Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Luas Finglas

Environmental Impact Assessment Report 2024

Appendix A5.1: Sustainability Plan

BARRY TRANSPORTATION
egis GROUP
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Project Ireland 2040
Building Ireland's Future

Transport Infrastructure Ireland

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Luas Finglas
Preliminary Design & Statutory Process

Sustainability Plan

August 2024

BARRY TRANSPORTATION

egis

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SECTION 1: INTRODUCTION

Barry Transportation EGIS have been appointed by Transport Infrastructure Ireland (TII) to undertake the Luas Finglas Design and Statutory Process. The current stage of the proposed Luas Finglas project requires Barry Transportation EGIS to develop a reference design to a level suitable for the purposes of supporting a Railway Order Application to An Bord Pleanála.

Luas Finglas involves the proposed extension of the Luas Green Line from its current terminus in Broombridge to Finglas. The preferred route (PR) for the proposed extension is approximately 3.9 km long and includes four new stops, St Helena's, Finglas Village, St Margaret's Road and Charlestown. The scheme also includes cycle and pedestrian path along much of the route, a 350-vehicle Park and Ride facility near the St Margaret's Road stop close to the M50, and an extension to the tram storage area at the Hamilton Depot at Broombridge. The route will provide interchange opportunities with bus networks at 3 of the 4 proposed stops and to the rail network via the existing Luas Broombridge Stop. Most of the route will be built using grass track which is a sustainable innovation for urban transport in Ireland.

Luas Finglas aligns with several objectives of Project Ireland 2040, the government's overarching National Planning Framework plan for the state. With the increased emphasis on sustainability, climate change emergency and protection of our environment, the project enables compact growth, sustainable mobility, access to services like education and healthcare, and crucially, a transition to a low carbon society. The scheme aims to serve the existing and future demand, provide a safe, reliable, efficient, environmentally friendly and socially inclusive public transport connection from the M50 to the city centre, via Finglas and Broombridge. It will use part of the existing Luas Green Line and reduce public transport journey times between Charlestown-Finglas and the city centre.

This document presents the Sustainability Plan for Luas Finglas. The purpose of this document is to establish the plan for addressing the key sustainability challenges, risks and opportunities to the Luas Finglas scheme and its long-term planning and operation. This document provides the basis of the project's approach to sustainability and how the design and implementation will be undertaken. This Plan promotes the benefits of the project and addresses the socio-economic and environmental issues.

The Sustainability Plan will be updated as the project progresses, and this will ensure that sustainability is at the core of the project and central to the decision-making process.

To support this sustainability plan, a Sustainability Tracker will be developed as a framework mechanism to track sustainability performance throughout the project progression and supportting evidence of progress towards fulfilling the Luas Finglas sustainability targets.

1.1 Relevant Plans, Policy and Guidelines

The report has been prepared by Barry Transportation EGIS in consultation with the following guidelines:

- Sustainable Development Goals, United Nations;
- Project Ireland 2040, National Planning Framework, Department of Housing, Local Government and Heritage (2019);
- The Sustainable Development Goals National Implementation Plan 2022-2024, Department of Communications, Climate Action & Environment (2022);
- National Development Plan 2021-2030, Department of Public Expenditure and Reform (2021);
- Sustainability Implementation Plan 2024, TII;
- TII Statement of Strategy 2021 to 2025, TII, 2021 (Updated 2023);
- Environmental Strategy, TII (2019);
- Applying a Gender Lens to TII Public Transport Projects, TII (2021);
- Dublin City Council Climate Action Plan 2019 – 2024 (2020);
- Transport Strategy for Greater Dublin Area 2016-2035, NTA (2015);

- National Biodiversity Action Plan 2017-2021, Department of Culture, Heritage and the Gaeltacht;
- Dublin City Biodiversity Action Plan 2021-2025, Dublin City Council (2021);
- All Ireland Pollinator Plan 2021-2025, National Biodiversity Data Centre (2021);
- Dublin Region Air Quality Plan 2021, Dublin City Council, Fingal County Council, South Dublin County Council and Dun Laoghaire-Rathdown County Council (2021).

SECTION 2: PROPOSED DEVELOPMENT

2.1 Site Location

Luas Finglas is the proposed new northern extension of the Luas Green line from its current terminus in Broombridge to a new terminus in Charlestown, refer to PR in Figure 1. The PR for the Luas Finglas is 3.9km long and has four new stops.

A non-statutory consultation for the Luas Finglas Emerging Preferred Route (EPR) took place from Tuesday 28th July to Thursday 17th September 2020. A PR has been developed based on the primary changes made to the emerging preferred route (EPR) as a result of the feedback received during the consultation.

After leaving Broombridge Stop, also serving the railway station, the Luas corridor turns north where it will overpass both the Maynooth railway line and the Royan Canal. Luas Finglas enters Tolka Valley Park adjacent to the protected structure, the Finglas Wood Bridge (RPS 906), which will be fully preserved and protected in situ. From here it will cross the park on a new bridge approaching Tolka Valley Road in proximity of the Carrigallen Estate. The new bridge over the Tolka River will carry two tracks and cycle lanes. The bridge is anticipated to have a span of 70m. During the development of the design, the St Helena's stop has been relocated slightly north closer to St Helena's Road to improve accessibility and interchange with bus routes. The alignment has also been slightly shifted to preserve trees and improve the pedestrian facilities. As the line continues north, the alignment has been shifted to the east of the original proposal to avoid bisecting the Farnham Park playing pitches. This will reduce environmental and visual impacts while enhancing Luas operational safety. The alignment has also been adjusted when it crosses Wellmount Road, to preserve trees that had been impacted by the EPR.

The PR for Luas Finglas also changes from the EPR as it enters Finglas village, to ensure the Finglas Village stop design integrates with proposals in the local area plan. The route continues straight along Cardiff Castle Road, passing through a new corridor created within the Garda Station car park, making its eastern turn onto Mellowes Road, where the stop will be located, aligned east/west. The newly positioned stop will be more open and accessible with visual links as well as walking and cycling links enabling direct interchanges with bus services along Mellowes Road. The route then proceeds north along the Mellowes Park, with the proposed stop on St Margaret's Road to the other side of Finglas Road opposite to Lidl supermarket. The proposed stop will be closer to newly rezoned Jamestown Industrial Estate, providing improved accessibility to existing and future residential and commercial development. The route then continues from the Finglas Road (R135) junction along the eastern side of St Margaret's Road, mainly off-road or segregated from the traffic in grass track until it reaches the terminus stop at Charlestown. On-street cycle facilities will be provided on both sides of St Margaret's Road. This stop provides convenient access to the Charlestown Shopping Centre, high-density residential areas and the Jamestown Industrial Estate.

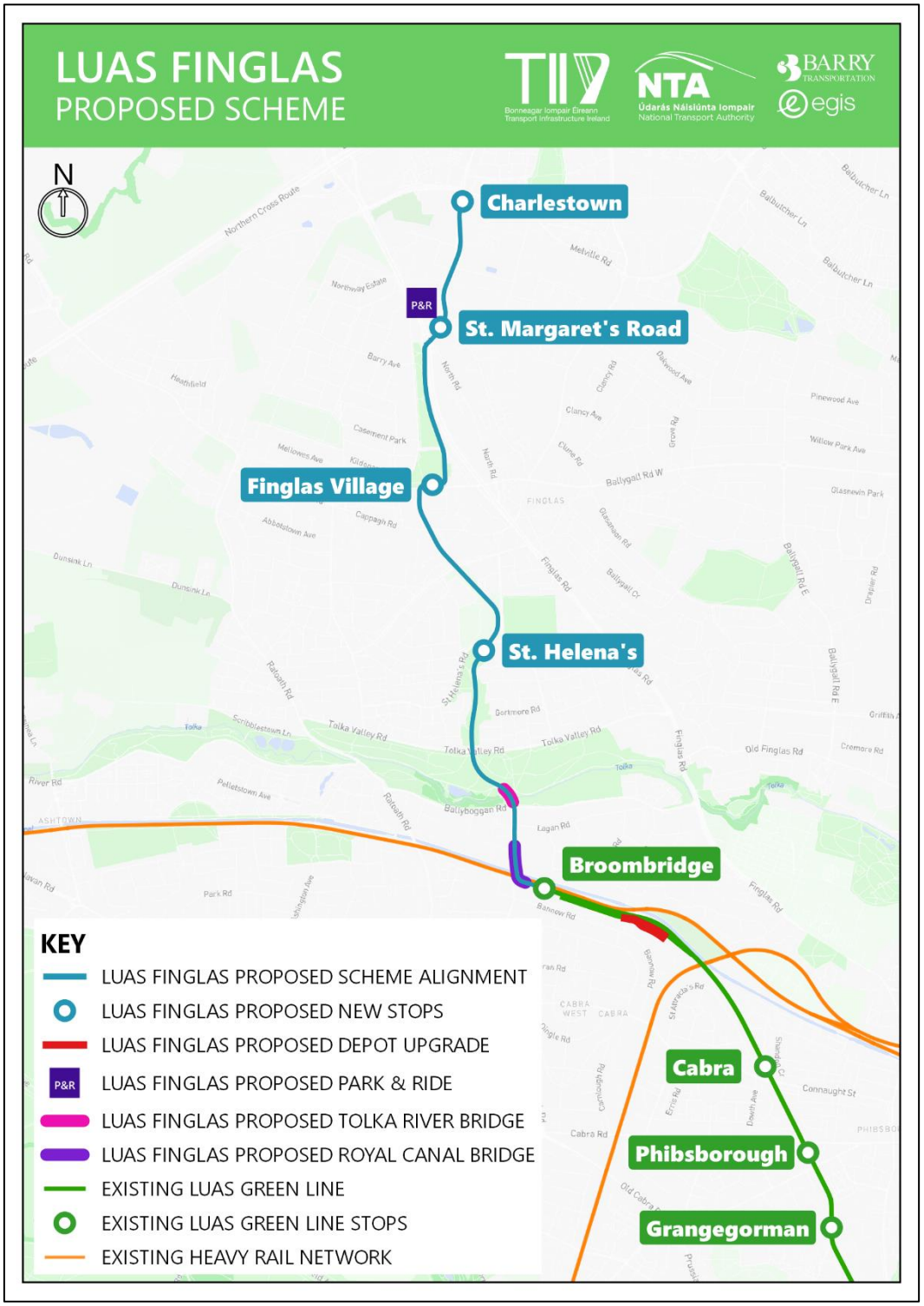

Figure 1: Overview of Preferred Route for Luas Finglas

2.1.1 Receiving Environment

The proposed Luas Finglas project extends through an urban area containing within it sections of green space, three parkland areas (Tolka Valley Park, Farnham Drive Park and Mellowes Park); and two watercourses, namely the River Tolka and Royal Canal, the latter of which is also a proposed Natural Heritage Area (pNHA), and both of which hydrologically connect the project to Dublin Bay.

