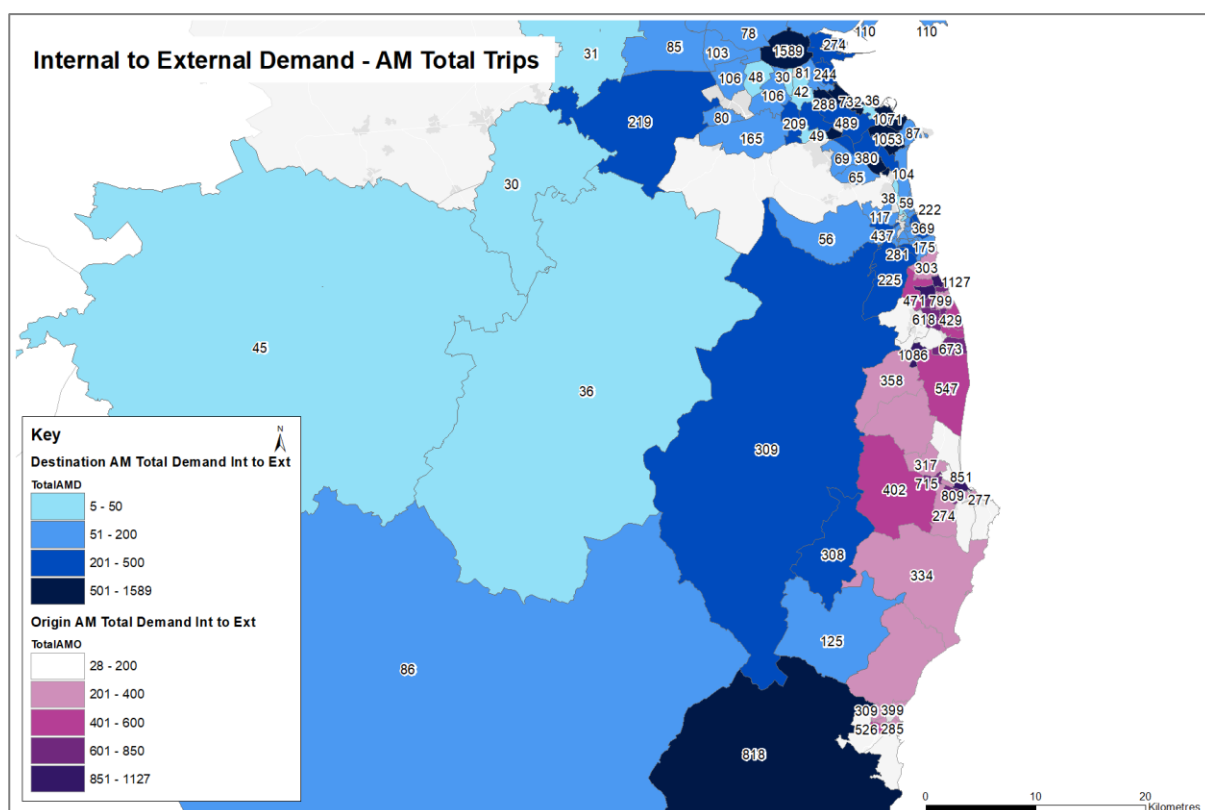


Figure 4-6: Map of total trips internal to external

For trips that originate in the study area in the AM peak, the main destinations are:

- Bray
- Dublin City Centre
- Dún Laoghaire
- UCD
- Blackrock
- Sandyford
- Cherrywood
- Gorey and further south.

The main origins for these trips are within and around the towns of Greystones, Wicklow-Rathnew, Newtownmountkennedy, and Arklow (Table 4-2).

Table 4-2: Trips to Key Destinations.

	Number of AM trips (AM Peak Hour 08:00-09:00)				
Destination	Car	Public Transport	Walk	Cycle	Total Demand
Bray	1002	180	3	1	1186
City Centre	39	680	0	0	719
Cherrywood	471	41	0	0	513
Dún Laoghaire	653	124	0	0	777
UCD	17	388	0	0	405

	Number of AM trips (AM Peak Hour 08:00-09:00)				
Gorey (large sector)	274	18	0	0	292
Sandyford	247	28	0	0	276
Boosterstown and Blackrock	182	99	0	0	281

It is clear from the profile of destinations for northbound trips towards the city centre from the study area that demand is concentrated along two main corridors, the coastal corridor (which includes the Dublin - Rosslare Rail Line and the Blackrock Core Bus Corridor) and an inland corridor (which includes the N11/M11, the Bray Core Bus Corridor and the Luas Green Line). Trips to the city centre can travel via either corridor.

While there is considerable demand from the study area to the city centre, a large amount of demand from the study area is centred around the area within the M50 but south of the city centre.

Trips to the Bray to Arklow study area

Figure 4-7 presents the origins and destination of external trips which have destinations within the study area in the AM peak.

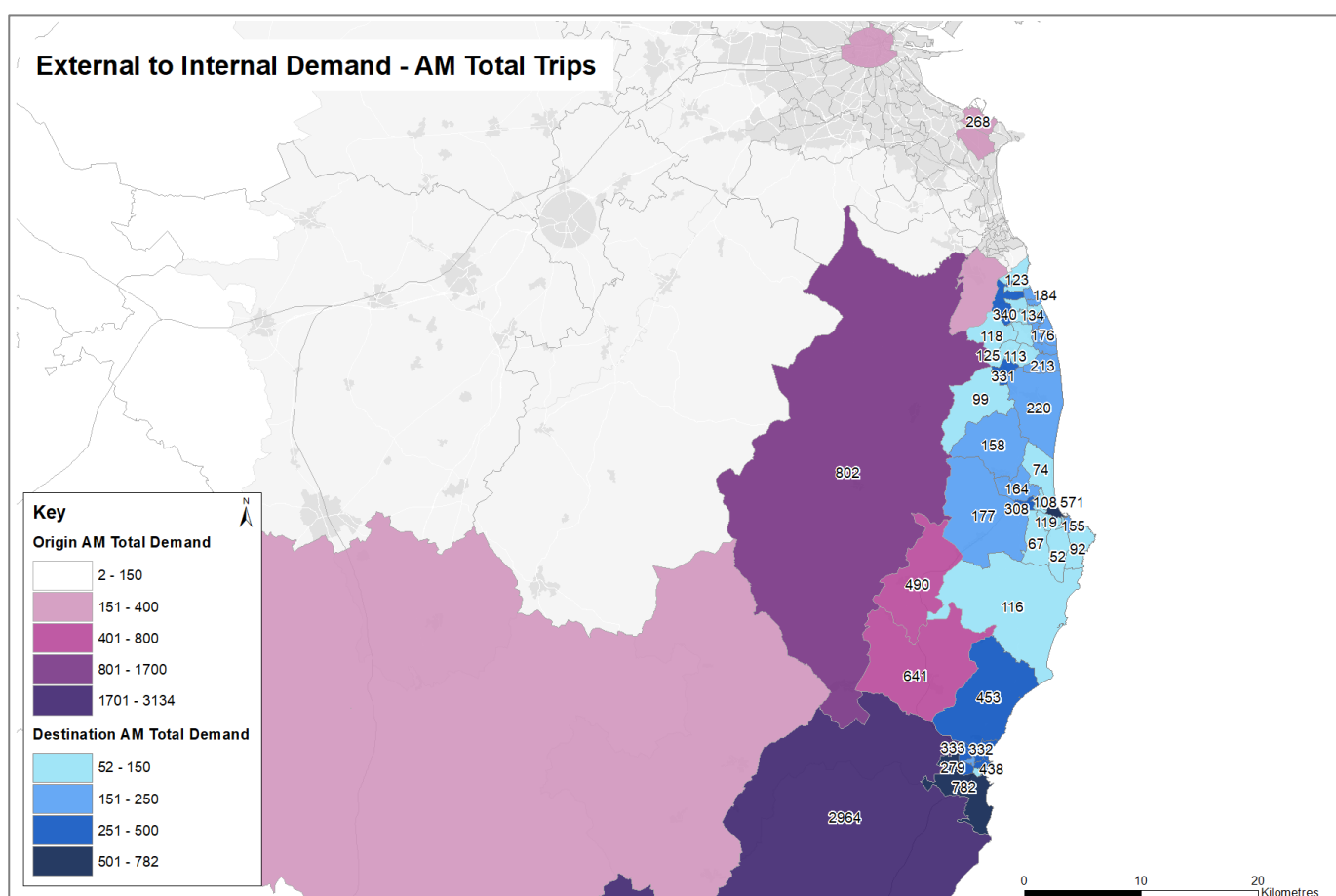


Figure 4-7: Map of total trips external to internal

The figure shows that the main movements into the study area in the AM peak originate from:

- Gorey and points south
- Rural hinterland of County Wicklow
- City Centre
- Dún Laoghaire

The destinations are predominantly to:

- Arklow and environs
- Wicklow
- Ashford
- Newtownmountkennedy
- Greystones

Trips within the Bray to Arklow study area

Figure 4-8 shows the internal movements in the Bray to Arklow study area for car trips in the AM peak between any two zones within the study area.

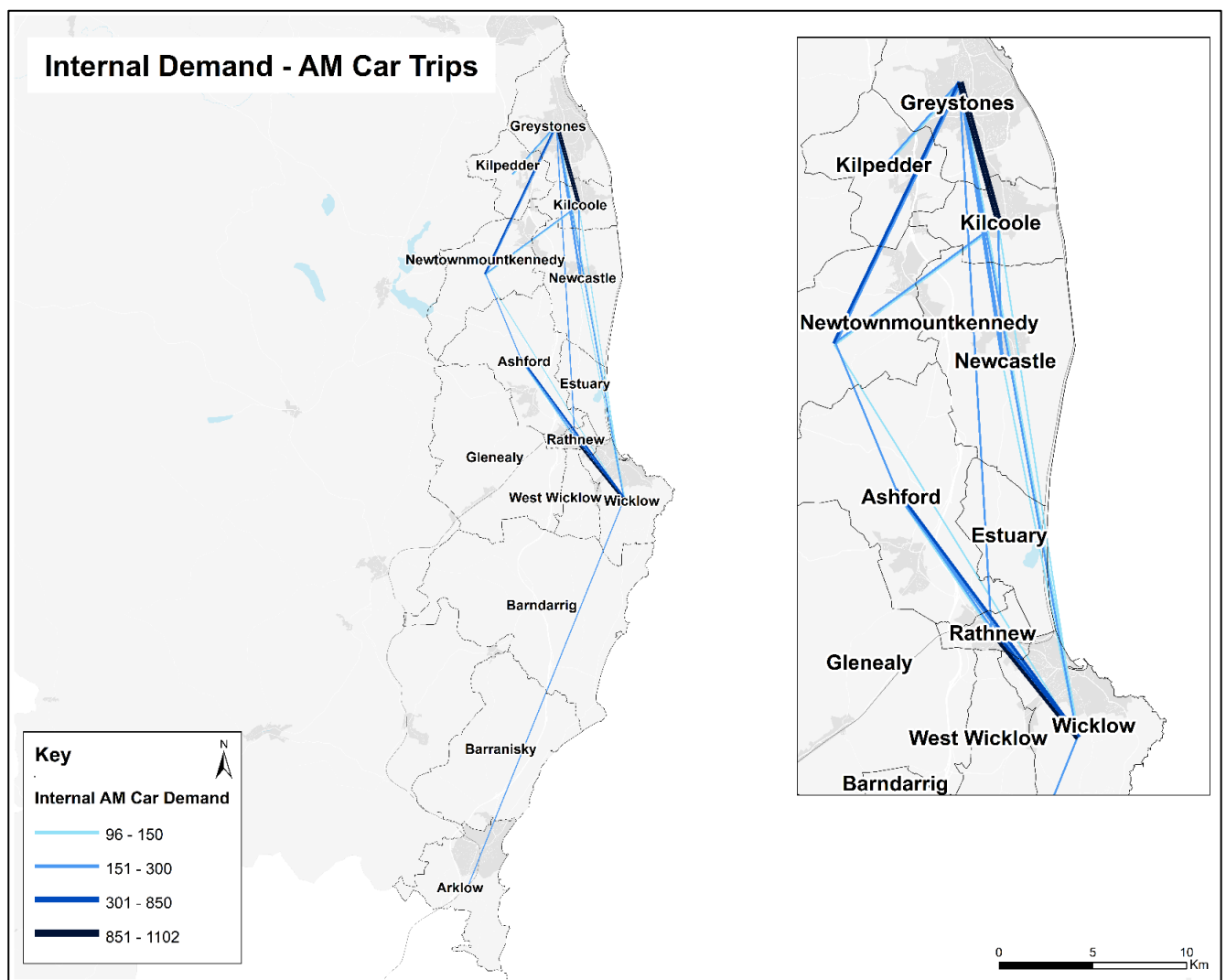


Figure 4-8: Map of total car trips internal to internal

The internal car movements are predominantly between neighbouring towns over modest distances:

- Kilcoole-Greystones
- Greystones-Kilcoole
- Wicklow – Rathnew
- Rathnew-Wicklow
- Newtownmountkennedy-Greystones
- Ashford-Wicklow

With smaller numbers of trips between:

- Kilpedder-Greystones
- Wicklow-Greystones
- Arklow-Wicklow
- Wicklow-Ashford
- Newcastle-Greystones
- Greystones – Newtownmountkennedy

Figure 4-9 shows the internal movements in the Bray to Arklow study area for public transport trips in the AM peak between any two zones within the study area.

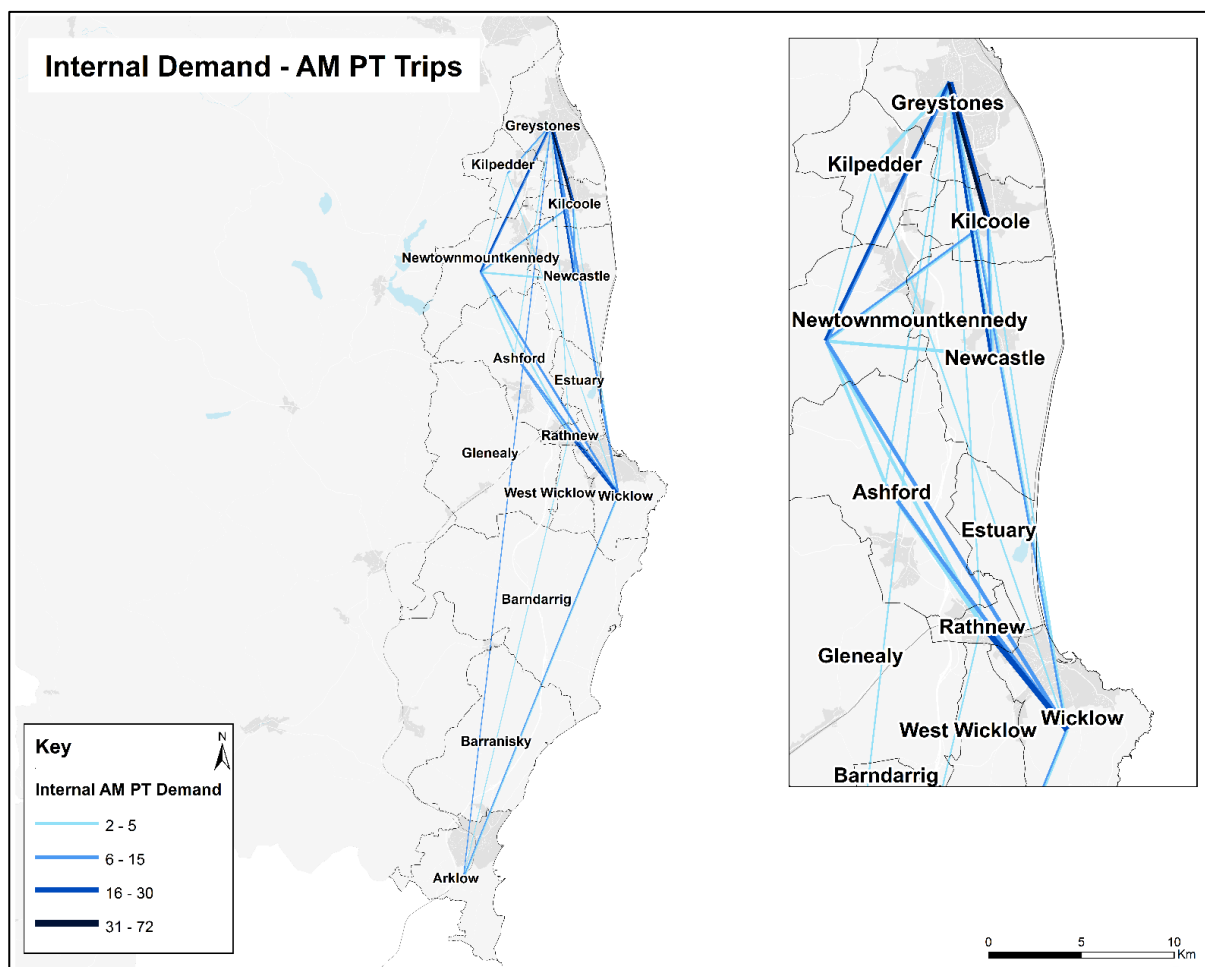


Figure 4-9: Map of total public transport trips internal to internal

The internal car movements are predominantly between neighbouring towns over modest distances:

- Kilcoole-Greystones
- Greystones-Kilcoole
- Rathnew-Wicklow
- Newtownmountkennedy-Greystones
- Wicklow-Rathnew

With a notable number of trips between:

- Newcastle-Greystones
- Ashford-Wicklow
- Wicklow-Greystones
- Newcastle-Kilcoole
- Arklow-Wicklow

Whilst the levels of public transport usage are considerably lower than private car for these inter-settlement trips, it is notable that the pattern of movements is very similar between car and PT travel, showing well matched desire lines, but suggesting that public transport is relatively unattractive.

