BUS CONNECTS CORK

SUSTAINABLE TRANSPORT FOR A BETTER CITY.

Preliminary Business Case

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NTA
Údarás Náisiúnta Iompair
National Transport Authority

Rialtas na hÉireann
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1. What is the problem?

Cork is expected to have significant economic and population growth in the coming decades, but its current transport and cycling networks have challenges meeting user needs.

2. Why is BusConnects Cork the right solution?

BusConnects Cork is the foundation for Cork's public transport network as it will serve current customer needs and provide the flexibility to connect future planned light and heavy rail, making public transport a viable travel option for more people.

3. What does it cost and what are the benefits?

A robust cost estimation and appraisal process shows that capital investment required for BusConnects Cork could deliver critical benefits for customers, the economy and the climate.

4. How will it be delivered?

The NTA has prepared to deliver the component projects of the BusConnects Cork programme in an integrated way to ensure all are delivered efficiently and to maximise benefits to the public.

5. What happens next?

Projects in the BusConnects Cork programme are progressing with early-stage development, noting Cork could start seeing the benefits of the programme in the coming years.

1. What is the problem?

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HOW DOES THIS CHAPTER COMPLY WITH THE INFRASTRUCTURE GUIDELINES?

- ✓ Confirmation of the strategic relevance of the proposal

1.1 Preparing for Cork's future growth

Cork is a growing city with a population of 222,526 in the 2022 Census, an increase of 6.6% over the 2016 figure of 208,669. Under Project Ireland 2040's National Planning Framework published in 2018 as part of Project Ireland 2040, Cork City is expected to become the fastest growing city region in Ireland. Its population is projected to increase by 50-60% between 2018 and 2040, up to at least 315,000 people. Economic activity is also expected to increase with similar growth in jobs.

This level of population and jobs growth brings many challenges. In the area of transport, **travel demand will significantly increase, placing additional pressures on an already stressed transport system**. The current transport network in Cork City is heavily car-dependent, as shown in the figure below, and experiences significant levels of congestion.

Figure 1.1.A: Mode share in the Cork Metropolitan Area[1]

Public transport is primarily focused on buses and is underperforming mainly due to a lack of infrastructure in the form of bus lanes or other bus priority measures to support bus reliability and punctuality. The bus network operates only diesel buses and has outdated ticketing technology. Additionally, while significant investment has gone into cycling projects over recent years, the city is still without a coherent cycle network. Chapter 2 goes into further detail about demand requirements into the future and how public transport will need to adapt to accommodate this future growth.

As set out in the National Planning Framework and incorporated into subsequent national and regional policies, much of predicted travel growth arising from the increase in population and jobs will need to be accommodated on sustainable transport modes, particularly high-quality public transport. Without that transition, the current car-dominated travel patterns will continue with increasing traffic congestion, growing greenhouse gas emissions and deteriorating journey times. This will negatively impact the city environment through pollution, noise and lower quality streetscapes as well as impacting quality of life at an individual level. Increased congestion and journey times can also have economic impacts by limiting business's access to employees and customers alike. **The focus of this business case is on investment in bus and cycling services to support the sustainable growth of Cork.**

1.2 Building on the overall transport strategy

In 2020, the National Transport Authority (NTA) published, in collaboration with Cork City Council, Cork County Council and Transport Infrastructure Ireland, the Cork Metropolitan Area Transport Strategy 2020-2040 (CMATS). This strategy sets out an overall plan to develop Cork's transport system over the next two decades to support its growth targets as established in the National Planning Framework. It encompasses all modes of transport—walking, cycling, bus, light rail, heavy rail and road—and focuses on transitioning the city to a more sustainable overall transport system.

CMATS focuses on supporting the future growth of Cork City through the provision of an efficient transport network and reducing dependency on private cars while increasing the appeal of sustainable transport options. Combining various proposals across different transport modes, CMATS seeks to

[1] Source: Cork Metropolitan Area Transport Strategy

provide a comprehensive, integrated transport system for the Cork Metropolitan Area (CMA) that serves its current and future needs over the next two decades. It also promotes more movement by sustainable transport modes, contributing to a better city environment, reduced greenhouse gas emissions and better life quality.

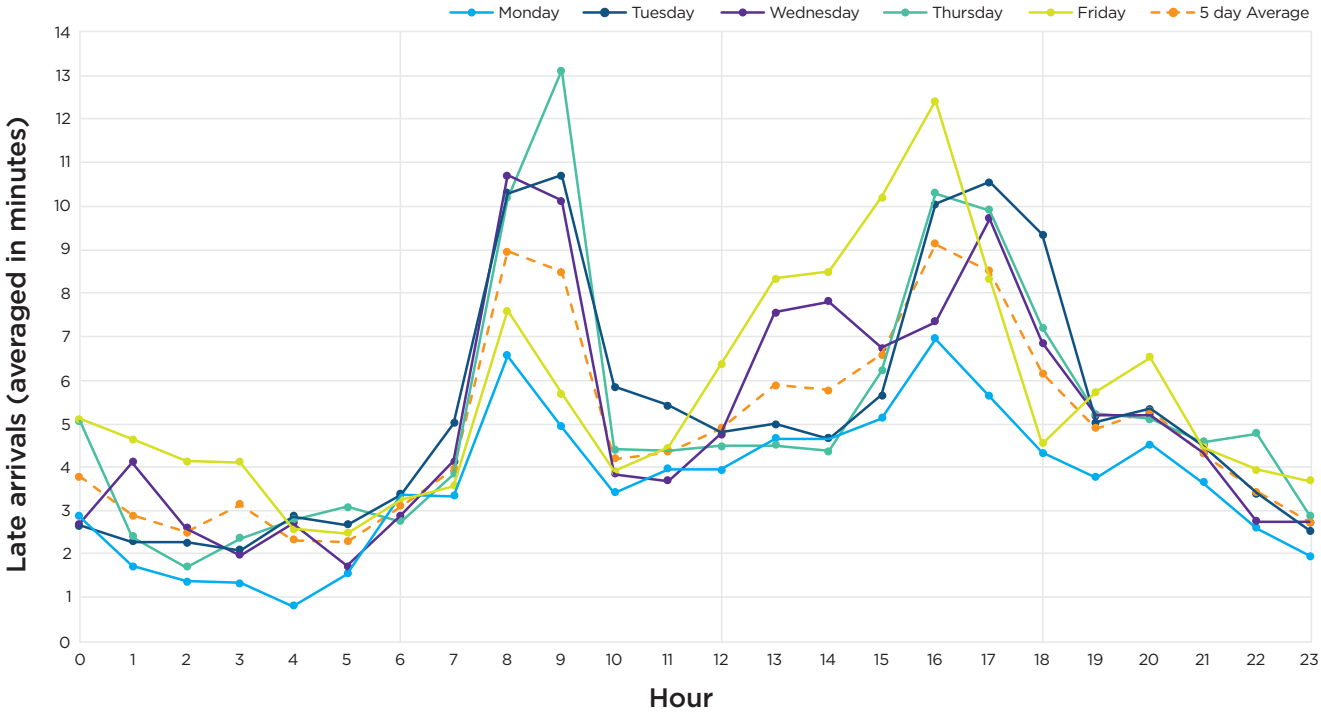
While CMATS contains both light and heavy rail proposals, it recognises that buses are currently, and will remain, the foundation of the public transport system in Cork. With its citywide reach combined with its flexibility and adaptability, the bus system is critical to supporting the planned growth of the city. The BusConnects Cork programme, which emerged from CMATS, is the NTA's programme to transform all aspects of Cork's bus system to make it more useful to more people and ensure that it is capable of supporting the growth projected for Cork City. BusConnects Cork is a cornerstone of the overall transport strategy for Cork as it aims to provide high quality, reliable and convenient bus services, with key routes delivering high frequency services to provide the necessary capacity to accommodate future demand. BusConnects Cork will stitch together the fixed light and heavy rail networks to provide high quality public transport connections across all destinations in the city. This Preliminary Business Case sets out the details of this transformational programme in Ireland's second largest city.

1.3 Addressing challenges of the existing bus system

The bus system in Cork faces many significant challenges that will only worsen as time goes on, resulting in a bus network that is not useful to passengers. These challenges include:

- **Inefficient bus network:** The system of bus routes in Cork has grown organically over many decades, amended and extended to support various developments. However, this type of reactive expansion has resulted in many inefficiencies in the network with circuitous and overlapping bus routes, and one-way systems that are not easily accessible to passengers. Due to frequency, areas served (and not served), and operating hours, the current network is not useful to many potential passengers, making it harder to attract those that have other transport options.
- **Old ticketing and fares systems:** Purchasing a bus ticket in Cork today involves significant boarding time at stops for people to pay the correct fare. The current bus ticketing system has no self-service option and involves interaction with the driver, impacting on boarding times and lengthening bus journey times. In addition, the current ticketing technology used on the Cork bus fleet is reaching end-of-life and requires replacement.
- **Required transition to zero emission fleet:** All of the bus fleet serving Cork are currently diesel vehicles. In line with Government policy to cease the purchase of diesel buses for State-funded bus services, and to meet the Climate Action Plan targets, the fleet must transition to zero emission electric buses.
- **Congestion impacting bus journeys:** Cork City experiences daily traffic congestion that impacts the bus system. There are only 14 kilometres of bus lanes currently in Cork City. This means that for most of the journey, buses are competing for space with general traffic and are also affected by the increasing levels of congestion. As a result, bus journeys that should be fast, reliable and predictable, are not due to this congestion.

Figure 1.3.A: Weekday variation in bus reliability using automatic vehicle location (AVL) data



- **Dependence on private cars:** There is a disproportionate dependency on the private car, with public transport and cycling only sharing a combined total of 7% of the 820,000 trips made every weekday in the CMA. This level of private car dependency leads to significant congestion in the CMA. If a portion of the 74% of the private car trips[2] can be moved onto public transport and bikes, Cork will see a significant reduction in congestion.

All of these factors make travel by bus time-consuming and often unreliable. Reduced journey times, facilitated by bus priority measures and faster boarding and alighting through improved methods of payment, are needed to improve efficiency.

Existing cycling challenges

The same corridors that are key routes for the bus system are also the main arteries for cycling demand. However, there are also many challenges to the existing cycle network, including:

- **Lack of segregated cycle facilities:** Currently, there are very limited sections of segregated cycling facilities along the main arteries of the city. Without this separation from other traffic, many people consider it unsafe to cycle for themselves and their children.
- **Lower uptake of cycling than expected:** Cork is a vibrant city with a youthful population and a dynamic workforce. Many large employers in the technology and pharma industry are based in Cork including Apple with over 5,000 employees on the north side of the city. Many of these industries are normally associated with sustainable transport and would be expected to generate high levels of cycling. Yet, overall cycling numbers in Cork are low, with the 2022 Census recording just over 1% cycling to work.[3]
- **Challenging street network:** Many streets in Cork are narrow and frequently provide parking on one or both sides of the road, with particularly challenging topography on the north side of the city, which makes it difficult to provide safe cycling routes that will be essential to lifting the level of cycling movement in Cork City.

The development of BusConnects Cork will design each of the relevant corridors to accommodate bus and car movement, but also provide appropriate cycling facilities to allow safe cycling by more people.

[2]Source: Cork Metropolitan Area Transport Strategy
[3]Source: Press Statement Census 2022 Results Profile 7 - Employment, Occupations and Commuting Cork - CSO - Central Statistics Office

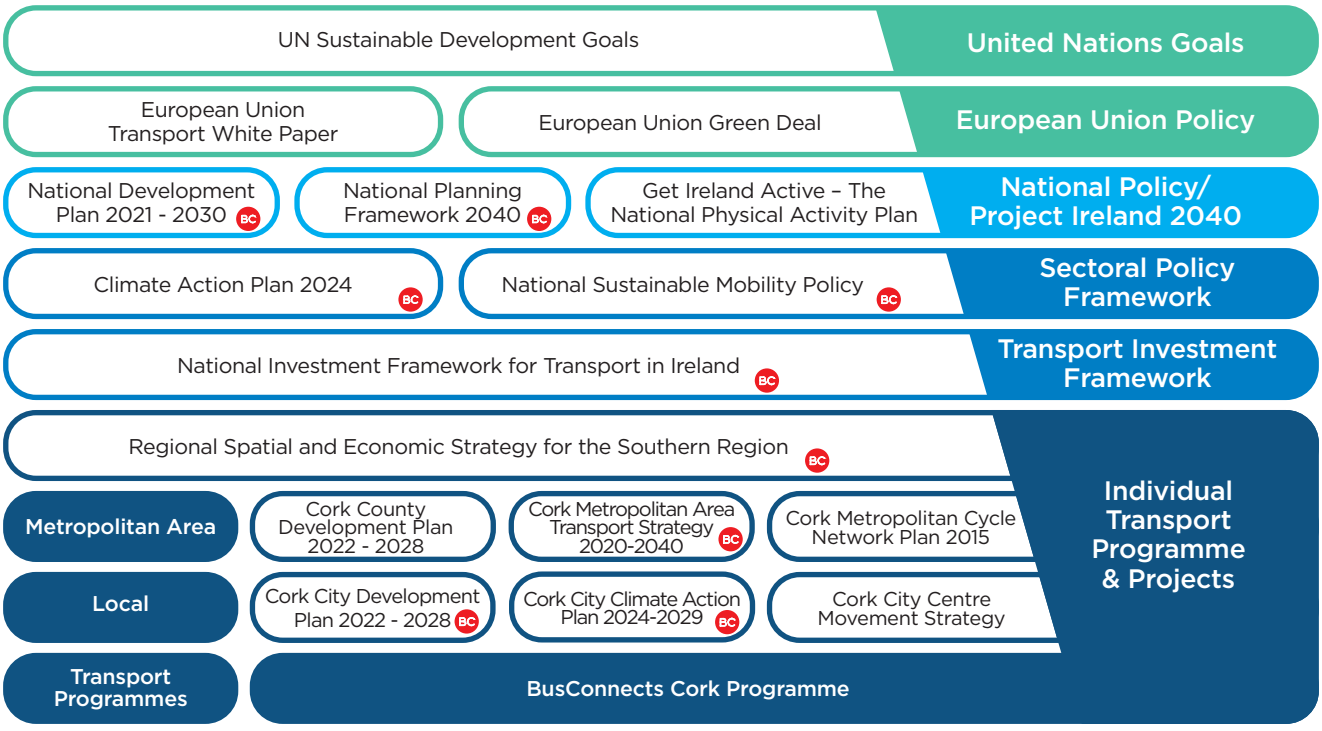
1.4 Managing climate change

In 2022, transport represented 19.1% of total greenhouse gas emissions in Ireland, and emissions from the transport sector have been the most responsive to changes in economic activity.[4] Decarbonisation of transport plays a key role in meeting the Climate Action Plan 2024 target to halve emissions by 2030 and reach net-zero no later than 2050. Further targets such as a 50% reduction in fossil fuel usage and a significant behavioural shift from private car usage to sustainable transport modes require making public transport and active travel viable options that are comparable to taking a private car. By addressing the challenges to the existing bus and cycle networks, emissions will also be lowered, leading to an improved environment.

1.5 Aligning with relevant strategies and policies

There are several local, national and European Union (EU) policies that must be followed when developing solutions to the above challenges. Extensive work has been undertaken nationwide and in the CMA to determine the best solution, out of which the BusConnects Cork programme was developed. BusConnects Cork has strategic alignment with the policies outlined below. In many cases, these policies explicitly reference BusConnects as a requirement to achieve their objectives, as noted by the red pushpins.

Figure 1.5.A: BusConnects Cork programme alignment with EU, national, regional and local policies



BC Mention of BusConnects Programme

The above diagram shows the EU, national, regional and local policies to which the BusConnects Cork programme is aligned. Working from top to bottom, the BusConnects Cork programme aligns with these policies as follows:

- UN, EU and National Climate Action Plan policies are followed as the programme will contribute to meeting emission reduction targets by driving modal shift through operation of improved bus services and active travel facilities as well as investment in zero emissions bus fleet.

[4]Source: CIE (2022) Irish Transport Sector

- BusConnects Cork is being developed in line with the core principles set out in the National Planning Framework, notably: National Strategic Outcome (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.
- BusConnects Cork and its component projects are named as core actions in the National Sustainable Mobility Policy Action Plan 2022-2025.
- Enhancing the bus network is consistent with the National Development Plan (NDP) 2021-2030 which envisages a significantly enhanced bus service for Cork by 2030.
- BusConnects Cork is aligned to all four National Investment Framework for Transport in Ireland (NIFTI) investment priorities of decarbonisation, protection and renewal, mobility of people and goods in urban areas, and enhanced regional and rural connectivity, with the first two priorities scoring as 'highly positive' and the second two as having a 'positive' impact in the NIFTI assessment template, shown below.

Figure 1.5.B: NIFTI template summary scoring

	Decarbonisation	Protectional & Renewal	Enhanced Regional & Rural Connectivity	Mobility of People & Goods in Urban Areas
Impact Score	High Positive	High Positive	Positive	Positive
Impact after mitigations	High Positive	High Positive	Positive	Positive

The programme also aligns to the hierarchies for mode and intervention. Abiding by the modal hierarchy of active travel, public transport and then private vehicles, BusConnects Cork includes investment in improving walking, cycling and bus networks to make active travel and public transport more attractive, encouraging modal shift away from use of private vehicles. The intervention hierarchy of 'maintain, optimise, improve, new' also aligns with BusConnects Cork as follows:

- Maintaining the existing transport network would lead to further overreliance on unsustainable private car travel, but existing infrastructure will be maintained where possible (e.g., existing roadways to be maintained where possible, and bus stop infrastructure).
- BusConnects Cork will optimise and improve Cork's public transport network and enable the sustainable compact growth of Cork City and its suburbs through a redesigned bus network, improved fleet and livery, electrification of depots, and optimising the fare structure with free interchange.
- BusConnects Cork will require some new infrastructure to maximise the potential benefits that can be delivered by the investment (e.g., new road infrastructure for bus priority lanes and cycle facilities, zero emission fleet, some stops and shelters, and a new ticketing system).

- The Regional Spatial and Economic Strategy for the Southern Region highlights the following transport investment objectives for the CMA, which will be specifically delivered under the BusConnects Cork programme: development of bus networks in the region; investment in bus network and service improvements; network and service reviews for the larger settlements and local bus services throughout the region; new interchange facilities; new infrastructure that fully integrates all public transport modes; enhanced passenger information; improvements to bus waiting facilities and bike-and-ride; support strategic bus networks (initiatives specifically identified as BusConnects in the NDP) through identification, safeguarding and phasing of strategic bus network routes throughout Southern Region's cities and metropolitan areas; upgrade of bus fleet to low carbon/low emissions; buses to be accessible for all; and support direct inter-regional bus services between the cities and key access points such as airports.

- As previously mentioned, and further discussed in Chapter 2, the transformation of the bus service through the BusConnects Cork programme is a central element of CMATS, and CMATS is the key document demonstrating how BusConnects is critical to and complementary of the broader transport strategy in the CMA. Buses will provide an increasingly important interchange with InterCity, suburban rail and light rail modes as well as the Park and Ride network. Additionally, the programme team will consult the more recently updated CycleConnects network for Cork to ensure continued alignment with segregated cycle facilities planned on the Sustainable Transport Corridors.

Building on the BusConnects Cork Strategic Assessment Report (SAR)

A Strategic Assessment Report was completed in March 2023 for the BusConnects Cork programme for the first stage of the Project Lifecycle (Decision Gate 0) as set out in the Department of Public Expenditure's Public Spending Code. Though no longer required in the new Infrastructure Guidelines published in December 2023, the SAR provided initial scrutiny of objectives, consideration of options, appraisal approaches to be used in supporting the programme development, governance arrangements and identification of risks. This Preliminary Business Case builds on the insights from the SAR and CMATS to advance the BusConnects Cork programme.

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HOW DOES THIS CHAPTER COMPLY WITH THE INFRASTRUCTURE GUIDELINES?

- ✓ Detailed specification of the objective of the proposal
- ✓ Description of the short-list of potential options to deliver objectives set out
- ✓ Detailed demand analysis and description of underlying assumptions

2.1 Delivering better sustainable transport to support Cork's travel needs

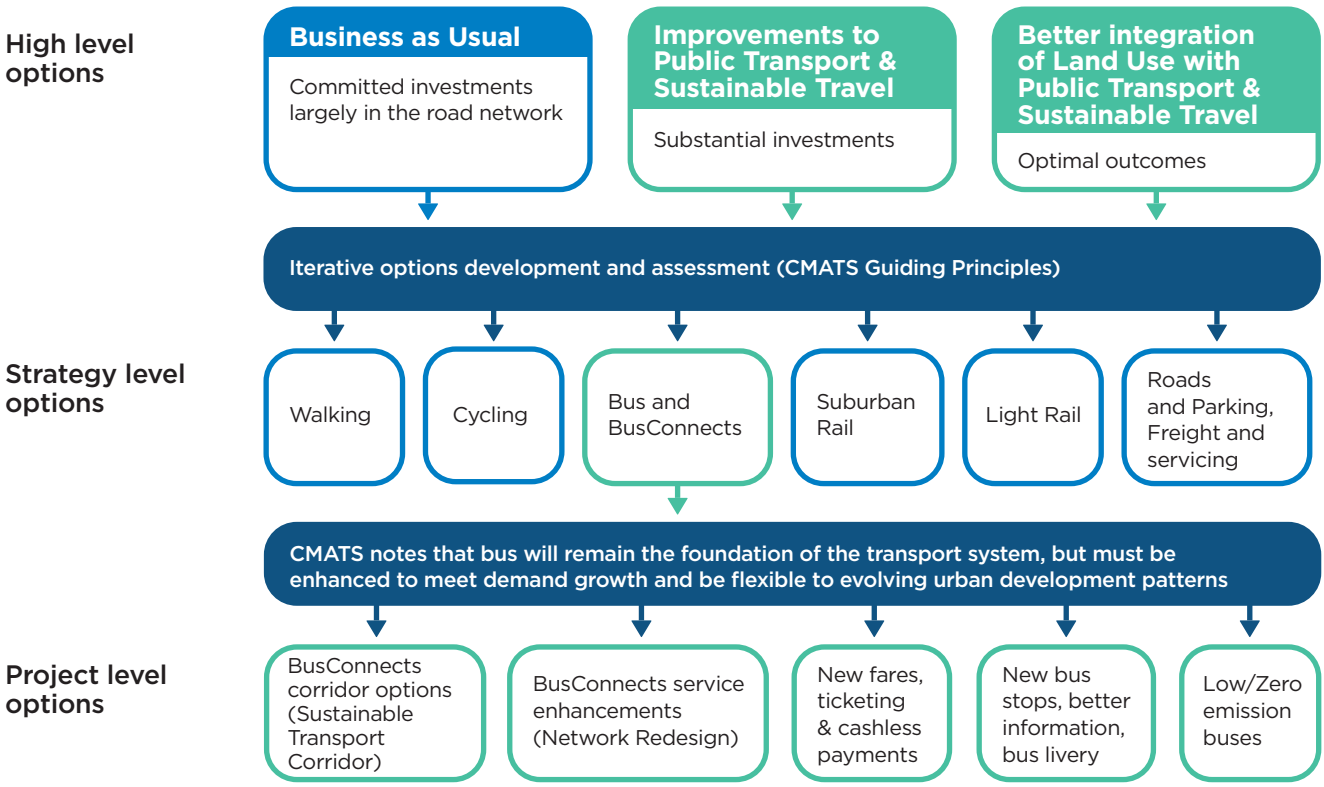
Citywide transport challenges are rarely solved by a singular project or programme and usually require a cross-modal approach to deliver the overall solution that a growing city needs. Cork is no exception. Focussing on a singular solution such as building additional roads or developing a rail network will not in isolation deliver an overall efficient and effective transport system for the city. Instead, an integrated solution that plans the city's different transport networks in a coordinated way is required.

Why a bus programme? Bus as the foundation of Cork's transport network

This overall citywide approach is delivered through the Cork Metropolitan Area Transport Strategy (CMATS). Adopted in 2020, CMATS is intended to deliver an accessible, integrated transport network that enables the sustainable growth of the Cork Metropolitan Area (CMA) as a dynamic, connected, and internationally competitive European city region. CMATS is about creating a liveable city and connected communities by giving everybody the opportunity to access sustainable public transport options, along with improved cycling and walking infrastructure. This is supplemented by necessary road development, park and ride provision, and a variety of other supporting measures.

The work undertaken in developing CMATS provides the strategic basis for the development of BusConnects Cork. CMATS undertook an options assessment that started by projecting future travel patterns and demand, working through a comprehensive assessment of the area's transport and land-use context, and then identifying a range of high-level transport options that meet the needs of the region. Following that, the assessment focused on a range of individual modal options available to support the strategy-level options, and then developed more tactically focused delivery alternatives. This options assessment process is illustrated in the figure below.

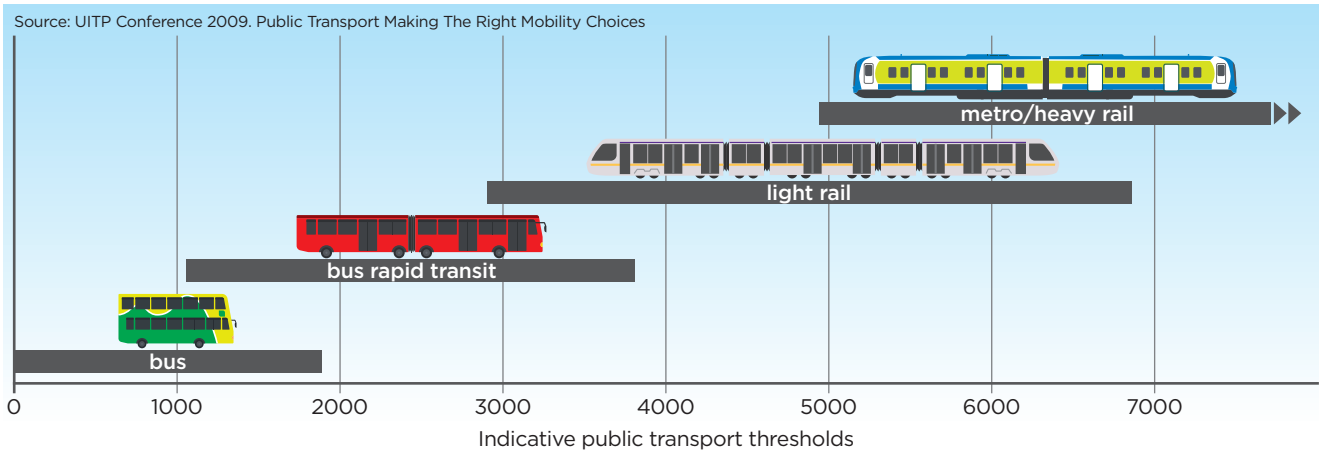
Figure 2.1.A: CMATS options development and assessment process



The full details of the assessment process are provided in CMATS[5] and in the Strategic Assessment Report (SAR) undertaken for BusConnects Cork, which is available as a supporting document to this Preliminary Business Case. The strategic level assessment undertaken for CMATS involved using the development of a simulated (or modelled) 'idealised' public transport network that included high frequency and high-capacity services running along all key routes. This 'idealised' network scenario facilitated an analysis of the potential public transport demand within key transport corridors in the CMA, allowing for the identification of maximum potential passenger demand along those corridors.

Using this public transport passenger demand, it was possible to identify which corridors are likely to be suitable for bus, light rail or heavy rail provision, using indicative mode capacity limits as set out in the figure below.

Figure 2.1.B: Transport mode capacity limits (passengers per hour per direction)



The assessment identified that other than the existing suburban rail lines to Midleton, Cobh and Mallow, only one other corridor—Ballincollig to Mahon—had the potential to require a light rail solution in the future based on possible passenger demand. Predicted passenger levels on all other corridors, even in the theoretical 'idealised' scenario, were below capacities requiring rail-based solutions and within the capacity limits of bus transport. Taking into account future population and employment, on most corridors within Cork City, demand of approximately 1,160 passengers per hour per direction is projected, which makes bus the optimal mode of transport for Cork and its surrounding suburbs.[6]

Even in the case of the potential light rail corridor, CMATS recognised that the level of consolidated development to support the provision of that light rail corridor does not currently exist. Accordingly, it recommended that this corridor should be served initially "*with a high frequency bus service*" and that there should be the development of "*bus priority measures along the route to enable a high level of performance in advance of its transition to light rail.*"

On an overall basis, the work undertaken in CMATS identified that the foundation of the public transport system in Cork would continue to be the bus system, primarily due to level of passenger demand, its ability to provide services across the full city area and the cost effectiveness of doing so. It identified the need for an enhanced bus system with additional services, improved bus priority, and modern ticketing systems and integrated fares. Coupled with the improvements to the bus system, CMATS also identified the need for the development of a comprehensive cycling network, involving safe, segregated cycling facilities across the city, including along the key arterial corridors upon which the bus system operates.