Public and Active Transport

The study area is served by various Dublin Bus routes. Under BusConnects, the 'F corridor' from Charlestown to the city centre is proposed as one of 16 core bus corridors which will consist of three spines,

one of which would travel along Finglas Road. Cycle infrastructure includes the Tolka Valley Greenway, Royal Canal Greenway and the Finglas Road cycle path which is segregated from the road and connects the city centre with Finglas Village. Secondary routes proposed in the Greater Dublin Area Cycle Network Plan (2013) follow Mellowes Road, North Road and Charlestown Place. All these active transport measures which help reduce the carbon footprint within the study area.

Land Use and Amenity

There are a broad range of different land uses in the proximity of the proposed project. The Broombridge and Dublin Industrial Estates are located in the southern extent of the study area bordering the Royal Canal. This area is separated from residential areas to the north by the Tolka Valley Park. The residential areas themselves are bordered to the west by Cardiffstown Road (R103) and, further out by Ratoath Road, and to the east by Finglas Road (R135) which is the major artery for the area extending north to the N2 and possessing dedicated bus lanes. East-west connections are provided by Ballyboggan Road, Tolka Valley Road (R102), Wellmount Road, Cappagh Road (R103) and Mellowes Road. Finglas Village is on the eastern side of this Finglas Road, to the north of which is Jamestown Business Park which extends north as far as the Charlestown Shopping Centre and the M50. Residential areas continue to the north on the west side of Finglas Road. Throughout the study area there are community facilities, including playing fields and areas of green space. Other local attractors and community facilities, most of which are accessed by mainly local vehicle, pedestrian and cycle traffic, include St. Oliver Plunkett's Church, St. Canice's Roman Catholic Church and the Kingdom Hall of Jehovah's Witnesses.

Open Space

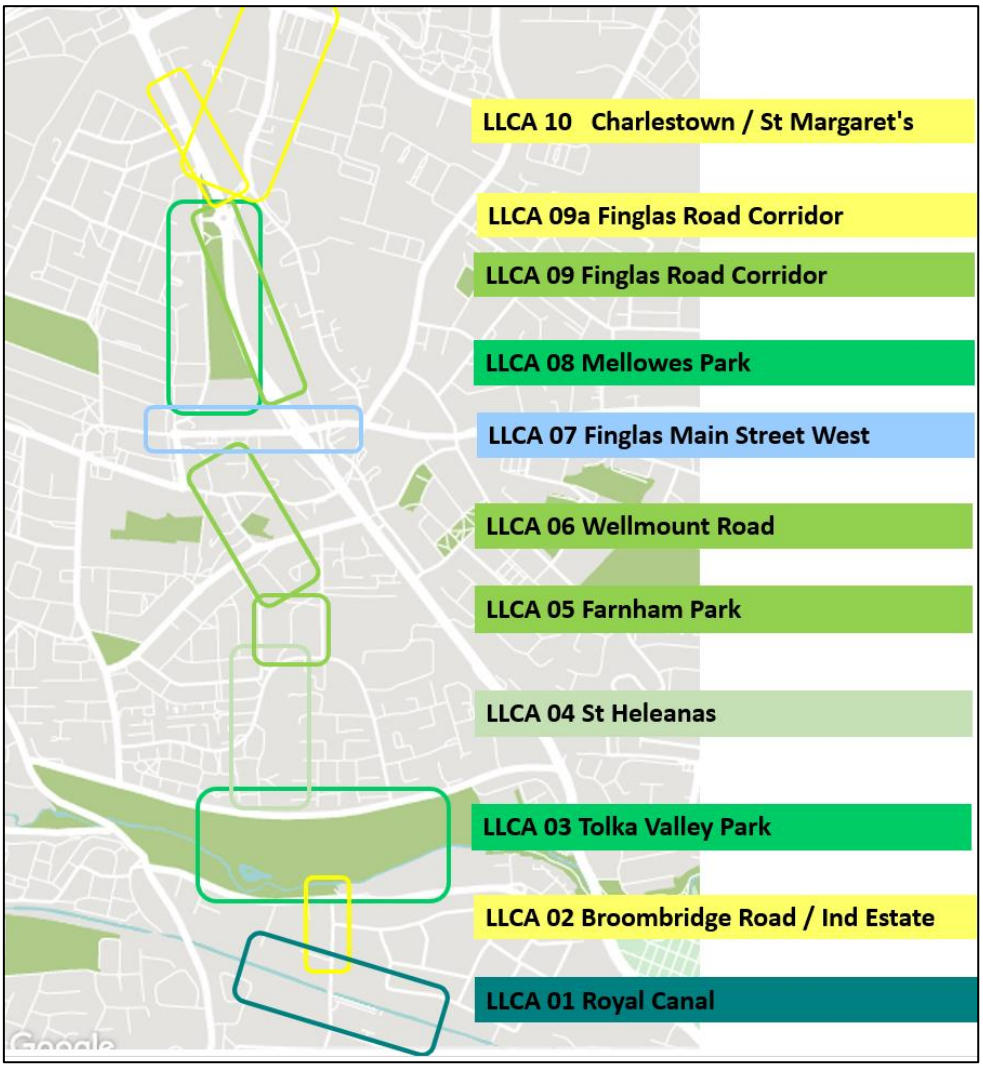

Figure 2: Local Landscape Character Areas (Source: Urban Integration Report)

The proposed scheme route goes through a number of open space areas. Parks and green space include Tolka Valley Park (including golf course), Farnham Drive Park and Mellowes Park, refer to Figure 2. The PR sees the Luas Finglas line continue from the existing terminus and turn northwards over the Royal Canal towards Tolka Valley Park. Tolka Valley Park is set upon a former landfill site, which was closed in the 1970s and was then reclaimed as a public open space. The proposed Luas route after crossing Tolka Valley Road, passes through the middle of the linear green space continues north towards St. Helena's Rd and into the Farnham Park area and then passes through Farnham Park to connect St Helena's Road to Wellmount Rd residential areas. St Helena's comprises a linear north – south green space between St Helena's Road and Tolka Valley Road/Park bordered by Barnamore Grove and St Helena's Road residential areas. Farnham Park is an active local open space located between Erins Isle Sports Club and St Helena's Road. It presently accommodates both soccer and GAA sports pitches within an amenity park setting. The Luas extension also traverses Mellowes Park in a north-south direction parallel to Finglas Rd (R135) between Finglas Sports Centre and the Finglas Road/North Road roundabout towards the Charlestown Shopping Centre.

Education, Sports and Leisure

There are also a large number of schools and colleges near the proposed development. Sports and leisure facilities in the study area include Erin's Isle GAA, Rivermount Boys FC, Valley Park United FC, Finglas United Youth FC, Leisure Point Sport and Fitness Centre, and Finglas Area Office and Sports Centre.

Health Services

There are social and family support services that include St Helena's Family Resource and Childcare Centre, Finglas Childcare, Finglas Youth Services, St Michael's House Technical Services for people with disabilities, Finglas Intreo Centre (Department of Social Protection) and Finglas Medical Centre.

Economic Activity

There are also numerous local neighbourhood shopping centres scattered throughout the area. The principal destinations or attractors are the Key District Centre of Finglas Village and Charlestown Shopping Centre, including also supermarkets and adjacent retail at Tesco (Clearwater), Aldi (St. Margaret's Road), Lidl (St. Margaret's Road), Dunnes Stores (Charlestown and Cardiffsbridge Road), as well as the Broombridge and Dublin Industrial Estates, Finglas Business Centre, and the North Road Commercial Area.

2.2 Description of the Proposed Works

2.2.1 Proposed Works

The proposed works for Luas Finglas involve the following:

- A 3.9 km extension to the Luas Green Line track from Broombridge to Finglas, see Figure 1;
- An extension to the Broombridge Luas depot stabling for extra tram storage;
- Provision of approximately 350 park and ride spaces near the St Margaret's Road stop, close to M50;
- Demolition of the existing overbridge at Mellowes Park;
- Construction of a new bridge over the River Tolka within the Tolka Valley Park;
- Construction of a new bridge over the Royal Canal and the Maynooth railway line at Broombridge;
- Modification of integrated constructed wetlands (ICW) at Tolka Valley Park;
- Farnham Playing Pitch Modifications;
- Site preparation including levelling and excavation works for track infrastructure;
- All associated utility diversions;
- New road layouts, new or modified junction layouts, footpaths and road layouts including junction signalling;
- Dedicated cycle facilities necessary as part of the scheme, including adjacent cycling on or off-road tracks along the entire length of the alignment;
- Provision of two new substations;
- Provision of additional traffic signalling infrastructure;
- Provision of additional lighting and street furniture; and
- Provision of landscaping and urban integration measures.

A detailed construction plan and schedule will be developed for the proposed scheme to ensure that the construction phasing allows for maximum efficiency while minimising potential for environmental impact.

The general sequence of activities to be followed when constructing the proposed scheme will be broadly as follows:

- Establishing the works area/site and the establishment of site offices, compounds and security;
- Site preparation including demolitions where required;
- Utilities diversion;
- Construction of bridges;
- Installation of light rail tracks;
- Construction of Luas stops;
- Installation of operating equipment;
- Fitting out of stops; and
- Finishing and landscaping.

2.3 Sustainability Measures for the Proposed Scheme

The following sustainability measures are being incorporated as part of the project:

- Suitable native and low maintenance landscaping along the track corridor along with integration and improvement of the landscaping;
- Creation or enhancement of ecological habitats;
- Maximising use of green track, for landscaping, reducing of urban heat island intensity; also resulting in minimising noise and vibration;
- Sustainable Drainage Systems and minimising attenuation structures:
  - Sand trapping via the drainage system;
  - Rainwater infiltration (in soil and plantation tree holes); and
  - Rainwater harvesting, green buildings and water saving measures.
- Sustainable building management systems;
- Sustainable material use, such as Green Cement and recyclable materials;
- Hazardous waste management; and
- Provision for cyclists including routes and cycle parking.