Origins and destinations by mode

Trip patterns have been disaggregated by mode where either the origin or destination is within the Bray to Arklow study area and the other origin or destination is outside the study area. Trips have been categorised as car, public transport and active mode trips. Maps are provided in Appendix B for the AM peak period (07:00-10:00).

Internal to External

As would be expected for the subset of trips that cross the study area boundary into predominantly rural areas, the quantum of active mode trips is very low. Public transport trip origins are clustered around the main towns, and public transport destinations are concentrated along a radial corridor through the south of the city to the city centre. The city centre and UCD are the two largest public transport destinations. Car trips, while concentrated in a similar radial corridor to PT trips, are more widespread with more origins from rural zones, additional notable destinations in Gorey and Tallaght/Firhouse, and a dearth of trips to the city centre.

External to Internal

Reflecting the internal to external trips, there are minimal active trips in this subset. There are far fewer PT trips coming into the study area than leaving it. There is a notable number of PT trips from Gorey and Rathdrum. There are also some PT origins concentrated in the same corridor through the south city, reflecting the pattern of available PT services. There is a large number of car trips from Gorey and its surrounding area into the study area. Most road trips into the study area come from the surrounding Wicklow/Wexford area, with a notable number of additional trips coming from Firhouse, Dún Laoghaire and the city centre.

4.3.3 Mode Share

Mode share data has been extracted from the model for trips originating in the Bray to Arklow study area for car, public transport, cycling and walking trips. This has been spatially analysed for the AM period and is shown in Figure 4-10. Overall, the AM peak data show:

- Car is the dominant mode (majority of zones 80%+, some 90%+)

- PT trips are highest in Greystones where there is access to the DART and BusConnects networks, and Wicklow where a number of coach routes begin;
- Walking trips are very low outside of urban areas, although mode share is notably high in Arklow; and
- Cycling mode share is very low throughout the study area.

The car mode share for the Bray to Arklow study area is consistently high, with lowest car share of any zone still reaching 56%, which exceeds national mode share targets. Rural areas are car dominant with up to 92% of trips being made by car. There are areas of high walk mode share in urban areas, Arklow in particular, and access to the DART and BusConnects networks is evidenced in relatively high PT mode share in Greystones.

The model outputs show that there are opportunities to increase PT and active travel mode share and reduce car trips in the area. This will be dependent on availability, capacity and favourable journey times, as well as a possible requirement to discourage private car travel. However, even with additional sustainable transport measures, the characteristics of the area with its dispersed population, extensive car network and car availability will likely result in relatively high residual car use. In developing measures, particular attention should be paid to relative journey times so as to match potential sustainable transport measures to trips that can be facilitated by decently competitive alternatives to the car.

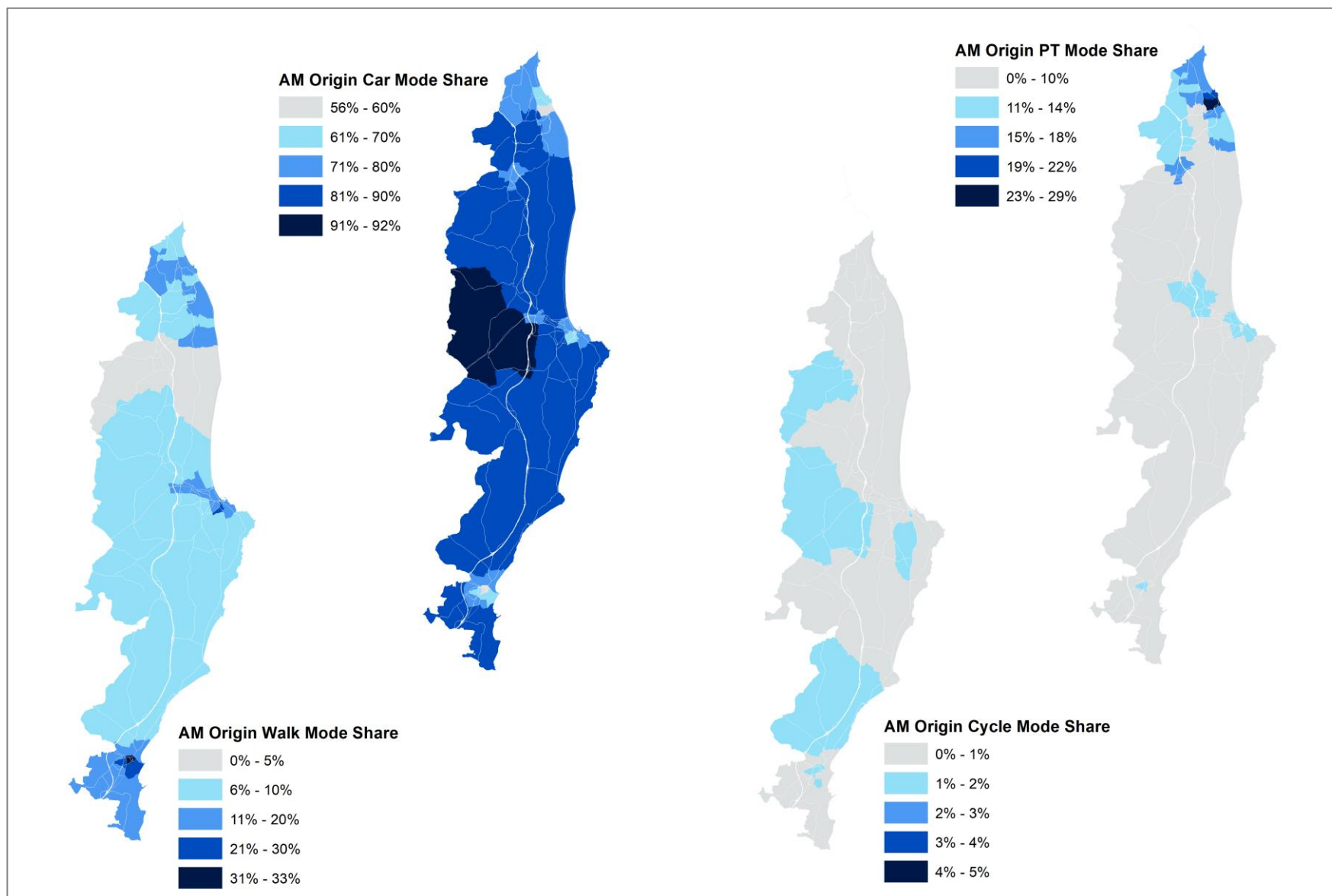


Figure 4-10: Mode Share Bray to Arklow, 2040 AM ERM

4.3.4 Capacity by Mode

Roads

Figure 4-11 identifies junctions within the Bray to Arklow area that experience a volume over capacity ratio higher than 60% in the 2042 forecast model run for the AM Peak. The majority of junctions that are over capacity are in the North of the study area on the N11 around Greystones, Bray and Newtownmountkennedy. The N11 in this area is operating at close to 100% of capacity.

The network south of the Kilcoole/Kilpedder area is part of the buffer SATURN network and as such there is no detailed junction modelling in this area. The map does not represent a network south of Kilcoole where every junction is operating at less than 60% volume over capacity. It is likely that congestion is less severe towards the southern end of the study area, but it is expected that there is delay at a number of junctions in urban areas.

Overall, within the north of the study area, the road network is moderately to considerably congested, although most junctions are operating within capacity. This allows for growth and a degree of flexibility to introduce meaningful measures to build greater resilience into the network through enhanced public transport and cycling infrastructure.

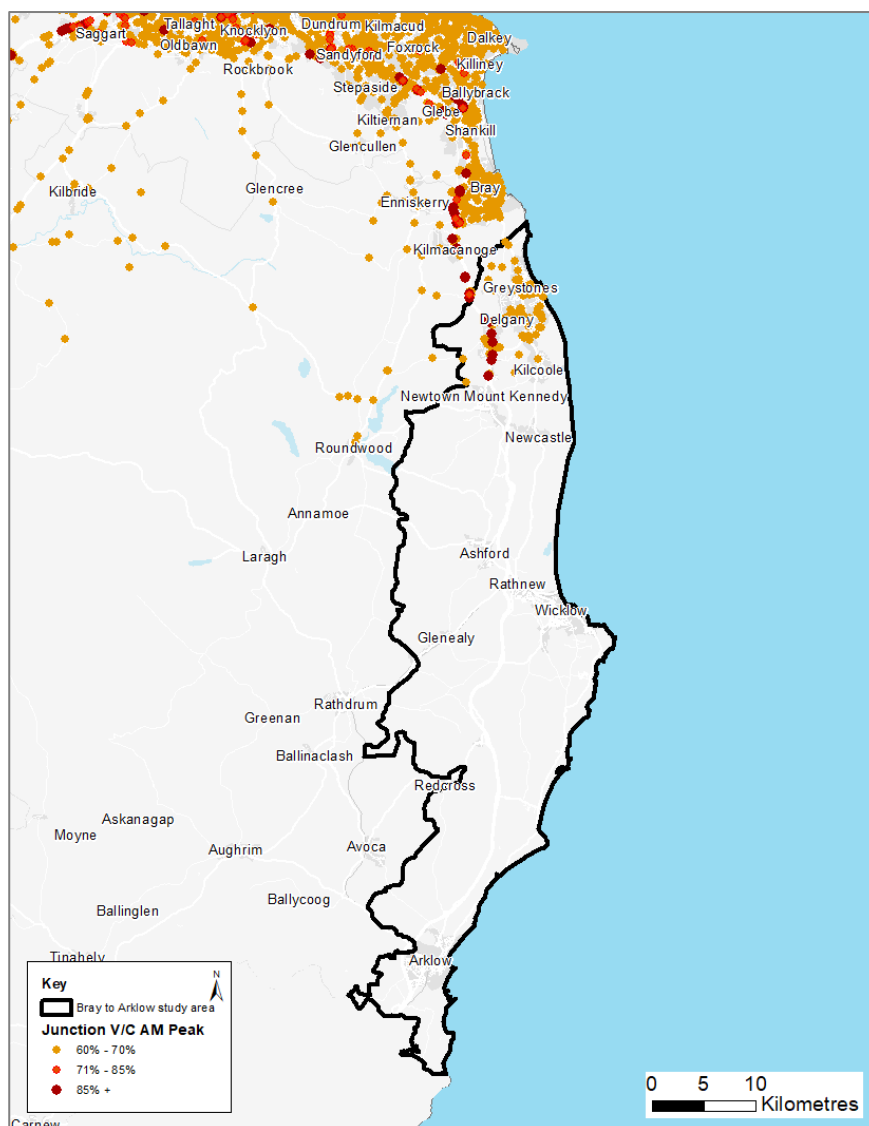


Figure 4-11: Capacity of road network

Public Transport

Public transport demand outputs from the model have been analysed to determine which routes are forecast to operate over capacity in the forecast year. There are two definitions of capacity, crush capacity and design capacity. Crush capacity is the technical term for when a vehicle is full, including a maximum number of standing passengers. Transport services are planned for on the basis that such a level of capacity is not reached and instead the design capacity is used. Design capacity equates to 85% of the crush capacity and therefore systems are designed with an element of headroom to allow for fluctuations in demand. The long-distance bus routes in this area are run on coaches where no standing is permitted, and design capacity is taken as the maximum capacity.

Public transport demand outputs from the model have been analysed for the forecast year in the AM peak hour in 2042 (Figure 4-12). Routes forecast to be over capacity include:

- The Dublin - Rosslare Rail Line between Wicklow and Greystones;
- Long distance coach services throughout the area, which utilise the N11/M11.

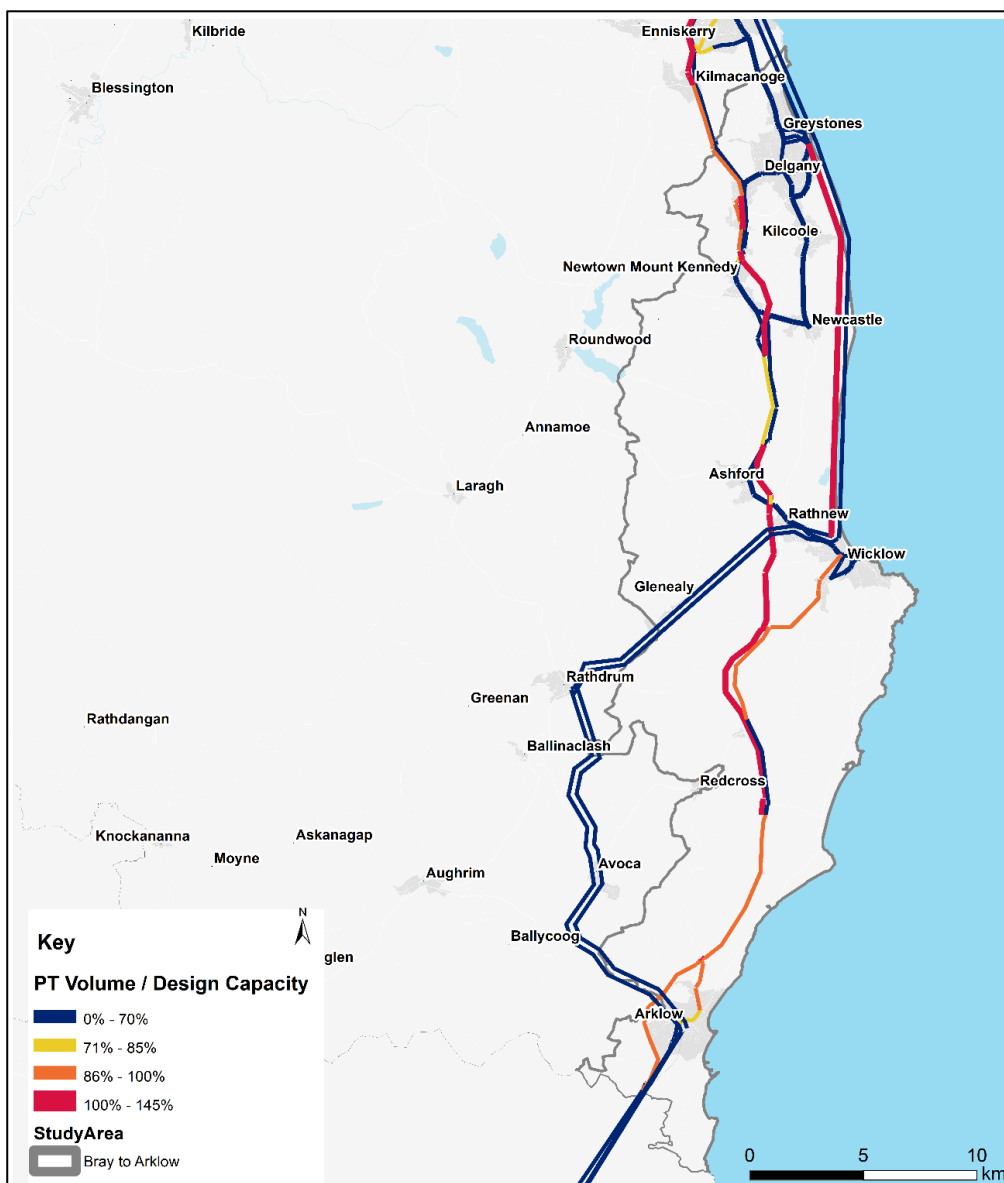


Figure 4-12: Capacity of public transport in the forecast year

Rail Services

Rail service through the study area along the Dublin - Rosslare Rail Line is predominantly via InterCity services from Rosslare to Connolly, serving Gorey (outside of the study area), and Arklow, Rathdrum, Wicklow, Kilcoole and Greystones stations in the study area. DART services extend south to Greystones. The rail line within the study area is single track with double track sections north of the study area from Bray to the City Centre and beyond. Overall, The DART services are expected to have available capacity whilst modelled demand on the Rosslare Dublin services is above the design capacity in 2042 (Table 4-3).

Table 4-3: Forecast capacity and demand on the rail line, 2042

Route		Frequency (per hour)	Design Capacity	Demand*	Extra Demand	Available Capacity
IC and commuter services	Rosslare - Dublin	1	561	641	80	
DART	Greystones - North	2	1,655	626		1029
Total			2,216	1,267	949 available capacity	

**Demand crossing the study area boundary northbound*

During the AM peak hour PT assignment there is one InterCity service from Rosslare operating in the base scenario, with a design capacity in the model of 561. As can be seen in the above map, this service is over capacity from Wicklow and crossing the study area boundary northbound has 80 more passengers than the design capacity of the service.

DART services northbound from Greystones operate roughly every half hour in the AM peak between Malahide/Howth. Combined these services have a design capacity in the model of 1,655 passengers with 626 passengers combined on board as these services cross the study area boundary. This leaves excess capacity on the rail line northbound as it leaves the study area.

North of the study area, demand is considerable, and the DART becomes increasingly overcrowded as it gets closer to Dublin City Centre. Whilst this will affect the comfort of travel, it will not limit the opportunity for Greystones passengers to board in the AM. However, in the PM, excess demand from the City Centre for southbound DARTs will impact on Greystones passengers' ability to board return services, thus detracting from the reliability of service from the passenger perspective.

Bus and Coach Services

The long-distance Buses / Coaches are forecast to have unmet demand (Table 4-4).