CMATS, as summarised in the SAR, undertook the strategic option assessment that underpins the BusConnects Cork programme. A more detailed bus options assessment was then undertaken as part of the development of the overall BusConnects Cork programme that will be outlined in Section 2.2, in addition to options assessments done to support individual BusConnects Cork component projects.

[5]Source: Cork Metropolitan Area Transport Strategy
[6]Source: BusConnects Transport Modelling using NTA Regional Models

2.2 Transforming Cork's bus and active travel systems: an introduction to BusConnects Cork

By aligning with all the relevant policies and following CMATS, BusConnects Cork is positioned to deliver necessary change to the bus and active travel system to support the growth of the region. BusConnects is the National Transport Authority's (NTA) programme to transform bus services in Irish cities by connecting people and places through an enhanced bus system and improved cycling and pedestrian facilities. It is a key part of national policy and aligns with Government's goal to improve public transport to support population and economic growth as well as address climate change.

In line with this overarching national programme, BusConnects Cork will deliver an integrated transport network that addresses the needs of all in the CMA, offering better sustainable transport choices. The BusConnects Cork programme is intended to fundamentally transform Cork's bus system so that journeys by bus will be fast, reliable, punctual, accessible, convenient and affordable. It will also transform the city's cycling infrastructure by improving cycle facilities on key corridors, including providing segregated cycling routes and reducing the need to share limited road space directly with the improved bus services.

The BusConnects programme will include investment across multiple interventions, which together will transform the bus service offering across Cork. The options considered in assessing the best path forward to meet the overarching strategic objectives and outcomes of the programme include a different combination of BusConnects component projects. Owing to the scale of the programme, each component is a project in its own right and has been through a rigorous assessment process.

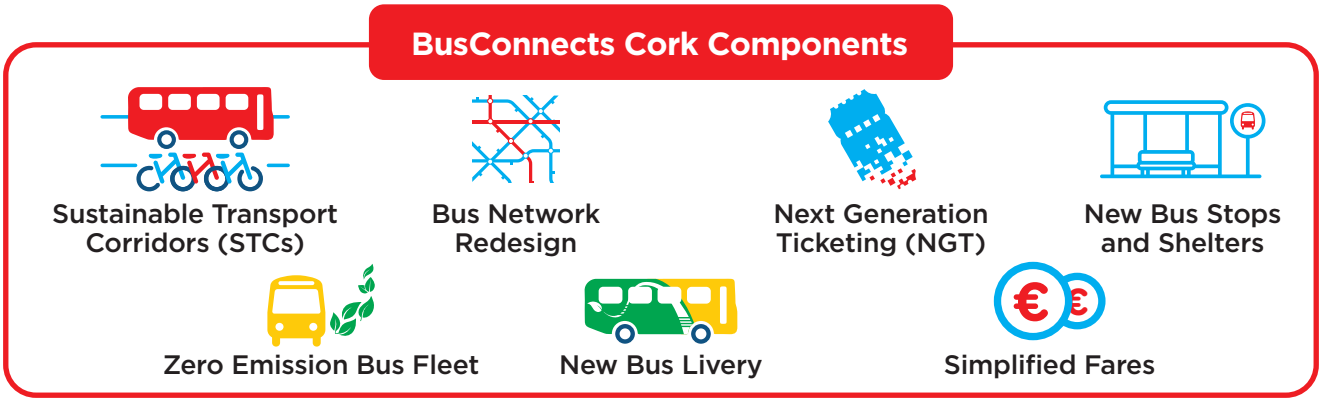
BusConnects Cork includes seven component projects that all contribute to a fundamental transformation of Cork's bus and active travel networks. By delivering BusConnects Cork as a programme, opportunities for combined benefits will bring a better overall outcome for customers, operators and wider stakeholders. A programme-based delivery will support complementary programme outcomes that are more than the sum of its individual component parts. If a programmatic approach were not taken, opportunities for integrated benefits would be missed if dependencies were not closely managed, which could lead to risks of omission, fragmentation, delay and cost overrun. The BusConnects Cork programme will leverage opportunities to bring better overall service for customers while minimising associated risks.

While the BusConnects programme brings together multiple elements identified in CMATS, the development of park and ride facilities, suburban rail and light rail are not within the scope of the BusConnects programme.

Projects included in BusConnects Cork

Each element of the BusConnects Cork programme contributes to transforming the bus system with the programme delivering more than the sum of its individual component parts. The key elements of the BusConnects Cork programme are shown in the figure below.

Figure 2.2.A: BusConnects Cork component projects



Bus Network Redesign

The new bus network will serve existing and future passengers in a more sustainable way. Reducing the need for private cars and moving more people onto public transport is a key part of tackling congestion in the region and climate change. Once fully delivered, there will be 53% more bus services (measured by in-service bus kilometres) with two routes that will operate 24-hour services—one running east-west and another running north-south—helping people travel when they need, to existing and future destinations, offering reliable public transport options for regular and occasional trips for work, school, healthcare or leisure like the cinema, opera house, sporting event or even the pub!

Access to public transport services will increase, with a 25% reduction in people who do not currently have access to any services within 400 metres of their house. There will be a 25% increase in the population with access to frequent services in the morning peak hours (defined as four or more buses per hour). The network redesign will also increase the population who have access to hospitals, schools and jobs within 30 minutes using public transport, thereby encouraging more sustainable journeys for a range of purposes.

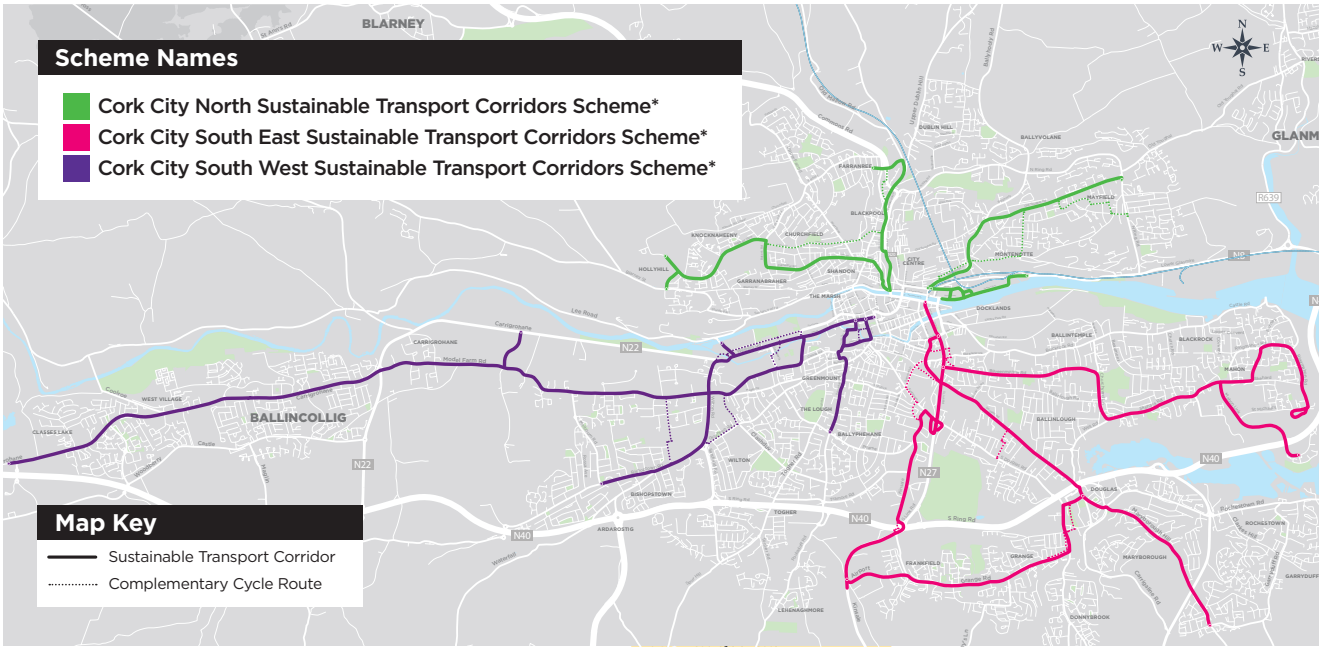
New Bus Stops and Shelters, and RTPI

As part of BusConnects Cork, updated poles will be installed for bus stops across the CMA alongside upgrades to bus shelters. This work will precede other enhancements such real time passenger information (RTPI) installation and other infrastructure installations to support the launch of new bus services as part of the redesigned network. Where new stops, shelters, and RTPI are required at locations along the Sustainable Transport Corridors (STC), these will be included in the relevant STC scheme. Any additional stop and shelter requirements that are not in the location of STC works will be delivered separately.

Sustainable Transport Corridors (including segregated cycle facilities)

This investment will provide continuous bus priority and cycle facilities along three proposed schemes consisting of 11 STCs. These proposals include approximately 90 kilometres of bus lane and bus priority to improve bus system efficiency, and 95 kilometres of cycle facilities (one direction), contributing to a significant expansion of Cork's cycling network on key arterial routes to the city. Following three rounds of public consultation, environmental impact assessment reports and planning documents are being prepared for the three schemes. The three proposed schemes are shown in the figure below.

Figure 2.2.B: Sustainable Transport Corridor proposed schemes with bus priority and cycle facilities

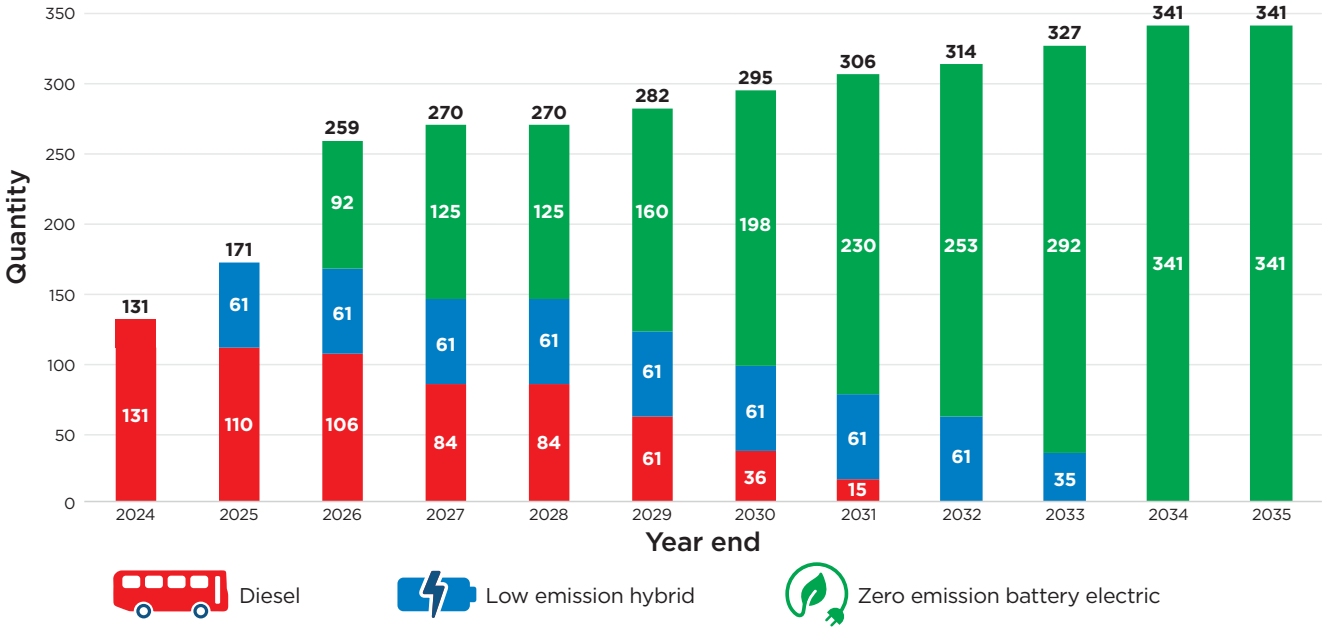


* Subject to Design Development

Zero Emission Bus Fleet (and associated depot infrastructure)

BusConnects Cork is planning a strategic shift towards achieving a zero emission bus fleet, marking a departure from traditional diesel buses to low emission alternatives, with the ultimate goal of a fully electrified fleet by 2034. To support the operation of the zero emission electric fleet and the increased fleet size required to cover the 53% increase in services created by the redesigned network (approximately 85 vehicles), some bus charging infrastructure will be installed at the existing Capwell bus depot with support from a temporary depot to be constructed at Tivoli. A new depot or depots will also be built as part of the BusConnects Cork programme to support the expanded electric fleet, shown in the figure below.

Figure 2.2.C: Transition to zero emission bus fleet as part of BusConnects Cork



Simplified Fares

The programme will include the introduction of a simpler fare structure that will eliminate penalties for interchanging and create a 90-minute fare option. The desire is to implement a flat fare within the city zone, covering the entire BusConnects Cork and commuter rail networks, along with a 90-minute ticket, which will allow for multiple trips on any public transport within the city, with the last trip commencing within 90 minutes of the first, making it easier and cheaper to get to and from destinations by bus or rail. Existing fare structures will be retained for longer-distance bus and rail journeys into Cork.

Next Generation Ticketing

The ticketing system will be upgraded to facilitate a variety of payment methods including mobile phones and debit or credit cards, making it easier for customers and ensuring they get the best price for their trip. This will also reduce delays at stops associated with driver interaction and fare payment.

New Bus Livery

The exterior branding of buses, known as the bus livery, will be standardised across different operators to give the bus system the feeling of a modern, effective public transport system. This is national livery, improving the awareness of public transport nationally, making it accessible to visitors and tourists who will see the same livery whether they are in Galway, Limerick, Dublin or Waterford. The new yellow branding on the front of the bus and doors will improve accessibility and inclusiveness of the bus service, making the buses more visible to those with visual impairments. The introduction of the new bus livery will occur organically as part of the regular bus procurement and repainting schedule.

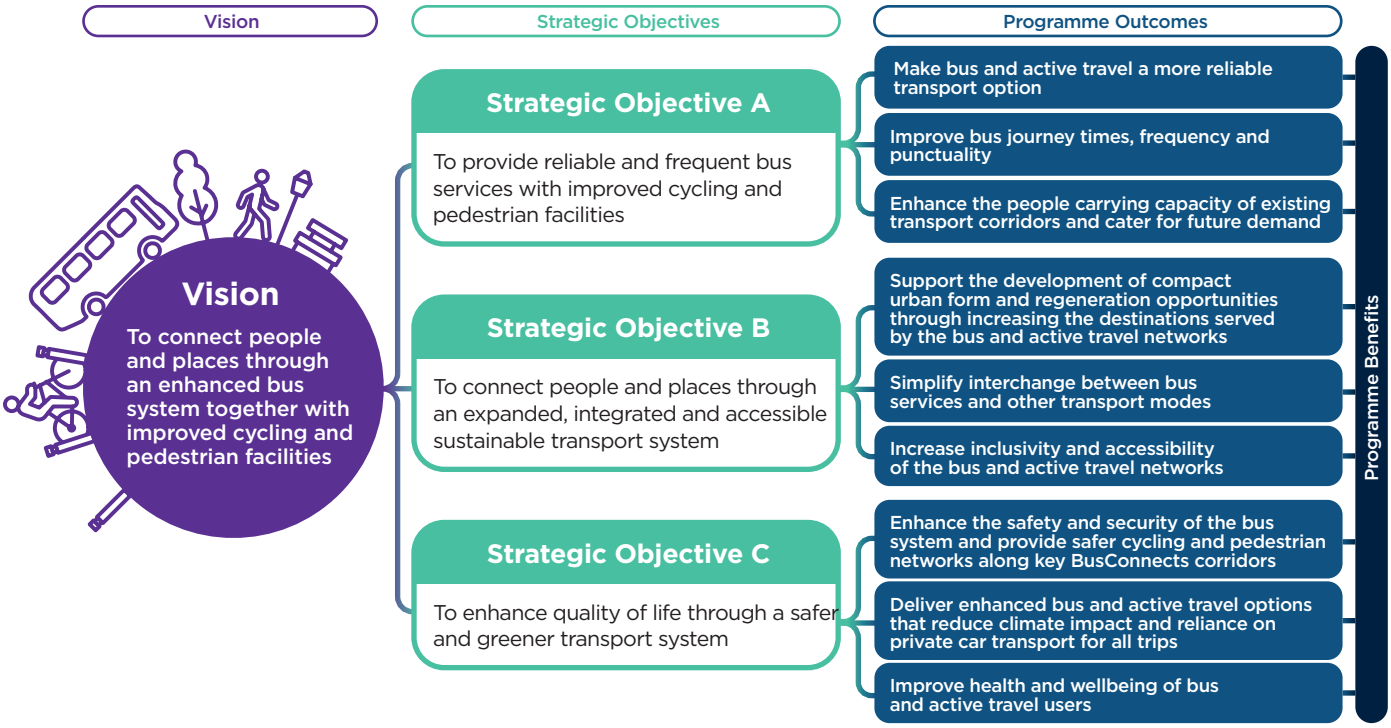
BusConnects Cork's vision, strategic objectives and programme outcomes

BusConnects is a programme of component projects to transform bus services in Dublin, Cork, Galway, Limerick and Waterford. The vision for all BusConnects programmes is 'to connect people and places through an enhanced bus system together with improved cycling and pedestrian facilities'. This vision is broken down in to three strategic objectives carried across the five programmes:

1. To provide reliable and frequent bus services with improved cycling and pedestrian facilities;
2. To connect people and places through an expanded, integrated and accessible sustainable transport system; and
3. To enhance quality of life through a safer and greener transport system.

Each BusConnects programme will have outcomes that are specific to that programme and are aligned to these strategic objectives as part of the programme's benefits management framework. The specific Cork programme outcomes shown below were used to support evaluation of options and are tracked by measuring progress of associated programme benefits.

Figure 2.2.D: BusConnects vision, strategic objectives and Cork programme outcomes



This framework approach allows all BusConnects programmes to work towards the same overarching vision and strategic objectives, aligned to specific outcomes for each regional programme. The Cork programme outcomes will be linked to associated programme benefits that are generated through the development of this Preliminary Business Case and further refined as the business case is developed through the programme lifecycle. It is through this linkage to quantitative and qualitive programme benefits that the programme outcomes will be SMART (specific, measurable, attributable, realistic and time-bound), noting they will continue to be more measurable as this business case develops. Achievement of programme outcomes, and therefore the BusConnects strategic objectives, will be determined through measurement and realisation of the programme benefits throughout the programme lifecycle and in the ex-post evaluation. This framework will allow the NTA to monitor progress of programme outcomes alongside the impact of other BusConnects programmes to achieve the overarching vision and strategic objectives.

The objectives previously set out in the SAR have been updated to align with the broader BusConnects benefits management framework, with specific outcomes based on the scope of the BusConnects Cork

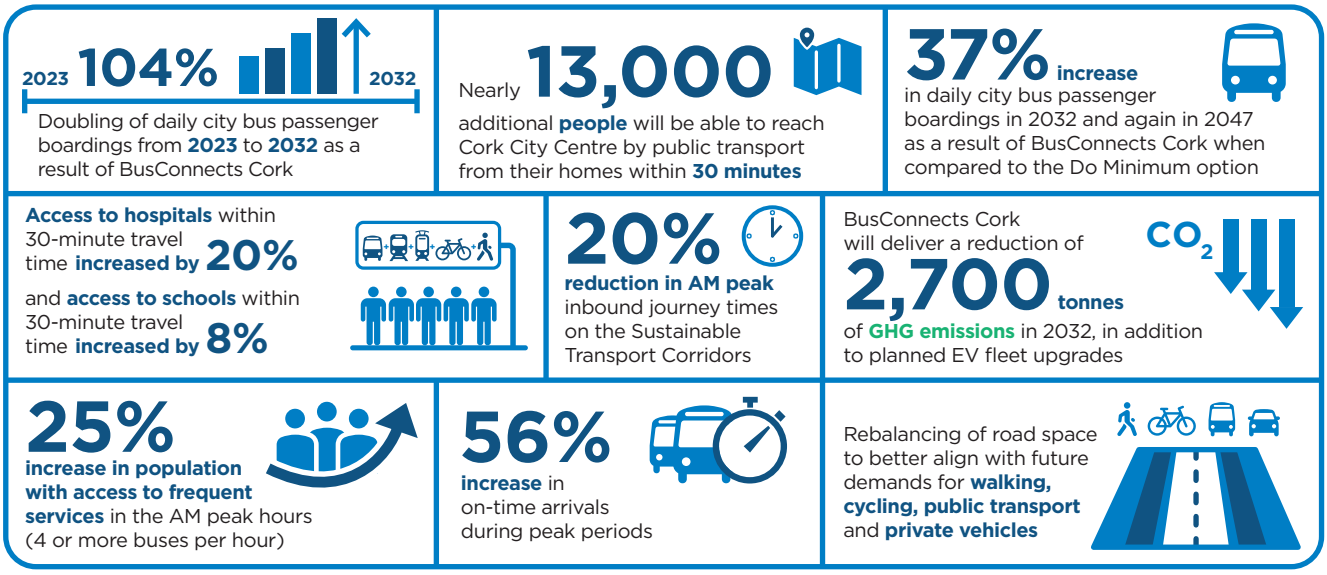
programme and project outputs. The updated programme outcomes also align with the objective set out in the CMATS "*to deliver an integrated transport network that addresses the needs of all modes of transport, offering better transport choices, resulting in better overall network performance and providing capacity to meet travel demand and support economic growth.*"

Programme benefits serve a crucial purpose in tracking the progress and evaluating the effectiveness of the programme outcomes. Intermediate, project level benefits will also be developed to support tracking progress to achievement of programme benefits, outcomes and broader strategic objectives. Programme impacts and benefits realisation is discussed in more detail in Chapters 3 and 4.

The expected impact of BusConnects Cork

The impact of the BusConnects Cork programme will be greater than the sum of its parts. Chapter 3 of this Preliminary Business Case will provide an overview of these quantitative and qualitative programme impacts with some of the key programme benefits highlighted in the figure below.

Figure 2.2.E: Key benefits of the BusConnects Cork programme



As outlined in Chapter 1, the CMA faces major challenges in catering for peoples' travel needs efficiently and sustainability now and into the future. BusConnects Cork will provide more attractive bus and active travel options that enable people to make the transition to a more sustainable mode of travel and avoid congested roadways. Bus priority lanes and better ticketing technology will allow for better journey times and more reliable services that will be expanded to reach more people and more destinations. Improved cycling infrastructure will provide improved safety, making this a more viable travel option for more people. A simpler fares structure will make it cheaper for people to complete an entire journey on public transport in the CMA, while improved stops, shelters, livery and a simpler bus network will make bus travel more accessible. These benefits cannot be fully achieved as outlined in this Preliminary Business Case without the integrated delivery of all components of the BusConnects programme.

2.3 Other bus options considered

This Preliminary Business Case builds on work carried out in the SAR and does not look to revisit decisions previously made in critical strategic documents like CMATS, which considered other modal options such as rail, light rail and other bus options. CMATS concluded that a robust and efficient bus network is required as the foundation for future transport in the region, therefore, the options assessment undertaken for the BusConnects Cork programme focused on different combinations of the component projects to deliver this transformed bus network. The next figure shows the process undertaken to develop and filter these programme level options, which has taken place in coordination with project level options filtering processes as shown in Figure 2.3.B. Figures 2.3.A and 2.3.B intend

to show the extensive optioneering that has taken place for the BusConnects Cork programme and component projects. Several of the projects have gone through rounds of public consultation and options selections processes in parallel to broader programme options process. The process has been iterative to ensure that as project options progress, they are considered by dependent projects and feeds into the programme options process.

Figure 2.3.A: Options filtering process to progress from a longlist of options to the preferred option

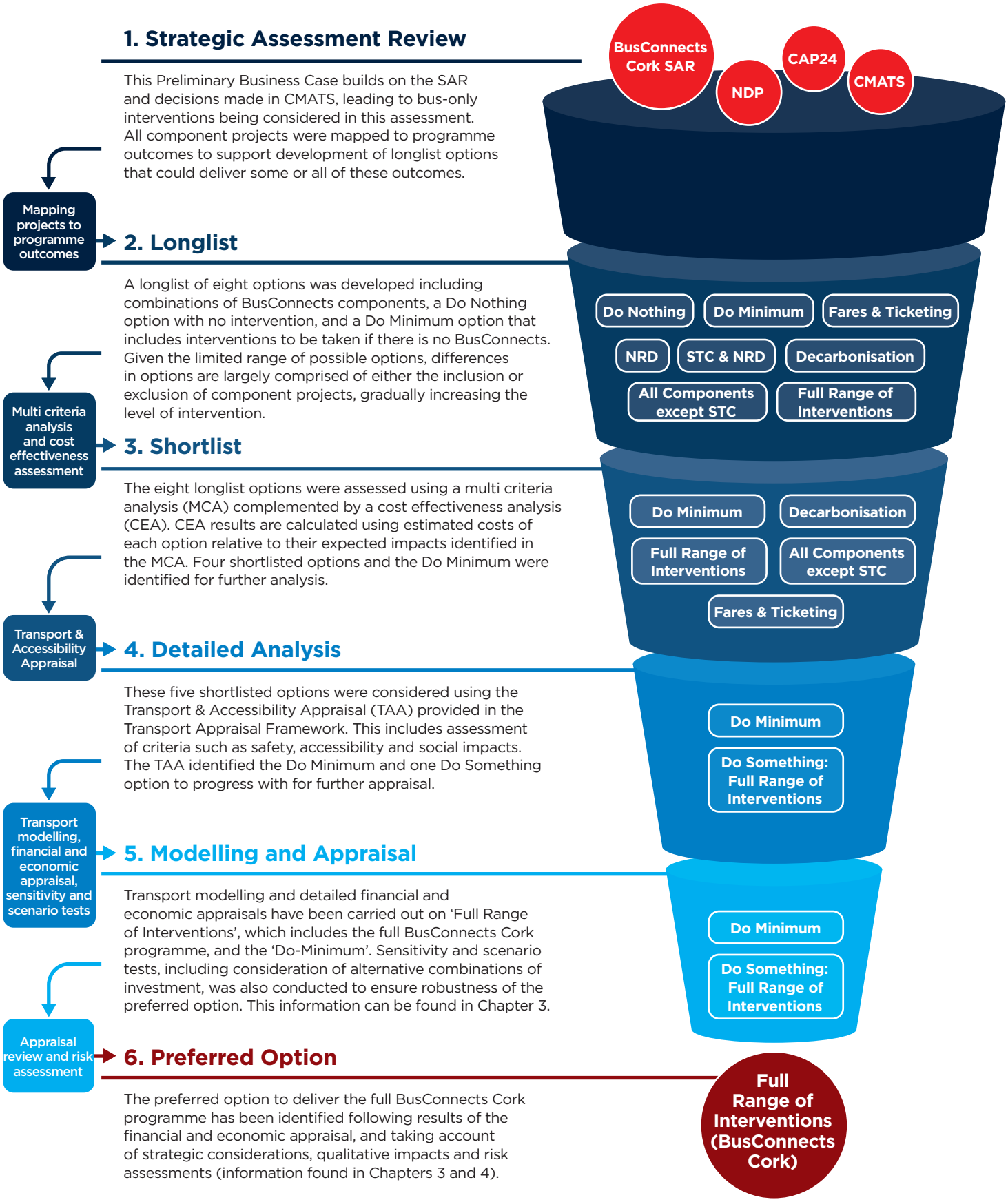
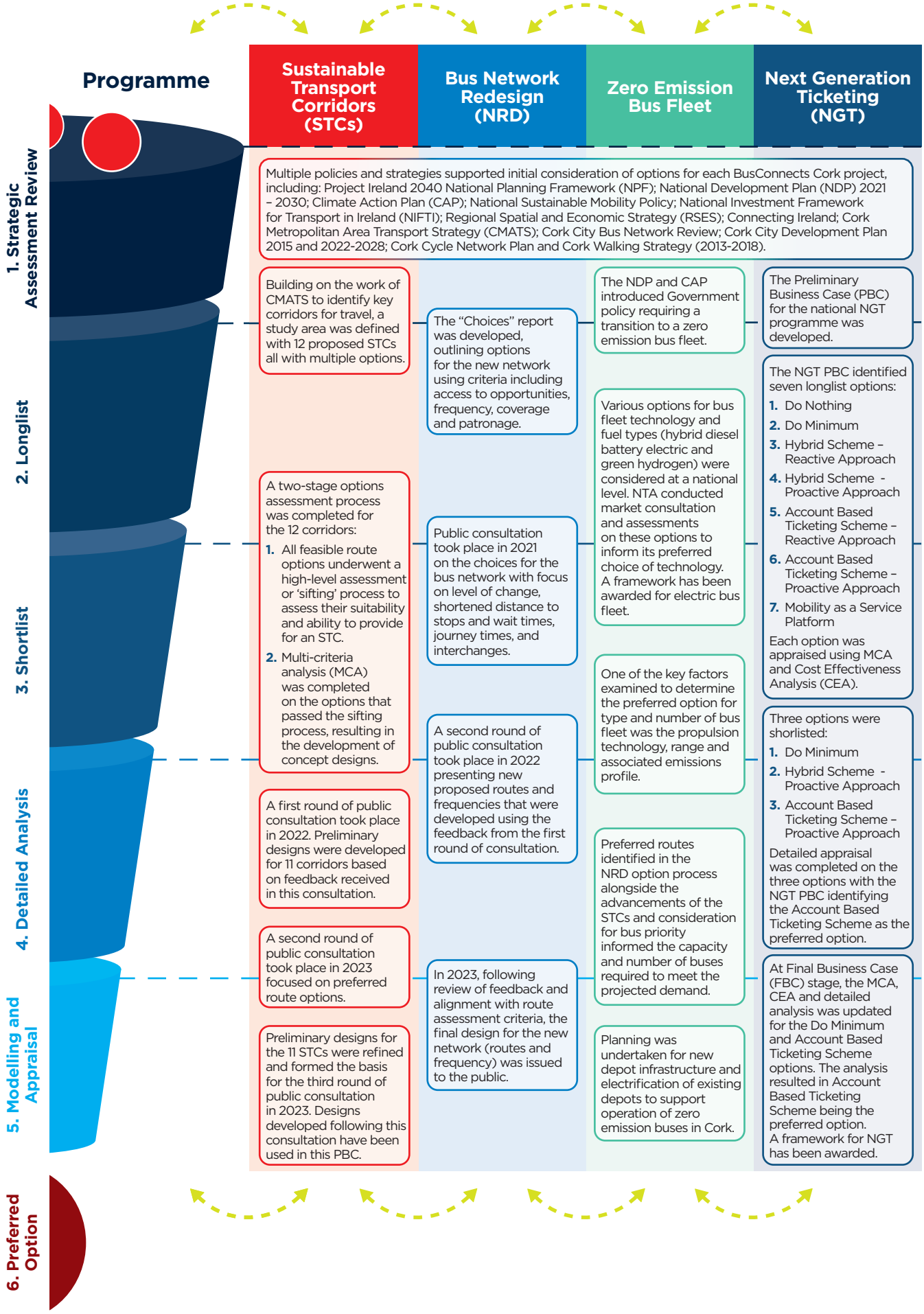


Figure 2.3.B: BusConnects Cork project options filtering processes



The mapping of project components to the BusConnects Cork programme outcomes referenced in Step 1 in Figure 2.3.A to support the development of the longlist of options is provided below. This shows that some projects support most of the programme outcomes, but most must be implemented alongside other components to ensure programme outcomes can be fully achieved.