Further measures considered as part of the proposed scheme as discussed in sustainability workshops (09/11/2021 and 15/12/2021) circular economy workshops (27/10/2021, 09/03/2022 and 23/09/2022) and recent TII publications include the following:

- To incorporate circular economy throughout the different phases of the project;
- The sustainable design for the project is based on the theme of space relocation to enhance public transport and to prioritise active travel above road traffic;
- Design and construction phases to be focused on waste reduction;
- Adoption of flexible construction lengths to reduce concrete waste;
- Adopting smaller footprint for construction elements;
- Refrain from oversizing and overengineering;
- Coordinated approach and sharing of infrastructure and overlap design needs to avoid overspecification;
- To promote active travel by reduced carriageway, increased pedestrian space and more accessible public areas;
- Sustainable design process to take into account track alignment and optimise gradients to reduce operational energy demand;
- Reducing stop and go by combining road junctions and stops in close proximity and increasing fully segregated/ off road sections to allow trams longer coasting at low energy consumption;

- Reduce energy needs/requirements for substation buildings, provision of vegetal roof or photovoltaic panel on top; provision of natural ventilation, using equipment standing wide range of temperature to avoid air conditioning;
- Consider concrete with 50% Ground Granulated Blastfurnace Slag (GGBS) to be used to reduce the carbon footprint and improve the overall sustainability of finished structures and this will be considered in future design stages. Concrete is a highly durable material, however, the production process of one of its main constituents- cement is highly energy demanding and has a larger carbon footprint;
- Regenerative design and nature-based solutions;
- Corridor design to provide for ecological and landscape connectivity and pollinator friendly spaces;
- All new roadside planting to have a significant proportion of pollinator-friendly plants;
- Design to include for ease of recovery and disassembly of the trackform;
- Design accommodates future environmental conditions including accounting for climate change effects on rainfall, storm occurrences and temperature;
- Design includes soil testing plan and strategy for enabling soil reuse;
- New landscaping to include tree pits for bioretention and stormwater management on hard surfaces along Broombridge and Finglas Road. Soil from construction site to be used to fill the tree pit post assessment for suitability of the soil. Stormwater tree pits provide a versatile stormwater management device for passive irrigation of street trees, stormwater quality treatment, peak flow and volume attenuation, canopy interceptions, evapotranspiration and infiltration and reduction in pollutants entering the waterways;
- Quantifying infiltration for new tree planting as part of landscaping to assist drainage design for the scheme;
- Carbon sequestration by new tree planting as part of landscaping and quantifying the sequestering value;
- Creating safe, segregated, family-friendly cycle and walking paths along much of the route, improving the quality of life for all. Also, to provide sufficient, secure and adequate cycle storage facilities and safe, efficient and convenient access to different transport modalities;
- Applying gender lens to enable inclusion of public life opportunities into the design process;
- Provide accessibility and social inclusion as the Luas will be fully accessible to people with a mobility impairment, the elderly and also to those with a hearing or visual impairment;
- Undertaking public life tools surveys along the route and also capturing data by questionnaires circulated to stakeholders in the area. The public life survey is aimed at capturing data for physical and social elements along the preferred route;
- Emphasis on place-making, public realm and greening infrastructure;
- Social aspect of sustainability is as important as economic and environment. To prevent anti-social behaviour social development around the proposed project before, during and after construction is integral to this plan;
- During environmental studies and public consultation, consider specific presentations to present positive aspects of transportation and urban renewal in schools along the Luas corridor, to ensure the students then educate their families about the Luas Finglas scheme as a sustainable transport option thereby increasing the acceptability of the scheme in the community;
- For construction phase, TII may introduce in contracts some proposals for local employment, so that local unemployed people take the opportunity to make their skills known and have a significant experience for their future jobs after completion of construction;
- For long term, the Luas corridor can be a positive opportunity for social development around different themes such as sport (Farnham pitches), nature (Royal Canal and Tolka river valley are high value places linked to others in the city), culture heritage (protected walls and bridges can be highlighted through story maps and expanding on previous Luas Cross City Story Maps, famous people appearing in city's road names can be emphasised, and contemporary culture can be developed);
- Citizens should be able to use it not only as transport corridor but for dedicated activity, sport, nature, culture, be proud of it, that's the key for general enhancement of the area.

These sustainability topics are considered further in Table 1 Sustainability Objectives, Measures and Governance and Sustainability Tracker.

2.4 Need for the Scheme

Since the completion of the Luas Green Line to Broombridge in 2017, the potential to extend the line to Finglas has been explored by TII and the National Transport Authority (NTA). Finglas and the surrounding areas need improved public transport services to connect with Dublin's wider public transport network. The arrival of Luas Finglas will bring significant benefits to the area by providing a reliable, efficient and high-capacity public transport service to the city centre via Broombridge.

The proposed extension will also:

- Support development of Finglas as a key centre within the Greater Dublin Area and promote local regeneration;
- Help Ireland reduce emissions and carbon output from transport by providing an attractive alternative to car use;
- Provide for reduced journey times by delivering a high-priority corridor to deliver consistent journey times throughout the day;
- Provide walking and cycling integration by creating safe, segregated, family-friendly cycle and walking paths along much of the route, improving the quality of life for all. This will be achieved by reduced carriageway, increased pedestrian space and more accessible public areas. Each of the Luas stops will include cycle parking facilities;
- Provide improved transport interchange and integration by connecting several existing public transport services including national, regional and commuter rail, Luas and bus services. The park and ride facility will allow people to switch from their cars onto the Luas network;
- Support ambitions for further development of Dublin as an attractive, vibrant location and focus for economic growth;
- Provide for gender equality, child, and elderly friendly spaces by recognising the needs of people and addressing them by the design process; and
- Provide societal benefits for Finglas by emphasis on place making and public realm.

2.5 Policy Overview

2.5.1 Transport Strategy for the Greater Dublin Area 2016-2035

The Sustainability Plan for Luas Finglas should align with the key policies for the Greater Dublin Area. The Transport Strategy for the Greater Dublin Area 2016-2035 is integral to the sustainable implementation of the Luas Finglas, as it prioritises addressing urban congestion, to improve the efficiency and sustainability of the urban transport system, increase public transport capacity and to improve and enhance walking and cycling infrastructure. The strategy also intends to develop the Light Rail network in the Greater Dublin Area through the implementation of an extension of Luas Cross City from its terminus at Broombridge to Finglas.

The Transport Strategy for the Greater Dublin Area is a plan at regional level and is informed by the National plans such as the National Planning Framework and National Development Plan which then informs and updates the Dublin City Development Plan and Local Area Plans. All these plans and strategies ensure better co-ordination in planning and development policy matters across local authority boundaries.

The Transport Strategy for the Greater Dublin Area 2016-2035 outlines the following strategic transport infrastructure that is proposed to be delivered within the lifetime of the strategy:

Heavy Rail Infrastructure

As part of this strategy, it is intended to enhance the rail network and create a full Metropolitan area DART network for Dublin to provide better connectivity and integration. The upgraded rail network will provide the core high-capacity transit system for the region and also aims to deliver a substantial increase in peak-hour capacity on all lines from Drogheda, Maynooth, Hazelhatch and Greystones. The proposed works will include the Phoenix Park Tunnel Link, Dart Expansion Programme, City Centre Re-Signalling, Train Control

Centre Upgrade, Provision of Additional Rail Stations, Station Upgrades and Enhancements, Train Fleet and other rail investments.

Light Rail Infrastructure

It is intended to develop further the Light Rail network in the GDA through the implementation of a number of projects such as Metrolink, Luas Green Line Capacity Enhancement, Metro South- Luas Green Line Capacity Upgrade, Luas Cross City, Finglas Luas, Extension of Luas Green Line to Bray, Lucan and Poolbeg Luas. All these proposed works will ensure that the existing Light Rail network is maintained in an adequate and safe condition and that services are efficiently delivered.

Bus Infrastructure

In order to ensure efficient, reliable and effective bus system, as part of the Bus Connects Strategy, the National Transport Authority's programme to greatly improve bus services in Irish cities, it is proposed to develop the Core Bus Network and provide continuous priority for bus movement on the Core Bus Network within the Metropolitan Area. This will include enhanced bus lane provision on these corridors to improve journey times. The proposed projects include Core Radial Bus Network, Core Orbital Bus Network, Core Regional Bus Network, Bus Rapid Transit, Combined Core Bus Network and other bus related measures.

Cycling Infrastructure

As part of the Greater Dublin Area Cycle Network Plan, it is proposed to expand the urban cycle network to over 1485 km in length and to provide over 1300 km of new connections between towns in the rural areas of the GDA. The network seeks to provide an inclusive cycling environment that is safe for all cycling abilities and ages with strong functional and recreational connectivity between homes and key destinations. Governments Climate Action Plan 2023 also aims to increase the number of walking and cycling networks so that cycling and other modes of active travel will account for 50% of all journeys made by 2030.The proposed project includes. The proposed works include enhancements of existing cycle ways and provision of new cycleways along the route to improve cycling integration within the proposed Scheme area.

Walking

This strategy also intends to provide safer and convenient walking environment for those with mobility, visual and hearing impairments and for those using buggies and prams. Further enhancement of pedestrian movement along the strategic pedestrian routes is proposed by widening footpaths and to ensure that permeability and accessibility of public transport stops and stations for local communities is maintained and enhanced.

Road Network

This strategy aims to prioritise road investment to maintain, renew, manage, and operate the extensive infrastructure consisting of roads, bridges, tunnels, footpaths, signposting and markings, traffic signals and traffic management systems. A number of development and enhancement projects for national roads, regional and local roads and freight movement are also proposed.

The other key national level policies and guidelines that the Luas Finglas must align with includes:

- Climate Action Plan 2023 (Department of the Environment, Climate and Communications, 2022);
- Dublin City Council Climate Action Plan 2019-2024 (Dublin City Council, 2019);
- Smarter Travel: A Sustainable Transport Future (Department of Transport, 2019, updated 2022);
- National Mitigation Plan (Department of the Environment, Climate and Communications, 2017, updated 2021);
- Planning Land Use and Transport Outlook 2040 (Department of Transport, Tourism and Sport, 2018);
- Spatial Planning and National Roads (Department of Housing, Local Government and Heritage, 2012, updated 2020); and
- Design manual for Urban Roads and Streets (Department of Transport, 2013, updated 2022).