Table 4-4: Forecast capacity and demand on the bus and coach services leaving the study area via the N11, 2042

Route		Frequency (per hour)	Design Capacity	Demand*	Extra Demand	Available Capacity
133/X	Bus Éireann PSO: Wicklow - Dublin	2	152 (modelled as 426)	390	238	
740	Wexford Bus: Wexford – Dublin Airport	3	203	212	9	
740	Wexford Bus: Arklow - Dublin	1	51	40		11
2	Bus Éireann non-PSO: Wexford – Dublin Airport	1	51 (modelled as 255)	269	218	
Total		7	457	911	454 extra demand	

**Demand crossing Study Area boundary (northbound)*

In reviewing the data on the high level of demand on services 133/X and 2 in relation to their frequency, it was noted that they were modelled with higher capacities than would be expected. To assist in the analysis, an estimation has been made on what the base network capacity should likely be and this is included in Table 4-5. This shows that there is a significant level of demand for bus along this corridor, far in excess of the likely level of capacity provided in the base network of only 3 coaches an hour combined across the two routes.

The BusConnects services which travel north from the study area are routed via the R761. These buses serve the Greystones area as well as Newcastle, Newtownmountkenedy and Kilcoole, and are operating with spare capacity in the AM peak period. In 2042 they are operating at about 30% of design capacity.

Table 4-5: Forecast capacity and demand on the BusConnects services leaving the study area via the R761, 2042

Route		Frequency (per hour, AM Peak)	Design Capacity	Demand*	Extra Demand	Available Capacity
L1	Greystones - Newcastle Loop Clockwise - Bray	1	78	43		35
L2	Greystones - Newcastle Loop Anticlockwise - Bray	1	78	58		20
X1	Kilcoole - Southern Cross - City Centre	4	313	203		110
X2	Newcastle - Kilcoole - Southern Cross - City Centre	2	156	77		80
Total		8	626	381	245 available capacity	

**Demand crossing Study Area boundary (northbound)*

4.3.5 Trip Lengths

Data on the distribution of trip lengths for the Bray to Arklow study area has been extracted from the model for 2016 and 2042 forecast year. The data are split by mode and presented in Figure 4-13.

Overall, the data show:

- Car – increase in average trip length between 2016 and 2043, with a lower percentage of car trips within the 0-2 and 2-4 km bands. There is some increase in PT trips lengths within these bands over the same period and a slight increase for walking distances of less than 2km, which may partially account for this drop in the percentage of car trips. This leaves a greater proportion of car trips occurring at longer distances by 2043. Given the mode share splits, it would be expected that in the base case, without additional sustainable transport measures, the volume of vehicle kilometres will increase. There are opportunities for increases in active travel of short distances through mode shift from car demand in the 0 – 4 km range. To mitigate against the increase in longer distance trips by car, measures supporting mode shift to public transport should be considered.
- Public Transport – the various peaks reflect, in part, the distances to Dublin from the north and central parts of the study area, and the level of demand for these trips. A significant proportion of PT trips are long and journey comfort will likely be particularly important to passengers as a result.
- Walking – most walking trips are short with the majority being less than 2 km in length.
- Cycling – trips tend to be fairly short in length, with a fairly similar profile to walk lengths, although the majority are over 2km. This reflects the smaller urban settlements in the study area requiring shorter travel distances for urban trips, and the unsuitability of the inter-settlement transport network for cycling.

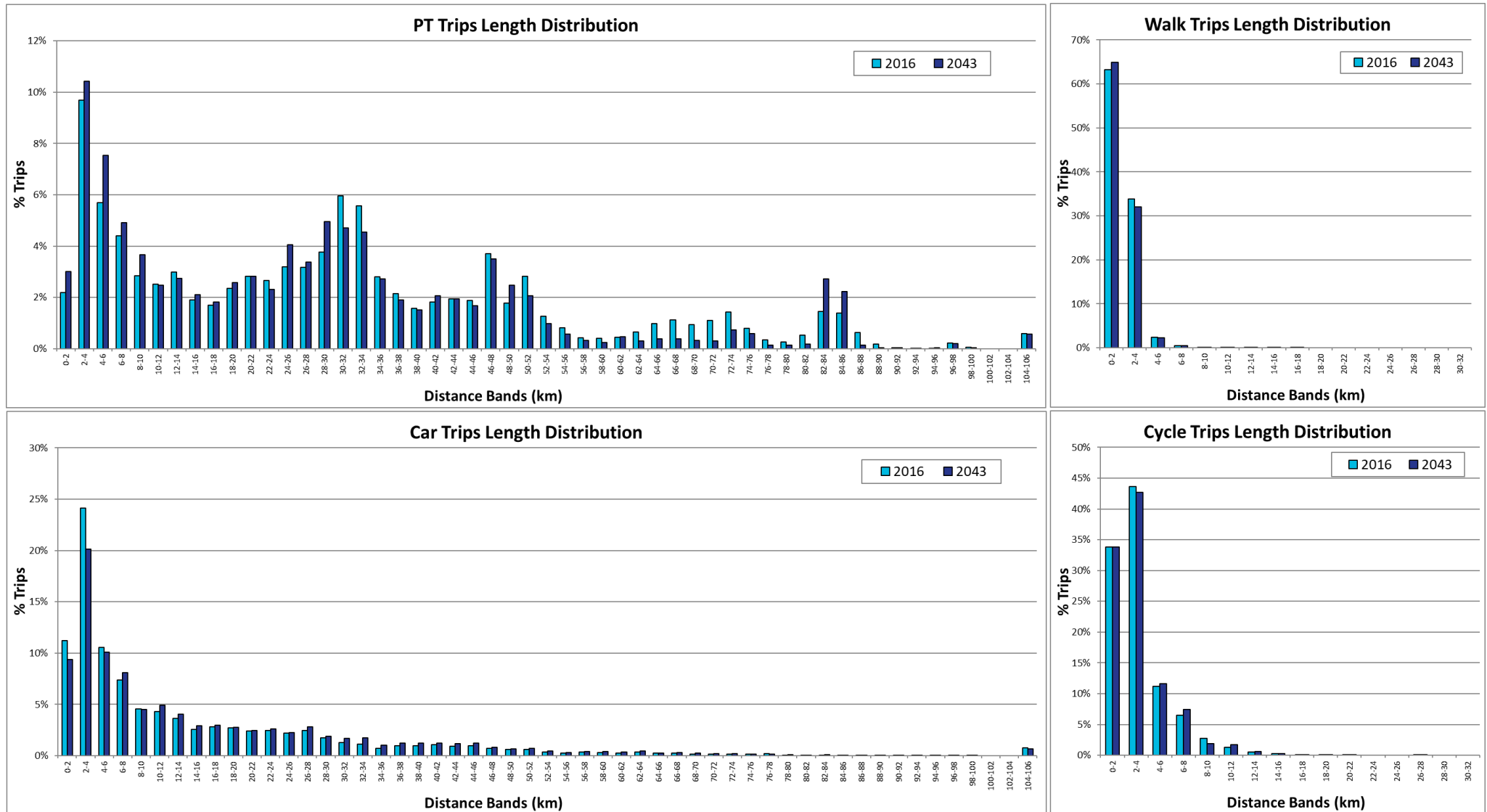


Figure 4-13: Bray to Arklow Trip Length Distributions

4.3.6 Journey Time by Mode

Journey time data, disaggregated by zones, have also been extracted from the model for car and public transport trips for key Origin and Destination pairs (Table 4-6 and Figure 4-14). For the Bray to Arklow study area, the data indicates that public transport trips experience significantly higher journey times in comparison to car trips to most destinations. However, destinations served by the Dublin - Rosslare Rail Line offer competitive journey times.

At present there is no significant bus priority within the study area. The planned BusConnects Bray Core Bus Corridor will likely reduce the relatively difference between bus and car journey times for some of the origin destination pairs.

It is notable that UCD attracts a very high mode share for PT of over 95%, despite the relatively longer journey time compared to car. This may indicate a combination of factors such as car availability amongst the student population or car parking availability within UCD.

Table 4-6: Model Journey Times by Mode

Wicklow Town to:				
	City Centre/Docklands	UCD	Dún Laoghaire 1	Dún Laoghaire 2
Car	81 minutes	62 minutes	53 minutes	50 minutes
Public Transport	93 minutes	95 minutes	73 minutes	88 minutes
Greystones to:				
	City Centre/Docklands	UCD	Dún Laoghaire 1	Dún Laoghaire 2
Car	71 minutes	53 minutes	44 minutes	41 minutes
Public Transport	72 minutes	79 minutes	51 minutes	66 minutes

The balance between catchment and directness is a constant challenge for bus services which must consider the efficiency of operations. Some of the BusConnects routes provide local connectivity and coverage but may not follow the most direct or fastest routes. For example, X1 and X2 are routed via Greystones town centre, the R761 and Bray Southern Cross, whereas the car demand from Kilcoole and south Greystones may access the N11 more directly and bypass those urban areas. This is illustrated by the journey times to the City Centre by bus shown in Table 4-7; the journey time on BusConnects routes, the X1/X2, are considerably longer than other travel choices (it should be noted the journey times in Table 4-7 exclude walk and wait time and the overall journey times will depend on the origin of the trip). It should be noted that the planned BusConnects infrastructure north of Bray is not included for in the modelled data.

Table 4-7: Model Journey Times by Mode

Journey Times for Trips to City Centre*		
	From Wicklow	From Greystones
Car	81 minutes	71 minutes
Rail	52 minutes	39 minutes
N11/M11 Bus (740/133)	106 minutes	72 minutes (measured from closest section of N11/M11)
BusConnects (X1/X2)		96 minutes

*excluding walk / wait time to Public Transport



Figure 4-14: Journey Time areas in Table 4-6

4.3.7 Bus speeds

Figure 4-15 presents the model output 2042 bus speeds for the AM peak on the N11/M11, and Figure 4-16 shows the same for the local roads. On the N11/M11 bus speeds are generally good throughout the study area. The notable exception being north of Newtownmountkenny, where the speeds drop, in some instances quite considerably, in a northbound direction. This suggests that onward travel by long distance coach may start to look unattractive as bus speeds are significantly lower than free flow speeds on the N11.

For buses on other routes speeds are curtailed in the urban areas, notably through Greystones and Bray (Figure 4-16). Therefore, long distance buses could have their competitiveness impeded if they have to navigate slower urban routes, and a balance would have to be struck between serving residents in Greystones northwards, and ensuring swift journey times for passengers who board further south.

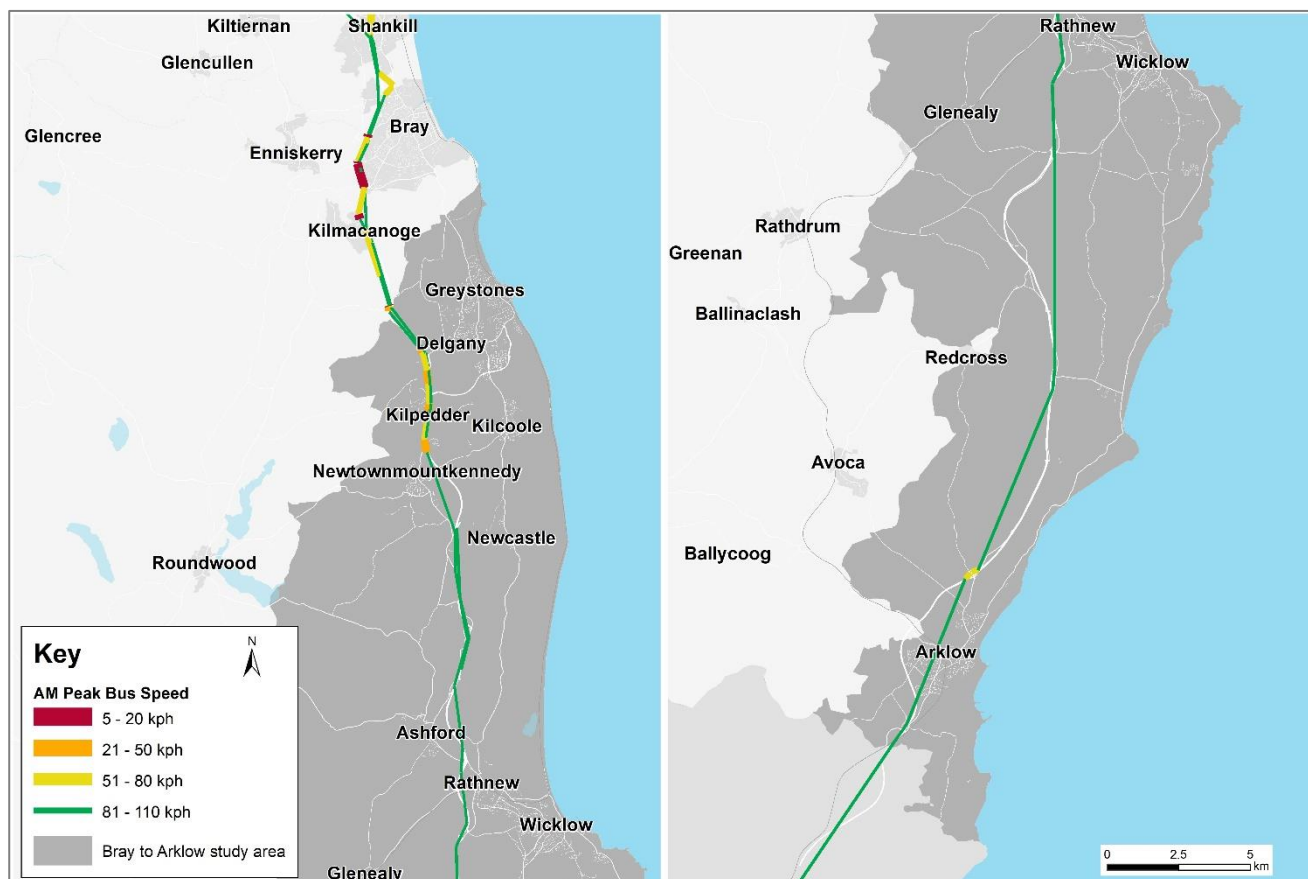


Figure 4-15: Bray to Arklow bus speeds on N11 and M11 (AM peak)

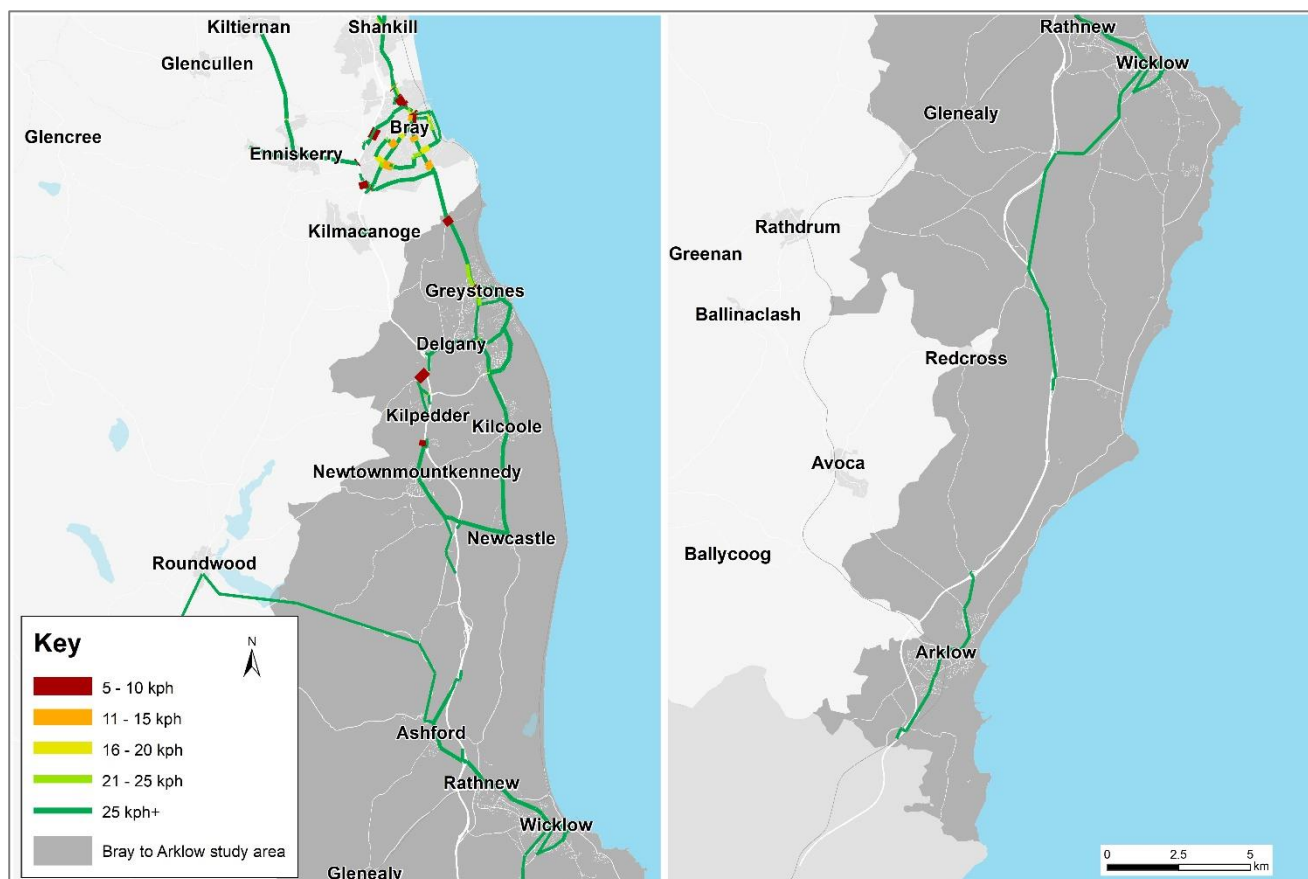


Figure 4-16: Bray to Arklow bus speeds on non-national routes (AM peak)

4.4 Mode Shift Analysis

4.4.1 Introduction

The previous section has considered the estimated travel demand and network performance in 2042. As well as the public transport network needing to accommodate public transport demand in 2042, there is also a need to cater for a mode shift from private car to sustainable modes such as walking, cycling and public transport. This mode shift is needed in order to, among other things, reduce congestion, improve air quality, and promote liveability in the towns and cities. This section considers different levels of mode shift for key movement corridors through the study area.