Figure 2.3.C: Components of the BusConnects Cork programme mapped to programme outcomes

BusConnects Cork programme outcome	New Bus Livery	Next Generation Ticketing (NGT)	Simplified Fares	Zero Emission Bus Fleet	New Bus Stops and Shelters	Bus Network Redesign (NRD)	Sustainable Transport Corridors (STC)
A1. Make bus and active travel a more reliable transport option		Contributes somewhat	Contributes somewhat	Contributes somewhat	Contributes somewhat	Very strongly contributes	Very strongly contributes
A2. Improve bus journey times, frequency and punctuality		Contributes somewhat	Contributes somewhat	Contributes somewhat	Does not contribute	Contributes somewhat	Very strongly contributes
A3. Enhance the people carrying capacity of existing transport corridors and cater for future demand				Contributes somewhat	Contributes somewhat	Very strongly contributes	Contributes somewhat
B1. Support the development of compact urban form and regeneration opportunities through increasing the destinations served by the bus and active travel networks			Contributes somewhat	Does not contribute	Contributes somewhat	Very strongly contributes	Contributes somewhat
B2. Simplify interchange between bus services and other transport modes		Very strongly contributes	Very strongly contributes	Does not contribute	Contributes somewhat	Very strongly contributes	Contributes somewhat
B3. Increase inclusivity and accessibility of the bus and active travel networks	Very strongly contributes	Contributes somewhat	Contributes somewhat	Very strongly contributes	Very strongly contributes	Contributes somewhat	Contributes somewhat
C1. Enhance the safety and security of the bus system and provide safer cycling and pedestrian networks along key BusConnects corridors		Contributes somewhat			Contributes somewhat	Contributes somewhat	Very strongly contributes
C2. Deliver enhanced bus and active travel options that reduce climate impact and reliance on private car transport for all trips	Contributes somewhat	Contributes somewhat	Contributes somewhat	Very strongly contributes	Contributes somewhat	Contributes somewhat	Very strongly contributes
C3. Improve health and wellbeing of bus and active travel users				Very strongly contributes	Contributes somewhat	Contributes somewhat	Very strongly contributes

Very strongly contributes | Contributes somewhat | Does not contribute

The longlist of eight options assessed in Step 2 are described below for reference, noting that Option 7 includes all component projects except the Sustainable Transport Corridors that provide bus priority and segregated cycle facilities, as it is the most expensive project in the programme.

Figure 2.3.D: Longlist of options considered

	Option 1: Do Nothing	Option 2: Do Minimum	Option 3: Fares & Ticketing	Option 4: NRD	Option 5: STC & NRD	Option 6: Decarbonisa-tion	Option 7: All Components except STC	Option 8: Full Range of Interventions
Option description	No intervention made	Minimal intervention to meet Public Service Obligation	Preferred intervention with Simplified Fares and Next Generation Ticketing	Bus Network Redesign (NRD) preferred intervention	Preferred intervention for NRD and STC	Preferred intervention for NRD, STC and fleet upgrade	Preferred intervention in all components with no STCs	Preferred intervention for all components (full BusConnects Cork)
Bus Network Redesign (NRD)	No intervention	No intervention	No intervention	Preferred intervention	Preferred intervention	Preferred intervention	Preferred intervention	Preferred intervention
Sustainable Transport Corridors (STC)	No intervention	Small infrastructure changes	Small infrastructure changes	Small infrastructure changes	Preferred intervention	Preferred intervention	Small infrastructure changes	Preferred intervention
Next Generation Ticketing (NGT)	No intervention	Leap-equivalent system procured	Preferred intervention	Leap-equivalent system procured	Leap-equivalent system procured	Leap-equivalent system procured	Preferred intervention	Preferred intervention
Simplified Fares	No intervention	No intervention	Preferred intervention	No intervention	No intervention	No intervention	Preferred intervention	Preferred intervention
New Bus Livery	No intervention	No intervention	No intervention	No intervention	No intervention	No intervention	Preferred intervention	Preferred intervention
New Bus Stops and Shelters	No intervention	No intervention	No intervention	No intervention	No intervention	No intervention	Preferred intervention	Preferred intervention
Zero Emission Bus Fleet	No intervention	Gradually introduced through end-of-life replacement & unavoidable fleet expansion	Gradually introduced through end-of-life replacement & unavoidable fleet expansion	Gradually introduced through end-of-life replacement & unavoidable fleet expansion	Gradually introduced through end-of-life replacement & unavoidable fleet expansion	Preferred intervention	Preferred intervention	Preferred intervention

No intervention | Partial intervention | Preferred intervention

Multi criteria analysis (MCA) was used to assess and compare the eight options in the longlist against four criteria: the three BusConnects strategic objectives and one deliverability objective. Each option was given a score in the range of 0 to 5 for each objective, considering impacts defined within each objective, for a combined score out of 20. Scores for the MCA are shown in Figure 2.3.E.

A cost effectiveness analysis (CEA) was completed to complement the MCA by presenting the economic efficiency of options. This analysis shows how the options compare in costs relative to their benefits, helping to guide strategic investment decisions that optimise resources. The CEA results are calculated using an estimated cost associated with each option relative to their expected impacts as identified in the MCA. In undertaking the analysis, two methods of CEA have been applied: one assessing the marginal cost of an additional unit of benefit (average cost effectiveness ratio or ACER); and the other assessing difference in additional cost and additional benefit gained relative to the next best performing option (incremental cost effectiveness ratio or ICER).

The application of the two metrics is to ensure that there is a clear understanding of the costs to achieving a higher scale of benefit, or that more benefits could be achieved with small cost increments. From a CEA perspective, the Do Nothing option, or indeed, the Do Minimum, can often perform best in CEA terms, but this clearly fails to achieve a range of the benefits. In cost effectiveness terms, the best performing option (highest MCA score) ranks sixth in the ACER, with the highest ACER Do Something option, Fares & Ticketing, ranking second. Clearly, the Fares & Ticketing option does not deliver the same level of benefit or achieve the objectives to the same extent. The ICER analysis was developed to capture the extent to which benefits are achieved across the options.

The shortlisted options were selected by considering the results of the MCA, ACER and ICER to ensure the analysis is robust and multidimensional. Final rankings for the CEA are shown in Figure 2.3.E with the separate rank (1-8) for the ACER and ICER.

Figure 2.3.E: Results from the MCA and CEA on longlist of options

	Multi criteria analysis (MCA)		Cost effectiveness analysis (CEA)	
Option	Score out of 20	Rank 1-8	Average cost effectiveness ratio (ACER) Rank 1-8	Incremental cost effectiveness ratio (ICER) Rank 1-7
1. Do Nothing	5	8	1	4
2. Do Minimum	8	7	5	1
3. Fares & Ticketing	12	3	2	6
4. NRD	10	6	3	5
5. STC & NRD	11	5	8	7
6. Decarbonisation	13	2	7	2
7. All Components except STCs	12	3	4	3
8. Full Range of Intervention	16	1	6	N/A
Maximum potential score	20	1	1	1

Overall, the CEA shows that while Option 8 (the full BusConnects Cork programme) has an ACER ranking of 6, this option stands out as the most ambitious and comprehensive. This option has the potential to deliver transformative impacts on the transport network's capacity, reliability and sustainability which are reflected in the high MCA ranking. This score denotes that while this option requires the largest investment, the potential for wide-ranging, long-term benefits align with the BusConnects strategic objectives. Option 7, which excludes the Sustainable Transport Corridors, still delivers some benefit, but both the MCA and CEA results show the negative impact of not having dedicated bus priority, leaving buses caught up in general traffic, negatively impacting the attractiveness of the service and discouraging modal shift. Similarly, Option 3 Fares & Ticketing and Option 6 Decarbonisation score highly in the MCA but also fail to meet some of the fundamental strategic objectives of the BusConnects programme.

These analyses were completed through a series of workshops with project teams and stakeholders in the NTA with relevant experience. Several options scored very closely together, with only small differences in overall scores, but the longlist process identified five options to progress for further consideration.

Shortlisted bus options

The figure below provides the detail for the five shortlisted options. As indicated in Figure 2.3.A, the Transport & Accessibility Appraisal (TAA) has been applied to assess the shortlisted options to determine which option should be progressed for detailed financial and economic appraisal. As this programme has multiple interdependent projects, each with their own options processes referenced in Figure 2.3.B, and a number of the options fail to meet the strategic objectives, undertaking detailed financial and economic appraisals including sensitivities on these options would not be of value. Furthermore, as only the preferred options are brought through the prelimiary design processes, there is not the robustness of designs and certainty of costs for each project to support this further analysis.

Figure 2.3.F: Scope of the five shortlisted options

BusConnects component project	Do Minimum	Do-Something: Fares & Ticketing	Do-Something: Decarbonisation	Do Something: All Components except STCs	Do-Something: Full Range of Interventions
Sustainable Transport Corridors (incl. segregated cycle facilities)	Existing network with committed schemes for road, public transport and active travel infrastructure: 9 road infrastructure schemes and active travel schemes	Existing network with committed schemes for road, public transport and active travel infrastructure: 9 road infrastructure schemes and active travel schemes	Existing network with committed schemes for road, public transport and active travel infrastructure: 9 road infrastructure schemes and active travel schemes. Addition of 3 proposed STC schemes (11 corridors)	Existing network with committed schemes for road, public transport and active travel infrastructure: 9 road infrastructure schemes and active travel schemes	Existing network with committed schemes for road, public transport and active travel infrastructure: 9 road infrastructure schemes and active travel schemes. Addition of 3 proposed STC schemes (11 corridors)
Zero Emission Bus Fleet (incl. associated depot infrastructure)	125 buses in the current fleet, 209 required by 2030 and 258 required by 2035. ZEF purchases begin in 2026. Depots in Tivoli, Capwell and Kinsale Road	125 buses in the current fleet, 209 required by 2030 and 258 required by 2035. ZEF purchases begin in 2026. Depots in Tivoli, Capwell and Kinsale Road	Max requirement of 341 low emission buses by 2035. ZEF purchases begin in 2026 and occur more rapidly than the Do Min scenario. Depots in Tivoli, Capwell, Kinsale Road and one other location (location TBC)	Max requirement of 341 low emission buses by 2035. ZEF purchases begin in 2026 and occur more rapidly than the Do Min scenario. Depots in Tivoli, Capwell, Kinsale Road and one other location (location TBC)	Max requirement of 341 low emission buses by 2035. ZEF purchases begin in 2026 and occur more rapidly than the Do Min scenario. Depots in Tivoli, Capwell, Kinsale Road and one other location (location TBC)
Bus Network Redesign	Maintain existing network	Maintain existing network	Network Redesign	Network Redesign	Network Redesign
Next Generation Ticketing	Leap-equivalent system procured	NGT for Cork	Leap-equivalent system procured	NGT for Cork	NGT for Cork
Simplified Fares	No change to current fare structure	Simplified Fares (use simplified representation of 90-min fare)	No change to current fare structure	Simplified Fares (use simplified representation of 90-min fare)	Simplified Fares (use simplified representation of 90-min fare)
New Bus Livery	Livery replaced in line with repainting programme	Livery replaced in line with repainting programme	Livery replaced in line with repainting programme	New Bus Livery	New Bus Livery
New Bus Stops and Shelters, and RTPI	Maintain existing infrastructure	Maintain existing infrastructure	Maintain existing infrastructure	New stops, shelters, signage and RTPI as per Network Redesign plans	New stops, shelters, signage and RTPI as per Network Redesign plans

Options are assessed for their impact against each of the criteria using the seven-point impact scale set out in the Transport Appraisal Framework: highly positive; positive; slightly positive; neutral; slightly negative; negative; and highly negative. The results of the TAA are shown below, noting that the 'Do Minimum' and 'Full Range of Interventions' (the full BusConnects Cork programme) were progressed for the next step of more detailed appraisals (Step 5 in Figure 2.3.A), which can be found in subsequent sections of this Preliminary Business Case.

Figure 2.3.G: Results of the TAA showing two options to be progressed to detailed appraisal

Criteria / Option	Do Minimum	Fares & Ticketing	Decarbonisation	All Components excluding STC	Full Range of Interventions (BusConnects Cork)
Option description	Minimal intervention to meet Public Service Obligations	Preferred Intervention on ticketing and fare systems only	Preferred Interventions for NRD and STC and full fleet upgrade	Preferred Intervention in all components but no change to STC	Preferred Intervention for each component
Accessibility	Neutral	Slight Positive	Neutral	Slight Positive	Positive
Social	Neutral	Slight Positive	Neutral	Slight Positive	Positive
Land use	Neutral	Neutral	Slight Positive	Slight Positive	Positive
Safety	Slight Positive	Positive	Neutral	Slight Positive	High Positive
Climate change	Slight Positive	Positive	Positive	Slight Positive	High Positive
Local environment	Neutral	Slight Positive	Slight Positive	Slight Positive	Slight Positive

Progressed for transport modelling and detailed economic and financial appraisal

In addition to the analysis and assessment of options for the BusConnects Cork programme, each component project also underwent its own assessment of options to come up with the best value for money project to deliver the project outputs and desired project level benefits.

2.4 Meeting future demand and delivering modal shift

As discussed in Chapter 1, **one of the main challenges for transport in the Cork region is developing a transport network that can support its continued growth, with the population expected to increase by 50-60% between 2018 and 2040**. A demand analysis has been carried out to quantify the need for investment in public transport and the impact the BusConnects Cork programme could have in the CMA, looking at the Do Minimum and Do Something option of 'Full Range of Interventions' ('Do BusConnects') options.

Demand for transport services arises because people need to get somewhere—to a job, education, healthcare and other services. As such, increases in population, employment opportunities or educational facilities in an area will increase the demand for public transport services, making this analysis critical in the planning and delivery of transport programmes like BusConnects Cork. Mode shift to use of public transport can be influenced by land use planning, distance to various destinations, transit oriented development and availability of suitable public and active travel options.

The South West Regional Model (SWRM) is a strategic multi-modal transport model representing travel by all primary surface modes including walking and cycling (active modes) as well as travel by car, bus, rail, tram, light goods and heavy goods vehicles. It covers the southwest of Ireland, including Cork County, and is the primary modelling tool for CMATS and the strategic assessment of the proposed BusConnects Cork programme. By inputting anticipated changes in population and employment into the SWRM, detailed projections of public transport demand are generated, including estimates of passenger boardings and number of trips. Outputs from the SWRM help provide an understanding of the volume of demand and the impact of investments like BusConnects Cork in catering for this demand.

The SWRM is a robust, well-established transport model that is part of a suite of models covering all of Ireland, developed over time and updated to incorporate the latest available data. The process to

calibrate the model reviewed observed data against modelled results, adjusting constants and other model parameters until the best fit was reached. This process ensures that demand forecasts are fit-for-purpose and can be relied on for appraisal in evaluating business cases. The NTA has developed population forecasts and distributions, which are agreed with the local authorities, for use in its regional transport models that take into consideration the 2040 National Planning Framework (NFP), Census data, regional growth projections and local authority plans. Population, employment and education growth are forecast based on development plans between now and 2040. Model runs were completed for opening year (2032) and an end-state (2047), for both a Do Minimum and Do BusConnects (previously noted as 'Full Range of Interventions') options, using the incremental demand changes between the two options in each year.

Census data and forecasts using the NTA's 2040 NPF reference case indicate an approximate 247,000 (+32%) increase in the total population of the South West Region between 2016 and 2047. Within Cork City, population growth of nearly 70% is forecast between 2016 and 2047, which will increase demand for travel within the city centre and across the region. Forecasts also indicate that the total number of students and employed people in the South West Region will increase by approximately 81% and 32% respectively between 2016 and 2047.

Figure 2.4.A: South West Region and Cork City population ('000)

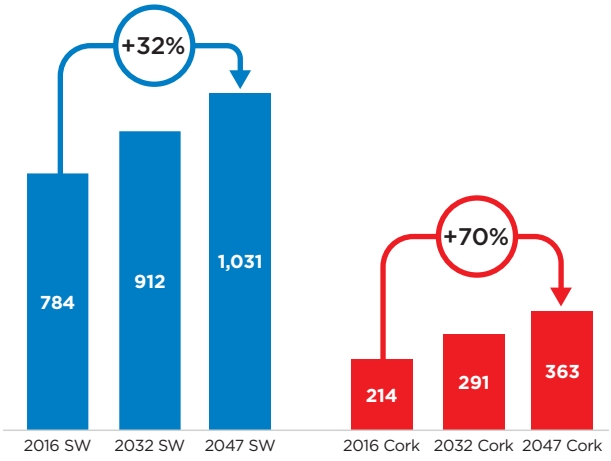
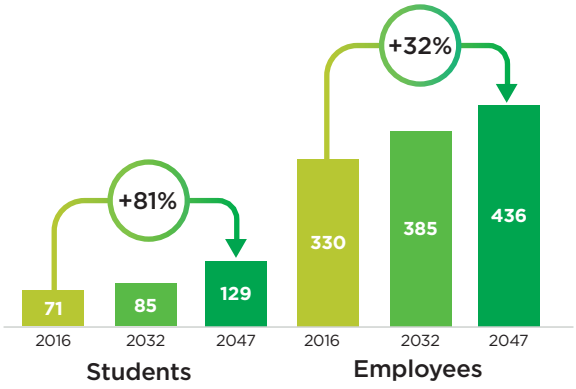


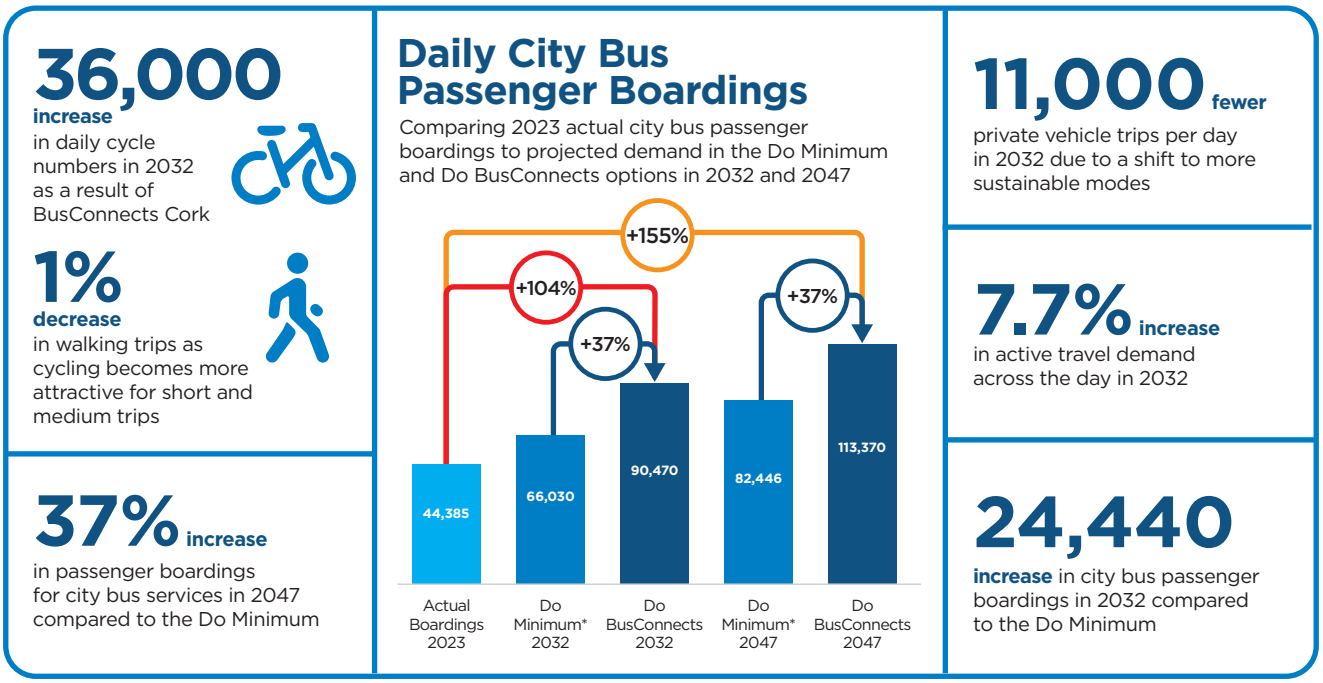
Figure 2.4.B: Increase in students and employees('000)[7]



The BusConnects Cork programme will transform bus and active travel services in the CMA, increasing demand for sustainable transport modes and reducing private vehicle use, summarised in the numbers captured on the next page.

[7] Source: 2016 Census Data, CSO and NTA Planning Sheets. Note: 2016 data for students includes higher education students only

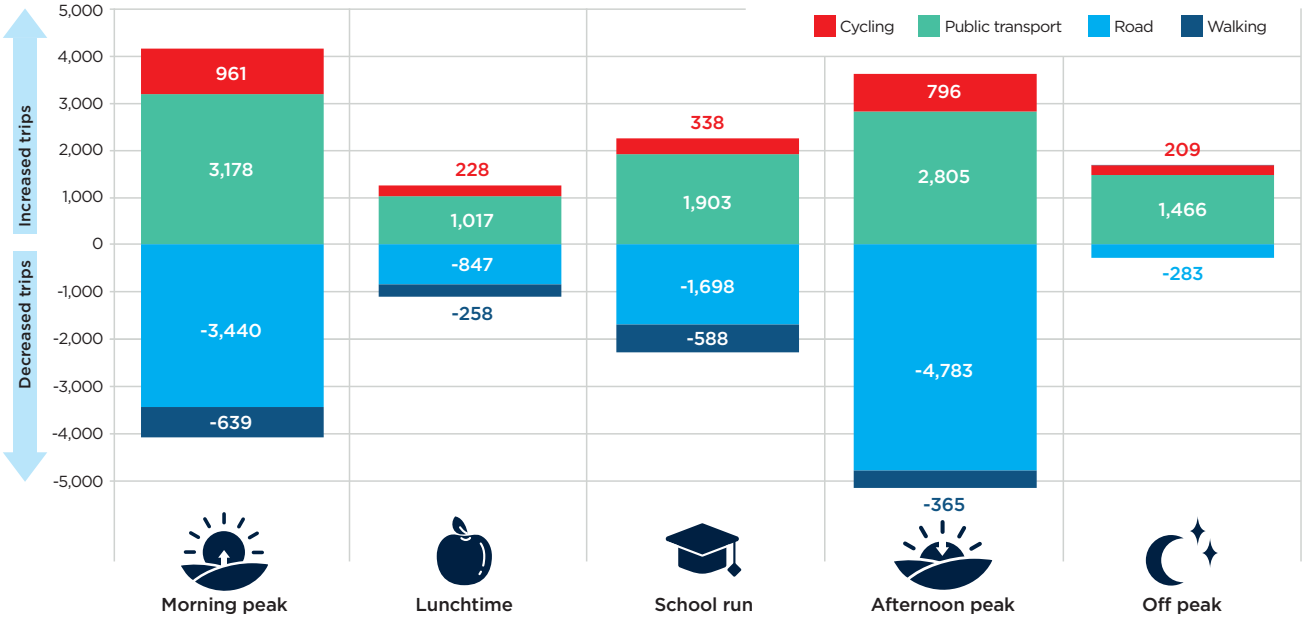
Figure 2.4.C: Travel projections for BusConnects Cork



*Note: In the appraisal of transport projects, the Transport Appraisal Framework places requirements on the development of the Do Minimum option, including that planned population and employment growth is kept constant. In that example, the true reflection of the impact of transport interventions such as BusConnects Cork, which is an enabler for planned growth, is not represented. The difference between the Do Minimum and Do BusConnects options underestimates the impact of BusConnects Cork and impacts of not delivering the programme, however, the overall impact of the Do BusConnects option is representative. In the absence of the necessary additional transport investments, the Do Minimum option would represent a deterioration from the existing transport conditions, with increased traffic congestion, lower bus reliability and longer bus journey times.

Figure 2.4.D shows the change in number of trips taken between the Do Minimum and Do BusConnects Cork options for 2032. **Across all time periods, there is a consistent increase in public transport demand and cycling trips as a result of BusConnects Cork.** Public transport demand sees a significant increase (over 10,000 additional trips), with the highest demand increases observed during the morning (+3,178 trips) and afternoon (+2,805 trips) peaks. Cycling trips also experience an increase, although on a smaller scale, with the most significant growth occurring during the morning (+961 trips) and afternoon (+796 trips) peaks. The use of private vehicles consistently decreases across all periods, indicating a successful shift from private car use to public transport and active travel modes. The afternoon peak shows the most substantial reduction in private vehicle use (-4,783 trips) followed by the morning peak (-3,440 trips).