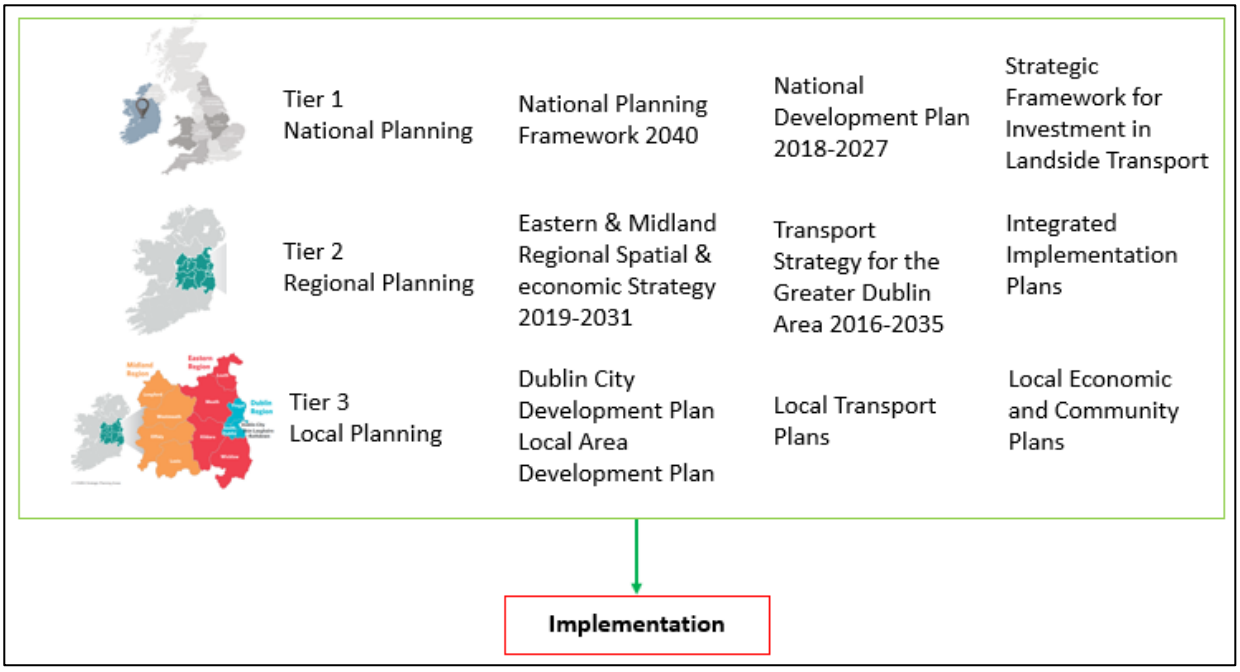

Figure 3: Transport Planning Hierarchy

2.5.2 Biodiversity Action Plans

The environmental pillar of the sustainability plan for Luas Finglas is guided by national and local biodiversity action plans as detailed below:

National Biodiversity Action Plan 2017-2021

The National Biodiversity Action Plan 2017-2021 sets objectives, targets and actions for biodiversity that will be undertaken by a wide range of government departments, civil, society and private sectors to achieve Ireland's Vision for Biodiversity. Hence, these objectives frame the sustainability measures for the proposed scheme.

These objectives include:

- Mainstream biodiversity into decision-making across all sectors;
- Strengthen the knowledge base for conservation, management and sustainable use of biodiversity;
- Increase awareness and appreciation of biodiversity and ecosystem services;
- Conserve and restore biodiversity and ecosystem services in the wider countryside;
- Conserve and restore biodiversity and ecosystem services in the marine environment;
- Expand and improve management of protected areas and species; and
- Strengthen international governance for biodiversity and ecosystem services.

Dublin City Biodiversity Action Plan 2021-2025

The Biodiversity Action Plan 2021-2025 sets seventeen objectives for biodiversity management and conservation along with a series of targeted actions with measurable outcomes to achieve these objectives. These link back to the strategic objectives of the National Biodiversity Action Plan (2017-2021). The plan focuses on restoration of biodiversity to reflect EU policy. The themes and objectives set here frame the sustainability objectives and measures for the proposed Luas scheme. The themes set within the action plan include:

- Maintaining nature in the city;
- Restoring nature in the city;
- Building for biodiversity;
- Understanding biodiversity in the city; and

- Partnering for biodiversity.

All Ireland Pollinator Plan 2021-2025

All Ireland Pollinator Plan (AIPP) is a shared plan of action to help restore pollinator populations in Ireland. The AIPP is supported by the Transport Authorities who promote pollinator friendly management of transport corridors. The plan sets out six objectives as below:

- Making farmland pollinator friendly- *By working together with the farming community, we want to achieve an increased awareness of pollinators and the resources they need in order to survive on farmland.*
- Making public land pollinator friendly- *By working together with Councils, Transport Authorities, Local Communities and others, we want to better coexist with biodiversity and help return food and shelter for pollinators to our island.*
  - Target 2.2 under this objective specifically sets actions for pollinator friendly transport corridors. It set measures for improvement of grassland management and pollinator friendly planting across transport corridors, to move grass-cutting frequency from condition-based maintenance to specified programme that is reduced number of cuts per year. It also set measures for roadside planting to have a significant proportion of pollinator friendly plants, reduction in use of pesticides and control and manage the spread of invasive plant species. All new landscaping planting specifications to incorporate AIPP pollinator-friendly planting code and creation of pollinator-friendly habitat on non-operational lands.
- Making private land pollinator friendly- *From gardens, to businesses, faith communities and sports clubs, we want to work together to create networks of biodiversity-friendly habitat across our landscape*.
- All-Ireland Honeybee Strategy- *By supporting beekeepers, we want to achieve healthy, sustainable populations, and for honeybees to be part of a cohesive pollinator message that balances managed and wild pollinator populations.*
- Conserving rare pollinators- *By improving our knowledge on rare pollinators, and by raising awareness through dedicated initiatives, we want to achieve a Plan that protects as much wild pollinator diversity as possible.*
- Strategic coordination of the Plan- *By continually raising awareness; addressing gaps in our knowledge through research; and by tracking where pollinators occur and how populations are changing, we want to work from an evidence base that enables us to coordinate a dynamic plan that is targeted and effective.*

Dublin Region Air Quality Plan 2021

The purpose of Dublin Region Air Quality Plan 2021 is to address reducing nitrogen dioxide emissions from transport in the Dublin region. The dominant primary source of nitrogen dioxide in ambient air in the Dublin Region is vehicular traffic. Increased nitrogen dioxide levels are of concern as it has been demonstrated to be associated with number of health effects. While individual vehicle engines have become less polluting and more efficient over time, the population increases, the number of vehicles and their pattern of movement have given rise to continuing elevated levels of nitrogen dioxide. This stresses the continued and improved use of land use and transportation planning strategies to deliver sustainable living. The plan sets specific measures and actions for consideration.

2.5.3 Aarhus Convention

The Luas Finglas will also be in line with the Aarhus Convention which establishes several rights of the public with regard to the environment. This includes:

- Access to environmental information;
- Public participation in environmental decision making; and
- Access to justice.

SECTION 3: SUSTAINABILITY

Sustainable development can be described as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'* Sustainable development ensures long term business resilience with a positive contribution to the economy, society, and environment. In September 2015, UN Member States adopted the 2030 Agenda for Sustainable Development which focuses on 17 Sustainable Development Goals (SDGs) and their respective 169 sub-targets. The UNSDGs provide a consistent framework for defining and considering sustainability and measuring positive actions against different plans, programmes, and policies. These UN SDGS are visible across the strategies of many government departments. Ireland has adopted the National Planning Framework to manage the growth in a planned, productive, and sustainable manner.

The objectives and strategies for Luas Finglas align with those laid down in the National Planning Framework as part of Project Ireland 2040 and the Sustainable Development Goals National Implementation Plan 2018-2020 and are reflected throughout this plan. The National Strategic Outcomes as set in the National Planning Framework sets goals for sustainable mobility in line with Ireland's Climate Change mitigation plans and to transition to a low carbon, climate resilient and environmentally sustainable economy.

The sustainability approach to Luas Finglas is guided by the goals set out in the TII's Statement of Strategy 2021 to 2025, refer to Figure 4. TII has set out this strategy for the period of 2021 to 2025 for the implementation of national transport strategy as determined by the Department of Transport. The strategic goals set by TII will be supported by specific actions to be included in annual plans and their fulfilment will be monitored. Other TII documents assisting in the implementation of sustainability for the proposed project include, Environmental Strategy, TII (2019), Applying a Gender Lens to TII Public Transport Projects, TII (2021) and TII Sustainability Implementation Plan.

The importance and benefits of incorporating sustainability for Luas Finglas and aligning it to the UNSDGs will enhance:

- Sustainable mobility;
- Active transport;
- Regional accessibility;
- Compact growth;
- Transition to low carbon and climate resilience;
- Biodiversity;
- Health and well-being impact from the projects;
- Stakeholder and public engagement;
- Efficient and productive resource planning;
- Societal benefits for Finglas by emphasis on place making and public realm;
- Gender Equality;
- Enhancing design by applying gender tool; and
- Clear working plan towards environmental, economic, and social challenges.

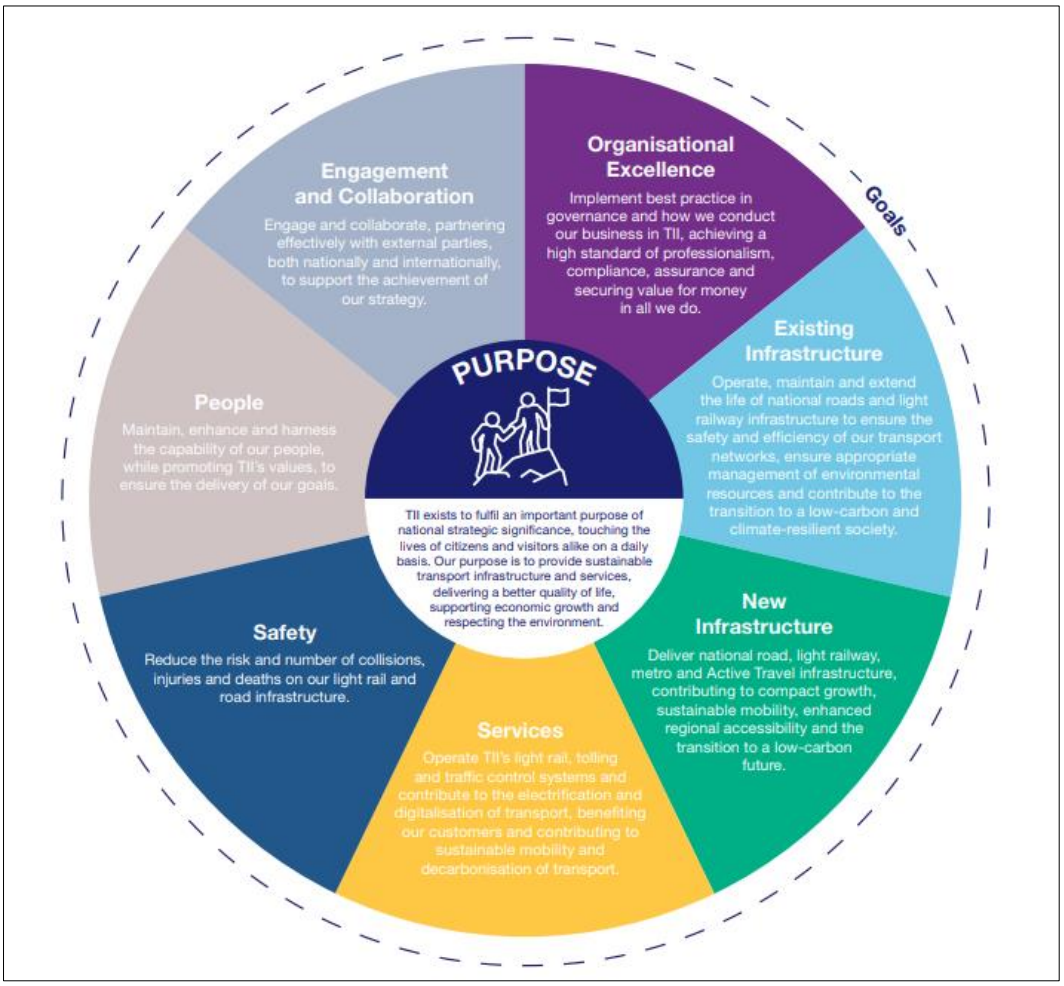

Figure 4: Strategic Goals as set out in the TII's Statement of Strategy 2021-2025 (2023)

3.1 Pillars of sustainability

Sustainable development is supported by three pillars of economy, society, and environment. The project aims to provide economic prosperity without damaging the natural environment or exhausting natural resources and to include all stakeholders working together at national or international levels. Figure 5 lists the key impacts of the project on the three pillars of sustainability and alignment of the project objectives with the Sustainability Themes as set out in the SDG National Implementation Plan 2018-2020 and also with the TII Sustainability Principles as set out in Sustainability Implementation Plan.