4.4.2 Methodology

A process has been developed to simulate how a change in mode shift could increase the demand for public transport trips. The potential number of public transport trips from the shift can then be used to indicate the level of public transport improvements which would be needed to accommodate a mode shift. This is summarised in Appendix C.

This process has been undertaken for two key movement corridors through the Bray to Arklow study area. The corridors were identified by identifying key origins and destinations using the data discussed in Table 4-6, alongside analysis of the network capacity utilisation, as presented in Table 4-5. The two key movement corridors are shown in Figure 4-17 and listed below:

- The Inland N11 Corridor
- The Coastal Rail Corridor

Due to the size of the zones within the study area, it was not possible to reliably group the origin zones from within the study area into rail line and N11/M11 origin zones. As such all trips originating within the study area with destinations along these corridors towards the city centre are considered.

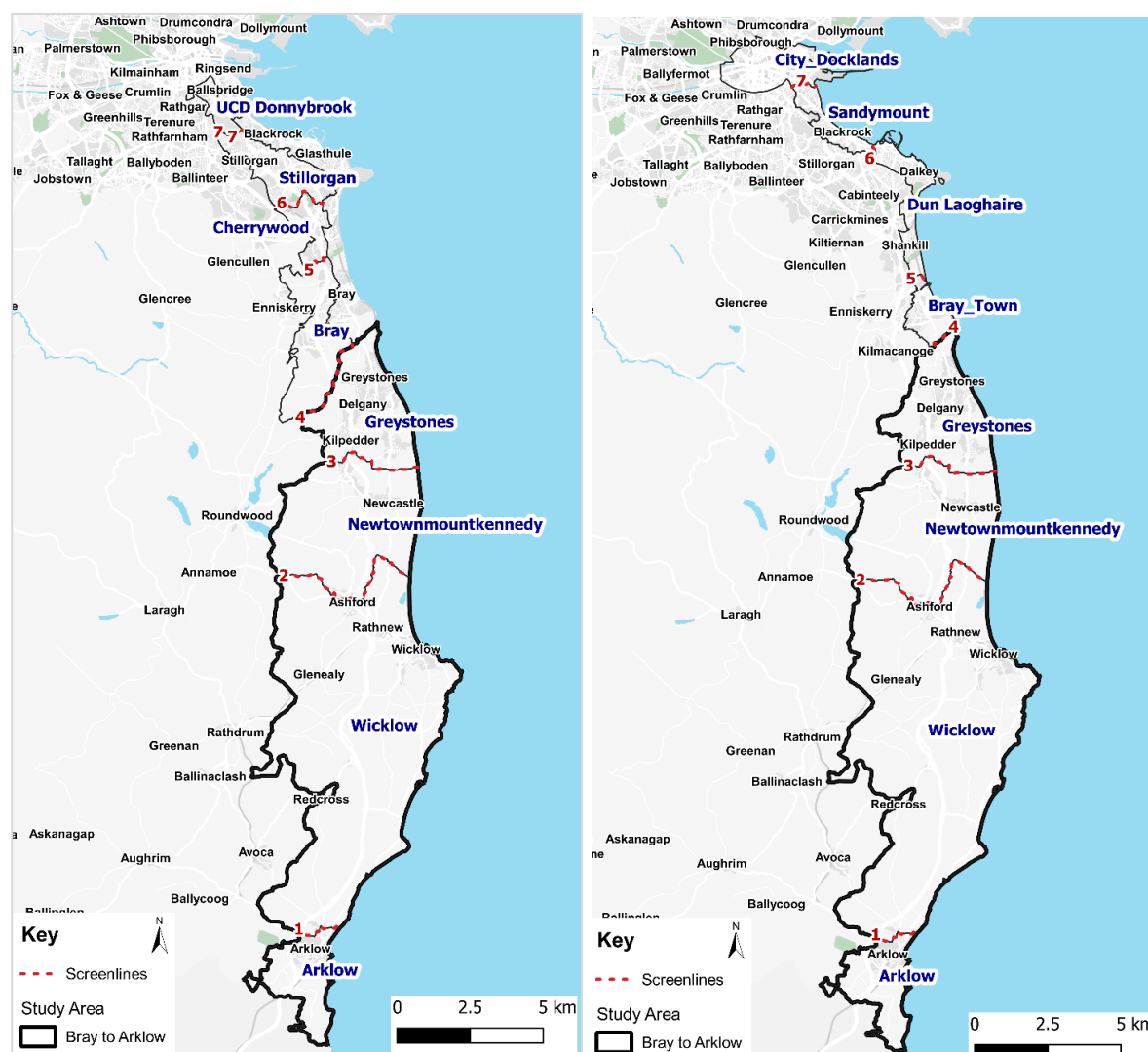


Figure 4-17 Study Area Key Movement Corridors Analysed for Mode Shift Impacts – inland (left) and coastal (right) corridors

For each corridor, model zones have been grouped into sectors and districts. The district boundaries form the screenlines for further analysis. Therefore, sectors are grouped into districts in accordance with where the screenlines are required. The screenlines were selected to analyse key movements into and out of the study area alongside key movements within the study area. These were mainly aimed at highlighting origins from the key towns in the study area and trips terminating in key destination along the corridors. The 2042 model demand outputs provide a baseline number of trips between each pair of sectors for car, public transport, cycle and walk. For a specified percentage car mode shift, the process estimates how many of the car trips become walk, cycle or public transport trips.

The distance between each pair of sectors has been estimated by calculating the straight line distance between the centroids of each sector. This allows the mode shift to be roughly based on distance, as shorter trips are more likely to become walking or cycling trips and longer trips are more likely to become public transport trips.

The distances have been divided into three bands based on the trip length distribution information in Section 0. Each sector-to-sector movement is then allocated one distance band. The shift from car to sustainable modes for each OD (Origin-Destination) movement is dependent on the distance band it is allocated, with shorter trips shifting to active modes more and longer trips more to public transport, in accordance with the sustainable mode splits for each distance band in the corridor.

4.4.3 Results

The information in this section outlines high-level, indicative results to inform option development, by providing order of magnitude changes in demand resulting from an assumed mode shift. Further analysis of mode shift and associated changes in demand for public transport will be undertaken in the strategic analysis for the GDA as a whole as part of the wider strategy development process.

Inland Corridor

To identify demand for public transport on the radial corridor, its model zones have been grouped into sectors and districts as shown in Figure 4-17.

In line with the methodology outlined above, distance bands for trips between these sectors were then calculated to identify which proportion of shifted car trips shift to public transport. The results are outlined in Table 4-8.

Table 4-8: Sustainable mode splits by distance band for the inland N11 corridor AM peak hour

Distance band (km)	Walk	Cycle	Public transport
0-2.5	83.1%	3.6%	13.3%
2.5-3.5	39.1%	7.4%	53.5%
3.5+	10.2%	3.7%	86.1%

According to the outputs from the model run, there are 11,793 car trips that originate within the study area with a destination along the corridor (including intra-study area and internal trips), 1,109 PT trips and 2,835 active trips. This car mode share of 75% for study area origin trips along the corridor is relatively high.

A car mode shift of 25% would result in a car mode share of 56% for study area origin trips along the corridor, while a 50% car mode shift would result in a car mode share of 37% for study area origin trips along the corridor. Given the trip length distribution and the proportion of short trips from the study area, it would be expected that a large number of these trips could potentially shift from car to public transport.

To consider public transport capacity on existing services, movements across screenlines have been analysed in more detail. A screenline is an imaginary line which enables movements which cross the line to be captured. The four screenlines, shown in Figure 4-17, have been chosen to capture key movements along the corridor.

Northbound AM peak movements between districts that cross each of the screenlines have been extracted for analysis for the corridor, with the results provided in Table 4-9.

The City Centre is served by both the inland corridor and the coastal corridor as they converge towards the City Centre. It is not possible to extract from the data analysis whether the demand destined for the City Centre would likely travel along the coastal corridor or the inland corridor. With rail services providing faster journey times to the City Centre for many and higher levels of capacity than the N11/M11 coaches, it was decided to add the City Centre demand to the coastal corridor for the purposes of analysis and therefore it is not included in Table 4-9. It will be important to focus on the shifted public transport demand shown in Table 4-9 alongside the demand by service on the N11 corridor (see Table 4-5 and Table 4-6) to ensure existing public transport demand to the City Centre along the inland corridor is captured in later analysis.

Table 4-9: Inland Corridor car mode shift by screenline (AM peak)

Screenline	Car mode shift	Existing public transport demand	Shifted public transport demand	Total public transport demand after mode shift
Screenline 1 (Into Wicklow Area)	0%	80	0	80
	25%		100	180
	50%		200	280
Screenline 2 (Into Newtownmountkennedy Area)	0%	320	0	320
	25%		250	570
	50%		500	820
Screenline 3 (Into Greystones Area)	0%	425	0	425
	25%		350	775
	50%		650	1075
Screenline 4 (STUDY AREA BOUNDARY - North of Greystones – to Bray)	0%	680	0	680
	25%		350	1030
	50%		700	1380
Screenline 5 (Into Cherrywood Area)	0%	600	0	600
	25%		275	875
	50%		550	1150
Screenline 6 (Into Stillorgan Area)	0%	550	0	550
	25%		150	700
	50%		300	850
Screenline 7 (Into UCD/Donnybrook Area)	0%	470	0	470
	25%		10	480
	50%		20	490

To achieve a car mode shift of 50%, provision for approximately 700 additional public transport trips to that provided for in the base would be required to cater for extra northbound demand across the study area boundary which is the highest level of demand across all of the screenlines.

The falling demand from the study area origin trips as the corridor nears the city centre illustrates that a significant proportion of demand is destined for areas south of the City Centre. For the coach services, there are restrictions on pick up as they travel through areas serviced by Dublin City Buses. In this case, the falloff in demand is representative of what service needs to be provided. In the case of BusConnects routes, it would be important to ensure that sufficient capacity is also provided to serve demand from the corridor itself north of the study area.

Coastal Corridor

To identify demand for public transport on the radial coastal corridor, its model zones have been grouped into sectors and districts as shown in Figure 4-17. As stated above, the demand between the study area and the City Centre cannot be assigned by corridor as the public transport services from the coastal and inland corridors converge in the City Centre. For the reasons stated earlier, this demand has been included only within the coastal corridor.

In line with the methodology outlined above, distance bands for trips between these sectors were then calculated to identify which proportion of shifted car trips shift to public transport. The results are outlined in Table 4-10.

Table 4-10: Sustainable mode splits by distance band for the radial corridor AM peak hour

Distance band (km)	Walk	Cycle	Public transport
0-2.5	67.5%	6.7%	25.8%
2.5-3.5	45.2%	7.5%	47.3%
3.5+	21.5%	6.9%	71.5%

According to the outputs from the model run, there are 11,700 car trips that originate within the study area with a destination along the corridor (including trips internal to the study area), 1,700 PT trips and 2,800 active trips. This car mode share of 71% for study area origin trips along the corridor is relatively high.

A car mode shift of 25% would result in a car mode share of 54% for study area origin trips along the corridor, while a 50% car mode shift would result in a car mode share of 36% for study area origin trips along the corridor. Given the trip length distribution and the proportion of short trips from the study area, it would be expected that a large number of these trips could potentially shift from car to public transport.

To consider public transport capacity on existing services, movements across screenlines have been analysed in more detail. A screenline is an imaginary line which enables movements which cross the line to be captured. The four screenlines shown in Figure 4-17, have been chosen to capture key movements along the corridor.

Northbound AM peak movements between districts that cross each of the screenlines have been extracted for analysis for the corridor, with the results provided in Table 4-11⁴.

⁴ Figures in this table have been rounded to the nearest 100.

Table 4-11: Coastal Corridor car mode shift by screenline (AM peak)

Screenline	Car mode shift	Existing public transport demand	Shifted public transport demand	Total public transport demand after mode shift
Screenline 1 (Into Wicklow Area)	0%	180	0	180
	25%		75	355
	50%		150	430
Screenline 2 (Into Newtownmountkennedy Area)	0%	550	0	550
	25%		175	725
	50%		350	900
Screenline 3 (Into Greystones Area)	0%	650	0	650
	25%		200	850
	50%		400	1050
Screenline 4 (STUDY AREA BOUNDARY - North of Greystones – to Bray)	0%	1,300	0	1,300
	25%		250	1,550
	50%		500	1,800
Screenline 5 (Into Dún Laoghaire Area)	0%	1,100	0	1,100
	25%		125	1,225
	50%		250	1,350
Screenline 6 (Into Sandymount Area)	0%	1,000	0	1,000
	25%		50	1,050
	50%		100	1,100
Screenline 7 (Into City/Docklands Area)	0%	800	0	800
	25%		10	810
	50%		20	820

To achieve a car mode shift of 50%, provision for approximately 500 public transport trips additional to those existing in the base demand would be required to cater for extra northbound demand across the study area boundary which is the highest level of demand across all of the screen lines.

4.5 Summary

4.5.1 Issues

There is significant growth forecast for the study area to 2040, with population growth forecast above the national average.

Currently within the study area there is a very high car mode share. This is likely due to a relatively free flowing road network in much of the study area as well as high car availability and plentiful parking at destinations in, and near, the study area.

There is a lack of public transport provision in some areas and for a number of key origin-destination patterns, whilst in other areas the services may provide uncompetitive journey times. There is also a low cycle mode share throughout the area, which is reinforced by and/or influenced by a lack of high-quality cycle infrastructure within urban centres and between urban areas over what would otherwise be distances well suited to cycling.

Analysis also shows that several public transport services are approaching or over capacity in the AM Peak, including routes into Dublin City Centre through the south city, which may further help encourage people to make journeys by car instead of public transport.

Within the study area, the rail line is routed in close proximity to the coast between Bray and Wicklow. A number of studies have identified a risk of future damage to the rail infrastructure as a result of coastal erosion which is likely to be exacerbated by climate change.

4.5.2 Constraints

With regards to public transport, there is a severe lack of public transport capacity in the south of the study area. Long distance coach routes are approaching capacity from Arklow northbound and the rail line is over capacity from Wicklow to Greystones.

While there are proposals to upgrade the rail line between Greystones and Bray, it is a single-track line that traverses cliff edge and tunnel for extended sections. Therefore, major upgrades could require significant capital expenditure.

In terms of car travel, the N11/M11 forms the core road spine through the study area. It experiences heavy congestion in the north of study area where it traverses the Glen of the Downs Nature Reserve. The lack of bus priority along this route is a constraint to providing competitive bus journey times.

For walking there is a need to provide footpaths on key routes in the smaller towns in the study area, but there are notable walk mode shares in the main towns. In terms of cycling, there is a dearth of infrastructure throughout the study area and a need to link key origins and destinations within the major towns and to increase the accessibility of rail stations by active travel.

4.5.3 Opportunities

There are two key radial public transport corridors through and leaving the study area, the coastal corridor and the inland corridor.

The extremely high public transport mode share for trips to the city centre shows the opportunity for modal shift to public transport for radial trips towards the city centre and to key destinations in the south city with a high level of public transport provision, and constraints to car travel.

The rail line is over capacity in the south of the study area, but there is capacity on the DART services leaving Greystones. There is an opportunity to provide higher frequency services between Arklow and Greystones and drive greater utilisation of DART capacity through modal shift.

There are a large number of internal car trips made within and between urban areas within the study area, so there is an opportunity to provide local bus services through and between towns that are not served by the BusConnects network.

Improving cycle infrastructure and facilities will help to increase cycle mode share and therefore help to decrease the number of short trips made via car, whilst providing interchange facilities at key transport hubs will facilitate modal shift away from car to active modes and public transport for longer length trips.

5. Options Development

5.1 Introduction

This Chapter outlines the approach to option generation and development for the Bray to Arklow study area. The analysis presented in Section 4.3.4 clearly shows that the capacity of public transport in the base case is insufficient for the projected demand in 2040. The base case also indicates a high level of car mode share which will need to be addressed through improvements to sustainable transport alternatives and other supportive measures.

5.2 Strategy objectives

To guide the identification of options for the Bray to Arklow study area, the NTA has outlined a set of overarching themes, outcomes and objectives for the Transport Strategy for the GDA; these are outlined in Table 5-1.

Table 5-1: GDA Transport Strategy theme, outcomes and objectives

Strategy theme	Strategy outcome	Strategy objective
Environment	An enhanced natural and built environment	To create a better environment and meet our environmental obligations by transitioning to a clean, low emission transport system through reducing car dependency and increasing walking, cycling and public transport use.
Community	Connected communities and better quality of life	To improve health and quality of life of our society by improving connectivity between people and places, delivering safe and integrated transport options, and increasing opportunities for walking and cycling.
Economy	A strong sustainable economy	Supporting economic activity and growth by improving the opportunity for people to travel for work or business where and when they need to and facilitating the efficient movement of goods.
Accessibility	An inclusive transport system	To deliver a high quality, equitable and accessible transport system, which caters for the needs of all members of society.