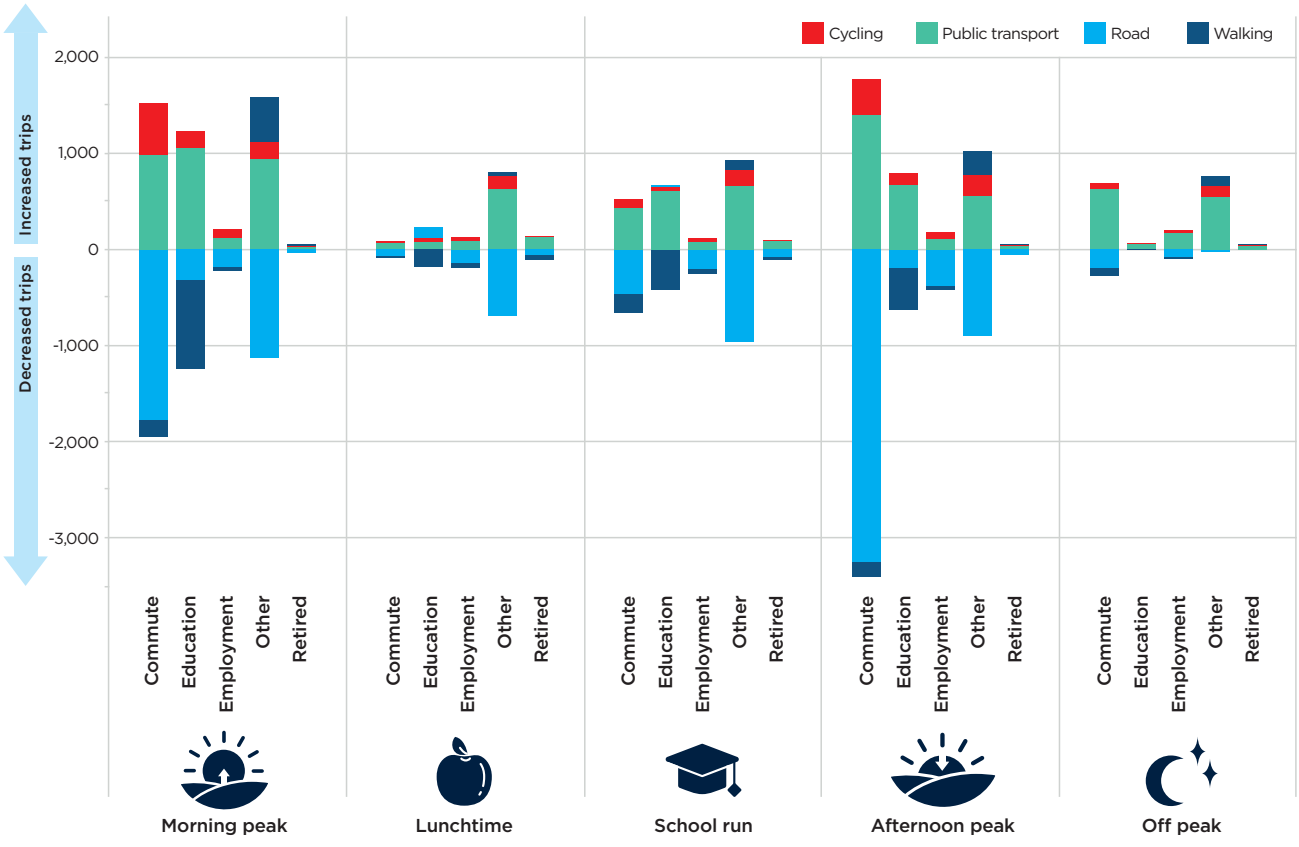
Figure 2.4.D: Change in demand between Do Minimum and Do BusConnects Cork scenarios by transport mode and time period for 2032 (number of trips)



The consistent increase in public transport and cycling trips across all time periods, alongside the reduction in private vehicle use, is a strong reflection of the impact of BusConnects Cork. By providing enhanced and reliable public transport services, **BusConnects Cork will successfully encourage a shift from private vehicle use to more sustainable modes of transport**, helping to reduce traffic congestion and support environmentally sustainable travel.

The next figure shows demand along the proposed locations for the combined 11 Sustainable Transport Corridors, which includes bus priority and dedicated cycle facilities. The most significant changes are seen during the peak periods for commuters, indicating a strong shift towards more sustainable modes of transport during times of high demand. During the morning peak, the most significant increase in trips occurs in public transport, particularly among commuters (+993 trips), those travelling for education (+1,069 trips) and other reasons for travel (+953 trips) indicating that BusConnects Cork will be highly attractive to these groups for use during the busiest period of the day. Additionally, there is a significant reduction in private vehicle trips during the morning and afternoon peaks, especially for commuters (-1,780 trips in the morning peak and -3,256 trips in the afternoon peak), reflecting a shift from private car use to public and active transport modes.

Figure 2.4.E: Change in demand between Do Minimum and Do BusConnects Cork scenarios by purpose of journey for 2032 (number of trips)



Demand analysis shows that BusConnects Cork will drive a substantial modal shift from private car use to more sustainable modes of transport across all time periods and for trips of different purposes. The increase in public transport use and cycling indicates strong demand for BusConnects Cork and is further indication that this programme is the right solution to support the continued growth of the CMA.

3. What will it cost and what are the benefits?

3.1	The cost of BusConnects Cork and how it was developed	30
3.2	Financial appraisal and affordability	37
3.3	Key benefits of the BusConnects Cork programme	40
3.4	Economic appraisal and sensitivity analysis	44

HOW DOES THIS CHAPTER COMPLY WITH THE INFRASTRUCTURE GUIDELINES?

- ✓ Options appraisal, including:
  - Financial appraisal
  - Economic appraisal
  - Sensitivity analysis
- ✓ Assessment of affordability within existing resources
- ✓ Assessment of climate and environmental performance

3.1 The cost of BusConnects Cork and how it was developed

When considering the cost and benefit of any capital investment, it is necessary to include costs and benefits over the lifecycle of the investment. For this reason, the costs of BusConnects Cork in this business case include the upfront cost of the infrastructure and bus fleet (capital costs), costs associated with renewing certain assets (renewal costs), and the operating costs required to keep the services running (operating costs). The cost of the BusConnects Cork programme have been compared to the costs of the Do Minimum option required to maintain current bus operations, which is known as the incremental cost. This section will review the costs and how they were developed to come up with the nominal incremental capital cost range for BusConnects Cork of €1.8 billion-€2.8 billion, and an overall nominal capital cost range of the programme (including Do Minimum costs that would be incurred without delivery of BusConnects Cork) of €2.3 billion-€3.5 billion.

€1.8-2.8bn
incremental capital cost range (P30-P80)

€2.3-3.5bn
total capital cost range (P30-P80)

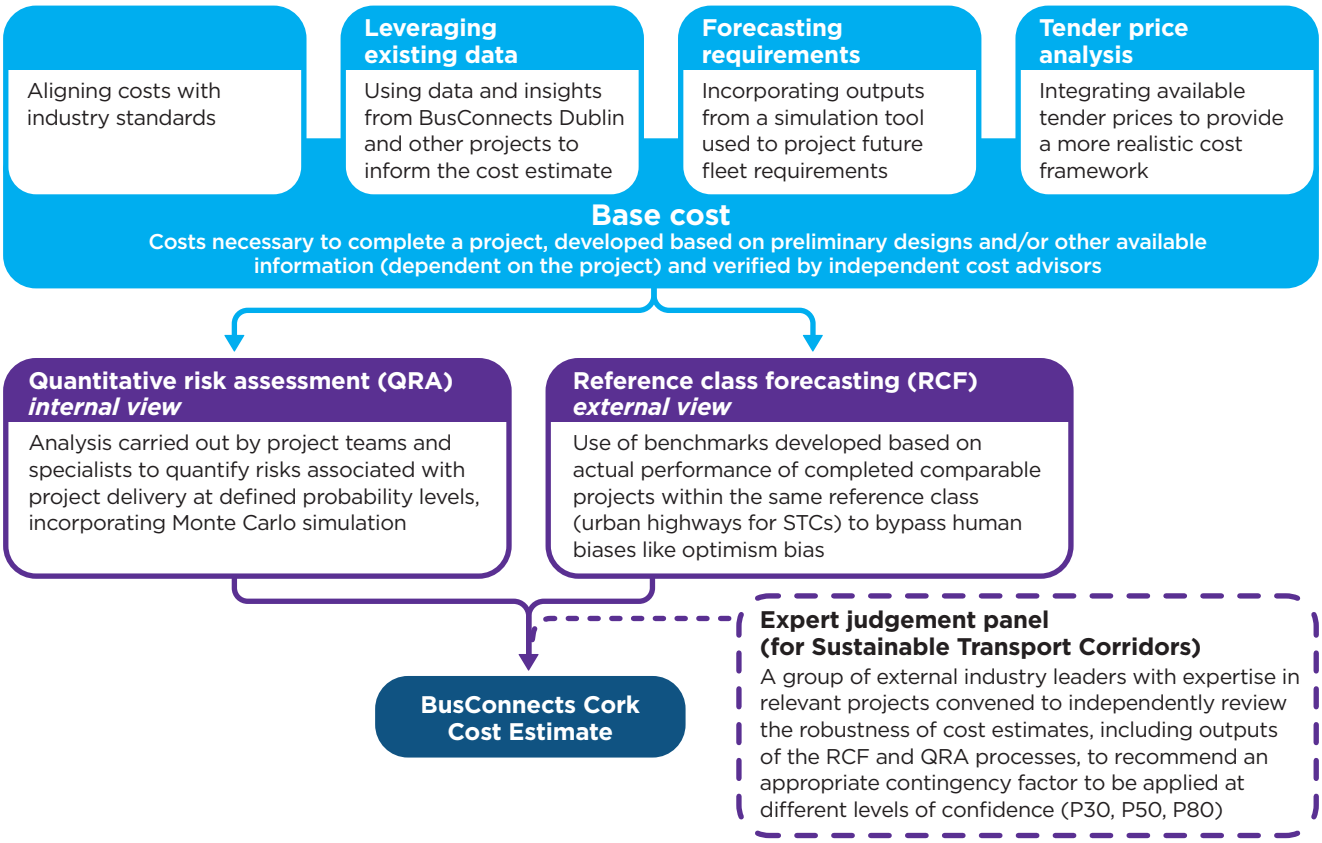
The BusConnects Cork cost estimate is made up of the components shown in the figure below to estimate the upfront capital cost of delivering infrastructure and bus fleet:

Figure 3.1.A: What makes up the BusConnects Cork cost estimate

- **Base cost:** Costs necessary to complete a project, developed based on preliminary designs or other available information (dependent on the project) and verified by independent cost advisors. Further detail on the bottom-up approach to developing base costs can be found in Figure 3.1.B.
- **Risk and contingency:** Contingency factors attempt to account for the inherent uncertainty involved in delivery of large transport capital programmes, including foreseeable and unforeseeable risks that could occur during the project and programme lifecycles. Factors are assigned for P30, P50 and P80 costs, which reflect a 30%, 50% and 80% probability or confidence level that the cost will not exceed that value. The construction costs of the Sustainable Transport Corridors have a realistic construction schedule applied to the P30 and P50 costs and a pessimistic construction schedule applied to the P80 cost.
- **Inflation:** Inflation is calculated annually over the appraisal period and applied to base costs and the risk and contingency allowance. Seven indices have been used (including construction, consumer price index, property, labour, etc.), averaging 2.5% annually at P50. Inflation rates are adjusted for the P30 and P80 cost estimates by -1% and +1% (lower case and upper case), respectively, noting that land and construction have different rates.
- **VAT:** VAT rates are applied to base costs, risk and contingency allowance and inflation as shown in the figure above. Relevant VAT rates have been applied to the capital costs of each project (either 13.5% or 23%) with a 23% VAT rate applied to renewal and operating costs.

Due to the complexity and wide-ranging scope of the BusConnects Cork programme, a comprehensive approach has been adopted for cost estimation in accordance with the Infrastructure Guidelines and the NTA's Cost Management Guidelines for Public Transport Projects. Each component project included in the programme has undergone thorough analysis to identify specific cost drivers, facilitated by the project teams. The next figure shows how base costs were developed for the programme, followed by quantitative risk assessment (QRA), reference class forecasting (RCF) and an expert judgment panel convened for the Sustainable Transport Corridors project.

Figure 3.1.B: BusConnects Cork approach to cost development



Base costs for each project were assessed based on several inputs as shown. In the case of the bus fleet, purchase costs for new fleet are already available through an existing framework contract for fleet purchase, making the cost estimation for fleet more precise. Similarly, for Next Generation Ticketing (NGT), a framework contract is already in place to inform costs. For depot infrastructure, preliminary designs and costs for similar depots in the BusConnects Dublin programme were used for reference.

Following the development of base costs, rigorous assessment processes were undertaken by the programme to establish the contingency allowances for different costs. The NTA's contingency calculator was used as a starting point for several projects, followed by QRAs to quantify risk and inform an internal view of the cost of risk for each project. This was supplemented by RCF to inform a contingency uplift to be applied to the cost estimate thereby de-biasing the estimate. An expert judgment panel was also convened to review the RCF and QRA results for the Sustainable Transport Corridors (STC) project and to recommend appropriate contingency factors for P30, P50 and P80 costs for the STCs.

These methodologies were used to develop an appropriate cost range for BusConnects Cork considering risk within this cost to create a realistic cost range. Costs and factors applied to the costs were selected based on the internal and external views provided by the QRA and RCF, and for STC costs, based on the experience of the expert judgment panel. The risk and contingency factors for each project and cost type are shown in the next figure.

Figure 3.1.C: Risk and contingency rates for used in BusConnects Cork

Project	P30	P50	P80
Sustainable Transport Corridors	57%	71%	119%
Sustainable Transport Corridors - Land	50%	50%	50%
Zero Emission Bus Fleet	5%	10%	20%
Depots (electrification of existing depot at Capwell)	10%	15%	44%
Depots (temporary depot at Tivoli)	10%	15%	20%
Depot (new depots)	20%	30%	50%
Bus Network Redesign	34%	54%	74%
Next Generation Ticketing	45%	50%	70%
Programme Support Costs	57%	71%	119%
New Bus Stops & Shelters	10%	12%	20%

Overall cost estimate

Costs are presented in ranges that consider the risk associated with delivering a large-scale transport capital programme, with the upfront capital costs shown below. These ranges include P30, P50 and P80 costs, which include contingency to reflect a 30%, 50% and 80% probability or confidence level that the cost will not exceed that value. The below figure shows the build up to €2.3 billion-€3.5 billion range of upfront capital costs for each project in the BusConnects Cork programme.

€ 1.8-2.8bn incremental capital cost range (P30-P80)

Figure 3.1.D: BusConnects Cork nominal capital costs per project at P30, P50 and P80 confidence levels

Upfront capital costs (€m)	P30	P50	P80
Sustainable Transport Corridors (STCs)	784	784	784
Zero Emission Bus Fleet	228	228	228
Depots	171	171	171
Bus Network Redesign	31	31	31
Programme Support Costs	11	11	11
Next Generation Ticketing (NGT)	11	11	11
New Bus Stops and Shelters	2	2	2
Total base costs (2024 prices)	**1,238**	**1,238**	**1,238**
Risk and contingency allowance	501	631	1,020
Inflation	259	394	763
VAT	290	329	442
Total nominal programme budget (incl-VAT) (2024 – 2062)	**2,288**	**2,592**	**3,463**

Figure 3.1.E: Nominal costs at P30, P50 and P80 for the capital costs of each BusConnects Cork project

Upfront capital costs (€m)	P30	P50	P80
Sustainable Transport Corridors (STCs)	1,608	1,832	2,564
Zero Emission Bus Fleet	324	363	424
Depots	253	278	332
Bus Network Redesign	55	65	76
Programme Support Costs	24	27	36
Next Generation Ticketing (NGT)	21	23	28
New Bus Stops and Shelters	3	3	3
Total nominal programme budget (incl-VAT) (2024 – 2062)	**2,288**	**2,592**	**3,463**

A complete view of costs for the programme from 2024-2092 has been developed through a 30-year appraisal period and a 30-year renewal period, and is separated in to the following categories:

- Capital costs (e.g., Sustainable Transport Corridors, new bus fleet, new ticketing system, etc.)
- Renewal costs (e.g., new buses every 12 years and new batteries every six years)
- Operating costs (e.g., fuel costs, maintenance costs, bus driver salaries, etc.)

The three figures below show the costs of the programme broken down into the capital, renewal and operating for the Do Minimum option, Do BusConnects Cork and the incremental cost, which is the difference between Do BusConnects and the Do Minimum. Renewal and operating costs are used to support the financial appraisal with approval sought for the upfront capital investment presented at the start of this section. The operating costs represent the cost to the Exchequer of running the BusConnects Cork programme.

Figure 3.1.F: Summary of nominal capital costs for Do Minimum, BusConnects Cork and the incremental costs at P50

Upfront capital costs (€m)	Do Minimum	Do BusConnects	Incremental cost
Sustainable Transport Corridors (STCs)	0	784	784
Zero Emission Bus Fleet	177	228	51
Depots	127	171	44
Bus Network Redesign	0	31	31
Programme Support Costs	0	11	11
Next Generation Ticketing (NGT)	26	11	-14
New Bus Stops and Shelters	0	2	2
Base cost (2024 prices)	**329**	**1,238**	**909**
Risk and contingency allowance	65	631	567
Inflation	61	394	333
VAT	88	329	241
Total nominal programme budget (incl-VAT) (2024 – 2062)	**543**	**2,592**	**2,049**

Figure 3.1.G: Summary of nominal renewal costs for Do Minimum, BusConnects Cork and the incremental costs at P50

Renewal costs (€m)	Do Minimum	Do BusConnects	Incremental cost
Zero Emission Bus Fleet	418	610	192
Depots	29	40	11
Next Generation Ticketing (NGT)	7	7	0
Base costs (2024 prices)	**454**	**657**	**202**
Risk and contingency allowance	53	76	22
Inflation	374	547	173
VAT	195	284	89
Total nominal renewal costs (incl-VAT) (2024 – 2062)	**1,077**	**1,564**	**487**
Total nominal renewal costs (incl-VAT & residual period) (2024 – 2092)	**3,697**	**4,873**	**1,177**

Figure 3.1.H: Summary of nominal operating costs for Do Minimum, BusConnects Cork and the incremental costs at P50

Operating costs (€m)	Do Minimum	Do BusConnects	Incremental cost
PSO Operating Costs	2,037	3,200	1,163
Zero Emission Bus Fleet	274	358	84
Next Generation Ticketing (NGT)	38	33	-5
New Bus Stops and Shelters	0	13	13
Base costs (2024 prices)	**2,349**	**3,604**	**1,255**
Inflation	2,013	3,184	1,171
VAT	1,003	1,561	558
Total nominal operating costs (incl-VAT) (2024 – 2062)	**5,366**	**8,350**	**2,985**
Total nominal operating costs (incl-VAT & residual period) (2024 – 2092)	**16,218**	**25,562**	**9,344**

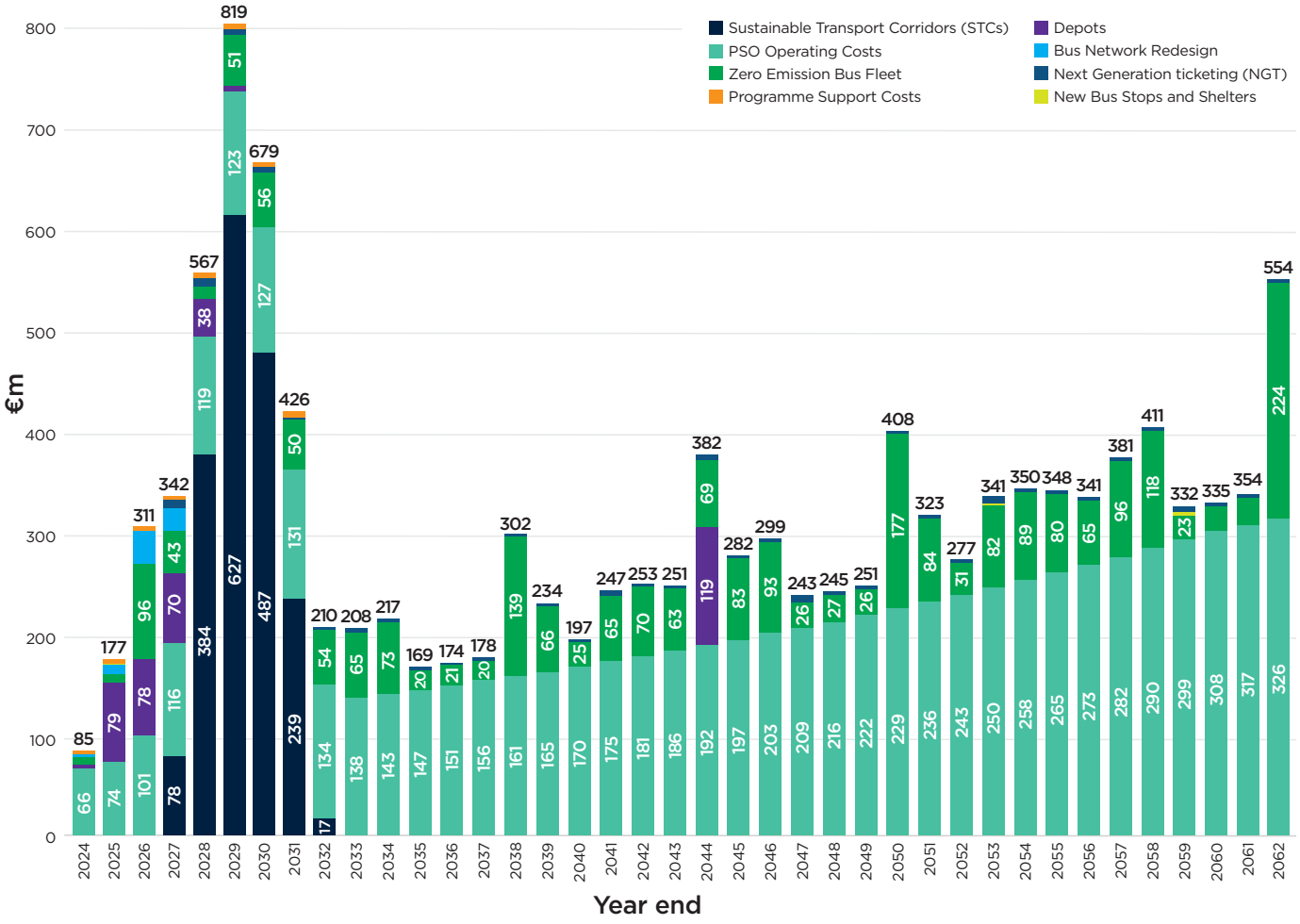
The scope of each component project included in the costs for the Do Minimum and Do BusConnects Cork options is shown in the figure below separated by the cost categories of capital, renewal and operational costs.

Figure 3.1.I: Project scope included in capital, renewal and operating costs for Do Minimum and Do BusConnects options

Capital scope		
Project	**Do Minimum scope**	**Do BusConnects scope**
STC	No costs	The 11 planned STCs corridors are grouped into three schemes as shown below: • Cork City North Sustainable Transport Corridors Scheme • Cork City South East Sustainable Transport Corridors Scheme • Cork City South West Sustainable Transport Corridors Scheme Capital expenditure is a combination of all upfront implementation costs including: infrastructure; land; and professional fees.
Depots	Capital expenditure includes: • Development of temporary depot at Tivoli • Electrification of existing depot at Capwell • Construction of a new electrified depots at Kinsale Rd	Capital expenditure includes: • Development of temporary depot at Tivoli • Electrification of existing depot at Capwell • Construction of two new electrified depots at Kinsale Rd and site TBD
Zero Emission Bus Fleet	Capital expenditure includes cost of purchasing zero emission and hybrid transition buses. Current fleet of 125 buses expands to 226 zero emission buses by 2034.	Capital expenditure includes cost of purchasing zero-emission and hybrid transition buses. The fleet will gradually be electrified. Current fleet of 125 buses expands to 341 zero-emission buses by 2034.
Bus Network Redesign	No costs - maintain existing network	Capital expenditure includes the cost of planning and design services for the new network. The light engineering costs includes the costs of stops, stands, signage, interchanges and termini.
Next Generation Ticketing (NGT)	The procurement costs for new ticketing system, capital costs for supply installation and LEAP compatibility of the new solution, ongoing LEAP operation costs and ongoing operating costs for the new solution.	Cost of implementing NGT includes mainly actual tendered rollout cost (with removal of rail and regional bus cost); and NTA implementation team cost. The assumption is that the implementation of the NGT back-office has already occurred in Dublin. NGT Cork would use this existing back-office leading to a lower capital expenditure than in the Do Minimum scenario, where a new back-office is procured.
New Bus Stops and Shelters	No costs - maintain existing infrastructure	Implementation costs of the real time passenger information, shelters and associated civil works.
Programme Support Costs	No costs	Capital expenditure costs includes advisory costs, preparation of business cases, future travel requirements and associated costs and office rental.
Operating scope		
Project	**Do Minimum scope**	**Do BusConnects scope**
Zero Emission Bus Fleet	Covers Zero Emission Bus Fleet maintenance and fuel/electricity costs. Inputs from BusConnects Dublin used once validated. Zero Emission Bus Fleet maintenance and fuel/electricity costs were removed from PSO cost to avoid double counting.	Covers Zero Emission Bus Fleet maintenance and fuel/electricity costs. The average fuel and electricity costs per kilometre by vehicle type is used to calculate the costs. This average cost was developed and used in the BusConnects Dublin PBC. Average annual maintenance costs per bus type were taken from the BusConnects Dublin PBC and used to the Cork vehicle type profile to calculate the cost.
Public Service Obligation (PSO) Costs	Includes driver/admin/engineering staff costs; overheads; and claims.	These are direct award contract costs for the operator (Bus Éireann) to deliver the new network. The total cost includes admin/engineering staff costs; overheads; and claims. Based on the Route Cost Model developed for Cork NRD, a direct award costs has been calculated for each of the new routes. The annual cost has been calculated using the current schedule for launching the routes.
Next Generation Ticketing	Estimated Leap 2.0 operational cost (including back-office and devices) plus the cost of maintaining Leap until 2031.	Actual tendered operational cost (back-office costs included in Dublin) plus the cost of running Leap in parallel until 2034.
Stops and Shelters	No costs	It is 0.05% of the capital expenditure for stops and shelters. It relates to the ongoing operation and maintenance of the real time passenger information and shelters.
Renewal scope		
Project	**Do Minimum scope**	**Do BusConnects scope**
Zero Emission Bus Fleet	It is assumed: • Every six years, post purchase, batteries are replaced • Every 12 years, post purchase, buses are replaced • Renewal costs commence in 2032	It is assumed: • Every six years, post purchase, batteries are replaced • Every 12 years, post purchase, buses are replaced • Renewal costs commence in 2032
Depots	Renewal of Capwell electrification after 20 years at 25% of initial cost.	Renewal of Capwell electrification after 20 years assumed to be 25% of initial cost.
Next Generation Ticketing	Renewal occurs every six years with the first renewal year being 2041. This is a capital renewal cost which is to maintain the system such as updating equipment.	Renewal occurs every six years with the first renewal year being 2041. This is a capital renewal cost which is to maintain the system such as updating equipment.

The next figure shows the profile of the total spend on the above scope through 2062, with the bulk of capital spend occurring between 2026 and 2031, peaking during construction of the STCs from 2028-2031. Operating costs run from 2024-2062 increasing at a rate of 3% per year with spikes in renewal spend in certain years due to bus fleet.

Figure 3.1.J: Profile of nominal spend to 2062 by BusConnects Cork project



Additional cost sensitivity analysis

The robust cost estimation process includes variations in inflation, construction timelines, and risk and contingency at P30, P50 and P80 confidence levels that allows the programme team to understand impacts and sensitivities to these different factors. Additionally, as it can be difficult to foresee changes in key input costs and to predict the performance of the network in the future, which could be driven by many different factors, sensitivities to changes in capital and operating costs were also tested. With an increase or decrease of 10% in base capital costs, programme costs increased by 8.6% and decreased by 10.8%. As would be expected, total programme costs are more sensitive to changes in base operating costs with a 10% increase or decreased leading to a 10% increase and 17% decrease in overall programme costs, shown in the next figure.

Figure 3.1.K: Capital costs (CAPEX) plus renewals and operating costs (OPEX) variability sensitivity analysis

Total cost (€m)	CAPEX & Renewals +10%	CAPEX & Renewals -10%	OPEX +10%	OPEX -10%
Base costs (2024 prices)	**2,088**	**1,701**	**3,928**	**3,281**
Risk and contingency allowance	779	635	-	-
Inflation	1,041	842	3,483	2,886
VAT	676	551	1,704	1,418
Total nominal programme budget (incl-VAT) (2024 – 2062)	**4,584**	**3,729**	**9,115**	**7,586**

Understanding impacts is important to maintain control over costs and management of contingency budgets. The next chapter will review how the BusConnects Cork programme will be delivered, which includes a robust and efficient governance structure that will manage cost and contingency on an ongoing basis. The management of the programme includes monthly cost reporting, quarterly forecast updates and access to contingency funds only following proper document and change control, to be released by the appropriate governance forum.