Sustainability Plan			
Pillars	**Environment**	**Economic**	**Social**
Luas Finglas Objectives	• Urban ecological habitats • Biodiversity enhancement • Carbon assessment and reduction • Waste reduction and management • Sustainable material use • Air quality • Green track • SuDS	• Circular economy • Maximise whole life value • Infrastructure resilient to climate change • Efficient and high-capacity public transport • Support local businesses	• Enhance collaborations • Stakeholder and public engagement • Local employment • Provision for active transport • Development of Finglas as a key centre within the Dublin Greater Area • Societal benefits by emphasis on place making and public realm • Applying gender lens to design
Our Sustainable Future Themes (SDG National Implementation Plan)	• Satisfaction of human needs by the efficient use of resources • Respect for ecological integrity and biodiversity • Respect for cultural heritage / diversity	• Economy	• Equity between generations • Gender equity • Social equity
TII Sustainability Principles (Sustainability Implementation Plan, TII)	• Transition to net zero	• Provide effective, efficient and equitable mobility • Ensure safe and resilient networks and services	• Collaboration for a holistic approach • Deliver end-to-end improvements • Create total value for society

Figure 5: Pillars of Sustainability

3.1.1 Environmental

It is essential for the project plan to improve air quality, reduce the use of fossil fuels and transition to a low carbon energy transport by accelerating a modal shift to public and active transport.

With regards to the environmental aspects of concern, the Environmental Impact Assessment process has identified the following significant environmental aspects detailed in the EIA Scoping Report:

- Human Health;
- Population;
- Biodiversity;
- Water;
- Land and Soils: Soils, Geology and Hydrogeology;
- Land Take;
- Air Quality;
- Climate;
- Noise and Vibration;
- Electro Magnetic Compatibility and Interference;
- Cultural Heritage;
- Material Assets: Infrastructure and Utilities;
- Material Assets: Traffic and Transport;
- Material Assets: Waste Management;
- Landscape and Visual Amenity;
- Risk of Major Accidents and Disasters; and
- Interactions between Impacts on Different Factors.

Urban Integration and Planning

Transport has become a critical issue as cities expand, congestion is increasing, and energy resources are getting scarce. The vision of Barry Transportation and Egis is that public transport projects, should be a tool to promote the cities of tomorrow, by including innovation in the design of the infrastructure and by using the light rail project as a foundation for urban planning strategy. These urban transformations are implemented through various means as below:

- Transit Oriented Development, which seeks to create or enhance centralities around the Luas Finglas, and particularly around Stops. The project facilitates integration of major urban development, contributing to the city's growth and socio-economic dynamism;
- The opportunity to recreate, refurbish and upgrade public spaces, which is of vital importance as the place where social interactions and cultural activities occur. It is a way to reshape the appearance and ambience of a city and to enhance social life;
- The opportunity to redefine the functionalities of the streets in order to re-order the shared space between all modes (cars, pedestrians, cycles and public transport). Dedicated spaces and landscaping enhancements along the line enhance the sense of safety, and smoother traffic flows;
- Consideration of the whole network in order to increase the connectivity of the city centre but also to extend the Luas network to suburban areas. Redesigning the existing public transport system to feed the Luas line to improve public transport performance, as it becomes more visible, integrated and understandable;
- The opportunity to promote active travel by providing for a modal shift from cars to public transport and cycle paths. It also provides for integration of the extension's terminus within a new multi modal transport hub including its the connectivity to the proposed park and ride facilities and bus stops with clear wayfinding and user-friendly layout.

These aspects, when studied together contribute to a higher attractiveness and quality of life in the areas served. Other means to include sustainability in the proposed project include:

- The infrastructure should be designed in such a way as to optimise resources and achieve maximum possible energy efficiency;
- The project aims to prioritise walking routes, increase social safety, ease the access and provision of secure parking for cyclists, inclusive gender and child safe streets, efficient mobility, allocate space for people and reclaim excess carriageway space and integrate adjacent spaces.

Further details are also included in the Urban Integration Report (Refer to Volume 5 – Appendix A21.2 of this EIAR). The project team is continuously liaising with Dublin City Council on careful integration of the alignment and stops with future redevelopment at particular nodes such as St Helena's, Finglas Village, Mellowes and Charlestown stops and also for mitigating anti-social behaviour as part of this approach.

3.1.2 Socio-Economic

In conjunction with the environmental impact assessment process there are also social-economic impacts associated with the works. The impacts are largely associated with the disruption caused during construction that is to be managed through positive engagement with the local stakeholders affected. This is detailed in the Engagement Implementation Plan, Engagement Plan and the Stakeholder mapping. Integral to this is the development of key stakeholder engagement, those stakeholders that have a direct and defined influence upon the design and construction of the route. This is captured in the Communications Plan.

The study area includes areas of high population density and pockets of social and economic disadvantage which will be assessed through a demographic analysis and through consultation with local bodies familiar with these issues locally.

The proposed Luas scheme will have a positive impact in facilitating access to community facilities in the study area, primarily by people living within and outside of the area who are not within convenient walking distance. It will also have a positive impact in providing people living in the study area with quicker and more convenient access to facilities outside of the study area, including the city centre and places of employment, especially for those people living further away from existing principal bus routes. This accessibility will provide local people with more opportunities in terms of access to employment, retail, and social facilities, and also provide benefits in terms of social and economic inclusion. The accessibility benefits will be realised particularly by people falling within lower CSO socio-economic categories, people with disabilities and those without access to a private car.

In addition, the proposed cycle paths alongside the line will enhance this accessibility providing further benefits in terms of safer and more convenient journeys and health benefits. There will be further effects in

terms of stimulating economic growth through enhanced access to employment opportunities to the benefit of both workers and employers, and by releasing the potential of unused lands for infill residential or business development.

Applying gender lens to the proposed Luas scheme will also provide a more complex understanding of mobility patterns and will help include public life opportunities into the design process.

Within the social and economic spheres, there are several specific areas where there is an opportunity for enhancement or further consideration in design and construction. These include:

- Aiding regeneration at adjacent re-development sites and increasing the range of transport options provided;
- Use of local supply chain to provide materials for construction;
- Local employment during development and construction and providing opportunities for apprentices and trainees;
- Provision of resilient infrastructure;
- Increased accessibilities between transport modalities;
- Public and stakeholder engagement;
- Minor intervention of seats at GAA pitches to provide more inclusive neighbourhood for multigenerational viewers of games and reduce social isolation in Finglas;
- Enhanced societal benefits to Finglas area by emphasis on place-making and public realm;
- Applying gender lens during design and public consultation; and
- Increased social benefits by provision of better and sustainable access to education and work.

Circular Economy

Circular economy couples growth to positive environmental and social outcomes. The key principles of circular economy include designing out waste pollution, regenerating natural systems and keeping products and materials in use.

Luas Finglas is a pilot project to incorporate circular economy objectives and principles. Project specific design opportunities will be identified to incorporate circular economy within the project followed by integration and implementation across all disciplines and stages of the project.

The circular economy approach benefits in the following ways:

- Value capture and reducing consumption of natural resources will result in cost savings to TII compared to the linear approach;
- Regeneration of natural systems contributes to a biodiverse environment and reinstation of self-sustaining systems. 90% of biodiversity loss and water stress come from resource extraction and processing;
- Minimising the carbon footprint of roads and rail will not only cost less, but also reduce infrastructure contribution to climate change;
- Reduction in consumption of unsustainable resources;
- Design to include for ease of recovery and disassembly of the trackform;
- Design accommodates future environmental conditions including accounting for climate change effects on rainfall, storm occurrences and temperature;
- Design includes soil testing plan and strategy for enabling soil reuse;
- Implementation of a circular economy strategy will reduce waste generation from projects, close loops and reduce planning risk; and
- Increase in energy efficiency by reducing energy demands for schemes and operating systems and the costs that come with this. Transition to responsible energy consumption adds to value capture and reduces climate change impacts.

Circular economy opportunities for the proposed scheme:

- Active travel and integration with wider network;

  - Facilitating active travel to minimise car use and trips on public transport, allowing for a range of transport modes on the same scheme;
  - Cycle lanes and footpaths can use surplus materials from construction to prevent removal from site e.g. demolition aggregate and recycled asphalt ;
  - Sharing of infrastructure e.g. stations between agencies, modes and routes.

- Regenerative design and natured-based solutions;

  - New trees, tree pits and planting for bioretention and stormwater management;
  - High value soil reuse (for example in tree pits);
  - Quantifying infiltration for new tree planting as part of landscaping to assist drainage design for the scheme;
  - Quantifying carbon sequestration by new tree planting.

- Infrastructure sharing and overlap in design needs;

  - Assess overlaps in design to avoid overspecification;

- Design for disassembly of trackside infrastructure;
- Design for deconstruction; and
- Bio-based trackside infrastructure.

Circular economy opportunities for the proposed scheme (including the above) are to be tracked by means of specific circular economy checklists developed for each stage of the process i.e Preliminary Design Report, Reference design, etc. and include the following:

- Landscape CE Checklist;
- Soil Re-Use CE Checklist;
- Trackform / Track Disassembly CE Checklist;
- Existing Buildings / Infrastructure & Streets CE Checklist; and
- Gender lens Checklist.

SECTION 4: LUAS FINGLAS SUSTAINABILITY VISION

BTEG, along with TII, commit to incorporate sustainability objectives for Luas Finglas scheme into the design, construction and operation of the Luas Finglas and thereby contribute to the economic efficiency, develop, protect, and enhance the environment and contribute to the overall well-being of society. This plan will complement the TII Statement of Strategy and the TII Sustainability Implementation Plan, both of which set the overarching approach to applying sustainability to all TII activities.