5.3 Options development

To identify options to serve travel demand in the study area in 2042, the following steps have been completed:

- A review of relevant planning and transport policies and strategies has provided the overall context for options, and identified current thinking in relation to the future transport network;
- A baseline analysis of the existing transport network identified existing network issues and opportunities;
- An analysis of planning and travel data from the 2040 Planning Sheet and a Do-Minimum run of the Eastern Regional Model for 2042 provided insights into future travel demand and network capacity constraints; and
- A review of the GDA Transport Strategy objectives against which all options should be measured.

The flow diagram outlined in Figure 5-1 summarises this option generation process. Two main categories of options were considered: those to enhance existing transport infrastructure and services and/or improve access to existing infrastructure and services; and new sustainable transport (public transport and active mode) infrastructure and services which could supplement the existing network to deliver a more holistic sustainable transport offering in the Bray to Arklow study area. It should be noted that a separate Park and Ride study was being undertaken by the NTA concurrently with this study. The preparation of the Transport Strategy will take this into account when devising the set of transport proposals for the Bray to Arklow corridor.

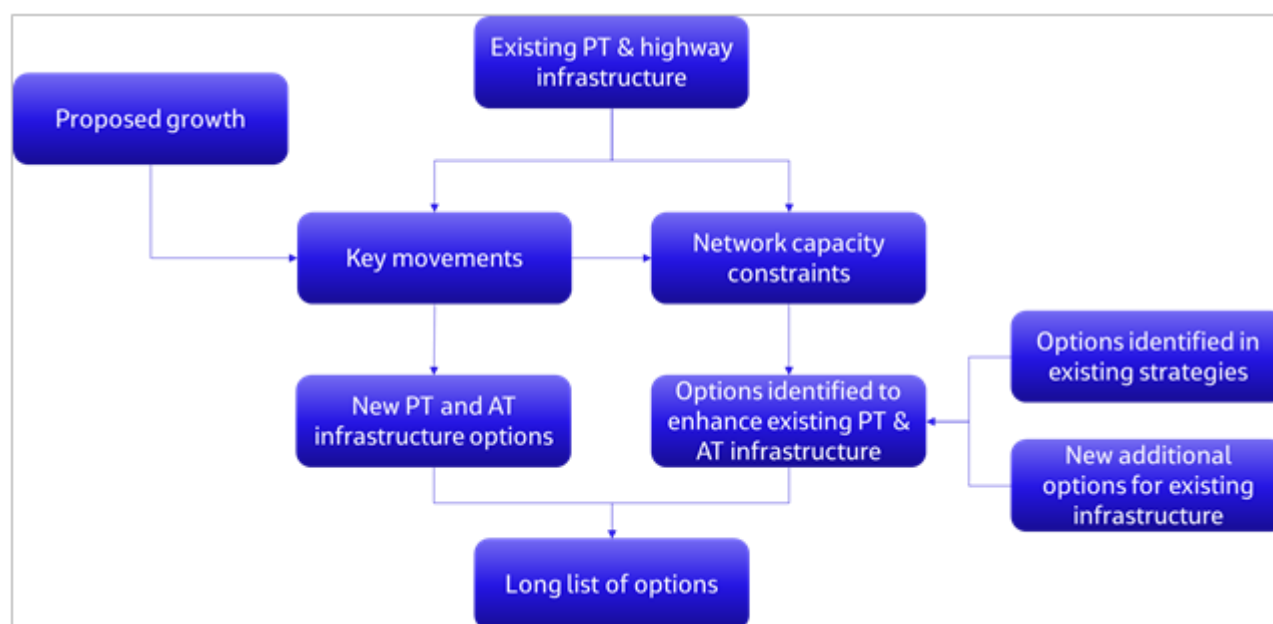


Figure 5-1 Option generation process flow diagram

Where enhancements and interventions have been identified for existing transport infrastructure and services, options previously proposed within existing local and regional strategies have been considered. Additionally, new options have been proposed for existing infrastructure where further enhancements could be beneficial to the wider accessibility of the study area, particularly due to the level of change proposed.

The above steps resulted in the preparation of an options long-list for key transport patterns, as well as supplementary options to provide a more holistic sustainable transport network within the Bray to Arklow study area, as detailed in Table 5-2. The options long list is discussed in more detail below.

Table 5-2: Options long list

Type of option	Description
PT corridor	Radial public transport option connecting study area with areas to the north along the coast
PT corridor	Radial public transport option connecting study area with areas to the north inland from the coast
Local PT links enhancements	Arklow - Gorey
Local PT links enhancements	Wicklow – Rathnew - Ashford
Local PT links enhancements	Kilcoole, Newtownmountkennedy, Kilpedder, Delgany-Greystones
Rural Transport Service enhancements	From rural areas to towns within Study Area
Bus infrastructure	Provide bus priority on N11/M11
Supporting infrastructure	Park and ride, interchange
Cycle infrastructure	Cycle measures for key settlements within the study area: Greystones-Delgany, Rathnew-Wicklow, Arklow
Cycle infrastructure	Strategic cycleways between key settlements

It should be noted that inherent within these options, in particular those that require intervention in the streetscape, is the intention to address the weaknesses of the pedestrian environment in the study area through improvements to junctions. Such measures would include additional crossing points, increased pedestrian crossing times and, where identified, the implementation of additional pedestrian links to connect residential areas with public transport services and local centres.

5.3.1 Public transport corridors

Inland Radial Corridor

The demand for this radial corridor calculated in Section 4.4 and summarised in Table 4-9 is used to inform the identification of appropriate options to serve this corridor. Five main options were considered as part of this study in order to meet anticipated demand to/from the study area. Each of the five main options considered has a theoretical capacity which is used as the basis on which to short-list options to progress through to the assessment stage. The capacity range for each mode is presented in Table 5-3 and based on UITP's 'Making the right mobility choices.' It should be noted that the capacity range for these modes have significant overlaps and are approximate.

Table 5-3: Public transport mode capacity range

Mode		Min	Max
1	Bus Spine	0	2,400
2	Bus with priority infrastructure	2,400	4,000
3	Light rail	3,600	7,000
4	Heavy Rail	5,000	50,000
5	Metro	7,500	25,000

In order to undertake the initial sift of options to progress through to the assessment, the corridor demand has been compared against the mode capacity range outlined in Table 5-3. The corridor demand figure used has been obtained from Table 4-9. For each direction the demand has been obtained from the screenline that has the highest level of demand when a 50% car mode shift has been applied. For northbound movements this was screenline 4 with 1,400 trips. From an analysis of the bus loadings in Table 4-4, it is estimated that an additional 250 passengers would travel through this corridor between origins/destinations outside the corridor. Table 5-4 presents the public transport options long list for each of the corridors alongside the initial assessment results for each option. An allowance has been made within the maximum capacity figures to account for the generally lower capacity of coaches versus city buses.

Where bus options are considered, two radial spines have been proposed to ensure suitable capacity but also accessibility. The development of a bus spine does not preclude the provision of bus services on other routes. Rather it indicates that the focus of additional services will be within the spine identified.

Table 5-4: Public transport options long list – Inland Radial Corridor

AM Demand		Option		Min Capacity	Max Capacity	Initial Assessment	Reason
NB	SB						
1,650		1	Do Minimum	1,100	1,100	Discount	Insufficient capacity
		2	Enhanced bus spine (higher frequency and capacity)	1,100	1,800	Progress	Sufficient capacity
		3	Enhanced bus spine with priority	1,200	3,000	Progress	Sufficient capacity
		4	Two enhanced bus spines	2,200	3,600	Discount	Insufficient demand
		5	Light Rail spine	3,600	7,000	Discount	Insufficient demand

As a result of the initial assessment presented in Table 5-4, the options being taken forward to the Multi Criteria Analysis (MCA) stage for the coastal radial corridor are as follows:

- Enhanced bus spine (higher frequency and capacity); and
- Enhanced bus spine (higher frequency and capacity) with Priority.

Coastal radial corridor

The demand for this radial corridor calculated in Section 4.4 and summarised in Table 4-11 is used to inform the identification of appropriate options to serve this corridor. Five main options were considered as part of this study in order to meet anticipated demand to /from the study area.

As in the case of the inland radial corridor, in order to undertake the initial sift of options to progress through to the assessment, the corridor demand has been compared against the mode capacity range outlined in Table 5-3. The corridor demand figure used has been obtained from Table 4-11. For each direction the demand has been obtained from the screenline that has the highest level of demand when a 50% car mode shift has been applied. For northbound movements this was screenline 4 with 1,800 trips. Table 5-4 presents the public transport options long list for each of the corridors alongside the initial assessment results for each option.

Where bus options are considered, two radial spines have been proposed to ensure suitable capacity but also accessibility. The development of a bus spine does not preclude the provision of bus services on other routes. Rather it indicates that the focus of additional services will be within the spine identified. These options are presented in Table 5-5.

Table 5-5: Public transport options long list – Coastal Radial Corridor

AM Demand		Option		Min Capacity	Max Capacity	Initial Assessment	Reason
NB	SB						
1,800		1	Do Minimum	2,200	2,200	Progress	Sufficient capacity
		2	Additional new bus services	2,200 + 500	2,200 + 1000	Progress	Sufficient capacity
		3	Feeder Bus services to DART north of study area (Bray, Woodbrook)	2,200 + 500	2,200 + 1000	Progress	Sufficient capacity
		4	Park and Ride north of study area (Bray, Woodbrook)	2,200 + 500	2,200 + 1000	Progress	Sufficient capacity
		5	Minor heavy rail enhancements (additional service capacity)	2,500	3,500	Progress	Sufficient capacity
		6	Major heavy rail enhancements (e.g. double tracking)	5,000	50,000	Discount	Insufficient demand

As a result of the initial assessment presented in Table 5-4, the options being taken forward to the Multi Criteria Analysis (MCA) stage for the coastal radial corridor are as follows:

- Do Minimum;
- Additional New Bus Services;
- Feeder Bus services to DART north of study area (Bray or Woodbrook);
- Park and Ride north of study area (Woodbrook); and
- Minor heavy rail enhancements.

5.3.2 Supplementary options

Alongside the public transport corridor options that have been taken through the MCA process, a number of other supplementary options have been identified. These consist of smaller scale cycle and bus interventions.

Upgrades to Proposed BusConnects bus services

As discussed in Section 4.3.4, the model outputs have been used to analyse the existing public transport capacity utilisation. The capacity of the BusConnects routes was sufficient for the volume of demand. However, it is noted that there is a very high car mode share in the area and significant potential for mode shift. The improvements to public transport services proposed for the Coastal and Inland radial corridors will attract and cater for some additional internal demand within the Bray to Arklow study area. However, some local connectivity will not be directly served by the radial corridors, and further local route enhancements will be needed to attract mode shift. For reasons of competitiveness, given the volume of local trips by car between settlements within the study area, options for improving frequency are recommended for further consideration to improve the attractiveness of public transport. For these routes, options have been identified to increase the capacity to accommodate the demand. These options are presented in Table 5-6.

Table 5-6: Options to upgrade BusConnects bus services

Route Type	Service	Route	Weekday Frequency
Local Routes	L1 / L2	Greystones - Newcastle Loop (L1 Clockwise - L2 Anticlockwise) - Bray	6am to 7pm: increase frequency from 40 minutes to 30 minutes 7pm to 12am: increase frequency from 60 minutes to 40 minutes
	L3	Greystones Circulator (1-way loop)	6am to 11pm: increase frequency from 30 minutes to 15 minutes 11pm to 12am: increase frequency from 60 minutes to 30 minutes

It is acknowledged that the above proposals have not been tested to see if the additional level of service would attract sufficient passenger demand to support the additional cost of operation. Therefore, further testing is required to determine the performance of these options and it is recommended that they are taken forward for further consideration as part of the GDA Transport Strategy work but are not considered as part of the MCA within this report.

Additional Local Services

With improvements to the coastal and inland corridor and enhancements to local services, nearly all key origin-destination demand patterns identified in Section 4.3.2 will be provided with enhanced public transport to support more sustainable transport within the Bray to Arklow study area. The analysis also identified travel demand between Arklow and Gorey to the south of the study area. Whilst the rail line and coach services connect Arklow and Gorey, they are both of relatively low frequency and don't provide significant coverage within the settlements. Therefore, consideration should be given to a potential local bus service to operate between and within Arklow and Gorey, integrating with the longer distance coach and rail services.

It is acknowledged that the above proposal has not been tested to see if the new bus service would attract sufficient passenger demand to support the additional cost of operation. Therefore, further testing is required to determine the performance of this option and it is recommended that it is taken forward for further consideration as part of the GDA Transport Strategy work, but this has not been considered as part of the MCA within this report.

Bus priority measures

A number of bus infrastructure options have been developed by firstly using the bus speeds presented in Section 4.3.7 to identify areas in the network where speeds are particularly low. The analysis identified slower bus speeds on the N11 both online and at junctions with delays to buses noted at Kilpedder, Delgany and north of the study area at Kilmacanogue and Bray.

The N11/M11 Junction 4 to Junction 14 Improvement Scheme is currently in planning with the Phase 2 Options Selection Interim Report published in December 2020. Within that report a need for consideration of bus priority on the N11 was identified with the following statement: *"The severity of the congestion issues on the N11/M11, in conjunction with public feedback, have identified an urgency for early intervention to address the problems on*

the corridor. Accordingly, a separate project to assess the feasibility of providing bus lanes on the N11/M11 corridor has progressed."

As a result, a separate project, entitled the N11/M11 Bus Priority Interim Scheme has commenced as a multi-authority project involving the National Transport Authority, Transport Infrastructure Ireland, Wicklow County Council and Dún-Laoghaire Rathdown County Council. It is recommended that an option for bus priority on the N11 be taken forward for further consideration as part of the GDA Transport Strategy work, but this has not been considered as part of the MCA within this report.

Bus Stop and Interchange Infrastructure

Additional and/or improved bus stop and interchange infrastructure would support a shift to public transport and will likely be necessary to derive fuller benefits from the proposed increase in public transport service provision. In particular for the Bray to Arklow study area, the potential requirements for interchange facilities should be brought forward as options for further consideration as part of the GDA Transport Strategy in these locations:

- Greystones (bus / bus / DART / Rail);
- Bray (bus / bus / DART / Luas [potentially]); and
- Cherrywood (bus / bus / Luas [or Metro potentially]).

Cycle interventions

As outlined in Section 4.2.6 there are benefits to be gained by plugging gaps in the cycle network and to better connect to public transport services and the rail stations within the study area in particular. The proposed delivery of the Greater Dublin Area Cycle Network Plan should be brought forward for consideration as part of the GDA Transport Strategy. In particular, the cycle links proposed within settlements and between neighbouring settlements should be considered as a priority in order to provide for a cohesive network of interconnected cycle routes. For the purposes of encouraging mode shift from car, it is recommended that these options provide for a high level of cycle connectivity in the following areas as soon as possible:

- Greystones – Delgany – Kilcoole
- Wicklow – Rathnew
- Arklow

These options were not assessed against the other options using the MCA and it is recommended that they be taken forward for further analysis as they would provide an alternative transport option for consideration in the preparation of the GDA Transport Strategy. It is expected that such interventions would result in positive environmental impacts as well as improvements to health.

Rural Transport Services

Rural transport services are important to the Bray to Arklow study area providing rural connectivity and accessibility within the study area and beyond. Wicklow Local Link operates a variety of timetabled services with varying frequency. Many are tailored to meet specific needs such as access to retail and services in key towns. The planning of rural transport services is complex, often responding to particular demand from isolated areas. The scale scope and routes for rural transport services in the Bray to Arklow area will likely evolve over the timeframe of the GDA Transport Strategy to 2042.

Options for rural transport services were not assessed against the other options using the MCA and such measures are recommended to be taken forward for further analysis in the preparation of the GDA Transport Strategy as they provide essential public transport accessibility.

6. Options Assessment

6.1 Methodology

The approach to the assessment of options is guided by the 'Guidelines on a Common Appraisal Framework (CAF) for Transport Project and Programmes October 2020' (Department of Transport). This requires all schemes to be appraised under the general themes of:

- Economy;
- Environment;
- Safety;
- Integration; and
- Accessibility / Social Inclusion.

Given the early nature of this study, a largely qualitative Multi Criteria Analysis (MCA) was considered to be an appropriate tool to guide the assessment of options. The MCA undertaken is a high-level assessment based on professional judgement.






Building on the key themes of the CAF, a set of criteria which sit within these overarching themes have been developed to enable a more detailed assessment of options to be undertaken. These criteria have been based on the GDA Transport Strategy objectives provided by the NTA (and presented in Section 5.1), as outlined in Table 6-1.

Table 6-1: Assessment criteria

Theme	Criteria	Description
Environment	Decarbonisation	Supporting the decarbonisation of transport by encouraging mode shift away from private car.
	Environmental Impact	Provides positive impact on the local built and natural environment e.g. landscape, air quality etc.
Economy	Sustainable growth	Support sustainable development and facilitate growth to 2040 by providing capacity aligned with demand.
	Journey Times	Improves time it takes to undertake similar end to end journey.
	Value for Money	Potentially provides good value for money.
	Resilience	Provide resilience for the future (beyond 2040).
Integration	Integration	Provides integration with the existing and future proposed transport network.
Accessibility and Inclusion	Accessibility and Inclusion	Improves accessibility to public transport services and enhances inclusion, catering for the needs of all members of society.
Safety	Road Safety	Improves road safety.
Health	Physical Activity	Increases physical activity.