3.2 Financial appraisal and affordability

The primary purpose of the financial appraisal is to understand affordability and the fiscal impact of implementing the BusConnects Cork programme. This evaluation serves as a foundational step preceding the economic analysis, focusing solely on financial cash flows, whereas the economic analysis delves into broader societal costs and benefits. The key aims of the financial appraisal are to estimate the financial cashflows, assess the extent to which investment, renewal and operational costs will not be recouped by net revenue, and calculate financial performance including net present value (NPV).

The BusConnects Cork programme is compared to the Do Minimum option, which assumes a future state without BusConnects Cork. The financial appraisal examines the incremental costs and revenues of the Do Something option (Do BusConnects, or the BusConnects Cork programme) over the Do Minimum.

In line with the Transport Appraisal Framework, the financial appraisal and economic modelling are carried out over an appraisal period between 2024 and 2032 for construction, followed by a 30-year appraisal period following opening year (2032-2062) and a 30-year residual value period that includes renewal costs and operating costs (2062-2092). This approach has been adopted in both the financial and economic appraisals.

As shown in Section 3.1, costs have been broken down by component project across capital, renewal and operating costs. Incremental costs are used to carry out the discounted cashflow (DCF) analysis and total costs are used for the affordability analysis, with the exception of operating costs, which are shown on an incremental basis in line with methodology used to calculate revenue and Public Service Obligation (PSO) costs. In the case of the capital costs used in the financial appraisal, the P5O costs are used, as they represent the most likely (by definition) outturn costs.

BusConnects Cork revenue comes from the collection of bus fares from customers and is exempt from VAT. Revenue is modelled on an incremental basis (i.e., the additional revenue that would be brought about by the Do BusConnects option). The 2023 gross revenue was sourced from the NTA's *Bus and Rail Statistics for Ireland – State Funded Services Statistical Bulletin*[8] and the revenue forecasts are outputs of the transport model at the design years of 2032 and 2047 for the Do Minimum and Do BusConnects options. Straight-line growth between these data points has been assumed to calculate revenue from 2024-2062.

[8]To be published: PSO Bus & Rail Statistics Bulletins 2012 – 2022 - National Transport

Discounted cash flow (DCF)

Cashflows are discounted using two rates to allow for sensitivity to potential variations in borrowing and inflation rates over time: a test discount rate of 4% in real terms; and a discount rate of 3.14% in nominal terms (per guidance from the Department of Public Expenditure, NDP Delivery and Reform and the National Development Finance Agency May 2025). A flat inflation rate of 2% has been applied to bus fare revenues and inflation rates for costs have been determined from multiple indices based on specific project components, as outlined in Section 3.1.

The figure below provides a summary of the DCF analysis based on incremental revenues and costs for BusConnects Cork compared to the Do Minimum option. These values are presented in both real and nominal terms, accounting for VAT and contingency at the P50 level. NPVs are calculated for these discount rate options by adding together the discounted cashflows, applying real or nominal terms as appropriate to the DCFs (i.e., real cash flows at real discount rates and nominal cash flows at nominal discount rates).

Figure 3.2.A: Discounted cash flow summary using incremental costs

Incremental (€m)	Cash flows	Discounted @4%	Discounted @3.14%
Revenue	1,539	394	993
Total inflows (real)	**1,539**	**394**	**993**
Capital costs	(1,475)	(1,170)	(1,381)
Renewal costs	(380)	(106)	(254)
Operating costs	(2,283)	(726)	(1,563)
Total outflows (real)	**(4,139)**	**(2,002)**	**(3,198)**
Total net cash flow (real)	**(2,599)**	**(1,607)**	**(2,205)**
Total net cash flow (nominal)	**(6,659)**	**(1,899)**	**(2,923)**
Total net cash flow (nominal incl. VAT)	**(8,852)**	**(2,304)**	**(3,674)**

Affordability

In addition to the DCF analysis, the Infrastructure Guidelines require an affordability assessment to outline the overall investment envelope, cost timing, and ongoing operation and maintenance costs (net of revenues). The affordability analysis is calculated using total capital investment and renewal costs and incremental revenues and operating costs for BusConnects Cork compared to the Do Minimum option.

The next figure shows the net cash flows annually from 2024 to 2032 and for the ten-year periods from 2032 to 2062 as well as the residual appraisal period from 2062-2092. Project components are presented in real terms (2024 prices), with inflation and VAT impacts considered on a total programme basis. It is assumed that the cash flow impacts illustrated would have consequential effects on the general Government balance sheet, with the VAT cost offset on an overall Exchequer basis.

Figure 3.2.B: Affordability assessment – total capital investment and renewal costs at P50 (cash outflow)

Capital cost and renewal cost cashflow (€m)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033-2043	2044-2053	2054-2063	2064-2092 Residual	Totals
Capital costs at P50 (real cashflow – base costs + risk and contingency allowance)														
Bus Network Redesign	(3)	(7)	(23)	(15)	-	-	-	-	-	-	-	-	-	(47)
Programme Support Costs	(2)	(2)	(3)	(2)	(3)	(3)	(2)	(2)	-	-	-	-	-	(19)
New Bus Stops and Shelters	-	(2)	(0)	-	-	-	-	-	-	-	-	-	-	(2)
Sustainable Transport Corridors (STCs)	-	-	-	(60)	(285)	(453)	(341)	(163)	(14)	-	-	-	-	(1,315)
Depots	(5)	(65)	(62)	(54)	(28)	(5)	-	-	-	-	-	-	-	(218)
Zero Emission Bus Fleet	-	-	(63)	(22)	-	(27)	(29)	(25)	(18)	(68)	-	-	-	(251)
Next Generation Ticketing (NGT)	-	-	-	(6)	(6)	(3)	(2)	-	-	-	-	-	-	(17)
Subtotal - capital costs (cash outflow)	**(9)**	**(76)**	**(151)**	**(159)**	**(321)**	**(490)**	**(374)**	**(189)**	**(32)**	**(68)**	**-**	**-**	**-**	**(1,869)**
Renewal costs (real cashflow + base costs + risk and contingency allowance)														
Bus Network Redesign	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Bus Stops and Shelters	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Depots	-	-	-	-	-	-	-	-	-	-	(52)	-	(80)	(132)
Zero Emission Bus Fleet	-	-	-	-	-	-	-	-	(10)	(202)	(244)	(252)	(672)	(1,380)
Next Generation Ticketing (NGT)	-	-	-	-	-	-	-	-	-	(2)	(5)	(2)	(12)	(22)
Subtotal - renewal costs (cash outflow)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**(10)**	**(205)**	**(300)**	**(255)**	**(764)**	**(1,533)**
Total cash outflow (real)	**(9)**	**(76)**	**(151)**	**(159)**	**(321)**	**(490)**	**(374)**	**(189)**	**(41)**	**(272)**	**(300)**	**(255)**	**(764)**	**(3,403)**
Inflation	(0)	(6)	(16)	(23)	(61)	(110)	(97)	(55)	(9)	(105)	(227)	(261)	(1,907)	(2,877)
Total cash outflow (nominal)	**(10)**	**(82)**	**(166)**	**(183)**	**(382)**	**(600)**	**(471)**	**(244)**	**(51)**	**(377)**	**(527)**	**(516)**	**(2,671)**	**(6,280)**
VAT	(2)	(12)	(32)	(29)	(51)	(80)	(64)	(34)	(8)	(87)	(111)	(119)	(557)	(1,185)
Total cash outflow (nominal incl. VAT)	**(12)**	**(94)**	**(198)**	**(212)**	**(434)**	**(680)**	**(535)**	**(278)**	**(58)**	**(464)**	**(638)**	**(635)**	**(3,228)**	**(7,465)**

The overall cash outflow above (including VAT and contingency) averages €278 million per annum between 2024 and 2032, peaking at €680 million in 2029. This highlights the funding required for the initial capital outlay, and the later renewals required.

Figure 3.2.C: Affordability assessment – incremental revenue (cash inflow) and incremental operating costs (cash outflow)

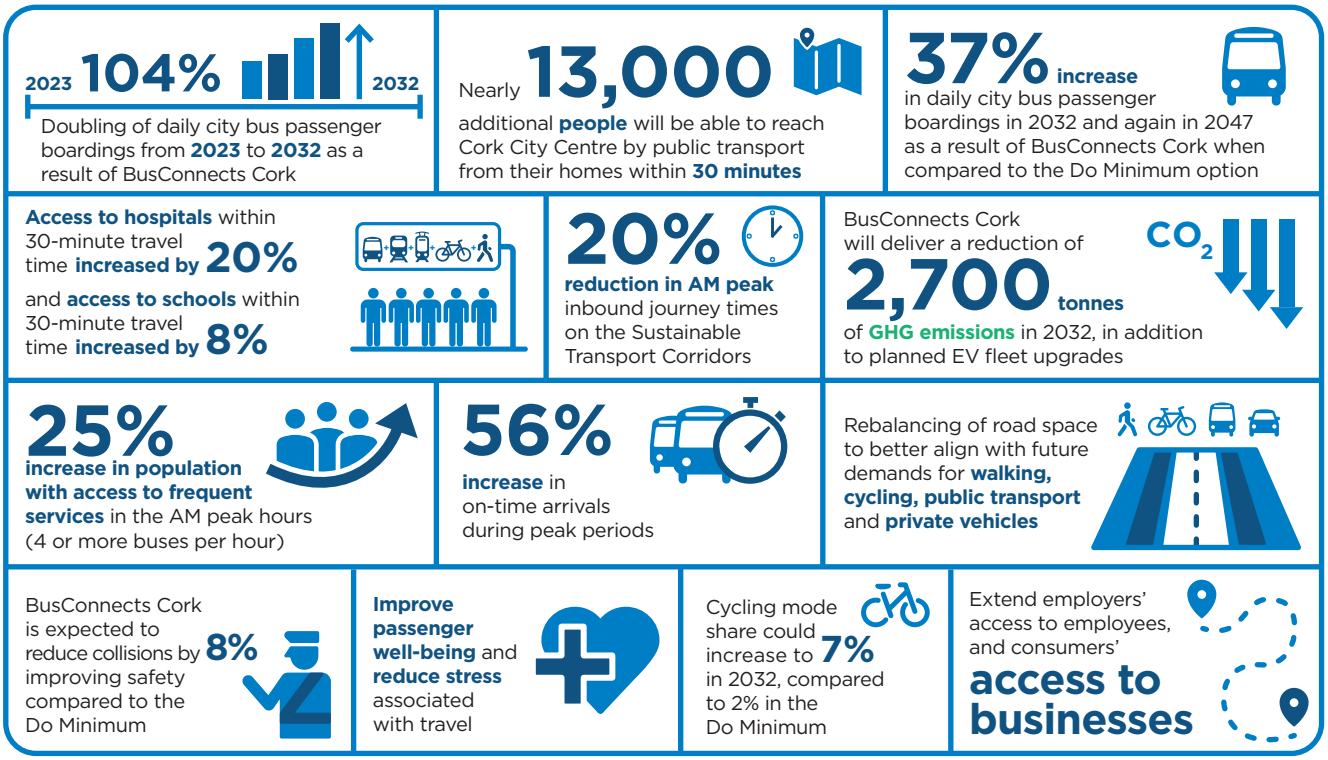
Incremental (€m)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033-2043	2044-2053	2054-2063	2064-2092 Residual	Totals
Total incremental revenue	-	2	4	6	8	10	12	14	16	192	205	233	839	1,539
Total incremental cash inflow	**-**	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**192**	**205**	**233**	**839**	**1,539**
Operating costs (incremental)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Next Generation Ticketing (NGT)	-	1	2	1	1	(0)	(0)	(0)	(1)	1	1	1	(3)	2
New Bus Stops and Shelters	-	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(4)	(4)	(4)	(11)	(25)
Increase in Bus PSO costs	-	(5)	(23)	(32)	(32)	(32)	(32)	(32)	(32)	(347)	(315)	(315)	(915)	(2,109)
Zero Emission Bus Fleet	-	-	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(25)	(23)	(23)	(65)	(152)
Subtotal - operating costs	**-**	**(4)**	**(23)**	**(33)**	**(33)**	**(34)**	**(34)**	**(35)**	**(36)**	**(376)**	**(341)**	**(341)**	**(994)**	**(2,284)**
Total incremental cash outflow (real)	**-**	**(4)**	**(23)**	**(33)**	**(33)**	**(34)**	**(34)**	**(35)**	**(36)**	**(376)**	**(341)**	**(341)**	**(994)**	**(2,284)**
Total incremental net cash flow (real)	**-**	**(2)**	**(19)**	**(27)**	**(25)**	**(24)**	**(23)**	**(21)**	**(20)**	**(184)**	**(136)**	**(108)**	**(155)**	**(744)**
Inflation	-	(0)	(2)	(4)	(4)	(5)	(6)	(7)	(7)	(139)	(240)	(379)	(2,344)	(3,137)
Total incremental net cash flow (nominal)	**-**	**(2)**	**(21)**	**(31)**	**(30)**	**(30)**	**(29)**	**(27)**	**(27)**	**(323)**	**(376)**	**(487)**	**(2,500)**	**(3,881)**
VAT	-	(1)	(6)	(9)	(9)	(9)	(10)	(10)	(11)	(134)	(165)	(221)	(1,164)	(1,747)
Total incremental net cash outflow (nominal incl. VAT)	**-**	**(3)**	**(27)**	**(39)**	**(38)**	**(39)**	**(38)**	**(38)**	**(38)**	**(457)**	**(541)**	**(707)**	**(3,664)**	**(5,629)**

The values above show that the PSO costs (i.e., staff, admin, and overhead costs) are the largest incremental cashflow experienced during operations, costing around €84 million per annum in real terms in Do BusConnects, which is roughly €32 million larger than in the Do Minimum option. **As is expected with a major public transport system, incremental operating costs are substantially greater than incremental revenue, which leads to an incremental net cash outflow throughout the appraisal period averaging around €48 million per year to 2062** (including VAT, inflation, and P50 contingency). This incremental cash outflow is counterbalanced by the societal and economic benefits associated with such critical infrastructure, which will be further explained in economic appraisal in the next section.

3.3 Key benefits of the BusConnects Cork programme

The economic impacts presented in the previous section tell a compelling story of the benefits of the BusConnects Cork programme with limited disbenefits to private vehicle users. Public transport users will have faster journey times, more reliable bus services and better access to public transport and other opportunities as a result. The simplification of routes, improved information and fare payments, together with investment in high quality bus shelters and interchange facilities will deliver a higher quality service that will make public transport more attractive. Improvements in cycling infrastructure, dedicated bus lanes and integrated ticketing will encourage a shift away from private vehicles to more sustainable modes. A fully electrified bus fleet will remove carbon emissions from services, combined with fewer private vehicle trips to deliver benefits to the environment. A summary of these key benefits is shown in the next figure.

Figure 3.3.A: Summary of BusConnects Cork programme benefits



BusConnects Cork is projected to increase demand for public transport, driving modal shift to more sustainable transport modes. There is a projected 22% increase in daily public transport passenger boardings and 37% increase in daily city bus passenger boardings in 2032 and again in 2047 when compared to the Do Minimum option. From 2023 to 2032, daily city bus passenger boardings are projected to increase by 104%, and 155% from 2023 to 2047, as a result of BusConnects Cork.

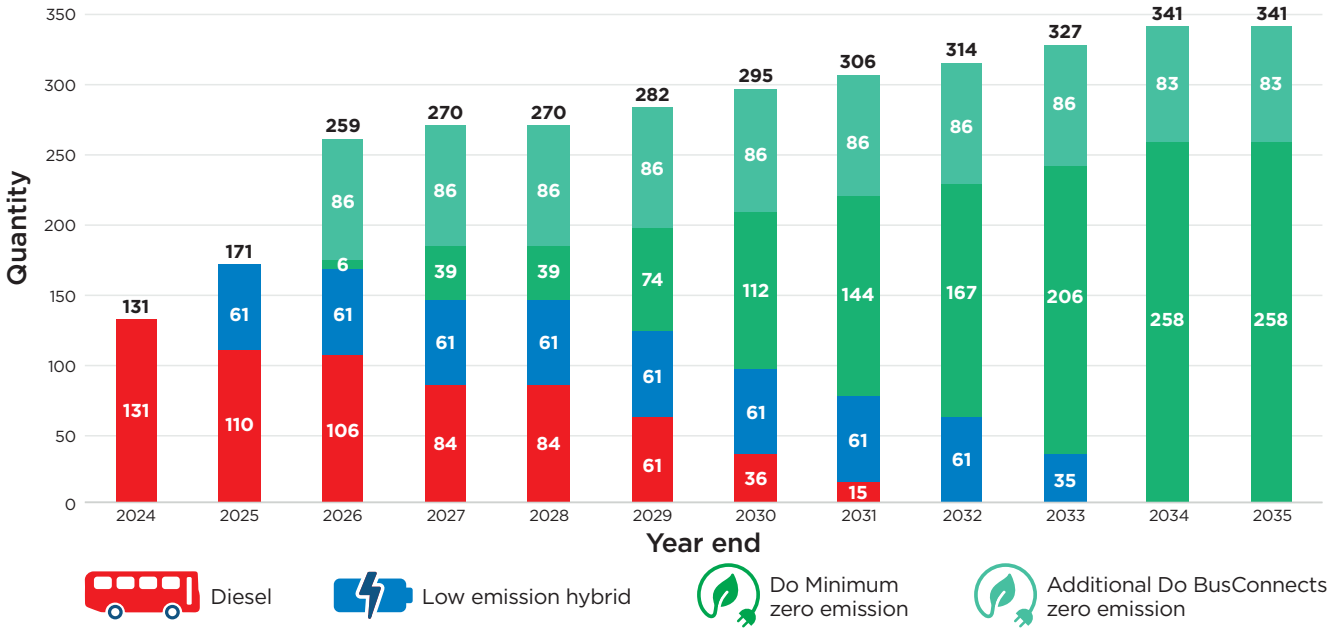
Additional benefits could materialise that are not possible to quantify at this stage, but that can be updated as part of the next business case. These include impacts on accessibility, job creation and some additional environmental impacts. The overall identified impacts to society are expected to be positive, increasing the population with access to frequent bus services and alternatives to private car use that currently dominates the region.

Climate and environmental performance

Core to the impact of the BusConnects Cork programme is its impact on greenhouse gas (GHG) emissions and how the programme supports environmental resilience. Transport emissions are the second largest source of GHG emissions in Ireland, contributing 19% in 2022. Government is committed to the Climate Action Plan to reduce emissions by 50% to 2030 and achieving net zero by 2050. The reduction in GHG emissions is a quantifiable benefit of the BusConnects Cork programme through modal switch towards public transport and cycling, a reduction in private vehicle kilometres travelled and a reduction in transport emissions through transition to a low and then zero emission bus fleet.

The figure below shows the transition of the fleet to low and zero emission vehicles including additional fleet required to deliver the BusConnects Cork programme.

Figure 3.3.B: Transition to low emission bus fleet, Do Minimum compared to Do BusConnects



The NTA's Environmental Appraisal Tool, including the ENEVAL software, has been used to estimate the changes in GHG emissions as a result of BusConnects Cork. Overall, the modelling estimates that BusConnects Cork will deliver a **reduction in carbon emissions of approximately 2,700 tonnes in its first year of operation (2032)**, which is equivalent to two Pairc Ui Chaoimh Stadiums or 545 Olympic-sized swimming pools. This is also approximately equal to the amount of GHG emissions produced each year to charge every smartphone in Ireland.

Over subsequent years, it is expected that the reduction in carbon due to BusConnects Cork will diminish as the rates of electrification of private cars increase in the Do Minimum scenario. Therefore, the quantified benefit is most pronounced at the beginning of the BusConnects programme's operational phase, as over time the wider transport network will tend toward decarbonisation. In the design year 2047, BusConnects Cork will lead to a reduction of just over 700 tonnes of carbon emissions before the eventual transition to net zero.

The reduction in carbon emissions as a result of BusConnects Cork was monetised using the March 2024 updated parameter values for the shadow price of carbon. This shadow price is based on the likely cost of removing these emissions from the atmosphere and increases annually, representing the increasingly urgent requirement to reduce emissions. The discounted monetised impact as a result of reductions in GHG emissions as €6,670,341 (2016 values).

In addition to the reduction of GHG emissions, infrastructure plays an essential role in building more resilient economies and societies by reducing vulnerability to current and future climate shocks. If infrastructure continues to operate despite an adverse weather event, communities and business can continue to function and better absorb these shocks. The components of the BusConnects Cork programme have been designed to understand and mitigate against environmental impacts including flooding events. The Sustainable Transport Corridors will undergo environmental impact assessments to ensure they can withstand impacts of climate change, while also being constructed in a sustainable way, limiting the impacts of construction on the environment. Similarly, other new infrastructure, such as depot facilities and stops and shelters, will consider appropriate building materials in preparation for further climate change and how to make sustainable choices in procurement and construction. All elements of the programme also take into account how to allow for increased capacity and additional services over time to continue to support a transition to more sustainable transport modes.

BusConnects Cork also supports the NTA Sustainability Strategy 2024-2030 by aligning with its three main goals: 'Avoid and Reduce,' 'Shift to Sustainable,' and 'Improve Energy Efficiency.' The figure below includes the objectives of the strategy and how BusConnects Cork will support achievement of those objectives.

Figure 3.3.C: BusConnects Cork supporting the delivery of the NTA Sustainability Strategy 2024-2030

NTA sustainability objective	How BusConnects Cork will help achieve it
1. Integrating land use and transport planning	Aligning with CMATS, the BusConnects Cork programme will improve bus and active travel to serve the growing population and economy in Cork, alongside other public transport improvements.
2. Promoting behaviour change	The programme encourages sustainable travel through improved and integrated public transport services, making buses and active travel more attractive options.
3. Incentivizing reduced car use	Through its redesigned bus network, introduction of bus priority lanes and cycle facilities, and simpler fares and ticketing, BusConnects Cork minimizes dependency on private car use and lowers greenhouse gas emissions.
4. Expanding active travel infrastructure	BusConnects Cork includes 95 kilometres of cycle facilities (one direction), contributing to a significant expansion of Cork's cycling network.
5. Developing sustainable public transport	The programme will enable more people to use buses by implementing a new bus network with a modern ticketing system better tailored to meet current and future passenger needs.
6. Providing public transport infrastructure	The programme includes 11 Sustainable Transport Corridors with dedicated bus lanes and new stops and shelters to support efficient public transport services.
7. Building public awareness	Through extensive public consultation and marketing of new services, BusConnects Cork raises awareness of sustainable transport options and new mobility solutions.
8. Adopting environmentally-friendly practices	The programme incorporates environmental procurement, construction and operational best practices.
9. Transitioning to low emission vehicles	BusConnects Cork includes the transition to a zero emission bus fleet, electrification of the existing bus depot and new, electrified depot infrastructure.
10. Embedding sustainability	The programme emphasizes sustainability in all component projects, promoting sustainable mobility and increased access to a user-friendly public transport network.

Ultimately, without the intervention of BusConnects Cork, congestion in the CMA will continue to increase, impacting physical health from increased GHG emissions and mental health from stressful and lengthy journeys. The BusConnects Cork programme provides critically important, reliable bus and active travel networks that give people a viable alternative to driving and can accommodate the continued growth of the region.

3.4 Economic appraisal and sensitivity analysis

This section explains the economic impacts that could arise from the BusConnects Cork programme and the appraisal carried out on those impacts. The economic appraisal is informed by requirements from the Infrastructure Guidelines and Transport Appraisal Framework with additional guidance from the NTA's Project Approval Guidelines (PAG) for specific models.

The economic appraisal takes into account several inputs including the programme costs in Section 3.1, the demand analysis outlined in Chapter 2, and is carried out on the Do Minimum and Do Something: BusConnects Cork options also described in Chapter 2 (with the scope of all shortlisted options shown in Figure 2.3.F). These inputs will be used in a cost benefit analysis (CBA) that compares the present value of quantified benefits against the present value of costs to come up with the economic NPV and the benefit cost ratio (BCR) alongside consideration of other qualitative economic impacts. This appraisal also includes a detailed sensitivity analysis to assess how vulnerable the programme is to unavoidable future uncertainties, and to test the robustness of the appraisal result.

The costs used in the central economic assessment are the P80 costs, representing the programme costs at which there is an 80% probability that those costs will not be exceeded. This is a prudent approach that is more conservative than using the P50 costs.

The CBA has been undertaken using a bespoke economic model and a suite of transport models, including the: South West Regional Model (SWRM);[9] Transport User Benefits Appraisal software (TUBA); Environment Module (ENEVAL); Cost and Benefits to Accidents – Light Touch (COBALT); and Tool for Economic Appraisal of Active Modes (TEAM). The figure below outlines the core assumptions used in the appraisal. Unless otherwise stated, all values throughout the appraisal are reported in 2016 price base, discounted to present value, and cover the full appraisal period (30 years from opening year, plus a 30-year residual value as noted in the financial appraisal).

Figure 3.4.A: Assumptions used in economic appraisal

Assumption	Value	Source
Price base	2016	Transport Appraisal Framework
Discount rate	4% for 30 years, 3.5% for 31-60 years, 3% thereafter	Transport Appraisal Framework
Shadow price of public funds	1.3	Transport Appraisal Framework
Shadow price of labour	1.0	Transport Appraisal Framework
Modelled years	2032, 2047	Project specific
Scheme opening year	2032	Project specific
Appraisal period	30 years from opening + 30 years residual value	Project specific, based on Transport Appraisal Framework
Values of time	Varies by purpose. Values per hour are: €26.16 for in-work travel €8.90 for commuting €8.01 for other	Transport Appraisal Framework
Shadow price of carbon	Varies annually	Infrastructure Guidelines, March 2024 circular

[9]Additional model details: NTA Regional Modelling System - Modelling Development Report for the South West Regional Model

The total present value of benefits measured over the 30-year appraisal period with a 30-year residual (€2,813 million) is projected to outweigh the total present value of costs (€1,866 million), resulting in an NPV of €943 million, shown in the next figures. The BusConnects Cork programme is estimated to have a BCR of 1.50 indicating that for every €1 spent, the programme will generate €1.50 in benefits in the core scenario.

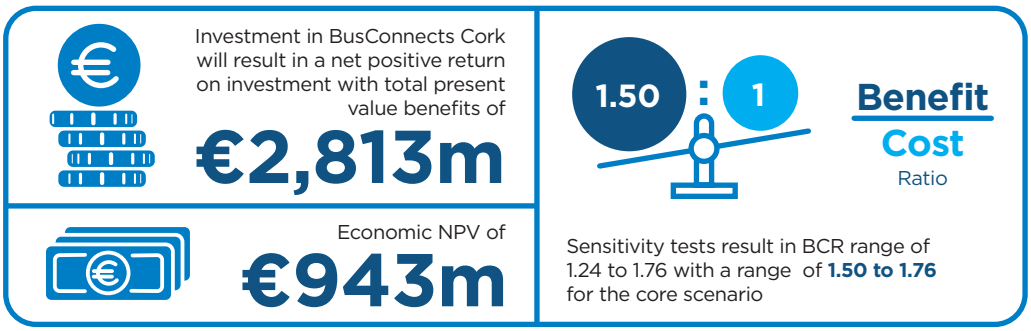
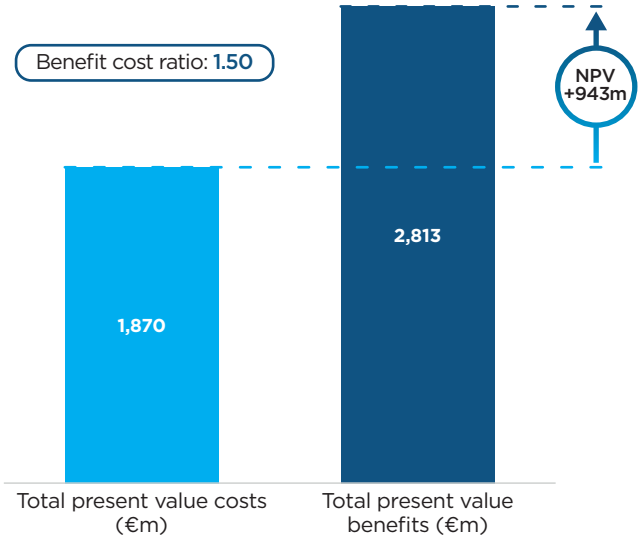


Figure 3.4.B: Economic appraisal results (€m, 2024-2092)

	Value (€m)
Transport users	1,592
Active mode	193
Reliability	994
Safety	27
Environmental	7
Total present value benefits	**2,813**
Total present value costs	**1,870**
Net present value	**943**

Figure 3.4.C: BusConnects Cork NPV (€m, 2024-2092) and BCR



Economic appraisal

The CBA seeks to monetise certain impacts of BusConnects Cork across a range of categories including impacts on: public transport and road users; active modes; reliability; safety; and the environment. The figure below shows the total net present value of these impacts (€2,813 million) that will be discussed in further detail. Other qualitative impacts are also noted, but not monetised and included in the NPV or BCR.