This plan establishes the framework for defining and addressing the key sustainability challenges, risks and opportunities for Luas Finglas and its effective and efficient long-term operation. The plan is to support consistency, collaboration, and action across the project to deliver and operate a more sustainable and resilient infrastructure and align the Luas Project to the UNSDGs and *Our Sustainable Future Themes* (National Implementation Plan 2018-2020).

The sustainability vision for Luas Finglas focuses on the following key points:

- **Reduce the environmental impact:** Protect, preserve, and improve the biodiversity, promote urban ecology, ecosystem services and biodiversity net gain.
- **Low carbon transport:** Provision of a low-emission light-rail. Carbon assessment and offset of carbon footprint.
- **Resource efficiency**: To minimise waste, to sustainably use and re-use materials and natural resource.
- **Infrastructure Resilience**: Provision of a reliable and climate resilient light-rail service.

- **Circular Economy:** Adopt the principles of circular economy to enable sustainable planning and land use management of natural resources and assets.
- **Regenerative or restorative design:** Creating resilient systems which integrate societal needs with nature.
- **Accessibility and sustainable growth:** To provide for integrated transport solution with better linkages between people, places and resources to drive economic activity and enhance regional productivity.
- **Active travel:** Reduced carriageway, increased pedestrian space and more accessible public areas.
- **Health and well-being:** Address air quality problems in urban and rural areas through better planning and design.
- **Engagement and collaboration:** Enhance collaborations, stakeholder, and public engagement.
- **Leadership**: Demonstrate leadership and commitment to sustainability through guidance to staff and suppliers.
- **Teamwork**: Effective teamwork, communication, and partnership.
- **Gender equality**: Applying gender lens to better address the complex understanding of mobility and inclusion of public life opportunities into the design process.
- **Societal benefits**: Emphasis on place-making and public-realm.

Figure 6: Luas Finglas Sustainability Vision

SECTION 5: SUSTAINABILITY OBJECTIVES

This section details on the sustainability objectives for the Luas Finglas under the 'three pillars' identified in the previous sections. It also details how the project design team will contribute to the fulfilment of these objectives in line with the UNSDGs, Our Sustainable Future Theme and TII Sustainability Principles. The sustainability aspects will cover not only design, but construction, maintenance and operations. Table 1 below lays down the sustainability objectives, measures, and metrics for the Luas Finglas. These measures and metrics will be further refined and streamlined as the project progresses.

UNSDGS are represented by the following references:

- SDG1- No poverty;
- SDG2- Zero hunger;
- SDG3- Good health and well-being;
- SDG4- Quality education;
- SDG5- Gender equality;
- SDG6- Clean water and sanitation;
- SDG7- Affordable and clean energy;
- SDG8- Decent work and economic growth;
- SDG9- Industry, innovation, and infrastructure;
- SDG10- Reduced inequalities;
- SDG11- Sustainable cities and communities;
- SDG12- Responsible consumption and production;
- SDG13- Climate action;
- SDG14- Life below water;
- SDG15- Life on land ;
- SDG16- Peace, justice, and strong institutions; and
- SDG17- Partnerships for the goals.

Our Sustainable Future themes are represented by the following references:

- SF1- Economy;
- SF2- Satisfaction of human needs by the efficient use of resources;
- SF3- Equity between generations;
- SF4- Gender equity;
- SF5- Respect for ecological integrity and biodiversity;
- SF6- Social equity;
- SF7- Respect for cultural heritage / diversity; and
- SF8- Equity between countries and regions.

TII Sustainability Principles:

- SIP 1- Provide effective, efficient and equitable mobility;
- SIP 2- Ensure safe and resilient networks and services;
- SIP 3- Collaboration for an integrated approach;
- SIP 4- Deliver end-to-end improvements;
- SIP 5- Transition to net zero; and
- SIP 6- Create total value for society.

Table 1: Sustainability Objectives, Measures and Governance

Sustainability Pillar	Luas Finglas Objectives		Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
Environment	Reduce our whole life carbon footprint across projects and operations	Reduce embodied carbon and green house (GHG) gas emissions	Calculate tCO2e (supplied by TII 'Carbon Assessment and Reduction Tool')	Assessment of key materials to focus carbon calculations as appropriate. Details of carbon calculations to be populated and continuously updated in the TII 'Carbon Assessment and Reduction Tool' and coordinated with standardisation of designs. Incorporate appropriate plans/strategies and scheme design to reduce carbon footprint and GHG emissions.	All sections of the PDR	All Chapters	8, 11, 12, 13	SIP 5	SF1, SF2, SF3	Dublin City Council Climate Action Plan 2019-2024	Environment (6,7)
		Incorporate measures to reduce energy consumption	Calculate kWh electricity per passenger km during operation using operation consumption forecasting tools (models) to assess effects of the measures outlined.	Consideration for the inclusion of solar to reduce energy requirements for substation buildings. Specific study for a solar energy source to be undertaken at the next stage of design.	Section 3 (Sustainability) Section 4 (Track Alignment) Section 5 (Track Systems) Section 6 (Power and Systems)	Chapter 13 - Air Quality Chapter 14 - Climate	7, 9, 11, 12, 13	SIP 5	SF1		Economy (2) Environment (6,7)
				The reference design will consider a wide operating temperature range for all electrical MV, Traction and LV equipment, which comply with the relevant standards. This approach aims to prevent the need for specific air conditioning, ventilation, or heating equipment/systems.						
				Optimise substation locations.							
		Provision of a low-emission light-rail. Carbon assessment and offset of carbon footprint.	Assess the reduction in road use emissions as a result of the proposed scheme.	The TII REM tool was used to model road use emissions for the opening year (2035) and the design year (2050).	Section 18 (Traffic)	Chapter 13 - Air Quality Chapter 14 – Climate Chapter 18 - Traffic and Transport	9, 12, 13	SIP 5	SF1, SF2		Environment (6,7) Physical Activity (10)
			Secure bicycle storage spaces as % of expected peak passenger numbers. Calculate for % use of park and ride spaces and shift in mode of transport.	Promote active travel through the provision of bicycle and walking tracks along the route. Cycle parking facilities are provided at each of the new Stops to support Cycle-Light Rail Vehicle (LRV) trips and further encourage sustainable travel choices. The provision of the P&R facility at this location will encourage M50 road users to use public transport for convenient, sustainable travel into the city centre.	Section 7 (Roads and NMU facilities)						
	Enhance resource efficiency	Provision of waste minimization and management	Optimised number of construction phases	To facilitate optimised construction phases, it is programmed that multiple sections will be progressed at the same time to optimise the programme duration. This approach will in turn lessen the duration of potential environmental impacts.	Section 20 (Construction phasing)	Chapter 6 – Construction Activities Chapter 19 – Resource & Waste Management	12, 14, 15	SIP 2, SIP 6	SF1, SF2, SF5	Eastern Midlands Regions Waste Management Plan 2015-2021	Environment (6)
			% Landfill diversion (excluding contaminated ground encountered)	Management Plans including method statements will be developed for excavations and construction activities that may encounter contaminated or hazardous material.	Section 8 (Earthworks)						

Sustainability Pillar	Luas Finglas Objectives		Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
			% of soil reuse for new tree planting	The soil recovered from on-site works will be assessed for suitability for use in new tree plantings and filling tree pits. The Construction & Demolition Resource and Waste Management Plan (CDRWMP) has been developed to facilitate reuse and recycling and divert waste from landfill.							
			% Vegetal to compost % Concrete and asphalt waste managed for reuse % Road equipment sent back for reuse	An inventory of all existing materials within permanent and temporary boundaries of the scheme (i.e. existing streetscape, footpaths, road pavement, structures, walls, fencing, etc.) is to be completed to explore reuse potential. Waste material arising from construction will be reused on site where possible, or otherwise sent to a suitably licenced waste facility, or given back to the local road authority (DCC) (stone curbs, road equipment such as signage).	Section 8 (Earthworks)						
		Incorporation of sustainable and recycled material [Also see Economic – Circular Economy]	Calculation of material recycled	The CDRWMP will include methods for recycling / reuse of waste. During construction the proposed Scheme has a commitment to source at least 20% (by weight, volume, value) of materials from re-used or recycled sources. The project will source concrete with 50% Ground Granulated Blast furnace Slag (GGBS) and also investigate the potential for also consider the utilisation of recycled aggregate types (e.g 6F2) from footpaths, walls, etc. under Article 28 – End of Waste.	Section 19 (Environment)	Chapter 19 – Resource & Waste Management	8, 9, 11, 12	SIP 5	SF1, SF2		
	Reduce the environmental impact	Assess biodiversity enhancement	Results of biodiversity net gain trial	The Biodiversity Specialist has undertaken Biodiversity Net Gain Trials as part of the preliminary design and has extended this to the entire scheme for the detailed design stage. Where necessary, mitigation measures will be outlined to avoid, negate or minimise adverse construction and operational phase impacts on identified ecological features or designated sites.	Section 19 (Environment)	Chapter 9 - Biodiversity	11, 12, 14, 15	SIP 6	SF3, SF5	Draft Dublin City Biodiversity Action Plan 2021-2025, Dublin City Council (2021); All Ireland Pollinator Plan 2021-2025, National Biodiversity Data Centre (2021).	Environment (6,7)
		Incorporation of SuDS systems, particularly nature based solutions	Comparison of attenuation requirements – oversized piping vs nature based solutions	A robust assessment of impact to water quality and hydrology was undertaken as part of the EIAR process. Relevant water quality and flood mitigation measures will be implemented as identified. SuDS based systems have been used to dispose of surface water runoff generated by the proposed development where possible. The reference design will also consider SuDS systems including: rain gardens and bio-retention areas, infiltration trenches, vegetated wetland and filter strips.	Section 9 (Drainage)	Chapter 10 - Water	3, 6, 9, 11, 12, 13, 14, 15	SIP 3	SF3, SF5	River Basin Management Plan 2018-2021	Environment (6)