The options identified have been assessed relative to each other against the aforementioned criteria using the rating scale outlined in Table 6-2.

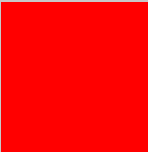

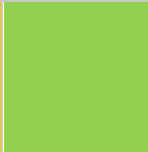
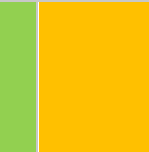
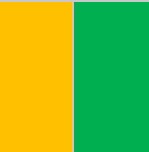





Table 6-2: Rating scale

Colour	Definition
	The option has significant advantages over other options
	The option has some advantages over other options
	The option is comparable to others
	The option has some disadvantages over other options
	The option has significant disadvantages over other options

6.2 Coastal Radial Corridor Results

6.2.1 Environment

Table 6-3: MCA results for environment

Criteria	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Decarbonisation	Supporting the decarbonisation of transport by encouraging mode shift away from private car.					
Environmental Impact	Provides positive impact on the local built and natural environment e.g. landscape, air quality etc.					
Criterion	MCA Result in terms of Decarbonisation	Summary of Assessment				
Option 1	Significant disadvantages	Does not provide any additional capacity or enhanced level of service in order to encourage mode shift away from private car				
Option 2	Some disadvantages	Unlikely to be attractive given the relative journey time by car and rail				
Option 3	Some advantages	With appropriate bus priority, there is potential to offer relatively competitive journey times. Would be somewhat attractive for trips from the Study Area that are not within direct catchment of a rail station.				
Option 4	Some disadvantages	Does not improve alternatives along the corridor within the study area. Would result in a mode shift for part of journeys, but not end to end therefore limiting the benefits in terms of decarbonisation.				
Option 5	Significant advantages	Rail offers relatively fast journey times. Less crowding and more certainty on available capacity for return journeys will benefit potential public transport users. Higher frequency rail services would encourage mode shift away from private car along the corridor.				
Criterion	MCA Result in terms of Environmental Impact	Summary of Assessment				
Option 1	Some disadvantages	Does not reduce congestion or address the air quality impacts of private car use.				
Option 2	Some advantages	Will provide some benefits for trips by public transport within the study area which will reduce the impact of the private car on the local environment (e.g. noise, air quality).				
Option 3	Some advantages	Will provide some benefits for trips by public transport within the study area which will reduce the impact of the private car on the local environment (e.g. noise, air quality).				
Option 4	Some disadvantages	May attract passengers away from low frequency direct public transport services therefore increasing the impact of the private car on the local environment (e.g.				

		noise, air quality).
Option 5	Some advantages	Will provide some benefits for trips by public transport within the study area which will reduce the impact of the private car on the local environment (e.g. noise, air quality).

6.2.2 Economy

All options would provide sufficient capacity for the analysed demand and whilst some will provide additional spare capacity, the order of magnitude is relatively low. Therefore, all options are considered to perform similarly well in terms of supporting sustainable growth to 2040 by providing capacity aligned with demand.

Table 6-4: MCA results for economy

Criteria	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Sustainable Growth	Support sustainable development and facilitate growth to 2040 by providing capacity aligned with demand.					
Journey Times	Improves time it takes to undertake similar end to end journey.					
Value for Money	Potentially provides good value for money.					
Resilience	Provide resilience for the future (beyond 2040).					
Criterion	MCA Result in terms of Journey Times	Summary of Assessment				
Option 1	Significant disadvantages	Will not improve journey times				
Option 2	Significant disadvantages	Bus journey times along this corridor are relatively slow compared to car and rail. Even with the addition of bus priority, a new bus services would not be attractive in comparison to rail in terms of journey time along this corridor.				
Option 3	Some advantages	With appropriate bus priority, there is potential to offer relatively competitive journey times.				
Option 4	Some advantages	Provides access to higher frequency rail services which may improve overall journey times for some, especially those outside the direct catchment of rail within the study area. Does not improve journey times within the study area and may result in additional car use that increases local congestion.				
Option 5	Significant advantages	Rail services provide attractive travel times. Higher frequency rail services will reduce wait times and improve end to end journey time along the corridor.				
Criterion	MCA Result in terms of Value for Money	Summary of Assessment				
Option 1	Some advantages	Will not result in additional costs, but nor will it deliver benefits (see other criteria)				
Option 2	Significant disadvantages	Will result in additional cost of operation of the new bus services, but will be uncompetitive and unattractive compared to the alternative rail and road, therefore offering limited benefits (see other criteria)				
Option 3	Some advantages	Will result in some additional cost and benefit (see other criteria)				
Option 4	Some advantages	Will result in little additional cost and little benefit (see other criteria)				
Option 5	Some advantages	Will result in relatively more additional cost and relatively more benefit (see other criteria)				
Criterion	MCA Result in terms of Resilience	Summary of Assessment				

Option 1	Significant disadvantages	Will not provide additional transport capacity in support of longer-term growth.
Option 2	Significant disadvantages	Will be unlikely to attract significant passenger numbers to warrant additional capacity provision to support longer-term growth
Option 3	Some advantages	Enhancements to feeder bus services could be delivered in response to longer-term growth.
Option 4	Some disadvantages	Longer-term growth would require a larger park and ride, but the road network capacity would not be able to sustain a significant increase in car traffic volumes to the park and ride site.
Option 5	Significant advantages	Provides the most spare capacity and would not limit more extensive improvements to rail services in the longer-term if required due to growth.

6.2.3 Integration

Table 6-5: MCA results for integration

Criterion	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Integration	Provide integration with the existing and future proposed transport network.					
Criterion	MCA Result in terms of Integration	Summary of Assessment				
Option 1	Some disadvantages	Will not alter the level of transport integration				
Option 2	Significant disadvantages	Will duplicate rail services along the corridor providing poor integration				
Option 3	Some advantages	Will provide for better integration between bus and rail services, extending the catchment of public transport beyond the direct areas served				
Option 4	Some advantages	Will provide for better integration between private car and rail services, extending the catchment of public transport beyond the direct areas served				
Option 5	Significant advantages	Can be integrated as part of the DART+ programme providing a stronger network of rail services in the GDA				

6.2.4 Accessibility and Inclusion

Table 6-6: MCA results for accessibility and inclusion

Criterion	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Accessibility and Inclusion	Improves accessibility to public transport services and enhances inclusion, catering for the needs of all members of society.					
Criterion	MCA Result in terms of Accessibility and Inclusion	Summary of Assessment				
Option 1	Significant disadvantages	Will not alter the level of transport integration				
Option 2	Some disadvantages	Duplication of rail services will provide little improvement in accessibility, though bus stops may be more accessible than rail stations for some.				
Option 3	Some advantages	Will provide for better integration between bus and rail services, extending the catchment of public transport beyond the direct areas served				
Option 4	Some disadvantages	Will provide for access to public transport for remote areas that areas that are not directly served by public transport but will not improve social inclusion for those without access to a car.				
Option 5	Significant advantages	Can be integrated as part of the DART+ programme providing a stronger network of rail services in the GDA				

6.2.5 Safety

Table 6-7: MCA results for safety

Criterion	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Road Safety	Improves road safety.					
Criterion	MCA Result in terms of Safety	Summary of Assessment				
Option 1	Some disadvantages	Won't have an impact on car traffic				
Option 2	Some disadvantages	Unlikely to have a significant impact on car traffic				
Option 3	Some advantages	Will support a reduction in car traffic volumes, but will result in a relatively small increase in the number of buses on the road network				
Option 4	Significant disadvantages	Will likely increase car traffic volumes within the study area and on approaches to the park and ride location				
Option 5	Significant advantages	Will support a reduction in road traffic volumes				

6.2.6 Health

Table 6-8: MCA results for physical activity

Criterion	Description	Option 1 Do Minimum	Option 2 Additional New Bus Services	Option 3 Feeder Bus services to DART north of study area	Option 4 Park and Ride north of study area	Option 5 Minor Rail Enhancements
Physical Activity	Increases physical activity.					
Criterion	MCA Result in terms of physical activity	Summary of Assessment				
Option 1	Some disadvantages	Will not increase physical activity				
Option 2	Some advantages	Will support minor increases in physical activity from new passengers walking or cycling to bus services				
Option 3	Some advantages	Will support minor increases in physical activity from new passengers walking or cycling to bus services				
Option 4	Some disadvantages	Could result in a minor decrease in physical activity as people choose to drive to the park and ride instead of walking to local public transport services				
Option 5	Significant advantages	Will support minor increases in physical activity from new passengers walking or cycling to rail services				

6.2.7 Summary

In summary, Option 5, minor rail enhancements, performs the best overall in terms of all criteria. The rail infrastructure is a significant asset for the study area and provides attractive public connections along the corridor offering competitive journey times to key destinations within and outside the study area.

The next best performing option, Option 3, feeder bus services to DART north of study area, is worthy of further consideration and may be very successful depending on the configuration of the network and the delivery of supporting infrastructure, particularly bus priority along the N11. Option 3 could be delivered in conjunction with Option 5, though the value for money of a combined option would need to be carefully considered.

There are some strengths to Option 4, park and ride north of study area. It did not perform as well as a solution to serve the coastal corridor demand from the Bray to Arklow area, mainly due to the relatively long car distances required to access the park and ride. It is likely that there would be greater benefits from the park and ride to serve closer demand from areas that are not directly served by public transport.

Both Option 3 and 5 should be brought forward for further consideration. Both options are explored in more detail in Chapter 7.

6.3 Inland Radial Corridor Results

Only two options were progressed from the long list of options for the inland radial corridor, both of which comprise a bus spine along the N11/M11, one with and one without priority. Whilst both would provide sufficient capacity to meet future demand including potential mode shift, the extent of delays to buses on the N11 identified in Section 4.3.7 would severely limit the attractiveness of the services. Such delays would also add to the operation cost of providing additional bus services further reducing the cost effectiveness. Finally, it is noted that the most recent reporting on the N11/M11 Junction 4 to Junction 14 Improvement Scheme included the initiation of the N11/M11 Bus Priority Interim Scheme.

On this basis, the need for bus priority is recognised and it is proposed to only bring forward Option 3, Bus Spine with Priority, for further consideration. This option is explored in more detail in Chapter 7.

7. Summary

This report has outlined the approach and results from the study of the Bray to Arklow area, as defined by the NTA for the purposes of providing input into the preparation of the GDA Transport Strategy. The area is extensive, comprising multiple settlements and predominantly rural areas. It benefits from two main transport corridors, one rail along the coast and the N11/M11 that caters for bus services and general traffic. There are also extensive local roads delivering connectivity between settlements, and infrastructure for pedestrians and cyclists within the settlements.

The area is significantly dependent on the private car having a mode share of more than 70% along the two main transport corridors. The vast majority of this car demand is internal within the area or destined for Bray, Dún Laoghaire and areas to the south of the City Centre. By contrast, the mode share to the City Centre itself is nearly entirely public transport with other destinations such as UCD exhibiting very high public transport mode shares.

From the demand analysis, the inland corridor along the N11/M11 will require additional public transport capacity in 2042. The coastal corridor will also require public transport enhancements to cater for demand and to support the continued attractiveness of public transport services. Local connectivity will also need to be provided for sustainable transport modes, i.e. walking, cycling and public transport. Finally, there is a need for the provision of rural transport services to ensure accessibility. All of the above will be considered in tandem with the recommendations of the separate Park and Ride study being undertaken by the NTA.

7.1 Public Transport Options

Given the early nature of this study, a qualitative Multi Criteria Analysis (MCA) was considered to be an appropriate tool to guide the assessment of public transport options. Building on the key themes of the CAF, a set of criteria which sit within these overarching themes has been developed to enable a more detailed assessment of options to be undertaken. These criteria have been based on the GDA Transport Strategy objectives provided by the NTA.

7.1.1 Coastal Radial Corridor

Following the development of a long list of public transport options for the coastal radial corridor, a high level sift was undertaken using forecast trips from the Eastern Regional Model against the context of the operational capacity of the options included on the long list. This sift identified five main options to be progressed to the MCA stage as follows:

- Do Minimum (no additional public transport services above those planned in BusConnects);
- Additional New Bus Services along the coastal corridor;
- Feeder Bus services to DART north of study area (Bray or Woodbrook);
- Park and Ride north of study area (Woodbrook); and
- Minor heavy rail enhancements.

These options are expected to provide for the forecast demand in 2042. Whilst all five options are viable options to accommodate the radial trips within the study area, the options that performed best at the MCA are as follows:

- Option 5: Minor heavy rail enhancements; and
- Option 3: Feeder services to DART north of study area.

Option 5: Minor Heavy Rail Enhancements

The analysis shows that there are capacity constraints on the rail network south of Greystones and that the capacity north of Greystones is also lower than future demand. The DART+ programme is expected to increase capacity on DART services and should be brought forward for inclusion within the Strategy for further analysis.

One additional rail service from areas south of Greystones would be sufficient to meet demand. Additional capacity could be provided through the operation of higher capacity trains in addition to frequency improvements. However, the possibility for additional services and higher frequencies should be explored as it will enhance the attractiveness of services by reducing overall journey times.

Capacity of the rail line between Greystones and Bray is constrained due to the single-track configuration. Options for providing increased passenger capacity on the Dublin - Rosslare Rail Line as identified in the GDA Transport Strategy 2016-2035 should be considered for retention in the Strategy update. This option would comprise "shuttle commuter train services operating south of Greystones, which will interchange with DART services at Greystones".

The Dublin - Rosslare Rail Line extends along the coast for much of its length and there are locations within the Bray to Arklow study area where the rail infrastructure is at risk of damage from coastal erosion. The need to protect the railway infrastructure against coastal erosion should be brought forward for consideration as part of the GDA Transport Strategy.

Option 3: Feeder services to DART north of study area

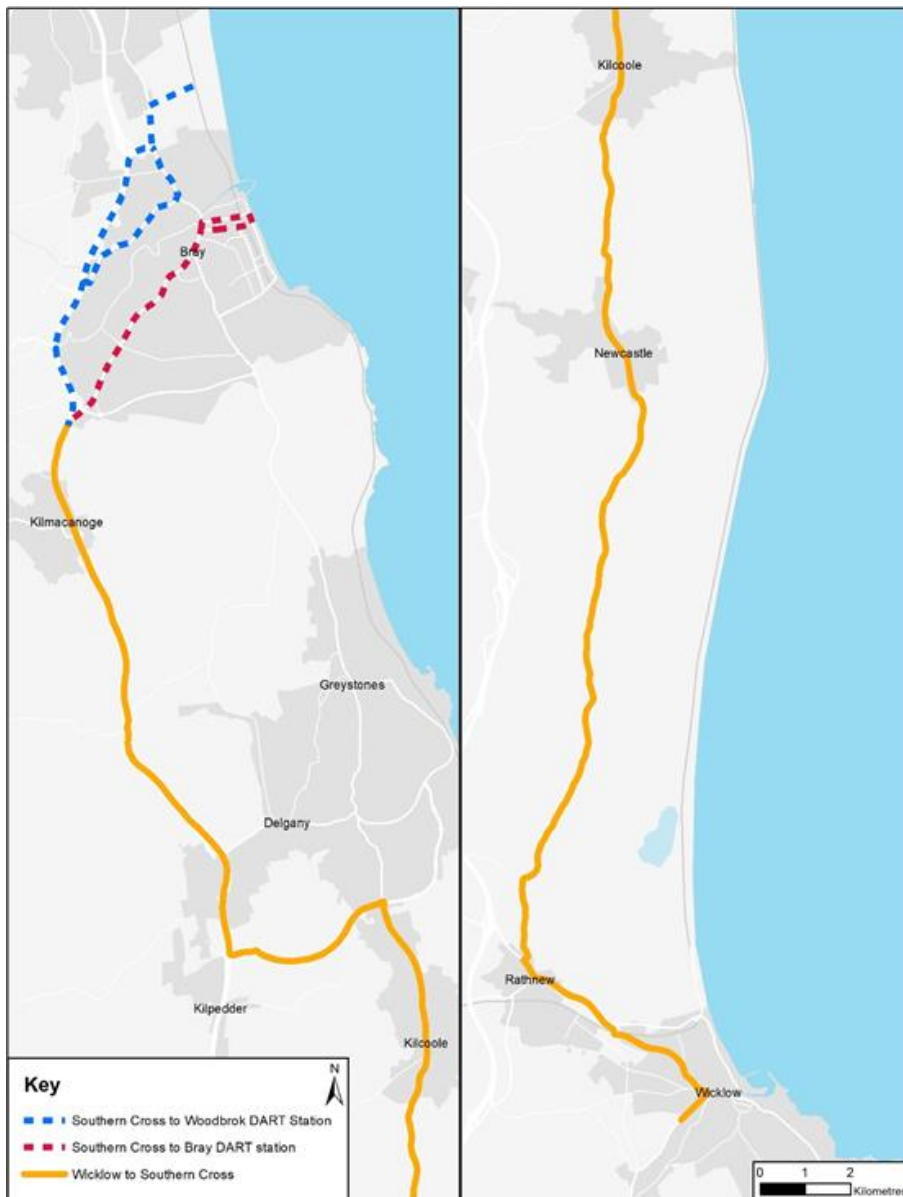


Figure 7-1 Indicative route for new feeder bus service to DART north of study area at Bray or Woodbrook.