Figure 3.4.D: Discounted BusConnects Cork benefits using 2016 price base (€'000)

Total impacts	Value (€'000)
Transport user impact: public transport journey time saving	2,012,876
Transport user impact: private vehicle journey time saving	-597,573
Transport user impact: revenue (tolls, fares and other charges)	210,403
Transport user impact: impact on tax revenues	-33,780
Active mode impacts	192,983
Reliability impact: lateness	853,328
Reliability impact: lost kilometres	140,317
Safety impacts	27,340
Environmental impacts	6,670
Total present value benefits	**2,812,564**

Transport user impacts

Transport user impacts were developed using the SWRM and TUBA models and include changes to journey time, charges and tax revenues from both public transport and private vehicle users. The generalised journey time measure includes in-vehicle time, transfer time, walk and wait time.

This analysis shows that while some private vehicle users will experience slightly longer journey times, the overall impact on transport users is positive with public transport journey time savings significantly outweighing disbenefits to private vehicles. Specifically, for public transport users:

- **The average public transport journey time will reduce by approximately 20% for travel into the city along the Sustainable Transport Corridors in the morning peak period.** The morning peak period is highlighted in this instance as it has the highest travel demand.
- Over 95% of benefits arise from journey time savings greater than five minutes (€1,924 million in quantified impact).

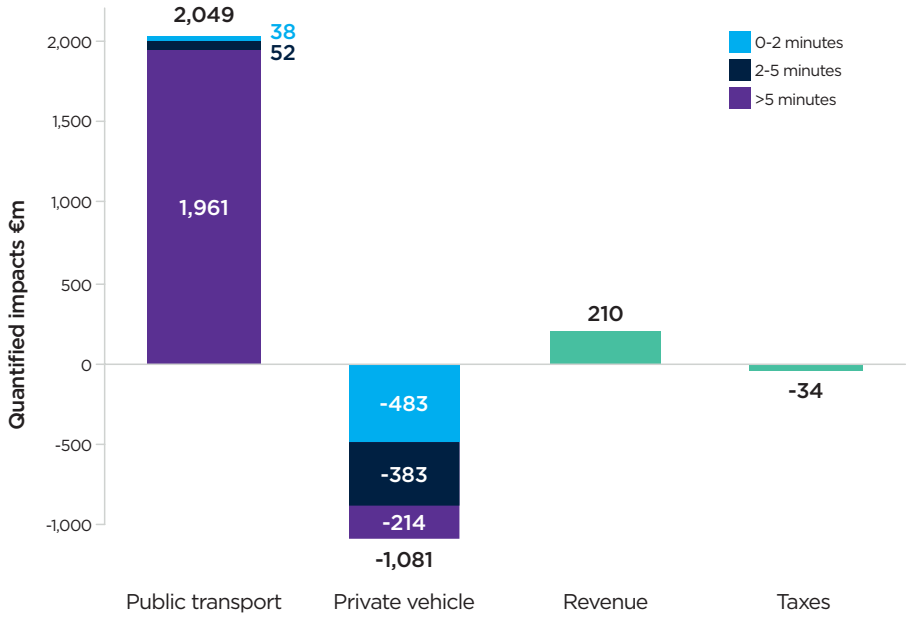
For some private vehicle users:

- Travel times increase due to road space being reallocated for bus lanes, redesigned junctions and bus gates that, combined, allow priority travel for public transport.
- Results indicate that 47% of traffic into the Cork City area in the morning peak will experience journey time changes of less than one minute, with 68% having a change of less than two minutes (equivalent to the length of one traffic signal cycle at a single signal-controlled junction), and only 20% experience impacts over five minutes.
- Approximately 57% of all private vehicle journey time disbenefits are represented by business users and goods vehicles. These users have the highest value of time, which means that disbenefits incurred by these users have a higher monetary penalty. Some of these impacts could be mitigated as business travellers may be more flexible in their journeys by choosing alternative modes, time of travel, or reducing the need to travel. Similarly, goods vehicles will likely adjust their schedules to avoid overly busy times.

The figure below shows the total quantified transport user impacts with a net benefit of €1,592 million when excluding both positive and negative journey time impacts of less than two minutes. Nearly half of private vehicle journey time disbenefits occur from a journey time increase of less than two minutes, with a weighted average increase in private vehicle journey times for commuters in the morning peak travelling within Cork City of only 37 seconds. As this impact is likely not noticeable to most people

given it is roughly equivalent to waiting at one cycle of a traffic signal, it was not included in the core scenario of this Preliminary Business Case. When the impacts to journey times under two minutes are included, the overall net benefit is €1,145 million.

Figure 3.4.E: Quantified transport user impacts (€m)



Active mode impacts

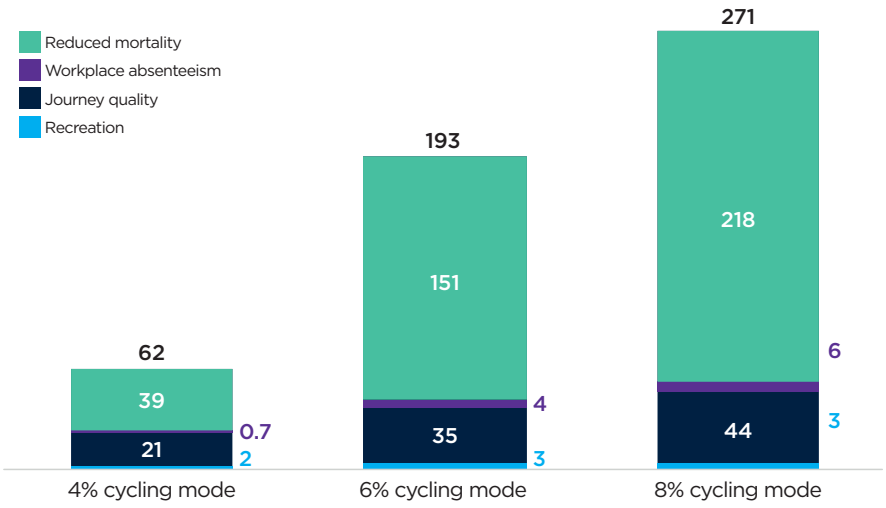
Active mode impacts were developed using TEAM and SWRM models as well as the NTA's Cycle Propensity Tool, and include health, quality and journey time benefits from changing travel mode to walking and cycling. The Cycle Propensity Tool estimates that following the implementation of BusConnects Cork, **cycling mode share could reach 7% in 2032, compared to 2% in the Do Minimum option**. Active travel brings benefits to society across many different aspects, including:

- **Health impacts:** Regular physical activity helps to reduce the risk of various illnesses such as diabetes, cardiovascular diseases and depression. Riding a bike to work every day reduces the risk of premature death by 41%.[10] Regular physical activity reduces absences from work due to improvements in physical health, increasing economic productivity.
- **Journey quality:** Segregated cycle facilities reduce the perceived levels of risk and conflict between cyclists and road users making this mode more accessible to a wider spectrum of potential users. Improved infrastructure will reduce collisions and protect cyclists who are the most vulnerable road users. In the case of improved cycle facilities, the average speed of cycling would be expected to increase, reducing journey times with further projected improvements in quality.
- **Recreation:** Cycling infrastructure improvements benefit both users for specific journeys and recreational users leading to improved well-being due to access to high quality facilities for outdoor recreation.

The figure below shows the quantified impact for walking and cycling, assuming different levels of increase in this active travel mode share, with 6% used in the total present value of benefits (€193 million).

[10]Sources: British Medical Journal, 2017; NTA Cork CMAT Cycling

Figure 3.4.F: Quantified walking and cycling impacts (€m)



Reliability impacts

Poor journey time reliability significantly impacts user confidence in the public transport network, particularly when seeking to connect with other modes of transport. There are two factors that can be measured—journey time variability (mean lateness calculating the average delay of bus arrival in minutes compared to the schedule at a given location) and lost kilometres (planned services that do not operate for various reasons like congestion and therefore reduce the frequency of services). The impact of these elements is not captured within the SWRM and is therefore calculated separately. Reliability impacts are more significant for existing rather than new users, and for this reason, the 'rule of half' is applied to new users per the Transport Appraisal Framework. In both measures of reliability impact, the assumptions and approach taken are considered to be conservative, using observed data from 2023 and holding this impact constant for future years. Care has been taken to avoid double counting and as the impacts are independent, and benefits from both approaches are included in the core scenario.

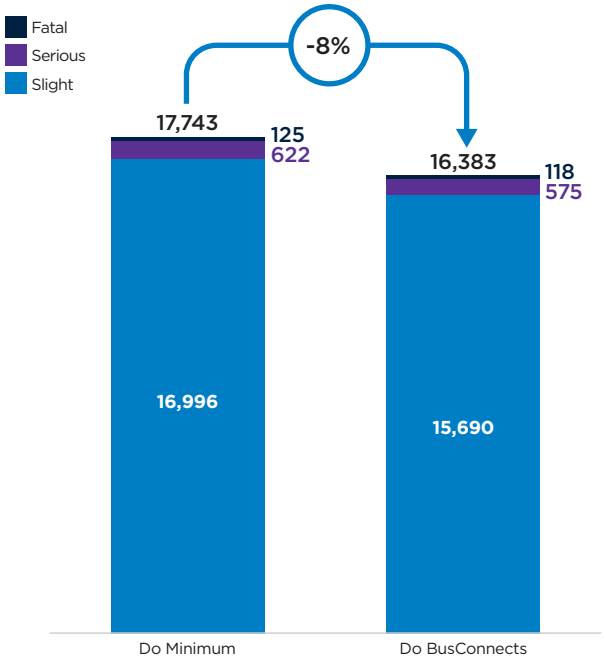
Based on automatic vehicle location (AVL) data, the weekday average lateness of bus services is 5.5 minutes, with this increasing to between 10 and 12 minutes at peak times, and reducing to three minutes at off-peak times. With BusConnects Cork, it is expected that all periods would operate closer to current off-peak conditions, therefore delivering **a reduction in weekday average lateness of 2.5 minutes per bus journey** for all urban bus users, i.e., from 5.5 minutes to three minutes. The total contribution to benefits is estimated as €853 million. For the user, this equates to a **56% increase in on-time arrivals during peak periods**.

One of the main issues with the current Cork bus network is planned services being cancelled for a variety of reasons, which is often known as 'ghost buses,' and in the contracts to operate these services, this is known as 'lost kilometres.' The scale of this problem in Cork is more significant that other parts of the bus network and is not captured in the transport modelling nor the mean lateness analysis specified in the Transport Appraisal Framework. Given this, a methodology to capture the change in lost kilometres as a result of the BusConnects Cork programme was developed and is presented in this case. Though a non-standard measure, this is a key component of improving the attractiveness and relibability of the Cork bus network and is a key benefit of the BusConnects Cork programme. To estimate the impact of lost kilometres, the headways between buses has been increased to reflect the time impact on passengers. BusConnects Cork will reduce the likelihood of some causes for services not to operate, including: 'no serviceable bus,' 'service cannot be operated to planned schedule' and 'abnormal traffic congestion,' amounting to a **reduction of 30% of the total lost kilometres**. This was applied with the headways to estimate the reduction in lateness with a total contribution to benefits estimated as €140 million.

Safety impacts

Safety impacts were assessed using the COBALT and SWRM models and include impacts from a reduction in overall collisions due to fewer private vehicles and improved infrastructure. **BusConnects Cork will contribute to a shift in mode share and a reduction in vehicles on the road network, leading to an 8% reduction in collisions.** These reductions are mainly occurring on urban streets with lower speeds in the CMA, which in the COBALT model has reduced collision rates (particularly serious and fatal collisions) when compared to more rural roads. This reduction in collisions generates €27 million in benefits.

Figure 3.4.G: Number of collisions in Do Minimum and Do BusConnects options (€m)



Environmental impacts

Environmental impacts were assessed using the ENEVAL and SWRM models along with emission rates from the COPERT 4 model and occur as a result of increased public transport usage and electrified fleet. BusConnects Cork will contribute to meeting Government's Climate Action Plan target of 50% reduction in greenhouse gas (GHG) emissions by 2030 and net zero 2050 by promoting modal shift to public transport and active travel, reducing private vehicle kilometres travelled, reducing emissions from the bus fleet as it transitions to an all-electric fleet, and making more efficient use of space to support long-term compact growth.

The total monetised benefit to the environment is estimated to be €6.67 million. This value shows an overall positive impact but may be lower than expected as the economic appraisal compares the Do Minimum to the Do BusConnects option, and the Do Minimum option includes upgrades to electric vehicle fleet for both buses and private vehicles. Therefore, the difference when BusConnects Cork is implemented is limited to the additional fleet required to operate the 53% increase in bus services. Additionally, there is an overall reduction in car mode share but a general increase in congestion from the increasing journey times and associated emissions for car trips. Overall, **BusConnects Cork will save 2,700 tonnes of GHG emissions in 2032** on top of the Do Minimum option.

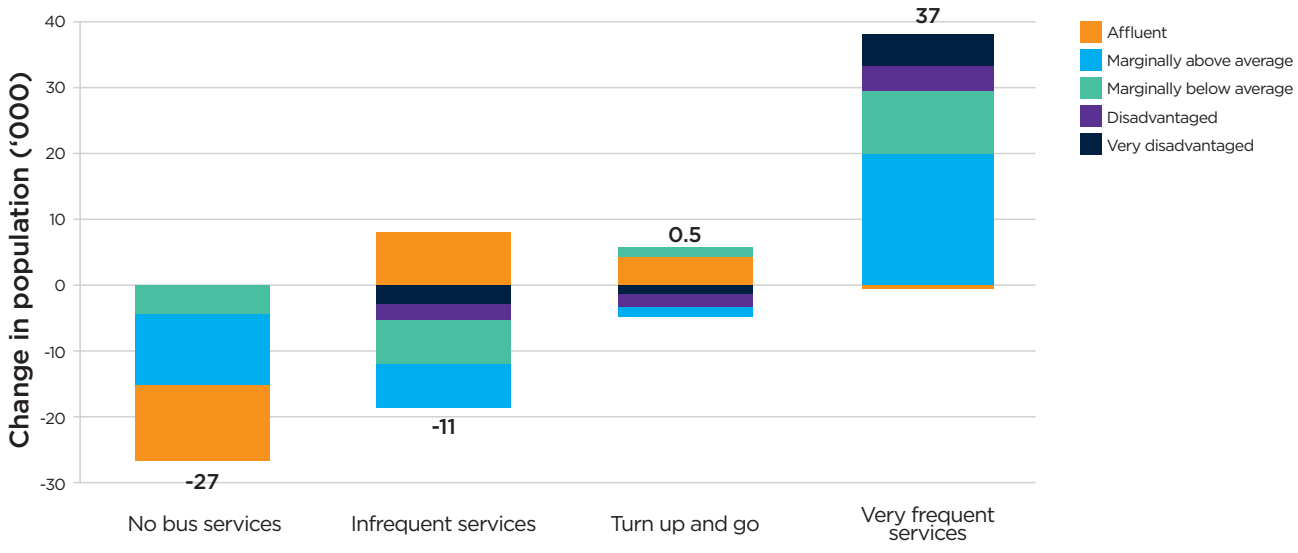
Additional information on environmental impact can be found in Figure 3.3.B on the programme's the environment and climate performance showing the difference in zero emission bus fleet numbers between the Do Minimum and Do BusConnects options, including the timeline of the transition to a fully electric bus fleet.

Other quantitative and qualitative impacts

BusConnects Cork will create some impacts that cannot be easily monetised or reliably quantified due to a lack of detailed information on the planned changes, lack of data to assess the impacts, or lack of robust methodology to assess them. More detailed consideration can be given to these impacts at the next stage of the business case development. These qualitative impacts include:

- **Access to key destinations:** An **additional 12,971 people will be able to reach Cork City Centre by public transport within 30 minutes. Access to key services within a 30-minute public transport travel time will also increase by 20% for hospitals and 8% for schools.**
- **Usability and wellbeing:** The simplification of routes, improved information services and fare payments, together with investment in high quality bus shelters and interchange facilities, will **deliver a higher quality service that can reduce the stress associated with travelling, improving health and wellbeing.**
- **Extended catchment for employers and customers:** The BusConnects Cork programme will significantly reduce peak period bus journey times making it easier for people to access opportunities and services throughout the CMA. **Employers will benefit from the larger employment catchment area that results from faster journeys,** and the programme may contribute to revitalisation of declining urban areas and improve their suitability as business locations.
- **Accessibility:** The redesign of the bus routes will provide greater access to bus services giving considerable social inclusion benefits consistent with the NTA's overall equality objectives. The improved journey times, more reliable services, increased frequencies and expansion of the network to serve more origins and destinations will improve access to employment, education, healthcare for all users including vulnerable groups. Additionally, analysis into the change in population within 400 metres of a bus stop after BusConnects is implemented shows **a reduction in the number of people with no bus services or infrequent services (less than 4 buses per hour)**. There is also an **increase in the population who will benefit from frequent services (4 or more buses per hour)**. The figure below shows changes in access to frequent bus service by level of affluence, suggesting that BusConnects Cork will deliver additional benefits to society beyond those that have been monetised.

Figure 3.4.H: Change in population by level of affluence impacted by change in bus service frequency ('000)



[11]Source: Failte Ireland

- **Other wider economic impacts:** BusConnects Cork will **create jobs** during the planning and construction of the proposed infrastructure. Once operational, the additional services will require more drivers, creating an uplift in employment. The investment in infrastructure will also **generate additional economic growth** across the region. The South West Region is also a destination for domestic and international visitors, attracting 4.7 million visitors in 2019.**11** For most visitors, buses and taxis are the most common mode of transport to get around Cork. BusConnects will **increase access to more destinations via bus through an easy-to-understand network with simpler fares and easier payments that will make it more attractive to use public transport.**
- **Other environmental impacts:** Additional environmental impacts could occur from construction of the STCs. Detailed work regarding examination of environmental impacts is underway that will inform the environmental impact assessment reports as part of a number of planning applications to An Bord Pleanála for the STCs. BusConnects Cork will also likely **reduce noise pollution** as the electric fleet will be quieter than the current diesel vehicles. Upgrades to stops and shelters will **enhance the visual appearance of the public realm** and **redesigned junctions will provide opportunities to improve the landscape**. Some disbenefits to biodiversity, water resources and soil quality could occur from road upgrades.

Economic costs

The steps to develop the economic costs are shown in the figure below and follows Infrastructure Guidelines and Transport Appraisal Framework.

Figure 3.4.I: Development of economic costs

Process:	Action:
Input:	**Financial costs at P80 contingency (from financial appraisal)**
	Remove revenue
	Remove VAT
	Rebase costs to 2016 prices
	Remove inflation
	Uplift for Shadow Price of Public Funds
	Discount to determine Net Present Cost
	Determine differential between 'Do Minimum' and 'Do BusConnects'
Output:	**Economic costs**

Economic costs are shown for the Do Minimum and Do BusConnects options for a 30-year operating period and a 30-year residual period and are based on the P80 cost estimates.

Figure 3.4.J: Economic costs for Do Minimum and Do Something: BusConnects Cork options (€m, 2024-2092)

(€m)	Do Minimum	Do BusConnects	Incremental cost
Capital costs (2016 price base)			
Sustainable Transport Corridors (STCs)	0	1,372	1,372
Zero Emission Bus Fleet	178	230	52
Depots	156	211	55
Network Redesign preparatory costs	0	45	45
Next Generation Ticketing (NGT)	37	16	-21
Programme Support Costs	0	20	20
Non-STC bus shelters and pole costs	0	2	2
Subtotal - capital costs	**371**	**1,897**	**1,525**
Renewal costs (2016 price base)			
Zero Emission Bus Fleet	934	1,264	330
Depots	110	118	8
Next Generation Ticketing (NGT)	21	21	0
Subtotal - renewal costs	**1,065**	**1,403**	**338**
Operating costs (2016 price base)			
Increase in bus PSO costs	3,028	4,800	1,772
Zero Emission Bus Fleet	407	534	128
Next Generation Ticketing (NGT)	54	52	-2
Non-STC bus shelters and pole costs	0	21	21
Subtotal - operating costs	**3,488**	**5,406**	**1,918**
Total costs			
Total cost (2016 price base)	4,924	8,706	3,781
Total cost including shadow price	6,402	11,318	4,916
Total economic cost (Total cost discounted to 2016)	**1,751**	**3,622**	**1,870**

Notably, Next Generation Ticketing (NGT) costs are lower in the Do BusConnects option compared to the Do Minimum because if NGT does not proceed, the NTA and/or Bus Éireann would need to run a new public procurement competition to source an equivalent replacement ticketing system. The cost of procuring an entirely new ticketing solution for Cork only would be more expensive than extending the NGT system to Cork as BusConnects Dublin will have paid for the NGT back-office and operational services, and a new standalone ticketing system would require these to be set up from scratch.

Sensitivity tests

Sensitivity tests were undertaken to understand the robustness of the economic appraisal conclusions and test the programme's vulnerability to unavoidable factors. Tests were carried out to show the effects of:

- Reduced growth in demand for services including changes in travel patterns as was seen post-Covid (alternative future demand sensitivity test);
- Additional transport infrastructure projects delivered that do not currently have planning permission, including demand management measures (change in supporting infrastructure sensitivity test);

- Additional journey quality components like real time passenger information and simplified ticketing identified in the UK's Transport Appraisal Guidance (including journey quality factors sensitivity test);
- Including private vehicle journey impacts of less than two minutes (all journey time impacts included in sensitivity test);
- Reduced reliability benefits realised as suggested in the Transport Appraisal Framework (reliability sensitivity test); and
- Reduced costs at P50 and P30 contingency levels, versus the P80 costs applied in all other tests (P50 cost and P30 cost sensitivity tests).

These tests varied the assumptions of the core scenario with results shown in the figure below. The test scenarios showed a range of BCRs from 1.24 to 1.76 compared to the core scenario of 1.50, indicating that the economic case for BusConnects Cork is robust, even if current assumptions change. Additionally, the BCR range of the core scenario itself varied by potential costs from P80 to P30 is 1.50-1.76, further indicating the strength of the economic case for the BusConnects Cork programme.

Figure 3.4.K: Summary of sensitivity test results (€000)

(Impacts in €m)	Core scenario: Do BusConnects	Alternative future demand	Change in supporting infrastructure	Including journey quality factors	All journey time impacts included	Reliability sensitivity	P50 cost contingency	P30 cost contingency
Transport user impact: public transport journey time saving	2,012,876	1,779,271	1,856,137	2,012,876	2,049,359	2,012,876	2,012,876	2,012,876
Transport user impact: private vehicle journey time saving	-597,573	-574,705	-450,106	-597,573	-1,080,882	-597,573	-597,573	-597,573
Transport user impact: revenue (tolls, fares and other charges)	210,403	187,440	133,897	210,403	210,403	210,403	210,403	210,403
Transport user impact: impact on tax revenues	-33,780	-33,968	-25,182	-33,780	-33,780	-33,780	-33,780	-33,780
Active mode impacts	192,983	61,739	192,983	192,983	192,983	192,983	192,983	192,983
Reliability impact: lateness	853,328	735,917	682,278	853,328	853,328	558,739	853,328	853,328
Reliability impact: lost kilometres	140,317	123,517	112,485	140,317	140,317	93,780	140,317	140,317
Safety impacts	27,340	24,237	10,086	27,340	27,340	27,340	27,340	27,340
Environmental impacts	6,670	6,670	6,670	6,670	6,670	6,670	6,670	6,670
RTPI and simplified ticketing	-	-	-	338,168	-	-	-	-
Total present value benefits	**2,812,564**	**2,310,119**	**2,519,248**	**3,150,732**	**2,365,738**	**2,471,438**	**2,812,564**	**2,812,564**
Total present value costs	**1,870,359**	**1,870,359**	**1,870,359**	**1,870,359**	**1,870,359**	**1,870,359**	**1,677,429**	**1,596,535**
Net present value	**942,205**	**439,760**	**648,889**	**1,280,373**	**495,379**	**601,079**	**1,135,135**	**1,216,029**
Benefit cost ratio	**1.50**	**1.24**	**1.35**	**1.68**	**1.26**	**1.32**	**1.67**	**1.76**

The NTA use P80 as the primary basis for the economic appraisal and most of the above sensitivity tests. This, alongside contingency levels that are robust, provides a conservative view of the benefit cost ratio. For completeness, the worst-case scenario, which combines the higher costs and lower benefits presented in the sensitivities above, would equal a BCR of 0.82. Additionally, should all reliability impacts be reduced to 0 for both metrics shown above, the BCR of the core scenario would be 0.98. While plausible, these are deemed to be a very low probability scenarios. The next chapter of this Preliminary Business Case will outline how it will be delivered to ensure delivery of the expected outcomes to cost, time and quality.

4. How will it be delivered?

4.1 Effective programme management and decision making 55

4.2 Proposed approach to procurement 67

HOW DOES THIS CHAPTER COMPLY WITH THE INFRASTRUCTURE GUIDELINES?

- ✓ Proposed approaches to implementation and operation
- ✓ Risk assessment, allowance for optimism bias and full risk management strategy
- ✓ Assessment of delivery risk
- ✓ Plan for monitoring and evaluation including key performance indicators
- ✓ Proposed approach to procurement

4.1 Effective programme management and decision making

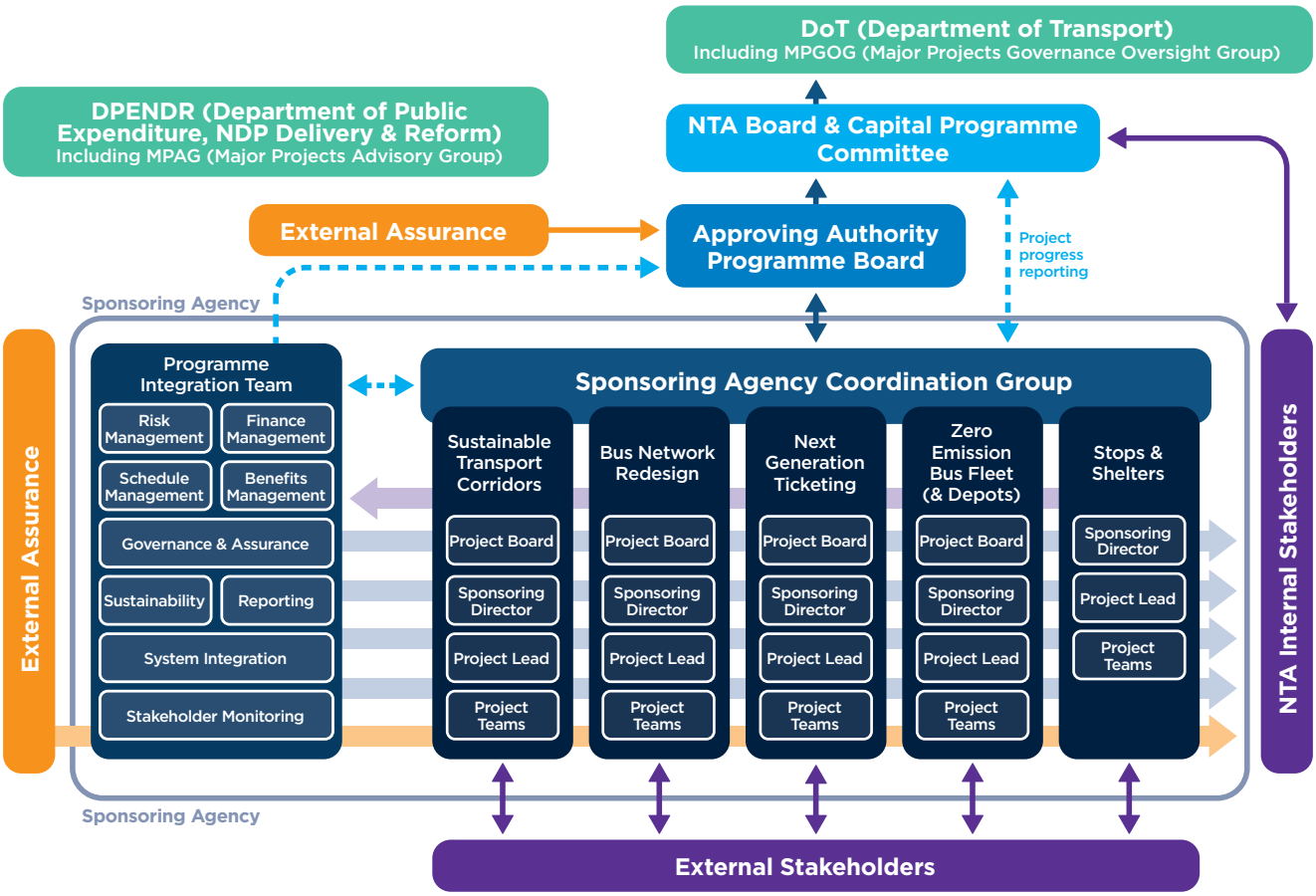
In preparing this Preliminary Business Case, it is not only important to set out the rationale for the investment, but to demonstrate how the programme will be managed through its lifecycle to ensure the expected outcomes can be achieved while getting best value for money.