Sustainability Pillar	Luas Finglas Objectives		Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
		Monitor air quality and climate	Air quality surveys to determine nitrogen dioxide levels, modelled PM10 emission reduction	Continuous PM10 and PM2.5 monitoring is undertaken at the EPA monitoring station at Finglas Garda Station in the centre of the Study Area. A Dust Management Plan will be developed and implemented as part of construction phase mitigation measures. A local air quality assessment to calculate NO2, PM10 and PM2.5 concentrations at representative worse-case human sensitive receptors within the air quality study area has been undertaken using the TII REM Tool.	Section 19 (Environment)	Chapter 6 – Construction Activities Chapter 7 - Human Health Chapter 8 – Population Chapter 13 - Air Quality Chapter 14 - Climate	3, 9, 11, 12, 13, 14, 15	SIP 2, SIP 3, SIP 6	SF5, SF6	Draft Dublin Region Air Quality Plan 2021	
		Monitor noise and Vibration	Noise surveying and modelling number of noise sensitive receptors in the vicinity of the scheme	Following an assessment of the baseline environment and predicted modelling of the construction and operational phases, additional mitigation measures were identified. A full monitoring and auditing programme will form part of the Construction Noise Vibration Management Plan. The project design will maximise the use of green track which will result for landscaping, reducing of urban heat island intensity in better passenger comfort and minimise noise and vibration. The current reference design for the Luas line extension includes 2.8km of grass track, 700m of embedded track and 360m of structure track.	Section 19 (Environment) Section 5 (Track Systems)	Chapter 6 – Construction Activities Chapter 7 - Human Health Chapter 8 – Population Chapter 15 - Noise and Vibration	3, 9, 11, 12, 15	SIP 2, SIP 3, SIP 6	SF5, SF6	Dublin Agglomeration Noise Action Plan for the Agglomeration of Dublin 2018-2023	
		Improvement of traffic and transport	% Change (increase / reduction) in traffic queuing % Increased usage of active travel in vicinity of scheme	An assessment of the baseline traffic environment was undertaken, and a local area model was completed to determine the impact in traffic flow. Traffic management plan will be implemented during construction stage to minimise any impacts. The Scheme is accompanied by active travel infrastructure along most of the route facilitating local connectivity between communities via walking and cycling. During the operational phase of the development typical mitigation measures may include signal optimisation to provide required level of priority to vulnerable road users and the LUAS while at the same time limiting the impact on general traffic. Cycle parking facilities are provided at each of the new Stops to support Cycle-Light Rail Vehicle trips and further encourage sustainable travel choices.	Section 18 (Traffic)	Chapter 18 - Traffic and Transport	3, 9, 10, 11, 15	SIP 1, SIP 2	SF6	Draft Dublin Region Air Quality Plan 2021	Environment (6,7) Integration (5)
			% Cycle track network that utilises existing streets	Some streets will be suitable for use as shared streets and thus avoids the need for creation of separate pavements for cycle tracks.	Section 7 (Roads and NMU Facilities)						

Sustainability Pillar	Luas Finglas Objectives		Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
			% Cycle track and footpath network draining into grass verges as opposed to directly into surface water sewer	Where possible paved areas have been converted to grass to provide for SuDS. The absorptive capacities of the grass and subsoil cause a reduction in the volume of surface water reaching the existing piped surface water sewers. The grass and subsoil also provide a measure of treatment to the surface water runoff, reducing the amount of silts and contaminants that enter the piped surface water sewers.	Section 7 (Roads and NMU Facilities)						
		Improvement of the landscaping and Visual Amenity (LVIA)	Surveys to establish sites of special significance within study area, % of sites under threat of degradation	A series of biodiversity surveys has been carried out. The Landscape team liaised with the cultural heritage team to ascertain if any cultural heritage features rely on landscape setting for their importance, and also with the ecological team to understand the biodiversity value of any trees or riparian vegetation which may be affected by the proposed Luas extension. A series of mitigation and management measures are proposed to avoid, reduce or remediate, wherever practicable, significant negative landscape (streetscape) and visual effects of the Construction and Operational Phase of the proposed Scheme. The project design will also provide for: Improvement of the landscaping adjacent to the Luas corridor. Providing visual screening between the Luas corridor and stops and visually sensitive properties or areas of sensitive landscape character using a mixture of landform and / or planting. Reconnection of severed and fragmented habitats and creation of green corridors and compensation planting within project corridor. Ensuring adequate space is maintained below bridges to allow for continuation of access and riparian strips.	Section 11 (Urban Integration)	Chapter 21 - Landscape and Visual Amenity	9, 11, 15	SIP 1, SIP 3	SF3, SF5, SF6, SF7	Fingal Development Plan 2017-2023, Dublin City Development Plan 2016-2022, Draft Dublin City Development Plan 2022-2028.	Environment (6)
			Use of Jan Gehl's public life tools results to assess the benefits of the proposed project on the public life in the study area	Using public life tools for surveys such as 'People Moving Count'. 'Stationary Activity Mapping', 'Age and Gender Tally' and 'Twelve Urban Quality Criteria' to understand the current use of public spaces and the impact the proposed project has on these spaces post development. Gender focused questionnaires to be incorporated into the Population assessment. By measuring certain aspects of public life, it identifies design interventions that can ensure that the potential impact of the scheme is reduced and public benefits are enhanced. The scheme will be designed to provide better access to education, better access to work, designing for women's safety, designing for children, etc.							

Sustainability Pillar	Luas Finglas Objectives		Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
		Assessment of Historic and Cultural Environment	Surveys to determine number of designated heritage sites within study area and % to be impacted	Baseline archaeological assessment to be undertaken by project archaeologist to determine and establish sites with archaeological value within the immediate and surrounding areas, to help protect and enhance these sites, and where required identify sufficient mitigation measures.	Section 19 (Environment)	Chapter 20 - Cultural Heritage	9, 11, 12, 15, 16	SIP 6	SF7	Fingal Development Plan 2017-2023, Dublin City Development Plan 2016-2022, Draft Dublin City Development Plan 2022-2028.	Environment (6)
		Assessment of Land and Geology	Application of geology and soil impact mitigation measures both in design and construction	A detailed ground investigation was undertaken to establish a route-wide ground model which will inform structures, earthworks and drainage design. An accurate ground model reduces ground related construction risks, facilitating more efficient design thereby reducing the unnecessary use of carbon intensive materials. Another key sustainability objective will include the re-use of site-won materials and minimisation of off-site disposal. Laboratory testing of soil and rock samples has allowed appropriate material classifications which in turn has informed re-use and disposal options during the construction phase.	Section 14 (Land use and accommodation works) Section 8 (Earthworks)	Chapter 11 - Land and Sols: Soils, Geology and Hydrogeology	12, 13, 15	SIP 2, SIP 3, SIP 6	SF5, SF7	Fingal Development Plan 2017-2023, Dublin City Development Plan 2016-2022, Draft Dublin City Development Plan 2022-2028.	Environment (6)
Social	Enhance collaborations, stakeholder, and public engagement.	Public consultation events Public information (mailing, billposting) Public engagement surveys/ questionnaire Jan Gehl's Public life tools and survey	Collaborate with local authorities (Dublin City Council / Fingal County Council) in the area. Ensure that stakeholders are provided with sufficient and appropriate information at key stages throughout the lifecycle and that public perception and acceptability of a proposal is considered. The constructive feedback from the consultation process has enabled a reference design to progress in order to apply for a Railway Order.	All	All Chapters	8, 9, 11, 12, 16, 17	SIP 4	SF6	Fingal Development Plan 2017-2023, Dublin City Development Plan 2016-2022, Draft Dublin City Development Plan 2022-2028.	Accessibility & Social Inclusion (8,9)
		Use of BIM for developing the scheme design	Use of BIM drives better collaboration within the project team and makes an efficient use of digital information to reduce design risks and enhance quality in the project's deliverables. It enables more accurate tender pricing and improved Construction Planning. It enables the collaborative development and implementation of the design through a robust information-sharing approach.								
	Demonstrate leadership and commitment to sustainability through guidance to staff and suppliers. Effective teamwork, communication, and partnership.	Development of Sustainability Tracker for each stage of the project	Report sustainability principles, activities, goals and progress. Support development of Finglas as a key centre within the Greater Dublin Area.				8, 17	SIP 3	SF3, SF6	Dublin City Council Climate Action Plan 2019-2024	Accessibility & Social Inclusion (9)

Sustainability Pillar	Luas Finglas Objectives	Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
	Applying gender lens to better address the complex understanding of mobility and inclusion of public life opportunities into the design process.	Use of Jan Gehl's public life tools Use of public engagement surveys / questionnaires	Applying TII gender lens to enable inclusion of public life opportunities into the design process. Using Jan Gehl's public life tools surveys such as 'People Moving Count' and 'Age and Gender Tally' and public engagement surveys and questionnaire forms to capture the age and gender of the people moving through the study area or spending time in these public spaces pre and post development. The gender -focused questionnaires and the Jan Gehl's Participant Survey will also help capture the public life in the area and to evaluate any gender-based constraints which could be addressed through scheme design.			5	SIP 6	SF4	Fingal Development Plan 2017-2023, Dublin City Development Plan 2022-2028.	Accessibility & Social Inclusion (9)
	Provision of landscaping and urban integration measures	Application of landscaping and urban integration mitigation measures in both design and construction	Lighting design developed in conjunction with the ecologist to limit the impact on bats. Security features, such as lighting, emergency call points, and CCTV are to be considered as part of the gender lens and within the designs.	Section 11 (Urban Integration) Section 19 (Environment)	Chapter 21 – Landscape and Visual Amenity	11	SIP 2	SF1	Fingal Development Plan 2017-2023, Dublin City Development Plan 2022-2028.	Environment (6)
	To maintain health, safety, and wellbeing and address air quality problems in urban and rural areas through better planning and design.	Model km of cycle lanes connected to Luas Finglas, number of bicycle spaces, %change in users, number of transport hubs	Creating safe, segregated, family-friendly cycle and walking paths along much of the route will provide for improved connectivity in the same manner as Luas, but allowing for direct accessibility to destinations between stops (including shops, workplaces, community facilities and parks), improving the quality of life for all. Also, to provide secure and adequate cycle storage facilities and safe, efficient and convenient access to different transport modalities. Enhancement of pedestrian routes is proposed by widening footpaths and to ensure that accessibility of public transport stops and stations for local communities is maintained and enhanced.	Section 7 (Roads NMU facilities)	Chapter 7 - Human Health Chapter 8 – Population Chapter 18 - Traffic and Transport	3, 5, 10, 11, 13	SIP 6	SF2, SF6	Draft Dublin Region Air Quality Plan 2021	Environment (6,7) Physical Activity (10)
Economic	Provision of resilient infrastructure	Whole life cost analysis	Whole life considerations to be included to support design decisions.	All	Chapter 17 – Material Assets: Infrastructure & Utilities	8, 9, 11, 12	SIP 2	SF1	Dublin City Council Climate Action Plan 2019-2024	Economy (1) Integration (5)
	To provide for integrated transport solution with better linkages between people, places and resources to drive economic activity and enhance regional productivity.	Calculate % of km travelled on sustainable transport modes. Number of transport interchanges	Ensure there is access to different transport modalities for all users, and ensure access to these modalities is convenient, frequent, efficient and safe. Sustainable procurement and a shift to use of sustainable modes of transport that are cost-effective and accessible with frequent, efficient, convenient public transport links and encourage more sustainable patterns of travel behaviour. The Scheme is accompanied by active travel infrastructure along most of the route facilitating local connectivity between communities via walking and cycling. The current proposed route provides interchange opportunities with bus networks at 3 of	All	Chapter 18 - Traffic and Transport	3, 10, 11, 13	SIP 1	SF2, SF6	Fingal Development Plan 2017-2023, Dublin City Development Plan 2022-2028.	Integration (4) Environment (6,7)