The options to upgrade BusConnects services would improve the connections between Greystones and Bray through enhancements to frequency on routes L1 and L2. For other settlements in the study area, an indicative new route is shown in Figure 7-1 which should be brought forward for further consideration as part of the GDA Transport Strategy. This route would operate from Wicklow via a coastal corridor to Bray or Woodbrook DART stations. A frequency of 20 minutes peak and 30 minutes off peak should be considered as an initial option for testing, though cost and demand may not warrant this level of service.

7.1.2 Inland Radial Corridor

Following the development of a long list of public transport options for the inland radial corridor and further consideration of the two leading options identified, it was proposed to bring forward a bus spine option with bus priority on the N11. The analysis shown in Table 4-5 indicates that there is available capacity on BusConnects route X1 and X2 to cater for the level of demand, including for mode shift. Also, the existing Wexford buses operating on the corridor will provide capacity for through trips (trips originating outside the corridor). Therefore, a capacity of 1,200 is estimated as being required on the N11 corridor by existing and new bus services from the Bray to Arklow study area. Initial options to provide the capacity required are shown in Table 7-1 and Figure 7-2.

The capacities have been calculated based on the allocation of coaches with the exception of services from Newtownmountkennedy. The frequencies shown are considered to be for the peak period. The New4 route from Newtownmountkennedy to Bray could be co-ordinated with the L11 from Kilmacanogue to provide a combined frequency of 6 buses an hour over common sections. Similarly, the New2 and New5 route could be co-ordinated to provide a combined frequency of 6 buses and hour over common sections.

Routes New2, New4 and New5 are presented as having options to extend to Dún Laoghaire. For reasons of operational efficiency, it might be preferable to terminate the routes at Cherrywood in the case of New2 and New5 or Bray in the case of New4 and allow passengers to transfer to Luas, DART or BusConnects services to continue their onward journey. Also, the road, bus stop and bus lane capacity may limit the potential to accommodate these new services. Subject to sufficient capacity being available on onward services, the preferable option may be to support connectivity through interchange with other services.

Table 7-1: Bus service options - inland radial corridor

Route	Origin	Destination	Do Minimum Frequency (per hour)	Proposed Frequency (per hour)	Proposed Design Capacity
133/X	Wicklow	Dublin	2	2	152
740	Wexford	Dublin Airport	3	3	203
740	Arklow	Dublin	1	4	204
2	Wexford	Dublin Airport	1	1	51
New1	Arklow	Bray	0	2	102
New2	Wicklow	Cherrywood / Dún Laoghaire	0	3	153
New3	Wicklow	UCD	0	2	102
New4	Newtownmountkennedy	Bray / Dún Laoghaire	0	3	234
New5	Newtownmountkennedy	Cherrywood / Dún Laoghaire	0	3	234
Total			7	23	1,435

The routes have the potential to interchange with other public transport services north of the study area, particularly:

- Bray DART Station
- Cherrywood Luas Stop
- BusConnects in Bray

- BusConnects on the N11

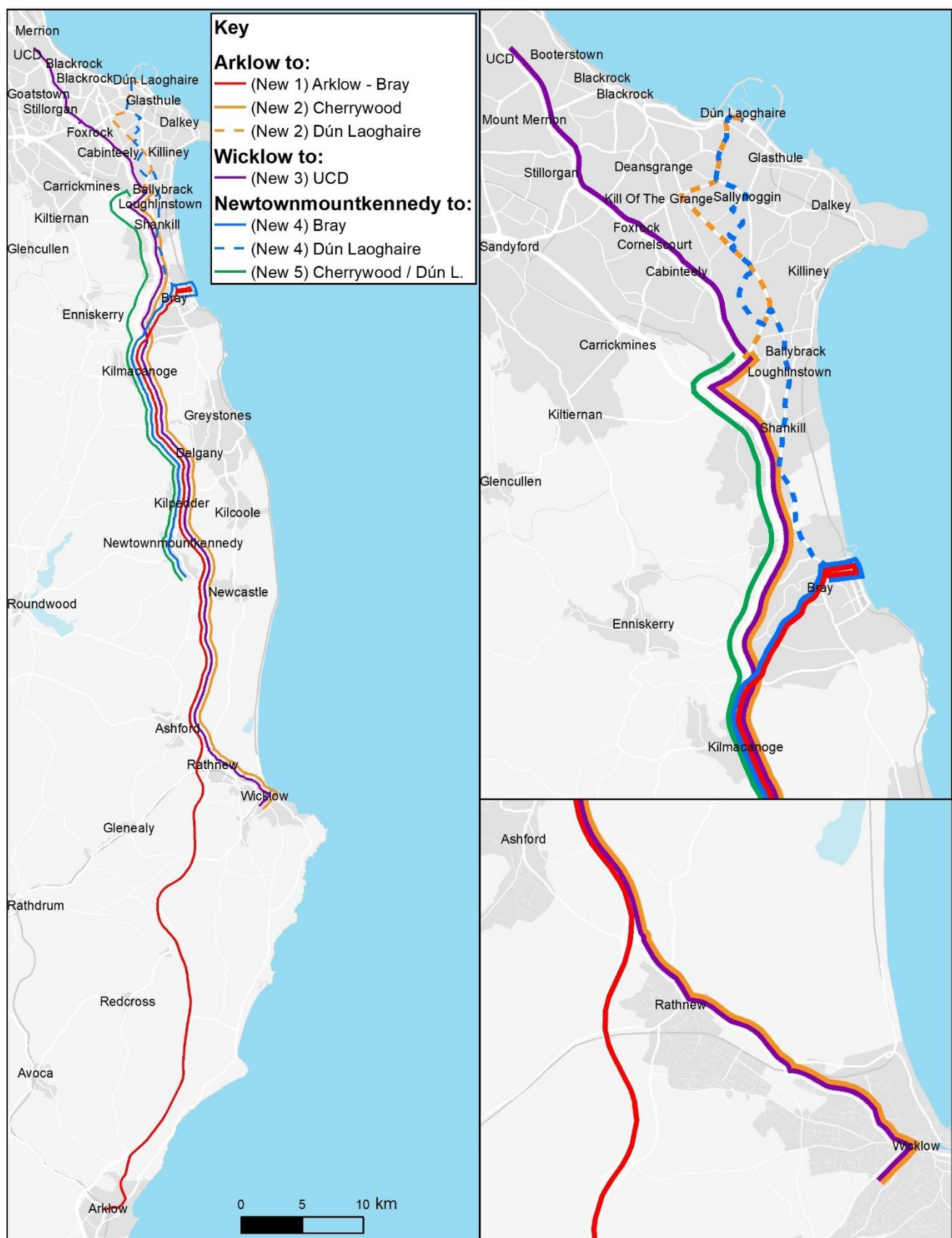


Figure 7-2 Indicative routes for Inland Radial Corridor.

7.2 Supplementary Options

Alongside public transport provision for the radial and orbital demand corridors, it is recommended that consideration be given to further supplementary options. These options should complement existing and proposed public transport services as well as improve accessibility and interchange for cyclists.

7.2.1 Park and Ride

The findings of the Park and Ride report, undertaken as an input into the preparation of the Transport Strategy, will also inform the proposals for this corridor. In addition to the existing facilities and the proposed Woodbrook Park and Ride, it is likely that a number of facilities could be brought forward along this corridor in order to complement the measures recommended in this report by extending the feasible catchment of public transport services, and in order to intercept a higher proportion of car trips on the N/M11 and convert them into public transport trips.

7.2.2 Cycle Interventions

The implementation of the GDA Cycle Network Plan will address gaps in the cycle network within key settlements. For the purposes of encouraging mode shift from car, it is recommended that these options provide for a high level of cycle connectivity in the following areas as soon as possible:

- Greystones – Delgany – Kilcoole
- Wicklow – Rathnew
- Arklow

7.2.3 Upgrades to proposed BusConnects services

No BusConnects routes within the Bray to Arklow study area were identified as having forecast demand exceeding the design capacity. It is noted that there is a very high car mode share in the area and significant potential for mode shift. Primarily for this reason, it is proposed to consider service frequency enhancements on local routes L1/L2 and L3 to increase the attractiveness of public transport and provide additional capacity to accommodate mode shift.

7.2.4 Rural Transport Services

Rural transport services are important to the Bray to Arklow study area providing rural connectivity and accessibility within the study area and beyond. Wicklow Local Link operates a variety of timetabled services with varying frequency. It is recommended that continued support for Rural Transport Services be taken forward for inclusion in the preparation of the GDA Transport Strategy as they provide essential public transport accessibility.

7.2.5 Bus priority measures

A number of bus infrastructure options have been developed by firstly using the bus speeds presented in Section 4.3.7 to identify areas in the network where speeds are particularly low. The analysis identified slower bus speeds on the N11 both online and at junctions with delays to buses noted at Kilpedder, Delgany and north of the study area at Kilmacanogue and Bray. It is recommended that an option for bus priority on the N11 be taken forward for further consideration as part of the GDA Transport Strategy.

7.2.6 Bus Stop and Interchange Infrastructure

Additional and/or improved bus stop and interchange infrastructure would support a shift to public transport and will likely be necessary to derive fuller benefits from the proposed increase in public transport service provision. In particular for the Bray to Arklow study area, the potential requirements for interchange facilities should be brought forward as options for further consideration as part of the GDA Transport Strategy in these locations:

- Greystones (bus / bus / DART / Rail);
- Bray (bus / bus / DART / Luas [potentially]); and

- Cherrywood (bus / bus / Luas [or Metro potentially]).

Appendix A. Do Minimum Model Run Transport Scheme

A.1 Road Schemes

The Do Minimum model run contains the following road schemes:

- N3 Castaheany Interchange Upgrade;
- N3-N4 Barnhill to Leixlip Interchange;
- North-South Road – west of Adamstown SDZ linking the N7 to N4 and on to Fingal;
- Glenamuck District Distributor Road;
- Leopardstown Link Road Phase 2;
- Porterstown Distributor Link Road;
- R126 Donabate Relief Road: R132 to Portrane Demesne;
- Oldtown-Mooretown Western Distributor Link Road;
- Swords relief Road at Lord Mayors;
- Poolbeg development roads;
- Cherrywood development roads;
- Widening of the M7 between Junction 9 (Naas Northern) and Junction 11 (M7/M9) to provide an additional lane in each direction; and
- Capacity enhancement and reconfiguration of the M11/N11 from Junction 4 (M50) to Junction 14 (Ashford) inclusive of ancillary and associated road schemes, to provide additional lanes and upgraded junctions, plus service roads and linkages to cater for local traffic movements.

A.2 Bus schemes

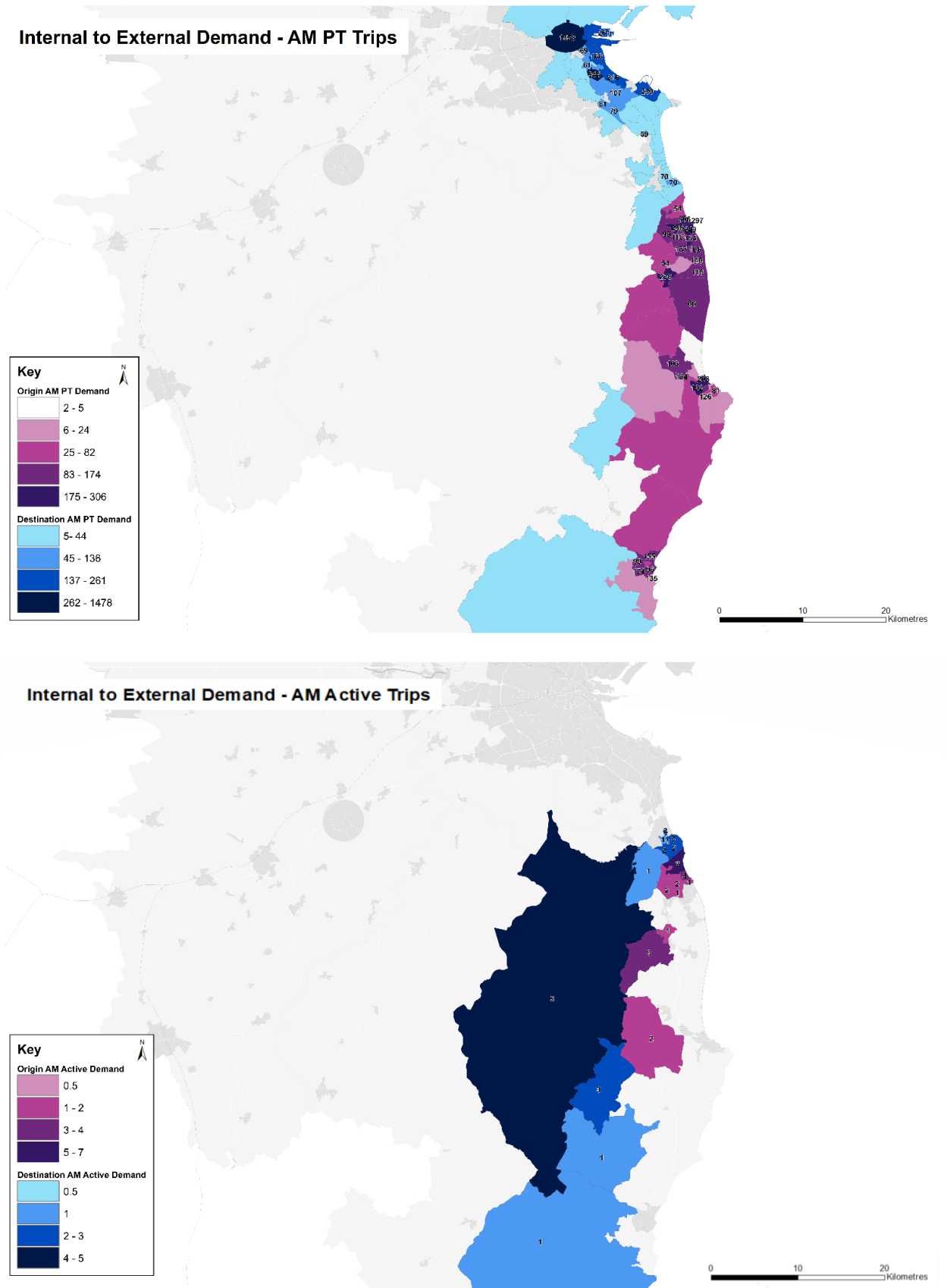
The Do Minimum model runs contains the bus services and frequencies related to the New Dublin Area Bus Network. The model does not include any of the of the associated BusConnects bus priority infrastructure proposals which would improve journey times.

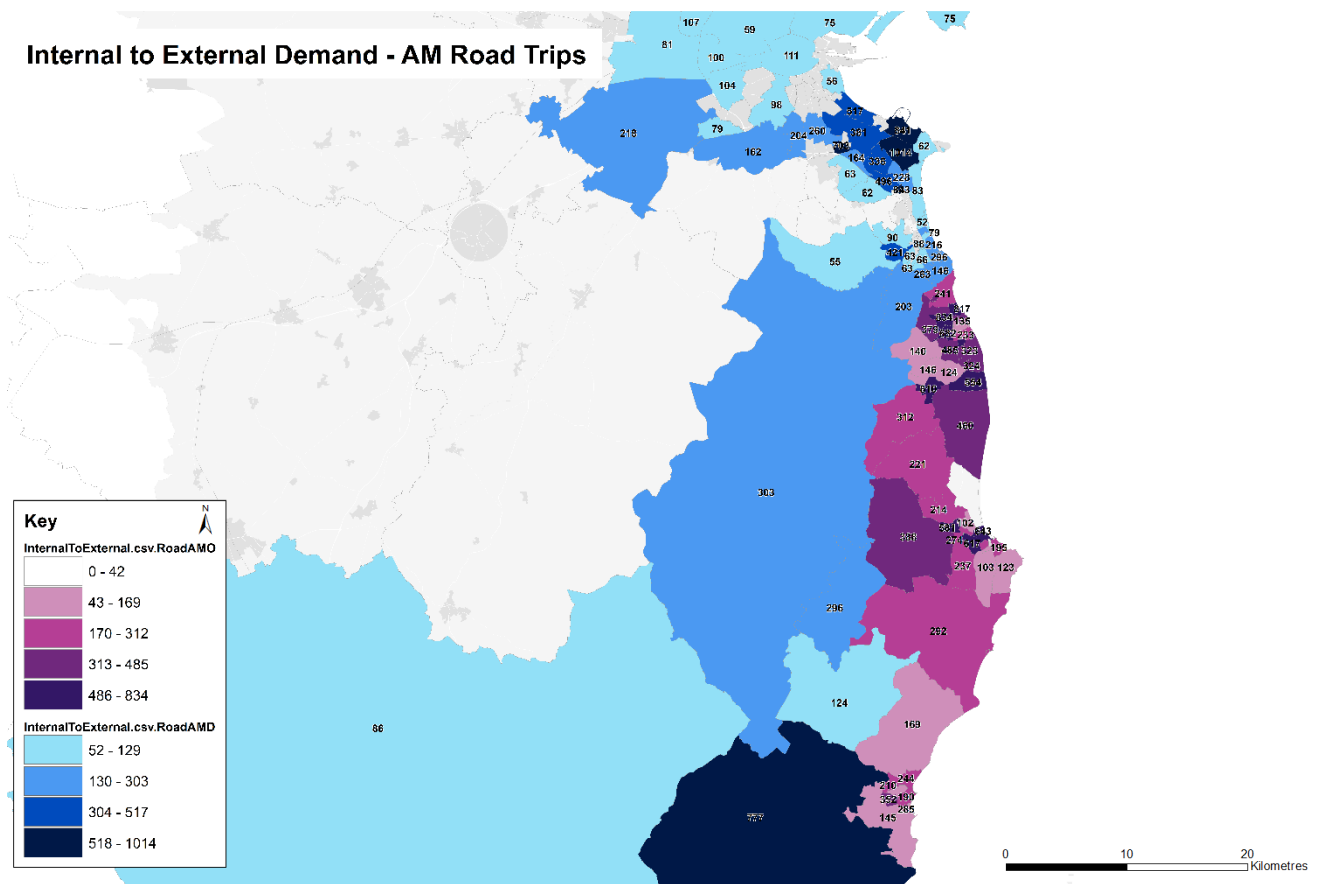
A.3 Rail schemes

The Do Minimum model runs contains the following rail schemes:

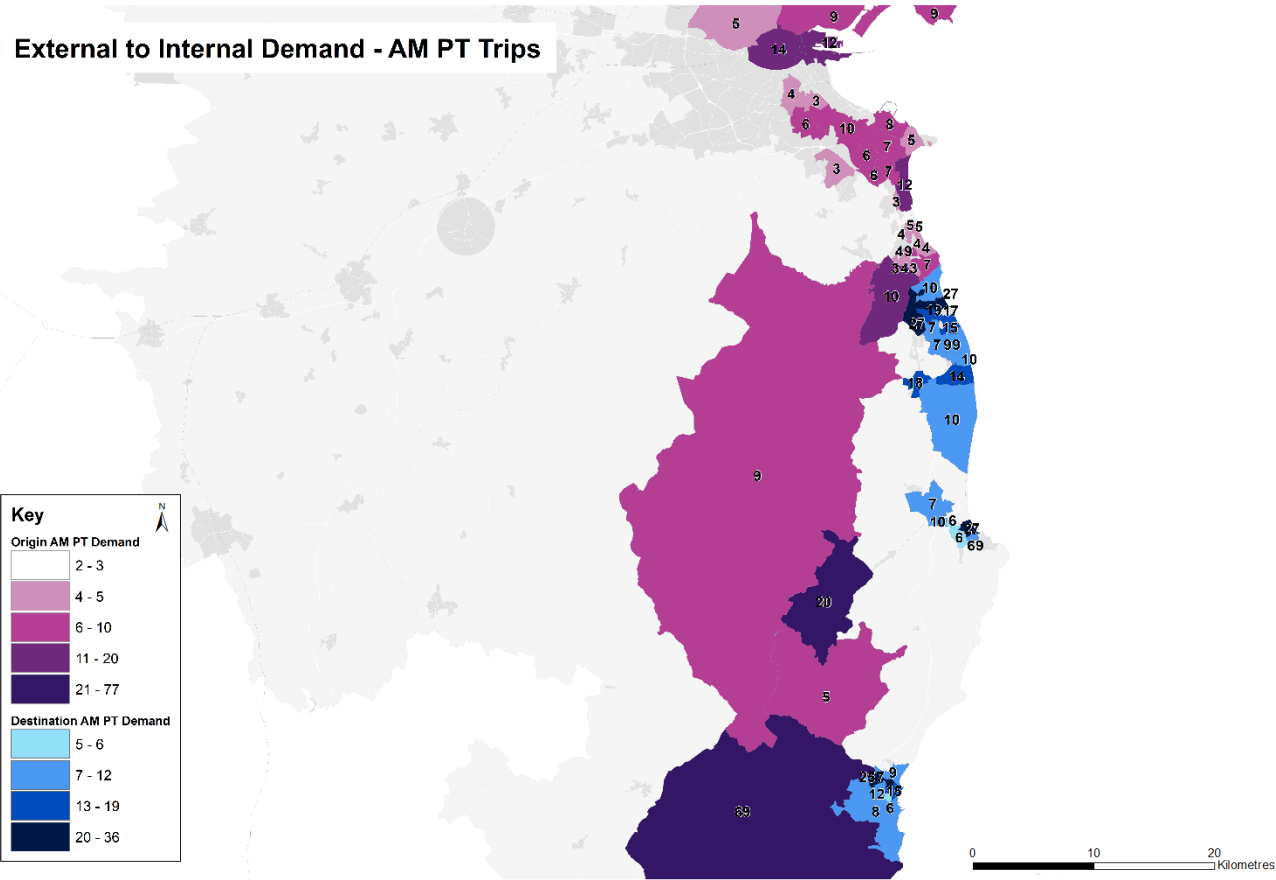
- Revised Irish Rail timetable;
- Interim DART Expansion Programme (non-tunnel elements) including additional stations at Kishogue and Pelletstown; and
- Luas Cross City incorporating Luas Green Line Capacity Enhancement - Phase 1.

Appendix B. Demand Maps split by mode (AM Peak Period 07:00-10:00)

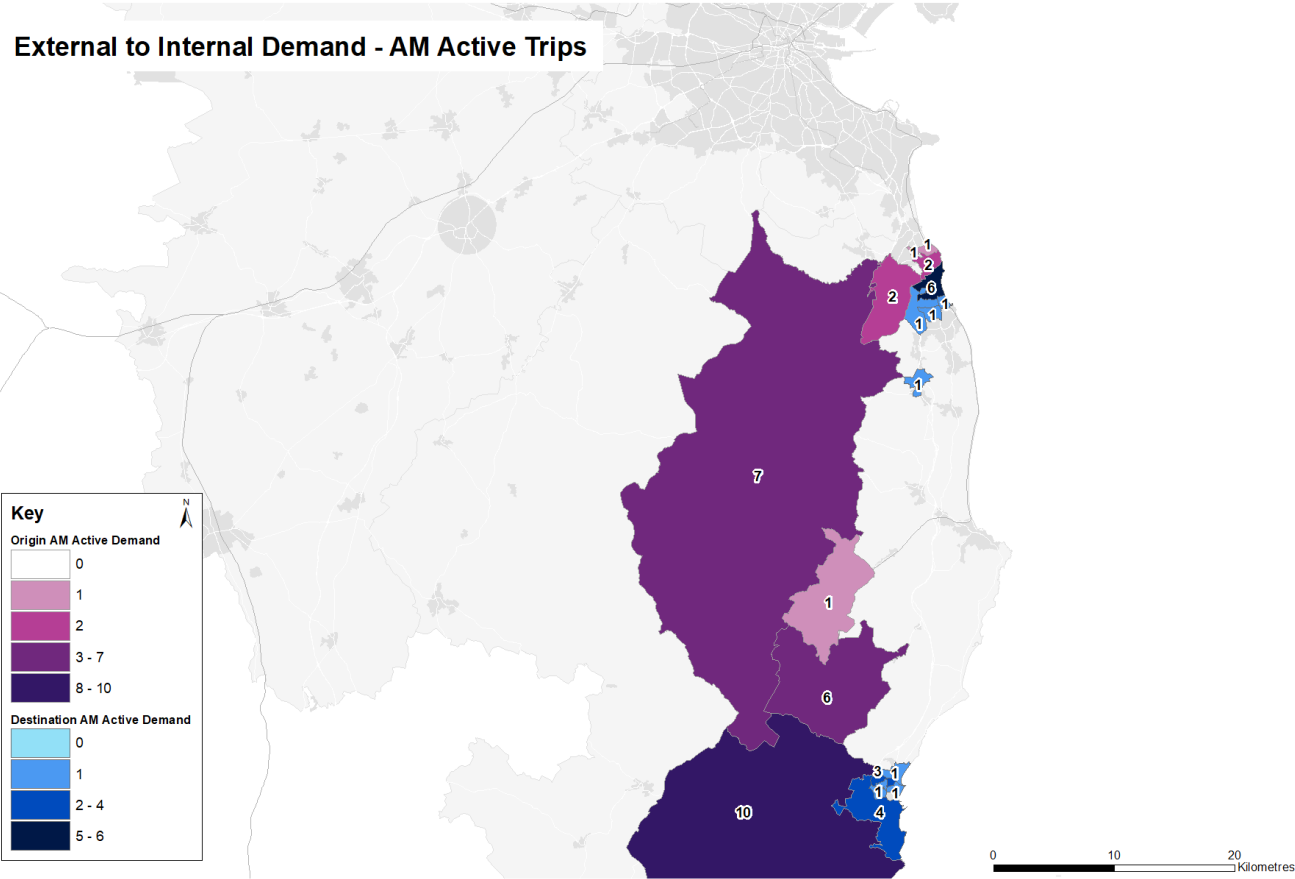


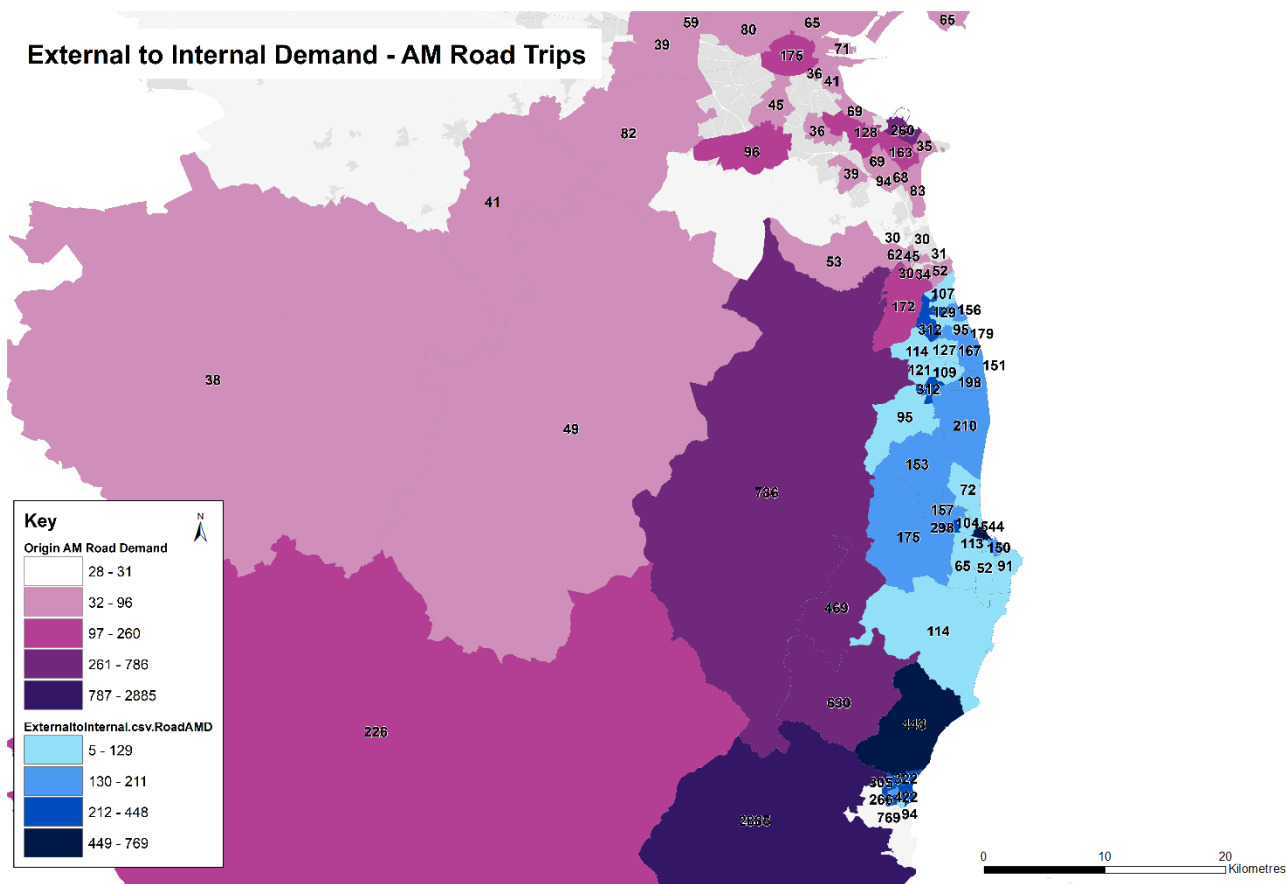


External to Internal Demand - AM PT Trips



External to Internal Demand - AM Active Trips



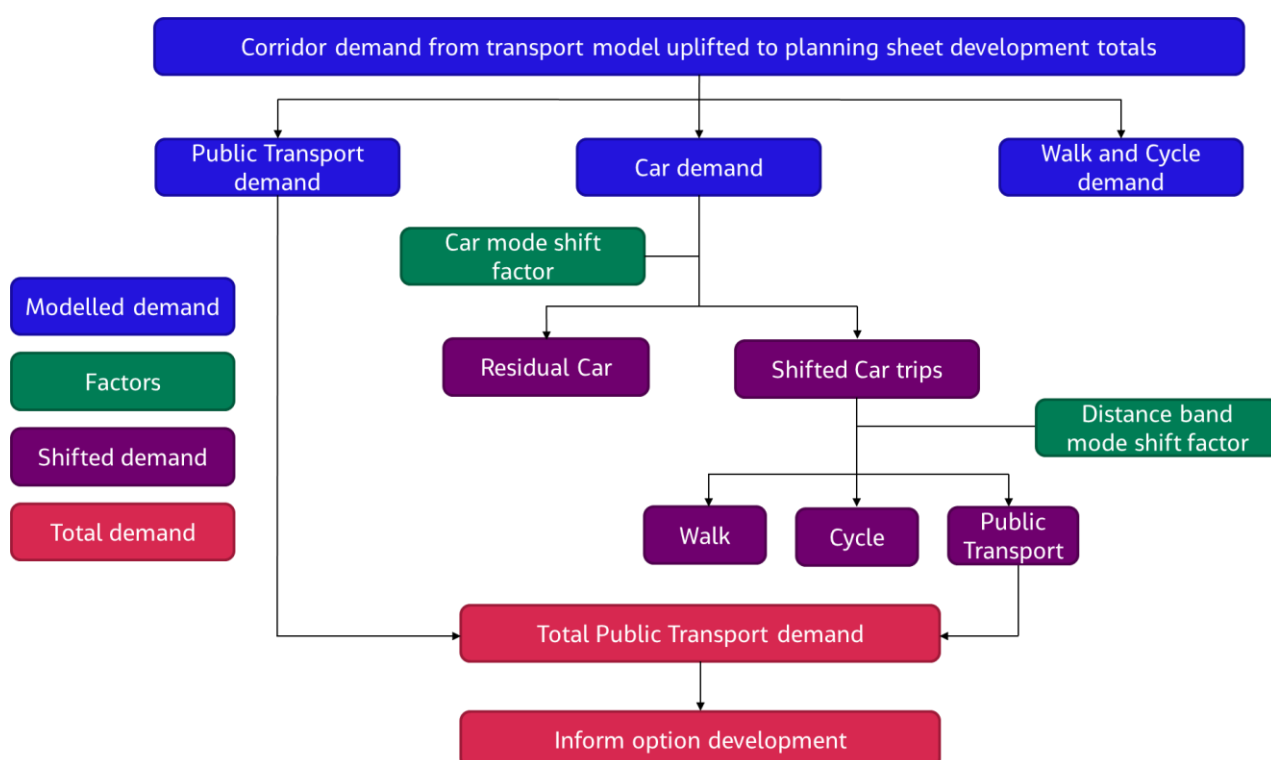


Appendix C. Mode shift analysis methodology

This technical note explains the mode shift calculation used to inform the option development process for each area being considered as part of the Greater Dublin Area Transport Studies. The mode shift calculation is based on the Eastern Regional Model (ERM) and the planning sheets provided by the NTA with the results providing an indicative number of additional public transport trips which need to be catered for if a mode shift away from car is achieved.

This method produces an indicative set of results which provides the order of magnitude of changes in demand which is considered sufficient to inform option development at this early stage. It is noted that the results are affected by the underlying assumptions of the planning sheet and ERM, i.e. demand is assigned to a constrained network and that no model run has been undertaken to identify mode shift.

This exercise has been undertaken for the AM period only when there is the largest car demand in the ERM. The flow chart below shows the overall process underpinning the mode shift calculation.



First a corridor is identified (e.g. outside the M50 into the city centre) and the transport demand using the corridor is obtained from the ERM, disaggregated by mode – public transport, car and walk and cycle.

A factor is then applied to the car demand to create the mode shift away from car to one of the other modes. Two factors for mode shift have been applied in this study: 25% of car trips shift and 50% of car trips shift. This aims to provide a broad order of magnitude of demand to inform option development and assessment.

The shifted car trips are then allocated to become either a new walking, cycling or public transport trip. This decision is based on the trip lengths of the shifted car trips as it is assumed that shorter trips are more likely to become walking trips and longer trips are more likely to become public transport trips. The trip length distributions for each mode are obtained from the ERM.

Three bands were defined:

- A lower band bounded a distance which 75% of walking trips in the ERM are shorter than or equal to;
- A middle band bounded by a distance which 75% of cycling trips in the ERM are shorter than or equal to; and
- An upper band for any trips with a longer distance.

For the Bray to Arklow study area, the following bands and mode shares by distance are obtained from the ERM:

Distance band (km)	Walk	Cycle	Public transport
0-2.5	83.1%	3.6%	13.3%
2.5-3.5	39.1%	7.4%	53.5%
3.5+	10.2%	3.7%	86.1%

In the lower band of trips less than 2.5km, 83.1% of the trips in the ERM are walking trips, but there are still 3.6% of trips which are cycle trips and 13.3% of trips which are public transport trips.

The proportion of trips in each band made by walk, cycle and public transport were derived from the ERM, and applied to the shifted car trips. This gives a number for the shifted public transport trips which can be added to the public transport trips from the ERM to provide a total public transport demand for the corridor. This number can then be used to inform the development of options to support the estimated demand along the corridor.