Governance and decision making

BusConnects Cork includes a diverse set of projects to deliver this service transformation, including complex infrastructure, technology and operational projects that have dependencies on one another. To deliver this programme efficiently and effectively, a wide range of resources with different skillsets are required. Considering the scale and complexity of the programme, and the NTA's role in ticketing and fares, bus fleet and infrastructure, and management of bus operators and services nationally, the NTA is best positioned to act as the Sponsoring Agency for the BusConnects Cork programme to ensure the programme outcomes and benefits are achieved. The NTA is also the Sponsoring Agency for the BusConnects Dublin programme and can apply that knowledge, lessons learned and experience in design and delivery of BusConnects Cork.

Programme structures and governance have been created to demonstrate clear roles and responsibilities and build in the necessary support to deliver this complex programme to its desired outcomes. The programme governance structure, shown in the figure below, was built to allow for timely decision making taken at the right levels, particularly on project level decisions that could have implications on other projects within the programme or the programme outcomes more broadly.

Figure 4.1.A: BusConnects programme governance structure



The solid blue line indicates interaction as per the Infrastructure Guidelines and the NTA Project Approval Guidelines processes and documentation to be developed by the Sponsoring Agency for approval by the Approving Authority

The dashed blue line indicates the flow of information as per best practice programme management reporting on schedule, cost, risk, dependencies, etc.

It should be noted that the New Bus Livery project implementation is managed as part of the Zero Emission Bus Fleet programme and the implementation of the Simplified Fares project forms part of the Bus Network Redesign project.

The governance structure includes several key components:

- **Sponsoring Agency:** The NTA is the Sponsoring Agency is responsible for programme delivery. The Sponsoring Agency structure includes the Coordination Group, Project Boards and teams (described below), and the Programme Integration Team. The Coordination Group facilitates integration and decision-making across the programme and its component projects. The Programme Integration Team is responsible for managing all BusConnects programmes, including BusConnects Cork, in areas of finance, risk, schedule and dependencies, benefits and sustainability, reporting, governance and assurance, to ensure coordination between the projects and across the BusConnects programmes, as required.
- **Project Teams:** Each of the BusConnects component projects has its own project team and project manager. The delivery of the individual workstreams for each of project is the responsibility of the project managers. They are also responsible for the management of the project scope, finance, risks, schedules and dependencies. Individual project meetings will focus on progress towards immediate goals, addressing any emerging issues, and providing regular reporting for consolidated programme level reports.
- **Project Boards:** Each project within the BusConnects programme has its own governance structure, including a Project Board chaired by the sponsoring director of the relevant NTA department. These boards oversee the development and implementation of their respective projects, ensuring they deliver the planned project outputs and benefits.
- **Approving Authority Programme Board:** The NTA is also the Approving Authority for the BusConnects Cork programme with clear governance delineations between those in the NTA that are acting on behalf of the Sponsoring Agency versus that of the Approving Authority. This board, comprised of senior members of the NTA that are not involved in the day-to-day delivery of BusConnects and external advisors, is responsible for overseeing and monitoring the progress of all BusConnects programmes as the Approving Authority, including BusConnects Cork. It grants approval for key decision gates in the project and programme lifecycles, ensuring that the programme is delivered as approved. Reporting is done on a monthly basis to the Programme Board, NTA Capital Programme Committee, NTA Board and Government.
- **NTA Board and Capital Programme Committee:** The NTA Board holds ultimate responsibility for the governance and strategic direction of the NTA. It approves key decisions related to major capital projects, including BusConnects Cork. The NTA Board also allocates resources required for programme delivery and receives regular updates on project and programme progress. To ensure there is additional scrutiny on delivery of major programmes like BusConnects Cork, the programme also reports monthly to the NTA's Capital Programme Committee that supports the NTA Board in decision making on these major transport programmes.
- **Government Departments:** The Department of Transport (DoT) facilitates seeking Government approval for major project and programme milestones. Per the Infrastructure Guidelines, the DoT Secretary General is the Accounting Officer of the BusConnects Cork programme. The DoT provides oversight and assurance of the BusConnects Cork programme through the Major Projects Governance and Oversight Group (MPGOG). Additionally, the Department of Public Expenditure, NDP Delivery and Reform (DPENDR) will be forwarded BusConnects Cork programme business cases for review by the Major Projects Advisory Group as it is estimated to cost over €200 million.

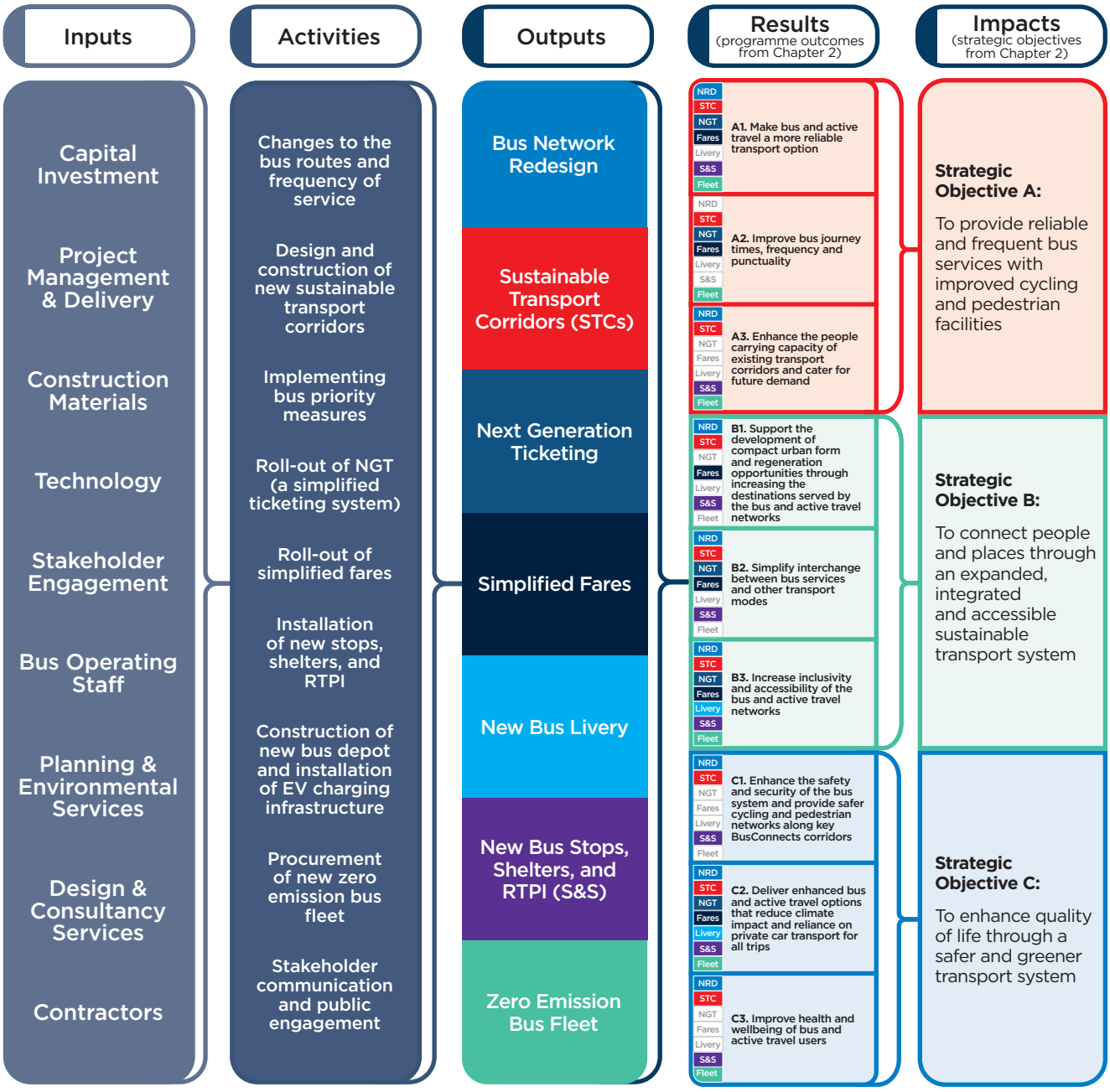
The Next Generation Ticketing (NGT) project is also subject to oversight by the Digital Governance Oversight Unit (DGOU) of the Office of the Government Chief Information Officer (OGCIO) in DPENDR. These entities will be responsible for reviewing and approving the call-off contract to implement NGT on buses in Cork and will also likely review the Final Business Case used to authorize this expenditure.

Monitoring and evaluation

Through its project and programme governance, the BusConnects Cork programme and its component projects are subjected to regular monitoring as well as mid-point and ex-post evaluations. Core requirements include regular monitoring of performance indicators, thorough evaluation of efficiency and effectiveness, and an independent review of programme performance, including its ongoing relevance. Programme monitoring and evaluation is designed to ensure robust delivery and facilitate and maximise learning opportunities within the BusConnects Cork programme.

As set out in the Infrastructure Guidelines and a key component of monitoring and evaluation, a logic path model is used to map the links between inputs, outputs, results and impacts of the programme. Programme outcomes and strategic objectives outlined in Chapter 2 are included in the model, shown below, to ensure that all inputs and activities are driving to those outcomes. The model identifies the causal paths from outputs to those outcomes, helping to identify interim steps required to realise benefits and where and when the benefits and objectives will be achieved. The model also supports identifying unintended results and complexity of interventions, including how to measure them.

Figure 4.1.B: BusConnects Cork programme logic path model



The key monitoring indicators will be determined by the programme outcomes defined in the logic path model and through the appraisal process. These indicators represent a method for measuring the success of the BusConnects Cork programme during and after implementation and allow actual performance to be assessed against projected performance. Establishing the indicators will ensure that robust baseline data is collected and suitable resources are allocated to the ongoing monitoring throughout programme implementation.

Key aspects of the programme are subject to statutory planning consent processes which may result in alterations to different project elements. Following the planning stage, the programme outcomes can be finalised and specific performance indicators confirmed, which will be included in subsequent business cases. Performance indicators will align to programme benefits, which will be linked to delivery of outcomes making those outcomes SMART through quantifiable targets.

Figure 4.1.C: BusConnects Cork key performance indicators for programme outcomes and corresponding data sources

Programme outcomes	Performance indicators	Data source(s)
A1. Make bus and active travel a more reliable transport option	Bus service reliability: ➔ Mean lateness ➔ Lost kilometres	➔ Automatic vehicle location (AVL) data ➔ Operator service kilometre data
	Number of cyclists	Cycle counters and surveys
A2. Improve bus journey times, frequency and punctuality	Journey times	AVL data
	Bus service performance: ➔ Regularity ➔ Punctuality	Operator service performance data
A3. Enhance the people carrying capacity of existing transport corridors and cater for future demand	Bus and public transport passenger boardings	Ticketing data
B1. Support the development of compact urban form and regeneration opportunities through increasing the destinations served by the bus and active travel networks	Increased access to housing, employment, and university places	NTA geographical information system
B2. Simplify interchange between bus services and other transport modes	Transport interchanges	Ticketing data
B3. Improve inclusivity and accessibility of the bus and active travel networks.	Accessibility of services	➔ Free travel pass ticketing data, separated by sub-category ➔ Nationwide mystery shopper surveys
C1. Enhance the safety and security of the bus system and provide safer cycling and pedestrian networks along key BusConnects corridors	Incidents data	Road Safety Authority reports
	Customer satisfaction (perception of safety and security while travelling)	Bus passenger satisfaction survey
C2. Deliver enhanced bus and active travel options that reduce climate impact and reliance on private car transport for all trips	Modal shift	➔ NTA Annual National Household Travel Survey ➔ CSO National Travel Survey ➔ Cycle and pedestrian surveys or counters
	Emissions reduction	Operator fleet emissions
C3. Improve health and wellbeing of bus and active travel users	Travel time saved	Ticketing and AVL data
	Customer satisfaction (perception of health and wellbeing associated with travel)	Bus passenger satisfaction survey

To ensure consistency in monitoring and evaluation while maintaining a proportionate and sustainable approach over the programme's lifecycle, datasets will be defined for each of the indicators. The table above sets out data required for each performance indicator, which will be reviewed and updated during the preparation of future business cases. Emphasis has been placed on data that is readily available and would not require additional expenditure beyond the processing and analysis.

Realising programme benefits

As previously mentioned, the success of BusConnects Cork depends on the successful implementation of many different component projects that have interdependencies. This programmatic approach to BusConnects Cork will allow for realisation of benefits greater than what can be achieved through implementation of individual projects. The NTA has the tools, capabilities and experience to measure, track and monitor the success of this programme. For more advanced projects such as Next Generation Ticket and the Sustainable Transport Corridors, there will be clear targets and processes set to measure the benefits associated with each. Other projects that are at earlier feasibility stages are still in the process of defining and aligning their benefits to the wider BusConnects Cork programme with the support of the Programme Integration Team.

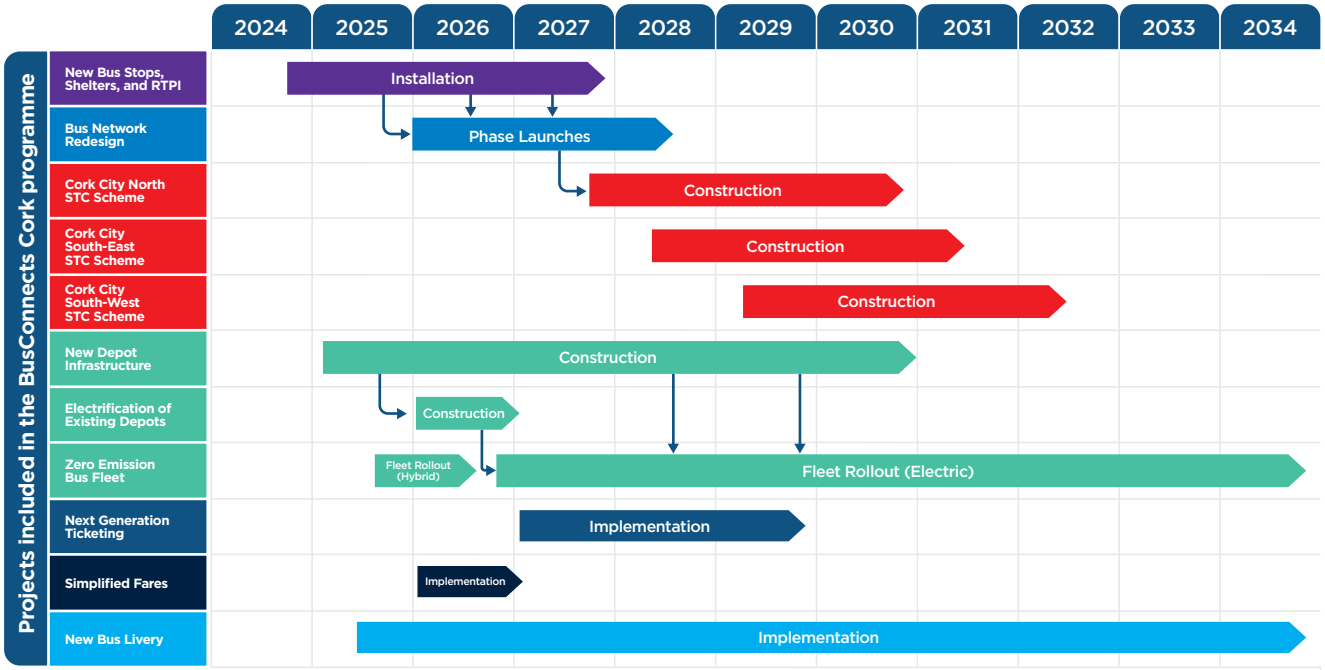
A strong programme-level benefits realisation plan and management process will be put in place to make sure that all benefits are materialising as planned, including identification of interim steps and indicators to show progress during implementation. Benefits management will be transparent and inclusive of all key programme and project stakeholders, integrated with other key project and programme management functions, and will be a continuous activity over the programme lifecycle. Benefits will be managed by the Programme Integration Team, which is also responsible for the benefits of the BusConnects Dublin programme, allowing for lessons to be learned and advanced preparation of data required to manage benefits realisation. The NTA currently publishes a twice-yearly progress report on the BusConnects Dublin programme showing the progress towards benefits realisation as component projects are implemented. When BusConnects Cork enters implementation, its component projects will be included in this report showing its progress towards achievement of its programme benefits. Data used in these reports is used to monitor performance of these projects as part of the above mentioned monitoring and evaluation.

Monitoring and reporting on progress of BusConnects Cork's benefits realisation will reside with the NTA as the Sponsoring Agency of the programme. The benefits realisation plan will build out and consider the roles of other key stakeholders that will have responsibilities for the ongoing operation and maintenance of the BusConnects Cork component projects, noting the NTA holds ultimate responsibility for ensuring the programme outcomes and benefits are achieved. For example, the Sustainable Transport Corridors will be handed over to the local authorities as the roads authorities for ongoing maintenance, but the monitoring of journey time and reliability of the bus services when the corridors are operational will reside with the NTA. Similarly, the Next Generation Ticketing system will be operated and maintained by a supplier, with boarding times and other relevant measures to be monitored by the NTA to ensure realisation of programme benefits. Further information on operation and maintenance of BusConnects Cork projects is addressed later in this section.

Delivery timeline

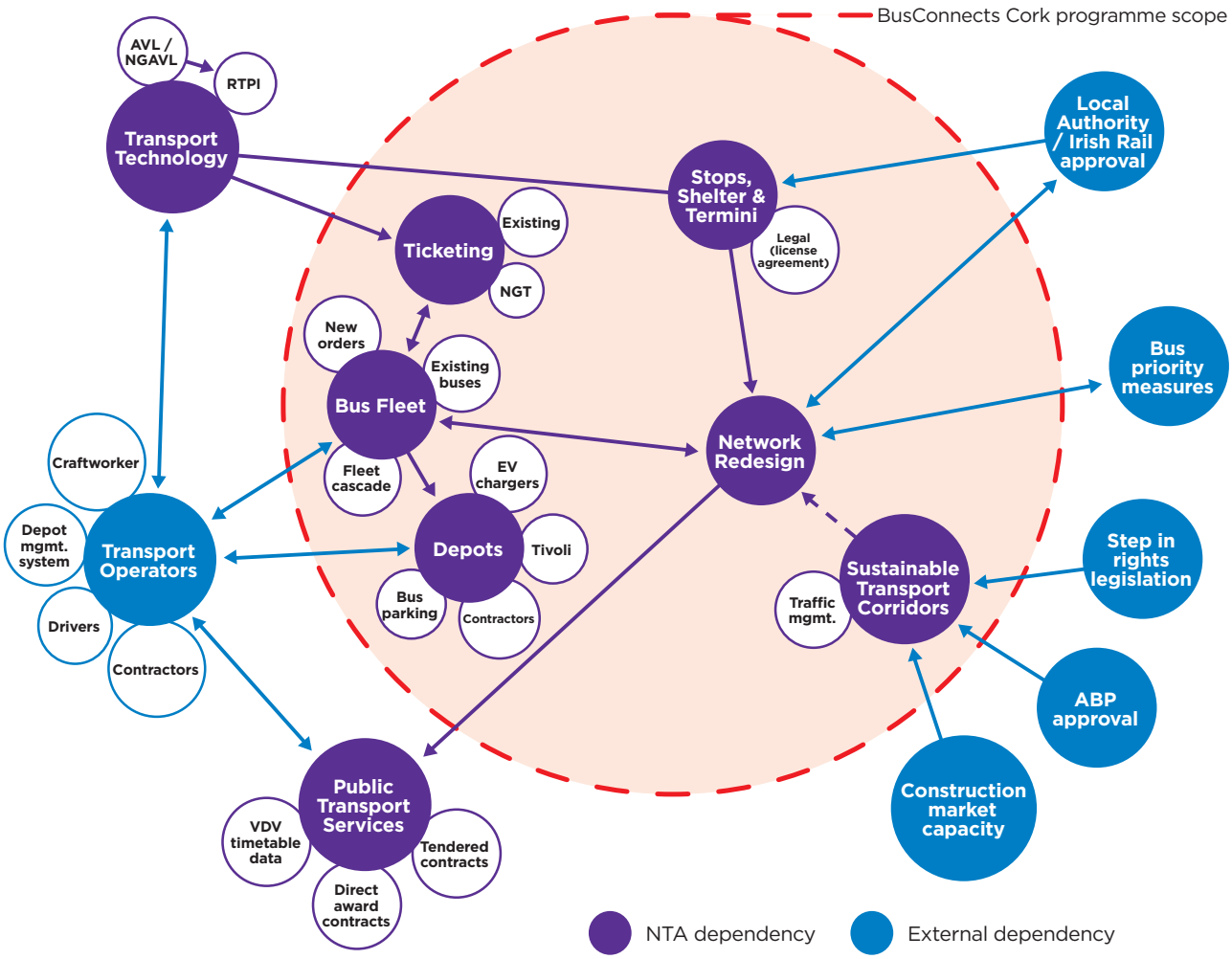
Implementation of the BusConnects Cork programme is shown in the high-level plan below. Arrows denote some of the dependencies between projects, noting that projects will need to progress or be completed to support implementation of other components, again solidifying the need for a programmatic approach delivered by the NTA.

Figure 4.1.D: BusConnects Cork indicative implementation timeline by component project showing key dependencies (as of November 2024)



To further outline the dependencies between the projects, an initial dependency map is shown in the next figure. This map shows the complexity of delivering this programme and importance of the NTA's role in delivery considering its existing areas of responsibility. The map also shows the importance of relationships with other stakeholders critical to successful delivery including bus operators, local authorities, contractors and other key suppliers.

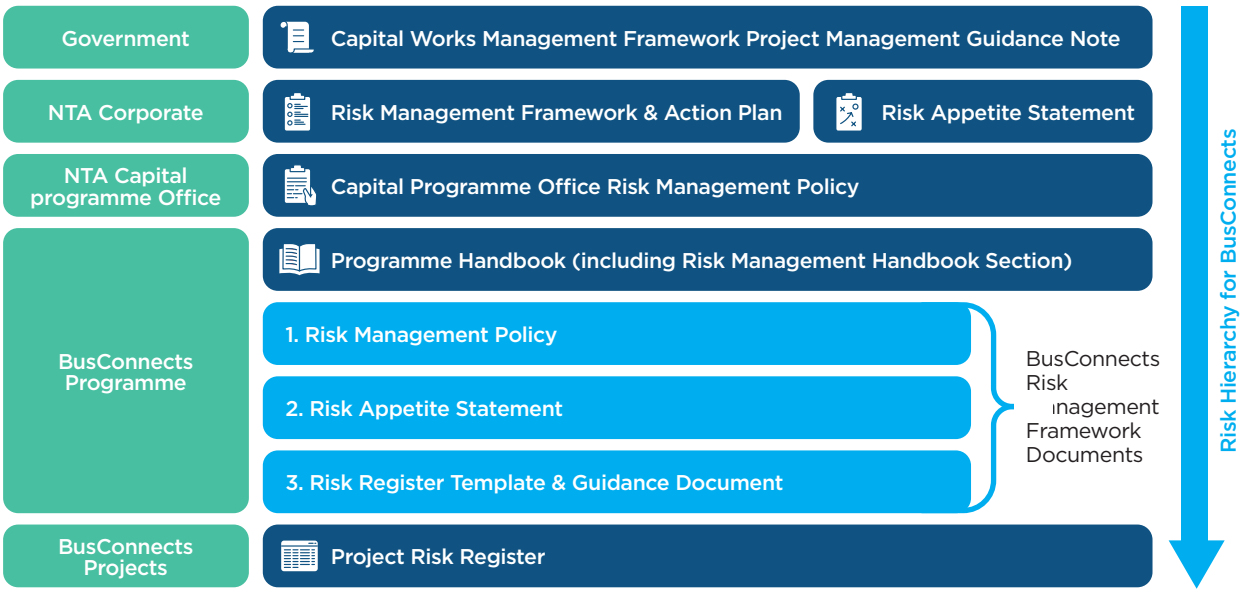
Figure 4.1.E: High-level dependency map for the BusConnects Cork programme



Assessment and management of risk

The BusConnects Cork programme will more efficiently and effectively achieve its outcomes if risk is actively managed and assessed over its lifecycle. The BusConnects risk management approach supplements the NTA's Risk Management Framework and Action Plan, and all associated policies set out by the NTA's Risk Management Team and the NTA's Capital Programme Office (CPO). The figure below sets out the hierarchy of risk documentation across the NTA, CPO and BusConnects to ensure alignment and coordination to support risk escalation and mitigation.

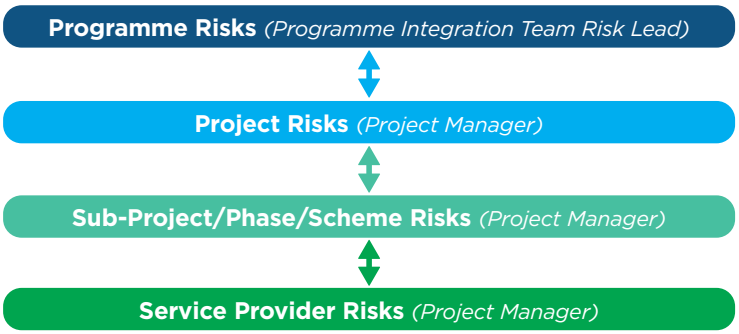
Figure 4.1.F: NTA, CPO and BusConnects programme risk documentation and approach alignment



Risk management

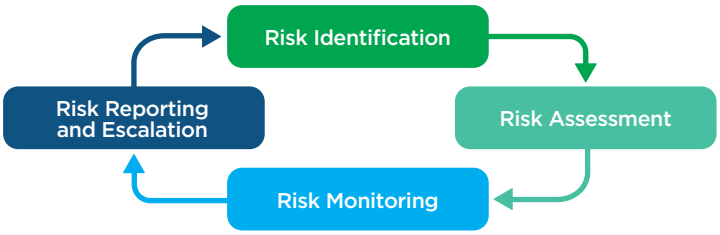
The BusConnects Programme Integration Team is responsible for managing risk and supporting the Sponsoring Agency to assess and mitigate risk at the programme level, working alongside project managers to review and escalate project level risks when required. The NTA as the Sponsoring Agency is fostering a risk-focused culture at both the programme and project levels to actively identify, review, mitigate and report risks throughout the project and programme lifecycles. This commitment to active risk management at all levels supports the integration of effective project controls, clear governance and provides both Project Boards and the BusConnects Programme Board with a clear status of risks and issues, supporting improved decision making.

Figure 4.1.G: BusConnects programme and project level risk management



The BusConnects Cork programme and component projects follow a simple risk management process, shown below. This series of steps are undertaken in a structured way, but steps can be concurrent as risk will constantly be refreshed, assessed and monitored over the programme lifecycle.

Figure 4.1.H: BusConnects risk management process



Risks will be identified by all project and programme stakeholders, as risk ownership is shared across the various BusConnects Cork teams. The Programme Integration Team will support collection of all identified risks into the BusConnects Cork Risk Register, which feeds into a risk dashboard managed across all five BusConnects programmes. Project and programme managers identify risks in their regular meetings and governance forums in addition to controls-focused sessions held monthly with all projects and the Programme Integration Team. Separate risk sessions are often held between the Programme Integration Team and project managers on a quarterly basis to refresh all risks and mitigating actions to combat risk staleness. Additionally, the programme and projects run pre-mortem workshops to support risk identification and management alongside consideration of lessons learned from BusConnects Dublin and other past major transport programmes.