Sustainability Pillar	Luas Finglas Objectives	Potential Metric	Project Design Team Action	Preliminary Design Report Sections	EIAR Chapter	UNSDGs	TII Sustainability Implementation Principles	Our Sustainable Future Theme (National Implementation Plan)	Regional and Local Area Plan Objectives	Appraisal Objectives - Business Case
			the 4 proposed stops and to the rail network via the existing Luas Broombridge stop.							
	Adopt the principles of circular economy to enable sustainable planning in land use management of natural resources and assets.	Estimated tonnes material per passenger km route.	The Scheme is designed to be resource efficient, minimising the use of materials, energy and other resources in order to reduce environmental impacts and costs; and implement a circular approach to the use of materials.	All	All Chapter	8, 9, 12, 13	SIP 3, SIP 5	SF1, SF3	Eastern Midlands Regions Waste Management Plan 2015-2021	Environment (6)
		Whole life cost analysis / Estimated % materials diverted from waste streams.	The Luas and its infrastructure has been designed for modular construction to allow for high value reuse, easy repair and disassembly.	Section 5 (Track systems)						
		Calculate % reuse of excavated materials onsite.	The current reference design includes the provision to re-use approximately 13,000 m³ of site excavated materials. This is to be developed as part of EIAR. Pavement Designer to Confirm Allowable % of Recycled Material to determine potential material re-use.	Section 8 (Earthworks)						
		Calculate % reuse of excavated materials onsite.	Cycle lanes and footpaths can use surplus materials from construction to prevent removal from site e.g. demolition aggregate and recycled asphalt.	Section 7 (Roads and NMU facilities)						
		Calculate % minimum non-virgin sourced materials (steel, aggregates etc) by mass.	Sharing of infrastructure e.g. stations between agencies, modes and routes. Assess overlaps in design to avoid overspecification. Bio-based trackside infrastructure. Use of concrete with 25% and 50% Ground Granulated Blast furnace Slag (GGBS).	Section 10 (Structures)						
		% Cycle tracks utilising existing site won material	The proposed scheme includes plans to reuse surplus materials from construction to prevent removal from site e.g. demolition aggregate and recycled asphalt.	Section 3 (Sustainability)		11	5	SFT 2	Eastern Midlands Regions Waste Management Plan 2015-2021	Environment (6)
		Design Coordination	Coordinated approach and sharing of infrastructure e.g. lighting and cameras between organisations and transport modes. Assess overlaps in design to avoid overspecification. The scheme has been designed to include fully segregated pedestrian and cycling infrastructure to prevent conflict between these modes. The current proposed route provides interchange opportunities with bus networks at 3 of the 4 proposed stops and to the rail network via the existing Luas Broombridge stop. The scheme includes automated fare collection.	Section 3 (Sustainability)		9,5	3	SFT2, 4	Fingal Development Plan 2017-2023, Dublin City Development Plan 2016-2022, Draft Dublin City Development Plan 2022-2028.	Economy (1)
		Design Integration								

SECTION 6: RESOURCE EFFICIENCY

6.1 Material Resource Efficiency Plan

6.1.1 Introduction

This section details the Material Resource Efficiency Plan which has been formulated in line with WRAP Guidance *Designing out waste: a design team guide for civil engineering*. This plan seeks to minimise waste generation and optimise material usage through design, while incorporating the overarching circular economy objectives of the project.

Waste is an important aspect of sustainable construction and solutions to minimise waste are generally two-fold, with these actions also playing a role in reducing the carbon footprint of the scheme. Design measures implemented to achieve carbon savings are presented in Section 7.

6.1.2 Approach

In developing the approach to designing out waste, opportunities to improve resource efficiency and reduce waste have been identified in line with the 5 key principles;

- Reuse / recovery;
- Off-site construction;
- Materials optimisation;
- Waste efficient procurement; and
- Deconstruction and flexibility.

Measures proposed within the scheme that contribute to material resource efficiency are outlined in Table 2 below.

Table 2: Material Resource Efficiency Opportunities

Designing Out Waste Principles	Key Considerations	Opportunities within the Scheme
Reuse / Recovery	Balancing cut and fill quantities presents an opportunity to optimise resources by effectively managing earthworks.	Material excavated to facilitate the alignment is incorporated for reuse within the landscaping plan.
	Consider the use of PFA or GGBS in concrete.	Structures will incorporate both 25% and 50% GGBS concrete while the trackform will include 50% GGBS concrete. It is anticipated that 60% of the concrete used within the P&R facility will be 25% GGBS.
	Reuse of existing pavements.	There is limited scope to reuse concrete paving (due to the presence of rebar in the concrete), however, bituminous paving can be recycled once processed.
	Design the site layout to incorporate existing topography and features.	The proposed alignment has been designed to navigate through two mounded landforms associated with the historic landfill within Tolka Valley Park.
	Pre-demolition audit of buildings to identify suitable materials to be recycled.	Develop an inventory of all existing materials within permanent and temporary boundaries of the Luas Finglas Scheme to explore reuse potential.
	Explore reuse opportunities e.g. as a by-product (Article 27) or as end of waste (Article 28).	Opportunities to reuse soil are outlined within the Soil Reuse Checklist.
	Reuse of existing components, such as drainage infrastructure.	Where existing roads are being realigned, existing gullies will be retained where possible.

Designing Out Waste Principles	Key Considerations	Opportunities within the Scheme
Off-site Construction	Incorporation of modular components to reduce waste.	The Luas trackform has been designed for modular construction to allow for high value reuse, easy repair and disassembly.
	Options for off-site construction will be considered in order to minimise waste	Main steelwork fabrication of structures will take place off-site and will be assembled and erected in place. Ancillary steelwork, like parapets will be fabricated off-site and installed.
Materials Optimisation	Components designed for durability and longevity to minimise replacement frequency, where possible.	All structures will be designed to meet Eurocode working life requirements – for bridges it is 120 years. This requirement applies to the main structural elements of the bridge – concrete slab, steel girder, segmental arches, and spandrel walls as well as piers and foundations.
	Incorporate maintenance-friendly features to prolong the lifespan of components.	The current reference design proposes a weathering steel material for bridge superstructures, which does not require maintenance, eliminating the need for the application of a corrosion protection paint system.
	Inclusion for standardised components to facilitate interchangeability, reducing the need for custom manufacturing.	The proposed design specifies standardised dimensions to ensure consistent future stock.
Waste Efficient Procurement	BIM and material data integration.	The design team are currently using a BIM model which will streamline collaboration and ultimately reduce waste through accurate design. It is estimated that approximately 20% of material waste can be prevented using BIM.
	Consider the sequence of work and the manner in which this can reduce waste.	Multiple sections of the scheme will be progressed at the same time and these will be coordinated from primary construction compounds, allowing for centralised material storage and maximum reuse opportunities.
	Identify where the potential waste streams are likely to occur in order to manage these streams efficiently.	An assessment of the predicted key demolition waste generated on the scheme was undertaken and it was predicted that an overall recovery rate of 95% can be achieved for C&D wastes (excluding soils and stones).
	Designing structural elements that can be constructed efficiently.	Certain concrete elements will include precast components (deck formwork panels and / or bespoke earth retaining elements).
Deconstruction and Flexibility	Design for disassembly to reduce the cost of waste disposal and separation upon replacement.	The Disassembly of Track Checklist has been established to ensure the number and complexity of disassembly steps are low.
	Design flexible spaces that can adapt to future changes to the line without major alterations.	The terminus design will include flexible adaptations to facilitate the potential future extension of the line.

SECTION 7: CARBON SAVINGS

7.1 Background

The TII Carbon Tool has been developed for Luas Finglas to allow the design team to compare and evaluate the lifecycle carbon impacts of design options at each stage of the project. Details of carbon calculations are populated and continuously updated in the TII 'Carbon Assessment and Reduction Tool' in coordination with the evolution of the design. A number of measures have been incorporated into the scheme design to reduce carbon footprint and GHG emissions.

7.2 Carbon Reducing Measures

The design includes a number of intrinsic considerations that will assist in the reduction of carbon (e.g. optimised gradients to reduce operational energy demand and reducing stop / go movements by combining road junctions in close proximity and increasing fully segregated sections to allow trams longer coasting at low energy consumption).

Alongside these design considerations, the proposed scheme includes a number of specific measures that include a quantifiable reduction in carbon, as outlined below.

Table 3: Carbon Reducing Measures

Measures included within Design	Rationale for Carbon Reduction	Reduction (tCO2e)
Maintaining existing tree corridors, where possible to minimise tree clearance.	Carbon storage associated with existing trees.	483.42
Habitat retention creation and enhancement. Carbon storage associated with habitats and gains in vegetated land.	1.27ha of Transitional Woodland Scrub has a carbon sink of 34.5tCO2e while 1.62ha of Mixed Forest has a carbon sink of 160.38tCO2e	194.9
Incorporation of concrete with 25% or 50% ground granulated blast furnace slag (GGBS) to reduce the carbon footprint.	Use of GGBS results in a reduction of 1025.95tCO2e across bridges and trackform. It also results in a reduction of 6621.52tCO2e for the Park & Ride (assuming 60% of concrete associated with the Park and Ride is GGBS).	7647.47
Proposed Vignole grass-track.	The design indicates >50% reduction in structural concrete.	729.42
Proposal to reuse approximately 4,000m3 of site won material to reinstate an existing void at the stabling site.	Sending 4,000m3 of soil to landfill would involve 4.96tCO2e associated with waste processing and 0.02tCO2e associated with transportation.	4.98
Larger construction site areas to facilitate optimised construction phases and reduce the transportation of waste.	Represents a 5% reduction in the transport of waste.	0.005
Provision of satellite compounds to reduce travel distances to reduce the overall fuel consumption associated with the construction phase.	Reduced travel represents a 5% reduction in fuel consumption during construction.	3.553
Inclusion of a solar array on the roof of the Park & Ride.	The proposed solar array generates 319,500kWh. This amount of electricity from the grid equates to 96.16tCO2e.	96.16
Implementation of nature-based SuDS solutions.	Nature-based SuDS solutions avoids 9,484m of 1.2m diameter concrete culverting.	4861.88

SECTION 8: GOVERNANCE

For the successful and efficient delivery of the sustainability objectives good practice governance will be required. The implementation of the objective will be managed by the Sustainability Lead.

The key roles and duties of the Sustainability Lead (and the design team) will include:

- Prepare sustainability plans;
- Implementation of TII carbon assessment tool;
- Deliver sustainability objectives against measurable targets and indicators;
- Report and keep track of sustainability measures and plans as detailed in Section 5 above;
- Liaise with other team leads and sub-consultants to ensure sustainability targets are met and integrated across all disciplines; and
- Communication and raising awareness of sustainability requirements throughout all levels.

The ongoing review and updating of the Sustainability tracker for all stages of the scheme will be managed by the Sustainability Lead.

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