Risk assessment

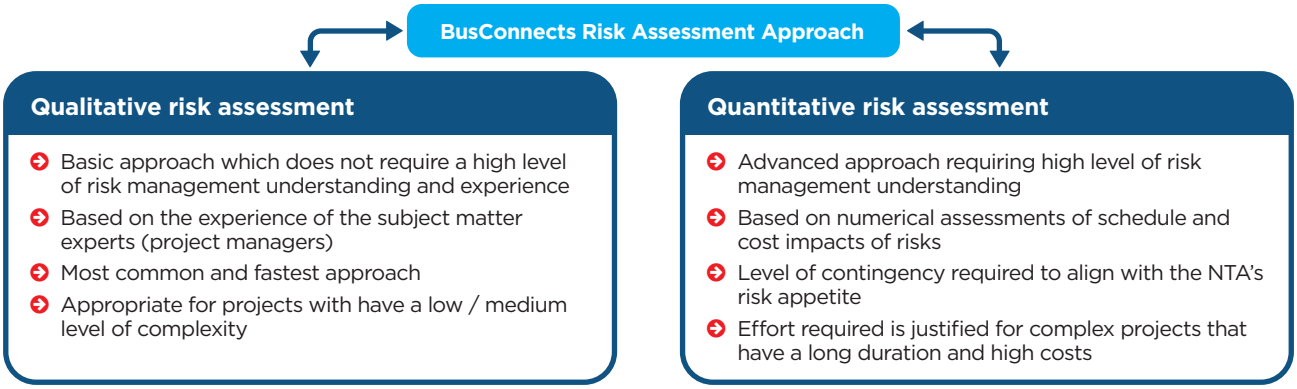
Risk is assessed on the BusConnects programmes using the NTA's risk matrix, shown below. This ensures that risks are rated in the same way across the NTA and all BusConnects programmes, including the Cork programme.

Figure 4.1.I: BusConnects risk matrix aligned to NTA's risk matrix and scoring

Probability	**Very High (>80%)**	**11**	**16**	**20**	**23**	**25**
	High (60-80%)	**7**	**12**	**17**	**21**	**24**
	Medium (40-60%)	**4**	**8**	**13**	**18**	**22**
	Low (20-40%)	**2**	**5**	**9**	**14**	**19**
	Very Low (<20%)	**1**	**3**	**6**	**10**	**15**
		Very Low	**Low**	**Medium**	**High**	**Very High**
Impact	**Scope impact**	Minimal	Minor	Moderate	Large	Major
	Cost impact	<0.5%	0.5 - 1%	1 – 3%	3 - 5%	>5%
	Schedule impact	No or limited schedule impact	Minor delays to schedule	Notable impact to the schedule at project or programme level	Significant impact to the scheduling timeline	Evidence of major scheduling impact at project or programme level
	Reputational impact	Minimal reputational damage	Some press impacting reputation	Reporting in press impacting reputation	Significant reputational damage from local press	Significant reputational damage from global press
	Economic, environmental and social impact	No or limited impacts	Minor negative impacts on economic or social value	Specific measurable impact that will require investment	Regulatory noncompliance issues	Major contravention of statutory policy
	Benefits impact	No benefits impact	Minor delays or reduction to benefits realisation	The benefits realised will be reduced / significantly delayed	The benefits realised will be significantly reduced	Unable to deliver many 'key' benefits
	Health and safety impact	No safety impact	Minor reportable health and safety incident	Multiple reportable health and safety incidents	Life changing injury	Death

BusConnects has established a tailored approach to risk assessment, considering the variations in scope, schedules, cost, and complexity of different projects within the programme. There are two approaches to risk management within BusConnects: qualitative and quantitative risk management. Descriptions of each can be found in the figure below. Risk will be managed qualitatively in most cases based on the above matrix, but a quantitative management approach may be used by the more complex projects or during a particular phase (e.g., Sustainable Transport Corridors during the construction phase, Next Generation Ticketing implementation phase).

Figure 4.1.J: BusConnects risk assessment approaches



Risk is also further delineated between Current Priority and Longer Term risks with the former focused on imminent risks and the latter on risks that could manifest in later years and may not change as much on a weekly or monthly basis. Currently, the BusConnects Cork programme has 43 project level risks and 30 programme level risks identified across the Current Priority and Longer Term categories. Of the 30 programme risks, 12 are rated red, 16 amber and 2 yellow. The top red programme risks (from score 24 to 21) include Longer Term risks on insufficient government funding, failure to deliver programme outcomes and constraints in the supplier market. Current Priority red risks include: readiness of transport operators to support delivery of component projects; delays to fleet absorption and fleet cascade from other regions; delivery of Tivoli depot and electrification of Capwell depot to allow for operation of new electric fleet or cascaded diesel/hybrid fleet from other regions; driver availability to bring in new services; delays to legislation required for NTA to deliver the Sustainable Transport Corridors in the CMA; and public opposition to the programme. Many of these risks are related to management of key dependencies between projects or with external stakeholders that could compromise delivery of the programme outcomes.

As part of the assessment of risk, each risk is assigned mitigations with owners and deadlines for each proposed activity. The programme has several approaches to risk mitigation that depend on the risk itself, including:

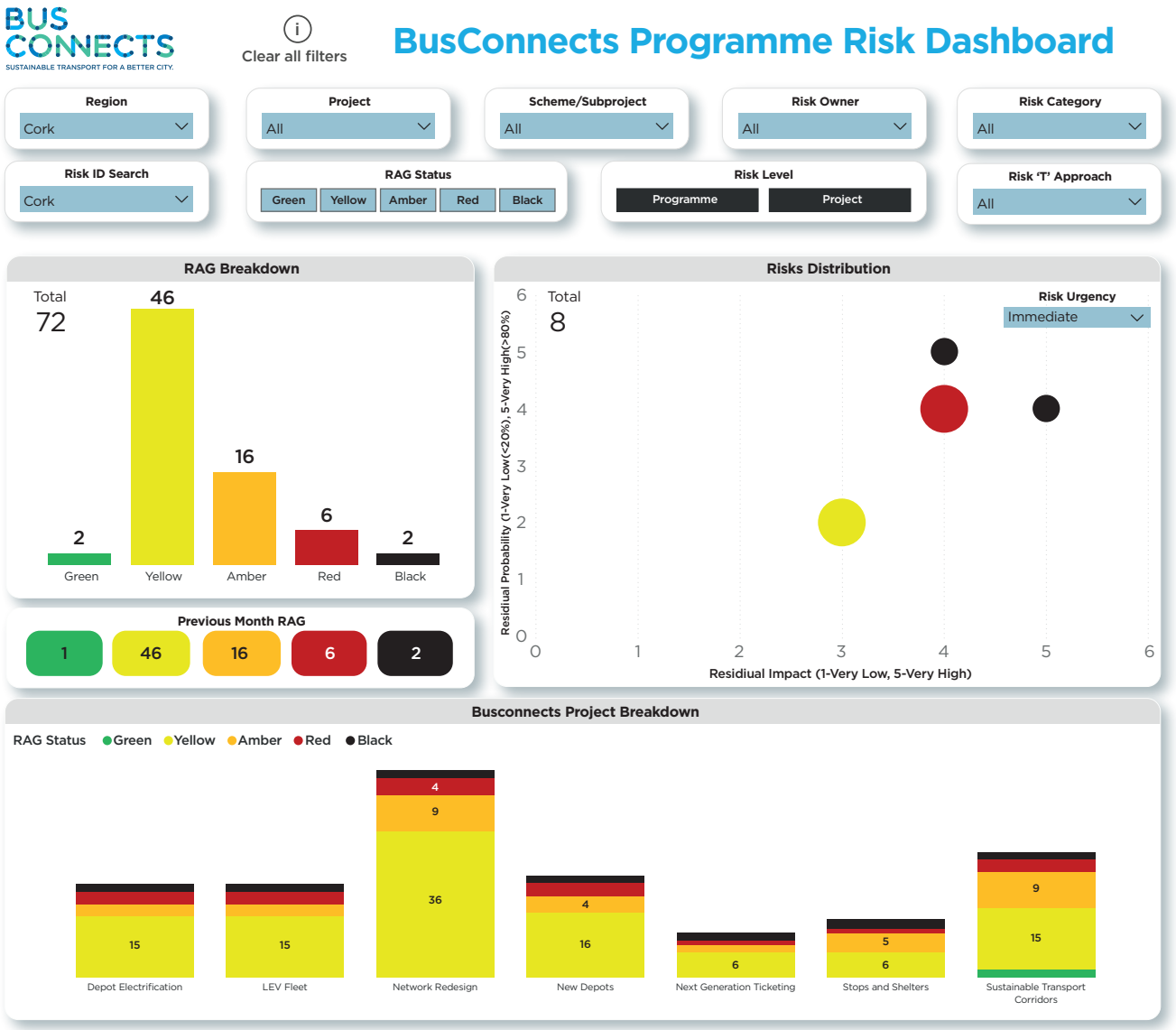
- **Avoid a threat:** Making the uncertain situation certain by removing the risk, which can often be achieved by removing the cause of a threat. This requires thorough analysis to identify source of the risk and how such a threat can be mitigated. It is possible upon investigation that a risk cannot be avoided altogether, in which case measures will be taken to reduce either the probability of the risk occurring, or the severity of the risk.
- **Reduce a threat:** Taking definitive action now to change the probability and/or the impact of the risk. It may be possible to reduce the threat to the point whereby it will not affect the delivery of the overall programme.
- **Transfer the risk:** Passing part of the risk to a third party. Insurance is a usual form of transfer where the insurer picks up the risk cost, but where the insured retains the impact in other areas (e.g., time delay).

- **Share the risk:** Sharing differs from the transfer response in that it seeks multiple parties, typically within a supply chain, to share the risk on a pain/gain share basis.
- **Accept the risk:** The NTA takes the chance that the risk will occur including its full impact. In some cases, this may be the only option or even the optimal approach to responding to risk and will be aligned to the NTA's overall risk appetite.

Risk monitoring and reporting

Risk is regularly monitored by all project and programme stakeholders through the BusConnects Risk Dashboard, shown below. This dashboard is automatically refreshed twice daily from the BusConnects Cork Risk Register and accessible to project and programme teams to bring visibility and transparency to risk and to ensure mitigations are being taken appropriately. Programme and project risks drive discussion at Project Boards and Coordination Group in particular, to ensure risk is at the centre of programme delivery. Red programme risks (Current Priority and Longer Term) are reported monthly to the BusConnects Coordination Group and Programme Board, the NTA's Capital Programme Committee and Board, and the Department of Transport's Major Projects Governance Oversight Group.

Figure 4.1.K: BusConnects risk dashboard filtered on Cork project and programme risks



Lessons learned

As part of the risk culture in the BusConnects programmes, lessons learned are shared formally and informally amongst BusConnects project and programme teams. Additionally, lessons are shared from other relevant national projects like Luas Cross City and international projects and programmes through engagement with internal NTA personnel and external experts. These lessons support proactive risk identification and development and management of risk mitigations.

There are many lessons learned that apply to majority of the BusConnects Cork component projects, specifically:

- Stakeholder engagement and public consultation: Close communication with stakeholders and third parties is critical and must be appropriately managed with feedback addressed to avoid potential challenges and delays.
- Programme interactions: Effective communication among project teams and robust project controls are critical to feed into the broader programme controls and management function. This helps in monitoring the programme schedule and dependencies ensuring alignment across all projects.
- Modelling and quantification of impacts: Regular updating of the business case as the programme moves through the lifecycle stages is essential. Lessons learned from the BusConnects Dublin programme on modelling and quantification of impacts are applied to ensure accuracy and reliability of the information.
- Approvals processes: Separate approvals processes for individual component projects, where possible and appropriate, can help mitigate delays. This approach has been beneficial in BusConnects Dublin and should be considered for BusConnects Cork.
- Design and scope changes: BusConnects Dublin progressed with design in parallel with the business case development, using a risk assessment framework to capture uncertainty to help manage design uncertainties.
- Procurement and Delivery: The delivery of long linear on-street works in urban and city environments is challenging due to the potential for unforeseen utilities and ground conditions, alongside managing access for properties and maintaining business operations. The NTA is applying lessons learned from Luas Cross City, Clontarf to City Centre Cycle Scheme and other projects, such as Edinburgh Tram. In tandem with extensive ground and utility surveys to inform designs, the form of contract is key to addressing unforeseen issues to ensure they are addressed efficiently on site, minimising costs, delay and disruption. For this reason, the NEC 4 contract, a collaborative form of contract successfully used on the Luas Cross City utility works project, will be adopted.

Other lessons are more unique to each project across areas such as options selection, procurement, contracting and implementation. These more specific lessons are described per component project in the next figure.

Figure 4.1.L: Summary of lessons learned to support BusConnects Cork

BusConnects Cork component project	Relevant lessons learned
Bus Network Redesign	• Challenges in reconfiguring networks, including during public consultation • Need for careful configuration of high-quality interchanges • Need for improved permeability of residential areas with clear and safe access routes (per the NTA Permeability Guide)
Sustainable Transport Corridors	• Increased stakeholder engagement and public consultation during options selection utilising multiple forums • Technical challenges and balance necessary to delivery bus journey time and reliability benefits while maintaining sufficient road space for other vehicles, including consideration of the public realm • Utilisation of all mechanisms available to achieve bus priority beyond bus lanes, e.g., signalling, bus gates • Consideration of minimum widths for different road configurations • Strong emphasis on reducing shared bus and cycle lanes while ensuring cycle provision is not lost • Handling of cycle lanes at and around bus stops • Utilisation of design guide developed following BusConnects Dublin design process to ensure design consistency from consultants
Next Generation Ticketing	• International experience from external consultants and subject matter experts on delivery of new systems elsewhere • Feedback from BusConnects Dublin procurement process and initial design stages, including on schedule development considering long lead items
Simplified Fares	• Feedback from development of BusConnects Dublin proposals and early delivery of the 90-minute fare
Stops, Shelters & RTPI	• Feedback from BusConnects Dublin on how to share high-quality information at stops • Experience with local authorities on activities of similar size and scope, including requirements to meet with key stakeholder groups or organisations • Coordination on sequencing of schedules between stop and shelter installation and RTPI orders and installation
Low & Zero Emission Bus Fleet	• Building on BusConnects Dublin progress in forecasting fleet requirements, including zero emission vs low emission and diesel fleet • Sharing trial information of zero emission buses in Dublin and other parts of the country across all operators • Consideration of trial and absorption timelines in project and programme schedules • Build out of national fleet cascade to utilise all available fleet to support current and new bus services in Cork as soon as possible
Bus Livery	• Accepted benefits of consistent branding and marketing without losing wider network benefits • Consideration of rollout alongside regular maintenance schedules
Bus Depot Infrastructure	• Forecasting fleet requirements for new and existing services to support understanding of depot capacity requirements • Engagement with local authorities on depot sites pre-purchase and planning submission • Design and delivery of temporary depot facilities to avoid service disruption during depot electrification

4.2 Proposed approach to procurement

Across the programme, procurement activities to deliver BusConnects Cork will be carried out in accordance with NTA procurement policies and procedures, adhering to the National Procurement Policy Framework that consists of five key elements: legislation (directives, regulations); policy (circulars, etc.); the Capital Works Management Framework; general procurement guidelines; and more detailed technical guidelines and notes issued periodically by the Office of Government Procurement. All external suppliers will be procured through a competitive tendering process.

Additionally, in light of Ireland's commitment to sustainability and the recent publication of the Department of Environment, Climate and Communications' Green Public Procurement (GPP) Strategy and Action Plan, BusConnects Cork procurement strategies will aim to prioritize green and circular procurement practices, incorporating criteria such as carbon accounting, social value, and value for money. Procurement for each BusConnects component will integrate GPP guidelines, monitor progress, and incentivize sustainable investment to ensure environmentally friendly construction processes (waste reduction, water conservation, sustainable landscaping, sustainable materials selection, modern methods of construction, etc.). Some specific GPP targets that will be considered in the procurement for BusConnects are outlined below:

- From 2025, a minimum proportion of construction materials procured by public bodies under new contract arrangements should comprise recycled materials, with sectoral targets to be provided following further analysis.
- From 2025, 100% of all tenders for the public procurement of energy related products (e.g., outdoor lighting, EV chargers. etc.) are to include a requirement for tenderers to specify recommendations and options for the product, when the product or components of the product comes to the end of life, that consider environmental sustainability, including options for reuse, repair, and recycling.
- 100% of all tenders for the public procurement of vehicles to procure zero emissions vehicles only, subject to exceptions as specified in the Climate Action Plan 2024.

Given the diverse nature of the BusConnects Cork programme and its component projects that will deliver a transformation of bus and active travel services, procurement approaches must be tailored to each project while carefully managing the impact of these approaches on key dependencies. A variety of materials and services must be procured to deliver these projects, each with unique requirements and challenges.

Sustainable Transport Corridors (including segregated cycle facilities)

The Sustainable Transport Corridors (STCs) include the greatest proportion of the upfront capital expenditure for the BusConnects Cork programme. The three proposed schemes, which include 11 corridors, will be procured based on timing of planning permissions and limiting construction impacts in an already congested CMA. Each of the three schemes will have their own environmental impact assessment report and separate planning applications. This sequential timeline allows for systematic progression through the planning stages, with each scheme addressing specific regulatory requirements and considerations, ultimately contributing to the overall advancement of the project.

Selecting the right form of contract and procurement method is crucial for managing risk in construction projects. The construction of STCs, predominantly situated in urban and suburban settings, poses delivery challenges for contractors. Factors such as archaeological findings, unidentified utilities, and the necessity to keep businesses operational and transport systems functional adds risks and limitations for contractors. Effectively dividing project scope among contracts and work packages, and choosing suitable contracts, is essential for ensuring successful delivery.

Over the last three decades, significant experience has developed in Ireland in delivery of major capital projects. The NTA has leveraged the lessons learned from these projects to develop an appropriate procurement strategy for the Core Bus Corridors (CBC) in BusConnects Dublin and will apply those learnings and additional lessons from the CBC project to develop its procurement approach for the STCs in BusConnects Cork. BusConnects Cork has the benefit of following the procurement timeline of the CBCs in Dublin, so changes to the procurement strategy can be implemented as a result of any lessons learned.

Additionally, choosing the optimal contract form will have a major impact on the successful delivery of the STCs. A full assessment of the suites of standard contracts was undertaken to determine the most appropriate contract form. Similarly to the CBCs in Dublin, NEC4 Option C (target contract with activity schedule) was identified to be the most suitable contracting option for each of the STC schemes. This is a cost reimbursable contract that is based on actual defined costs plus a contracting partner's fee, which is limited to performance against a target price. This type of contracting arrangement allows transparent costing of risk through open book and target cost provisions. A key advantage of this model is that it encourages collaboration through proactive risk management and allows for suitable risk allocation.

Following completion of the STCs, the relevant road authorities will be responsible for the operation, maintenance and renewal of the assets. The net increase of the road pavements to be managed will be minimal. Additionally, the level of rehabilitation and renewal of the existing road assets delivered through the construction of the STC schemes will help to offset the cost of operating, maintaining and renewing additional assets.

Next Generation Ticketing

The Next Generation Ticketing (NGT) project has concluded a competitive dialogue procurement process to establish a single party framework agreement encompassing all NGT elements. Following a comprehensive tendering process using the competitive dialogue procedure, a successful tenderer was selected and a framework agreement was officially signed in April 2024.

Under that framework contract, the NGT system will be implemented in phases, managed by the single service provider. The initial phases of NGT will focus on the Dublin area to: set up an account-based ticketing (ABT) back office which is capable of being utilised for all public transport operations across Ireland; roll out fare collection equipment onto Dublin city bus services, Luas services, Irish Rail services, and other services in the Greater Dublin Area (GDA). BusConnects Cork is intended to be the next extension of the NGT system after the initial rollout phase in Dublin.

In addition to design and delivery of the NGT project, the framework agreement also includes the operation and maintenance of the NGT system for up to 20 years, which will be managed by the NTA.

Zero Emission Bus Fleet (and associated depot infrastructure)

BusConnects Cork involves a strategic shift towards operation of a zero emission bus fleet, marking a departure from traditional diesel buses to low-emission alternatives, with the ultimate goal of a fully electrified fleet. The fleet size must also increase to meet the required service outlined in the Bus Network Redesign project. Buses will be procured by the NTA and only zero emission buses will be purchased as indicated in the new GPP strategy and the Climate Action Plan 2024. Timelines for procurement of fleet will be driven by project schedules for electrification of the existing Capwell depot and construction of new depots. During the transition period (shown in Figure 2.2.C), to support the increase fleet size requirement when the new bus network is implemented, some buses are being sourced from Galway and Limerick, where depot electrification is also underway.

As the fleet size is set to increase in Cork and the fleet will be gradually electrified, additional depot space will be required and the electric vehicle chargers will need to be installed. Procurement is underway for a contractor for the Tivoli temporary depot, which will allow for the procurement of a supplier to electrify the existing Capwell bus depot. The NTA is currently engaging the market to set up a framework to procure suppliers for depot electrification as this will be required across Ireland to support the nation's transition to a fully zero emission fleet. It is expected that bus operators will call-off services from this framework for future electrification works of existing depots. A new depot site or sites are also being identified, following which suppliers will be procured to build and electrify any new depot infrastructure.

Bus Network Redesign

Procurement for the redesigned network will focus on procuring bus operators. A large portion of the new bus network will be delivered through a direct award contract to Bus Éireann with other elements of the network to be competitively tendered. The NTA will administer and manage these operator contracts in line with its statutory responsibility to secure public passenger transport services.

New Bus Stops and Shelters, and RTPI

Bus pole replacement and new stops and shelters will be delivered in coordination with the phased launch of the redesigned network through supplier procurement as part of national stops and shelters implementation. Any stops and shelters along the STCs will be included as part of that project's procurement packages.

Simplified Fares

The upcoming fare structure simplification, which eliminates penalties for interchanging and introduces a 90-minute fare option, stands as a pivotal aspect of the network transformation. It will require coordination with the Next Generation Ticketing and Bus Network Redesign projects and will be delivered by the NTA.

New Bus Livery

The introduction of the new bus livery will occur organically as part of the regular bus procurement and repainting schedule.

5. What happens next?

5.1 Next steps 71

HOW DOES THIS CHAPTER COMPLY WITH THE INFRASTRUCTURE GUIDELINES?

✓ Recommendation for the Approving Authority

5.1 Next steps

Given the BusConnects Cork programme has several components with different interdependencies and implementation timelines as shown in Figure 4.1.D, progress will be made on each project concurrently and managed as a programme as described in Chapter 4. Next steps and key decision points for each project are outlined below.

Bus Network Redesign

Following two public consultations in 2021, the new bus network was published in 2022. Work is ongoing to launch new and amended services across multiple phases in coordination with bus operators and the local authorities, with phases to be initiated from 2026. Phase launches will be agreed with the relevant operators and are dependent on available fleet, drivers and completion of any infrastructure works required to accommodate the services.

New Bus Stops and Shelters, and RTPI

In advance of phased launches of the new bus network, works to facilitate installation of new bus poles for the network across the CMA, alongside upgrades to shelters, are being progressed through design, tendering and delivery. Design and planning for additional infrastructure works are also in progress to support service changes, including termini. These works will continue in coordination with key stakeholders—local authorities, landowners, operators and the NTA—to enable new network phase launches.

Sustainable Transport Corridors (including segregated cycle facilities)

The three STC schemes are all progressing with development of planning documentation for submission to An Bord Pleanála from 2025. Following receipt of planning permissions, each scheme will require approval to tender for contractors to build the schemes (known as Approval Gate 2 in the Infrastructure Guidelines), with procurement to commence from the end of 2026, dependent on timing of planning permissions. Approval Gate 3, or approval award the construction contract and proceed with construction works, could commence as early as the end of 2027. Procurement and construction of the schemes will be staggered and ordered based on consideration of construction impacts and traffic management, timing of planning permissions and national contractor resource capacity.

Zero Emission Bus Fleet (and associated depot infrastructure)

Operation of hybrid or low emission fleet is estimated to commence in 2025 with work ongoing to progress with electrification of the existing Capwell bus depot. Identification of one or more sites for additional bus depots is underway to support the expanded electrified fleet required to deliver the redesigned bus network. Planning permissions will be sought for new depot locations as early as 2025 with construction to follow. Electrification works will likely be completed via the NTA's national depot electrification framework with procurement commencing from the end the 2025. As chargers are made available, fully electric fleet will be brought into service, which is expected to commence in 2026.

Simplified Fares and Next Generation Ticketing

The introduction of a 90-minute fare is currently being planned for launch in 2026. Works to implement the new ticketing system with contactless payment methods are expected to commence in 2027 with possible introduction on bus services in 2029-2030.

New Bus Livery

The new exterior bus branding will be introduced from 2025 onward as part of business-as-usual maintenance and re-painting and as new buses are introduced into the network.

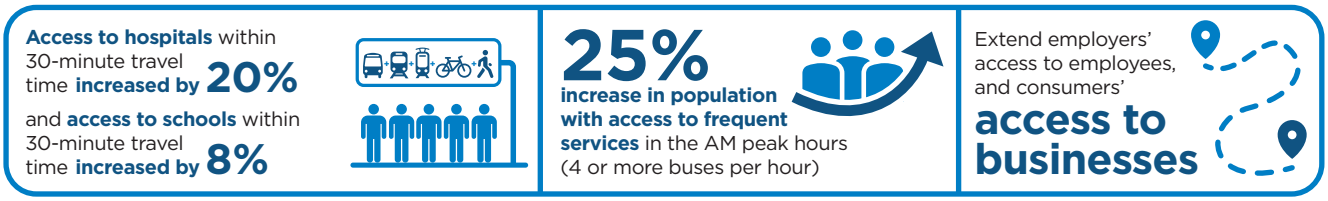
When will the CMA start seeing results?

As is shown in Figure 2.2.D, all of the component projects of BusConnects Cork contribute to the achievement of the programme outcomes. Chapter 3 provides additional detail on the impacts of the programme and the benefits it will bring to the CMA. These benefits will begin to materialise as component projects are implemented but will not be fully realized until the entire programme is complete.

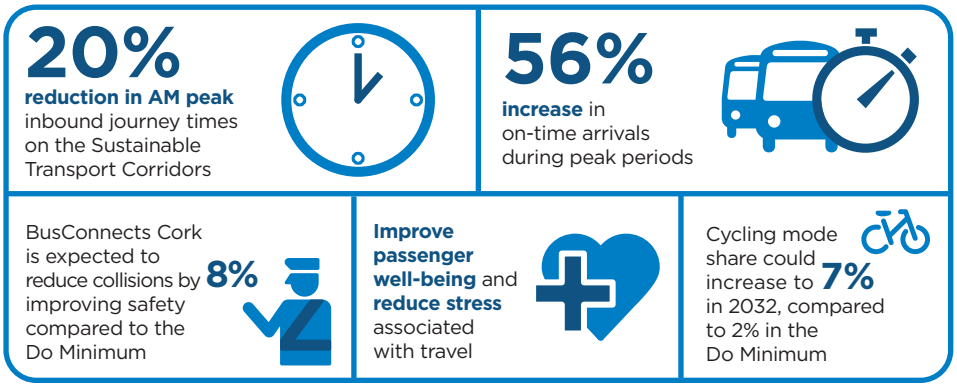
So, when will the CMA start to see an impact from the BusConnects Cork programme? Referring to the indicative implementation plan in Figure 4.1.D:

- Bus users should see the installation of new bus stops and shelters and the initiation of the new network in 2026, which should drive increased patronage on the network as it provides increased services to more people with more access to more destinations.

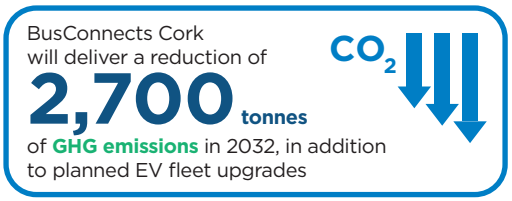
- Introduction of the 90-minute fare in 2026 will make bus services more affordable and attractive to travellers, making interchanges between transport modes simpler, hopefully increasing bus patronage.



- Upon completion of the STC schemes and implementation of the new ticketing system, bus journey times should be reduced and bus and active travel will be safer and more reliable for users.



- The low and zero emission fleet will be steadily introduced from 2025 and contribute to a decrease in greenhouse gas emissions during this transition period.



While implementation of different components will show incremental improvement in the public transport network in the CMA, the end results outlined in this Preliminary Business Case will be realised fully if the projects are delivered as part of a single, integrated programme, and when the entire programme is complete.

Recommendation to the Approving Authority

This Preliminary Business Case builds on the Strategic Assessment Report that was developed in 2022 and approved in 2023, demonstrating a clear preferred option for the BusConnects Cork programme and the outcomes it is expected to deliver for the CMA. The recommendation to the Approving Authority is that this is granted Approval in Principle (Approval Gate 1 in the Infrastructure Guidelines), and the programme is permitted to proceed to the next stage in its development.

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